



The TRELIS™ Real-Time Infrastructure Optimization Platform

User Guide

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TABLE OF CONTENTS

Product Overview	1
Platform Architecture	1
Platform services	1
TRELLIS™ platform modules	2
TRELLIS™ Intelligence Engine	2
TRELLIS™ platform RESTful API	3
Avocent® Universal Management Gateway Appliance	3
Bulk Data Processing Tool	4
Avocent® DSView™ Management Software Access	4
Common Access Card (CAC) Access	4
Mobile Access	5
Installation Overview	5
User Interface (UI) Overview	7
Getting Started	7
Launchpad	7
Understanding the UI	8
Using Menus	12
File menu	12
Quick Launch menu	12
Administration menu	13
Using Search Panel Accordions	13
Catalog of available devices	13
Inventory list of devices	15
Capacity Search	17
Using Properties Panel Accordions	18
Using Views in the Workspace	19
Portfolio View	19
2D Graphical View	22
Using levels	24
3D Graphical View	27
Elevation View	29
Device views	31
Viewing events	31
Basic Configuration	33
Using the Licensing Menu	33
User Management	33
Assigning scalable permissions	34
Working with users	34
Managing account and password policies	35
Custom Header Authentication	37
Working with user groups	39
Working with roles	42

Viewing and Modifying System Configuration	48
Viewing Server Status	49
Viewing Server Topology	49
Configuring email and SMS notification servers	51
Modifying the online help file location	51
Using the Alarm Settings screen	51
Using the SNMP Trap Destination screen	52
Configuring server logs	52
Using the Scheduler for tasks	53
Using the Notifications Menu	55
Configuring an account notification	55
Configuring notification templates	56
Using notification rules	57
Configuring a periodic notification test	58
Using the Configuration Menu	58
Configuring power-phasing nomenclature for a building	58
Configuring user-defined properties for a device category	59
Collection Settings	60
Configuring Hovers	61
Configuring units of measure	62
Configuring global thresholds on sensors	62
Integrating Avocent® DSView™ management software	63
Heat Map Legend	64
Data Collection Engine	67
Intelligence Engine Services	67
Encryption	68
Service Processor Support	68
Firewall Ports	69
General Information	69
Default install options	69
Installing the Intelligence Engine	70
Stopping, Starting and Restarting the Intelligence Engine	71
Stopping the Intelligence Engine	71
Starting the Intelligence Engine	72
Restarting the Intelligence Engine	72
Status of the Intelligence Engine Services	73
Registering the Intelligence Engine	73
Replacing the Intelligence Engine	74
Unregistering the Intelligence Engine	74
Uninstalling the Intelligence Engine	75
Uploading and Upgrading the Avocent® Universal Management Gateway Appliance Firmware	75
Adding the Avocent® Universal Management Gateway Appliance to the Inventory	76
Registering the Avocent® Universal Management Gateway Appliance Engine	77
The TRELIS™ Inventory Manager Module	79

Understanding Your Environment	79
Working With Data Centers and Buildings	80
Working With Floors	81
Creating and deleting a floor	81
Adding a text label to a floor	82
Working With Spaces	82
Creating and deleting a space	83
Understanding Consumption Capacities	84
Working with floor and space capacities	84
Working with power capacities	86
Working with heat capacities	87
Working with air flow capacities	88
Working with blade slot capacities	89
Working With Standard and Unusable Zones	89
Creating unusable zones	90
Working With Racks	91
Adding and deleting a rack	91
Selecting and moving one or more racks	92
Copying and pasting racks	92
Rotating a rack	93
Modifying rack properties	93
Tracking assets in a rack	94
Working With Devices	98
Adding a device	98
Moving a floor-mounted device in a space	98
Using the Placement accordion	99
Moving devices to containers in Elevation View	99
Placing devices in zero-U (0U) space in a rack	99
Placing a device on different floor levels	100
Copying and pasting a device	101
Rotating a device	102
Restricted access	102
Storing devices in Unplaced Inventory	102
Using device placeholders	103
Assigning device properties	103
Creating device groups	106
Understanding Consumption and Operational Thresholds	107
Configuring consumption thresholds	107
Operational thresholds for a parametric data point	107
Operational thresholds for an enumerated data point	108
Configuring a device for monitoring and data collection	108
Working with Power Connections	111
Power connections in the Beta UI	112
Managing Panelboards	112

Working with Data Connections	117
Assigning data connection properties	117
Configuring data connections in Portfolio View	119
Data connections in the Beta UI	119
Configuring data connections in 2D Graphical View	120
Deleting a data connection	121
Working With Colorization	121
Zone colorization	121
Available rack space	122
Rack space consumed	122
Reserved rack space	123
Rack power remaining	123
Critical infrastructure equipment	123
Consumed blade slots	124
Environmental conditions	124
Creating and deleting user-defined colorization	124
Working With Catalog Symbols and Element Libraries	126
Locating and replacing symbols	126
Submitting a new symbol request	127
Upgrading a symbol in the catalog	128
BMS Integration, Symbol and Element Libraries	129
Importing Data	132
Importing a floor	132
Validating imported devices	133
Importing an AutoCAD Floor Plan to Use as a Background	133
Software tool requirements for image conversion	134
Loading, cleaning and converting a floor plan	134
Scaling the .svg file and editing the final file dimensions	135
Importing the .svg file as a background	136
Drawing squares and polygons on the imported background	136
Exporting Inventory	137
Exporting a floor or a building from Portfolio View	137
Exporting devices	138
Understanding Change Planning	138
Managing projects	139
Project workspace	140
Project toolbar	140
Managing project tasks	141
Using the Device Timeline	143
Using the DSView™ Software Session	145
The TRELIS™ Power Systems Manager Module	147
Module Requirements	147
About Switchgear Equipment	148
Adding Switchgear	148

Changing switchgear properties	148
Adding switchgear components	149
Adding a busbar to switchgear	149
Adding breakers and switches to switchgear	150
Making Power Connections	151
Creating power connections in Portfolio View	151
Creating power connections in Graphical View	153
Configuring power port connections in Graphical View	153
Managing Load Accumulation Power Connections	154
Understanding the One Line Diagram	155
Using the One Line Diagram View toolbar	156
Using symbols for the one line diagram	157
Creating and reading the one line diagram	160
Creating a one line diagram for multi-equipment systems	161
Viewing connection states	161
Displaying dependent devices from a one line diagram	161
Displaying updated data point values on the one line diagram	162
Overriding one line diagram port expressions	162
Building Power Systems Dashboard	164
Capacity Trend Dashboard	164
The TRELIS™ Site Manager Module	165
Understanding Energy Insight and Efficiency	166
Understanding Power Usage Effectiveness (PUE)	166
Understanding Data Center Infrastructure Efficiency (DCiE)	167
Configuring PUE levels	167
Understanding Element Libraries	173
Factory element library	174
Custom element library	174
Using element libraries	175
Understanding Detailed Device View	176
Dashboard tab	177
Configuration tab	177
Additional Data Points tab	177
Control tab	177
Dry Contacts tab	178
Understanding Service Processors (SPs)	182
Monitoring a device using an SP	182
Discovering and mapping an SP	183
Using the Stop Monitoring feature for SPs	184
Monitoring iCOM-S Devices	185
Placing and Moving Sensors in Racks	188
Sensor Locations in Elevation View	188
Sensor Locations Portfolio View	189
Configuring Alarms	192

Viewing and assigning alarm severity levels	192
Renaming the default alarm severity	193
Assigning active alarms	193
Assigning alarms by floor or space	194
Assigning alarms by equipment	194
Acknowledging alarms	194
Clearing alarms	194
Adding comments to alarms	195
Suppressing alarms	195
Managing threshold alarms	196
Configuring SNMP traps	196
Configuring Maintenance Mode	197
The TRELIS™ Process Manager Module	199
Process Manager Administration	199
Organization	200
Process Manager Roles	200
Calendar	200
Organization Units	201
Parametric Roles	201
Extended User Properties	202
Flex Fields - Public and Protected	202
Task Administration	203
Approval Groups	203
Evidence Search	203
Task Configurations	203
Process Dashboard	203
Process Workspace	204
Process Request	204
Process Tracker views	228
Task list views	229
Process reports	229
Smart Install	230
Business Process Composer	233
Process Service	234
The TRELIS™ Thermal Systems Manager Module	237
Working With Thermal Views	237
Displaying Thermal Heat Maps	239
Reports	241
Report Permissions	241
Using the Folders Menu	242
Using Report Templates and Folders	242
Creating a personal folder under a user folder for reports	244
Adding a report template to a personal folder	244
Using Report Filters	245

Creating a custom filter	245
Running a Report	247
Editing a Report	247
Exporting a Report	248
Formatting a Report	248
Scheduling a Report	249
Ad Hoc Reports	249
Data Management	257
Understanding Spreadsheets	257
Data received from the server	258
Connection spreadsheets	259
User-defined properties	259
Update Port and Slot Names	259
Using the Tool	259
Spreadsheet Types	263
Buildings	263
Floors	264
Rectangular Spaces	265
Flexible Spaces	266
Zones	268
Racks and Cabinets	269
Rack Mounted Devices	271
Floor Mounted Devices	272
Blades	273
Components	274
Rack Mounted Devices (Zero U)	276
Power Strips for Floor-Mounted Devices (FMD)	277
Generators	278
UPS	280
PDUs	281
Remote Power Panel (RPP)	282
Panels	284
Breakers	285
Breaker to PowerStrip	286
Breaker to Device	287
PowerStrip to Device	288
Data Connections	289
Update Port Names	289
Update Slot Names	290
Placement Types	291
Appendices	293
Appendix A: CAC Certification	293
Appendix B: Platform Shut Down and Restart	294
Windows operating systems	294

Linux operating systems	296
Appendix C: Certificate (SSL/TLS) Replacement	299
Process overview	299
Pre-Requisites	299
SSL Refresh utility	300
Running the Platform utility on the back machine for CSR generation	302
Running the Platform utility on the front machine for CSR generation	303
Verifying the multi-tier CA	303
Running the Platform utility on the back machine for certificate replacement	304
Running the SSL Refresh Utility for a certificate update on the appliance	305
Transferring files between the back and front machines	306
Running the Platform utility on the back machine to import the Peer Server Certificate	306
Running the Platform utility on the front machine to import the Peer Server Certificate	307
Running the Platform utility on the back machine for recovery	307
Running the Engine utility for a certificate update	308
Running the Platform utility on the front machine for recovery	309
Running the Engine utility for certificate recovery	309
Considerations	310
Appendix D: Supported Service Processor Profiles	311
Appendix E: Intelligence Engine Firewall Ports	312
Appendix F: Bulk Data Processing Error and Status Codes	315
User Interface Errors	315
Error Codes	315
Status Codes	316

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Product Overview

The *Trellis*™ Real-Time Infrastructure Optimization platform is the total Data Center Infrastructure Management (DCIM) Solution that reduces the complexity and operating costs of a data center. By identifying, tracking and monitoring assets, as well as analyzing critical data, you can make better decisions to optimize your environment both today and when planning for future changes.

The total *Trellis*™ platform solution minimizes inventory management and asset health management and allows every member of your data center team to view the infrastructure as a whole or by individual assets and quickly access informative data.

With the *Trellis*™ Real-Time Infrastructure Optimization platform, you can:

- Reduce the total cost of ownership of data centers
- Proactively manage energy usage
- Predict infrastructure failures before they occur
- Optimize server and power chain headroom
- Communicate with and control equipment with different communication protocols and physical interfaces
- Automate policies and procedures to reduce operational costs
- Extend the useful life of existing data centers

Platform Architecture

The *Trellis*™ platform architecture includes the platform services, optional modules, the powerful *Trellis*™ Intelligence Engine and APIs that allow you to build your system. These components gather and present a variety of types of data in a meaningful way. Together, they allow you to see what is happening in your data center, decide on a plan of action and either resolve a problem or optimize performance.

Platform services

The platform services enable communication between hardware and software. They are located on the *Trellis*™ platform servers and run in the background. These intelligent services ensure that all platform components are accessible by all authorized parties and function within the suite. The platform services include the following.

Available Platform Services

Authentication	Licensing
Authorization	Report Engine
Console Framework	Reporting
Dashboard	Scheduling
Email/SMS Services	Symbols Library
Event Engine	Trust Store
Import/Export	

TRELIS™ platform modules

The *Trellis*™ platform consists of modules that can be combined to create specialized infrastructure management solutions.

The *Trellis*™ Inventory Manager module provides the ability to collect a detailed catalog of all inventory in the data center. With this module you can see where all devices are located and understand how much capacity (power, cooling, weight and space) is consumed or available at any point in the data center. This information is based on faceplate or derated values. The Change Planning feature allows data center managers to plan, assign, execute and audit changes in the data center, faster and more intelligently.

The *Trellis*™ Site Manager module, with its separately installed *Trellis*™ Intelligence Engine, tracks and reports the health of facility-critical devices and provides information about power, cooling and environmental conditions such as temperature and humidity. The Energy Insight feature in this module, provides greater visibility into energy consumption and uses PUE/DCiE calculations to measure operating efficiencies within the data center.

The *Trellis*™ Process Manager module allows you to organize, manage and track processes. This module brings together your process details, task ownership and work flow status.

When all of the modules are combined with the *Trellis*™ Power Systems Manager module, they provide the total data center management solution. The *Trellis*™ Power Systems Manager module adds a comprehensive view of the data center power system from the utility entrance to rack power distribution. This view helps managers and engineers cut energy costs and maximize capacity.

The *Trellis*™ Thermal Systems Manager module allows you to reduce power costs and improve data center efficiency by monitoring and managing real-time thermal visualization in your data center. For optimal functionality of this module, the *Trellis*™ Site Manager module, with its Intelligence Engine, must also be installed.

TRELIS™ Intelligence Engine

With the *Trellis*™ Intelligence Engine, real-time communications are possible within the solution. The data collection engine is responsible for polling and collecting data from all the managed elements in a data center. The Intelligence Engine can be installed on Red Hat® or Ubuntu operating systems on a standalone server or a virtual environment.

The Intelligence Engine processes and aggregates the data and then sends the data for storage and/or consumption by the platform. The transferred data is encrypted using SSL and is stored in the database. The raw data is consolidated, averaged and uploaded into the platform and is used to present data and create trend graphs. If normal communication occurs between the engine and the platform, data is retained per the data retention policy; however, if communication is interrupted, the most recent seven days of data is stored locally and sent to the platform when communication is restored.

Two versions of the *Trellis*™ Intelligence Engine are available. One engine is provided with the Site Manager module and the other engine is provided with the Avocent® Universal Management Gateway appliance. An overview of their functionality is explained in the following sections. For more information about the appliance, see [Avocent® Universal Management Gateway Appliance](#) on page 3. For more information about the Intelligence Engine, see [Data Collection Engine](#) on page 67.

Site Manager module's TRELIS™ Intelligence Engine

Along with the previously mentioned functionality, the module's Intelligence Engine allows you to collect the following additional types of information:

- Parametric data points - measurable values such as temperature, humidity, battery capacity and voltage
- Operational data points - non-numeric information about the device operational state such as On/Off, Eco mode, Cooling and In Bypass
- Device status - a monitored device status (Normal, Not Responding, Critical, Warning, Info or Maintenance Mode) that is polled separately from the parametric and operational data points
- Events - changes in operational state and device generated alarms or result from thresholds set in the user interface

CAUTION: If the device does not support secure mode, the data transfer from endpoint devices is not secure.

TRELIS™ platform RESTful API

The *Trellis*™ Real-time Infrastructure Optimization Platform RESTful API provides access to resources and functionality of the *Trellis*™ software. The APIs support full Create, Read, Update and Delete operations on devices and connections with the ability to query containers and symbols.

Additional features include, pagination through query results, localization of messages, projections to control the level of detail in the response, sorting, and predefined queries. The message formats for request and response supported are JSON and XML over a secure HTTP connection.

Detailed examples of the HTTP requests, information on headers and query parameters, and schema for resource requests and responses are explained in the API help. All the API information can be found in the API help Resources section of the *Trellis*™ Platform RESTful API documentation.

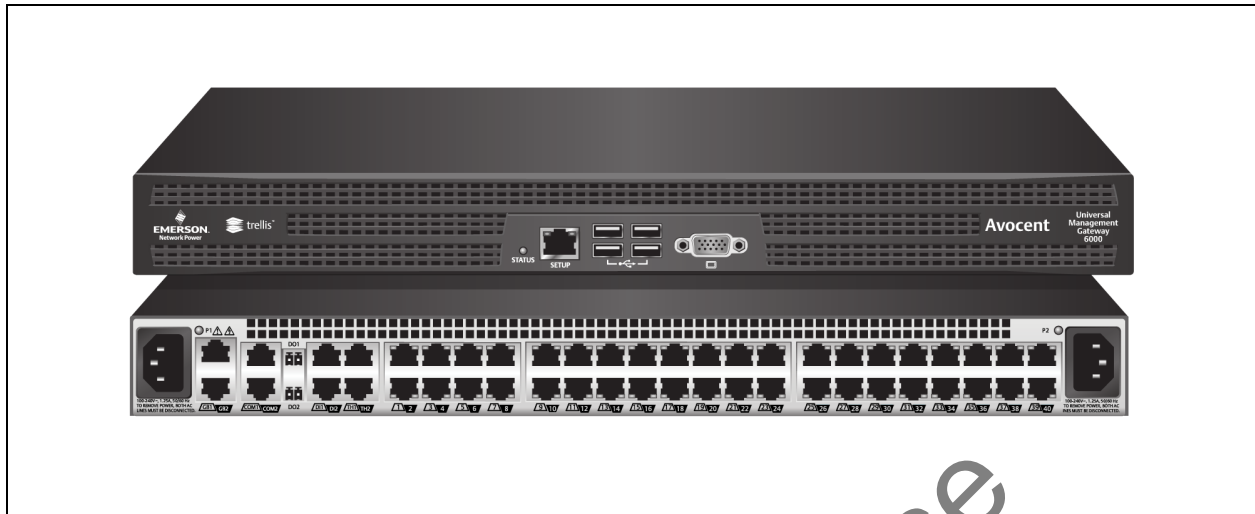
To access the *Trellis*™ Real-time Infrastructure Optimization Platform RESTful API documentation, modify the link by replacing <TrellisSystem> with the fully qualified domain name of the front machine and click the link: <https://<TrellisSystem>/api/help/trellisrestfulapi.html>

NOTE: <TrellisSystem> is the the fully qualified domain name of the front machine.

Avocent® Universal Management Gateway Appliance

The *Trellis*™ platform can also be used with the Avocent® Universal Management Gateway appliance. This appliance has its own *Trellis*™ Intelligence Engine that provides real-time communications. This 1U rack appliance serves as a single point of access and administration of target devices, and it supports secure remote and out-of-band management of IT assets from any location worldwide.

Avocent® Universal Management Gateway Appliance



Depending on the model, the Avocent® Universal Management Gateway appliance supports keyboard, video and mouse (KVM), serial and service processor (SP) capabilities, thereby consolidating key functionality into one package. These features provide the ability to remotely perform server management tasks, including power control and console access on managed target devices. Multiple administrators can be logged into an appliance at the same time and can use the web user interface or command line interface (CLI utility).

For additional information about the appliance, see the Avocent® Universal Management Gateway Appliance Installer/User Guide.

NOTE: The physical appliance should be installed with a secure connection to the platform server before the appliance can be enrolled, added to the catalog and placed in inventory.

Bulk Data Processing Tool

The Bulk Data Processing tool is an application that allows you to create, update and delete large quantities of data in the *Trellis*™ platform database. User-defined properties for these containers, device categories, connections and ports can also be bulk loaded. For more information, see [Data Management](#) on page 257.

NOTE: Java version 7 or 8 is required to use the Bulk Data Processing tool.

Avocent® DSView™ Management Software Access

The DSView Session feature allows you to manage devices in the DSView software from the *Trellis*™ platform. All mouse controls and keyboard actions work as they do in the DSView™ software. Access to DSView™ software is based on user permissions.

Common Access Card (CAC) Access

CAC access is supported in the *Trellis*™ platform software. The CAC feature requires that the platform has the appropriate Public Key Infrastructure (PKI) certification loaded via the SSL Refresh utility. See [CAC Certification](#) on page 293 for instructions to activate and deactivate the CAC on the server side.

Mobile Access

The *Trellis*™ Mobile Suite application allows you to quickly access and manage the *Trellis*™ platform data from your data center floor. This will ensure that you can always keep your environment up to date. Either online or offline, you can add, identify, audit, move and delete devices, and even edit power connections from your mobile interface without returning to your desk. With a wireless network connection from the *Trellis*™ Mobile Suite app to the *Trellis*™ Real-Time Infrastructure Optimization Platform database, you can also view the floor plan in three-dimensional (3D) view, duplicate devices, check capacities and respond to alarm notifications.

To learn more about the *Trellis*™ Mobile Suite application, ask your *Trellis*™ representative.

Installation Overview

Professional Services installs and assists with the initial setup of your environment in the *Trellis*™ platform software. In preparation for the installation, be sure to read The *Trellis*™ Real-Time Infrastructure Optimization Platform Pre-Installation Guide. In addition, a list of prerequisites provided by Professional Services must be completed before the installation.

Whereas installation is not possible by our customers, other operations such as upgrades, back up and restore and maintenance procedures can be performed by our customers. See the <http://global.avocent.com/us/olh/trellis/> web site for upgrade and back up and restore procedures. See [Platform Shut Down and Restart](#) on page 294 for maintenance procedures.

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User Interface (UI) Overview

After the installation is complete, please make sure you have read this guide to learn about creating your environment in the software. This chapter provides an overview of the interface with some globally used procedures. More detailed procedures are included later in this guide.

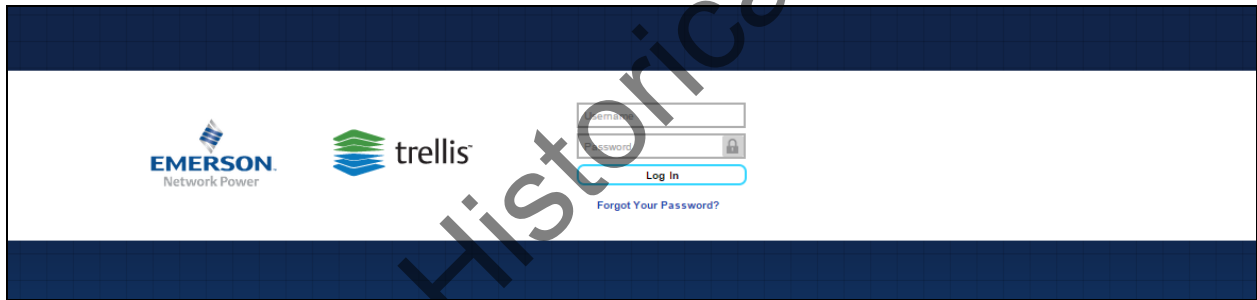
The user interface streamlines the management of your environment by providing the following:

- A single application to manage your facilities and/or data center
- Process planning for equipment installation and removal
- Enterprise-wide project control
- Real-time device monitoring and alarm notifications
- Data center mapping
- Textual and graphical-based views of your inventory

Getting Started

After receiving your username and password, you can log in to the platform UI and reset your password.

Log In Screen



To log in to the platform:

1. Open a web browser and navigate to the *Trellis*[™] platform console URL **http://<fully qualified domain name of the front machine>/trellis**.
2. Enter your username and password and click *Log in*.

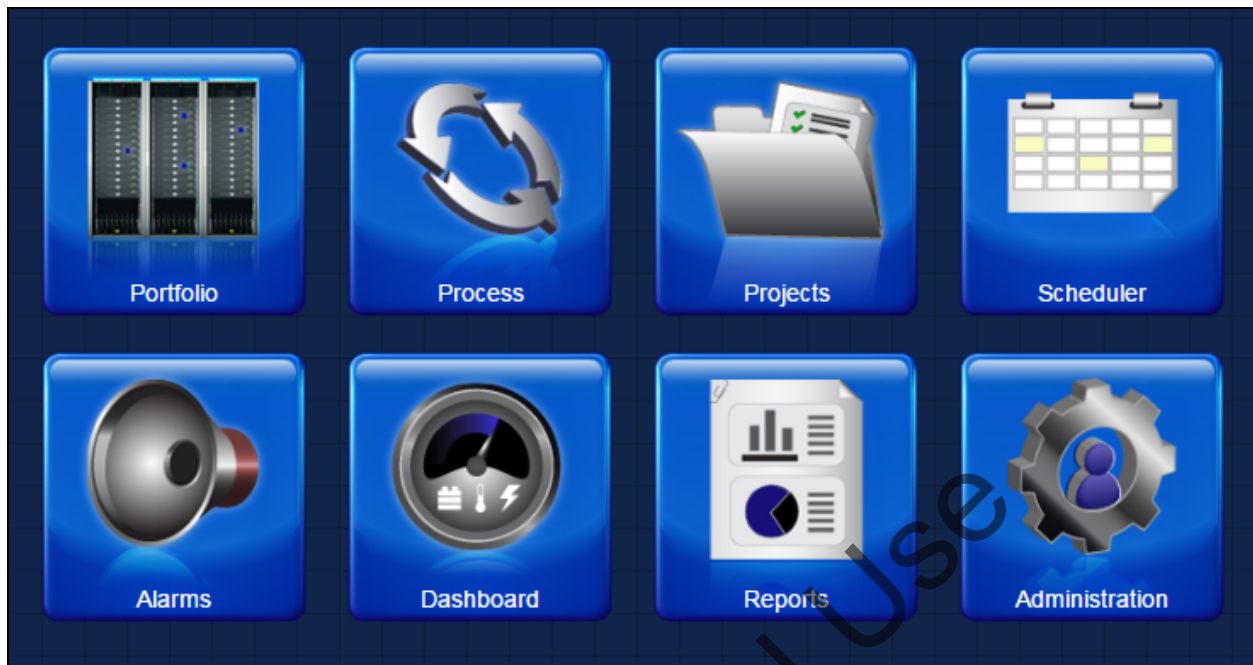
To reset your password:

Open a web browser to the *Trellis*[™] platform console URL, click *Forgot Your Password* and follow the onscreen instructions.

Launchpad

After logging in to the *Trellis*[™] platform software, a launchpad provides you with a central location for facilities and/or data center management. The launchpad allows you to access functionality that is typically used in daily operations. Icons appear on the launchpad based on the appropriate platform licenses and permissions.

Launchpad



Launchpad Icon Descriptions

Name	View	Functionality
Portfolio	Data center assets in a list	Add, modify, move and delete your assets in a data center
Process	Process manager	Organize and track your data center by requesting details for processing tasks such as adding, moving, decommissioning and renaming equipment
Projects	Project planner	Create and manage data center projects
Scheduler	Calendar	Schedule and verify data center tasks
Alarms	Alarm viewer and status	Display a summary of alarms for all monitored devices in the data center
Dashboard	Graphs and charts	Display PUE, Electrical Energy Consumption, Capacity Trend, Building Power Systems and the Workload/Performance per process and participant
Reports	Report forms	Create, run, edit, copy, paste, delete and filter reports
Administration	Navigation menu	Manage licensing information, user roles and permissions, passwords, user notifications and system configuration

Understanding the UI

The *Trellis*™ platform UI is designed to greatly simplify the complexity of data center management. You can click the *Trellis*™ platform logo on the top-left corner of the window to go back to the launchpad to access functionality at any time.

In the *Trellis*™ platform, you have the option to choose your viewing experience in the UI. After you log into the product, you are automatically working in the Classic UI which has the menu bar with the File, Quick Launch and Administration buttons. For a different experience, you can try our new UI by selecting the *TRY*

NEW INTERFACE button in the middle of the tool bar. This button takes you to the User Preferences menu where you can select either the *Classic* or *Beta* UI. Then, after you log out and log back in, your selected UI is displayed. In the Beta UI (see [The TRELIS™ Platform Beta UI Icons](#) on page 11), the menu bar buttons (File, Quick Start and Administration) are removed and a quick start menu icon is added that has the same functions. Each time a window is opened from this icon, a tab is displayed and remains visible to allow you to quickly view opened windows. A return icon has also been added to quickly open the menu to select and return to the Classic UI mode again. Another addition in the Beta UI (located at the top), is the new feedback icon that allows you to submit comments about the UI.

In both the Classic and Beta UI, the icons on the right side of the toolbar alert you of alarm and task notifications and allow you to change user profiles, system preferences and notifications. Access to the help text is also available from the toolbar.

Under the toolbar is the dynamic workspace that changes views depending on your licenses, user permissions, the icon you select from the launchpad and the type of view you select. For example, if the Portfolio icon is selected from the launchpad, your facility and its assets may be displayed in the workspace as lists, tables or as interactive images, including asset locations. Selecting other icons from the launchpad may display configuration information, graphs or reports.

Side accordions also depend on your selections. For example, when the Administration icon is selected from the launchpad or the quick start icon, the Administration navigation menu is displayed on the left side of the workspace. If the Portfolio icon is selected, the dynamic search panel accordions, which are used to locate assets, images and search capacities, are displayed on the left side of the workspace. And on the right side of the workspace, dynamic properties panel accordions provide details about selected devices. The functionality of the workspace and side accordions is discussed in more detail in the following sections.

NOTE: In this document, the terms "Portfolio" and "Portfolio View" are used interchangeably.

The *Trellis*™ Platform Classic User Interface (Portfolio View Workspace Shown)



The *Trellis*™ Platform Classic UI Descriptions

Item	Name	Function
1	Product name and logo	Returns you to the launchpad at any time.
2	TRY NEW INTERFACE (shown only in the Classic UI)	Allows you to select English or Metric values and the Classic or Beta UI. For these interface changes, you must log in again to activate the change. See Beta UI Icon Descriptions on page 11.
3	Menu bar buttons (shown only in the Classic UI)	File menu - Allows downloading of files, create new items, select existing items, import and delete items in the platform.
		Quick Launch menu - Accesses dashboards, projects, reports, bookmarks, schedules and configuration options.
		Administration menu - Accesses Licensing, User Management, Notifications and System Configuration menus.
4	Tool bar - User identification and sign out	Displays the name of the logged in user and provides a sign out link to close the software platform session.
5	Tool bar - Alarm and task icons	Includes critical (red X), warning (yellow exclamation point), information (blue i) and process notifications (purple notepad) to alert you of alarms and tasks that need attention. If no alerts or tasks are present, the notification icons are dimmed in gray. Notifications can be viewed from a drop-down list and accessed directly to the device view

Item	Name	Function
		from the notification link. The notifications may be cleared one at a time or all at once.
6	Tool bar - Account icon -	Provides access to select user-defined profiles/preferences and configure user work notification schedules.
7	Tool bar - Help icon	Provides a link to the platform help text.
8	Properties panel (right side)	Contains accordions with properties and attributes for what you have selected in the workspace.
9	Divider bars/arrows	Maximize the workspace by collapsing or restoring panels.
10	Workspace	Contains the tabbed viewing areas including: Administration View - Employee/database management. Portfolio View - Tabular view of the inventory. 2D and 3D Graphical Views - Aerial view of data center floors, spaces and devices. Elevation View - Front/rear view of devices.
11	Search panel (left side)	Contains Administration menus in Administration View Contains the Catalog, Inventory, Capacity Search and Planning accordions in Portfolio, Graphical and Elevation View.

The TRELIS™ Platform Beta UI Icons



Beta UI Icon Descriptions

Item	Name	Description
1	Feedback icon	Select to tell us what you think about the new UI.
2	Return arrow	Returns you to the menu to select the English or Metric values and the Classic or Beta UI. For these interface changes, you must log in again to activate the change.
3	Quick start icon	Includes the same options provided from the Quick Start button in the Classic IU. Adds a tab for each window you open to allow you to quickly access previously opened workspaces.

To open the Beta UI:

1. In the Classic UI, click *TRY NEW INTERFACE*.
2. On the WHAT's NEW pop-up window, click *Try It Now*.
3. For the View Preference, click the Beta radio button.
4. Click *Sign Out* and log in again.

To return to the Classic UI:

In the Beta UI, click the return arrow icon, select the Classic radio icon and log in again.

Using Menus

In the Classic UI, many general file and system administration functions are performed using the File, Quick Launch and Administration menus. Clicking these buttons opens a search list for additional menus and information.

File menu

The File menu is used to create, open, import and delete information.

File Menu Options

Option	Description
Download	Downloads selected software tools to the Downloads folder on your machine
New	Adds a new floor, building, data center, space or grid
Save	Saves changes
Save As	Saves as a specific file type
Import	Imports background images, power connections, device information or a floor

Quick Launch menu

The Quick Launch menu is used to access the following information that is used most often in daily operations.

Quick Launch Access

Information Type	Description
Administration	Accesses Licensing, User Management, Notifications and System Configuration menus.
Alarm Viewer	Displays alarm summary information (Manual clear, Acknowledge, Comment or Escalation) for monitored devices.
Event Viewer	Displays event details and summary information; see Viewing events on page 31.
Portfolio	Displays workspace for data center and device configuration.
Scheduler	Used to schedule and verify tasks.
PUE Configuration	Used to configure and verify PUE and DCiE usage.
Dashboard	Available dashboards are dependent on the module as follows: <i>Trellis</i> ™ Site Manager module includes the PUE Dashboard, Electrical Energy Consumption, Capacity Trend Dashboard and Building Power Systems dashboards. <i>Trellis</i> ™ Process Manager module includes the Workload per process, Performance per Process, Workload per participant and Performance per participant dashboards.
Advanced Reports	Used to create and configure reports.
Projects	Used to create and manage projects; <i>Trellis</i> ™ Change Planner module is required.
Process Manager	Organize and track your data center by requesting details for processing tasks such as adding, moving, decommissioning and renaming equipment.

Administration menu

The Administration Menu allows an administrator to manage licensing information, user roles and permissions, passwords, user notifications and system configuration, which are defined in the following table. To begin using the Administration Menu, see [Basic Configuration](#) on page 33.

Administration Menus

Name	Function
Licensing	Used to view package versions, activate and manage licenses
Process Manager	Organize and track your data center by requesting details for processing tasks such as adding, moving, decommissioning and renaming equipment
User Management	Used to manage users, including roles, permissions and notifications
System Configuration	Used to display system status, help, server logs, alarms and appliance configurations
Data Management	Accesses the downloaded bulk data processing tool
Configuration	Used to configure the device type parameters, properties, system default measurement type and manage power-phasing assignments for buildings

To learn about additional organization and task administration menus, see [The TRELIS™ Process Manager Module](#) on page 199.

Using Search Panel Accordions

The search panel accordions are used to locate the devices and symbols (images of the devices) that have been added to the *Trellis*™ platform software database in order to create textual and graphical views and manage your environment. Depending on user permissions and context, expanding the search panel accordions provides access to the functions described in the following table.

Search Panel Overview of Accordions

Accordion	Function
Catalog	A list created as you add or import assets to the database which then provides a searchable database of devices and symbols that can be added to your placed or unplaced inventory; provides global or advanced criteria search options such as manufacturer name, model, category, description or product line
Inventory	A list of devices that are in your placed inventory; provides global or advanced criteria search options such as manufacturer name, model, category, description or product line and more
Capacity Search	A search option for devices by power, space, weight or heat capacities
Planning	Used with 2D Graphical View to plan the evolution of your enterprise

Catalog of available devices

The Catalog accordion allows you to view the devices and symbols that have been added to the *Trellis*™ platform software from the List tab or from the Search tab. From the List tab you can locate an asset or symbol by selecting the asset type, manufacturer and model from a list. From the Search tab you can perform a global search by entering known information about an asset in the Search field or by using the Advanced Search

criteria fields where you enter/select the known manufacturer, model, category, description, product line or multiple criteria to locate the asset or symbol.

After performing a search for all the devices that meet the entered criteria, you can select a specific device from the displayed results and view a symbol of the asset with its dimensions, if a symbol has been added to the database. Two icons are provided with the symbol that allow you to rotate and flip the symbol.

Additionally, you can click the *Find Capacity* button to display its capacities, if applicable. If you decide to search for another asset, you can click the *Clear* button and enter new information.

To learn more about symbols, see [Working With Catalog Symbols and Element Libraries](#) on page 126.

If a device image is not in the catalog, see [Submitting a new symbol request](#) on page 127.

Catalog Search by Manufacturer

The screenshot shows the 'Catalog' search interface. The 'Advanced Search' section is expanded, showing search criteria for Manufacturer (apc), Model, Category (Select), Description, and Product Line. Below the search fields is a table of search results. The selected row is highlighted in blue. Below the table is a preview of the selected device symbol, showing the APC logo and dimensions: 3 POLE - 208V 16A 1RECEP, H 1.75 W 19.00 D 12.00 (in.). A 'Find Capacity' button is visible at the bottom right.

Manufacturer	Model	Cat
APC	AFX-210-A-KA-D, AFX-210-A-KA-D	CRA
APC	AP5015, AP5015 V2	Mo
APC	AP7541, 208V 30A 2PS 24R	Rac
APC	AP7701, AP7701 V2	Rac
APC	AP9617, AP9617 V2	Car
APC	AP7732, AP7732 V3	Rac
APC	AP7750, AP7750 V2	Rac
APC	AP7941, 208V 30A 2PL 24R V2	Rac

APC
3 POLE - 208V 16A 1RECEP
H 1.75 W 19.00 D 12.00 (in.)

Find Capacity

To search the catalog for device types:

1. Expand the *Catalog* accordion, click the arrow next to the device type to expand the list of manufacturers and their associated devices.
2. Click the device to view the image with its height, weight and depth.

3. Click *Clear* to clear the image.

To search for a symbol:

1. Expand the *Catalog* accordion, enter a keyword in the global search field and click *Search*.
2. Enter criteria in the one or more of the advanced search fields and click *Search*.
3. In the results table, highlight one or more symbols and click *Find Capacity*.
4. From the displayed Capacity Search accordion, enter additional criteria and click *Search*.

Inventory list of devices

From the Inventory accordion you can search for devices globally or by the following specific criteria:

- Name
- Model
- Manufacturer
- Category
- User Defined Property
- Monitoring State
- Placement
- Building
- Floor
- Space

NOTE: The category selected in the inventory search must match the category of the device symbol you are seeking.

The User Defined Property field allows you to customize properties. To learn more about defining properties, see [Configuring user-defined properties for a device category](#) on page 59.

Inventory Search

The screenshot displays the 'Inventory Search' interface. It features a 'Catalog' section with 'Inventory' expanded. A search bar is located below the 'Inventory' section. The 'Advanced Search' section is also expanded, showing various search criteria: 'Search By' (Physical Properties), 'Name', 'Model', 'Manufacturer', 'Category' (Blade Chassis), 'User Defined Property' (Select), 'Monitoring State' (Enabled), 'Placement' (Placed), 'Building' (AH Bldg), 'Floor' (Select), and 'Space' (Select). There are 'Clear' and 'Search' buttons. At the bottom, a table with columns 'Name', 'Description', and 'Location' is shown, with the message 'No data to display.'

To search inventory for devices globally:

1. Open a floor in Portfolio or Graphical View and expand the *Inventory* accordion.
2. Enter a keyword in the global search field and click *Search*.
3. After the results are displayed (by device name, category and description), select a device in the table to view it on a floor.

To search inventory for devices by criteria:

1. For an advanced search, enter or select information from the available fields, such as Name, Model and so on.
2. Select *Placed* or *Unplaced*, enable *And/Or* if needed and click *Search*.
3. Click *Clear* to clear the criteria fields and the table.
4. After the devices are found and displayed, click the device to view the image along with height, weight and depth of the device.

-or-

Right-click the device and select *Locate* to find the device in the Portfolio list.

NOTE: If needed, you can click the rotate or flip icons and/or double-click the device to view it on the floor.

5. Click *Clear* to clear the image.

To search inventory for devices in planning mode:

1. Select a project from the *Planning* accordion.
2. Search for future inventory changes based on your project end date.

Capacity Search

The Capacity Search accordion allows you to search for available capacities in devices and blade servers. You can perform a search by type, building, floor, space or zone. The operational search parameters are power, space, cooling and weight. After receiving results, the Expand Results button provides access to more specific details.

NOTE: The capacity results are coming from the racks as the parameters are entered.

Capacity Search

To search for capacities:

1. In the left pane, expand the *Capacity Search* accordion, select the type from the drop-down list and select a building, floor, space and zone from the drop-down lists.

NOTE: As you enter information in a field, the next field is populated with specific information. For example, if you select a building, the floor drop-down list is populated with floors associated with that building. When you select a floor, the space field is populated with spaces associated with that floor.

2. Enter search criteria in one or more of the following fields:
 - Power (W)
 - Space (RU)
 - Cooling (BTU/Hr)
 - Weight (lbs)
3. Click *Search* and view the results.

Depending on the search criteria, the following results are displayed:

- Selecting a building highlights the building in Portfolio View.
- Selecting a space opens the 2D Graphical View of the space on a floor.
- Selecting a floor opens the 2D Graphical View of the selected floor.
- After selecting a space using the *Search* button, clicking *Expand Result* opens the 2D Graphical View where the space is located.
- Selected search results in 2D Graphical View can be cleared.
- After selecting a zone using the *Search* button, clicking *Expand Result* opens the 2D Graphical View where the zone is placed.

To search for available capacities in devices and blade servers in planning mode:

1. Select a project from the *Planning* accordion.
2. Search for future device and blade server changes based on project end date.

Using Properties Panel Accordions

Depending on user permissions and the modules you have purchased, the properties panel accordions can be used to view and manage attributes for an asset that is selected in the workspace.

List of Accordions on the Properties Panel

Accordion	Description	Required Module
Properties	Used to verify and modify the attributes of containers and devices.	Trellis™ Inventory Manager
Placement	Manages X and Y offsets and rotation values of a device or container.	Trellis™ Inventory Manager
DSView Session	Used to access, view and modify devices in DSView software from the platform.	Trellis™ Inventory Manager
Ports	Displays a list of ports, port types and connections in the Portfolio and Elevation views (current and planned).	Trellis™ Inventory Manager
Capacities	Used to assign and verify real-time power, cooling, weight and space capacities for floors and devices.	Trellis™ Inventory Manager
Connections	Displays a list of devices with connections, the type of connection and an arrow indicating if the connection is up stream or downstream. It also displays planned data connections in planning mode.	Trellis™ Inventory Manager
Groups	Groups common devices in Portfolio, Graphical or Elevation View.	Trellis™ Inventory Manager
Monitoring Configuration	Escalates alarms automatically.	Trellis™ Inventory Manager
Control	Displays current alarm triggers and can be used to add/edit triggers.	Trellis™ Site Manager

See the following topics for more information:

- [Working With Racks](#) on page 91
- [Working With Devices](#) on page 98

- [Understanding Consumption Capacities](#) on page 84
- [Working With Standard and Unusable Zones](#) on page 89
- [Placing a device on different floor levels](#) on page 100

Using Views in the Workspace

The main viewing options available in the workspace are:

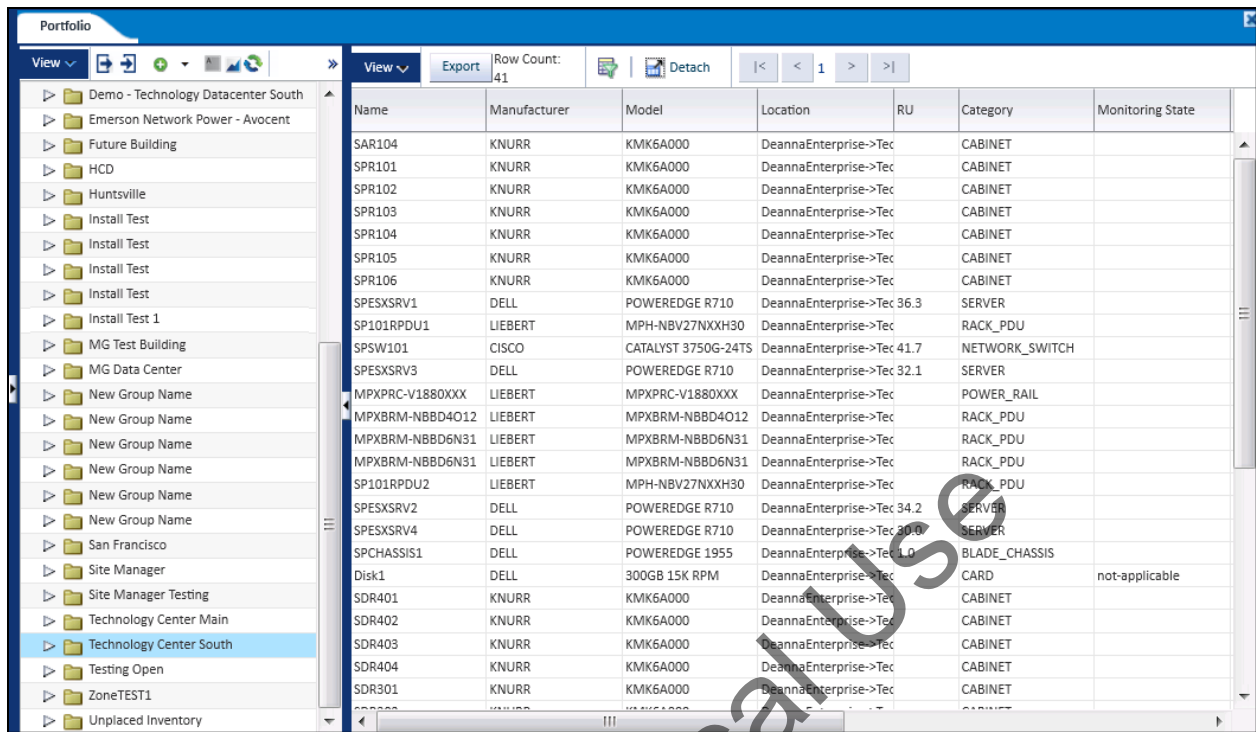
- Portfolio View - Used to add your assets and manage their locations
- 2D and 3D Graphical Views - Used to arrange your assets on a floor and verify consumption and capacity for space, power and cooling
- Elevation View - Used for placement of devices
- Device views - Used to create power and data connections

Navigation is performed using basic point-and-click, click and drag or right-click actions. Some objects in the workspace can be right-clicked to go to another view, such as from Elevation View to Device View. Each view provides different functionality within the software to ultimately create a representation of your data center environment. Component details, ports and power connections are displayed in one or more views and depending on your solution, more options are available, such as dashboards with graphs and time lines, and calendars that facilitate planning and scheduling for notifications.

Portfolio View

Portfolio View is used to create and manage your inventory. To begin creating your environment in the UI, you can add containers such as data centers, buildings, floors, spaces and devices (including racks) in a hierarchy. After each container is created, you can click the container and create its contained devices in a table on the right. For each device you can add its details in the device name, manufacturer, model, location, rack unit (RU) position category, monitoring state, building and space columns.

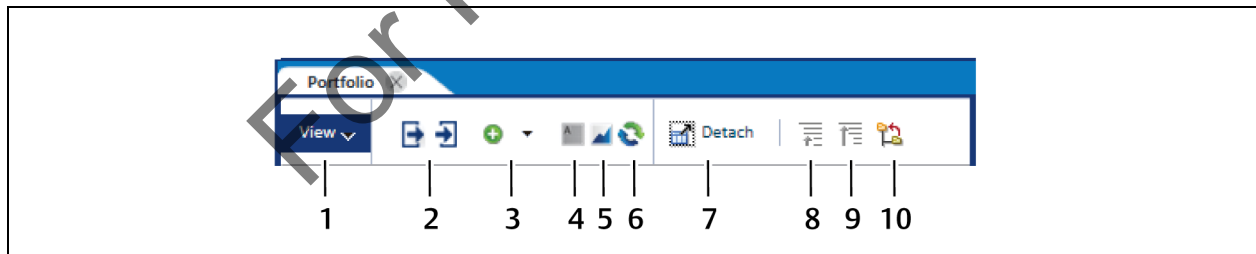
Portfolio View Workspace



NOTE: Vertical bars allow you to expand/collapse each side.

The toolbar is used to expand, detach and scroll views, manage rows and columns, access drop-down menus and select navigational tools. The table can be filtered and customized to display only selected fields. Some functions apply for both the container and contents. If the function is different, it is listed separately.

Portfolio View Toolbar



Portfolio View Toolbar Descriptions

Item	Name	Description
1	View	Displays commands to select columns to display, detach the view, expand/collapse columns, move rows to the top and scroll through rows
2	Export Zip and Import ZIP	Exports selected floor data as a CSV-formatted spreadsheet or a ZIP file; imports floor data as an svg-formatted spreadsheet or zip file
3	Create New	Allows you to add a new data center, building, floor or space; in the Beta UI, you must refresh the screen each time a container is added
4	Device List View	Displays all devices in the selected view
5	2D Graphical View	Displays the 2D Graphical View on the right pane

Item	Name	Description
6	Refresh	Refreshes the view
7	Detach	Detaches the Portfolio View table from the workspace
8	Go Up	Moves the selected item up one level
9	Go to Top	Moves the selected item to the top level
10	Show as Top	Displays the selected row or building as the top most level

NOTE: When you highlight a floor in Portfolio View, you can right-click the floor and select *2D Graphical View* to manage inventory using images and drawing tools.

Using right-click menus

When in Portfolio View, you can right-click an item in a menu to display its command options. The following are right-click selections.

Right-Click Selections

Command	Description
One Line Diagram	Displays the diagram view
View Downstream Devices	Shows devices that are downstream from one another
2D Graphical View	Opens 2D graphical view
3D Graphical View	Opens 3D graphical view
Refresh	Refreshes the current view
Elevation View	Opens elevation view
Thermal View	Opens thermal view
Discovered Service Processors	Shows service processors that are available
Show Events	Displays events
Replace Symbol	Provides symbol replacement
Show Connections	Displays device connections
Network Configuration	Displays configuration of network
Latest Readings	Shows latest readings
Manual Validation	Validate data manually
Network Configuration	Displays network monitoring information and allows you to select a protocol or enter an IP address for an item
Show Real-Time Data	Opens the latest data point readings for the selected item and allows you to view using charts, select data points and change collection configurations
AssetSync	Syncs up assets
Assign RFID	RFID are assigned
Accessories	Shows accessories
Delete	Deletes a selected item
Status	Displays a sub-menu to place an item in maintenance mode

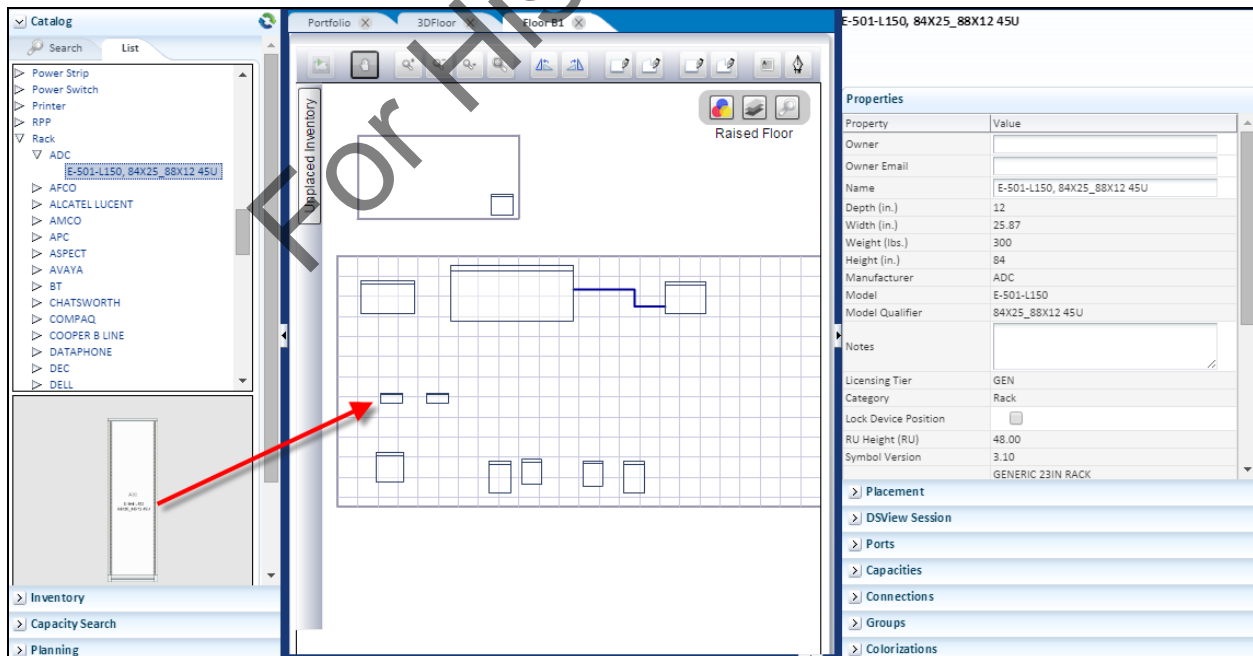
Command	Description
Remove Association	Removes associations from a selected item
Assign Alarm	Assigns an alarm
Actions	Displays a sub-menu to suppress an alarm
Add to New Group	Adds a selected item to a new group
Expand/Collapse	Expands or collapses an item
Show as Top	Displays the selected item as the top most level

2D Graphical View

2D Graphical View is a top-down visual representation of buildings, floors, spaces, zones and floor-mounted devices in your inventory. This view can be accessed from the Quick Launch menu, Portfolio View (by highlighting and right-clicking a floor and selecting the *2D Graphical View* option) or from 3D Graphical View. In this view, you can create a floor and create inventory on the floor using drawing tools and images. For example, using the Space/Zone drawing tool, you can create usable and unusable spaces on a floor and add symbols/images to represent the devices in your environment. Text labels can also be created to identify devices so that hovering over a device on a floor displays the name of the device.

Three additional icons are available in the top-right corner of the workspace to provide additional functionality. Floor-mounted devices can be color-coded to signify capacities such as how much space and power is available in each rack, the number of ports available and the heat output of each rack. Levels can be used to represent the status and placement of devices in your data center, including monitored environmental sensors. The search icon can be used to locate an existing space to add to the view.

2D Graphical View



NOTE: If devices are not visible on a floor in 2D Graphical View, click the *Levels* icon to make sure the correct levels are active.

Using the 2D Graphical View toolbar

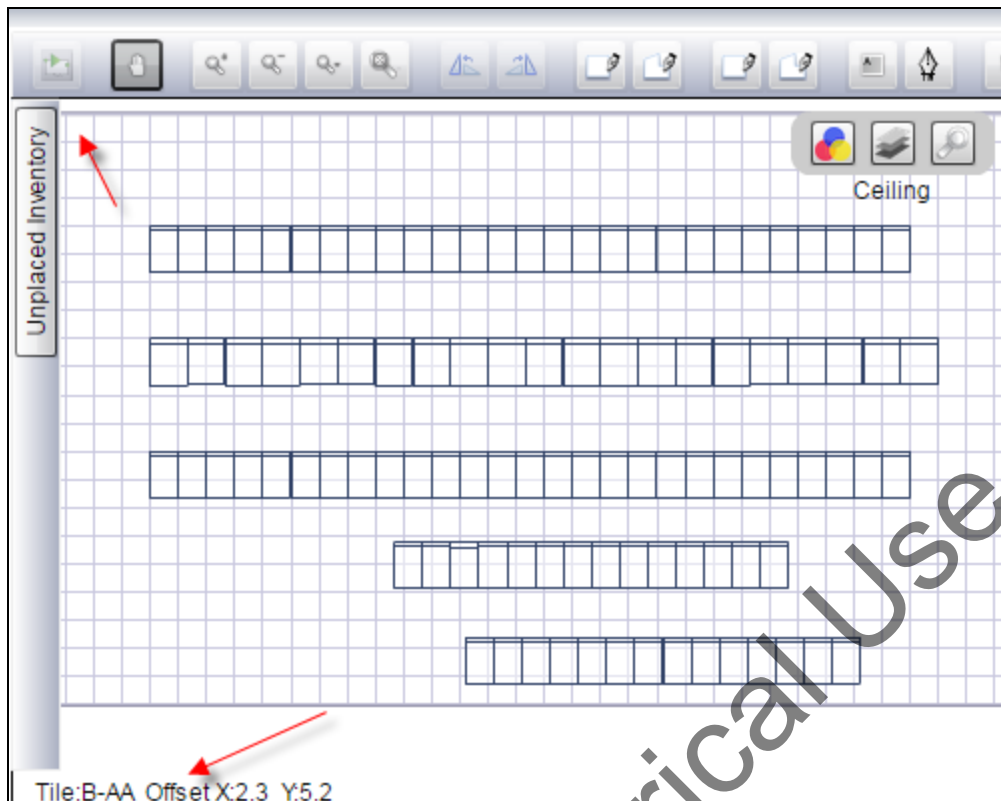
Depending on your permissions, the following are functions of the 2D Graphical View toolbar.

2D Graphical View Toolbar

Function	Description
Pan/Zoom Mode	Grabs an elevation and moves it anywhere on the workspace
Zoom In	Increases the view
Zoom Out	Decreases the view
Zoom Window	Select an area to zoom into an item to view
Zoom Extents	Moves everything on a floor to the center of the workspace
Rotate Left	Rotates objects to the left
Rotate Right	Rotates objects to the right
Space Rectangle Drawing Tool	Draws rectangle space on the floor
Space Polygon Drawing Tool	Draws polygon spaces on the floor
Zone Rectangle Drawing Tool	Draws rectangle zones on the floor
Zone Polygon Drawing Tool	Draws polygon zones on the floor
Text Drawing Tool	Adds text
Create a Spline	Creates spline
Select Mode	Selects one or more objects on a floor to be manipulated
Align Left	Aligns items to the left
Zoom Extents	Moves everything on a floor to the center of the workspace
Select Mode	Selects one or more objects on a floor to be manipulated
Current State	Displays the elevation as it is today
Colorization	Used to add and configure colors to indicate consumption capacities of devices on a floor.
Levels	Select one or more levels such as status, text, ceiling, drop ceiling, raised floor, floor, space grid and background
Search	Searches on items in the 2D Graphical View

The column and row names for the floor tiles are displayed at the bottom of the workspace and are dynamic as the cursor moves. The tile name is displayed with the X and Y coordinates.

Floor Tile Coordinates



Using levels

From 2D Graphical View, you can assign devices to one or more levels in the workspace. Red highlighting indicates when a device from unplaced inventory is added to a specific level. The level options are defined in the following table.

Level Descriptions

Name	Description
Status	Status of devices when monitoring is enabled
Text	Displays and hides text; if disabled, the text remains on the floor, but is not visible unless you hover over where text is placed
Ceiling	Displays or hides devices placed on a ceiling
Drop ceiling	Displays or hides devices placed on a drop ceiling
Raised Floor	Displays or hides devices placed on a raised floor
Floor	Displays or hides devices placed on a floor
Space Grid	Enables or disables the grid lines on a floor
Background	Enables or disables the background of the floor

NOTE: Devices can be placed on different levels, but cannot span multiple levels.

For more information, see the following:

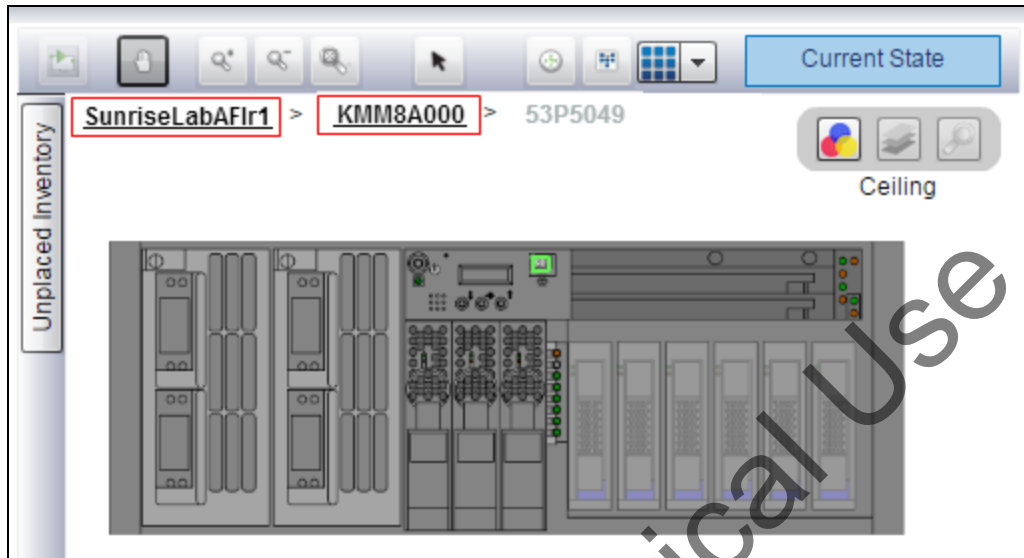
[Placing a device on different floor levels](#) on page 100

[Importing an AutoCAD Floor Plan to Use as a Background](#) on page 133

Using breadcrumbs

The breadcrumb trail can be used to navigate backwards. For example, if you open a floor, a rack and a device in the rack, you can click the floor breadcrumb to return to the floor.

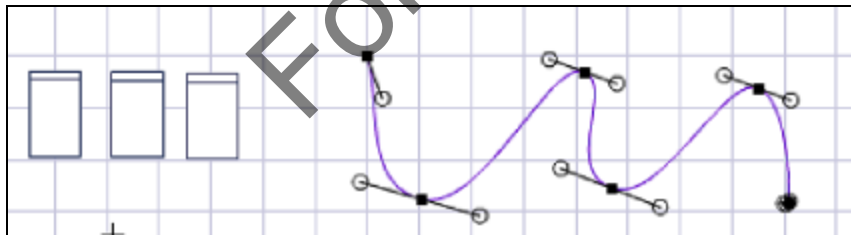
Breadcrumbs



Drawing splines










On all levels, straight and curved lines (splines) can be drawn to represent the placement of cables on a floor, under a floor or on a ceiling. The point of origin is signified by an open edit point and termination is signified by a closed point. Selecting the spline drawing tool allows you to click in the active space and place control points that make up the spline. The following figure illustrates a spline drawn on a floor.

Creating a Spline



The following table describes the spline options.

Spline Drawing Menu Options

Action	Right-click Options	Cursor image
Spline selection menu options	Straight Segments	
	Curved Segments	
	Set Attributes	Add color, line width, inches
	Delete Line	N/A
	Save	N/A
	Show Redraw Region	N/A
Create spline menu options	Straighten Segments	N/A
	Curve Segments	N/A
	Set Attributes	N/A
	Close and Save	N/A
	Save	N/A
	Show Redraw Regions	N/A
	Move the entire drawing	
Edit spline menu options	Add Points	
	Edit Points	
	Delete Points	
	Open Path	N/A
	Close Path	N/A
	Smooth Points	
	Comer Points	
	Straighten Segments	
	Comer Segments	N/A
	Exit Edit Points	N/A

Spline option tips

- Pressing the **Esc** key terminates the spline at the last placed control point and exits the spline drawing mode.
- All control points are contained within the same space; therefore, attempting to place a control point across spaces terminates the spline.
- Color and thickness can be added to lines.

- When dragging a point, that section of the line curves and stretches and the other points remain fixed. For example, if you have a straight line with three points, with one at each end and one in the middle, dragging the middle point creates a U shape.
- When clicking and dragging a line segment instead of a point, the entire line moves as a single unit without being reshaped.
- When dragging an end point, as the line stretches, the approximate line/cable length is displayed in the preset type of measurement.

To create a spline:

1. In 2D Graphical View, open the floor where the spline is to be drawn and select the Create a spline tool from the toolbar.
2. Click a starting point on the floor and move the cursor.
-or-
Right-click, select *Straight Segments* and draw the line.
3. Right-click to add control points as needed, select *Set Attributes* to add properties to the lines, such as color and thickness, and click *OK*.
4. Press **Esc** to end the line and exit the drawing tool.

To edit a spline:

Select a control point and drag it to a new position, right-click and delete a control point or select one of the control point handles and move to adjust the curve. Right-click a point along the spline in which a control point does not already exist, right-click and add a control point.

To delete a point:

Select the *Delete* icon and click the point.

3D Graphical View

3D Graphical View allows you to view an entire floor or a single space within a floor. This view can be accessed from Portfolio View by highlighting and right-clicking a floor and selecting the *3D Graphical View* option. You can view spaces on a floor and view symbols to represent the devices in your environment. Clicking on a device on the floor displays the name of the device in the Properties accordion.

3D Graphical View



Depending on your permissions, the following are functions of the 3D Graphical View toolbar.

3D Graphical View Toolbar

Item	Icon	Description
1	Export	Allows you to export the floor image; the camera icon saves the image in PDF format and the plan icon creates a printable file

Item	Icon	Description
2	Thermal Maps (Optional)	Displays hotspots using bottom, middle and top level views of the floor
3	Levels	Displays the levels for you to select and view; levels include Ceiling, Drop Ceiling, Raised Floor, Floor and Space Grid
4	Colorization	Displays the colorized view of the selected device criteria on the floor image; views include Front Rack Space Available, Rear Rack Space Available, Blade Slot Available, Critical Infrastructure, Temperature Thresholds and Humidity Thresholds
5	Alarms	Displays the alarm status of the selected device on the floor image
6	Graphical Floor Plan View	Displays the floor in 2D Graphical View
7	Text	If configured in 2D Graphical View, displays and hides text; if disabled, the text remains on the floor, but is not visible unless you hover over where text is placed
8	Refresh	Brings 3D Graphical View to a fixed position
9	Hide/Show	Hides and displays the 3D Graphical View toolbar

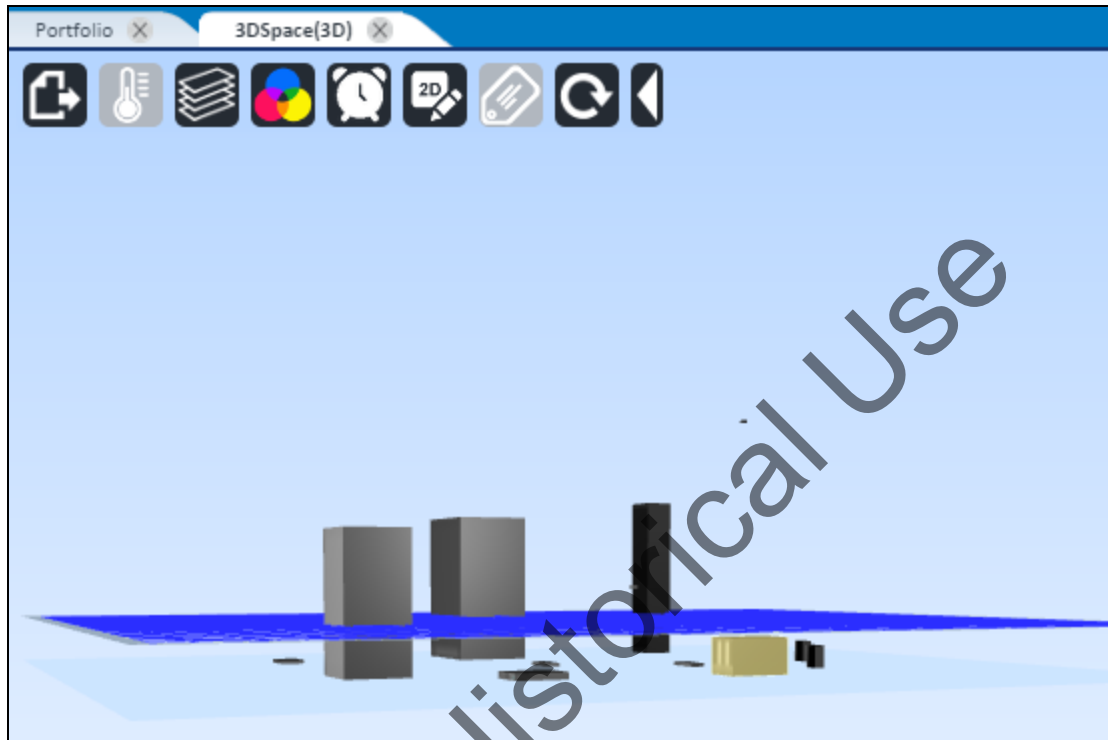
Depending on your permissions, the following are functions of the 3D Graphical View keyboard and mouse controls.

3D Graphical View Keyboard and Mouse Controls

Function	Description
Highlight a Device	Using the mouse, single left-click a device and it appears in a magnified view. Click X to close the magnified view. If a second device is selected, the first device is deselected.
Manipulate Magnified Device View	Use the left mouse button to rotate the magnified view.
Device Properties	Use the mouse to select a device, the device properties can be viewed and modified.
Placement Properties	Use the mouse to select a device, the placement properties can be viewed and modified.
Hide/Show Toolbar	Use the left and right arrow buttons on the tool bar to hide and view the tool bar.
Manipulate Space and Axis View	Click the left mouse button to rotate the space and axis views. Right-click mouse button to pan the space and axis view.
Zoom Space and Device	Spin the mouse wheel to zoom in and out on the space and device views, or press the shift key then, the up and down arrows to zoom in and out.
Center space and Devices	Click and hold the mouse wheel or center key mouse button to move everything on a space or device view to the center of the workspace.
Rotate Objects	Press the up, down, left and right keyboard arrows to rotate objects.
Pan Objects	Press Ctrl , then press the up, down, left and right keyboard arrows to pan objects.
Space Boundaries	Select and double-click the space boundary to view the space walls, drop ceiling and ceiling levels. Double-click the floor boundary to show the floor wall.

Function	Description
Viewing a Device	Select and double-click a device to open it in Elevation View.
Viewing zero-u devices	From Elevation View, click the zero-u device icon in the top-left corner to show and hide devices on the outside of the rack.

3D Graphical Rotate Zoom View



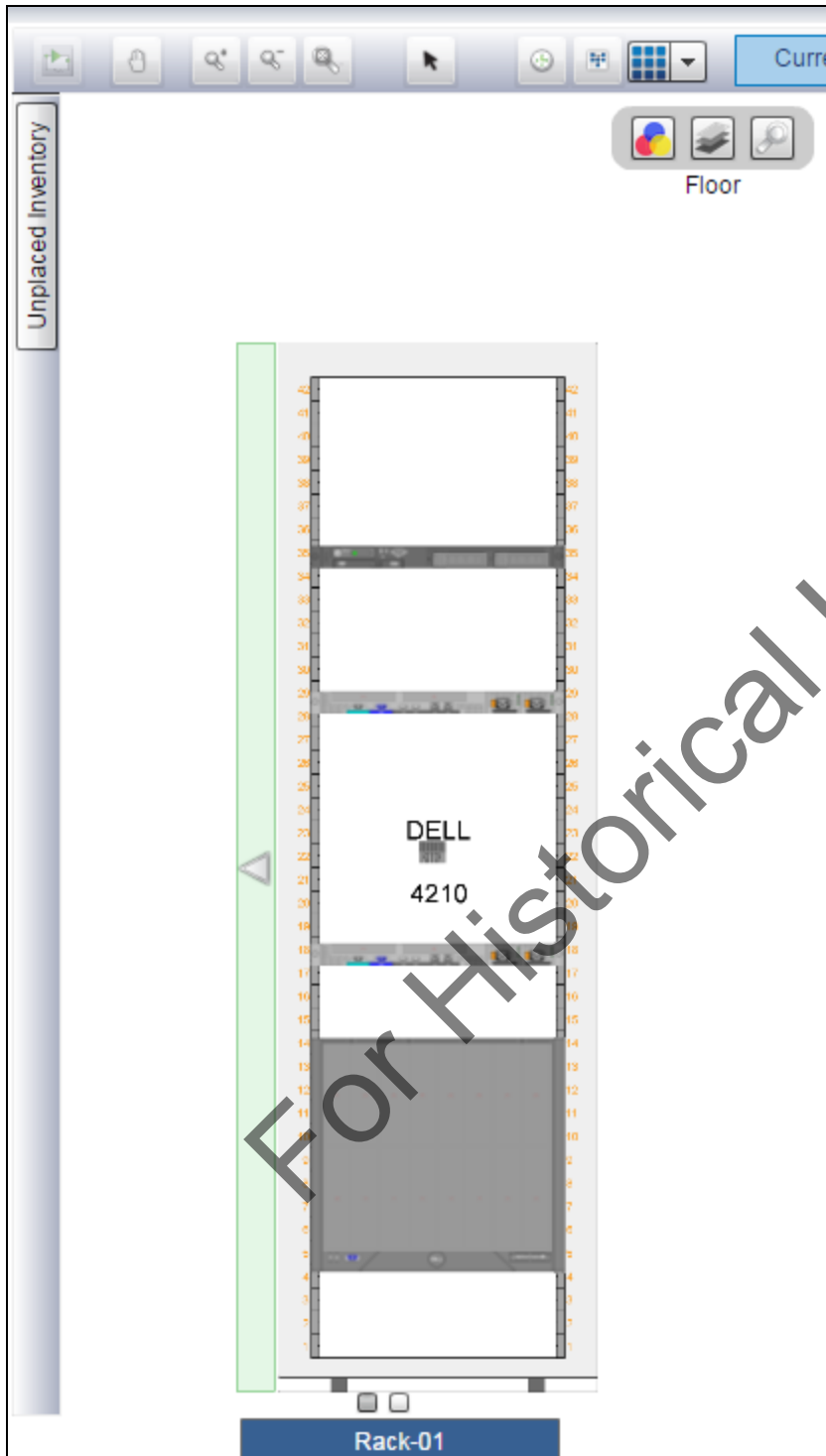
Elevation View

Elevation View is a front/rear graphical representation of a floor-mounted device, such as a rack, with all the devices and any placeholder devices installed in the rack. This view can be used to perform various actions such as device placement, movement and so on.

In Portfolio View, 2D or 3D Graphical View, you can double-click a device to open its Elevation View. After the Elevation View is open, you can use the icons below the device to display the front or rear view or you can place a device in zero-U space.

For monitored devices, there is an additional icon on the Elevation View toolbar that toggles between the Device Elevation View and Detailed Device View. For more information, see [Device views](#) on page 31.

Elevation View of a Rack



To open Elevation View:

In Portfolio View, select and right-click the device and select *Elevation View*.

-or-

In 2D Graphical View, double-click the device.

-or-

Click the *Select Mode* tool to surround multiple racks and double-click to open *Elevation View*.

Device views

With the *Trellis*™ Site Manager module, details about a device can be accessed using the Device View feature. If the selected device is not monitored and is open in Elevation View, you can click the *Detailed Device View* icon to open a view of the device. In all other cases, a right-click option opens an image of the device, which can be rotated to view the front or back of the device. If the device is monitored, the Detailed Device View is opened first and the Device Elevation View can be selected.

In Detailed Device View, you can verify the name and status of the selected device and access the Alarm Summary if there are any alarms for the device. The Alarm Summary enables you to see any issues with the selected device in the past twenty-four hours and monitor any conditions that need to be addressed. You can also view an image of the device in Elevation View, view a list of data points by categories and search for specific information. With the *Trellis*™ Power Systems Manager module, you can access the One Line Diagram feature (if the device is capable of sending an image), view a list of data points by categories.

For more information, see the following:

- [Understanding Detailed Device View](#) on page 176
- [Understanding the One Line Diagram](#) on page 155

Viewing events

The Event Viewer displays ongoing status and history of events in real-time. Events are occurrences or changes to inventory that the platform detects and records. The Event Viewer also allows you to identify equipment that is in maintenance mode and manage the following processes:

- Verifying the appropriate actions have taken place in response to system issues
- Capturing events from equipment
- Monitoring communication between IT system management software and monitoring software

NOTE: Email or SMS notifications can be sent to components that are managed by the software, and components can be configured to respond to an event or to a designated user.

In the Event Viewer, events can be sorted, columns can be displayed or hidden and text can be wrapped in a column. Managed elements include, but are not limited to, the items in the following table.

Event Viewer Columns

Column	Description of Displayed Information
Severity	Severity of the event (information, warning or critical)
Date/Time Received	Date and time the system received the event
Event Description	Brief description of the event
Source Name	Name of the user/account that generated the event
Source Type	Source (platform, application, device or data collection engine) that generated the event
Subject Name	Name (item, group, user or location) of the subject impacted by the event
Subject Type	Type of subject impacted by the event
Subject Category	Category, such as IT Equipment

Column	Description of Displayed Information
Detailed Description	Detailed description of the event
Event Type	Describes the type of event that occurred
Component	Name of the component impacted by the event

For more information, see the following:

- [Using the Notifications Menu](#) on page 55
- [Configuring Alarms](#) on page 192

To view events:

1. From the Quick Launch menu, click *Event Viewer*, select *View - Columns* and click the columns you want to view or select *Show All*.

NOTE: The Columns Hidden field in the status bar displays the number of columns that are currently hidden.

2. Click *View - Detach* to float the Event Viewer in a separate window.
3. Click *View - Query by Example* to filter events by certain columns.
4. In the text boxes displayed over the columns, click the *Severity* text box, enable *Source Name* and enter the source name.
-or-
Enable the *Subject Name* box and enter the subject name.
-or-
Enable the *Component* box and enter the subject name.
5. To format the information, drag the column to the desired size.
-or-
Click *Format - Resize Columns*, enter or select the column width in the Width spin box and then select *Pixels* or *Percent* in the list box and click *OK*.
-or-
Click the column and click *Wrap* to wrap text in a column.

Basic Configuration

Basic configuration includes licensing, user management, events/alarms, notifications and system configuration/management. Your role and the modules you have purchased determine which tasks can be accessed.

NOTE: Some of the features in this menu may be addressed in more detail in a following module chapter. You may want to bookmark this chapter for future reference.

Using the Licensing Menu

The Licensing menu is used to activate and verify the license-related information for the platform and symbols. If you are unable to activate your licenses online, please contact Technical Support for activation assistance.

To activate new licenses:

1. From the Administration menu under Licensing, select *Licensing*, enter the entitlement/license number in the Entitlement ID box and click *Submit*.
2. On the Available Activation ID list, enter the number of license numbers in the Number to Activate Column and click *Activate*.
3. Log out of the *Trellis*™ platform and log in again with an account that has the *Trellis*™ platform Administrator role to activate the license.

NOTE: The license for the *Trellis*™ Site Manager module is required for the *Trellis*™ Intelligence Engine or registration of the Avocent® Universal Management Gateway appliance.

To verify platform versions and licensing information:

1. From the Administration menu under Licensing, click *About Trellis* to view the currently installed version of the *Trellis*™ platform, patches and their release dates.
2. Click *Licensing* to view the current licenses.

NOTE: A blank value in the Expiration Date field means a permanent license is activated.

User Management

Managing users involves role-based authorization in which you assign roles to users and user groups to manage their access to system-level and specific rights. Permissions and resources are assigned to roles and roles are assigned to users.

The User Management menu provides access to the following screens and functions.

User Management Functions

Item	Description
Users	Creating users and assigning users to groups and roles

Item	Description
User Groups	Creating, assigning and managing user groups
Roles	Creating and assigning permissions to roles
Authentication	Managing user access to resources
Account Policies	Creating user sessions policies, for example, password expiration and whether the user needs defined session policies
Notifications	Configuring roles for notification of events and alarms

Assigning scalable permissions

For larger organizations, scalable administration allows you to organize and manage permissions more efficiently. Assigning scalable permissions involves assigning user groups to roles, then adding users to the groups. User groups can be created to represent organizations within the company, for example, by geographic structure, job function or management structure.

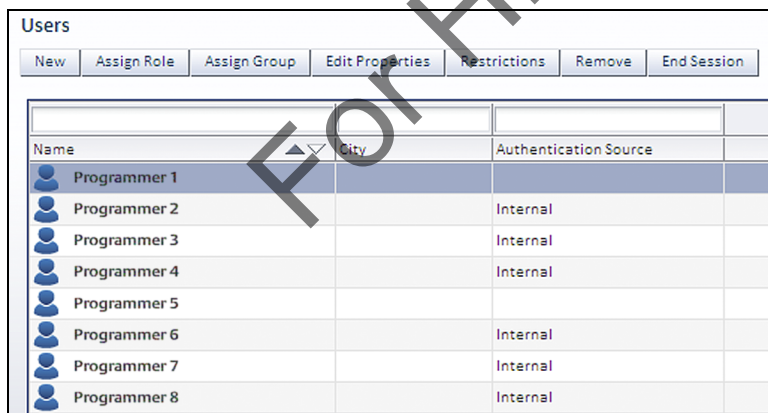
To assign scalable permissions:

1. Create a role, create a user group and assign the role to the user group.
2. Create users or add existing users to the user group.

Working with users

The Users screen allows you to create and edit user details and restrictions, assign a user to a role or a group, remove a user and end a session. To find a user, enter text in the field header dialog boxes. To verify user information, select a user and view the information in the properties panel under the Properties, Contact, Groups or Roles accordions.

Users Screen



Users		
Name	City	Authentication Source
Programmer 1		
Programmer 2		Internal
Programmer 3		Internal
Programmer 4		Internal
Programmer 5		
Programmer 6		Internal
Programmer 7		Internal
Programmer 8		Internal

To create a user:

NOTE: When creating a user account, you do not set up the user password. The *Trellis*™ platform generates a user password and sends it to the user.

1. From the Administration menu, under System Configuration, select *Users*.
2. Click *New* and under Create a New Internal User, enter the username and email address (without spaces).

3. If needed, select an internal group and click *Save*. An email is sent to the user with a username and password.

NOTE: The username must not contain spaces.

Creating restrictions for a user

Specific account restrictions can be applied to individual user accounts. The following restrictions are applied at the user level:

- Applying password restrictions
- Disabling a user account
- Locking a user account
- Ending a user session
- Setting an account expiration date

To create restrictions for a user:

1. From the Administration menu, under User Management, click *Users*.
2. Select the user for whom you want to create restrictions, click *Restrictions* and enable the checkbox for the following applicable restrictions:
 - User must change password at next login
 - User cannot change password
 - Password never expires
 - Account is disabled
3. Under Account Expiration, click *Never*.
-or-
Click *End of* and enter or select the date to expire the user account.

NOTE: If you select *End of*, you can also click the *Select Date* icon to select the date of account expiration.

4. Click *Save* to apply the restrictions.

To remove a user:

Select a user and click *Remove - Yes*.

To end a session:

Select a user and click *End Session - Yes*.

Managing account and password policies

From the Account Policies screen you can configure password and session rules for all users. Passwords are automatically generated using the local policy for complexity and sent to the user via email or SMS. This password must also be validated against the configured password policy. You can configure settings for the following policies:

- Password account policy

- Account lockout policy
- Session management policy

NOTE: When a password policy is changed, the new policy becomes effective the next time a user changes their password.

Assigning a password account policy

Assigning a password account policy determines the level of complexity that user passwords require. You can prevent or reduce password reuse by enforcing password history and requiring a minimum password age. Enabling password complexity allows you to select password character requirements.

To assign a password account policy:

1. From the Administration menu, under User Management, click *Account Policies*.
2. Under account Password Policies, select the desired options that to use and under Complexity, select *Enabled* or *Disabled*.
3. Enter or select the number of passwords the system remembers in the Enforce password history box. This setting prevents users from using the same password after their current password expires.
4. In the Maximum password age box, enter or select the number of days after which passwords will expire.
5. In the Minimum password history box, enter or select the number of days that current passwords must remain active. This setting prevents users from repeatedly changing their password to bypass the policy and continue using their original expired password.
6. Enter or select the minimum number of characters that passwords must contain in the Minimum password length box.
7. Enter or select the number of days after which the system sends a password expiration notification in the Send email notification days before password expires box.
8. Click the Send daily reminders after this date checkbox to send daily reminders after the first password expiration notification.
9. Click the Upper and lower case checkbox to allow passwords to contain both upper and lower case letters.
10. Click the Numeric characters checkbox to allow passwords to contain numbers.
11. Click to select the Non-alphanumeric (special characters) checkbox to allow passwords to contain special characters.
12. Under Store passwords using reversible encryption, select *Enabled* or *Disabled*.

NOTE: Enabling reversible encryption supports application protocols that require a user password for authentication.

13. Click *Save* to apply the policy.

NOTE: If the *Save* button is hidden, collapse the navigation menu or click the scroll button at the bottom of the menu.

Assigning an account lockout policy

Assigning an account lockout policy defines account lockout conditions. You can set the number of invalid login attempts that users are allowed before the system locks their account. You can also set the length of lockout durations and the number of minutes after which the lockout counter resets. To enable an indefinite lockout after a specified number of invalid login attempt, select the option to require an administrator to reset locked accounts.

To assign an account lockout policy:

1. From the Administration menu, under User Management, click *Account Policies*.
2. In the Account Lockout policies section, select the options you want to use and click *Save* to apply the policy.

Assigning a session management policy

Assigning a session management policy configures the maximum amount of time allowed for inactive and active sessions. All sessions ending as a result of inactivity require users to log in and establish a new session.

To assign a session management policy:

1. From the Administration menu, under User Management, click *Account Policies*.
2. In the Session Management policies, enter or select the number of minutes of inactivity before ending a session.
-or-
Click *End All Active Sessions*.
3. Click *Save* to apply the policy.

Custom Header Authentication

The custom header authentication feature in the *Trellis*™ platform is used to bypass the standard log-in process if you are authenticating via a third-party, API-based, single sign-on solution. When configured for custom header authentication, pre-configured authentication headers are present in the initial request that permits access to the platform. If the required values are not present in the headers, the platform presents the traditional log-in page. An optional SSL certificate check can also be enabled to further validate any authentication requests.

Prior to creating a custom authentication provider in the *Trellis*™ platform, the following are required:

- The *Trellis*™ platform version 4.0.1 or higher must be installed and active.
- All necessary files (Java project) are in the `/u01/trellis/support/extensions/mbeatypes` file.

WebLogic custom identity assertion functionality

A token from outside of the WebLogic Server is passed to an identity assertion provider. The provider is responsible for validating tokens of that type and is configured as active. If the token is validated, the identity assertion provider maps the token to a WebLogic Server username and sends that username back to the WebLogic Server, which then continues the authentication process. Specifically, the username is sent via a Java Authentication and Authorization Service (JAAS) CallbackHandler and passed to each configured

Authentication provider's LoginModule, so the LoginModule can populate the subject with the appropriate principals.

The WebLogic custom authentication provider requires the following components:

- ExampleCallbackHandlerImpl.java : for authentication context
- ExampleIdentityAsserter.xml: for configuring headers
- ExampleLoginModule.java : for populating groups
- ExampleProviderImpl.java: for asserting or validating header tokens
- Miscellaneous files for building the MBean jar:
 - Commo.dtd
 - build.xml
 - setWLSEnv.sh: The environment or WebLogic version for which the provider is being created; this file resides in the /u01/fm/11.1.1.7/wlserver_10.3/server/bin directory.

To add custom headers:

1. Add and modify the following token types to the CustomIdentityAsserter.xml file:

```
<MBeanAttribute
Name = "SupportedTypes"
Type = "java.lang.String[]"
Writeable = "false"
Default = "new String[] { &quot; CUSTOMER-ID, USERNAME, USER-ID, SESSION-KEY&quot; }"
/>
<MBeanAttribute
Name = "ActiveTypes"
Type = "java.lang.String[]"
Default = "new String[] { &quot; CUSTOMER-ID, USERNAME&quot; }"
/>
```

2. Modify the CustomProviderImpl.java file to handle the logic for additional providers.
3. Run the following commands to build the custom jar from the custom provider directory:

```
./setWLSEnv.sh
ant build
```

4. Verify the customAuthentication provider jar is in your directory to confirm the build.

To configure a custom authentication provider:

1. Copy the CustomAuthenticationProvider jar to the following directory:
/u01/fm/11.1.1.7/wlserver_10.3/server/lib/mbeantypes
2. Restart all servers on the front machine of the *Trellis*™ platform.
3. Log in to the WebLogic Server Administration Console, navigate to *Security Realms - myrealm* and click the *Providers- Authentication* tabs.

Settings for myrealm

The screenshot shows the Oracle WebLogic Server Administration Console. The main content area is titled 'Settings for myrealm' and includes a navigation menu with tabs for Configuration, Users and Groups, Roles and Policies, Credential Mappings, Providers, and Migration. The 'Providers' tab is selected, and the 'Authentication Providers' section is active. Below this section, there is a table of authentication providers. The table has three columns: Name, Description, and Version. The providers listed are Kerberos, SAML2AP, OVIDAuthenticator, SystemTest, Millwood, DefaultAuthenticator, and DefaultIdentityAsserter. The 'DefaultIdentityAsserter' is highlighted. The table also includes 'New', 'Delete', and 'Reorder' buttons at the top and bottom.

Name	Description	Version
<input type="checkbox"/> Kerberos	WebLogic Negotiate Identity Assertion provider	1.0
<input type="checkbox"/> SAML2AP	SAML 2.0 Identity Assertion Provider. Supports Security Assertion Markup Language v2.0.	1.0
<input type="checkbox"/> OVIDAuthenticator	Provider that performs LDAP authentication	1.0
<input type="checkbox"/> SystemTest	Provider that performs LDAP authentication	1.0
<input type="checkbox"/> Millwood	Provider that performs LDAP authentication	1.0
<input type="checkbox"/> DefaultAuthenticator	WebLogic Authentication Provider	1.0
<input type="checkbox"/> DefaultIdentityAsserter	WebLogic Identity Assertion provider	1.0

4. In the Change Center section on the top left, click *Lock & Edit*.
5. In the Authentication Providers section, click *New*.
6. Enter the name and type, such as **ExampleIdentityAsserter**.
7. Click *Reorder* to move ExampleIdentityAsserter to the first one in the list and click *OK*.
8. Click *Activate Changes* and restart all servers on the front machine.

Working with user groups

Users can be combined into groups. When you create a new user group, you must select an authentication source for the group. If you select an internal authentication source, you can create an internal group and create a name for the new instance.

After an internal authentication source has been created, you can map it to an external authentication source, map the external users to a group and map the group to user roles. For more information about authentication, [Adding an external authentication source](#) on page 40.

To create a user group:

1. From the Administration menu, under User Management, click *User Groups - New*.
 2. Enter a new group name and select a user to be added.
- or-
- Click *Add All* to add all available users and groups to the new group.
3. Click *Save*.

To edit a user group:

1. On the User Groups screen, select a group name and click *Edit Group*.
2. On the Edit Group screen, make the changes and click *Save*.

To remove a user group:

On the User Groups screen, select a group name and click *Remove*.

Adding a group member

After you create a group, you can add members to it. Users can belong to multiple groups.

To add a member to a group:

1. From the Administration menu, under User Management, click *Users*, select a user and click *Assign Group*.
2. Select a group to assign to the user and click *Add*.
-or-
Click *Add All* to assign all available groups to the user.
3. Click *Save*.

Adding an external authentication source

Authentication is the process of verifying the identity of a user attempting to access the system. The *Trellis*™ platform uses LDAP or Windows Active Directory for authentication. Internal default authentication properties are configured during installation. After adding an external authentication source, external groups can be mapped to internal groups. The external users in the mapped group inherit all Coarse Grain Authorization (CGA) and Fine Grain Authorization (FGA) permissions that are assigned to the internal group. In addition, if you customize the default security configuration to use a custom authentication provider, you must use the administration tools supplied by that security provider to create a user.

NOTE: All new authentication instances appear at the top of the list.

CAUTION: Please contact Professional Services before adding an external authentication source.

Authentication Screen

To add an external authentication source:

1. From the Administration menu, under User Management, click *Authentication - New*.
2. Enter the required Name, Host, Port, Root, Base DN (domain name), Group Base DN and User Base DN.
3. Select *Active Directory* or *LDAP* and if you are encrypting information over the Internet, enable *SSL Mode* and click *Save*.

NOTE: Enabling SSL Mode provides maximum security and automatically sets the Port Number field to a default port number of 636. Disabling SSL Mode is the least secure mode, which automatically sets the Port Number field to the default port number 389.

4. Under Access Credentials, enter your username and password, and if desired, enable *Chasing Referrals* and click *Save*.
5. On the server restart message, click *OK* and if you are using an unsecured connection, on the warning, click *OK* to transmit credentials and clear the text.
6. Restart the back machine first, then restart the front machine to apply the changes.

To remove external authentication sources from the UI:

1. From the Administration menu, under User Management, select *Authentication*.
2. Click the authentication source and click *Remove - Save*.

Mapping a group

When you select an external authentication source, you must select an internal group to hold the user group, and select an external group in which to map.

NOTE: If the servers have not been restarted after adding the authentication service, an error message is displayed when mapping the group.

To map a group:

1. From the Administration menu, under User Management, click *User Groups*.
2. On the User Groups screen, select the group to be mapped and click *Map Group*.
3. Select the authentication source in the Authentication Source list.
4. Select the specific external user groups to which you want to map in the Available list and add to the Selected list.
-or-
Click the double arrows to map all available external user groups.
5. Click *Save*.

Working with roles

Roles are used to assign categories and permissions to users and user groups. The Administrator role is created automatically during the installation process, with permissions to add, edit, duplicate and remove roles. After adding a user, the user is assigned to one of the following default role categories and then general permissions are added:

- Administrative
- Operator
- Planning
- Reports

Roles can be customized by combining types of permissions, such as Events and Alarms Management and Real-Time Data Management. If two permissions are assigned to a role with different levels of rights to the same operation, the role with the highest level of rights overrides the lower level.

Adding a role

Roles define general permissions and resource rights and delegate those permissions and rights to users/groups. General Permissions are system level rights, for example, to create a plan. Resource Rights are equipment level rights, for example, to reboot a server. An Administrator can create, edit, duplicate and remove roles. The Administrator role is created and assigned during the installation process and has complete access to all *Trellis*™ platform permissions.

Using the built-in user role

The *Trellis*™ platform includes one built-in user role named *TrellisAdministrator*. This role provides complete access to all *Trellis*™ platform modules and permissions. The user “*TrellisAdministrator*” is case sensitive.

TrellisAdministrator must be entered with initial caps (as shown) to get full and correct authorization permissions. The built-in user role cannot be edited. You can assign a user to the following built-in user role.

NOTE: Some permissions are not available when the feature license is not active.

NOTE: You can assign equipment to a role by containment level on the Assign Rights window.

NOTE: All other users created using the *Trellis*™ platform user interface (UI) need to be logged in using lower case characters to get full and correct authorization permissions.

Adding permissions

Adding permissions to user roles ensures that users can perform their jobs and prevents roles from becoming too restrictive. If a user with the role of Project Planner wants to run a report in *Trellis*™ Inventory Manager prior to moving equipment, the Project Planner will be denied access to the report. This happens because the default permissions for a Project Planner role restrict those users from running reports. You can solve this problem by adding the Reporting – Inventory Manager permission to the role of Project Planner.

If a user has two roles that grant different levels of permission to the same operation, the role with the highest level of permission overrides the lower level. A user with read/write permission to an operation from one role and read only permission to the same operation from another role will have read/write permission as a result.

You can also add the following permission types to roles:

- Identity Management
- Task Management
- License Management
- System Configuration Management
- Event and Alarm Management
- Real-Time Data Management
- Reports Management

Using permissions for operations

All other name assignments, such as Facilities Engineer and IT Engineer, are used for permissions. You can assign users to the following user permissions.

User Roles

Name	Permissions
Facilities Engineer	Read/write access to all <i>Trellis</i> ™ Site Manager module capabilities
Facilities Technician	Read access only to all <i>Trellis</i> ™ Site Manager module capabilities
IT Engineer	Read/write access to all <i>Trellis</i> ™ Inventory Manager module capabilities
IT Technician	Read access only to all <i>Trellis</i> ™ Inventory Manager module capabilities

Name	Permissions
Project Planner	Read/write access to all <i>Trellis</i> ™ Change Planning feature capabilities
Project Viewer	Read/write access to all <i>Trellis</i> ™ Change Planning feature capabilities

NOTE: Some permissions are not available when the feature license is not active.

The following table lists the permissions that can be assigned for each operation. Read Only (R), Read/Write (RW) or Not Applicable (NA) permissions are designated.

NOTE: Identity Manager, License Manager, Real-Time Data Manager, Scheduler and System Configuration Manager permissions are not included for operations in the following table.

General Permissions for Operations

Operations	Admin	Facilities			IT		Project		Event/ Alarm Manager	Rep	
		Eng	Tech	Simple Tech	Eng	Tech	Plan	View		User	Adm
Add Accessory Devices to Primary	RW	RW	R	R	RW	R	NA	NA	NA	NA	NA
Alarm Assignment	RW	RW	R	NA	NA	NA	NA	NA	NA	NA	NA
Alarm View	RW	RW	R	NA	NA	NA	NA	NA	NA	NA	NA
Assign Notification Rules to Roles	RW	RW	R	NA	NA	NA	NA	NA	NA	NA	NA
Capacities Accordion	RW	RW	R	R	NA	NA	NA	NA	NA	NA	NA
Capacity Search	RW	RW	R	R	RW	R	NA	NA	NA	NA	NA
Change Severity Level of Alarm Types	RW	RW	R	NA	NA	NA	NA	NA	NA	NA	NA
Configuration Access	RW	RW	R	R	NA	NA	NA	NA	NA	NA	NA
Configure Accelerated Polling Interval for Data Point Collection	RW	RW	R	R	NA	NA	NA	NA	NA	NA	NA
Configure Alarm Suppression	RW	RW	R	R	NA	NA	NA	NA	NA	NA	NA
Configure Custom Data Points	RW	RW	R	NA	NA	NA	NA	NA	NA	NA	NA
Configure Data Point Collection Interval	RW	RW	R	R	NA	NA	NA	NA	NA	NA	NA
Configure Email/SMS Server Settings	RW	RW	R	NA	NA	NA	NA	NA	NA	NA	NA
Configure Notification Preferences	RW	RW	R	R	NA	NA	NA	NA	NA	NA	NA
Configure Notification Rule Template	RW	RW	R	NA	NA	NA	NA	NA	NA	NA	NA
Configure Notifications	RW	RW	R	R	NA	NA	NA	NA	NA	NA	NA
Configure Operational Thresholds	RW	RW	R	R	NA	NA	NA	NA	NA	NA	NA

Operations	Admin	Facilities			IT		Project		Event/ Alarm Manager	Rep	
		Eng	Tech	Simple Tech	Eng	Tech	Plan	View		User	Adm
Configure Thresholds for Parametric and Enumerated Data Points	RW	RW	R	R	NA	NA	NA	NA	NA	NA	NA
Configure Polling Interval to Monitor Device Status	RW	RW	R	R	NA	NA	NA	NA	NA	NA	NA
Configure Power Meter	RW	RW	R	R	NA	NA	NA	NA	NA	NA	NA
Configure PUE	RW	RW	R	NA	NA	NA	NA	NA	NA	NA	NA
Consolidate Alarms	RW	RW	R	R	NA	NA	NA	NA	NA	NA	NA
Monitoring Configuration Accordion	RW	RW	R	R	NA	NA	NA	NA	NA	NA	NA
Critical Infrastructure Colorization	RW	RW	R	R	RW	R	NA	NA	NA	NA	NA
CRUD Containers	RW	RW	R	R	RW	R	NA	NA	NA	NA	NA
CRUD Containers - Change Planning	RW	NA	NA	NA	NA	NA	RW	R	NA	NA	NA
CRUD Zone/Group	RW	RW	R	R	RW	R	NA	NA	NA	NA	NA
CRUD Zone/Group - Change Planning	RW	NA	NA	NA	NA	NA	RW	R	NA	NA	NA
Dashboard - Consumption	RW	RW	R	R	NA	NA	NA	NA	NA	NA	NA
Dashboard - Cooling	RW	RW	R	R	NA	NA	NA	NA	NA	NA	NA
Dashboard Load	RW	RW	R	R	NA	NA	NA	NA	NA	NA	NA
Dashboard - Search	RW	RW	R	R	NA	NA	NA	NA	NA	NA	NA
Dashboards	RW	RW	R	R	NA	NA	NA	NA	NA	NA	NA
Data Connections	RW	RW	R	R	RW	R	NA	NA	NA	NA	NA
Device Discovery - Automatic	RW	RW	R	R	NA	NA	NA	NA	NA	NA	NA
Device View	RW	RW	R	R	NA	NA	NA	NA	NA	NA	NA
Device Management	RW	RW	R	R	RW	R	NA	NA	NA	NA	NA
Device Management - Change Planning	RW	NA	NA	NA	NA	NA	RW	R	NA	NA	NA
DSView™ Session Accordion	RW	RW	R	R	RW	R	NA	NA	NA	NA	NA
Energy Consumption Graph	RW	RW	R	R	NA	NA	NA	NA	NA	NA	NA
Event Viewer	R	R	R	NA	R	R	NA	NA	NA	NA	NA
Export Trend Graph Data	RW	RW	R	R	NA	NA	NA	NA	NA	NA	NA
Filter Alarms by New Severity Level	RW	RW	R	NA	NA	NA	NA	NA	NA	NA	NA
Heat Map	RW	RW	RW	RW	NA	NA	NA	NA	NA	NA	NA
Import .zip	RW	NA	NA	NA	NA	R	NA	NA	NA	NA	NA
Import .svg	RW	RW	NA	NA	RW	R	NA	NA	NA	NA	NA

Operations	Admin	Facilities			IT		Project		Event/ Alarm Manager	Rep	
		Eng	Tech	Simple Tech	Eng	Tech	Plan	View		User	Adm
Levels - Status - Alarms	RW	RW	R	R	NA	NA	NA	NA	NA	NA	NA
Manage Alarms	RW	RW	R	NA	NA	NA	NA	NA	NA	NA	NA
Manual Clear Alarms	RW	RW	R	NA	NA	NA	NA	NA	NA	NA	NA
Power Connections	RW	RW	R	R	RW	R	NA	NA	NA	NA	NA
Project Planning	RW	NA	NA	NA	NA	NA	RW	R	NA	NA	NA
Reporting - Inventory Manager	RW	NA	NA	NA	NA	NA	NA	NA	NA	R	RW
Reporting - Site Manager	RW	NA	NA	NA	NA	NA	NA	NA	NA	R	RW
Reporting - Energy Manager	RW	NA	NA	NA	NA	NA	NA	NA	NA	R	RW
Restricted Device Access	RW	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Specifications Accordion	RW	RW	R	R	RW	R	NA	NA	NA	NA	NA
Status Change Control	RW	RW	R	R	NA	NA	NA	NA	NA	NA	NA
Submit Periodic Test Notification Task	RW	RW	R	R	NA	NA	NA	NA	NA	NA	NA
Support Accordion	RW	RW	R	R	RW	R	NA	NA	NA	NA	NA
Thermal View	RW	RW	R	R	RW	R	NA	NA	NA	NA	NA
Threshold Colorization	RW	RW	R	R	RW	R	NA	NA	NA	NA	NA
Threshold Configuration	RW	RW	R	R	RW	R	NA	NA	NA	NA	NA
Trend Data Point Collection History Graph View	RW	RW	R	R	NA	NA	NA	NA	NA	NA	NA
Update Severity Settings	RW	RW	R	R	NA	NA	NA	NA	NA	NA	NA
View PUE	RW	RW	R	R	NA	NA	NA	NA	NA	NA	NA

Creating a custom role

Creating a custom role gives the administrator more control over functions that a specific user might need. When creating custom roles, you can focus on function and containers in the *Trellis*™ platform rather than a job title. When creating a planning architect sample in the *Trellis*™ platform, consider what roles are needed for the user to access a function.

Fine Grained Authorization (FGA) provides a level of security where roles are granted to view or manage access rights to resources such as enterprises, buildings, floors, spaces and zones that are created in the *Trellis*™ platform. Users are able to view and manage resources based on their assigned rights to roles.

NOTE: The *Trellis*™ platform System Administrator always has full access rights to all resources in the *Trellis*™ platform.

We could give this custom Planning Architect role the following general permissions:

- Project Planner
- Report User
- Report Administrator

- Events and Alarms Management Permissions

You can create a customized role by:

- Combining permission types (for example, Event and Alarm Management and Real-Time Data Management)
- Adding permissions to a pre-configured role (for example, IT Engineer role + Event and Alarm Management)
- Combining pre-configured roles (for example, Facilities Technician and IT Engineer)

To create a role:

1. From the Administration menu, under User Management, click *Roles*.
2. On the Roles screen, click *New* and enter a name with alpha-numeric characters and no spaces.
3. Select a category from the drop-down list and enter an optional description.

NOTE: The brief description should explain the purpose of the role and the permissions assigned to it.

4. Under General Permissions, move the desired general permissions from the Available column to the Selected column and click *Save*.

To edit a role:

Select a role, click *Edit*, complete your changes and click *Save*.

To duplicate a role:

1. Select a role, click *Duplicate* and under Duplicate Role, enter a name and description for the new role.
2. Click the drop-down arrow, select the role to be duplicated and click *Save*.
3. In the General Permissions area, select the role, click the arrow to select the new role and move it to the selected area.
4. Click *Save*.

To remove a role:

Select a role and click *Remove - Yes*. Notification rules associated with the role are removed as well.

To assign rights to a role:

1. Under Administration, expand User Management, click *Roles*, select a role from the list and click *Assign Rights*.
2. In the Search list box, click a containment type or use the default All levels to view and select the Assign Rights you want to add to a role. A specific portfolio, location and/or policy can be searched. On the Policy list box, select *All*, *None*, *View* and/or *Manage* and click *Search*. A list of all assigned rights including Portfolio, Location and Containment type are displayed based on your search criteria.

NOTE: To remove all the items in the search fields click *Clear*.

3. In the Policy column, the following assigned user right options are available:
 - None - does not allow the assigned user the right to view properties of a particular container in the portfolio. When a new role is created, all policies are defaulted to None.

- View - allows the assigned user the right to view properties of a particular container in the portfolio, but cannot manage by adding, modifying or deleting a container.
- Manage - the assigned user has the right to view, modify and delete a particular container in the portfolio.

NOTE: The child container will inherit the policy of the parent container or device. For Example, if the parent container policy is set to Manage, then all containers under the parent are automatically set to the view policy.

4. In the Policy selection list box, click the down arrow to select View or Manage.
5. Click *Save*.

Another approach to setting policies is to start from the bottom up. For example, change the child containers and then proceed to the parent containers. If you do not have assigned rights, an information note appears informing you that you are not authorized to perform this operation.

NOTE: If upgrading from *Trellis*™ platform software version 3.2 to 3.3, all current users will inherit the same assigned rights.

To assign notifications to a role:

1. Under User Management, click *Roles*, select a role and click *Assign Notifications*.
2. In the Available list box, click to select the notifications you want to add to the role and click *Add*.
-or-
Click *Add All* to add all available notifications.
3. In the Selected list box, click to select the notifications you want to remove from the role and click *Remove*.
-or-
Click *Remove All* to remove all available general notifications.

To assign a notification rule to a role:

1. From the Administration menu, under User Management, click *Roles* and select a role.
2. Click *Assign Notifications* and select an available notification rule.
3. Click the arrow to select the rule and click *Save*.

Viewing and Modifying System Configuration

The *Trellis*™ platform configuration can be modified from the following System Configuration sub-menus.

System Configuration Submenus

Name	Description
Server Status	Displays the status of subcomponents.
Server Topology	Displays a graphical representation of server status, memory heap and startup date and time information.
Server Locations	Displays help file locations, email and SMS notification server

Name	Description
	configurations.
Server Logs	Displays server log configurations and related notes.
Event Viewer	Opens Event Viewer.
Alarm Settings	Displays alarm severity defaults and configuration options.
Data Collection Engine	Displays the status of the real-time data collection engine, registers a new appliance and also restarts, replaces and upgrades an existing engine. The engine can also be unregistered and backed up.
Device Installation	Removes and uploads device firmware.
SNMP Trap Destination	Forwards collected and generated active alarms via SNMP trap.
Custom Data Points	Displays the data point name, device, data source and date and time.

Viewing Server Status

The Server Status read-only workspace displays overall system status, currently installed system components and any alarms that pertain to those components.

Component status includes the component server name, Host server name, component state, status and a description.

Server Status View



To view system status:

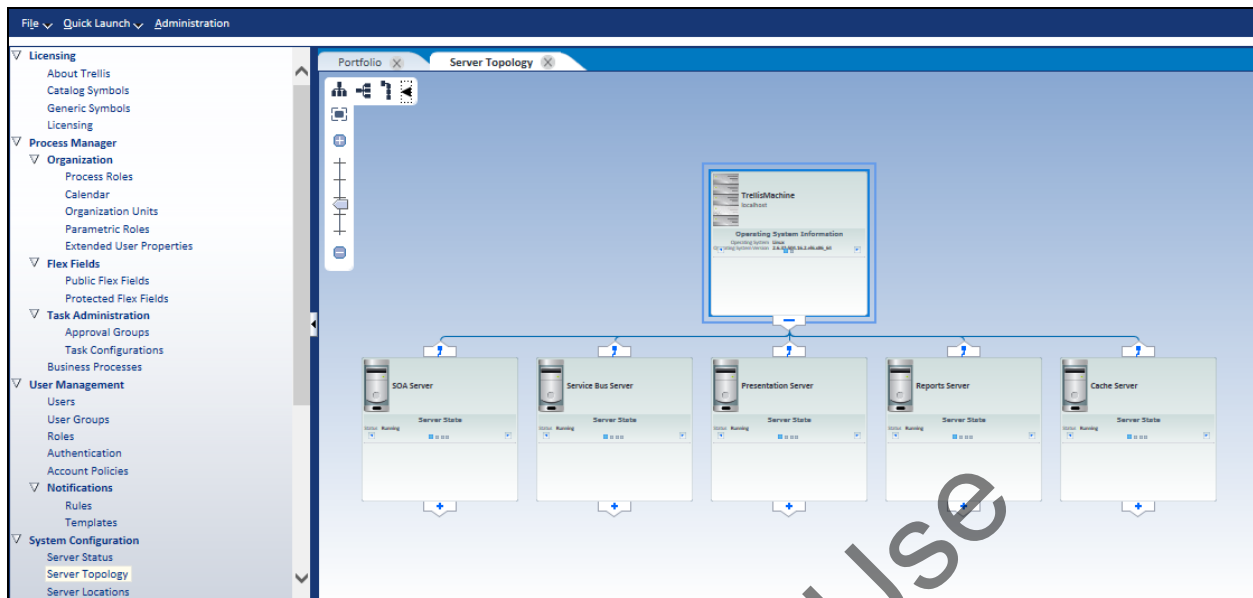
From the Administration menu, under System Configuration, click *Server Status*.

Viewing Server Topology

The Server Topology tab displays graphic representations of the local host machine, servers, appliances and other components that are physical instances in your system.

Using the icons at the top of the screen, you can shift the diagram in any direction, zoom in or out, modify the layout and display information simultaneously for all devices.

Server Topology Screen



Possible components are:

- SOA Server
- Service Bus Server
- Presentation Server
- Reports Server
- Cache Server

The following options are at the bottom of each graphical representation:

- Server State - Real-time component status is indicated with the following four possible values:
 - Running: normal operation
 - Stopped: no activity
 - Off-line: not identified
 - Critical: overload, can be verified by the CPU and memory utilization values
- Startup Information - Displays the date and time the server was started
- Server Status - Displays the health of the server
- Server Memory Information - Displays the Heap Memory status of the server

Use the left and right arrows to scroll through the buttons or hover over them to magnify them.

NOTE: The local host machine displays only its OS and Heap Memory information.

The following Server Status columns can be sorted by clicking a column header and dragging the header to the desired location or by clicking the column arrows to sort each column individually in ascending or descending order.

To view one device at a time:

1. Click the connection symbol outside the device to separate the equipment from the topology diagram.
2. Click the connection symbol again to reattach it to the topology diagram.

To view and sort Server Topology:

From the Administration menu, under System Configuration, click *Server Topology*.

Configuring email and SMS notification servers

Notifications for alarms can be sent by email to one or more roles. Notifications can be sent for a specific alarm or all alarms from a floor, a device or a group of devices.

The incoming and outgoing servers can be configured for sending notifications to *Trellis*™ platform users via email or SMS.

NOTE: Configuring SMS for notifications allows you to utilize Microsoft Exchange Server 2010 or a third-party SMS service provider.

To configure the email and SMS notification servers:

1. From the Administration menu, under System Configuration, click *Server Locations*.
2. For the outgoing server, enable the Outgoing checkbox and enter the applicable information.
3. For the incoming server, enable the Same as outgoing checkbox or enter the applicable information and select the protocol.
4. Enable/disable the Register Access Point checkbox for the incoming server, click *Save* and restart the SOA server for the changes to take effect.

To modify the email and SMS server configurations:

1. From the Administration menu, under System Configuration, click *Server Locations*.
2. Under the applicable server, enable or disable the Outgoing Server or Incoming Server checkbox, modify as necessary and click *Save*.

Modifying the online help file location

The online help file provides information about the UI and includes task instructions. The file can be accessed via an active internet connection or the file location can be modified to install the help file on another server.

To modify the file location:

1. From the Administration menu, under System Configuration, click *Server Locations*.
2. In the Help Documentation section box, click *View Help from Avocent web site* to access the *Trellis*™ platform online help from the Avocent web site.

-or-

Click *View Help from Trellis*™ server help location to download the *Trellis*™ platform online help file and upload it as a local copy.

3. Click *Save*.

Using the Alarm Settings screen

On the Alarm Settings screen device alarms can be assigned by severity and device type. For more information, see [Viewing and assigning alarm severity levels](#) on page 192.

Using the SNMP Trap Destination screen

The SNMP trap destination must be configured in order to collect SNMP traps for alarms. For more information, see [Configuring SNMP traps](#) on page 196.

Configuring server logs

Configuring a server log allows you to customize the *Trellis*™ platform server log messages. You can capture server logs by file size, capture logs over a specific time interval or accumulate messages in a single file. Other settings allow you to limit the number of retained log file messages.

You can configure server log settings to capture specific logs from the WebLogic Server. Configuring server log settings allows you to extract abstract data from the servers and place it in a designated location. For example, using a JDBC logging API you can create handler classes that give you the ability to send your abstract data to a file or console.

NOTE: Server logs are located in file directories u01/u02.

To configure a server log:

1. From the Administration menu, under User Management, click *Server Logs*, click to select the server log to be configured and click *Modify Server Logs*.
2. Click the JDBC Logging Enabled checkbox to enable Java Database Connectivity (JDBC) logging and enter a name for the log file in the File Name box.

NOTE: The File Name box displays a default name for the server log that you can use.

3. In the Rotation Type list, click *By Size* to rotate the file when the log file reaches a specific size.
-or-
Click *By Time* to rotate the file after a specific time interval.
-or-
Click *None* to rotate the file after a specific time interval.

NOTE: If you select *By Size* or *By Time*, the server renames the log file and accumulates messages in a new file with the name specified in the File Name box. If you select *None*, you must erase the contents of the file to prevent it from becoming too large.

4. Enter the minimum file size (between 1 and 65535) in the File Min Size box to rotate the file by size and enter the start time (hours and minutes) of the interval in the Rotation Time box.
5. To limit the number of files to retain in the log, click the *Limit Number of Files* option, enter the maximum number of files to retain in the File Count box and click *Save*.

NOTE: When the server reaches the limit indicated in the File Count box, the server deletes the oldest log file and creates a new log file with the newer suffix.

To view and update server logs:

1. From the Administration menu, under System Configuration, click *Server Logs*, click the server log to be modified and click *Modify Server Logs*.
2. Check *JDBC Logging Enabled*, enter the filename and click *Rotation Type*.
3. In the Rotation Type list, click *By Size* and enter the File Minimum Size between 1 and 65535.
-or-
Click *By Time* and enter the Rotation Time and File Time Span.
-or-
Click *None*.
4. Check to enable *Limit Number of Files*, enter the File Count number and click *Save*.

Using the Scheduler for tasks

Tasks can be added, edited and deleted on the Scheduler tab workspace. The initial view of the workspace is a monthly calendar with currently scheduled tasks and the current date highlighted. The tasks can also be viewed by day, week or month, or as a list.

Scheduler

Scheduler						
<input type="button" value="New Task"/> <input type="button" value="Scheduled Tasks"/> <input type="button" value="Edit Task"/> <input type="button" value="Delete Task"/>						
<div style="display: flex; justify-content: space-between; align-items: center;"> <div> <input type="button" value="Calendar"/> <input type="button" value="List"/> <input type="button" value="Week"/> <input type="button" value="Month"/> </div> <div> Today April 2013 </div> </div>						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
31	1	2	3	4	5	6
← Purge Analytics Reports →						
	11:45 AM Test +2 more	11:45 AM Test +2 more	11:45 AM Test +2 more	11:45 AM Test +2 more	11:45 AM Test +2 more	11:45 AM Test +2 more
7	8	9	10	11	12	13
← Purge Analytics Reports →						
12:45 PM Test +2 more	12:45 PM Test +2 more	12:45 PM Test +2 more	12:45 PM Test +2 more	12:45 PM Test +2 more	12:45 PM Test +2 more	12:45 PM Test +2 more
14	15	16	17	18	19	20
← Purge Analytics Reports →						
12:45 PM Test +2 more	12:45 PM Test +2 more	12:45 PM Test +2 more	12:45 PM Test +2 more	12:45 PM Test +2 more	12:45 PM Test +2 more	12:45 PM Test +2 more
21	22	23	24	25	26	27
← Purge Analytics Reports →						
12:45 PM Test +2 more	12:45 PM Test +2 more	12:45 PM Test +2 more	12:45 PM Test +2 more	12:45 PM Test +2 more	12:45 PM Test +2 more	12:45 PM Test +2 more
28	29	30	1	2	3	4
← Purge Analytics Reports →						
12:45 PM Test +2 more	12:45 PM Test +2 more	12:45 PM Test +2 more	12:45 PM Test +2 more	12:45 PM Test +2 more	12:45 PM Test +2 more	12:45 PM Test +2 more

NOTE: Fields may be populated or defaulted from Global settings.

To add a notification task using the Scheduler:

1. From the Quick Launch menu, select *Scheduler* and select the task from the calendar.
2. Click *New Task*, enter a task name, description and action name, select an action type and click *Add Action* at the bottom of the screen.
3. Click *Schedule* and under Task Information, enable *Scheduled Task* or *Run Now*.
4. Under Scheduling Information, enable a recurrence and select a date and time range.
5. Click *Next*, verify the task, select *Add to Calendar* and on the confirmation screen, click *OK*.

To edit a task for notifications using the Scheduler:

1. From the Quick Launch menu, select *Scheduler* and select the task from the calendar.
2. Click *Edit Task*, and if desired, modify the appropriate fields, select an action type and click *Add Action* at the bottom of the screen.
3. Click *Schedule* and under Task Properties, enable *Scheduled Task* or *Run Now*.
4. Under Scheduling Information, enable a recurrence and select a date and time range.
5. Click *Next*, verify the task, select *Add to Calendar* and on the confirmation screen, click *OK*.

To delete a notification task in the Scheduler:

1. From the Quick Launch menu, click *Scheduler-Scheduled Tasks* and select the task from the Scheduled Tasks list.
2. Click *Delete Task* and on the confirmation screen, click *Yes*.

To schedule a report:

1. From the Quick Launch menu, select *Advanced Reports* and under Folders, select the template type.
2. Under Report Templates, right-click a report template and select *Schedule*.
3. Enter a job name and description, enable the Start Date and Time radio button and click the calendar icon to select a date.
4. Slide the hour and minute bars to the desired time, click *Close* and if applicable, select a time zone from the drop-down list.
5. For Recurrence, click *Run Once* and click *Next*.
-or-
Click *Repeat*, select additional options and click *Next*.
6. For Parameters, under Set the Parameter Values, select a report from the Use saved values list and click *Save*.
-or-
Select the desired parameters in each field and click *Next*.
7. For Report Output Properties, enter a name, description and select a file format.
8. Select a language from the Output Translation drop-down list and click *Submit*.

To archive/purge events using the Scheduler:

1. From the Quick Launch menu, select *Scheduler* to display the scheduler calendar and select *New Task*.
2. Enter a task name, description, action name and select *Archive Alarms and Events* from the Action Types list.

3. Select an action from the Added Actions list and click *Add Action*.
4. Select *Schedule* to go to the Scheduling Information screen, click *Run Now* or select a later date and click *Next*.
5. Click *Add to Calendar* to create the new task containing the Archive Alarms and Events action type, and execute at the scheduled time.

Using the Notifications Menu

Notifications are used to automatically notify one or more roles of triggered alarms. They are created by building a rule in an expression area with container categories, device types and alarm types. Rules can be built to send a notification from a specific device or all devices and from a specific alarm or all alarms. SNMP traps can be forwarded and formatted as a notification and can also be sent from agents to third-party systems, such as network management systems (NMS).

Notifications are delivered by email or short messaging service (SMS) and are normally sent immediately following an alarm. If desired, an alarm delay can also be configured. For example, if you take a server offline for system upgrades, you can set a delay for 120 minutes so that a notification is only sent if the server remains offline for more than 120 minutes. The notification function itself can be tested to ensure notifications are received.

NOTE: SMS text messaging is supported for AT&T® and Verizon Wireless.

Before assigning notifications to a role, see the following:

- [Configuring SNMP traps](#) on page 196
- [Configuring email and SMS notification servers](#) on page 51
- [Configuring an account notification](#) on page 55
- [Configuring notification templates](#) on page 56

Configuring an account notification

The contact information and work schedule are set up on the Account tab. The email address and SMS number must be configured to designate where notifications are sent. Scheduling is used to designate when a user is available to receive notifications and when to stop notifications. Specific or all alarm notifications are configured from a plan or equipment.

NOTE: Email and SMS messages can be sent in Rich Text or Plain Text formats using templates. Users must also configure email/SMS messaging under Server Locations.

NOTE: Configuration of work hours and the method of notification is independent of configuring user roles.

Account Notification Screen

The screenshot shows the 'Account' tab selected in a navigation bar. Below it, the 'User Details' section contains input fields for 'Email Address' (john.doe@johndoesjob.com) and 'SMS Number' (1256555555). The 'Notification Schedule' section has three checkboxes: 'During Working Hours' (checked), 'Outside of Working Hours' (checked), and 'Stop All Notifications Between' (unchecked). Each checked checkbox has a corresponding 'Email' dropdown menu. Below these are two empty input fields for dates, separated by 'and'. The 'Working Schedule' section is a table with columns for days of the week, start time, and end time. All days are currently unchecked. The 'Current Notifications' section has an 'Edit' button and a table with columns for Notification Name, Expression, and Notification Delay.

Notification Name	Expression	Notification Delay
testNotification	Category(UPS).Dev...	0
notification	Category(Rack PDU...	1

To configure your notification profile:

1. On the Option bar, click *Account* and select *Notifications*.
2. Under *User Details*, enter your email address and SMS number.

NOTE: Enter the plus (+) icon before the SMS number.

3. If applicable, under *Notification Schedule*, enable *During Working Hours* and *Outside of Working Hours* and use the drop-down menus to select to be notified by *Email* or *SMS*.
4. If applicable, check *Stop All Notifications Between* and select the start and end notification dates.
5. Under *Working Schedule*, select the days and hours to receive notifications and click *Save*.

NOTE: Assigned alarms are displayed in the calendar.

Configuring notification templates

Templates can be used for sending similar email or SMS notifications for alarms. Notifications can be sent from a floor, device or a group of devices.

NOTE: For each *Trellis*™ platform module, the applicable driver must be configured to handle traffic for each specific channel and type of notification.

You can also create custom templates for regularly used notifications.

To add or modify a template for email or SMS notification:

1. From the Administration menu, under User Management, click *Notifications - Templates* and click *Add*.
2. Select to be notified by *Email* or *SMS* and select a language.
3. Select and drag an item to the Subject area and enable either *Rich Text* or *Plain Text* format.
4. Under Available Fields, select and drag items to the Summary Text expression area and select the desired font and format attributes for the notification.
5. If desired, select and drag items to the Repeating Text expression area, select the font and format attributes, enter the name for the template and click *Save*.

NOTE: For email and SMS servers, which must be configured prior to sending a notification, [Configuring email and SMS notification servers](#) on page 51.

Adding an attachment to an email notification

With write access permission, you can configure notifications to include device status/real-time data when an alarm occurs. For example, temperature threshold and current temperature data can be configured to be sent with a notification for a high temperature alarm. Read access permission is required to view the notification.

Using notification rules

A notification rule is a conditional expression used to filter alarms and assign one or more roles to receive specific notifications. Alarms can be filtered individually or by floors, equipment or equipment groups.

To add or modify a notification rule:

1. From the Administration menu, under User Management, click *Notifications - Rules* and click *Add* or *Edit*.
2. Under Notification Rule, enter a name, and if a delay is desired, select the value and unit for the delay.
3. Select the Notification Type and select a template.
4. If selecting a specific device, enable the Device Instance checkbox under the category list.
5. Click the arrow under the Device Instance checkbox to expand the expression area.
6. If modifying the expression, right-click and select *Clear Last Value* or *Clear*.
7. From left to right, drag one or more container/device categories, device types, alarm types and optional types of operations into the expression area.
8. Click *Save* and verify the notification was added.

NOTE: Also [Configuring SNMP traps](#) on page 196.

To remove notification rules:

Select a rule and click *Remove*.

NOTE: To assign a notification rule to a role, see [Creating a custom role](#) on page 46.

Configuring a periodic notification test

At times you may want to verify that notifications are being sent. A periodic test notification can be performed from the Scheduler screen. If there are any issues, an alarm will be generated.

To configure a periodic notification test:

1. From the Quick Launch icon, click *Scheduler - New Task*.
2. On the Task properties screen, fill in the blank fields, select *Periodic Notification Test* and click *Schedule*.
3. On the Scheduler screen, select the test intervals and click *Save*.

Using the Configuration Menu

The Configuration menu allows you to perform the following tasks.

Configuration Menu

Name	Description
Building	Changes power-phasing assignments for buildings
Hovers	Configures which device type parameters are displayed (by device category) when you hover over a device icon on the floor
User Defined Properties	Creates user-defined properties for device categories
Collection Settings	Assigns the method of collection for the data collection engine
Units of Measure	Changes the default units of measure for the platform
Global Thresholds	Changes the default global sensor thresholds for the monitoring temperature in a rack
DSView Configuration	Configures the Avocent® DSView™ Management Software server name, port service account name and password
Heat Map Legend	Changes the color scale temperature values on the heat map

Configuring power-phasing nomenclature for a building

The following are the nomenclature options, which are configured on the Building Power-Phasing screen:

- L1, L2, L3 (default) applied to every object in the system
- A, B, C
- R, S, T
- X, Y, Z
- R, Y, B
- R, W, B
- U, V, W

Building Power-Phasing Screen

Building	
Building	Power Phasing Label
AT-BD-1109201113-AUTOSMOKETEST-2	L1,L2,L3
AT-BD-1109201745-AUTOSMOKETEST-2	L1,L2,L3
FPSbuilding	L1,L2,L3
SSBuilding	L1,L2,L3
Build1	L1,L2,L3
Wendys BLDG	L1,L2,L3
AT-BD-1109210310-AUTOSMOKETEST-2	L1,L2,L3
karthikbuidling	L1,L2,L3
@AK	L1,L2,L3
AT-BD-1109163029-AUTOSMOKETEST-3	L1,L2,L3
AT-BD-1109203000-AUTOSMOKETEST-2	L1,L2,L3

To configure the power-phasing nomenclature:

1. From the Administration menu, under Configuration, click *Building* and select a building in the left column.
2. Select a label from the drop-down list in the right column and click away from the field to save the changes.

Configuring user-defined properties for a device category

The User Defined Properties screen allows you to create, update, assign and delete properties of a containment type, device category, connection type or port type. You can also verify the association of a property to a device or area.

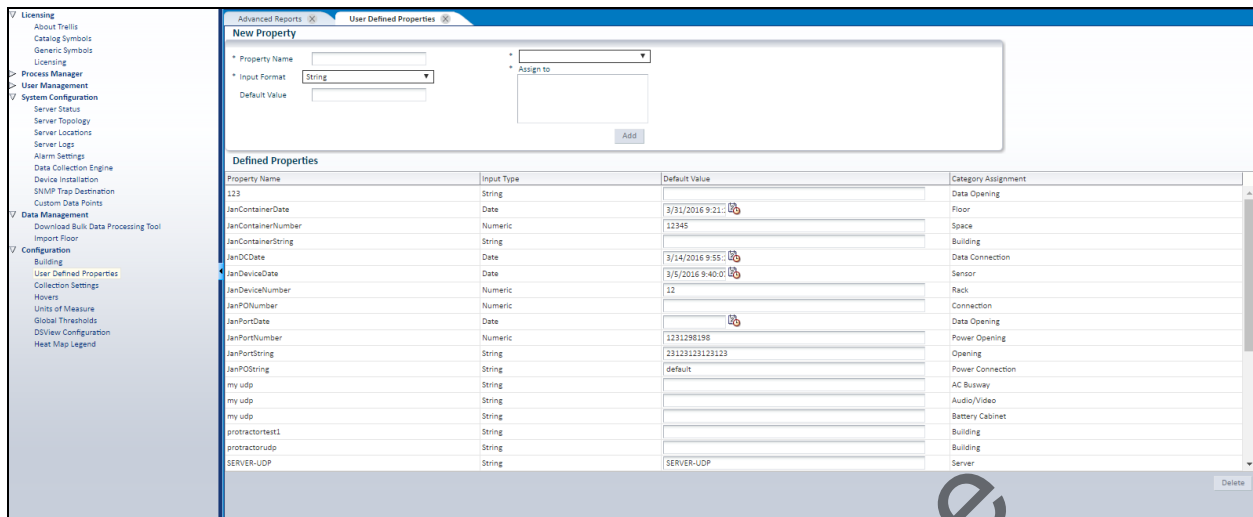
Assignable properties are the name, input type (string, date or numeric), default value and category assignments. User-defined property names are displayed in the format Name-Category.

A user-defined property name can be used across categories, but duplicate names are not allowed in the same category. For example, when using Temp-Rack in a category, you can create the property name Temp-Server, but not Temp-Rack.

Existing properties can be viewed in the Defined Properties list. New properties are added to the end of the User Defined Property list.

NOTE: When using the Properties accordion, fields without information can be hidden.

User Defined Properties



The following are selectable categories and the applicable types for each category:

- Containment - Data Center, Building, Floor, Space, Zone
- Device Category - All Breakers, Blade Chassis, Branch Breaker, Breaker Panel, Card, Main Breaker, PDU, Power Rail, Rack, Rack PDU, Sensor, Server, Subfeed Breaker, Transfer Switch, UPS
- Connections - Data Connection, Power Connection
- Ports - Data Port, Power Port

To create a user-defined property:

1. From the Administration menu, under Configuration, select *User Defined Properties*.
2. Enter the property name and select an input type from the drop-down list.
3. Enter a *Default Value*, select a category from the drop-down list, select an Assign to option and click *Add*.
4. To verify a defined property, go to Portfolio or 2D Graphical View, select the device for which the user-defined property was created and expand the *Properties* accordion.

To delete a user-defined property:

1. From the Administration menu, under Configuration, select *User Defined Properties*.
2. Select the user-defined property from the Defined Properties list and click *Delete*.

To verify the association of a user-defined property:

In Portfolio View or 2D Graphical View, select a container or device and expand the *Properties* accordion to verify that the user-defined property is associated with the container or device.

Collection Settings

The *Trellis*™ platform software gathers data point values that are received for each data point definition. The *Trellis*™ platform software reports the collected data point values to the platform for storage in the *Trellis*™ platform database. Change of Value is the default reporting mode. Select one of the following system configured data point reporting modes:

- Interval - Data points will be collected at their configured interval rate and these collected values are aggregated every 15 minutes and reported to the platform for storage in the *Trellis*™ platform database.

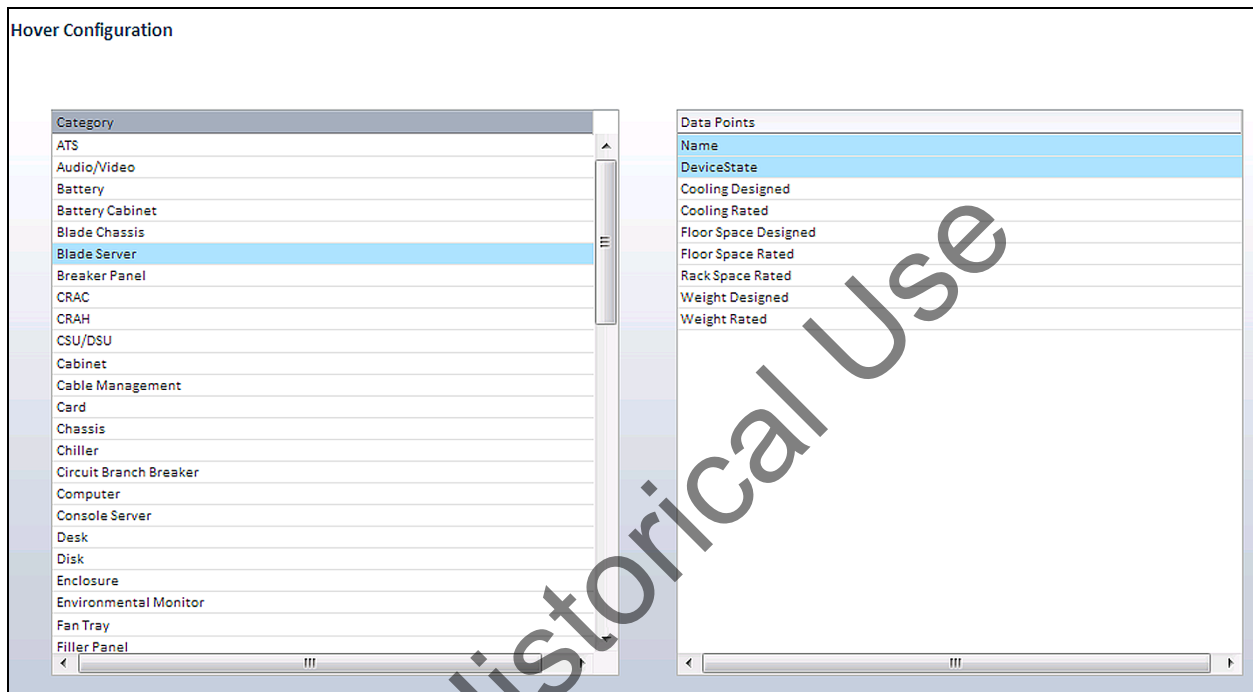
- Change of Value - Data points will be collected at their configured interval rate and only reported to the platform when a change is recognized in the value.

Configuring Hovers

Information can be configured to be displayed when you hover your cursor over equipment on a floor.

Information that can be displayed includes configured device categories and their associated data points.

Hover Configuration Screen



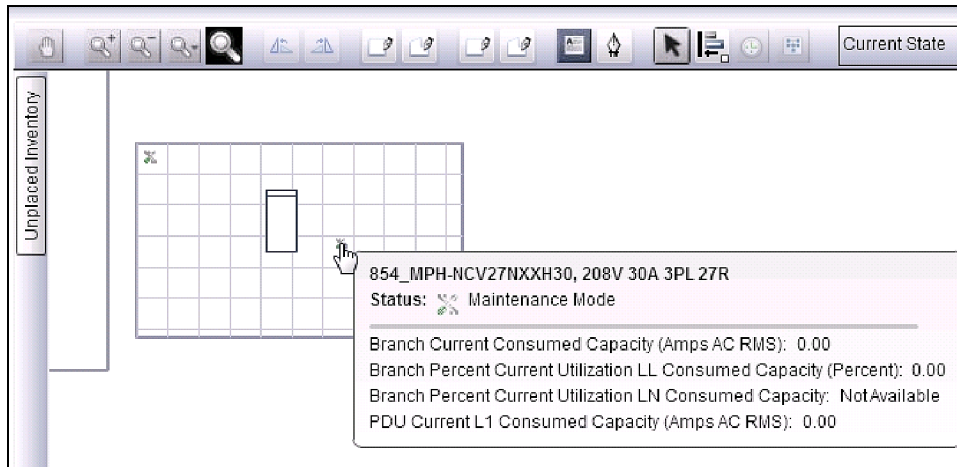
To view data point parameters:

1. Open a floor in 2D Graphical View with a monitored device placed on the floor.
2. From the Administration menu, under System Configuration, select *Hovers*.
3. Highlight a device in the Category column and highlight a device category in the Data Points column to save the configuration.

NOTE: Selecting more than five data points can significantly slow the performance of the system. Name and Device State are considered as default selected data points.

4. Go back to the floor in 2D Graphical View and place the cursor over the device to view the selected data point parameters.

Hover Data Points in 2D Graphical View



Configuring units of measure

System-wide measurements can be configured for English or Metric units.

NOTE: System settings can be overridden with personal settings by clicking *Accounts* on the top Option bar.

To configure units of measure:

In the System of Units column, select *English* or *Metric*.

NOTE: The system measurement default at the bottom of the screen changes accordingly.

Configuring global thresholds on sensors

Thresholds can be set up globally for sensors, depending on the placement of the sensors in a rack or cabinet. When assigning sensor thresholds, the Global Thresholds tab provides two settings that must be considered. From the Global Sensor Thresholds window you can select to retain the thresholds that are assigned for individual sensors on the Monitoring Configuration accordion or reset the assigned values entered in the Inlet and Exhaust fields as shown in the following figure. The options are defined in more detail as follows:

- Retain individual sensor temperature values - The values of an active/monitored sensor are retained even if the sensor is moved to a different position in the rack or cabinet. If a sensor is moved from one front location to another front location, and the Retain checkbox is enabled, the temperature values do not change. The temperature does change if the sensor is moved from the front to a back location.
- Reset individual sensor temperature thresholds to the values in the pane - Active monitored sensor temperature threshold values are updated to the values listed in the pane when either dragging/dropping the sensor to a new location or changing the sensor's location in the Placement accordion.

Global Sensor Temperature Threshold Values

Location	Low Critical (F)	Low Warning (F)	High Warning (F)	High Critical (F)
Inlet	55	60	80.6	
Exhaust	55	64.4	125	

See [Placing and Moving Sensors in Racks](#) on page 188 for sensor placements that will cause temperature threshold values to be updated and how to configure thresholds for an individual sensor.

The following table provides the default inlet and exhaust temperature threshold values.

Inlet and Exhaust Default Temperature Threshold Values

Temperature	Inlet Default Values	Exhaust Default Values
Low Critical	55 degrees Fahrenheit	55 degrees Fahrenheit
Low Warning	64.4 degrees Fahrenheit	64.4 degrees Fahrenheit
High Warning	80.6 degrees Fahrenheit	125 degrees Fahrenheit
High Critical	90 degrees Fahrenheit	130 degrees Fahrenheit

To modify the Inlet and Exhaust Temperature Threshold Values:

1. From the Administration menu, under Configuration, click *Global Thresholds*.
2. On the Global Sensor Thresholds window, click in a field and enter a new temperature value in the Inlet or Exhaust row.
-or-
Click *Reset to Defaults*.
3. Click *Save*.

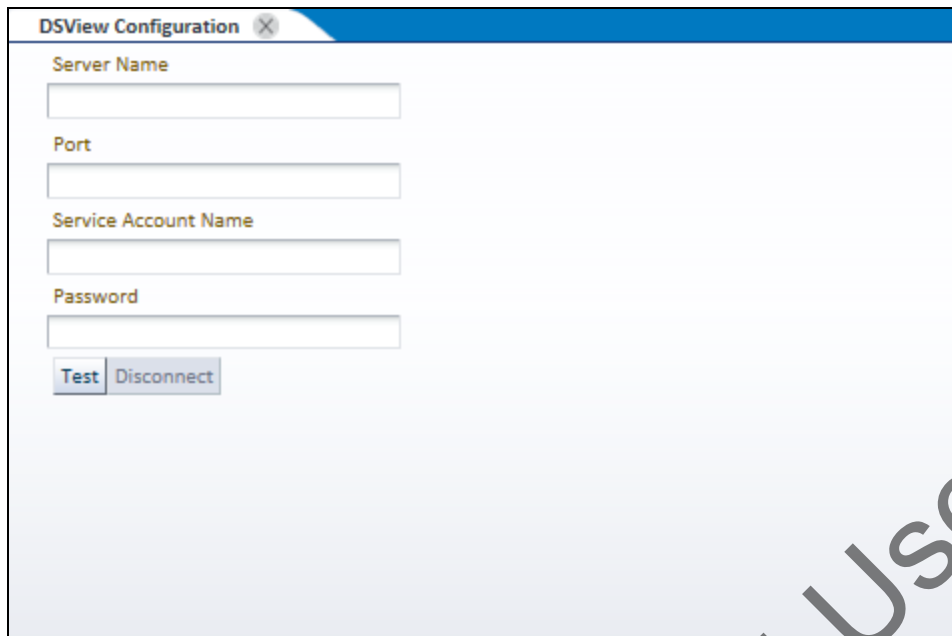
Integrating Avocent® DSView™ management software

DSView™ management software can be integrated in the *Trellis™* platform software.

To integrate the DSView™ software:

1. From the Administration menu, under Configuration, click *DSView Configuration*.
2. Enter the following DSView™ software information:
 - Server Name - name of the DSView™ software server
 - Port - name of the port
 - Service Account Name - DSView™ software account user name
 - Password - DSView™ software account password

DSView™ Software Configuration Screen



The screenshot shows a web-based configuration window titled "DSView Configuration". It features four text input fields stacked vertically, labeled "Server Name", "Port", "Service Account Name", and "Password". At the bottom of the form, there are two buttons: "Test" and "Disconnect".

3. Click *Test* to save the DSView™ software information and test the configuration session. An information window will show the success of the connection.

-or-

Click *Disconnect* to disconnect the DSView™ software session from the platform.

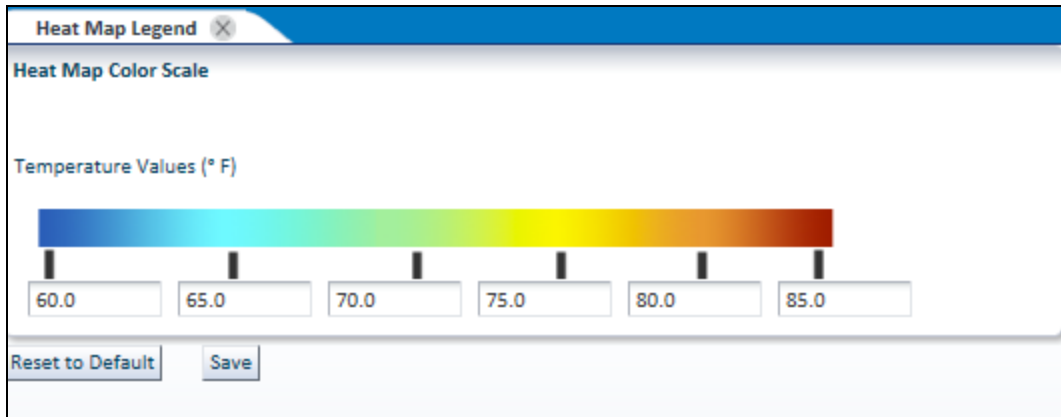
Heat Map Legend

If your system is licensed for the *Trellis™* Thermal Systems Manager module, the Configuration Menu includes the Heat Map Legend option. Selecting the *Heat Map Legend* displays a color scale that represents a range of temperatures for thermal energy patterns in your data center. From this window, you can use or modify the following default temperature values:

- Cold is 60.0 degrees Fahrenheit
- Cool normal is 65 degrees Fahrenheit
- Normal is 70.0 degrees Fahrenheit
- Warm normal is 75.0 degrees Fahrenheit
- Warm is 80.0 degrees Fahrenheit
- Hot is 85.0 degrees Fahrenheit

When modifying temperature values, the left most value is always the lowest temperature. As you enter values, each field to the left of the field you are modifying must be lower than the field you are modifying. For more information about the module, see [The TRELIS™ Thermal Systems Manager Module](#) on page 237.

Heat Map Legend



To enter temperature values:

1. From the Administration menu, under Configuration, click *Heat Map Legend*.
2. Click a field and enter the new temperature value.
3. Click *Save*.

To change temperature values to the default settings:

1. Click *Reset to Default*.
2. Click *Save*.

For Historical Use

For Historical Use

Data Collection Engine

The software-based *Trellis*™ Intelligence Engine and the embedded *Trellis*™ Intelligence Engine component of the Avocent® Universal Management Gateway appliance continuously query and analyze information that is collected from devices (IT and facility equipment) in the data center. After the data is collected, the information is provided to the applicable platform software modules.

Both engines include many of the same functions. They can both be replaced, upgraded, registered and unregistered within the *Trellis*™ platform and both engines have the multi-select feature that allows you to select one or more engines to perform upgrade and unregister functions. They both include a protocol browser utility and a quick Element Library installation feature. And they allow for you to monitor service processors, provide an alert for an engine start event and run the engine's services as a non-root user with the super user permission.

The following are additional functions that apply only for the *Trellis*™ Intelligence Engine provided with the *Trellis*™ Site Manager module:

- Restart Intelligence Engine services - Allows the administrator to restart one or more services from the platform or command line.
- Backup and backup history - Allows you to back up the engine configuration, delayed events and L2 data if it is present. The multi-select feature can also be used.
- Upgrade history - Displays all the upgrades on the Intelligence Engine, including the upgrade file, number of devices monitored during the upgrade and the upgrade completion time.
- Engine stop, start and restart - Allows the administrator to stop, start and restart the engine and create events.
- Encrypt - Provides monitored device communication properties.

This chapter discusses the requirements and procedures to manage the *Trellis*™ Intelligence Engine provided with the *Trellis*™ Site Manager module, unless stated otherwise.

For the supported operating systems and PostgreSQL databases, see the *TRELLIS*™ Real-Time Infrastructure Optimization Platform Pre-Installation Installer/User Guide.

For backup/restore and upgrade procedures, see the administrator's guides for Red Hat Linux and Microsoft Windows.

If your platform uses the appliance-based engine to collect data, see [Uploading and Upgrading the Avocent® Universal Management Gateway Appliance Firmware](#) on page 75. See the Avocent® Universal Management Gateway Appliance Installer/User Guide for more information about the appliance's and its engine's features and functionality.

Intelligence Engine Services

The following table includes the service commands and descriptions for the Intelligence Engine.

Intelligence Engine Service Commands

Script	Name	Description
MSScont.sh	Service management script	Allows you to start, stop, restart and view the Intelligence Engine services and their current status.

Encryption

By default, the Intelligence Engine encrypts communication properties for monitored devices. The backup of the Intelligence Engine containing configuration data and database are also encrypted.

The Intelligence Engine uses the Symmetric type of encryption algorithm. The full name of the algorithm is AES and the key length (in bits) is 256.

Service Processor Support

The Intelligence Engine uses the Service Processor Management (SPM) protocol. The SPM upgrade modules can be downloaded via the Emerson web site using the

<http://www.EmersonNetworkPower.com/TrellisDownloads> URL. It can be installed or uninstalled using PuTTY or a similar program.

To install the SPM software package in the *Trellis*™ platform UI:

1. From the Symbol Portal web page, select *Trellis*™ platform version 4.0.2 and higher to download and install the Service Processor Symbol.
2. In the platform UI, click *Administration - Device Installation* and upload the service processor manager software package using a supported operating system.
3. Click *Administration - Data Collection Engine*, select one or more data collection engines from the list.

NOTE: When selecting multiple engines for an upgrade, the engines must be the same operating system, either Ubuntu or Red Hat.

4. Click *Upgrade Engine* and select the applicable SPM installation or upgrade package with the tar.gz file, for example, `ieupgrade_package-<version>-RELEASE-UBUNTU` or `ieupgrade_package-<version>-RELEASE-RHEL`.
5. After the SPM package is installed or upgraded, select the SPM protocol and enter the required properties to monitor the service processor's monitored devices. The supported service processors are listed in the following table.

Supported Service Processor Element Libraries Using the SPM Protocol

Manufacturer/Vendor	Element Library
Cisco	cisco-ucs
Dell	dell-poweredge
Fujitsu	fujitsu-primergy
HP	hp-bladesystem
IBM	ibm-bladecenter ibm-systemx
SUN	sun-enterprise sun-fire

See [Supported Service Processor Profiles](#) on page 311.

Firewall Ports

The following are the firewall configuration criteria for the Intelligence Engine. See [Intelligence Engine Firewall Ports](#) on page 312.

General Information

The Intelligence Engine installation or upgrade can be performed via command line. The administrator user must log in to SSH on a host operating system where the Intelligence Engine is being installed or upgraded from a previous version.

To install or upgrade Intelligence Engine using the sudo/root permission:

1. As administrator user, log in via **SSH**.
2. Enter **sudo su** or root permission and password.

Default install options

The database and backup data have default storage locations that can be overridden. The device properties can also be encrypted or unencrypted.

To configure or override the default installation options:

1. After extracting the *ie_installer.tar.gz* file, enter **cd ie_installer** to change to the *ie_installer* directory.
2. In a text editor (such as *vi*), open the *install-prop.ini* file and use one of the options in the following table.

Install Options for the Intelligence Engine

Install Options	Default Value	Supported Value	Description
DBLocation	/mss-db	Any valid local or shared drive location that is accessible by running installation and PostgreSQL	Location where the Intelligence Engine stores collected data. If normal communication occurs between the engine and the platform, L1 data is retained for two days; however, if there is a communication interruption, the most recent seven days of L2 data is stored and sent to the platform when communication is restored.
BackupLocation	/iebackup	Any local or shared drive location accessible by sudo permission user and engine backup services	Location where the Intelligence Engine stores the engine backup executed from the <i>Trellis™</i> platform. This is assigned using the <i>Backup Engine</i> button on the Data Collection Engine web page for the selected Intelligence Engine.
Encrypted	true	true/false	By default, the <i>Trellis™</i> Intelligence Engine encrypts the device

Install Options	Default Value	Supported Value	Description
			communication properties. Changing the encrypted value to false causes the Intelligence Engine installer to configure the engine to store unencrypted device communication properties in the database.
AcceptEULA	No	yes/no	Accept the EULA by setting the value to yes.

NOTE: If an invalid value is set, a warning message is displayed and installation proceeds with the default value.

Installing the Intelligence Engine

The *Trellis*™ Intelligence Engine can be downloaded from the Emerson web site using the <http://www.EmersonNetworkPower.com/TrellisDownloads> URL. It can be installed or uninstalled using PuTTY or a similar program.

The package contains the following applicable tar.gz installer and corresponding MD5 checksum:

RHEL: ie_installer-<version>-RELEASE-RHEL.tar.gz

Ubuntu: ie_installer-<version>-RELEASE-UBUNTU.tar.gz

To install the Intelligence Engine via command line:

1. Enter **tar zxvf ie_installer.tar.gz** to extract the ie_installer.tar.gz folder.
2. Enter **cd ie_installer** to change to the ie_installer directory.
3. On a supported operating system, run the applicable script (**./install-intelligence-engine-redhat.sh** for Red Hat® or **./install-intelligence-engine.sh** for Ubuntu) to install the Intelligence Engine with the default installation options.

-or-

Run the applicable script (**./install-intelligence-engine-redhat.sh** for Red Hat® or **./install-intelligence-engine.sh** for Ubuntu) and change the default options for the Backup location, Enable/Disable Encryption and/or Database location. See the [Default install options](#) on page 69.

After installation, the following message is displayed.


```

Preparing to unpack intelligence-engine.deb ...
.....
Using database path /mss-db with available size 11259604
Using backup path /iebackup with available size 11259604
Database will be encrypted
Installation is almost done.. Please wait..
[=====] (100%) Done
Successfully installed the Intelligence Engine!!!
It took 24 seconds to install the dependencies.
It took 45 seconds in total to finish the installation.

```

NOTE: During the installation, you are required to read and accept the EULA to continue installation of the Intelligence Engine.

4. Run the **MSScont.sh status** command to verify the status of the engine.
-or-
If the engine is not running, run the **MSScont.sh start** command.
5. After installation, see [Registering the Intelligence Engine](#) on page 73 to register the Intelligence Engine in the *Trellis*™ platform.

Stopping, Starting and Restarting the Intelligence Engine

Stopping the Intelligence Engine

The **MSScont.sh stop** command stops all *Trellis*™ Intelligence Engine services and displays their current status as OK or Stop. If the Intelligence Engine is registered in the *Trellis*™ platform, executing this command stops the monitoring of all devices managed by the Intelligence Engine.

To stop the Intelligence Engine:

Enter **MSScont.sh stop** and verify the following is displayed.

```

stop
cron stop/waiting
cron start/running, process 23228
Stopping Intelligence Engine exporter... OK.
Stopping Intelligence Engine Event Service... OK.
Stopping Intelligence Engine ELF... OK.
Stopping Intelligence Engine... OK.
Stopping Intelligence Engine Node service... OK.

```

NOTE: If the Intelligence Engine is enrolled in the platform, the engine stopping event is displayed on the platform's Event Viewer window and the engine services gracefully stop.

Starting the Intelligence Engine

If the Intelligence Engine is registered in the platform, the `MSScont.sh start` command is used to start all Intelligence Engine services and display their current status (OK or Started). After a successful start and established communication to the platform, the OK or Started status is displayed in the Event Viewer.

To start the Intelligence Engine:

Enter **`MSScont.sh start`** and verify the following is displayed.

```
start
Thu Mar 24 03:27:53 UTC 2016 : Executing dbpartition script...
Thu Mar 24 03:27:54 UTC 2016 : dbpartition done.
Starting Intelligence Engine ELF... OK.
Starting Intelligence Engine Node Service... OK.
Starting Intelligence Engine exporter... OK.
Starting Intelligence Engine Event Service... OK.
Starting Intelligence Engine... OK.
Adding msscron watchdog to crontab...
cron stop/waiting
cron start/running, process <process id>
```

Restarting the Intelligence Engine

If the Intelligence Engine is registered in the platform, the `MSScont.sh restart` command stops and restarts all Intelligence Engine services to the platform and monitored devices. After a successful restart and re-established communication to the platform, the OK or Started status is displayed in the Event Viewer.

To restart the Intelligence Engine:

Enter **`MSScont.sh restart`** and verify the following is displayed.

```

restart
cron stop/waiting
cron start/running, process 23344
Stopping Intelligence Engine exporter...Not running or stopped already...
Stopping Intelligence Engine Event Service...Not running or stopped already...
Stopping Intelligence Engine ELF...Not running or stopped already...
Stopping Intelligence Engine...Not running or stopped already...
Stopping Intelligence Engine Node Service...
Not running or stopped already...
Thu Mar 24 03:48:20 UTC 2016 : Executing dbpartition script...
Thu Mar 24 03:48:20 UTC 2016 : dbpartition done.
Starting Intelligence Engine ELF... OK.
Starting Intelligence Engine Node Service... OK.
Starting Intelligence Engine exporter... OK.
Starting Intelligence Engine Event Service... OK.
Starting Intelligence Engine... OK.
Adding msscron watchdog to crontab...
cron stop/waiting
cron start/running, process 23656

```

Status of the Intelligence Engine Services

The current status of all the Intelligence Engine services can be displayed.

To display the current status of the Intelligence Engine services:

Enter the **MSScont.sh** command and verify the following is displayed.

```

MSScont.sh status
The Intelligence Engine is currently running.
The Intelligence Engine ELF is currently running.
The Intelligence Engine exporter is currently running.
The Intelligence Engine Event Service is currently running.
The Intelligence Engine Node Service is currently running.

```

Registering the Intelligence Engine

To register the data collection engine:

1. As administrative user, log in to the platform's UI.
2. Place the Intelligence Engine symbol in the *Trellis*™ Inventory portfolio.
3. From the *Administration* menu under System Configuration, click *Data Collection Engine*.
4. Click *Register New Engine* and enter the IP Address of where the Data Collection Engine is installed.
5. After registration, click *Details - Element Library*, set up the monitoring range and install the Element Library to the data collection engine.

Replacing the Intelligence Engine

The data collection engine can be replaced from the *Trellis*™ platform 4.0.2 and after.

Trellis™ Intelligence Engine and Appliance Feature Matrix

Data Collection Engine Model From (Appliance must be in Responding/Not Responding Status and Active State)	Data Collection Engine Model To (Registered/Enrolled and Responding Status)	Firmware and Intelligence Engine Version	Manual EL Installation To Replace the Data Collection Engine
2000	4000	From and To must be the same version	Optional
2000	6000	Must be the same version on From and To	Optional
2000	2000	From and To must be the same version	Optional
4000	4000	From and To must be the same version	Optional
4000	6000	From and To must be the same version	Optional
6000	6000	From and To must be the same version	Optional
2000, 4000 and 6000	Intelligence Engine	Any Appliance Firmware to Intelligence Engine 4.6	Optional

Unregistering the Intelligence Engine

One or more Intelligence Engines can be selected to perform the unregister operation.

NOTE: During the unregister operation, if the data collection engine is in the Not Responding Status mode or the platform is unable to reach it, use the manual procedure to unregister the engine.

To unregister the data collection engine:

NOTE: Unregistering a data collection engine removes all monitoring configuration from the Data Collection Engine and unregisters it from the platform.

1. As administrative user, log in to the *Trellis*™ platform UI.
2. From the Administration menu under System Configuration, click *Data Collection Engine*.
3. Select Data Collection Engine from the list of registered and active devices.
4. Click *Unregister Engine* and follow the dialog to unregister the Intelligence Engine from the *Trellis*™ platform and hosted operating system.
5. The unregister operation logs the event, including the user that initiated the un-registration and a success/failed unregister event is logged in the *Trellis*™ platform for auditing purposes.

To manually unregister the Intelligence Engine:

1. Enter **SSH** to the Data Collection Engine hosting operating system as the user with sudo permission.

2. Enter **cd /etc/mss/utility** and navigate to the `/etc/mss/utility` folder:
3. Enter the **sudo ./UnEnroll.sh** command.

To manually unregister the engine in the Avocent Universal Management Gateway appliance:

1. Using **admin**, enter **SSH** to access the data collection engine hosting the appliance.
2. Enter **cd /mss/engine/bin** to go to the `/mss/engine/bin` folder.
3. Execute the **./mss-run UnEnroll.sh** command.

NOTE: This manually unregisters the engine from the hosted operating system. If the data collection engine is still registered in the platform, see the previous applicable procedure: To unregister the data collection engine.

Uninstalling the Intelligence Engine

To uninstall the Intelligence Engine:

1. Enter **SSH** to log in to the Intelligence Engine hosted operating system.
2. Enter the **sudo su** command.
3. Enter **cd /etc/mss/scripts** to change the directory.
4. For Ubuntu, execute the **./uninstall-intelligence-engine.sh** command.

-or-

For Red Hat®, execute the **./uninstall-intelligence-engine-redhat.sh** command.

Both commands uninstall the Intelligence Engine from the hosted operating system and remove all monitored devices.

NOTE: It is recommended to unregister the Intelligence Engine or unmonitor the devices first from the *Trellis*™ platform UI for tracking/auditing purposes.

Uploading and Upgrading the Avocent® Universal Management Gateway Appliance Firmware

When uploading or upgrading the firmware version of the Avocent® Universal Management Gateway appliance into the platform software, make sure it is compatible with the *Trellis*™ platform's software version.

Data that is stored in the engine database should be backed up prior to the upgrade and restored after the upgrade. The element libraries that were installed should also stay intact, along with any other engine configuration through the user interface, such as registering, monitoring or discovering. The device receiving the firmware upgrade should already be registered.

For more about configuring racks and other devices, see [Configuring a device for monitoring and data collection](#) on page 108. To learn more about racks and devices, see [Working With Racks](#) on page 91 and [Working With Devices](#) on page 98.

To upload the device firmware:

1. From the Administration menu under System Configuration, select *Device Installation*.
2. Click *Upload Firmware* and enter the name of the device.

-or-

Browse to the */tmp* directory where you saved the downloaded firmware and click *OK*.

3. When the confirmation message is displayed, click *OK* to add the firmware to the device installation list.
4. Click *OK* in the confirmation box and follow the progress bar.

The appliance will reboot as it processes the update.

NOTE: This upgrade affects both the version of the appliance firmware and version of the embedded *Trellis*™ Intelligence Engine because they are packaged together.

To upgrade the device firmware:

1. From the Administration menu under System Configuration, select *Data Collection Engine*.
2. Select the engine, then click the *Upgrade Engine* button and select the applicable upgrade package.
3. In the Scheduler window, select *Schedule the upgrade now*.

-or-

Select a specific date/time and click *OK*.

4. Click the *Add to Calendar* button to confirm the schedule.

NOTE: This upgrade affects both the version of the appliance firmware and version of the embedded *Trellis*™ Intelligence Engine because they are packaged together.

If you are using the appliance's engine, configure the time and date in the appliance before registering the appliance. The software depends on the clock configuration in the appliance, so the information containing time stamps, such as collected data points and events, is sent to the necessary platform components. See the Avocent® Universal Management Gateway Appliance Installer/User Guide for more information to configure the time and date.

To delete device firmware:

1. On the Device Installation screen, select the UMG firmware and click *Remove*.
2. On the confirmation message, click *OK*.

Adding the Avocent® Universal Management Gateway Appliance to the Inventory

Before registering the appliance in the *Trellis*™ platform software, the appliance must be added to the inventory. The platform software depends on the time configuration of the appliance so that information containing time stamps, such as collected data points and events, is sent to the necessary platform components.

To add the appliance to Unplaced Inventory in Portfolio View:

1. From the Quick Launch menu, click *Portfolio View*, expand the *Enterprise*, building, floor, space and Unplaced Inventory nodes to receive the appliance.
2. From the catalog, drag the model name (not the image) to the row in Unplaced Inventory.
3. Expand the *Properties* accordion, update the properties and click away from the field to save.

To add the appliance to a rack in 2D Graphical View:

1. From the Quick Launch menu, click *Portfolio View*, expand the *Enterprise*, building and floor nodes to receive the appliance.
2. Right-click the floor, click *2D Graphical View* and select the rack to receive the appliance.
3. Double-click the rack to open Elevation View and drag the image of the appliance to the appropriate slot.

NOTE: The image can be flipped to display the front or rear view before placing it.

Registering the Avocent[®] Universal Management Gateway Appliance Engine

After configuring the time and date on the appliance itself, the engine can be registered in the platform software. For information about the appliance, see the Avocent[®] Universal Management Gateway Appliance Installer/User Guide.

To register a new engine:

1. From the Administration menu under System Configuration, select *Data Collection Engine* and click *Register New Engine*.
2. Select the appropriate engine, click *Next* and enter the IP address of the appliance. Leave the default port number as 4440.
3. Select the engine again, click *Next* and enter the IP address range of devices to be monitored.

NOTE: Separate the address range using a dash with no spaces. Additional ranges can be separated with a comma.

4. On the Element Library screen, select only the libraries for the devices to be monitored by the current appliance and click *Next*.

NOTE: Additional Element Libraries can be added as required.

5. On the bottom of the screen, click the calendar icon in the Date field, select a minute later, click *Schedule the Upload* and click *Close* to schedule the element library upload.

For Historical Use

The TRELIS™ Inventory Manager Module

Now that you understand the UI, you are almost ready to create a custom environment within the workspace and begin managing your inventory.

The *Trellis*™ Inventory Manager module is used to manage your infrastructure devices and is designed to minimize time, effort and errors. With this module you can know where assets are located, how they are connected and who is responsible for them. In addition, a set of text and graphical tools allow your data center infrastructure team to map out floor space and manage asset inventory and the Change Planning feature allows you to view the location of devices over time.

The *Trellis*™ Inventory Manager module provides the following benefits:

- Searching and locating the full data center inventory
- Creating realistic floor plan models by importing AutoCAD plans as .svg files for the floor background
- Organizing the data center plan by creating spaces to quickly differentiate between areas, such as production
- Viewing spaces and zones in a customizable XY-tiled format to get a more accurate location of devices
- Viewing device details, including properties, capacities and contained devices
- Viewing power connections between device ports and the up stream and down stream devices
- Viewing connection details, including cable type, identifier, owner and maintenance date
- Planning current and future layouts of your data center floor using 2D graphical views and timelines
- Running reports on your inventory, as well as rack and space availability

NOTE: When used in conjunction with the *Trellis*™ Site Manager module and a data collection engine, the *Trellis*™ Inventory Manager module also provides access to real-time power and cooling values.

Understanding Your Environment

With the workspace open in Portfolio View, the created list of your inventory is structured logically as you would build a physical environment. The Enterprise node is at the top, representing your total environment. The Enterprise node components are created so that when you click the node beside the name, it is expanded and its data center or building nodes are revealed. These components contain floors, each floor contains spaces and zones are contained within the spaces. Each space contains racks and other floor-mounted equipment, and racks contain devices. If you click the name beside the node, a second screen opens with a list of the devices contained within it. When you highlight a floor in Portfolio View, you can right-click the floor and select *2D Graphical View* to manage inventory using drawing tools and images.

NOTE: The Enterprise node can be renamed, but you cannot delete it or create a new one. Names can contain up to 256 alphanumeric characters. This naming convention also applies to data centers, buildings, floors, spaces and zones.

Trellis™ Platform Hierarchy



Environment Hierarchy

Number	Description
1	Enterprise level
2	Data center or building level
3	Floor level
4	Space level
5	Device level

Working With Data Centers and Buildings

After Professional Services has created your Enterprise node, you can create data centers and buildings that reside within that node. A building within the *Trellis™* platform represents a physical building. You can have multiple buildings and each building can have multiple floors.

NOTE: Under the Enterprise node, click the desired building, space or device to display the associated devices in alphabetical order.

To create a building:

1. From the File menu, click *New - Building*.
2. Enter the name, address and optional information and click *Create*.
3. Click *Refresh* to display the building.

To view buildings, floors and spaces:

After your Enterprise node has been configured in the software, in Portfolio View, you can click the arrow beside each node to expand the *Enterprise*, building, floor, space or device nodes and display their attributes in the properties panel accordions.

NOTE: To move your building to the top of the screen, highlight the building and click *Show as Top* on the toolbar. To go back to the tree view, click the Up arrow next to the building name.

NOTE: When you expand a floor or space, all of its assets are listed underneath it and the device name, manufacturer, model, space, location and RU position are displayed.

To delete a building:

In Portfolio View, right-click the building and select *Delete*.

NOTE: Buildings cannot be deleted in 2D Graphical View.

Working With Floors

After you have created a building in the platform software (Portfolio View), you must add at least one floor in the building to represent a physical floor in your building. Each building can contain multiple floors.

From Portfolio View, you can right-click a floor and select either *2D Graphical View* or *3D Graphical View*. If 2D Graphical View is selected, and you select an item on the floor, you can modify the item. In addition, icons are displayed in the top-right corner that provide additional functionality. The icons allow you to colorize the selected item, assign levels to the item or search for a space to add to the floor. From 3D Graphical View, you can change the view, select 2D Graphical View, export the image or refresh the image.

In Portfolio View and both graphical views, you can expand the *Properties* accordion to view/assign the attributes of the selected floor, including the altitude of the floor. The altitude can be a range between -1500 to 20000 feet or -457 to 6096 meters.

After the floor is created, you can proceed to create one or more spaces on the floor.

For more information, see the following:

[2D Graphical View](#) on page 22

[3D Graphical View](#) on page 27

[Using Properties Panel Accordions](#) on page 18

[Working With Spaces](#) on page 82

[Understanding Consumption Capacities](#) on page 84

Creating and deleting a floor

To create a floor:

1. From the File menu, click *New - Floor* and select a building where you want to add the floor.
2. Enter a name for the new floor, click *Create* and click *Refresh* to display the floor.

To delete a floor:

In Portfolio View, right-click the floor and click *Delete*.

NOTE: A floor cannot be deleted from 2D or 3D Graphical View.

Adding a text label to a floor

Text can be added to a graphical representation of a floor along with its contained spaces and zones.

To add a text label to a floor:

1. In 2D Graphical View, open the floor and click the *Levels* icon to verify the correct levels are active.
2. Select the *Text Drawing* tool and draw the text box on the floor.
3. Place your cursor in the text box and enter text.
4. Expand the *Properties* accordion to modify the attributes.

-or-

Click the text box, right-click and select *Move Front*, *Move Back*, *Delete Text* or *Set Attributes* and modify the attributes.

To hide text on a floor:

Click the *Levels* icon and disable the Text checkbox.

To display hidden text:

Hover over the area where the text was placed.

Working With Spaces

After creating a floor, the drawing tools in the 2D Graphical View toolbar can be used to create one or more spaces/zones on the floor. After the space is created, you can assign the colorization and level attributes from the icons in the top-right corner. Space level height attributes include the ceiling, drop ceiling and raised floor heights. Ceiling height is the distance between the floor level and the ceiling level. The drop ceiling height is the distance between the floor level and the drop ceiling level and the raised floor height is the distance between the floor level and the raise floor level. The maximum space height is 50 feet. If one or more devices are in a space, the platform allows the space height to be greater. The space must be empty to decrease the height.

NOTE: Heights for drop ceilings or raised floors must be configured prior to assigning devices to those levels.

NOTE: Spaces cannot be nested. For example, you cannot add a space to an existing space.

From Portfolio View, you can right-click a space and select *3D Graphical View* to view the space. From 3D Graphical View, you can also select a space and edit its properties in the Properties panel accordions. After you have created one or more spaces or zones, you can proceed to create one or more devices in each space or zone.

For more information, see the following:

[2D Graphical View](#) on page 22

[3D Graphical View](#) on page 27

[Using Properties Panel Accordions](#) on page 18

[Working With Standard and Unusable Zones](#) on page 89

[Working With Racks](#) on page 91

[Working With Devices](#) on page 98

[Understanding Consumption Capacities](#) on page 84

Creating and deleting a space

To create a space in Portfolio View:

1. From the File menu, click *New - Space*, click a building and floor node.
2. Enter a name for the space.
3. Click *Create - Refresh* to display the floor.

NOTE: Before adding spaces, zones or devices to a floor, click the *Levels* icon on the right side of the UI and ensure only the appropriate level is selected, such as the Floor level.

To create a space in 2D Graphical View:

1. In Portfolio View, right-click the floor and select *2D Graphical View*.
2. Select the *Space Rectangle* icon in the toolbar, then click and hold the mouse as you draw a rectangular or square on the floor.
-or-
For an asymmetrical space, select the *Space Polygon* icon and click the floor to add the first point. Move to the next point, click again and continue until you return to the point of origin.
3. On the New Space Name dialog box, enter the required name for the space with any optional details and click *Create*.

To delete a space:

In 2D Graphical View, highlight the space using the arrow button, right-click and select *Delete*.

NOTE: The devices in a space must be deleted before the space is deleted.

To duplicate a space:

1. In 2D Graphical View, select the space to be copied and click *File - Save As*.
2. Enter a unique name, floor name and the X and Y coordinates for the new space and click *Save*.
3. On the confirmation message, click *Continue*.

To rename a space:

1. In Portfolio View, expand the space node.
-or-
In 2D Graphical View, open the floor that contains the space and click the space.
2. Expand the *Properties* accordion, change the name and click away from the field to save.

Understanding Consumption Capacities

The Capacities accordion is used to configure the consumption capacity and threshold for a data center, building, floor, space, zone or device. The thresholds can be configured for weight, space, power and cooling; however, a capacity threshold may or may not be applicable. For example, a threshold for weight does not apply for floors or spaces. Most thresholds can be configured in Portfolio View or 2D Graphical View, but floor capacities must be configured in Portfolio View. It is also important to configure the capacities at each level before starting to populate a floor or space.

Thresholds are configured using aggregated values or if no aggregated values are available, measured capacity values are used:

- Aggregated values - Faceplate values for a device in respect to connections and containment, such as a rack with the combined values of power consumers in the rack
- Measured values - Calculated with values gathered from a monitored device

The following categories are used when calculating capacities:

- Rated - Faceplate value assigned by the manufacturer
- Designed - User-defined value for the percentage of consumption compared against the rated value
- Reserved - User-defined value for the percentage of capacity reserved compared against the designed value
- Consumed - Aggregated value for the percentage consumed compared against the designed value
- Remaining - Aggregated value for the percentage of the remaining capacity, once reserved and consumed and subtracted from the designed value

Working with floor and space capacities

Capacities for floors and spaces are configured using aggregated or measured values and assigned threshold values. Colorization is used to indicate consumed and remaining capacities. To learn more about colorization, see [Working With Colorization](#) on page 121.

To add floor or space capacities in Portfolio View:

1. In Portfolio View, select the floor or space and expand the *Capacities* accordion.
2. Expand the applicable capacity type (*Power, Cooling, Weight* or *Space*) and select the applicable unit of measure.
3. Enter the capacity values and click *Threshold* to enter limits for that capacity.

NOTE: Capacity planning cannot be modified in Portfolio View.

To add floor or space capacities in 2D Graphical View:

1. In 2D Graphical View, open a floor, select the space in the workspace and expand the *Capacities* accordion.
2. Expand the applicable capacity type (*Power, Cooling, Weight* or *Space*) and select the applicable unit of measure.
3. Enter the capacity values and click *Threshold* to enter limits for that capacity.

To plan or modify a floor or space capacity in planning mode:

1. Select a project from the *Planning* accordion.
2. Enter the related/designated capacity planned for floor, spaces or devices within a selected project.

To modify floor or space capacities:

1. From the Quick Launch menu, select *Portfolio* and expand the *Enterprise*, building, floor and space nodes.
2. If desired, right-click the floor and select *2D Graphical View*.
3. Expand the *Capacities* accordion and click the *Space* capacity type.
4. Modify the designed value and click away from the field to save.

NOTE: For a container such as a rack, modify the designed value for the front and rear of the device. For a contained device such as a server, the rated value for consumption is pre-populated.

Space Capacity

Capacities

- ▶ Power
- ▶ Heat
- ▶ Weight
- ▼ Space

Front Rear

Type	%	Value
Rated	100	45
Designed	100	45
Reserved		
Consumed		
Remaining	100	45

▶ Threshold

Square Feet Square Meters

Consumption

Type	%	Square Feet
Rated	100	2.16
Designed	100	2.16

Blade Slot Consumption

Type	%	Slots
Rated	100.0	
Consumed		
Remaining		0

Working with power capacities

Power capacities are configured using aggregated or measured values and assigned threshold values. Colorization is used to indicate consumed and remaining capacities for power. To learn more about colorization, see [Working With Colorization](#) on page 121.

To modify power capacities:

1. From the Quick Launch menu, select *Portfolio* and expand the *Enterprise*, building, floor, space and device nodes.
2. If desired, right-click the floor, select *2D Graphical View* and select the device on the floor.
3. Expand the *Capacities* accordion, select the *Power* capacity type and select the unit of measure.
4. For a container (floor, space, zone or rack), enter the rated and designed value for the aggregated capacity. The consumed power capacity for a container is the sum of the designed power capacity for all contained power consumers. The remaining capacity is the designed which includes the reserved and consumed power.

-or-

For a contained power consumer device, modify the designed value for consumption.

-or-

For a power distributor device, modify the designed value for either the aggregated or measured capacity. The aggregated consumed power is based on all downstream power consumers and is displayed per phase in Amps.

5. Click away from the field to save.

For Historical Use

Configuration for Power Capacities

5JS Rack ATS-01

- > Properties
- > Placement
- > DSView Session
- > Ports

Capacities

Power

kW Amps kVA

Aggregated Measured

Type	%	A,B,C
Rated	100	16
Designed	100	16
Reserved		
Consumed	67.75	3.81, 3.18, 3.85
Remaining	32.25	12.19, 12.82, 12.15

Threshold

Weight

Space

To plan for power capacity in planning mode:

1. Select a project from the *Planning* accordion.
2. Enter the related/designated power capacity planned for devices within a selected project.

Working with heat capacities

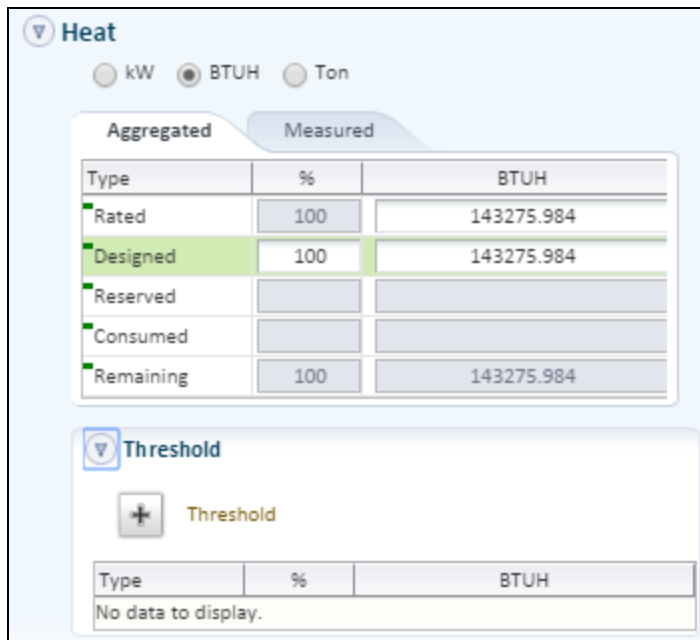
Heat capacities are configured using aggregated or measured values and assigning threshold values.

Colorization is used to indicate consumed and remaining capacities for heat. To learn more about colorization, [Working With Colorization](#) on page 121.

To modify heat capacity values:

1. From the Quick Launch menu, select *Portfolio*, expand the *Enterprise*, building, floor and space nodes and select the device.
2. If desired, right-click the floor, select *2D Graphical View* and select the device on the floor.
3. Expand the *Capacities* accordion, click the *Heat* sub-menu and select the unit of measure.
4. For a container, modify the designed value for either the aggregated or measured heat capacity.
-or-
For a contained device, modify the designed value for consumption.
5. Click away from the field to save.

Heat Capacities for a Container (Rack)



Heat

kW BTUH Ton

Aggregated Measured

Type	%	BTUH
Rated	100	143275.984
Designed	100	143275.984
Reserved		
Consumed		
Remaining	100	143275.984

Threshold

+ Threshold

Type	%	BTUH
No data to display.		

Working with air flow capacities

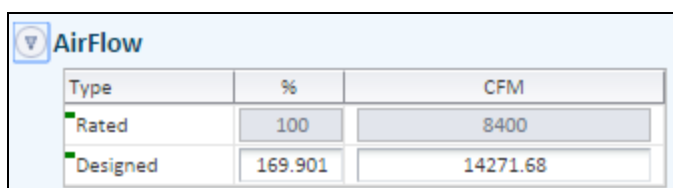
Air flow capacities are configured using measured values. This option is only available when a cooling device is selected. Containers are modified by the designed value for either the percentage, Cubic Feet per Minute (CFM) or Cubic Meters per Hour (CMH) which is used as per Unit of Measure (UOM).

NOTE: This option is not available at the floor or space level.

To modify air flow capacity values:

- From the Quick Launch menu, select *Portfolio*, expand the *Enterprise*, building, floor and space nodes and select the device.
-or-
Right-click the floor, select *2D Graphical View* and select a cooling device on the floor.
- Expand the *Capacities* accordion, click the *Air Flow* sub-menu.
- For a container, modify the designed value for either the percentage, Cubic Feet per Minute (CFM) or Cubic Meters per Hour (CMH) which is used as per Unit of Measure (UOM).
- Enter the Designed air flow values. These values compute the percentage of the designed air flow.
- Click away from the field to save.

Air Flow Capacity for a Container (CRAC)



AirFlow

Type	%	CFM
Rated	100	8400
Designed	169.901	14271.68

Working with blade slot capacities

Blade slot capacities are the number of blade slots available in the chassis. For a rack, it will be the sum of all slots across all the blade chassis's placed in it.

NOTE: Blade slot capacities are read only, they cannot be entered or changed by a user.

Blade slots rated:

- This is the total number of blade slots in the chassis.

Blade slots consumed:

- This is the sum of all slots occupied by blade servers inside the chassis.

Blade slots remaining:

- This is the sum of all open slots remaining in the blade chassis.

Blade slots rated, consumed and remaining, all get accumulated onto the rack with all blade chassis placed in it.

Colorization is used to indicate consumed and remaining capacities for blade slots. To learn more about colorization, see [Working With Colorization](#) on page 121.

To view blade slot capacity values:

- From the Quick Launch menu, select *Portfolio* and expand the *Enterprise*, building, floor, space and device nodes and select the chassis. Open the *Capacities* accordion to view the blade slot capacity.

Blade slot capacities in planning mode:

- In 2D Graphical View, select a project from the *Planning* accordion to view the sum of all related/designated blade slot capacities in real-time.

Blade Slot Capacities in Planning Mode

Consumption		
Type	%	Kg
Rated	100	100.15
Designed	100	100.15

Space

Consumption		
Type	%	RU
Rated	100	6

Blade Slot Consumption		
Type	%	Slots
Rated	100.0	8
Consumed		0
Remaining	100.0	8

Working With Standard and Unusable Zones

In 2D Graphical View, zones can be created to define areas within a space. Zones can be placed above, on or below a floor and can be created in areas where floor-mounted items cannot be placed.

There are two types of zones, standard and unusable. A standard zone can contain devices while an unusable zone cannot. For example, if you want to designate a zone for service processors, it is a standard zone. Also, if your data center contains a desk, it is an unusable zone, because devices cannot be placed in that part of your data center.

To create a zone:

1. From the Quick Launch menu, select *Portfolio* and expand the *Enterprise*, building, floor and space nodes.
2. Right-click the floor, select *2D Graphical View* and expand the *Levels* accordion to make sure the correct levels are active.
3. Select *Zone Rectangle Drawing Tool* or *Zone Polygon Drawing Tool*, draw the zone on the floor, enter the name of the zone and click *Create*.
4. Expand the *Properties* accordion, select *Standard* or *Unusable* from the drop-down list and click away from the field to save.

-or-

Right-click a zone and toggle between *Set Zone Usable* or *Set Zone Unusable*.

To delete a zone:

Delete everything associated with the zone, right-click the zone and select *Delete*.

NOTE: If more than one level is selected, the zone is transparent. If the zone is placed under a device, the zone is gray.

Creating unusable zones

An unusable zone allows you to designate certain areas, either on, below or above a floor, as unusable. An unusable zone cannot overlap other zones on the same level; however, an unusable zone can overlap another zone if they are on separate levels. If you have multiple levels visible and you create an unusable zone, the zone spans all the levels. When an unusable zone is selected, the properties panel automatically displays its properties.

NOTE: A zone cannot be unusable if it contains devices. Devices cannot be placed in an unusable zone and zones cannot be resized to encompass a device.

The following are characteristics of unusable zones:

- An unusable zone only has space capacities if it is on the floor level.
- An unusable zone on the floor level is a consumer, therefore only rated and designed space capacity are displayed.
- When an unusable zone is closed, the rated capacity is a non-editable calculated area. When a zone is marked unused, you cannot edit the capacity. If a line is not drawn yet, the rated zone is editable.
- When there is an unusable zone on a floor level inside a space, the rated capacity for the zone is equal to the area of the zone, minus the area of unusable space on the floor level.
- Any change to the unusable zone overwrites existing rated capacity.
- When a space has an unusable zone, the unusable zone is not calculated into the total space capacity.

To mark a zone as unusable:

1. In 2D Graphical View with the floor displayed, click the *Select Mode* icon and click the zone you want to mark as unusable.

NOTE: Before adding an unusable zone, click the *Levels* icon and disable the *Ceiling*, *Floor* and *Under Raised Floor* options. Otherwise, the unusable zone will be created in all active levels.

2. Right-click and select *Set Zone Unusable*.

-or-

Expand the *Properties* accordion and select *Unusable* in the Zone Type.

NOTE: If more than one level is selected, the zone is displayed as transparent. If placed under a device, the zone is gray under the device.

To remove an unusable zone:

1. In 2D Graphical View, select the unusable zone.
2. Right-click and select *Delete Zone* to remove the zone from the total space capacity and add it to the available floor space capacity.

Working With Racks

After you have created a space, devices (including racks) can be added to the space and other devices, such as switches, servers and service processors can be placed within racks. This section provides information that is specific to racks, [Working With Devices](#) on page 98 for additional information about racks.

Adding and deleting a rack

Racks can be added in Portfolio and 2D Graphical View. After a rack is added, you can configure or modify the properties of the rack and including weight capacity.

To add a rack in Portfolio View:

1. In Portfolio View, expand the *Enterprise*, building, floor and space nodes.
2. Expand the *Catalog* accordion, select the rack and drag the model number (not the image) to a space.
3. Select the added rack and expand the *Capacities* accordion, then modify the capacity and threshold values.

To add a rack in 2D Graphical View:

1. In Portfolio View, expand the *Enterprise*, building and floor nodes.
2. Right-click a floor and select *2D Graphical View*.
3. Expand the *Catalog* accordion, select the rack and drag the image to a space on the floor.
4. Select the added rack and expand the *Capacities* accordion, then verify and/or modify the capacity and threshold values.

To delete a rack:

1. In Portfolio View, expand the *Enterprise*, building, floor and space nodes.

2. Right-click the rack, select *Delete* and click *OK*.
-or-
3. Right-click the floor and select *2D Graphical View*.
4. Select one or more racks, right-click and select *Delete Devices*.
5. On the confirmation message stating all contained devices and external connections will be deleted and this cannot be undone, click *Delete Device*.

Selecting and moving one or more racks

When you add a rack you can designate its placement and move one or more racks within a space.

To move a rack:

Click the rack, move the cursor to the side or bottom of the rack until the double arrows are displayed, then drag it to the new location.

-or-

Expand the *Placement* accordion and modify the X and Y offset coordinates.

To select multiple racks in 2D Graphical View:

1. In Portfolio View, expand the *Enterprise*, building and floor nodes.
2. Right-click the floor node and select *2D Graphical View*.
3. Click a rack.
-or-
Click the *Select Mode* tool and surround a group of racks.
-or-
To select specific racks, click the *Select Mode* tool and hold the **Ctrl** key while clicking each additional rack.

NOTE: When selecting more than one rack, only the common properties are displayed.

Copying and pasting racks

When copying and pasting racks consider the following functionality:

- All the rack attributes are also copied; however, “Copy <n>” is added to the rack name, where (n) is an integer that increments for every copy made of the original devices. The contained devices retain the same name.
- All the devices within the racks are copied.
- All power or data connections are copied. If a device has a connection outside the selected devices, the outside connections are not copied.
- The spatial relationship between the selected racks is preserved.
- If multiple users copy a group of racks and either delete or move them, the paste does not occur and a warning message is displayed.

To copy and paste racks:

1. In Portfolio View, expand the *Enterprise*, building, floor and space nodes.

2. Right-click the floor node, select *2D Graphical View* and using the *Select Mode* tool, surround the desired racks.
3. Right-click and select *Copy Devices*, then right-click and select *Paste Devices*.

Rotating a rack

To rotate a rack:

1. In Portfolio View, expand the *Enterprise*, building, floor and space nodes and select the rack.
2. On the rack, click and hold the blue rotate icon and rotate the rack.

-or-

Expand the *Placement* accordion, add the rotation value and click *Save*.

Modifying rack properties

To modify rack properties:

1. In Portfolio View, expand the *Enterprise*, building, floor and space nodes.
 2. Select the rack.
- or-
- In Portfolio View, right-click the rack and select *2D Graphical View*.
3. Expand the *Properties* accordion, modify the properties and click away from the field to save.

Assigning an RU starting position number

When assigning the RU position in a rack the starting number is zero or one and the starting position is either top or bottom. For racks that do not have device RU numbering, the default is number one beginning at the bottom.

NOTE: The rack must be empty to modify the configuration. When you place a device into a rack, the settings become disabled, so you must empty the rack of all devices first.

To assign a starting position and number to an RU:

1. Open the rack in Elevation View and expand the *Properties* accordion.
2. In the *Start Number* field, select *0* or *1* from the drop-down list.
3. In the *Start Position* field, select *Top* or *Bottom* from the drop-down list.
4. Click away from the field to save.

Modifying weight capacities

To modify weight capacity:

1. From the Quick Launch menu, select *Portfolio*, expand the *Enterprise*, building, floor and space nodes and select the device.

-or-

In Portfolio View, right-click the floor, select *2D Graphical View* and select the device.

2. Expand the *Capacities* accordion, select the *Weight* capacity type and select the unit of measure.

3. For a container, modify the designed value.
-or-
For a contained device, modify the consumed value.
4. Click away from the field to save.

Weight Capacity for a Container (Rack)

The screenshot shows the 'Capacities' interface with the 'Weight' section expanded. The 'lbs' unit is selected. The main table displays the following data:

Type	%	lbs
Rated	100	100
Designed	2000	2000
Reserved		0
Consumed		0
Remaining	100	2000

Below the table is a 'Threshold' section with a '+' button and a table with columns for Type, %, and lbs. The table currently shows 'No data to display.'









Tracking assets in a rack

If your system includes the data collection engine and an external appliance, such as the Data Cabinet Intelligence Module with Remote Frequency Identification (RFID) tags, you can track the location of a device within a rack and the movement of a device into and out of a rack using RFID tags.

To use this feature, an RFID tag is placed on each device before it is installed in the rack. The asset-tracking appliance monitors the device, recognizes when any tagged device is added or removed from the rack and relays the placement and status of the device to a connected server or device. Multiple asset-tracking appliances can be added to the data collection engine..

If procedures are not followed explicitly, errors may occur. The following table provides solutions for unexpected messages in the Alarm Viewer.

Alarm Viewer Messages

 Critical 1/31/2014 4:26 PM Controller Not Associated With Cabinet
<p>Occurs if you monitor the CCM on a floor instead of a rack and remove or add the RFID tags in the hardware.</p>
 Critical 2/11/2014 1:41 PM RFID Not In System
<p>Occurs if you placed an RFID tag in the hardware but have not placed a corresponding device in the software and you perform an asset sync for the rack.</p>
 Critical 1/31/2014 11:06 PM Device Not In Rack Unit
<p>Occurs if no RFID tag is on the hardware but a corresponding device (rack) has been placed in the software and you perform an asset sync for the rack.</p>
 Critical 1/31/2014 11:06 PM Rack Unit Not Empty
<p>Occurs if no RU is available for a server to be placed because it is occupied by another server. In the software, an RFID server is already assigned to an RU and in the hardware the tag is moved to another RU. In the software, the rack is already occupied by another server with an RFID.</p>
 Critical 1/31/2014 5:10 PM Rack Capacity Exceeded
<p>Occurs if the rack capacity is exceeded while adding a server. If an RFID tag is removed from the hardware and in the software the corresponding device rack is moved to unplaced inventory, the capacities of the rack change. When the tag is placed back in the hardware, it causes the corresponding server to be moved back into the rack in the software.</p>
 Critical 1/31/2014 4:37 PM Rack Unit Specified In Event Is Not In Rack
<p>Occurs if the rack in the software is different from the hardware rack. Hardware racks have 48 RUs, but the software has 36 RUs. Placing a tag at RU1 corresponds to RU1 in the software with an assigned RFID. However, if a tag is moved to RU48 in the hardware, there is no RU 48 in the software.</p>
 Critical 1/15/2014 12:03 PM Multiple RFIDs Detected
<p>Occurs if two RFID tags are configured for the same device. In the hardware a tag is placed at RU1 and 2 and in the software RU 3 is occupied by a rack (occupying RU1, 2 and 3) and you attempt to assign an RFID.</p>
 Critical 1/14/2014 12:40 PM RFID Assigned To Different Device
<p>Occurs if the same RFID is assigned to two different devices. A rack is assigned an RFID at RU1. If the device is moved to unplaced inventory and another device is added to the same RU and you attempt to assign an RFID.</p>

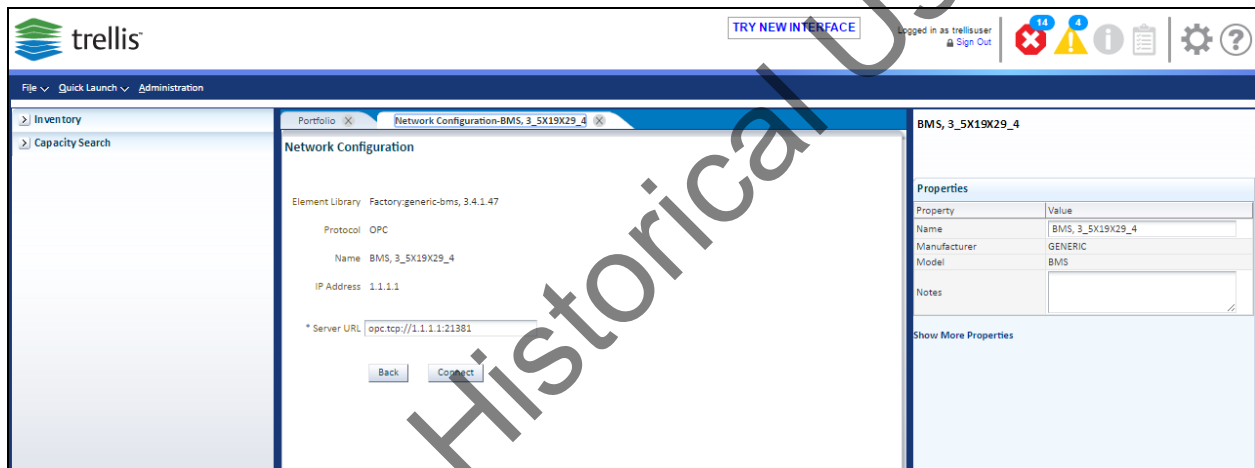
To track a device in a rack:

Attach an RFID tag to each server or device in a consistent location, on the side of the device and facing the reader in the middle of the highest RU zone of the device. When the RFID readers on the rack are powered on, an LED marks the middle of the RU in the rack.

NOTE: RFID tags should be kept between five and 15 millimeters from the surface of the reader.

To configure a rack for tracking:

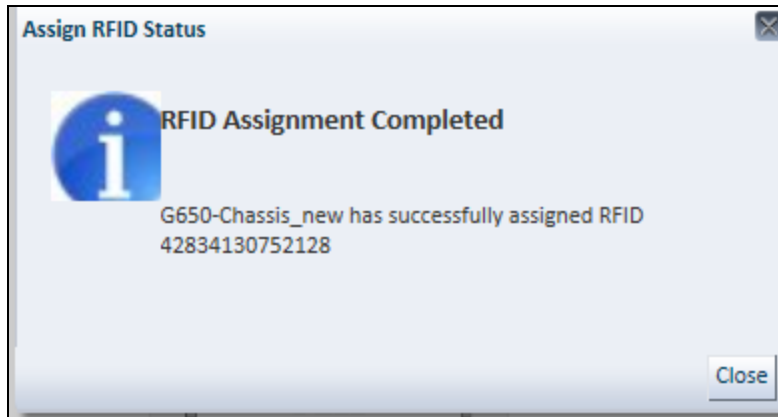
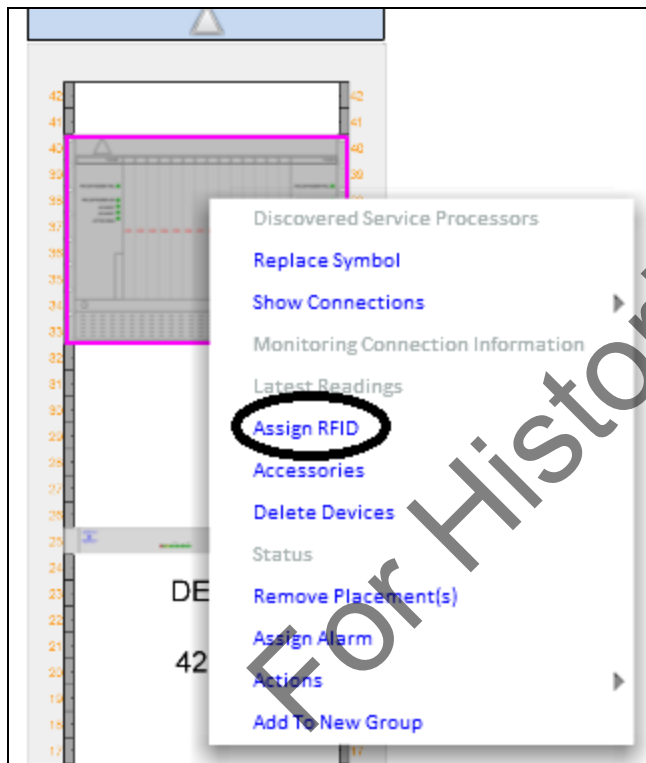
1. Place a rack on a floor, drag the CCM symbol from the asset controller in the catalog and drop it into the rack.
2. Select and right-click the CCM and click *Network Configuration*.
3. From the protocol drop-down list, select *TELNET*, enter the IP address and the transmission time out (20 seconds is the recommended minimum) and click *Connect*.

Network Configuration**To assign the RFID to a device:**

1. Expand the *Catalog*, then select and drag the device into any RU inside the rack.

NOTE: Make sure the RU is a whole number such as 1.0, 2.0 and so on. Also, make sure the hardware device and configured device in the UI are placed in the same RU.

2. Select and right-click the device, click *Assign RFID*, pause for the confirmation message and click *Close*.

RFID Confirmation Message**Assigning the RFID****To assign the RFID to a group of devices:**

1. Expand the *Catalog*, then select and drag the devices into any RU inside the rack.

NOTE: Make sure the RU is a whole number such as 1.0, 2.0 and so on. Also, make sure the hardware server and configured server in the UI are placed in the same RU.

2. Select and right-click the rack, click *AssetSync*, pause for the confirmation message and click *Close*.

To validate the hardware devices in the Trelis™ platform rack:

Select and right-click the rack, click *Manual Validation*, pause for the confirmation message and click *Close*.

To assign an RFID to a device occupying more than one RU device:

The procedure is the same as when assigning an RFID to a device occupying a single RU except the device RFID position is calculated based on the height of the device. For example, when the tag is placed at RU1 and the device occupies RU1, RU2 and RU3, the RU position is considered at RU3.

Working With Devices

A space must exist on a floor before adding a device, including a floor-mounted power distribution unit (PDU), remote power panel (RPP) or a rack and the contents of each. Devices, with their contents, can be added directly to a space or can be placed in a rack within a space. Devices can be placed in a building (unplaced inventory), floor (unplaced inventory) and data center (unplaced inventory). When placing a device, you can also use the rotate or flip icons to maneuver the device. Depending on the device, you can also add and edit its attributes in the Properties accordion.

After adding a PDU or RPP to a space, see [Managing Panelboards](#) on page 112 to add panelboards and related components.

Adding a device

To add a device to a space in Portfolio View:

1. In Portfolio View, expand the *Enterprise*, building, floor and space nodes.
 2. Expand the *Catalog* or *Inventory* accordion, then select and drag the model number (not the image) to the space.
- or-
- Drag the device to the Unplaced Inventory node under the space.

To add a device to a space in 2D Graphical View:

1. In Portfolio View, expand the *Enterprise*, building, floor and space nodes.
2. Right-click the floor and select *2D Graphical View*.
3. To add a device, expand the *Catalog* or *Inventory* accordion.
4. Select and drag the device to a space.

To add a device to a rack:

1. In Portfolio View, expand the *Enterprise*, building, floor and space nodes.
2. If desired, right-click the floor node and select *2D Graphical View*.
3. In Portfolio or 2D Graphical View, expand the *Catalog* accordion, expand the rack and the manufacturer.
4. Select the device and drag the model number or image of the device to the rack.

Moving a floor-mounted device in a space

Floor-mounted devices can be moved from one space to another.

To move a device in Portfolio View:

Open a floor, select the device in a space and drag it to another space.

To move a device within a space in 2D Graphical View:

1. On the 2D Graphical View toolbar, click *Select Mode* and highlight the device.

2. Hover over the border of the device until the cross-hair icon is visible and click and drag the device to a different location in the space.

To move a device within a rack:

1. In 2D Graphical View, select and double-click the rack to open Elevation View.
2. Click and drag the device to the desired location in the rack.

Using the Placement accordion

When placing floor-mounted devices, for an accurate representation of your environment, you can add/edit the grid tile location, name and offsets in the Placement accordion.

To move devices using the Placement accordion:

1. In Portfolio View, expand the *Enterprise*, building, floor and space nodes.
2. Open the *Placement* accordion and enter the grid tile location and name, X and Y offsets and Rotation fields and click *Save*.

Moving devices to containers in Elevation View

When a device and two containers are visible in Elevation View, a device can be moved from one container into the other container. For example, if two racks are visible in Elevation View, you can drag a server from one rack (container 1) into another rack (container 2).

NOTE: Only one device can be moved at a time.

To move a device in Elevation View:

1. Open a floor in Portfolio or 2D Graphical View, select both devices and double-click to open Elevation View.
2. Drag a device from one container and drop it in another container.
3. If the device triggers a placement or capacity violation, on the warning, click *Cancel* to stop the operation.

NOTE: If another user makes a change, a message is displayed advising that your screen is being refreshed.

4. If you click *Continue*, the device is placed with the violations.

Placing devices in zero-U (0U) space in a rack

Rack spaces are given identifiers for placing devices in a rack. In a rack there is a left, right, top and bottom 0U space where devices can be placed.

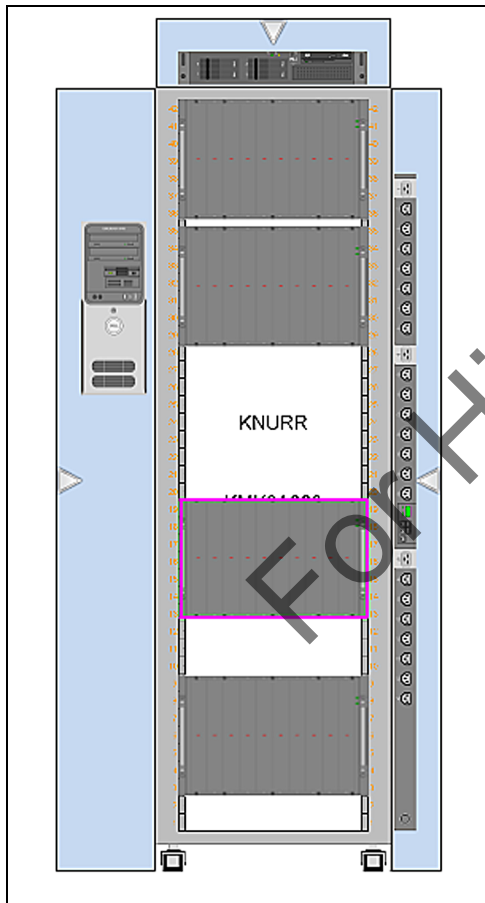
If multiple devices are placed in the top 0U space, they are automatically stacked on top of each other. If multiple devices are placed in the bottom 0U space, they are automatically stacked under each other. As devices are removed, the stacks are readjusted.

Before placing a device in a rack, you can flip the device to display either the front or rear view.

To place a device in zero-U space:

1. From the Quick Launch menu, select *Portfolio* and expand the *Enterprise*, building, floor and space nodes.
2. If desired, right-click the floor node and select *2D Graphical View*.
3. In Portfolio or 2D Graphical View, double-click a rack to open Elevation View.
4. Expand the *Catalog* accordion, expand the device category and expand the manufacturer.
5. Select the desired device, drag the image of the device to a side, top or bottom of the rack.
6. After the blue zero-U space becomes visible, verify placement by clicking the arrow to open and close the blue space.

NOTE: With the device selected, if you expand the Placement accordion, the Placement Type field displays Zero U Placement.

Zero-U Space in the Rack**Placing a device on different floor levels**

A device, including its monitored environmental sensors, can be placed on a floor, under a raised floor and in the ceiling plenum, which is a space used for air circulation for heating, ventilation and air-conditioning.

NOTE: Devices cannot span multiple levels.

To use the Levels options:

1. In 2D Graphical View, click the *Levels* icon and verify that only the applicable levels are active (enabled).

NOTE: Spaces, zones and devices are added to all active levels.

2. Select a device and place it on the active floor.

NOTE: In the workspace, the device icon is visible on the active level where it is placed. A device may not be visible if a larger device is placed over it in upper levels.

3. Click each level option to view where devices are placed and perform any of the following tasks:
 - Click *Status* to see the status of the devices when monitoring is enabled.
 - Click *Text* to display or hide text. If disabled, the text remains on the floor, but is not visible unless you hover over where text was placed.
 - Click *Ceiling* to display or hide devices placed on the ceiling level.
 - Click *Drop Ceiling* to display or hide devices placed on the drop ceiling level.
 - Click *Raised Floor* to display or hide devices placed on the raised floor level.
 - Click *Floor* to display or hide devices placed on the floor level.
 - Click *Space Grid* to enable or disable the grid lines on the space.
 - Click *Background* to enable or disable the background on the floor.

Copying and pasting a device

In 2D Graphical View, you can copy a device configuration from a space and paste it on a different floor or space. When copying and pasting, the spatial relationships between the selected devices are always preserved.

NOTE: Copying and pasting a device is not allowed in Portfolio View.

Conditions of copying and pasting a device in spaces

- All the attributes are copied; however, in Portfolio View, for the top level, the name attribute "Copy (n)" is added, where (n) is an integer that increments for every copy made of the original devices. The contained devices retain the same name.
- For multiple copies of an original space, if one is deleted, the numbering in the copy picks up the number available in the sequence.
- Any modules or cards in slots are copied.
- If the device is a rack, all devices contained in the rack are copied.
- All power or data connections are copied. The connections are only carried over if the device is cut.
- No monitor-specific information is copied.
- If multiple users copy a group of devices and either delete or move them, the paste does not occur and a warning message is displayed.

- Closing the browser during the paste action aborts the action.

To copy and paste one or more devices:

1. Open a floor in 2D Graphical View, highlight one or more devices on the floor, right-click and select *Copy Device*.
2. Move the selection tool to the desired location on the floor or space, right-click and select *Paste Device*.

Rotating a device

Devices can be rotated on a floor or using the Properties accordion.

To rotate a device on a floor:

1. Click *Select Mode* on the toolbar or press **Ctrl**+click to select one or more devices to be rotated.
2. Click the rotation tool appearing in the upper, left corner of the device and rotate.

To change the rotation of a device in Properties:

1. Click *Placement*, select a type of placement and select a location.
2. After the *Offset X and Y* positions are populated and the *Rotation* field is populated, which are editable, click *Save*.

Restricted access

Access to a device can be restricted or allowed by a *Trellis™* administrator. When a device is configured with restricted access, non-administrator roles cannot make any changes to the device. Children devices of the selected device are not affected by the restrictions.

NOTE: Multi-device restrictions can also be performed using platform APIs.

To restrict access to a device:

1. As **TrellisAdministrator**, log in to the platform software.
2. Select *Portfolio* and then expand the *Enterprise*, building, floor and space nodes.
3. Select the device to be restricted and expand the *Properties* accordion.
4. Enable the Restrict Access checkbox and click away from the field to save.

Storing devices in Unplaced Inventory

Inventory that you know you will be using, but are not ready to place in your environment, can be moved to the Unplaced Inventory repository that is located under each container in Portfolio View.

Also, devices that have been placed in a space can be removed from the space and stored in Unplaced Inventory until they are ready to be placed again.

This feature is useful when a device from your environment is being removed, for example during maintenance, and you want to make sure the location is available when the device is ready to be returned to the rack.

When placed inventory is moved from a floor or container to the Unplaced Inventory repository, its contents are also moved, as well as any connections. It can still be associated with a floor or a space on a floor, but

does not have specific floor information, such as capacities, until it is moved from the Unplaced Inventory repository to a specific container.

To move a device to Unplaced Inventory:

1. In Portfolio or 2D Graphical View, open a floor and select one or more devices from a space to move to Unplaced Inventory, right-click and select *Remove Placement*.
2. If the devices have connections, you will receive a warning advising that the devices contain existing external connections. Click *Continue* to move the devices.

Using device placeholders

When a requested device is not in the catalog, you can mount a placeholder to reserve the space until the new device is available. Placeholder symbols, located in the catalog, are available in different sizes.

Properties and connections can be assigned to placeholder symbols as you would other devices, including capacities and/or consumptions, which are added to the total consumption values for the rack where the device resides.

To add reserved space to a device:


1. In Portfolio View, select the space node and expand the *Catalog* accordion, *Placeholders* and *Reserved*.
2. Select the appropriate size for the symbol and drag the model name (not the image) to the appropriate device.
3. Right-click the symbol and select *Elevation View* to verify the position of the reserved space.
4. If desired, right-click the floor, select *2D Graphical View* and drag the reserved symbol to the desired location.

Assigning device properties

Device properties can be assigned or edited in Portfolio, Graphical and Elevation Views. Selecting more than one device displays the common properties. If the properties are changed, the devices are updated and the new information is displayed.

NOTE: Planned devices in planning mode can be viewed from the device properties pane.

Device Properties

UMG 2000_10.207.58.141
 Normal

Properties

Property	Value
Owner	<input type="text"/>
Owner Email	<input type="text"/>
Name	UMG 2000_10.207.58.141
Depth (in.)	20
Width (in.)	19
Weight (lbs.)	26
Height (in.)	1.7
Manufacturer	AVOCENT
Model	UMG 2000
Model Qualifier	UMG 2000
Notes	<input type="text"/>
Licensing Tier	GEN
Category	Trellis Management Appliance
Lock Device Position	<input type="checkbox"/>
RU Height (RU)	0.97
Symbol Version	4.55

> Placement

> DSView Session

> Ports

> Capacities

> Connections

> Groups

The available attributes for devices are:

- Owner
- Name
- Depth
- Width
- Weight
- Height
- Manufacturer
- Model
- Model Qualifier
- Notes
- Licensing Tier

- Category
- Restricted Access
- Rack unit Height
- Symbol Version
- Description
- Serial Number
- Asset Number
- Bar Code Number
- Start Number
- Start Position...
- User-defined properties are displayed if assigned

Assigning or editing device properties

In Portfolio View, you can add a device from the catalog or from the inventory.

To assign or edit properties for a single device:

In Portfolio or 2D Graphical View, select a device, expand the *Properties* accordion, edit the properties and click away from the field to save.

To assign or edit properties for multiple devices:

1. In Portfolio View, press **Ctrl**+click to select more than one device.
-or-
In 2D Graphical View, click a space and surround the devices.
2. Expand the *Properties* accordion to edit the values and click away from the field to save.

NOTE: Planned devices in planning mode can be viewed from the device properties pane.

Configuring device status polling

The polling rate can be configured for gathering the parameters that determine the status of a device. Device status polling can be configured per device or it can be applied to all devices in a particular device category. For example, you can set a higher polling rate for the UPS category and a lower rate for the CRAC category. If a managed device fails to respond to the poll, a device unavailable alarm-event is displayed in the alarm event viewer. The device status and corresponding icons are displayed as Normal, Not Responding, Critical, Warning, Info or Maintenance.

To change the device status polling configuration:

1. In Portfolio View, select a monitored device, and on the properties panel, expand the *Monitoring Configuration* accordion.
2. Expand *Device Status Polling Interval*, enter a number and select a time interval from the drop-down list.
3. Enable the Apply this setting to all <device category> checkbox and click *Apply*.
4. If you chose to apply the setting to all devices in the same category, on the warning message stating all devices in the category will be affected, click *Cancel* or *Continue*.

Creating device groups

Grouping devices allows you to manage similar devices. For example, you can create an SP group to simultaneously manage the group across multiple floors and spaces.

To create a new device group:

In Portfolio or 2D Graphical View, select a device and perform one of the following:

- Expand the *Groups* accordion, click the plus (+) icon, enter a new group name and click away from the field to save. Next, add the new group to the list of groups and to the inventory list at the building level.
- Expand the *Groups* accordion, click the pencil icon and on the Device Groups screen, click *New*. Next, enter the name and owner, click away from the field and click *Add*.
- Right-click the device, select *Add to New Group*, enter a name for the new group and click away from the field.

To add a device to a group:

1. In Portfolio View, select a device.
2. Expand the *Groups* accordion and click the pencil icon to open the Edit Groups tab. Under the device groups, select an existing group and enter a new group name.
-or-
In 2D Graphical View, select and right-click the device, then select *Add to New Group* and enter a name for the new group.
3. Click away from the field to save.

To edit devices in a group:

1. In Portfolio View, expand the *Enterprise*, building, floor and space nodes.
2. Expand the *Groups* accordion and click the pencil icon.
3. Click the device group name and under Group, edit the name and owner, click away from the field and click *Update*.

To delete a group or a device in a group:

1. In Portfolio View, expand the *Enterprise*, building, floor and space nodes.
2. Expand the *Groups* accordion and right-click the group to verify if any devices exist in the group.
3. To delete a group and its devices, in the Groups accordion, right-click the group and select *Delete*.
-or-
Click the pencil icon and in the Edit Groups tab under Device Groups, right-click the group and select *Remove*.
4. To delete devices in a group, right-click the device and select *Delete*.
-or-
Click the pencil icon and in the Edit Groups tab under Selected Devices, right-click the device and select *Remove*.

Understanding Consumption and Operational Thresholds

Both consumption and operational thresholds are supported by the *Trellis*™ platform. Consumption thresholds can be configured for space and weight. Configuring these thresholds provides a way to manage the placement of equipment on a floor more efficiently. Operational thresholds can be configured using both the *Trellis*™ Inventory Manager module and the *Trellis*™ Site Manager module. Operational thresholds apply for the operation of any device and are configured using parametric data points and enumerated data points. Configuring these thresholds provides a way to stay informed about the status of critical infrastructure equipment.

For information about threshold alarms, see [Managing threshold alarms](#) on page 196.

NOTE: Planning thresholds are not available in real-time mode.

Configuring consumption thresholds

Generally, consumption thresholds can be configured similarly for heat, weight, space and power capacities.

To configure or delete consumption thresholds for a device:

1. In 2D Graphical View, open a floor and select the device to be changed.
2. Expand the *Capacities* accordion and select the applicable *Heat*, *Weight*, *Space* or *Power* sub-menu.
3. Click *Threshold* and select the threshold type from the table.

NOTE: The selected type is removed from the list for the next time a threshold is set for that same device. For example, if you set a low critical threshold, when another threshold for the same container is set, low critical is no longer in the drop-down list.

4. Set the value for the threshold.
- or-
- Right-click and select *Delete* to delete the threshold.
5. Click away from the field to save.

Operational thresholds for a parametric data point

With the *Trellis*™ Site Manager module, devices/device accessories can be configured to provide data point values and threshold values that are evaluated by the embedded controller in the device.

If a data point value received from a device either has no threshold or does not have a threshold you need, you have the option of creating and configuring the threshold and attributes in Portfolio or 2D Graphical View.

The supported thresholds for parametric data points are:

- High/Critical
- High/Warning
- Low/Warning
- Low/Critical

To configure a threshold for parametric data points:

1. In Portfolio or 2D Graphical View, open a floor and select the device.

2. Expand the *Monitoring Configuration* accordion, click *Thresholds* and click *View-All Columns*.
3. Select *Parametric Datapoint*, edit the threshold value (High Critical/High Warning/Low Warning/Low Critical) and click *Save*.
4. Verify or modify thresholds in the chart using the icons at the top of the workspace.

Operational thresholds for an enumerated data point

In some cases, devices provide data points where the values are not parametric, which means they do not fall into a contiguous range with consistent meaning. The value of these non-parametric data points is commonly called an enumerated data type with a value that has a specific meaning.

The supported thresholds for enumerated data points are:

- Critical
- Warning

To configure a threshold for enumerated data points:

1. In Portfolio or 2D Graphical View, open a floor and select the device.
2. Expand the *Monitoring Configuration* accordion, click *Thresholds* and click *View - All Columns*.
3. Select *Enumerate Datapoint*, edit the threshold value (Equal to Warning/Equal to Critical) and click *Save*.
4. Verify or modify thresholds in the chart using the icons at the top of the workspace.

To modify thresholds for a device group:

1. Click the desired capacity and click *Thresholds*.
2. Enter the values and click away from the field to save.

Configuring a device for monitoring and data collection

Data can be collected from devices and used to manage trends and availability in your data center. Both the *Trellis™* Inventory and Site Manager modules are required in order to use this feature. Also, the *Trellis™* Intelligence Engine or registered Avocent® Universal Management Gateway appliance is required and your platform software must include the symbol and element library with the device. With these components in place, you can proceed to configure the specific device for monitoring.

For additional information, [Working With Catalog Symbols and Element Libraries](#) on page 126.

To configure a device for monitoring:

1. In Portfolio View, scroll to the device, right-click the device and select *Network Configuration*.
2. On the Network Monitoring screen, select the appropriate protocol.

NOTE: This screen varies depending on the protocols available in the current local element library for a specific device model. The drop-down options combine the protocol with the interface device and the connection type.

3. Enter the IP address of the device and click *Next*, enter the *Relative index to controller* and click *Connect*.

To configure a device for collecting data:

1. In Portfolio View, expand the *Enterprise*, building, floor and space nodes.
2. Right-click the device, select *Show Real Time Data* and click the arrow to expand the list of data points.
3. On the Device - Latest Reading screen, expand *Data Points* in the table and drag up to four data points to the Selected Data Points box on the right.
-or-
Remove data points from the selection box by right-clicking a data point and selecting *Remove*.
4. Select a chart type from the drop-down list and select a duration from the drop-down list.
5. Click *Collections Settings*, expand the *data points*, modify the configuration as needed and click *Collect All* or *Apply*.

NOTE: Changing a data point collection configuration affects the number of data points collected by the device.

6. Click *Device-Latest Readings* to return to the previous screen, click *Chart* and at the bottom of the screen, if desired.

NOTE: Options in the legend can be enabled or disabled.

To verify data is being collected:

1. In Portfolio View, select the monitored device, expand the *Properties* accordion and verify the status is normal (indicated by a green check icon).
2. Right-click the device, select *Show Real Time Data* and pause for the data to be collected.
3. Click the arrow on the left to expand the data points field and verify the data point values are updated.

NOTE: To configure the polling rate for gathering the parameters that determine the status of a device, [Configuring device status polling](#) on page 105.

NOTE: To verify symbol and element library information and update monitoring synchronization of device symbols with the data collection engine, see [BMS Integration, Symbol and Element Libraries](#) on page 129.

To stop monitoring a device:

1. In Portfolio or 2D Graphical View, select and right-click the monitored device.
2. Select *Network Configuration* and click *Stop monitoring*.

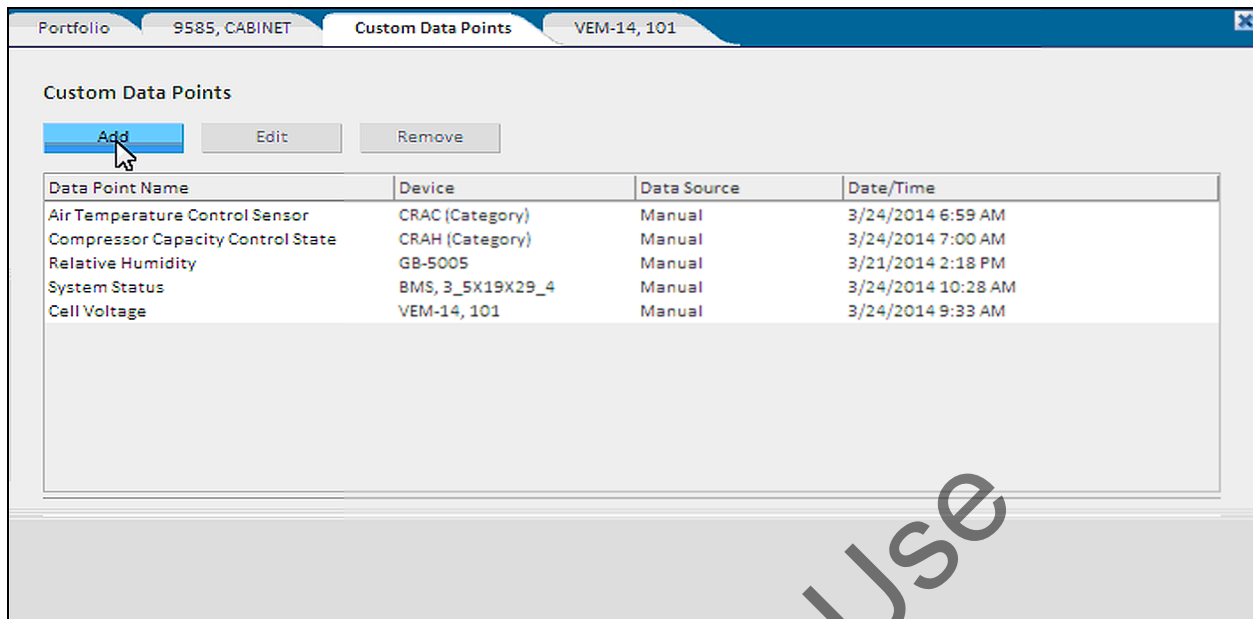
Adding a custom data point

Custom data points can be created to track and manage monitored devices.

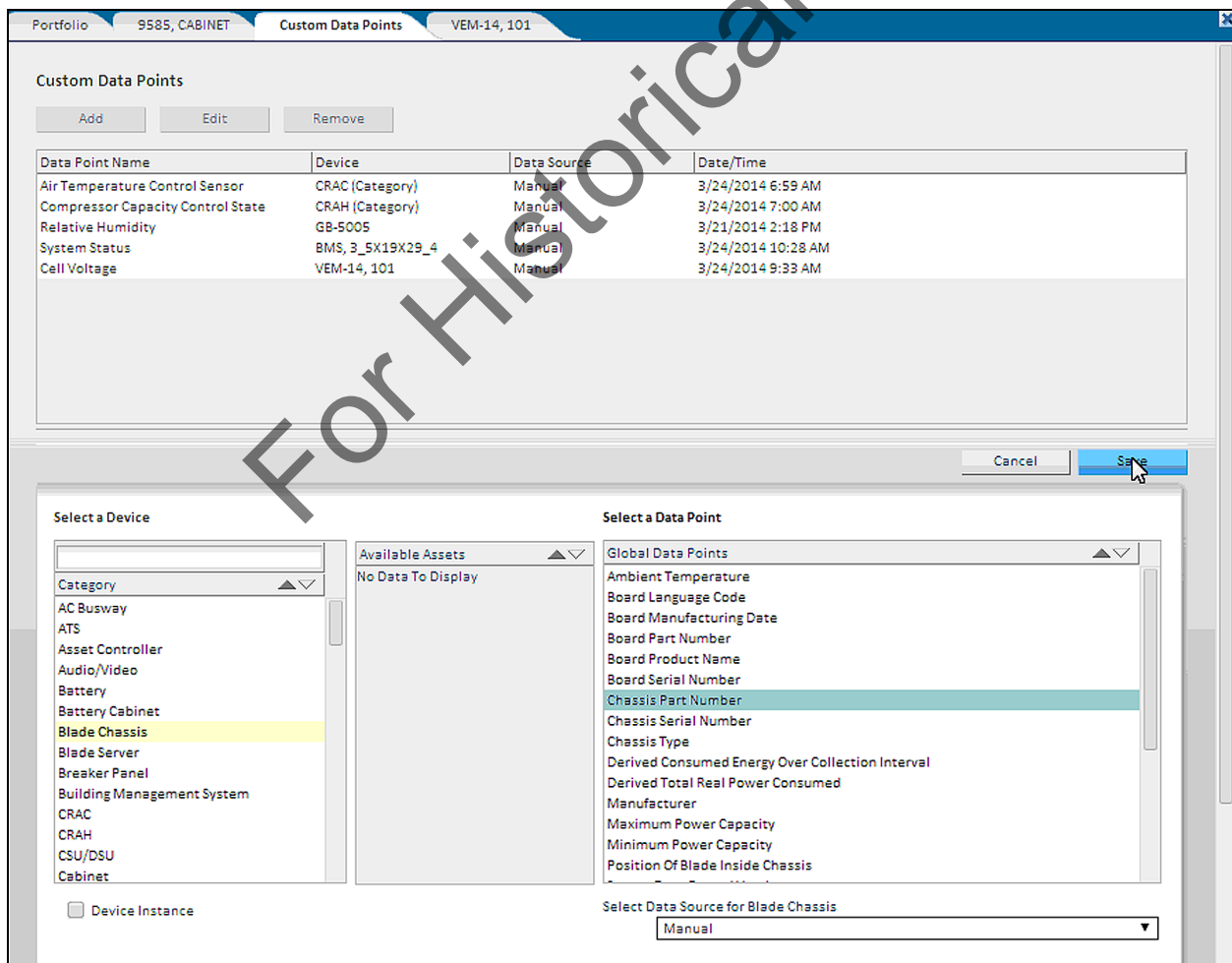
To add a data point manually:

1. From the Administration menu, under System Configuration, click *Custom Data Points*.
2. On the Custom Data Point workspace, click *Add*, select a device from the list, select a data point from the list and click *Save*.

Adding a Custom Data Point



Selecting a Category and a Data Point



3. In the Select Data Source drop-down list, select *Manual* and verify the data point has been added to the list of data points.

Verifying the Custom Data Point is Added

Data Point Name	Device	Data Source	Date/Time
Air Temperature Control Sensor	CRAC (Category)	Manual	3/24/2014 6:59 AM
Compressor Capacity Control State	CRAH (Category)	Manual	3/24/2014 7:00 AM
Chassis Part Number	Blade Chassis (Category)	Manual	3/27/2014 4:28 PM
Relative Humidity	GB-5005	Manual	3/21/2014 2:18 PM
System Status	BMS_3_5X19X29_4	Manual	3/24/2014 10:28 AM
Cell Voltage	VEM-14, 101	Manual	3/24/2014 9:33 AM

Entering manually collected data and time

If you would like to track a device, but the data points have not been configured in the *Trellis*™ platform software, you can manually enter the collected data and the time and date of the collection. For example, if you want to record the room temperature and humidity on a floor, but the devices are not provided with meters or sensors providing access to the data, you can set up a periodic process to gather the data.

To enter manually collected data:

1. In Portfolio or 2D Graphical View, open a floor and double-click the device to open Device View.
2. Click *Configure*, enter the data point sample information and click *Save*.

For more information, [Adding a custom data point](#) on page 109.

Working with Power Connections

Power connections are simulated with a power opening, power node and power connection objects. Power connections also have a direction associated with them that reflects the flow of power from provider to consumer.

A basic connection is made when the user specifies only the devices, but not any ports. A specific connection is made to a specified port. Both power and data connections can be either basic or specific at each end.

When you make basic power connections, the *Trellis*™ platform may issue a warning that basic connections limit the amount of detail that can be obtained about power utilization and ask for confirmation that you intend to create a basic connection. When viewing connections in Portfolio View, a basic power connection is labeled as Unknown.

NOTE: When you click *Connect* to connect devices, if the power load is exceeded, the Load Violation message advises that the load has been violated, but allows you to continue if desired.

To create a basic power connection:

1. In Portfolio View, with connections displayed, select two devices (rather than their ports) and click *Connect*.
2. On the pop-up box, select *Power Connection*.

For more information about power connections, see [Making Power Connections](#) on page 151.

Power connections in the Beta UI

In the Beta UI, instead of expanding the enterprise levels, you can search for devices to create connections. You can also specify the lowest level to view the possible connections. When you select a device, the possible connections for the opposite end are displayed in a second panel. Then you can click to select the device connector on the opposite end. An icon is displayed to indicate multiple connections.

In the Beta UI, you can also use the following filters to minimize the list of connectors: Power Openings, Data Openings, Locked Openings or Connected Openings.

To create a connection:

1. In the window, click *Search* and enter the device name.
2. In the list of connections, click the first connector.
3. In the right panel, click the connection for the opposite end.

To remove a connection:

Click the connection and select *Accept* in the pop-up window.

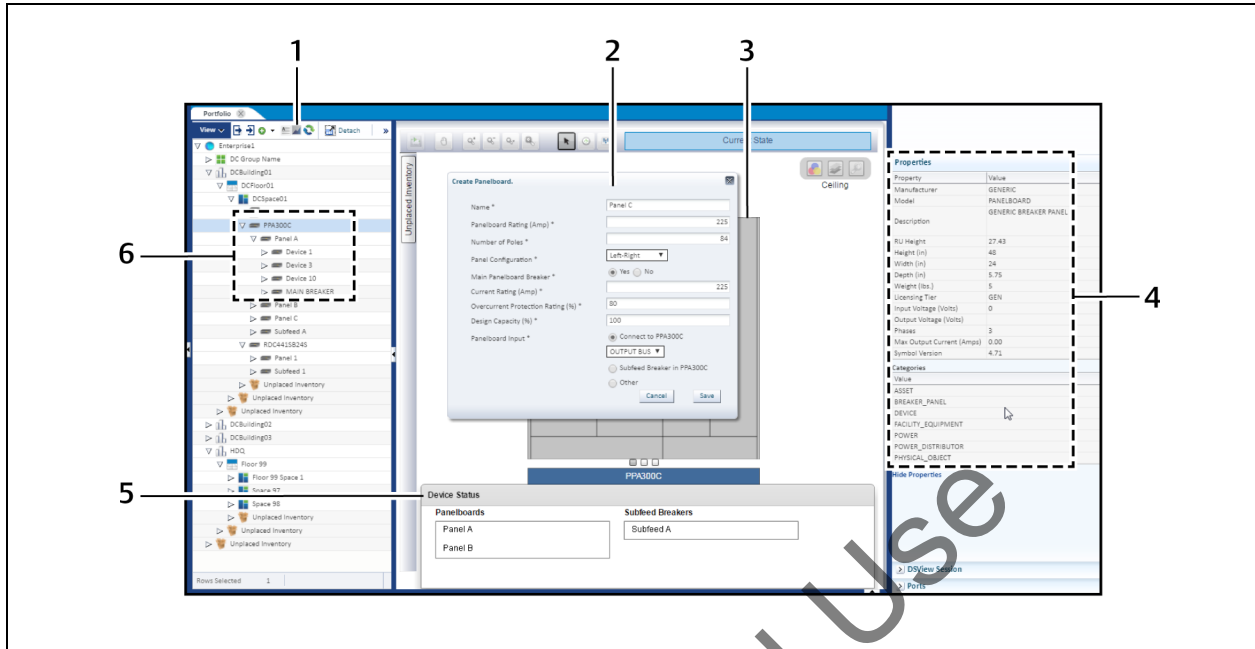
Managing Panelboards

NOTE: Prior to adding any devices, see [Working With Devices](#) on page 98.

CAUTION: Always consult with your facility engineer to verify the circuit schematic or wiring diagram before configuring a panelboard.

From Portfolio View, you can add a panelboard (also called a breaker panel) or a subfeed breaker to a floor power distribution unit (PDU) or remote power panel (RPP). After a panelboard is configured and added to the PDU/RPP, a main breaker, circuit branch breakers and subfeed breakers can be added. In order to add or delete a breaker panel, circuit branch breaker or subfeed breaker, you must be in the floor PDU/RPP Elevation View. When adding or deleting a circuit branch breaker, you must also have a panelboard open.

General View of a Floor PDU With Panelboards and Devices



Panelboard Configuration

Item	Name	Description
1	Graphical View icon	Accesses Graphical View
2	Properties pop-up window	Used to define the device properties
3	Device Elevation View in a 2D Graphical View pane	Displays containers and components such as the floor PDU; components are dragged here from the Manufacturer's list
4	Properties accordion	Displays the assigned properties of the selected device
5	Device Status	Lists the contained panelboards and subfeed breakers (if applicable)
6	Containers and devices	Lists the floor PDU and its components

From the Catalog accordion in the left side bar, you can search for a panelboard, circuit branch breaker or subfeed in the Manufacturer's list to add them to the PDU/RPP. Each selection displays a pop-up window with the following applicable fields and selections to configure the device.

Panelboard/Circuit Branch Breaker/Subfeed Configuration Fields

Name	Fields	Description
Panelboard (Breaker Panel)	Name	Unique name given to a device
	Panelboard Rating (Amp)	Maximum current the panelboard supports
	Number of Poles	Number of legs; corresponds to the number of electrical pulses
	Panel Configuration	Circuit arrangement on the panelboard; can be selected from a drop-down menu (top to bottom, left to right or a single column)
	Main Panelboard Breaker	Circuit breaker used in the panelboard
	Current Rating (Amp)	Rated value representing a device's current in Amps
	Overcurrent Protection Rating (%)	Overcurrent percentage over the rating that the panelboard can support
	Design Capacity (%)	Manufacturer's rated capacity for the device
Circuit Branch Breaker	Number of Poles	Number of legs; corresponds to the number of electrical pulses
	Pole Position	Position of the breaker in the panelboard in relation to the corresponding electrical leg
	Name	Unique name given to a device
	Current Rating (Amp)	Rated value representing a device's current in Amps
	Overcurrent Protection Rating (%)	Percentage over the standard breaker rating at which it will trip
	Design Capacity (%)	Manufacturer's rated capacity for the device
Subfeed Breaker	Number of Poles	Number of legs; corresponds to the number of electrical pulses
	Neutral	The subfeed breaker configured to have a Neutral line
	Name	Unique name given to a device
	Current Rating (Amp)	Rated value representing a device's current in Amps
	Overcurrent Protection Rating (%)	Percentage over the standard breaker rating at which it will trip

Name	Fields	Description
	Design Capacity (%)	Manufacturer's rated capacity for the device
	Subfeed Breaker Input	Subfeed breaker input – input feed to the subfeed breaker

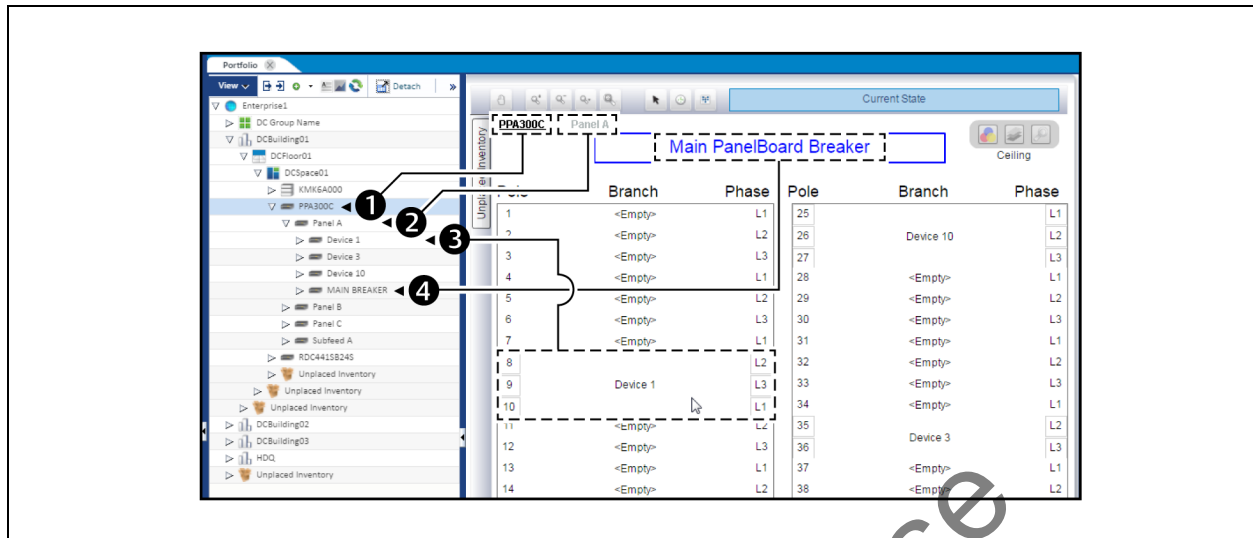
NOTE: If you need to modify any information after a panelboard component is configured, you must first delete it and then add it back on the panelboard within the Main Panelboard Breaker window.

To add a breaker panel in 2D Graphical View:

NOTE: A breaker panel can be connected to a floor PDU/RPP or a subfeed breaker when the breaker panel is added.

1. In Portfolio View, click a floor and space in the data center and double-click the PDU or RPP to open its Elevation View.
 2. In the search panel, click *Catalog - Advanced Search*, then click the Catalog drop-down arrow, select *Breaker Panel* and click *Search*.
 3. In the displayed list, select the breaker panel with the applicable number of poles and drag the model number to the symbol of the PDU/RPP.
 4. If applicable, click the *Find Capacity* button under the symbol to configure the capacity values for the device.
 5. In the Create Panelboard pop-up window, enter/select the information for the breaker panel and click *Save*.
 6. In the Device Status Panelboards list under the PDU symbol, click the created breaker panel to view its properties in the Properties pane.
- or-
- Double-click the created breaker panel to display the panel's configuration.

Breaker Panel Configuration



Breaker Panel Configuration Descriptions

Item	Name
1	Floor PDU
2	Panel
3	Device
4	Circuit Breaker

To delete a breaker panel:

Right-click the breaker panel, click to expand the list of options and select *Delete*.

NOTE: A displayed message states the selected panelboard includes contained devices and external connections will be deleted. This action cannot be undone.

To add a circuit branch breaker to a breaker panel:

- After the breaker panel is in place, click *Catalog - Advanced Search*.
- Click the Category drop-down arrow, select *Circuit Branch Breaker* and click *Search*.
- In the displayed list, select the breaker (with the applicable number of poles) and drag the model number to the appropriate panel.
-or-
Drag the model number to the symbol of the PDU/RPP.
- In the Enter Branch Breaker Properties pop-up window, enter/select the information for the breaker and click *Save*.
- If applicable, click the *Find Capacity* button under the symbol to configure the capacity values for the breaker.
- In the Device Status Panelboards area under the PDU symbol, click the breaker to view its properties in the Properties pane.

-or-

Double-click the created breaker to display the Main PanelBoard Breaker configuration.

To delete a circuit branch breaker:

Right-click the circuit branch breaker, click to expand the list of options and select *Delete*.

To add a subfeed breaker to a breaker panel:

NOTE: If the subfeed field is displayed on the pop-up window while creating the panelboard, it can be connected during configuration of the panelboard.

1. After the breaker panel is in place, click *Catalog - Advanced Search*.
2. Click the Category drop-down arrow, select *Subfeed Breaker* and click *Search*.
3. In the displayed list, select the breaker with the applicable number of poles and drag the model number to the appropriate panel.

-or-

Drag the model number to the symbol of the PDU/RPP.

4. In the Enter Subfeed Breaker Properties pop-up window, enter/select the information for the subfeed and click *Save*.
5. If applicable, click the *Find Capacity* button under the symbol to configure the capacity values for the subfeed.
6. In the Device Status Panelboards area under the PDU symbol, click the created subfeed to view its properties in the Properties pane.

-or-

Double-click the created subfeed to display the Main PanelBoard Breaker configuration.

To delete a subfeed breaker:

Right-click the subfeed breaker, click to expand the list of options and select *Delete*.

Working with Data Connections


Data connections can be simulated in the platform software. Both power and data connections can be either basic or specific at each end. When viewing connections in Portfolio View, a basic data connection is labeled as Unknown Data.

Assigning data connection properties

Data connection properties can be assigned or edited in portfolio, graphical and elevation views. If the properties are changed, the data connections are updated and the new information is displayed.

NOTE: Planned data connections can be viewed from the connection properties panel as well.

Data Connection Properties

Properties	
Property	Value
Owner	<input type="text"/>
Name	<input type="text"/>
Maintenance Date	<input type="text"/> 
Connection Type	Data
Cable ID	<input type="text"/>
Cable Type	<input type="text"/>
To	
Property	Value
Connected to (Device Name)	S3500 MAS, S3500 MAS V2
Connected to Port	USB 4
From	
Property	Value
Connected from (Device Name)	XSERVE, MEZGFX 230V
Connected from Port	USB 3
User Defined Properties	
Hide Blank Properties	
Property	Value
dataconnection	<input type="text" value="dcc"/>
xserver_zone	<input type="text" value="Connected"/>
<ul style="list-style-type: none"> > Placement > Ports > Capacities > Connections > Layers > Monitoring Configuration 	

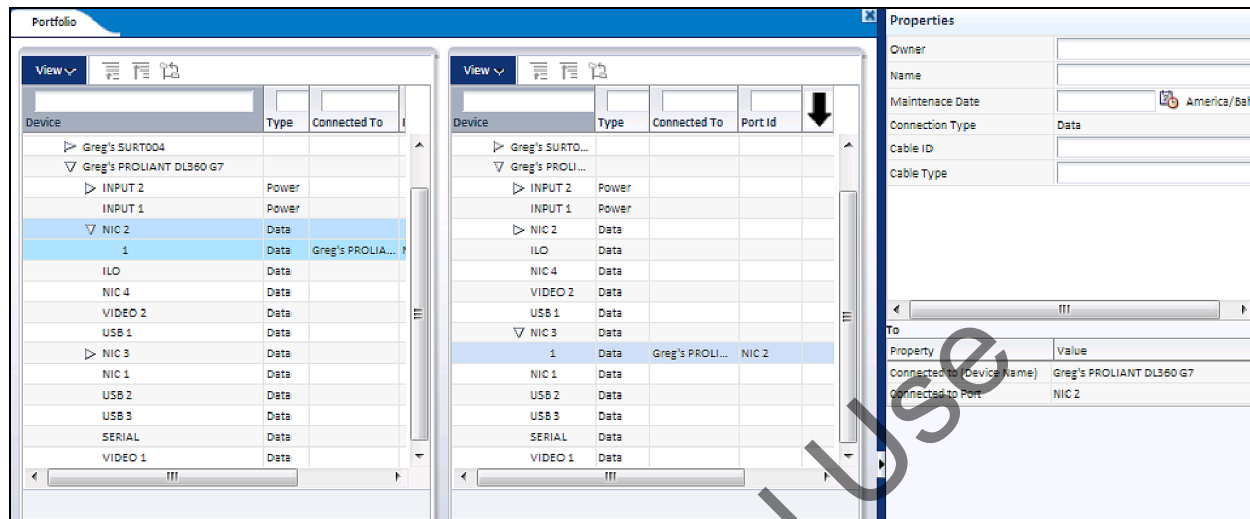
The available attributes for data connections are:

- Owner
- Name
- Maintenance Date
- Connection Type
- Cable ID
- Cable Type
- To Property and Value
 - Connected to (Device Name)
 - Connected to Port
- From Property and Value
 - Connected from (Device Name)
 - Connected from Port
- User Defined Properties

Configuring data connections in Portfolio View

In Portfolio view, you can connect data ports and view the properties of each port. In the Ports accordion, you can view the connected ports, their type and number of connections.

Data Connections in the Classic UI, Portfolio View



NOTE: Planning data connections are not available in Portfolio View.

To connect data ports:

1. Expand the building, floor and space nodes.
2. Right-click the port of the device in the left column and select *Show Connections*.
3. In the connections view, expand the space node on the left column, expand the device in the right column and select the port that needs to be connected.

NOTE: If using a basic connection on the device, select the actual device.

4. In the right column, expand the space and device to select a port that needs to be connected.
5. Click *Connect* and on the message, click *OK*.
6. Click *Back* to return to Portfolio View.

To view properties of data connected between two ports:

1. Expand the building, floor, space and device nodes.
2. Right-click the port of the device in the left column and select *Show Connections*.
3. Select the port with the power connection and expand the *Properties* accordion to display the devices and ports on each end of the connection, as well as the connections to and from the devices and ports.

Data connections in the Beta UI

In the Beta UI, instead of expanding the enterprise levels, you can search for devices to create connections. You can also specify the lowest level to view the possible connections. When you select a device, the possible connections for the opposite end are displayed in a second panel. Then you can click to select the device connector on the opposite end. An icon is displayed to indicate multiple connections.

In the Beta UI, you can also use the following filters to minimize the list of connectors: Power Openings, Data Openings, Locked Openings or Connected Openings.

To create a connection:

1. In the window, click *Search* and enter the device name.
2. In the list of connections, click the first connector.
3. In the right panel, click the connection for the opposite end.

To remove a connection:

Click the connection and select *Accept* in the pop-up window.

Configuring data connections in 2D Graphical View

In 2D Graphical View, data connections are displayed as a line from the selected device to the device in the connected devices box. Planning data connections are available in 2D Graphical View.

To connect data ports:

1. With the floor displayed, right-click the device and select *Show Connections - Show Data Connections*.
2. Expand the *Inventory* accordion, search for the next device to be connected and drag and drop the image of the new device to the connected devices box.

NOTE: To access the outlets, click the middle button under the image to flip to the rear side of the device. The data connection shows the main device and the devices connected to it. The power connection shows the up stream and down stream connections.

3. Click the port in the left box, drag the line to the port of the applicable device and release the mouse to create the connection.
4. On the Success dialog box, click *OK*.

NOTE: The connection background is highlighted and a delete icon is in the top, right corner. The background changes to gray when a connection is made or disappears when the delete icon is selected. If no connection is made and you move the cursor away from the image, the device disappears.

To view properties of data connected between two ports:

1. Expand the building, floor, space, and device nodes.
2. Right-click on the device and select *Show Connections*.
3. Select the port with the data connection and expand the *Properties* accordion to display a list of all the device and port information on each connection, as well as the connections to and from the devices and ports.

To plan for a connection in planning mode:

1. Select a project from the *Planning* accordion.
2. Right click on the device and select *Show Connections - Show Data Connections*.
3. Expand the *Inventory* accordion, search for the next device to be connected and drag the image of the new device to the connected devices box.

4. Click the port in the left box, drag the line to the port of the applicable device and release the mouse to create the connection.
5. On the Success dialog box, click *OK*.
6. When the connection task project is complete, the connection is shown in 2D Graphical View.

Deleting a data connection

To delete a connection:

1. Expand the building, Floor, space and device nodes.
2. Right-click on the device and select *Show Connections*.
3. Select the port with the data connection.
4. Click *Delete*.

Working With Colorization

The colorization feature allows you to quickly identify devices and where space or capacities exist in your environment. After configuration, colors indicate the percentage of availability or consumption for devices on an opened floor. Capacities based on thresholds of devices can also be configured for devices on an opened floor. Colorization is applied and displayed for only the racks you are authorized to view, activate or deactivate.

NOTE: Use 2D Graphical View to view and access the colorizations accordion.

Racks are colorized in a spectrum of green (empty) through red (full). When you select a colorization and choose a new option, the color clears and new parameters are displayed. If you change a parameter in the current colorization, the color is updated based on the parameters. The following are consumption and capacity instances that can be identified using colorization:

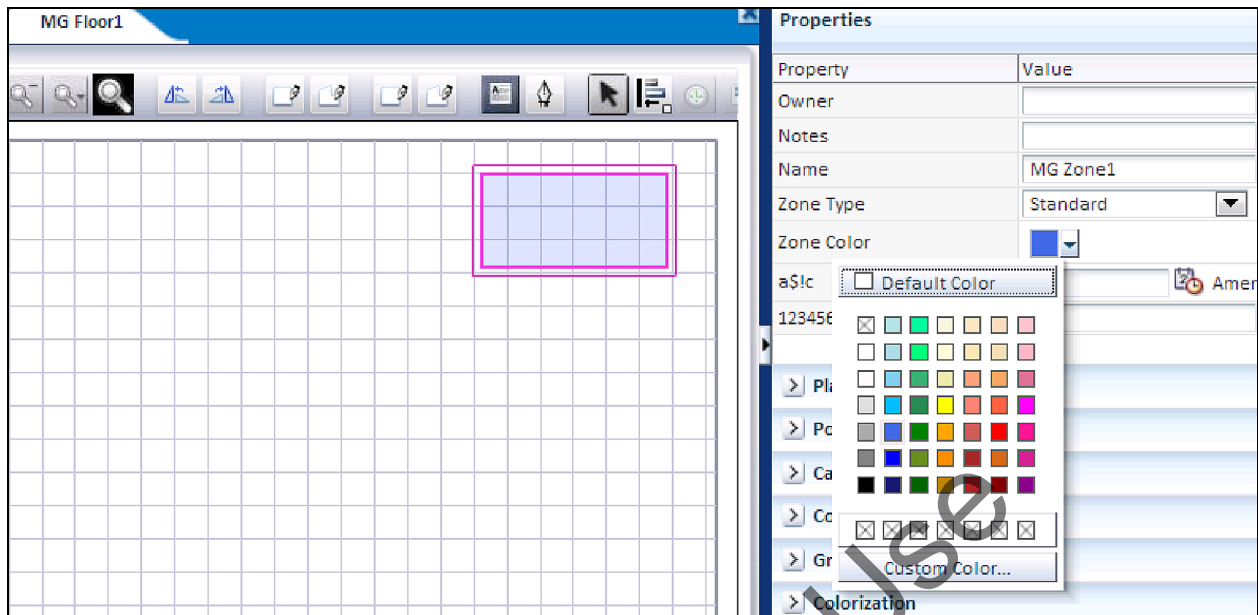
- Zones
- Available rack space
- Rack space consumed
- Reserved rack space
- Rack power remaining
- Critical Infrastructure Equipment (CIE)
- Consumed blade slots
- Environmental conditions

The user-defined colorization feature allows custom colorization configurations using the AND/OR logical operators, see [Creating and deleting user-defined colorization](#) on page 124.

Zone colorization

Zone colorization is used to designate high-density zones, networking areas, storage areas, pending projects, or in the case of collocated facilities, to differentiate between customer spaces.

Zone Colorization



To add color to a zone:

1. In 2D Graphical View, use the *Select Mode* tool to highlight the zone.
2. From the properties panel, expand the *Properties* accordion and click the *Zone Color* field to view the color palette.
3. Select a color or create a custom color and verify the zone changes to the selected color.

Available rack space

Racks that are located in a space (top-down view only) can be colorized to show the percentage of rack space that is available for placing a device. One colorization can be enabled at a time and colorization is applied and displayed for only the racks you are authorized to view.

The number of rack units for rack space available is calculated against the rack space threshold, if available. Otherwise, it is based on the maximum rack space capacity. The resulting values are applied to the front and the back of the rack. This means if you set the rack space threshold to a single value of 70%, the front capacity is set to 70% and the rear capacity is set to 70%. The colorization persists until deactivated by the user.

To colorize available space in a rack:

1. In 2D Graphical View with the floor displayed, expand the *Colorization* accordion and select *Available Rack Space*.
2. In the next drop-down list, select the *Front* or *Rear* view to verify the percentage of available rack space in the *Colorization* accordion.

Rack space consumed

Devices and racks that are located in a space can be colorized to show the percentage of space consumed by a device type, including the devices inside racks. A range of colors are used from green representing a low percentage to red representing a high percentage of consumption.

The percent of rack space consumed is calculated against the rack space threshold, if available. Otherwise, it is based on the maximum rack space capacity. This is limited to space within a rack and is placed in an RU. The colorization is persistent across sessions and different plans. When a new colorization is selected from the colorization drop-down list, the previous colorization is cleared and new parameters are displayed.

NOTE: If the racks on the floor are empty, then the device list will be empty as well. The device list populates as racks get populated with devices such as servers and blade chassis.

To view the rack space consumed:

1. In 2D Graphical View with the floor displayed, expand the *Colorization* accordion and select *Rack Space Consumed*.
2. Select the device type to view the rack space capacity consumed.

Reserved rack space

Space can be reserved in a rack for future placement of devices. This selection colors the devices and racks in a space to indicate the percentage of space consumed by reserved placeholders.

The racks having reserved space are highlighted in blue and the remaining racks are displayed with the default background color white.

To colorize reserved rack space:

1. In 2D Graphical View with the floor displayed, expand the *Colorization* accordion.
2. With read access privileges, expand the first drop-down list and select *Reserved Rack Space* to view any reserved space in all the racks.

Rack power remaining

This function uses colors to show the percentage of available rack power capacity for all power consuming devices associated to a rack. This information is useful when searching for a place for a power consuming device.

Results come from designed data or rated data. A range of colors from green at 100% remaining power capacity to red at 0% remaining power capacity is available. The colors are based on total kilowatts (kW) consumed. The consumed power is the sum of the designed power for all power consuming devices associated with the rack. If the device is associated to the rack, but not placed, it shows the consumption of power.

To display rack power remaining:

1. In 2D Graphical View with the floor displayed, expand the *Colorization* accordion.
2. With read access privileges, expand the drop-down list, select *Rack Power Remaining*.
3. Select *Designed Data* or *Rated Data* and verify the colorization for power remaining.

Critical infrastructure equipment

One color can be used to indicate all devices on a floor that are considered critical and racks containing critical infrastructure devices. The Critical Infrastructure flag is configured for the devices at the symbol level itself and cannot be accessed via the *Trellis*™ platform software.

The racks containing critical infrastructure and critical devices on the floor are highlighted in blue.

To colorize critical infrastructure equipment:

1. In 2D Graphical View with the floor displayed, expand the *Colorization* accordion.
2. From the drop-down list, select *Critical Infrastructure Equipment*.

Consumed blade slots

The racks containing blade chassis have blade slots. The racks containing blade chassis are highlighted in blue. The remaining are displayed with the default background color (white).

When this option is selected in the Colorization accordion, the racks are highlighted based on the consumption of blade slots in that rack. The colorization is dark green for 0% usage of the blade slots followed by various shades and ending with dark red to indicate 100% usage of the blade slots.

To colorize consumed blade slots:

1. In 2D Graphical View with the floor displayed, expand the *Colorization* accordion.
2. From the drop-down list, select *Consumed Blade Slots*.

Environmental conditions

With the *Trellis*™ Site Manager module, certain environmental conditions can be monitored using sensors. After values are configured for temperature or humidity conditions, colorization is used to represent High Critical, High Warning, Low Warning and Low Critical results. Results are indicated by rectangles at the RU location of the corresponding sensor. For sensors placed in the left and right RU, rectangles are displayed beside the corresponding RU position.

If both temperature and humidity environmental conditions are selected, whichever has the highest priority is displayed. In Elevation View, each sensor type in a rack can be configured.

To colorize environmental conditions:

1. In 2D Graphical View with the floor displayed, expand the *Colorizations* accordion.
2. On the drop-down list, select *Environmental Conditions* and enable or disable the applicable checkboxes.
3. Double-click a rack to see its Elevation View, then navigate back to the 2D Graphical View of the floor to verify the selected colorization.
4. In the Colorization accordion drop-down list, select *Select a Colorization* to remove all colorization.

NOTE: With no colorization selected in 2D Graphical View, the Elevation View also has no colorization. However, in Elevation View, you can select *Select a Colorization* from the drop-down list to add colorization. Adding colorization in Elevation View also adds colorization in 2D Graphical View. If you do not select another colorization when the Elevation View of the rack is displayed, the same colorization is available when you return to the floor in 2D Graphical View.

Creating and deleting user-defined colorization

One or more expressions can be added to each user-defined colorization to further define them. Expressions can be created to use colors to signify various attributes, including the following:

- Name
- Owner
- Model
- Manufacturer
- Model Qualifier
- Category
- Product Line

When using multiple expressions, you can use the And/Or operators to determine whether the items meet both or either expression.

To create or modify user-defined colorization:

1. In 2D Graphical View, expand the *Colorization* accordion.
2. From the drop-down list, click *Select User Defined Colorization*, then click the *Configure* button.
3. On the opened User-Defined Colorization flyout, click the plus (+) icon to create a new definition.
4. Enter or modify the name for the user-defined colorization and in the Color column, click the *Color* button.
5. To select a color, enter the hex code for a color in the *Choose a color* box and click *OK*.
-or-
Click *Custom Color* and enter the hex code for the color, then enter the RGB value or click a color in the color spectrum box.
6. Click *OK*, click the *Define Expression* link and in the Attribute column, select the property to define the color.
7. In the Value column, enter the property value.
8. Click *Save*.
-or-
Right-click the expression and select *Insert After* or *Insert Before* to define the expression.
9. In the Grouping drop-down list, select *And* to colorize items with both attributes.
-or-
Click *Or* to colorize items with either attribute.
10. When you finish adding expressions, click *Save - Close*.

The user-defined colorization is displayed in the Select User Defined Colorization drop-down list in the Colorization accordion.

To view and apply a user-defined colorization:

1. In 2D Graphical View, click the *Colorization* icon.
2. From the drop-down list, click *Select User Defined Colorization*.
3. Select the user-defined colorization to be applied.

To delete a user-defined colorization configuration:

1. In 2D Graphical View, click the *Colorization* icon.
2. From the drop-down list, click *Select User Defined Colorization*, then click the *Configure* button.

3. In the Color column, right-click the *Color palette* button and select *Delete*.
4. Click *Save-Close* to save your changes and close the flyout.

Working With Catalog Symbols and Element Libraries

A symbol package provides inventory and monitoring related meta data that is used for creating various device instances in the *Trellis*™ platform software. If the device is going to be monitored, the symbol package must provide monitoring-related information such as an element library for that symbol. A typical symbol package for monitored devices contains the following elements:

- Device images (.png format) for the front and rear view of the device
- Resource bundle files for localization
- Symbols collection .xml file with the device inventory related meta-data
- Factory element library with the tar.gz extension that contains shared libraries and meta-data
- Zero or more custom element libraries, depending on whether the symbol is downloaded from a portal or customized
- *Trellis*™ Global Data Dictionary (TGDD) as the source of truth for all the ENUMs, data point definitions, event definitions and so on
- Master data file to store the CDM seed data

The Catalog Symbols screen displays the current items and devices in your inventory that have symbols. Symbol libraries can be replaced, removed, requested, uploaded and distributed and the history of symbols can be uploaded with the name, version and date of the upload.

Symbols can be filtered by the following columns or by entering filter criteria in the text box above each column:

- Manufacturer
- Model Qualifier
- Model
- Version Major
- Version Minor
- Date Installed
- Monitored

To learn about element libraries in the symbol package, [Understanding Element Libraries](#) on page 173.

Locating and replacing symbols

Device symbols can be replaced and will retain the name, owner, notes, data and power connections and other device properties of the original device.

The same device can be updated or replaced with a different model or brand, however, if you attempt to replace a symbol with a symbol from a different device category, or one that does not fit in the space, you will receive a conflict message.

To locate a symbol in the catalog:

1. Expand the *Catalog* accordion to display a list of symbols by manufacturer.

2. Expand the manufacturer name to display the associated devices and highlight a symbol in the list to display it along with its height, width and depth.
3. Drag the symbol image to a space to add it to your inventory.

To replace a symbol:

1. Open the view of the device with the symbol you want to replace.
2. Expand the *Catalog Search* accordion, search for the new device, right-click the device to be replaced and select *Replace Symbol*.
3. In the search results, drag the new symbol into the flyout area and click *Save*.
4. After the confirmation opens, right-click the new symbol and select *Show Connections – Show Power Connections* to ensure all connections are maintained.

To replace symbol functionality:

1. In Portfolio, Graphical or Elevation View, select and right-click the existing device and click *Replace Symbol*.
2. Expand the *Catalog* accordion, select the replacement symbol (belonging to the same category as the symbol being replaced).
3. Drag the symbol to the *Replace symbol* window and click *Save*.

NOTE: To replace symbol functionality, the programmatic names of ports and the symbol extension properties must match.

Submitting a new symbol request

If you cannot find a symbol, you can submit a request for a new symbol.

After you submit a symbol request, it is reviewed and if approved, a researcher identifies the best rendering of the requested symbol and Drawing Services produces the new symbol. After Quality Assurance ensures that the symbol meets requirements, the symbol is uploaded for access.

The timeframe from a customer request to availability is about four to five weeks. When the new symbol file is uploaded, information pertaining to the symbol is updated and a notification is sent to you.

NOTE: A bulk request can be submitted for a large number of devices such as for 1000 devices.

To submit a symbol request:

1. Go to <http://symbolsorder.emerson.com>
-or-
From the Catalog Symbols screen, click the *Symbol* web site button (using Internet Explorer).
2. Enter your login credentials, press **Enter** and click *Request Symbols*.
3. Scroll down the page, click *Select Existing Symbols* to search the catalog and enter or select criteria to find the symbol.

NOTE: To increase the number of search results, provide the least amount of information that covers the range into which the symbol fits.

4. Click *Locate* and on the List of Symbols, verify the search results do not contain the symbol.
 5. Click *Add* and on the New Symbol Detail box, enter the full manufacturer name in the Manufacturer box (without abbreviations).
-

NOTE: To search for a manufacturer, click the *Locate Manufacturer* button.

6. Enter the model number in the Model Number box. Do not enter the name of a product line, series or family.
 7. Select an available symbol type from the drop-down list. If the device type is not listed, select *Other* and specify the device type in the Comments field.
 8. In the Monitoring field, select *Yes* or *No* to signify if the device requires an element library.
 9. Select the appropriate mounting type from the drop-down list (rack-mounted or floor-mounted devices).
 10. In the Comments field, enter any additional information regarding the device that would be helpful when creating the symbol. If you selected *Other* in the Symbol Type field, include the device type in your comments.
-

NOTE: All other fields are not required but are helpful if you have the information to provide to the Symbols Team.

11. In the Upload a File field, click *Browse* to attach manuals, specifications, pictures or any other documentation you may have available to create the symbol.
 12. Click *Create* on top of the page and on the main request form, click *Submit Request* to process the request.
-

NOTE: You will receive an email notification when a new library has been published that contains the new symbol.

Upgrading a symbol in the catalog

After a new version of a symbol is available in the symbol catalog, you can select a device instance that uses the older version of the symbol and request a symbol update for that device instance. The device instance selected may be from Portfolio or 2D Graphical View.

For example, if you have a device instance on a floor using the current symbol version of a HP DL380 and an upgraded version of the symbol is downloaded and installed into the catalog, you can right-click the device instance on the floor and select the *Upgrade Symbol Version* option.

After selected, you can browse all available symbol upgrade candidates in the symbols library.

If a symbol is upgraded, all of the following actions occur:

- Data attributes associated with the device instance are retained (device name, derated values).
- All user-defined attributes associated with the device are retained.
- New attributes are added if they are required and not optional for any device instance.
- Data points in TSD are updated if they are required (bug fixes, reference changes).
- Required database changes to support the upgraded version are updated and history is retained.

Uploading and removing device symbols

The following are required before upgrading a device symbol:

- Activation of a current support agreement
- Implementation of the *Trellis*™ platform software
- Accessibility to the symbols web site
- Installation of the most current symbols library in your existing local library
- Placement of existing symbols on a floor

After the symbol is ready, you will be notified by email with a link to the latest library; after which you can upload the symbol package and add the symbol to your catalog.

To upload a symbol:

1. From the Administration menu, under Licensing, select *Catalog Symbols* and click *Upload Symbol*.
2. Click *Browse* to locate the file path, select the symbol package and click *Open*.
3. Click *OK* to import the symbol and click *OK* again.
4. After the message confirms the symbols are installed successfully, click *OK* to close the dialog.

To remove symbol history:

1. From the Administration menu, under Licensing, select *Catalog Symbols* and click *Upload History*.
2. Under Upload History, select the symbol and click *Remove* on the right.
3. On the confirmation screen, click *OK*.

To remove a catalog symbol:

1. From the Administration menu, under Licensing, select *Catalog Symbols*.
2. Select the device, click *Remove*, and on the confirmation screen, click *OK*.

BMS Integration, Symbol and Element Libraries

The device monitoring feature of the *Trellis*™ platform has been enhanced to support all monitored devices, including monitored devices of the Building Management System (BMS) module. This module uses custom element libraries and element library (EL) synchronization to update the monitoring configurations of devices. The BMS module, included with the symbol library, provides the ability to create custom element libraries so that a common device instance or a BMS device can be used for different sets of data points. This feature is applicable for all the monitored devices in your enterprise.

If you are interested in BMS functionality, Professional Services is available to perform the configuration and activation. After the initial configuration, you will have the ability to view, create, monitor and update devices using custom device symbols. You can also import an existing symbol library, customize an element library inside it and export it back as a new symbol with the same symbol version. Each item in the element library must be altered using the custom element library tool. The exported symbol .zip file can be uploaded to the *Trellis*™ platform software via existing symbol upload functionality.

Creating a custom symbol library using BMS integration

To create a BMS instance:

1. In Portfolio View, expand the building node to place the device, click *Catalog* and locate the device symbol.
2. Select and drag the symbol to the list to create a device instance and open the *Properties* accordion to view the attributes.

To view symbol properties:

1. In Portfolio View, expand the *Catalog Search* accordion, and in the Category drop-down menu, select *Building Management System* and click *Search*.
2. Under the Search button, verify the manufacturer, model and category for the device.
3. From the *Catalog* accordion, open the *Building Management System* folder, select the device and view the properties on the *Properties* accordion.

Synchronizing global data files

Global data for a device must be synchronized between the *Trellis*™ platform software and the data collection engine that monitors the device. This synchronization ensures the TGDD and master data used by the device are supported by the engine. This functionality can be either triggered on an ad-hoc basis or can be scheduled using the Scheduler.

To synchronize global data files (Master Data and TGDD) with the appliance:

1. From the Administration menu, under System Configuration, click *Data Collection Engine*.
2. On the opened window, select the data collection engine and click *Details* to go to the administration window for the appliance.
3. Click *Global Data File Synchronization* to verify the currently installed and synchronized files and select the file to be synchronized.
4. Under Schedule Global Data files Synchronization, click *Synchronize Now*.
-or-
Click *Schedule Synchronization*.
5. Click the task to open the calendar and in the *Properties* accordion, select the task to confirm that the file is synchronized with the appliance.

Monitoring a primary or secondary device

Minor differences exist in the displayed information of a monitored primary device and a monitored secondary device. For a primary device, the device name is displayed. For a secondary device, the device name of the primary device (whose IP address is used for monitoring) is displayed.

Before configuring a device for monitoring, an element library must be selected. The list of available libraries includes the factory-provided element library and all the custom element libraries for that symbol version.

The following are additional requirements before any device can be monitored:

- For a secondary device, ensure its associated primary device is already monitored (IP address is already present in system).
- For a primary device, the IP address is not used.

- The element library for the device must be pushed to the appliance that is listening to the IP address of the device.
- The most current TGDD data and master data, if available, must be pushed to the appliance that is listening to the IP address of the device (using Global Data Synchronization).

Selecting the Element Library

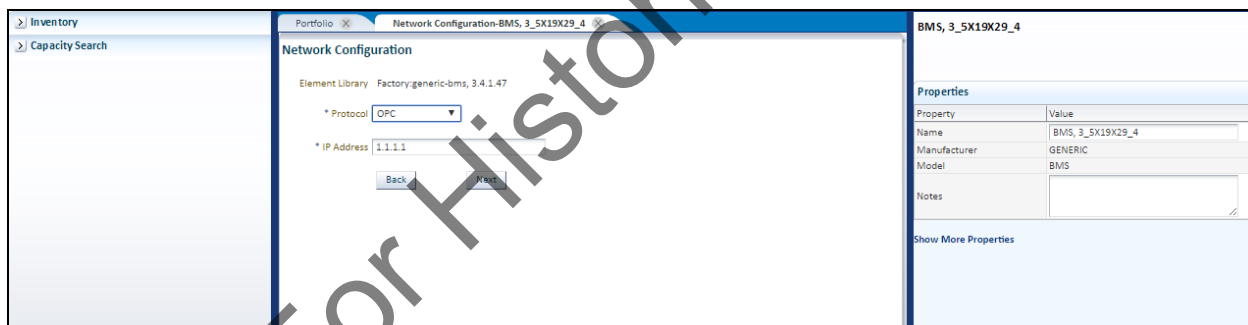


All the custom element libraries have the same symbol version as that of the factory-provided element library, however, they have different element library versions.

To select the element library:

1. Click *Select Element Library*, select the protocol and IP address and click *Next*.
2. Update any monitoring communication parameters and click *Connect* to start monitoring.

Providing the Protocol and IP Address



To monitor a primary or secondary device:

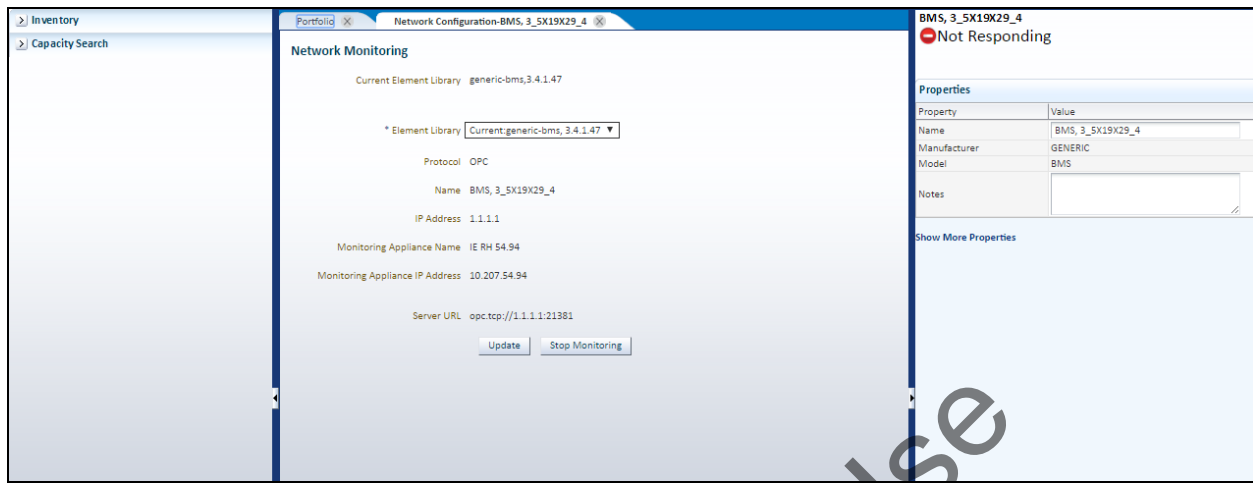
1. In Portfolio View, select the device and click *Network Configuration*.
2. From the drop-down menus, select the element library and protocol and click *Next*.
3. Select the protocol, select the IP Address and click *Next* again.
4. Enter the URL for the server, click *Connect* and on the confirmation message, click *OK* to go back to Portfolio View.
5. From the Quick Launch menu, click *Event Viewer* and in the Event Viewer Log, verify the device has been added to the list of devices being monitored.

Updating the element library for a primary or secondary device

The main functionality of BMS integration is being able to quickly make changes for data points to be monitored. For an existing monitored device, specific communication-related parameters can be modified. An element library can also be re-selected, such as by changing the IP address (for primary devices) and protocol values. After this, you can reconnect the device and begin monitoring again.

NOTE: IP addresses can only be changed for primary devices.

Update Monitoring



To update the element library for a primary or secondary device:

1. In Portfolio View, in the inventory list, navigate to and click the BMS device folder.
2. Select *View-Show at Top*, click the BMS folder and click the device.
3. In the *Properties* accordion, verify the device is currently monitored.
4. In the inventory list, click the device and select *Network Configuration*.
5. Under Network Monitoring, change the library to *Custom* and click *Update* to change any additional parameters such as the IP Address username and password.

NOTE: The IP address can only be changed for a primary device. The type of device can be verified by the label of the device field. A primary device is indicated by the word Name. A secondary device is indicated by the word Controller Name.

6. After all the changes are complete, click *Reconnect* and on the confirmation message, click *OK* to return to Portfolio View.
7. From the Quick Launch menu, click *Event Viewer* and verify the monitored configuration has been updated for the device.

NOTE: Manually push the element library to the appliance before using that particular element library (custom or factory) for monitoring.

Importing Data

Data import is performed using the Bulk Data Processing tool. For more about bulk data processing, see [Data Management](#) on page 257.

Importing a floor

Restoring a floor allows you to import a file containing a single floor with all of its associated devices, attributes, connections, backdrops and any other associated containment. A copy of a floor can also be

imported back into the application as a new floor.

NOTE: Delete any duplicated floors prior to the import.

To import a floor:

1. From the File menu, click *Import-Floor(ZIP)* and select the building from the drop-down menu.
2. Click *Choose File* and locate the floor.zip file to import.
3. Click *Continue* to load the floor and follow the on-screen instructions.

Validating imported devices

Validating imported devices allows you to validate and commit an imported list or partial list of devices. The import mechanism provides validation in the form of a "sneak peek" of the data to be imported to ensure it appears correctly after import.

To validate an imported device:

1. Select up to 50 records and click the *Validate* button.

NOTE: To select a group, click the first imported item in the list, scroll down, press and hold **Shift** to select the last record in the group and with the group of records selected, verify the number of selected rows at the bottom-left of the screen.

2. Click the *Validation Type* drop-down menu and select one of the following options:
 - All - Validates all imported data fields against the *Trellis*™ platform data loading field requirements
 - Data Type - Ensures the device can be committed to the selected location and validates the placement fields for information consistency
 - Symbol - Checks the manufacturer, model and model qualifier of the imported data against the *Trellis*™ platform instance symbol catalog

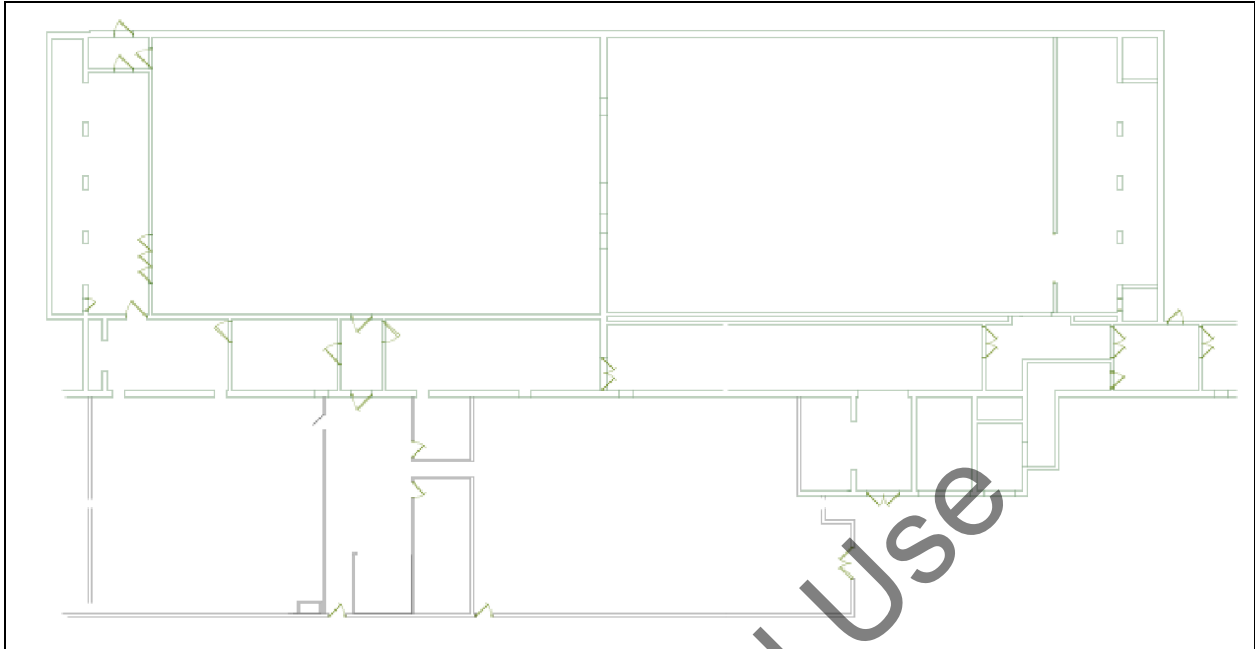
Importing an AutoCAD Floor Plan to Use as a Background

If you already have an existing floor plan created in AutoCAD, you can convert it to an .svg file and import it into the *Trellis*™ platform to use as a background. In 2D Graphical View, the floor plan becomes your background and can be exported to any floor. This allows you to map your floor plan by drawing shapes to represent spaces and zones.

Importing a floor plan involves the following procedures:

- Loading, cleaning and converting a floor plan
- Scaling the .svg file and editing the final file dimensions
- Importing the .svg file as a background

Example of a Floor Plan Used as a Background



Software tool requirements for image conversion

To convert a floor plan to an .svg file, you must have software tools that allow you to load, edit and manipulate the current floor plan format as well as convert it to an .svg file. The following example software tools can be used in this process:

- TurboCAD® Deluxe is a commercial 2D/3D Computer Aided Drafting (CAD) program. It can load a variety of formats, including AutoCAD formats such as .dwg, .dxf and .dgn. After a CAD drawing is loaded, it can be manipulated to display only required elements. After the drawing is cleaned up, TurboCAD can save the CAD image in the .svg format for importing into the *Trellis*™ platform.
- Inkscape is an open source product that can be downloaded from the Internet. It allows manipulation of .svg images. This tool is used to modify the dimensions of the .svg image to match the architectural dimensions of the actual drawing. It establishes a uniform scale for the image that can be read by the *Trellis*™ platform.
- Wordpad .svg files are XML documents. Manual changes should be made as a result of the Inkscape modifications. Wordpad or any other suitable text editor can be used to make these changes.

Loading, cleaning and converting a floor plan

Basic clean up may be required before an existing floor plan can be converted to the .svg format. After loading the CAD file into TurboCAD, you can clean the drawing, designate the architectural dimensions of the final rendering and save it as an .svg file.

NOTE: Any commercial 2D/3D CAD program can be used, however, this procedure uses TurboCAD.

To load, clean and convert the floor plan to an .svg file:

1. Load the drawing and select the levels.
2. Select the graphics for the final drawing, move them across levels and change their colors.

3. Add text and delete any levels or graphics as needed.

NOTE: In TurboCAD there is a level manipulation tool that can facilitate this process and also select individual drawing items to see the respective levels to which they belong.

4. After the clean up, select all elements in the drawing to verify the architectural size of the drawing. After the floor plan is cleaned up and the dimensions are determined, click the *Save As* feature in the CAD program to save the floor plan in the .svg file format.

NOTE: TurboCAD shows the height and width of the selected items measured in inches. If the drawing was created using a different unit of measure, convert it to inches to get the proper dimensions for scaling.

NOTE: Record the height and width dimensions to use later when scaling the .svg file.

Scaling the .svg file and editing the final file dimensions

The file conversion is complete and now the .svg file is an XML file that requires scaling and editing to match the architectural dimensions noted during the cleaning process.

When using a scaling program such as Inkscape, the height and width parameter values are automatically set to 100% when the file is saved, and after scaling the file, an XML text editing program must be used to manually edit the height and width of the drawing to be ten times the architectural dimensions that you noted when cleaning your floor plan. This helps to ensure the dimensional scaling is accurate.

NOTE: The following procedures use Inkscape to normalize the .svg floor plan file to a common scaling factor and use WordPad to edit the .svg file dimensions, however, similar programs can be used.

To scale the .svg file:

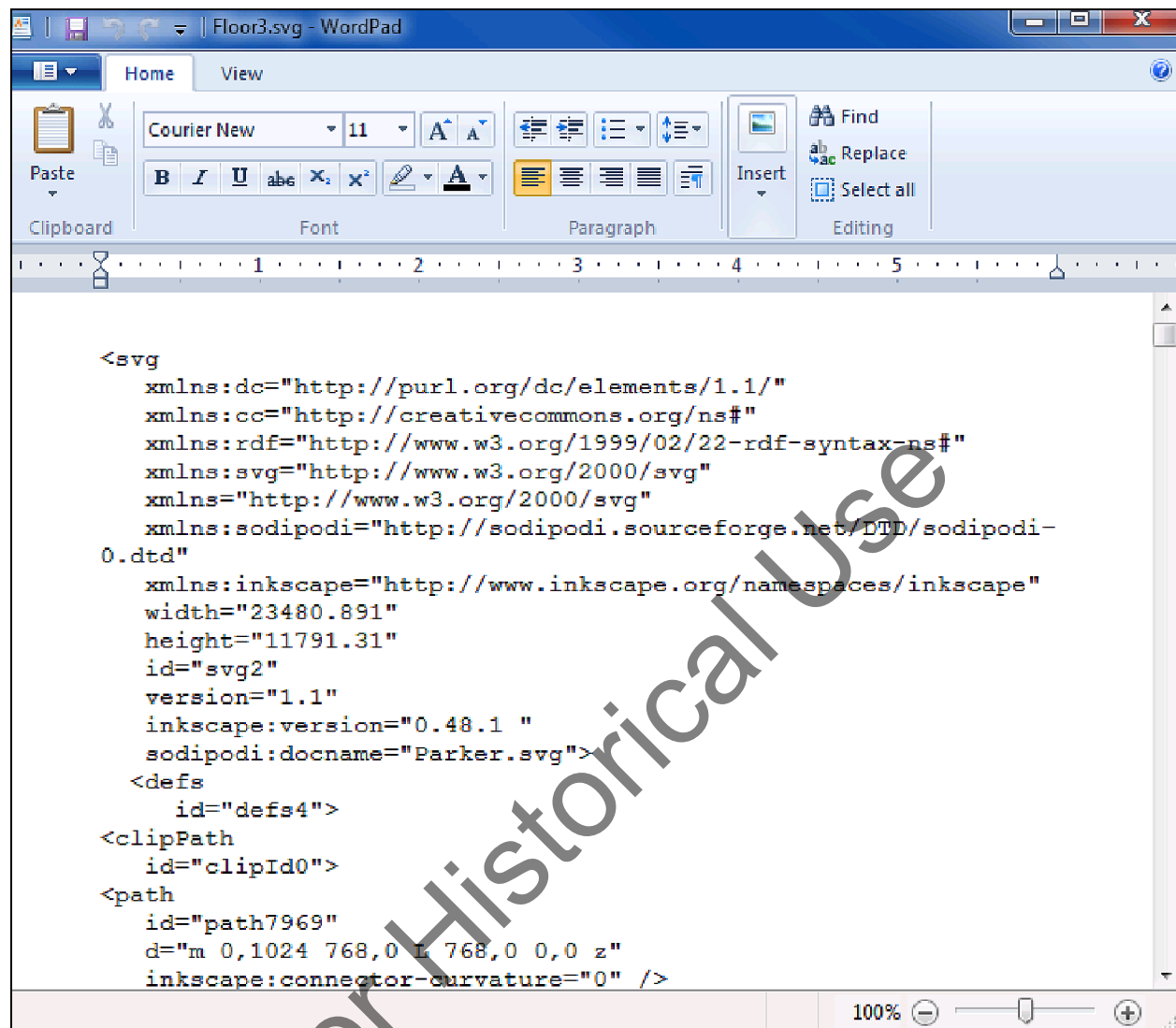
1. In a scaling program such as Inkscape, click *File - Open* and select the .svg file to be scaled.
2. Click *File - Document Properties* to open the Document Properties dialog box and locate the architectural dimensions recorded during the cleaning process.
3. Still in Inkscape under the Custom size option, adjust the height and width to be ten times the previously noted dimensions.
4. Click *Edit - Select All* to select all the vectors in the image and in the toolbar under the menu and verify the current dimensions of the selected vectors.
5. Verify the values are set to pixels (px), change the X, Y, W and H fields to zero (0) and click *Save*.

NOTE: Changing the fields causes the selected vectors to fill out the document to its edges. Occasionally, changing one property causes another to change, so ensure the values match exactly as listed.

To edit the .svg file dimensions:

1. In a text editing program such as WordPad, open the .svg file and in the XML code, locate the height and width parameters, shown as 23480.891 and 11791.31 in the following figure.
2. Change the height and width parameters to ten times the height and width that you identified when cleaning up your floor plan and save the .svg file to be imported directly into 2D Graphical View.

Example .svg File in WordPad



```

<svg
  xmlns:dc="http://purl.org/dc/elements/1.1/"
  xmlns:cc="http://creativecommons.org/ns#"
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:svg="http://www.w3.org/2000/svg"
  xmlns="http://www.w3.org/2000/svg"
  xmlns:sodipodi="http://sodipodi.sourceforge.net/DTD/sodipodi-
0.dtd"
  xmlns:inkscape="http://www.inkscape.org/namespaces/inkscape"
  width="23480.891"
  height="11791.31"
  id="svg2"
  version="1.1"
  inkscape:version="0.48.1 "
  sodipodi:docname="Parker.svg">
  <defs
    id="defs4">
  <clipPath
    id="clipId0">
  <path
    id="path7969"
    d="m 0,1024 768,0 L 768,0 0,0 z"
    inkscape:connector-curvature="0" />

```

Importing the .svg file as a background

When editing is complete, the floor plan can be imported into the *Trellis*™ platform.

To import the .svg file as a background:

1. From the File menu, click *Import - Background (.svg)*, select a building and a floor, click *Browse* to go to the .svg file and click *Open*.
2. Click *Load* and on the message, select to update the file.
3. In 2D Graphical View with the floor displayed, click the *Levels* icon, enable the *Background* and verify the background on the floor.

Drawing squares and polygons on the imported background

After importing a background image file of the floor, the 2D Graphical View toolbar can be used to draw spaces and zones to fit the image. You can draw rectangles or polygons for both spaces and zones.

The rectangle drawing tools allows you to create a defined space or zone within your background or within the console workspace. After you select the tool, you can draw an outline of the space.

The polygon drawing tool is used when the space or zone is not a square or rectangle. After you add a point, the *Trellis*™ Inventory Manager module creates the wall until you add the next point. After the space or zone is created, you can configure your tile system or grid.

Exporting Inventory

As a quick way to back up an environment or area within an environment, you can export the environment with all of its associated devices to a .csv or .zip file. If you need to create a duplicate of a floor or similar area, or reverse changes made to it, you can import the .CSV or .zip backup file.

WARNING: The *Trellis*™ platform does not support importing files from previous versions. To maintain an archive of legacy backups during an upgrade, import the backups into placeholder buildings and re-export them after the upgrade.

To export inventory:

1. In Portfolio View, click *Export* at the top of the workspace and select the .csv or .zip format.
2. On the displayed confirmation, click *Continue* and save the file to the desired location.

NOTE: UTF-8 encoding should be used to open CSV files generated using “Export -> CSV” functionality.

Exported Inventory

	A	B	C	F	G
1	NodeType	EnterpriseName	BuildingName	DataCenterName	DeviceName
68	DATACENTER	Enterprise1		AT-DC-1012240754-SUN-TFOCUS16	
69	DATACENTER	Enterprise1		AT-DC-1012240754-SUN-TFOCUS16	
70	DATACENTER	Enterprise1		AT-DC-1012240754-SUN-TFOCUS16	
71	DATACENTER	Enterprise1		AT-DC-1012240754-SUN-TFOCUS16	
72	DATACENTER	Enterprise1			
73	BUILDING	Enterprise1	EI_BUILDING		
74	BUILDING	Enterprise1	FalgunisBuilding		
75	BUILDING	Enterprise1	FPB		
76	BUILDING	Enterprise1	Fremont		
77	BUILDING	Enterprise1	JES-Bug16931Test		
78	BUILDING	Enterprise1	MSB103		
79	DATACENTER	Enterprise1		MSDC103	
80	BUILDING	Enterprise1	MYIMPORTBUILDING		
81	BUILDING	Enterprise1	NODC-CCAC		
82	DATACENTER	Enterprise1		PKRDC	
83	BUILDING	Enterprise1	Prashant		
84	BUILDING	Enterprise1	RBuilding		
85	BUILDING	Enterprise1	ReportsBuilding		
86	BUILDING	Enterprise1	SunBuilding		
87	BUILDING	Enterprise1	UDPBuilding		
88	BUILDING	Enterprise1	Z_SM		
89	ENTERPRISE UNPLACED	Enterprise1			Unplaced Inventory

Exporting a floor or a building from Portfolio View

To export a floor:

1. Expand the *Enterprise* and building nodes, then select a floor.

2. Click the *Export* tab and select *ZIP*.
3. On the confirmation screen, click *Continue* and save the file to the desired location.

To export a building:

1. Expand the *Enterprise* node and select the building.
2. Click the *Export* tab and select *CSV* or *ZIP*.
3. If you selected the CSV format, verify the building and data center information on the displayed spreadsheet.

-or-

If you selected the ZIP format, on the confirmation screen, click *Continue* and save the file to the desired location.

Exporting devices

A list of devices can be exported as a .csv file to be used as a reference point for the current configuration.

To export devices in Portfolio View to a spreadsheet:

1. In Portfolio View, expand the building or data center node to see its containers and devices.
2. In the Inventory details table in the workspace, click the *Export* tab to download a spreadsheet to your computer with the information for the selected data center or building.

The following figure illustrates an exported .csv file for the devices in a selected building.

Exported Devices Contained in a Building

	A	B	C	D	E	F	G	H	I	J	K
1	Name	Manufacturer	Model	Location	RU	Category	Monitoring State	Communication Status	Building	Floor	Space
2	APPLIANCE 2000	AVOCENT	APPLIANCE 2000	>sp		TRELIS_MANAGEMENT_APPLIANCE	enabled	responding	RBuilding	RFloor	sp
3	AP7541, 208V 30A 2PL 24R	APC	AP7541	>sp		RACK_PDU	not-applicable		RBuilding	RFloor	sp
4	AP7732, AP7732 V3	APC	AP7732	>UNPLACED		RACK_ATS	not-applicable		RBuilding		
5	E-501-L150, 84X25_88X12 45U	ADC	E-501-L150	>sp		RACK	not-applicable		RBuilding	RFloor	sp
6	SU044-1	APC	SU044-1	>sp		RACK_ATS	not-applicable		RBuilding	RFloor	sp
7	AP7732, AP7732 V3	APC	AP7732	>sp		RACK_ATS	not-applicable		RBuilding	RFloor	sp
8	VI-24-PTY	ADC	VI-24-PTY	>sp		PATCH_PANEL	not-applicable		RBuilding	RFloor	sp
9	MAIN BREAKER	GENERIC	MAIN BREAKER	Enterprise1->RBuilding->RFloor->sp->PPA075C225S2812-		MAIN_BREAKER	not-applicable		RBuilding	RFloor	sp
10	PULSAR STS 16	MGE	PULSAR STS 16	>sp		RACK_ATS	not-applicable		RBuilding	RFloor	sp
11	S3500 MAS	AVAYA	S3500 MAS	Enterprise1->RBuilding->RFloor->sp->LSC-1000	16.3	SERVER	not-applicable		RBuilding	RFloor	sp
12	PPA075C225S2812	LIEBERT	PPA075C225S2812	>sp		FLOOR_PDU	not-applicable		RBuilding	RFloor	sp
13	2poleBreaker	GENERIC	PANELBOARD	Enterprise1->RBuilding->RFloor->sp->PPA075C225S2812		BREAKER_PANEL	not-applicable		RBuilding	RFloor	sp
14	LSC-1000	ALCATEL LUCENT	LSC-1000	>sp		CABINET	not-applicable		RBuilding	RFloor	sp
15	POWEREDGE 1650, POWEREDGE 1650 V3	DELL	POWEREDGE 1650	>sp		SERVER	not-applicable		RBuilding	RFloor	sp

Understanding Change Planning

The Change Planning feature is used for implementing changes in the data center from planning and execution to auditing and reporting. Data center managers who use actual consumption and capacity values as a baseline, can confidently say a new asset will be supported in its new location. Therefore, impact can be determined before making a capital investment.

Change Planning Feature



The Change Planning feature provides the following benefits:

- Planning data center changes and managing relationships across projects
- Fully complying with auditing requirements using a detailed record of changes
- Previewing change impact before committing resources
- Auditing data center change history using a timeline
- Exporting projects to a spreadsheet or printing tasks to a .pdf file

Managing projects

A project consists of logically-connected tasks that represent future work. In the Properties accordion, you can view and highlight project information, then view additional details in the Projects tab. The properties panel allows you to update specific project information including the project name, owner information, start dates and status. Information on specific tasks, including name, owner information and status is updated in the Tasks tab.

When in 2D Graphical View, the current state, floor-mounted devices and devices mounted in racks that are assigned for future placement are indicated by a transparent blue box.

NOTE: A device shaded in blue, could also mean that the device could be decommissioned in future.

Devices that come into existence in the "future" state are shown as shaded, transparent blue fills on the floor. Similarly, ports on which there are changes in the future meaning a connection may be added or decommissioned in future will be shaded, transparent blue filled. This gives you the ability to plan the data connections effectively.

Changes are shown from the top level view of the floor in 2D Graphical View, from the front and rear view of the rack in Elevation View and within devices in Device View. This gives you the ability to plan and maximize floor and rack space more effectively.

Project workspace

Project information can be accessed from the Quick Launch menu and in 2D Graphical View as follows.

- From the Quick Launch menu, the Project workspace contains tasks in a list/table format and in a calendar. The list of projects contains the same information as the Properties accordion with selected project and task attributes. The calendar is actually a Gantt chart where you can see the relationships between project tasks and time. Task dependencies are displayed as lines connecting the tasks.
- In 2D Graphical View, the Planning accordion contains a drop-down list of viewing options for a project as follows:
 - Current State is the project status as of today.
 - Project End Date displays the list of associated tasks for the project end date.
 - Date is used to view the project status on a specific date in a calendar.

Project toolbar

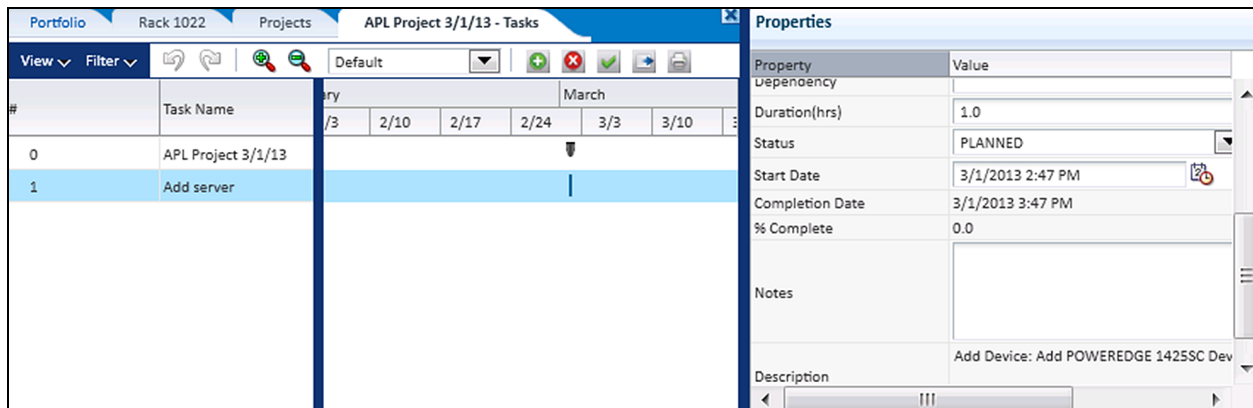
The project toolbar, located at the top of the workspace, provides the following functions:

- Viewing projects in a table list and sorting the columns
- Filtering projects by properties
- Undoing and doing a task
- Zooming in and out
- Displaying a project in weeks, months and one year or the entire project in the Gantt chart calendar
- Increasing and decreasing the size of the workspace
- Adding and deleting projects
- Exporting a project to a spreadsheet or print tasks to a .pdf file
- Moving the calendar bar to the right to see projects in a list
- Viewing the history of a project

Creating projects

Creating a project starts by creating a data center, building and floor in 2D Graphical View.

Project Screen



To create and modify a project:

1. From the Quick Launch menu, click *Projects* to display the list of projects.
2. Select an existing project or click *New Project* to create the [ProjectAutoNamexx] file at the end of the project list.
3. Expand the *Properties* accordion, change the name of the project and enter the remaining properties for the project.
4. In 2D Graphical View, expand the *Planning* accordion, change the devices as needed and verify the tasks are displayed.

To delete a project:

Select a project and click the red X on the toolbar.

-or-

Right-click the project, click *Delete* and on the message stating the project and all associated tasks will be deleted, click *Delete* again to continue.

NOTE: Deleting the project cannot be undone.

NOTE: After completing all tasks in a project, change the View By field to *Current State*.

Managing project tasks

A project uses tasks and task properties to represent any actions in a future project, including the duration of the tasks.

For tasks involving a device, the device must already exist at the date of the task. And for any task that is dependent on a previous task, the previous task must be completed.

Project tasks can be created in two ways:

- Design tasks are created chronologically on a floor in 2D Graphical View as you add, delete, move or edit devices in a project.
- Generic tasks are created from the Projects screen and a floor in 2D Graphical View.

Creating generic tasks

Generic tasks are created from the Projects screen using Go to Task on the toolbar. The Projects screen provides the following views:

- A table of all projects
- A calendar chart with the project time span depending on the selected default time
- The Properties accordion where you define the details of the project

Project Task List

To create a generic task:

1. From the Quick Launch menu, click *Projects* to view the list of projects, select a project from the Project Name list and click *Go to Task*.
2. Click *New Task* to create the [TaskAutoNamexx] file, expand the *Properties* accordion, enter the properties and click away from the field to save.
3. Continue adding tasks until the end of the project.

To edit a generic task:

From the properties panel, click the *Properties* accordion and edit the properties.

To delete a generic task:

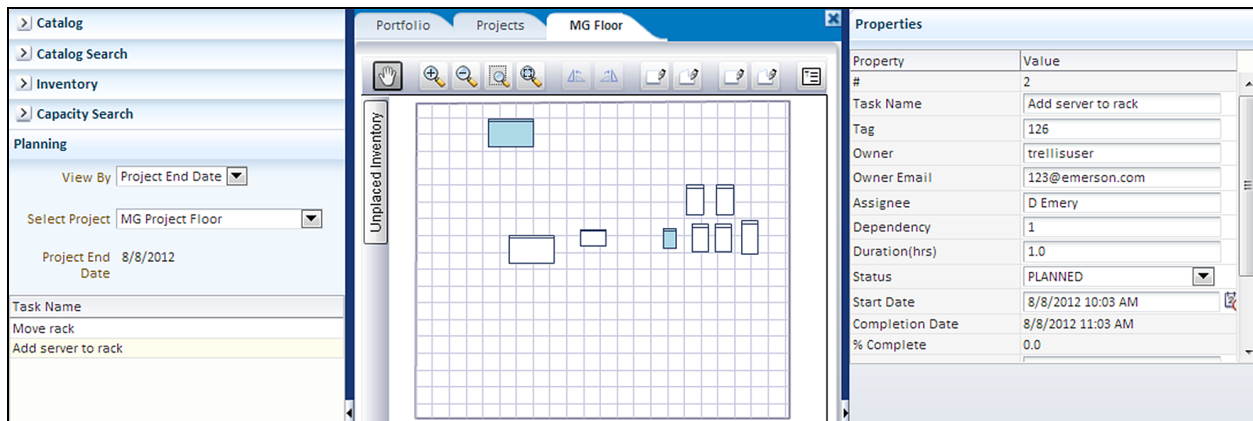
1. From the list of tasks, select and right-click the task and click *Delete*.
2. On the confirmation message, click *Delete* again to remove the task from the project.
3. Verify the duration changes accordingly.

Creating designed tasks

Designed tasks are created chronologically on a floor in 2D Graphical View as you add, edit, move or delete devices in a project. As you make changes, tasks are updated in the Planning accordion and attributes are updated in the Properties accordion.

A designed task can be created to represent adding a device to a floor. The device must already exist in the plan on the date of the task. Operations are created in a sequence to denote their dependency within the selected project. The positioning of a task determines its dependencies to and from surrounding tasks. When performed, you will have a task-by-task record showing future changes in the selected project. You cannot create a task that deletes a device if there are dependencies.

Creating Designed Tasks in 2D Graphical View



To create designed tasks:

1. From the Quick Launch menu, click *Projects* and create a new project.
2. Expand the *Properties* accordion, enter the name and all available information.
3. Open the associated floor in 2D Graphical View and expand the *Planning* accordion.
4. From the View By drop-down menu, select *Project End Date*.
5. From *Select Project*, click the appropriate project name and on the floor plan, begin making physical changes such as adding, moving or deleting devices.
6. Verify the tasks in the *Planning* accordion, click each task and enter the properties.

Completing project tasks

After completing all tasks in your project, change the View By field to *Current State*. This gives you a record of the project with completed tasks.

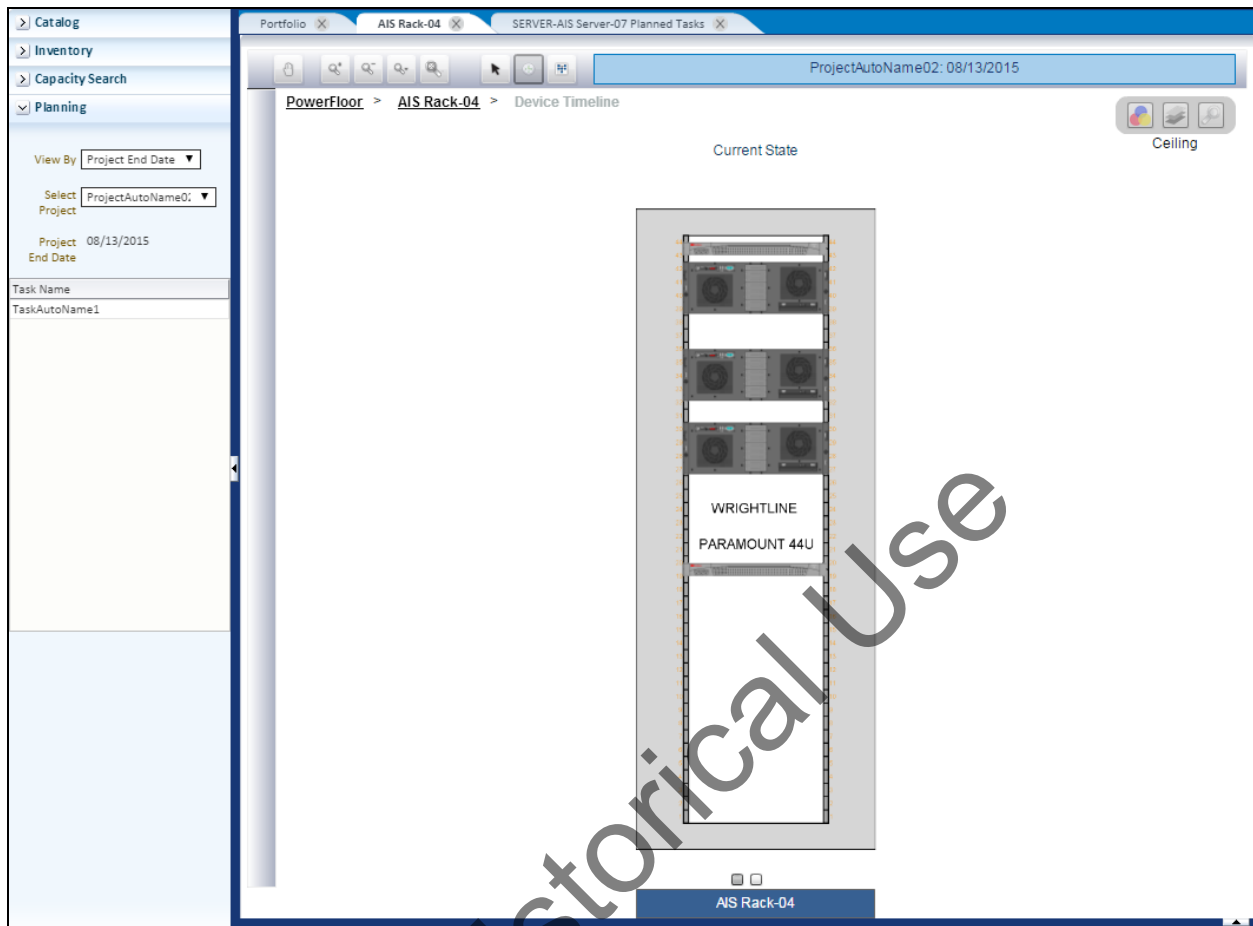
To complete a task and commit it to current state:

1. From the Quick Launch menu, click *Projects*, open the project and click Go to Task.
2. Select the task to be completed. Tasks are marked complete in the order they occur.
3. Expand the *Properties* accordion, select *Complete* from the Status drop-down list and verify the task is shown in green in the gantt chart to signify it is complete and committed to the current state of the project.

Using the Device Timeline

The timeline depicts a device as it appears in the present day, as well as all future versions based on any upcoming projects where the device appears. To use the timeline, a project must be created with at least one task. Device timelines can be displayed in 2D Graphical View, Elevation View or as a table.

Device Timeline in Elevation View



To view a timeline for a device from Graphical and Elevation View:

1. In 2D Graphical View, open and double-click the desired device to open Elevation View.
2. Expand the *Planning* accordion and from the View By drop-down list, select *Current State*.
3. On the toolbar, click *Device Timeline View* to view the device in its current state and at the end of the project.

NOTE: A device must be selected to display the timeline buttons.

4. Use the breadcrumbs to return to the 2D Graphical View or Elevation View of the floor.

To view a timeline for a device as a table:

1. In 2D Graphical View, open a floor and select a device associated with a project.
2. On the toolbar, click *Textual Timeline View* to view a list of projects with tasks and details.
3. After you are finished, close the timeline tab or click the *2D Graphical View* floor tab to view the floor.

Device Timeline in Portfolio View

Project Name	Task Row	Task Name	Task Description	Task Start Date	Task Duration(hrs)	Task End Date	Project Start Date	Task Owner
MG Project Move Rack	3	TaskAutoName3	Move Device: Move 10	1/24/2013 4:15 AM	1.0	1/24/2013 5:15 AM	1/22/2013 3:15 PM	trellisuser
APL Project 2.20.13	6	TaskAutoName6	Move Device: Move PC	2/20/2013 6:07 PM	1.0	2/20/2013 7:07 PM	2/20/2013 1:07 PM	trellisuser
APL Project 2.20.13	7	TaskAutoName7	Move Device: Move PC	2/20/2013 7:07 PM	1.0	2/20/2013 8:07 PM	2/20/2013 1:07 PM	trellisuser
APL Project 2.20.13	8	TaskAutoName8	Move Device: Move PC	2/20/2013 8:07 PM	1.0	2/20/2013 9:07 PM	2/20/2013 1:07 PM	trellisuser

Viewing projects in current or future state

The current and future state of a project can be displayed in 2D Graphical View and Elevation View.

To view a project in its current state:

In 2D Graphical View, open a floor and select *Current State* from the *Planning* accordion to view the floor with devices as it looks currently.

To view a project at a future date:

Expand the *Planning* accordion and select *Project End Date* or any date in the project.

Using the DSView™ Software Session

The following sessions can be launched from the *Trellis™* platform in the DSView™ Session accordion:

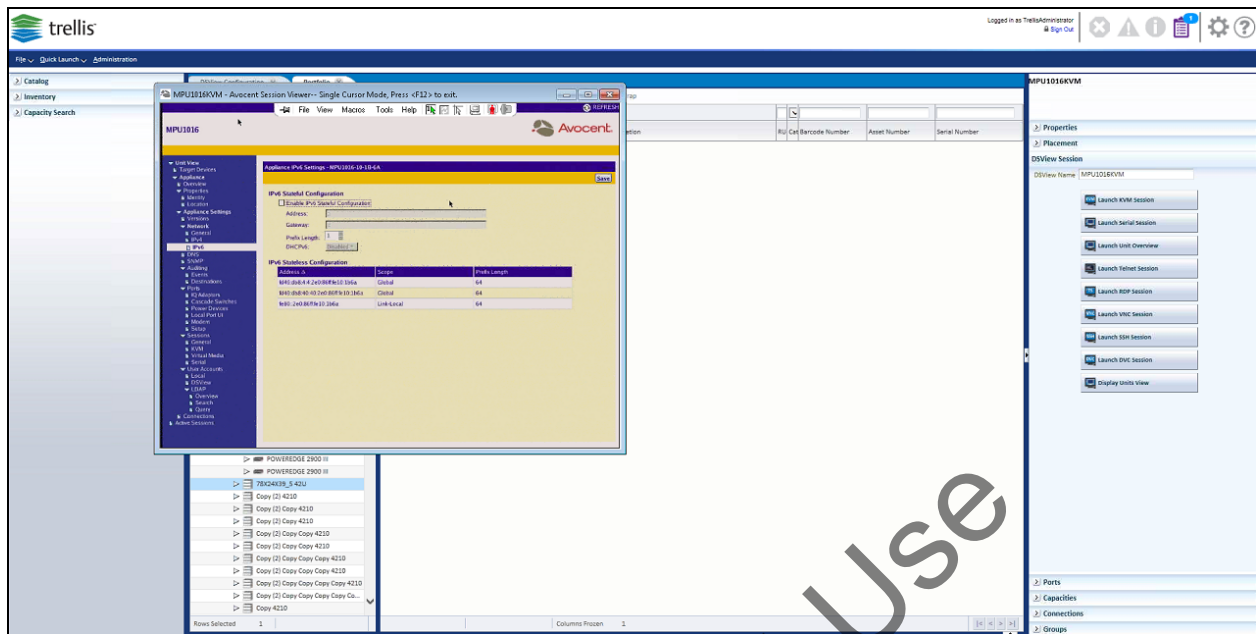
- KVM Session
- Serial Session
- Unit overview
- Telnet session
- RDP
- VNC
- SSH
- DVC
- Display Units view

NOTE: Devices must be accessible by the DSView™ software to be able to launch it using the platform.

To view and modify devices using DSView™ software:

1. In Portfolio View, click the device you want to access in the DSView™ software.
2. Click the *DSView Session* accordion, enter the DSView™ device name and press **Enter**.
3. Click on the applicable session type to launch it.

DSView™ Session



The TRELIS™ Power Systems Manager Module

The *Trellis*™ Power Systems Manager module provides insight into the critical power system of the data center. This module builds on the device monitoring capabilities of the *Trellis*™ Site Manager module to provide system level management from the utility entrance to rack power distribution. It provides a comprehensive view of resource utilization and capacity with awareness of the active power path and the status of each device in the power system.

The Building Power Systems dashboard and capacity charts provide the capacity of the building power elements on a single page. Capacities are provided for the primary infrastructure power devices of generators, automatic transfer switches, UPSs and switchgear mains for a building.

Another dashboard displays trends using power capacity reports. reports can have multiple graphs for each device on a single page and can be exported as a CSV or PDF file. Filters allow report customization by building, floor, space, device domain, device category, consumed and/or remaining capacity and range of time.

Dynamic one line diagrams can be created to illustrate the critical power path in the data center. One line diagrams also allow you to view the status of each monitored device and identify devices that are dependent on another infrastructure device.

In a real-world scenario, after receiving a notification that one of the power supplies for a server is without power, you can navigate to that server in the software, verify its connections and identify the device at the remote end of the connection. You can also verify what other devices are connected to that same device and check their status using the software.

The *Trellis*™ Power Systems Manager module provides the following benefits:

- Viewing power system resource utilization and capacity
- Increasing awareness of the active power path and device status in the power system
- Understanding the dependencies of the entire power system
- Visualizing the combined status and capacity of paralleled power devices
- Creating and verifying connections using one or more inputs to many outputs in the 2D Graphical View
- Moving and rotating devices for viewing and placement
- Displaying all downstream devices impacted by the operational state of another device
- Editing, restoring and deleting port expressions for determining the state of connections

Module Requirements

The *Trellis*™ Power Systems Manager module requires the *Trellis*™ Site Manager module configuration information.

- Site Manager Module - A licensed *Trellis*™ Site Manager module is required to receive device data and alarms and configure power capacity thresholds.
- Dependencies on Site Manager Module - The Power Systems Manager module has a dependency which builds on the capabilities of the Site Manager module and requires an active *Trellis*™ Site Manager license to function properly. The Site Manager module allows you to review data in Device View and to configure power capacity thresholds for use with the Power Systems Manager module. In

In addition, the Site Manager module allows you to configure and send notifications when the thresholds you configure are exceeded.

To access and work on Power Systems Manager functionality, the user must enable the Power Systems Manager license after enabling the Site Manager module license.

About Switchgear Equipment

Switchgear is an enclosure with a combination of electrical disconnect switches, fuses or circuit breakers used to control, protect and isolate electrical equipment. Some switchgear equipment also has gauges or meters that provide kilowatt hours (kWh), volts and other information.

With switchgear equipment you can perform the following:

- Interconnect multiple devices to work in conjunction to control the flow of electricity in the data center
- Provide protection from the interruption of short-circuit and overload fault currents while maintaining service to unaffected circuits
- Isolate circuits from power sources and increase availability by allowing alternate power sources to feed the same load

Adding Switchgear

Switchgear can be added to the *Trellis*™ platform in 2D Graphical View the same way floor-mounted devices are added. Search for the term “switchgear” in the catalog, select it in the search results, and drag the switchgear image to the floor.

To add switchgear:

1. After logging in to the *Trellis*™ platform, in Portfolio or 2D Graphical View, expand the *Enterprise*, building and floor nodes.
2. Select either the *Portfolio* or *2D Graphical View*.
3. From the Catalog panel, search for Switchgear device and place it on either Portfolio or 2D Graphical View.
4. To add a Switchgear device to the one line diagram, you need to search from the inventory.
5. Select and drag the switchgear image to the one line diagram.

Changing switchgear properties

After adding a generic switchgear device to the floor, you can change its properties to match your specific switchgear. To make these changes you will need the name and email of the owner, name of the device, dimensions, weight, manufacturer, model, model qualifier, notes, lock device position, serial number, asset number and bar code number of the generic switchgear to match the properties of the switchgear on your floor.

NOTE: Licensing tier, category, symbol version and description are not changeable in the Properties accordion.

NOTE: Because switchgear devices are often custom built, it is a best practice to change the dimension properties of the switchgear you add in the *Trellis*™ platform to match those of the installed switchgear.

To change switchgear properties:

1. In 2D Graphical View, select the switchgear device to be changed.
2. On the Properties accordion, modify the property values.

Adding switchgear components

Components can be added to switchgear from the Elevation View. After the components are added, you can manage them in the contents list that is displayed in Elevation View. You can use this list to change component properties, such as name and model, as well as remove them from the switchgear. Some devices also have a power flow diagram that displays the names and properties of the device connections.

To add switchgear components :

1. In the 2D Graphical View toolbar, click *Select* mode.
 2. Click the switchgear device to which you want to add components.
 3. Double-click the device to open Elevation View.
 4. On the search panel, expand the *Catalog* accordion and click *Catalog*.
 5. Enter a keyword in the global search field and click *Search*.
- or-
- Enter criteria in the one or more of the advanced search fields (Manufacturer, Model Category, Description, Product Line), select *And* or *Or* and click *Search*.
6. Select the appropriate symbol from the search results list. The image of the symbol is displayed underneath, along with the height, width and depth of the device.
 7. Drag the symbol to the switchgear image on the floor.

To delete switchgear and its components:

1. In Portfolio/Graphical/Elevation view, expand the *Enterprise*, building, floor, space nodes and switchgear.
2. Select either the Portfolio or 2D Graphical View.
3. Right-click the switchgear and click *Delete Device(s)* from the menu. Deleting the selection will delete the entire Switchgear and any contained devices from the Portfolio. Devices contained in Switchgear can only be deleted from the Switchgear Graphical, Elevation Portfolio View and one line diagram view.
4. The following warning message will be displayed "All contained devices and external connections will be deleted. This cannot be undone."
5. Select *Delete* to remove the switchgear.

Adding a busbar to switchgear

Busbars are commonly used in switchgear devices to provide a common electrical point for tying together multiple breakers, switches, meters and other devices. These bars are usually made of copper or aluminum.

To add a busbar to switchgear:

1. In Portfolio View, expand the *Enterprise*, building, floor and space nodes.
 2. Select and right-click the switchgear and click *Elevation View* from the menu.
- or-

Double-click the switchgear.

3. In Elevation View, right-click the switchgear image and click *Add Bus* from the menu.

To modify busbar properties in switchgear:

1. In Portfolio View, expand the *Enterprise*, building, floor, space nodes and switchgear.
2. Select the busbar.

-or-

In Elevation View, right-click the switchgear image and select the busbar from the Contents table.

3. Expand the *Properties* accordion, edit the properties and click away to save.

To delete a busbar from switchgear:

1. In Portfolio View, expand the *Enterprise*, building, floor, space nodes and switchgear.
2. Right-click the busbar and click *Delete* from the menu.

-or-

Right-click the switchgear, open it in Elevation View and select the busbar from the Contents table.

3. Right-click the busbar and click *Delete Bus* from the context menu.
4. On the confirmation message, click *Delete*.

Adding breakers and switches to switchgear

Breakers and switches are also commonly found in switchgear. Properties can be used to identify the purpose of breakers and switches or properties can be used for reporting purposes. For example, a breaker that is the Main can be listed in the Building Power Systems dashboard on the Switchgear Main Breaker chart.

The following devices can be added to switchgear:

- Surge Protective Device
- ATS
- Transformer
- Centralized Static Switch
- Medium Voltage Circuit Breaker
- Low Voltage Circuit Breaker
- Subfeed Breaker
- Low Voltage Switch
- Low Voltage Isolator
- Power Meter
- STS
- Medium Voltage Switch

To add a device to switchgear:

1. In Portfolio View, expand the *Enterprise*, building, floor and space nodes and select the switchgear.
2. Expand the *Catalog* accordion, search for a device and drag the name of the device on to the switchgear.

-or-

Double-click the switchgear, search for it in the Catalog accordion and drag the image on the switchgear image.

To modify properties of a device that is contained in switchgear:

1. In Portfolio View, expand the *Enterprise*, building, floor, space nodes and switchgear.
 2. Select the device.
- or-
- In Elevation View, right-click the switchgear, open it and select the device from the Contents table.
3. Expand the *Properties* accordion, edit the properties and click away to save.

To delete a device that is contained in switchgear:

1. In Portfolio View, expand the *Enterprise*, building, floor, space nodes and switchgear.
2. Right-click the device and click *Delete* from the menu.

NOTE: A confirmation message states all contained devices and external connections will be deleted and this cannot be undone.

3. Click *Delete*.
- or-
- Right-click the switchgear, open it in Elevation View and select the device from the Contents table.
4. Right-click the device and click *Delete Device* from the context menu.
 5. Click *Delete Device*.

To view the state of a device:

The state of a device (if monitored) placed in switchgear is listed in the State column of the table in Elevation View of the switchgear.

Making Power Connections

The *Trellis*™ platform allows you to create connections using one or more inputs-to-many outputs. Power connections can be viewed in Portfolio or 2D Graphical View. These are very common connection configurations with busbars in the switchgear. You can also create output-to-output and input-to-input connections, but you must identify the up stream and down stream devices. This is seen with switchgear that provides for redundant or alternating sources.

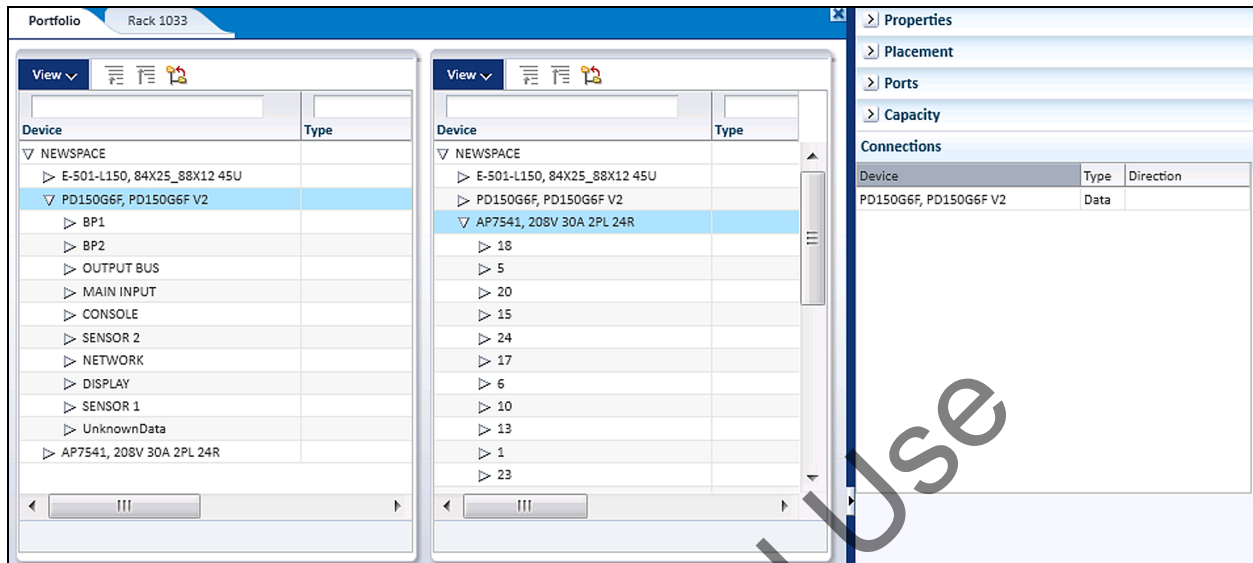
If available, use a copy of the one line diagram as a guide for making connections in the data center. Power connections must be configured in the *Trellis*™ platform before building the one line diagram. After connections are created, you can view, edit or delete the connection properties.

Creating power connections in Portfolio View

When creating power connections in the Classic UI, you must drill down to the inputs/outputs for each provider and consumer of power. For example, if making an up stream connection from a breaker to a rack PDU, you must drill down to the output on the breaker listed in the left screen, and drill down to the input on your rack PDU on the right.

Device connections can be viewed and modified on the Connections tab by selecting an input device in one box and an output device in the other box. Multiple connections can be created on port types that allow it.

Power Connections in Portfolio View



NOTE: The Connection tab displays two panes, one for up stream and one for down stream connections. It does not matter which side is down stream or up stream.

To create power connections in Portfolio View:

1. Click *Portfolio*, expand the *Enterprise*, building, floor and space nodes and then select the device to be connected.
2. Right-click the device and select *Show Connections* to display the Connections tab with the applicable devices on the left and right sides of the workspace.

NOTE: In the Beta UI mode, you can click the Filter icon and select the Power Openings, Data Openings, Locked Openings or Connected Openings filter.

3. In the connections view, expand the space node on the left column, expand the device in the right column and select the port that needs to be connected.

NOTE: If using a basic connection on the device, select the actual device.

4. In the right column, expand the space and device to select a port that needs to be connected.
5. Click *Connect* and on the message, click *OK*.
6. Click *Back* to return to portfolio view.

NOTE: If making a down stream connection from a breaker to a rack power strip, you must drill down to the breaker output on the left and the input on the rack power strip on the right.

7. When the Power Connection Success dialog box opens, click *OK*.

To delete a connection:

1. In Portfolio View, select and right-click the device and click *Show Connections*.
2. Expand the applicable device, select the port to be deleted and click *Delete*.

Creating power connections in Graphical View

The Graphical Connection View displays a selected device with its power endpoint details (if any) in the center column with an Ups Stream and Down Stream box on the left and right, respectively. This view allows you to search for a device, select an endpoint for each device or select the device itself (if there are no pre-defined endpoints) and make or change a connection.

In Graphical Connection View, the endpoints are colorized as follows:

- Green = no connection
- Yellow = connected port
- Pink = selected port
- Gray = locked port

Configuring power port connections in Graphical View

In Graphical View, power port connections are displayed as a line from the selected device to the device in the connected devices box. Planning power port connections are available in Graphical View.

To connect power ports:

1. With the floor displayed, right-click the device and select *Show Connections - Show Power Connections*.
2. Expand the *Inventory* accordion, search for the next device to be connected and drag and drop the image of the new device to the connected devices box.

NOTE: To access the outlets, click the middle button under the image to flip to the rear side of the device. The data connection shows the main device and the devices connected to it. The power connection shows the upstream and downstream connections.

3. Click the port in the left box, drag the line to the port of the applicable device and release the mouse to create the connection.
4. On the Success dialog box, click *OK*.

NOTE: The connection background is highlighted and a delete icon is in the top, right corner. The background changes to gray when a connection is made or disappears when the delete icon is selected. If no connection is made and you move the cursor away from the image, the device disappears.

To change a connection:

1. Select the power outlet in the center Up Stream or Down Stream box and move it to a different outlet. The connecting line moves to the new location and the outlet colors change.
2. Click away from the field to save your changes.

To view properties of a power connection between two ports:

1. Expand the building, floor, space and device nodes.
2. Right-click on the device and select *Show Connections*.
3. Select the port with the power connection and expand the *Properties* accordion to display a list of all the device and port information on each connection, as well as the connections to and from the devices and ports.

To plan for a connection in planning mode:

1. Select a project from the *Planning* accordion.
2. Right-click on the device and select *Show Connections* and then *Show Power Connections*.
3. Expand the *Inventory* accordion, search for the next device to be connected and drag the image of the new device to the connected devices box.
4. Click the port in the left box, drag the line to the port of the applicable device and release the mouse to create the connection.
5. On the Success dialog box, click *OK*.
6. When the connection task project is complete, the connection is shown in Graphical View.

To delete a connection:

1. Expand the building, Floor, space and device nodes.
2. Right-click on the device and select *Show Connections*.
3. Select the port with the power connection.
4. Click *Delete*.

If that was the only connection between the devices, the devices are removed from the upstream and downstream boxes. If there are more upstream or downstream connections to the device in the center, those devices remain in their respective boxes.

To view connection properties:

1. In Portfolio View, highlight and right-click a device with connections, then select *Connections*.
2. Expand the *Properties* accordion.

NOTE: The Connect button is disabled unless you add information to the predefined properties.

Managing Load Accumulation Power Connections

Load accumulation identifies the full potential of power consumption per phase for each power distributor which is based on all the downstream power consumers. Load accumulation is not applicable when data center equipment properties are considered on the following circuits:

- low-voltage breaker
- medium voltage breaker
- low voltage switch
- medium voltage switch
- low voltage isolator

Depending on the configuration of a selected power distributor, the following additional options may be available in the drop-down list from the Properties accordion:

- Tie
- Load bank
- MOB - Module output breaker
- QE - Output isolator
- MFB - Module feeder breaker
- MFI - Module feeder isolator
- MFS - Module feeder switch

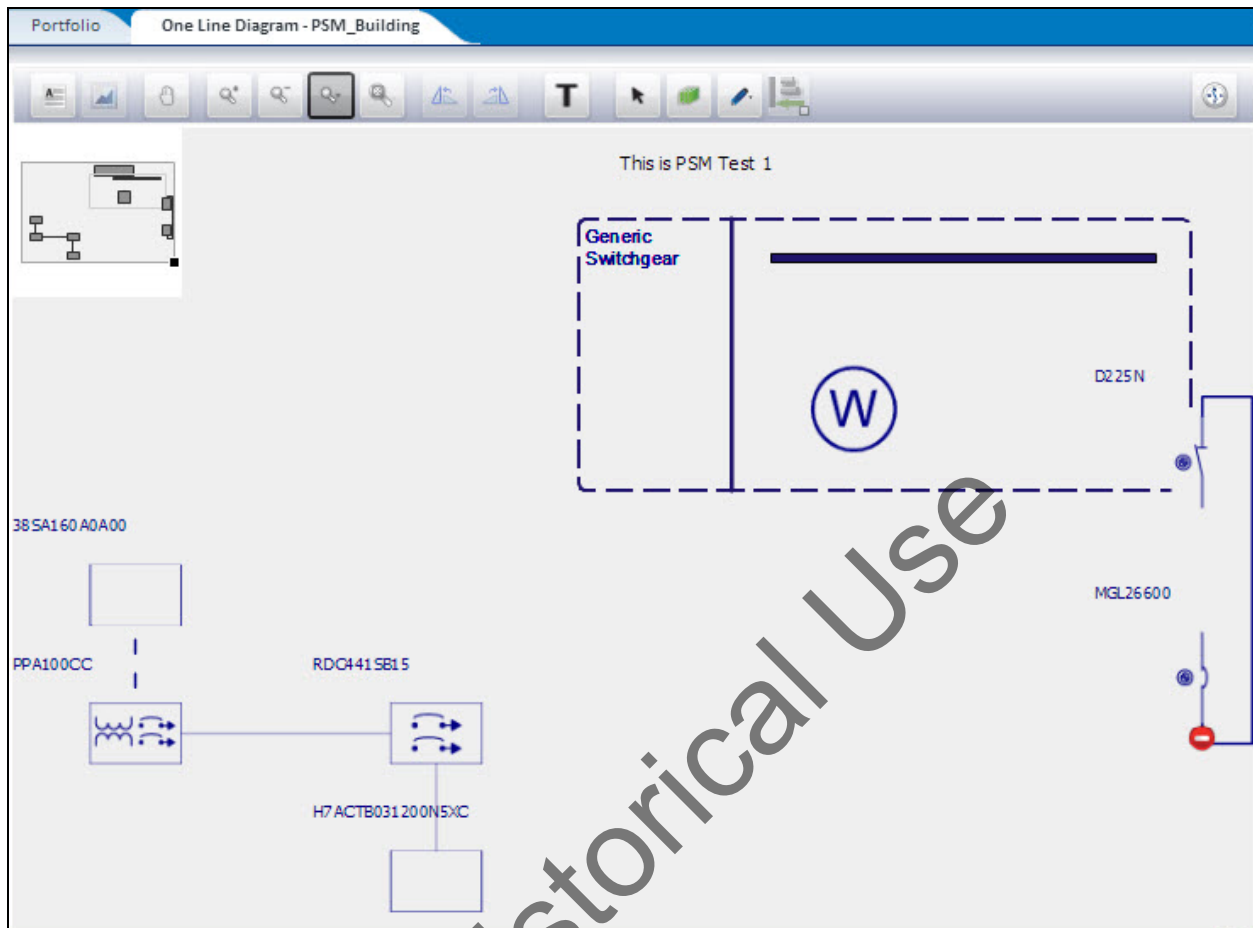
Understanding the One Line Diagram

The *Trellis*™ Power Systems Manager module provides several features you can use with one line diagrams. You can view levels to see the status, capacity (remaining or consumed) and text labels for the monitored device. You can also move device label positions. Free-form, blank text labels allow you to add additional information to the diagram anywhere you want to place a label. Device alignment and device rotation tools allow you to efficiently position devices in your data center environment.

The one line diagram illustrates connections between devices, supplemental metering and instrumentation to better understand the energized power path through power equipment. These connections are created using the connection functions in the *Trellis*™ platform. The one line diagram includes all equipment from the utility entrance to floor PDUs, power panels and standalone panelboards. You can use symbols to create one line diagrams for the devices and supplemental metering. The symbols are contained in the catalog and devices can be added from inventory.

When viewing the one line diagram, you can select and double-click any monitored device to view its details. The following graphic is a monitored device that shows the Alarm Viewer. Unmonitored devices are shown in the Elevation View.

The Trellis™ Platform One Line Diagram



For additional information about one line diagrams, [Using symbols for the one line diagram](#) on page 157 and [Creating and reading the one line diagram](#) on page 160.

Using the One Line Diagram View toolbar

Depending on your permissions, the following are functions of the One Line Diagram View toolbar:

One Line Diagram View Toolbar

Function	Description
Portfolio View	System opens up the Portfolio View and displays the expanded nodes of the building
Graphical Floor View	System opens up the Graphical Floor view and by default highlights the selected device
Pan Mode	Grabs an elevation and moves it anywhere on the workspace
Zoom In	Increases the view
Zoom Out	Decreases the view
Zoom window	Brings the view back to original size
Zoom Extends	Moves everything on a floor to the center of the workspace
Rotating Left	Rotates objects 90 degrees to the left
Rotating Right	Rotates objects 90 degrees to the right

Function	Description
Text	Adds text
Select Mode	Selects one or more objects on a floor to be manipulated
Arrange Mode	Arranges information on the workspace
Edit	Removes, locks and unlocks devices on the workspace
Align	User can align the device on One Line Diagram

The column and row names for the floor tiles are displayed at the bottom of the workspace and are dynamic as the cursor moves. The tile name is displayed with the X and Y coordinates.

Using symbols for the one line diagram

Connection nodes are not visible and are only shown below as a reference to the location of the connection line intersections with the device images. The equipment device name string is visible when symbols are placed on a diagram. The string is movable so it can be placed in the best viewing area. The default location is to the right of the symbol.

One-line diagram symbols and descriptions are defined in the following table.

One-Line Diagram Symbols and Descriptions


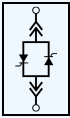



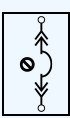
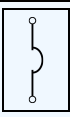
Image	Description
	Automatic Transfer Switch (ATS)
	Centralized Static Switch NOTE: This symbol does not change state.
	Chiller
	Circuit breaker, low-voltage-draw out type (Closed)
	Circuit breaker, low-voltage-draw out type (Open)
	Circuit breaker, low-voltage-draw out type (Not Monitored) NOTE: The state of the disconnect is displayed if known. If the state cannot be detected, use the "Not Monitored" version of the disconnect.
	Circuit breaker, low-voltage-fixed position type, subfeed breaker (Closed)

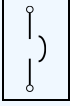
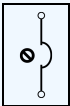
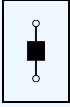
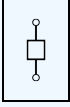
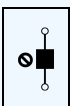
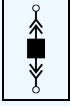
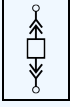
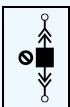




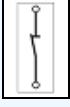
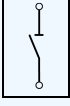
Image	Description
	Circuit breaker, low-voltage-fixed position type subfeed breaker (Open)
	Circuit breaker, low-voltage-fixed position type, subfeed breaker (Not Monitored) NOTE: The state of the disconnect is displayed if known. If the state cannot be detected, use the “Not Monitored” version of the disconnect.
	Circuit breaker, medium-voltage-fixed position (Closed)
	Circuit breaker, medium-voltage-fixed position (Open)
	Circuit breaker, medium-voltage-fixed position (Not Monitored) NOTE: The state of the disconnect is displayed if known. If the state cannot be detected, use the “Not Monitored” version of the disconnect.
	Circuit breaker, medium-voltage-draw out type (Closed)
	Circuit breaker, medium-voltage-draw out type (Open)
	Circuit breaker, medium-voltage-draw out type (Not Monitored) NOTE: The state of the disconnect is displayed if known. If the state cannot be detected, use the “Not Monitored” version of the disconnect.
	Condenser or drycooler
	Coolant Distribution Unit (CDU), also known as a Modular Pumping Unit (MPU)
	CRAC, CRAH, also known as a Modular Cooling Unit
	Generator
	Isolator, low-voltage switch-fixed position type (Closed)
	Isolator, low-voltage switch-fixed position type (Open)

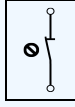
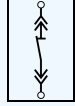
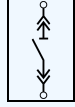
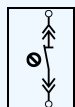










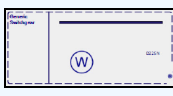

Image	Description
	<p>Isolator, low-voltage switch-fixed position type (Not Monitored)</p> <p>NOTE: The state of the disconnect is displayed if known. If the state cannot be detected, use the “Not Monitored” version of the disconnect.</p>
	<p>Isolator, low voltage switch-draw out position type (Closed)</p>
	<p>Isolator, low voltage switch-draw out position type (Open)</p>
	<p>Isolator, low-voltage switch-draw out position type (Not Monitored)</p> <p>NOTE: The state of the disconnect is displayed if known. If the state cannot be detected, use the “Not Monitored” version of the disconnect.</p>
	<p>PDU (floor) without panelboards, with subfeeds and breakers.</p>
	<p>PDU (floor) with panelboards, without subfeeds and breakers.</p>
	<p>PDU (floor) with panelboards, without subfeeds and breakers. The subfeeds should be displayed below the symbol connected to the openings.</p>
	<p>RPP with panelboard</p>
	<p>RPP with panelboard, subfeeds and breakers. The subfeeds should be displayed below the symbol connected to the openings.</p>
	<p>UPS with remote battery string (dual input UPS)</p>
	<p>UPS with remote battery string (single input UPS)</p>
	<p>Power meter</p>
	<p>Surge protection device</p>
	<p>Static switch (STS)</p>
	<p>Switchgear with busbar. This device(s) container including a number of buses showing up stream and down stream connection nodes. There can be multiple buses within a container. The bus can be extended and devices connected can be moved along the bus. The container itself can be extended vertically and</p>

Image	Description
	horizontally. The bounding box for these enclosures will be built dynamically by the application.
	Transformer

Creating and reading the one line diagram

With the *Trellis*™ Power Systems Manager module, you can build dynamic one line diagrams that illustrate the flow of power through your data center. The flow of power and arrangement of elements and symbols on a one line diagram follow a standard left-to-right and top-to-bottom sequence.

Only a single one line diagram is allowed per building in the *Trellis*™ Power Systems Manager module. All devices used in your one line diagram must be in your *Trellis*™ platform inventory. If you add a device, use inventory to find the device and add to the one line diagram. If you remove devices from the diagram, the items from inventory and connections continue to exist, which can cause these diagrams to become extremely large. When the one line diagram becomes larger than what can be shown on the screen, a panoramic view appears in the top-left corner to assist in navigating the larger drawing being viewed.

To create a one line diagram:

1. In Portfolio View, right-click a building and select *One Line Diagram*, search the catalog for the one line symbol and drag it to the workspace.

NOTE: There are multiple ways to navigate to the one line diagram, which can consist of multiple pages.

2. After the Properties accordion opens with the general properties of the symbol, if a message advises that the device is not selected from your current inventory, select the current device to replace or move the device into the same building and click *Add*.

NOTE: If you add the device to inventory, the device is displayed in the workspace. Validation steps and configurations from other features may be required.

-or-

Use Inventory Search to find the device, drag it to the workspace and verify the image of the device to the symbol that appears on the one line diagram.

To display the device status on the one line diagram:

1. Click *Levels* to expand the pane.
2. Enable the Status checkbox in the pane to display the status of devices in the one line diagram.
3. When you hover over or select the monitored device, the status is displayed. The different device states are Critical, Warning, Maintenance and Not Responding. These states are populating based on:
 - Alarm generation
 - If device is in maintenance mode
 - If a simulator goes in unstable mode where you cannot ping the simulator or device for the latest readings

To display the consumed power for each power distributor on the one line diagram:

1. Click *Levels* to view the pane.
2. Enable the Data Points checkbox to display the data points of the device and select *Measured Consumed Capacity* or *Measured Remaining Capacity* and a unit of measurement. KiloWatts (*kW*), Amps (*A*), Kilo Volt Amperes (*kVA*), or percentage can be selected.

Creating a one line diagram for multi-equipment systems

The multi-equipment one line diagram displays systems that are bound together such as multi-module UPS, multiple CRACs within a zone or multiple chillers in a cooling plant. The diagram can also display the electrical dependencies of the complete electrical infrastructure, which includes utility feeds, switchgear, PDUs and rack PDUs.

To create a one line diagram for multi-equipment systems:

1. In Portfolio View, right-click a building and select *One Line Diagram*.
2. Search for symbols and devices to add to the diagram and drag them to the workspace.

Viewing connection states

Electrical connection states are displayed dynamically between the devices and can be viewed on the one line diagram, by hovering over the connection state or by using the Port accordion to access the ports states for a device.

The following connection state displays on the one line diagram:

- Active - Electrical potential (voltage) and current flow across the power connection
- Energized - Electrical potential across the power connection (voltage), but there is no current flow
- De-Energized - No electrical potential across the power connection or it is below the defined threshold used to recognize electrical potential
- Not Monitored - The platform has been configured to not evaluate the state of this connection, possibly because of a lack of monitoring information or interest in the state of the connection
- Not Responding - Status of the power connection cannot be determined at this time due to lack of data

To display connection state in a one line diagram:

1. Open the one line diagram, select the connected monitored device and expand the *Port* accordion.
2. Click *Port state* to Open Expression Builder, open *Active/Energized Expression*, update the expression as required and click *Save*.
3. On the one line diagram, hover over the connection line to view the connection state.

Displaying dependent devices from a one line diagram

For the purpose of power maintenance planning, the View Downstream Devices feature can be used to list power connections between power distributors and power consumers.

To display dependent racks from a one line diagram:

1. Verify the one line diagram exists with equipment and power connections.

NOTE: Only power distributors have the View Downstream Devices option enabled from the right-click menu.

2. In Portfolio View, right-click a building and select *One Line Diagram*, then highlight a device, right-click and select *View Downstream Devices*.
-

NOTE: The Device or Elevation View opens for the selected device after clicking the device hyperlink for monitored and non-monitored devices. If a device is located in a rack, you can click on the device to access the Rack Elevation View.

3. In Elevation View, with the dependent, floor-mounted devices visible, click *Text* in the toolbar to change to a table view.
 4. In the table, which contains devices by device category in the order of the downstream power connection, select a device and click *Properties* to update the information.
-

NOTE: A building could be excluded if a one line diagram is already at the building level.

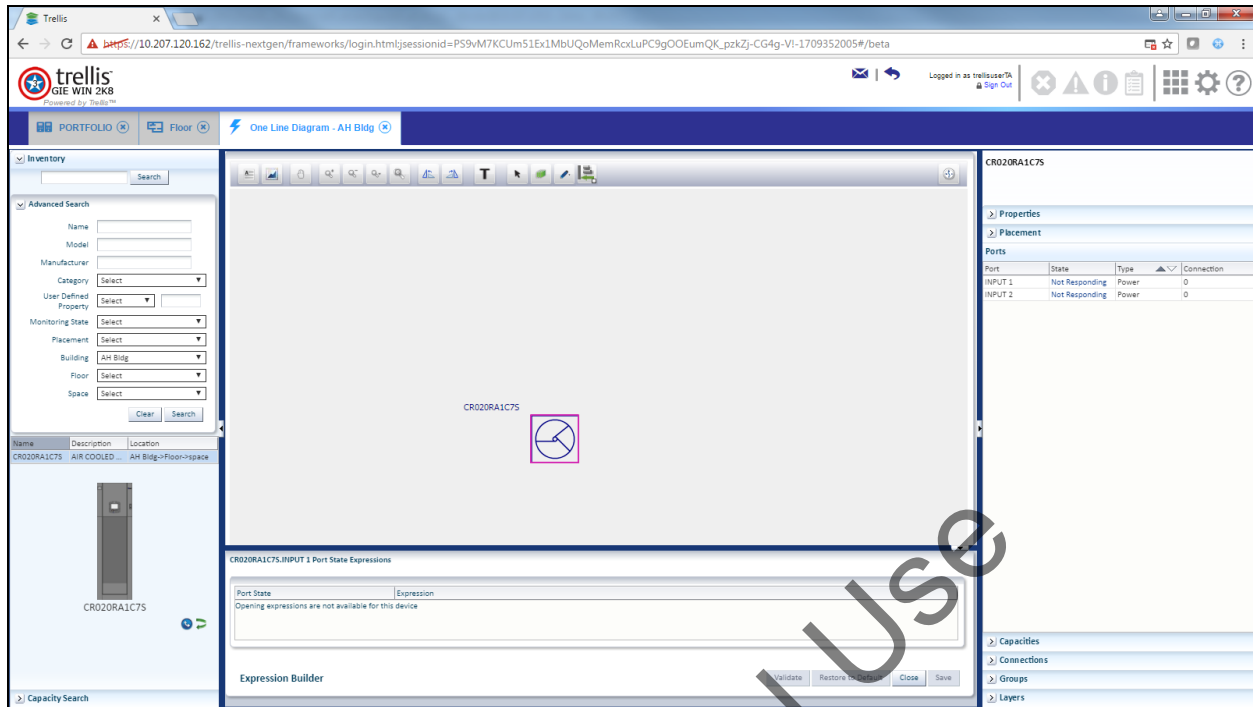
Displaying updated data point values on the one line diagram

When a data point value for a device is changed through the simulator, the server will retrieve updated data point values after the collection interval has passed and the updated data point value appears on the latest reading and on the one line diagram.

Overriding one line diagram port expressions

By default, initial device port expressions are commonly provided in the Element Library by device, port and state (active or energized). However, for a few devices the default expressions are not specified. For these devices, the default expressions for device ports can be overridden for devices that do not have default expressions specified as part of the Element Library. You can specify in a configuration file provided in the *Trellis*™ platform, a default expression to be applied in the One Line Diagram Port State Expression View based on the device category, port name and state of a selected device.

Overriding the Port Expressions



To create the default expression configuration file:

1. Locate the configuration file in the defaultExpressions directory on the *Trelis™* platform front machine under U02/domains/<Your Domain> (Linux).
-or-
Locate the configuration file in the defaultExpressions directory on the *Trelis™* platform front machine under U02/domains/<Your Domain> (Windows).

NOTE: This directory contains an initial empty ExpressionDefaultTypes.properties file where the default expressions will be configured. This folder, and the file it contains, is created by default the first time a device and/or port is selected from the Placement accordion, for a device selected in the One Line Diagram that does not already contain default expressions.

2. If the folder does not exist, it can be created by opening the One Line Diagram for a building, selecting a monitorable device, then a port from the Placement accordion (one for which a default expression is known not to exist) and then opening the Port State Expressions view. The message “Opening expressions are not available for this device” is displayed, and the defaultExpressions folder and empty ExpressionDefaultTypes.properties are created automatically in the default expressions folder.
3. Edit the ExpressionDefaultTypes.properties file and add the default expressions to be used in the *Trelis™* platform. Each default expression is keyed by the Device Category, Opening Name, State and the Default Expression to be used. Use the previous figure as a guide for entering data into the ExpressionDefaultType.properties file.
4. Edit the expression again by opening the one line diagram and selecting a device and port. This automatically reads the configuration file and picks up the expression that matches the device category,

port name and state. After the default expression is picked up from the configuration file, it is displayed in the Port State Expressions view where it can be edited as needed and saved.

5. After making changes to the default expressions, if reverting changes is necessary, the Restore to Default button can be used to override any changes and re-install the initial default expression (from the configuration file).

Building Power Systems Dashboard

The Power System Status Dashboard shows the state, consumed capacity and percent utilization for key elements of the power system. For example, status can be shown for the main breaker of the switchgear, utility mains, generators, automated transfer switches and UPS systems. The displayed status can also be saved as a PDF file.

The dashboard displays graphs, a list of available critical power devices within the selected building and the following information:

- Device (name of device)
- Design Capacity
- State
- Load kW/ Load Amps
- Load %

To view the Building Power Systems dashboard:

1. From the Quick Launch menu, click *Dashboard* and select *Building Power Systems*.
2. Under the Rules section, select a building from the drop-down menu.
3. In the UPS Rating (in kW) \geq field (optional), enter a value and click *Get Devices*.

NOTE: Values refresh in real-time while polling.

Capacity Trend Dashboard

The Capacity Trend dashboard displays trends for device power capacity and utilization.

To view and export the Capacity Trend dashboard:

1. From the Quick Launch menu, click *Dashboard* and select *Capacity Trend Dashboard*.
2. Under the Capacity Trend Dashboard Rules section, select the building, floor (optional), space (optional), domain and category.
3. In the % Consumed $>$ and % Remaining $<$ fields (optional), enter the values and click *Get Devices*.
4. Click the *Create Chart* icon next to one or more devices to view trending graphs and use the checkboxes to filter information.
5. If desired, click *Exports As CSV* to open a spreadsheet with details about the device and click *Save as PDF* to save the file in PDF format.

NOTE: Values refresh in real-time while polling.

The TRELIS™ Site Manager Module

Management of alarm notifications is an integral part of building efficiencies within the data center. Using the *Trellis*™ Site Manager module keeps systems running at peak performance and ensures maximum use of time and resources. It tracks and reports on the health of facility-critical devices and provides information on power, cooling and environmental conditions such as temperature and humidity.

Customizable notifications and threshold validation allow you to focus on critical, active alarms that need immediate attention. This increases the ability to find and work out issues with critical infrastructure devices. It also presents device level data with trends and provides total and detailed insight into the status and environmental conditions of the data center.

In addition, the *Trellis*™ Site Manager module allows you to configure and send notifications when the thresholds you configure are exceeded.

NOTE: The *Trellis*™ Intelligence Engine, provided with the Avocent® Universal Management Gateway appliance or the *Trellis*™ Site Manager module, is required for real-time monitoring and alerting features. To learn more about the Intelligence Engines, see [Data Collection Engine](#) on page 67.

The *Trellis*™ Site Manager module provides the following benefits:

- Assuring business-critical continuity with comprehensive event management and alarm notifications
- Creating user-defined rules regarding email notifications and reducing time sorting through messages
- Monitoring business-critical infrastructure and environmental conditions of the data center
- Configuring and managing alarm significance
- Managing alarm notifications via SMS and email
- Toggling between active and cleared alarms
- Access to editable web page, camera and device support URLs
- Collecting and analyzing real-time data
- Understanding and tracking inefficiencies within devices and sub-systems
- Identifying real-time power consumption
- Calculating utility cost at the system and unit levels
- Complying with industry-approved efficiency metrics
- Determining current and future energy needs based on historical data
- Viewing operating efficiency losses and recognizing areas for performance improvements
- Configuring source and currency to be used for utility cost calculation
- Viewing the configured Power Usage Effectiveness (PUE) level (0, 1, 2)
- Viewing electrical energy consumption
- Monitoring service processors

Understanding Energy Insight and Efficiency

A unified, customizable dashboard provides visibility into the energy consumption and operating efficiency of the data center. IT managers are able to use the gathered information to determine system peak performance, maximize energy usage, minimize energy waste and reduce utility costs. With this feature, managers can view current and historical efficiency metrics, as well as calculate both consumption and costs for data centers that are not yet properly instrumented for measuring facility and IT load.

The following are required for energy calculations:

- One appliance must be enrolled and all devices must be monitored by the appliance and functioning in a normal operating state.
- For PUE 0 and 1, at least one UPS and power meter must be monitored.
- For PUE 2, at least one PDU and power meter must be monitored.

Understanding Power Usage Effectiveness (PUE)

PUE is an industry metric for measuring how well a data center is delivering energy to its IT equipment. It has been adopted globally as the preferred standard for determining performance efficiency.

PUE measures the relationship between the total facility energy consumed and the IT equipment energy consumed. The PUE metric is calculated by dividing the Total Facility Power by the IT Equipment Power. The formula is:

$$\text{PUE} = \frac{\text{Total data center energy consumption or power}}{\text{IT energy consumption or power}}$$

Persisted PUE values originating from the Time Series Database (TSD), are displayed as the following values:

- Period value - Selectable based on predefined weekly, monthly or yearly values
- Historic value - Graph chart with current and previous values
- DCiE value - Accompanies each PUE value
- PUE value - Computed with power or energy sampling frequency, but not meeting the configured PUE configuration minimum sampling frequency

The following PUE categories 0-2 are recommended for calculating PUE measurements within a data center:

- PUE category 0 is a demand-based calculation that represents the peak load during a 12-month measurement period.

IT power is represented by the demand kilowatt (kW) reading of the UPS system output, or sum of outputs if more than one UPS system is installed, as measured during peak IT equipment utilization.

Total data center power is measured at utility meters and reported as demand kW on the utility bill.

Consistent measurement can provide valuable data that assists in managing energy efficiency.

PUE category 0 can only be used for all-electric data centers and not for data centers that also use other types of energy such as natural gas and district chilled water.

- PUE category 1 is a consumption-based calculation that represents the IT load by a 12-month total kilowatt hour (kWh) reading of the UPS system output or sum of outputs if more than one UPS system is installed.

This cumulative measurement requires the use of kWh consumption meters at all measurement points. The total energy is obtained from the utility company bills by adding the 12 consecutive monthly kWh readings and annual natural gas or other fuel consumption readings (converted to kWh).

This measurement method captures the impact of fluctuating IT and cooling loads and provides a more accurate overall performance picture than PUE category 0.

- PUE category 2 is a consumption-based calculation that represents the IT load by a 12-month total kWh reading taken at the output of the PDUs supporting IT loads or sum of outputs if more than one PDU is installed.

This cumulative measurement requires the use of kWh consumption meters at all measurement points. The total energy is determined in the same way as category 1.

This measurement method provides additional accuracy of the IT load reading by removing the impact of losses associated with PDU transformers and static switches.

Understanding Data Center Infrastructure Efficiency (DCiE)

On the PUE Configuration screen is another metric, DCiE, that can be used for determining data center efficiency. DCiE is calculated as follows:

$$\text{DCiE} = \text{IT Equipment Power (ITEP)} / \text{Total Facility Power (TFP)} * 100$$

DCiE and PUE are reciprocals of one another. They are both measured at the same levels and assess the efficiency of the infrastructure. The formulas are the inverse of one another with DCiE presenting efficiency values as a percentage.

Configuring PUE levels

The PUE levels, ranges and devices must be configured on the PUE Configuration screen before receiving results on the dashboard. The following must be in place prior to PUE level configuration:

- IT load devices (floor UPS, floor PDU) and facility load devices (power meters) must be monitored using supported monitoring protocols.
- The PUE is configured for a particular building using the same IT and Facility Load devices.

PUE/DCiE Configuration

To configure the PUE level:

1. From the Quick Launch menu, select *PUE Configuration* and in the Select Data Source field, click *Browse*, select a building and click *OK*.
2. Enable the *Configure by PUE* radio button, select a PUE level, select the Averaging Period for energy calculation and enter the following values for Good, Fair and Poor results.

PUE Level Configurations

PUE Level	Good	Fair	Poor	PUE Target Value
0	1.2	1.7	2.0	1.4
1	1.1	1.5	2.1	1.3
2	1.2	1.7	2.0	1.4

3. On Set Target PUE, enter the applicable target PUE, select the frequency of the energy data point to be calculated and enter a start date.
4. Using the following criteria, drag one or more devices (such as a power meter) from the inventory to the PUE Total Facility Load or devices (such as a floor UPS) to the Total IT Load table.
 - For PUE category 0 and 1, only UPSs can be dragged to Total IT Load.
 - For PUE category 2, only floor PDUs can be dragged to Total IT Load.

NOTE: Total IT Load applies only for PUE calculations. DCiE configuration is read-only.

NOTE: If you drag a device that is not recommended for the PUE level, or is not configured at the correct polling interval for the minimum sampling frequency, hover over the device to view an additional column with an icon representing further details.

5. Click Save and the next day verify the configured PUE and DCiE results as shown in the following figures.

NOTE: The DCiE table is populated based on the PUE configuration.

Verify the Derived Data Points for the Power Meter are Non-Zero Values (Real-Time Data)

Data Points	Value	Date/Time
Average Voltage Line-to-Line (Volts AC RMS)	0	6/20/2013 6:55 PM
Average Voltage Line-to-Neutral (Volts AC RMS)	0	6/20/2013 6:55 PM
Derived Consumed Energy Over Collection Interval (WattHours)	299	6/20/2013 6:55 PM
Derived Total Real Power Consumed (Watts)	1,000	6/20/2013 6:55 PM
Emergency Apparent Energy Net (kVARreactiveHours)	0	6/20/2013 6:55 PM
Emergency Energy Export (KiloWatt Hours)	0	6/20/2013 6:55 PM
Emergency Energy Import (KiloWatt Hours)	0	6/20/2013 6:55 PM
Emergency Energy Reactive Net (kVARreactiveHours)	0	6/20/2013 6:55 PM
Emergency Net Energy (KiloWatt Hours)	0	6/20/2013 6:55 PM
Emergency Source Energy Reactive Export (kVARreactiveHours)	0	6/20/2013 6:55 PM
Emergency Source Energy Reactive Import (kVARreactiveHours)	0	6/20/2013 6:55 PM
Input Switch Position	Normal	6/20/2013 6:55 PM
Instantaneous Watt Demand (KiloWatts)	0	6/20/2013 6:55 PM
Maximum Instantaneous Power Consumed (KiloWatts)	0	6/20/2013 6:55 PM
Normal Energy Reactive Export (kVARreactiveHours)	0	6/20/2013 6:55 PM
Normal Energy Reactive Import (kVARreactiveHours)	0	6/20/2013 6:55 PM
Normal Net Energy (KiloWatt Hours)	3	6/20/2013 6:55 PM
Normal Source Accumulated Energy Import (KiloWatt Hours)	0	6/20/2013 6:55 PM
Normal Source Net Reactive Energy (kVARreactiveHours)	0	6/20/2013 6:55 PM
Output Apparent Power Phase A (KVA)	0	6/20/2013 6:55 PM
Output Apparent Power Phase B (KVA)	0	6/20/2013 6:55 PM
Output Apparent Power Phase C (KVA)	0	6/20/2013 6:55 PM

Verify the Derived Data Points for the Floor UPS are Non-Zero Values (Real-Time Data)

Data Points	Value	Date/Time
Battery Percentage Charge (Percent)	100	6/20/2013 7:12 PM
Battery Time Remaining (Minutes)	90	6/20/2013 7:12 PM
Battery Volts for Cabinet (Volts DC)	324	6/20/2013 7:12 PM
Bypass Input Frequency (Hertz)	59.9	6/20/2013 7:12 PM
Bypass Input Voltage RMS A-B (Volts AC RMS)	123	6/20/2013 7:12 PM
Bypass Input Voltage RMS B-C (Volts AC RMS)	122	6/20/2013 7:12 PM
Bypass Input Voltage RMS C-A (Volts AC RMS)	122	6/20/2013 7:12 PM
DC Bus Current (Amp DC)	1	6/20/2013 7:12 PM
Derived Consumed Energy Over Collection Interval (WattHours)	1,026.09	6/20/2013 7:12 PM
Derived Total Real Power Consumed (Watts)	12,300	6/20/2013 7:12 PM
Output Current Crest Factor Phs A	1.4	6/20/2013 7:12 PM
Output Current Crest Factor Phs B	1.4	6/20/2013 7:12 PM
Output Current Crest Factor Phs C	1.4	6/20/2013 7:12 PM
System Input Frequency (Hertz)	60	6/20/2013 7:12 PM
System Input Power Factor Phs A	0.99	6/20/2013 7:12 PM
System Input Power Factor Phs B	0.99	6/20/2013 7:12 PM
System Input Power Factor Phs C	0.99	6/20/2013 7:12 PM
System Input RMS A-B (Volts AC RMS)	215	6/20/2013 7:12 PM
System Input RMS A-N (Volts AC RMS)	0	6/20/2013 7:12 PM

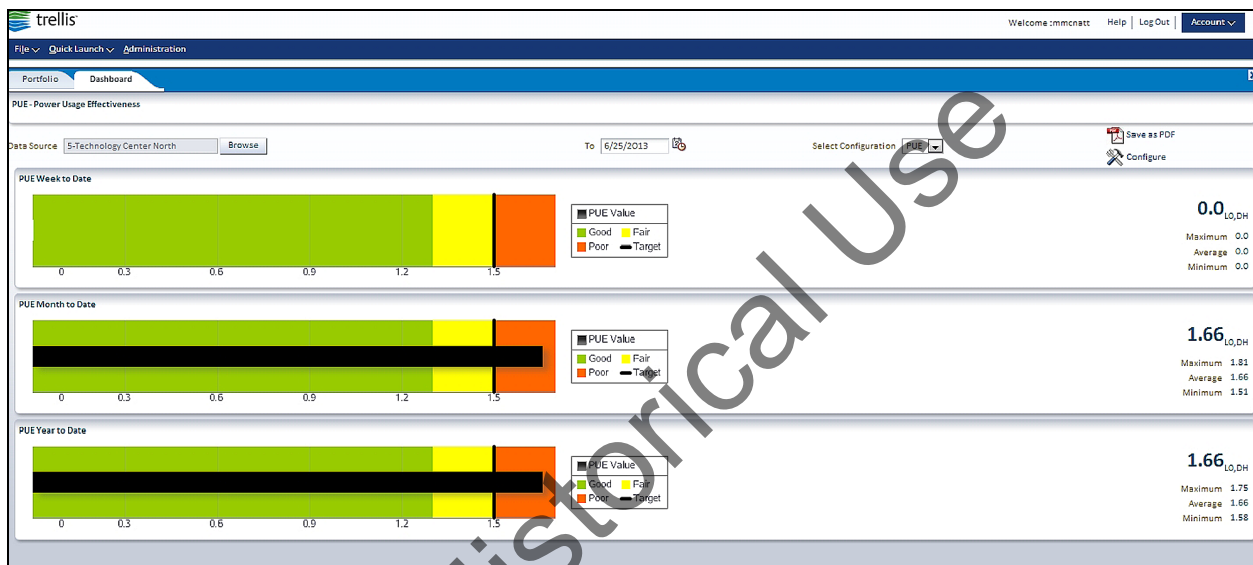
Viewing the PUE/DCiE dashboard

After configuring the PUE/DCiE details for a data center, you can see the historical values in a graph format as illustrated in the following figure. The PUE results are displayed on the dashboard as 1.66L0,DH.

To view PUE levels and calculated PUE and DCiE values:

1. From the Quick Launch menu, select *Dashboard* and select *PUE Dashboard* in the table.
2. Click *Browse*, select a data source and click *OK*.
3. Enter the *To* date and select the PUE or DCiE configuration value.
4. Click *Save as PDF* and click *Configure* to navigate to the PUE Configuration screen.

The Energy Insight Dashboard



Selecting an energy source to monitor electrical usage for a billing record

An energy source type, real-time or manual input, can be included when calculating utility cost. If real-time is selected, you can select a utility meter with a power meter or similar device embedded and view the kW reading directly from the selected energy source. If manual is selected, you can select a device and manually create its data point entries for the kW reading, which helps when normalizing data points across one or more devices.

To add an energy source in Portfolio View for a billing record:

1. In Portfolio View, expand the building, floor and space nodes.
2. Select and drag the device, such as a *Power Meter*, to the space.
3. Select the device, expand the *Properties* accordion and enter the following properties:
 - Frequency
 - Billing Start Day
 - Average Unit Cost
 - Currency
 - Source
4. Click *Billing Record*.

Energy Source Configuration

The screenshot displays the TRELIS Site Manager interface. On the left, a tree view shows the hierarchy: Enterprise1 > Apex Floor > Apex Space > PAC3200. The main pane shows a table with columns 'Name' and 'Manufactur Mod', which is currently empty with the message 'No data to display.'. On the right, the 'Properties' panel for device 'PAC3200' is visible, showing the following configuration:

Property	Value
Description	BASIC POWER METER
Frequency	Monthly
* Billing Start Day	4
* Currency	USD
* Source	Manual
* Average Unit Cost	10.0
RFID Position	1
RFID	
Web Page	
Serial Number	
Asset Number	
Barcode Number	

Below the properties, there is a 'Billing Record' button and a list of expandable sections: Placement, DSView Session, Ports, Capacities, Connections, and Groups.

To add an energy source in 2D Graphical View for a Billing Record:

1. Right click the floor and select *2D Graphical View*, expand the *Catalog* accordion and look for an energy source device such as a power meter.

Power Meter Properties

Properties	
Owner	<input type="text"/>
Owner Email	<input type="text"/>
Name	PAC3200
Depth (in.)	2
Width (in.)	3.77
Weight (lbs.)	0.72
Height (in.)	3.77
Manufacturer	SIEMENS
Model	PAC3200
Model Qualifier	PAC3200
Notes	<input type="text"/>
Licensing Tier	Tier 2
Category	Power Meter
Lock Device Position	<input type="checkbox"/>
RU Height (RU)	2.15
Symbol Version	4.54
Description	BASIC POWER METER
Frequency	Monthly
*Billing Start Day	4
*Currency	USD
*Source	Manual
*Average Unit Cost	10.0
RFID Position	2
RFID	1
Web Page	<input type="text"/>
Serial Number	<input type="text"/>
Asset Number	<input type="text"/>
Barcode Number	<input type="text"/>
Billing Record	

2. Drag the selected device to the floor and in the *Properties* accordion, enter the following attributes:

- Owner
- Owner Email
- Device Name
- Notes
- Frequency: Monthly
- *Billing Start Day: 1-31
- *Currency: USD or EURO
- *Source: Real-Time or Manual

NOTE: Real-Time cannot be selected for a non-monitored device.

- *Average Unit Cost

*Required fields.

3. Click *Billing Record* and enter an initial *Kilowatt hour (kWh)* per period.

Electrical Energy Consumption

Portfolio 1-Floor Electrical Energy Consumption		
Energy Source: POWERLOGIC ION7550, M7550		
Billing Date	Total Cost	Kilowatt hour (kWH) per period
1/1/2015	2460.00	20500.00

WARNING: The initial Kilowatt hour per period value cannot be edited or deleted once it's submitted. Utility power meters provide continuous measurements, however, monthly billings may not start at the beginning of each month. The Billing Date is calculated automatically based on the Billing Start Day.

NOTE: After the average unit cost is entered, it remains the same from one pay period to the next pay period unless it is changed manually. If you change the average unit cost, historical records for the calculated energy cost are not updated.

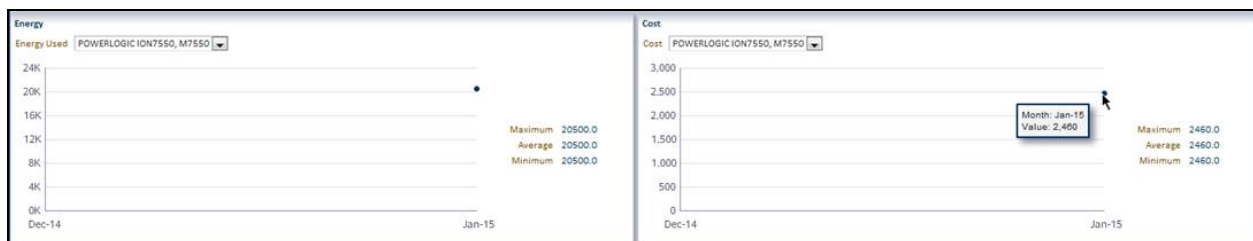
Viewing the total electrical energy consumption and total cost dashboard

The energy efficiency feature provides a dashboard for total electrical energy consumption and total utility costs. It also maintains a record of total consumption over time. Data statistics for maximum, minimum, average and historical usage can be displayed for a selected period and readings are plotted in monthly increments on line charts. Values can be measured or manually entered and each chart includes a drop-down list for individual meter selection.

To view the dashboard for the utility meter:

1. From the Quick Launch menu, click *Dashboard* and select *Electrical Energy Consumption* to view the dashboard.
2. Browse to the desired building, select a date to view energy and cost, select a device in the Energy section to view energy used and in cost to view cost.
3. To export, click the *Save as PDF* link.

Dashboard Utility Meter



Understanding Element Libraries

An element library is included in the symbol package and can be identified by the tar.gz extension. Each element library is associated with a unique symbol package name and version. A typical element library contains Shared Libraries and Data Definition files. Shared Libraries are .so files that act as a driver for communicating with the data collection engine. Data Definition files are XML files that contain information

related to supported protocols, communication parameters, supported events, collection rules, analysis rules and so on. This is a meta-data file that is used by applications for monitoring-related functionality.

The two types of element libraries are factory and custom.

Factory element library

A factory element library is uploaded with a symbol upload (from the Administration Console of the *Trellis*™ platform); however, the version of the symbol package and its element library are independent of one another. Also, for any device type, two factory element libraries cannot have the same symbol version and cannot have two symbols that use the same factory element library.

Custom element library

The customized version of a factory element library is created with a customization tool that uses input from an existing symbol package (containing the factory element library) and outputs a modified symbol package with the custom element library and the factory element library. Similar to the factory element library, a custom element library is associated with an element library package name, element library package version and a symbol version. The version of the symbol package (with the custom element library) is the same as that of the symbol package version with the factory element library because both element libraries are basically created for same symbol. So for the custom element library there is a one-to-many relationship between the symbol package version and the element library version.

The following applies for the platform, version 3.0 and after:

- The symbol package tag and version number remain unchanged when a custom element library is created for a given symbol.
- The element library version number is changed to have a unique value for a given symbol version when a custom element library is created from a factory version of symbol (or from an existing custom symbol).
- The symbol version is the basis used to identify all the related factory and custom element libraries to be available in the element library drop-down list on the device monitoring screen.

The custom element library can be distinguished from the factory element library when its XML attribute "isOnsite" is set to true. (The element library customization tool performs this operation, so the file should not be modified.)

The customization tool also performs the following tasks:

- Customizes the factory element library per site map for any protocol and any existing factory symbol with element library
- Adds/removes data points for an element library
- Changes data point address for data points commands and events
- Changes the scaling for data point and commands
- Maps active/inactive states of events
- Imports/exports .csv files for quick element library customization and replication of multiple similar models on site; bulk element library creation by importing .csv.
- Increments the element library version for customized element libraries
- Gives a custom EL name for newly customized element libraries

- Gives a custom symbol qualifier for platform version 2.2 and older
- Gives a visual mock-up peek of the Device View from the Data Display tab
- Displays symbol details like categories, images, openings and extensions from the Symbol tab
- Browses through multiple customized element libraries under the same factory element library
- Stores a global database of the already customized element libraries for future reference

NOTE: After changing an element library for a device instance, the alarms are per device and not per the data point of a device, and data point information is only displayed in the description of the alarm. Due to this, when an element library associated with a device instance is modified, for example, from a factory element library to a custom element library, there is no change in the generated and displayed list of alarms. All the alarms continue to be displayed until the alarms for the data point, which are not measured anymore, are cleared manually.

Using element libraries

Element libraries define the protocols that the device uses to communicate between the data points that can be monitored and the events the device can generate for its various configurations.

The supported protocols are:

- BACnet IP and RS-485
- Modbus IP and RS-485
- SNMP (versions 1, 2 and 3)
- Velocity/IP and RS-485

For a device to be monitored, the element library for that device must be uploaded to the appliance and the device symbol must be associated with its element library. The version of the symbol determines which version of the element library is supported. This is particularly important when adding the ability to monitor an existing symbol that previously did not have monitoring capabilities.

A single element library can support multiple symbols within a product family. However, after the initial appliance enrollment, you may need to add additional element libraries to your appliance. The version of the element library must be compatible with the version of the *Trellis*™ Intelligence Engine and the platform software.

NOTE: Certain functionality within the platform software may only be supported with a specific version of the element library.

To upload new element libraries to the appliance:

1. From the Administration menu, under System Configuration, select *Data Collection Engine* and click *Details*.
2. Click *Element Library* and on the existing library list, click *New*.
3. In the Available Element Libraries column, click the library to be uploaded, click the calendar icon, increment the time by at least two minutes from the current date and time and click *OK*.
4. On the Upload Schedule screen, click *Schedule Upload - Close*.

To verify that the element library was uploaded to the appliance:

1. From the Quick Launch menu, click *Scheduler* and click *Schedule Tasks*.
2. In the Task Name column, select the *UploadELibrary_Date_Time* format to confirm a successful upload.

Understanding Detailed Device View

From Detailed Device View, you can view additional information about a selected device that is located in a space. The different types of information are displayed by clicking the *Dashboard*, *Configuration*, *Additional Data Points* or *Control* tabs.

As each Device View tab is selected, the data for the selected device is refreshed. The arrow at the top of the opened tab can be clicked to expand/collapse the Alarm Viewer to view all the alarms for the selected device. If a selected device has dry contacts, the Dry Contacts tab appears, which can be clicked to display contact-specific information.

When in Device View, the properties panel accordions can be used to verify and configure device and data point data, and if available, you can click the Web Page hyperlink to access the additional information about the device.

For monitored devices, see [Monitoring Configuration accordion](#) on page 179.

NOTE: The Status and Contents information can be collapsed/expanded to view additional data.

Device View With the Dashboard Tab Open

To open the device view:

In Portfolio View, double-click a device listed under a space.

-or-

In 2D Graphical View, double-click a device on a space.

-or-

In Elevation View, click the *Device View* icon.

Dashboard tab

The Dashboard tab, shown in the previous figure, displays a summary of accessory devices (or data points) in the overview category of a monitored device. If receptacles exist, they are also displayed on the Dashboard tab. Results can be displayed as a bullet chart or a table and are refreshed with real-time updates each time you access the screen. From this tab, you can access additional information by expanding the properties panel accordions.

Configuration tab

On the Configuration tab, data point values can be configured and reflected in the device information. Also at this tab, attributes can be categorized in data groups and attribute types (parametric vs. enumerated). If the configuration settings for the device fail, an error message is displayed.

Additional Data Points tab

Any additional data points are listed on the Additional Data Points tab and are grouped by data groups and attribute types (parametric vs. enumerated).

Additional Data Points Tab

The screenshot displays the 'Additional Data Points' tab for a device identified as '82.184 MPXPEM-NHBXXV30'. The interface is divided into several sections:

- Capacity:** A table showing data points for PDU Percent L1, L2, and L3 Current, all at 0 Percent.
- Input:** A table showing data points for Rated Input Line, with values of 50 Amps... and 208 Volts...
- PDU:** A table showing various PDU metrics such as PDU Accumulated, PDU Available (45 Amps...), PDU Neutral Current, and PDU Voltage L (207.3 Volts...).
- Power:** A table showing data points for Derived Consumption (0 KiloWatts) and Derived Total Power (6 Watts).
- Properties Panel:** Located on the right, it shows the device status as 'Normal' and lists various properties including Name, Depth, Width, Weight, Height, Manufacturer (LIEBERT), Model (MPXPEM-NHBXX), Model Qualifier (3 PHASE), Licensing Tier (Tier 2), Category (Rack PDU), and Lock Device Position.

Control tab

NOTE: Control data points are typically enumerated data points, but it is possible for a control data point to be parametric.

On the Control tab, a list of data points is displayed for the selected device (including the data group, value, unit of measure and/or localized enumerated value list for each data point). The data groups and data points

are listed in alphabetical order and are indicated as ON or OFF. The data point name, along with the unit of measure and data point value for parametric data points, are also displayed. If a data point has a null value, the Last Updated field is updated with the current time.

The Properties accordion provides data about the selected device or a message indicates if no data is available.

Control Tab With Expanded Alarm Viewer

The screenshot displays the TRELIS user interface. The main window is titled 'Administration' and shows a list of devices. The 'Alarm Viewer' tab is active, displaying a table of alarms. The 'Properties' accordion is expanded, showing details for the selected device '82.182 MPXPPEM-PDU2'.

Property	Value
Owner	
Owner Email	
Name	82.182 MPXPPEM-PDU2
Depth (in.)	2.9
Width (in.)	2.9
Weight (kg.)	2.5
Height (in.)	10.5
Manufacturer	LIEBERT
Model	MPXPPEM-NHBXXV30
Model Classifier	3 PHASE
Notes	
Licensing Tier	Tier 2
Category	Rack PDU
Lock Device Position	<input type="checkbox"/>

The 'Alarm Viewer' table shows the following data:

Severity	Start Date/Time	Alarm Description	Subject Type	Subject Name	Subject Category	Assigned To
Important123_Critical	12/11/2015 8:18 AM	High Warning Thres...	Device	82.182 MPXPPEM-PD...	Facility Equipment	

The 'Control' tab is also visible, showing a table of data points for the selected device:

Data Point	Value	Units of Measure
Reset PDU Accumulated Energy		

Dry Contacts tab

A managed device can have associated devices and associated contact closure openings. If a device with dry contact openings is selected, the Dry Contacts tab opens with details, including the severity of alarms for the dry contacts. When a dry contact opening is selected, its details are displayed in the Properties accordion and the values are refreshed each time a selection is made. Related information can also be viewed in the Event Viewer and Alarm Viewer.

The expected state of a dry contact opening is set previously, as shown in the following figure.

Verifying the State of a Dry Contact Opening

The screenshot displays the 'Dry Contacts' table for device VEM-14, 101. The table has columns for Status, Dry Contact Name, Current State, Normal State, and Accessory To. The 'Status' column shows green checkmarks for contacts 0-6 and 8-9, and a red 'X' for contact 7. The 'Accessory To' column lists 'MPH-NK27NKKF30-139' for contact 7 and '40PC2S020AGPC' for contact 9.

Status	Dry Contact Name	Current State	Normal State	Accessory To
✓	0	Closed	Normally Closed	
✓	1	Open	Normally Open	
✓	2	Open	Normally Open	
✓	3	Open	Normally Open	
✓	4	Closed	Normally Closed	
✓	5	Open	Normally Open	
✓	6	Open	Normally Open	
✗	7	Open	Normally Closed	MPH-NK27NKKF30-139
✓	8	Open	Normally Open	
✓	9	Open	Normally Open	40PC2S020AGPC

Below the table is the 'Control Command Alarm Trigger for VEM-14, 101' configuration window. It includes fields for Trigger Name, Alarm Type (set to 'Equal To Warning State'), Device to Control (D5070ADA0E1495A), Data Point (System On/Off Control), and Value (off). A 'Select a Device from Inventory' button is at the bottom.

To add dry contacts as accessory devices:

1. Select a monitored device, right-click the device and select *Accessories* from the pop-up list.
2. In the Inventory Search accordion, enter a device in the Search field and click *Search*.
3. When the monitored device is displayed in the Inventory Search accordion, select and drag the image to the Accessory Devices workspace.
4. For devices without dry contact openings, the device is added to the list of devices.

-or-

For devices with dry contact openings, on the dry contacts pop-up list, select one or more dry contacts and click *Select* to associate them with the device.

The dry contacts are added to the Accessory Devices list, unless the dry contacts are already an accessory to a device. In this case, a warning message is displayed.

Monitoring Configuration accordion

The Monitoring Configuration accordion opens with the Device Status Polling Interval, Alarm Trigger for Escalation and Alarm Commands - Triggers options that display related device data in the workspace. These options allow you to set intervals between data polling and create and edit alarm trigger commands.

On this accordion, you can also click the *Thresholds* button to view the Latest Readings, Data Collection Settings and Connection Settings configuration screens and set thresholds.

Device - Latest Readings Workspace

Data Points	Value	Date/Time
Average Voltage Line-to-Line (Volts AC RMS)	0	6/20/2013 6:55 PM
Average Voltage Line-to-Neutral (Volts AC RMS)	0	6/20/2013 6:55 PM
Derived Consumed Energy Over Collection Interval (WattHours)	299	6/20/2013 6:55 PM
Derived Total Real Power Consumed (Watts)	1,000	6/20/2013 6:55 PM
Emergency Apparent Energy Net (kVAReactiveHours)	0	6/20/2013 6:55 PM
Emergency Energy Export (KiloWatt Hours)	0	6/20/2013 6:55 PM
Emergency Energy Import (KiloWatt Hours)	0	6/20/2013 6:55 PM
Emergency Energy Reactive Net (kVAReactiveHours)	0	6/20/2013 6:55 PM
Emergency Net Energy (KiloWatt Hours)	0	6/20/2013 6:55 PM
Emergency Source Energy Reactive Export (kVAReactiveHours)	0	6/20/2013 6:55 PM
Emergency Source Energy Reactive Import (kVAReactiveHours)	0	6/20/2013 6:55 PM
Input Switch Position	Normal	6/20/2013 6:55 PM
Instantaneous Watt Demand (KiloWatts)	0	6/20/2013 6:55 PM
Maximum Instantaneous Power Consumed (KiloWatts)	0	6/20/2013 6:55 PM
Normal Energy Reactive Export (kVAReactiveHours)	0	6/20/2013 6:55 PM
Normal Energy Reactive Import (kVAReactiveHours)	0	6/20/2013 6:55 PM
Normal Net Energy (KiloWatt Hours)	3	6/20/2013 6:55 PM
Normal Source Accumulated Energy Import (KiloWatt Hours)	0	6/20/2013 6:55 PM
Normal Source Net Reactive Energy (kVAReactiveHours)	0	6/20/2013 6:55 PM
Output Apparent Power Phase A (KVA)	0	6/20/2013 6:55 PM
Output Apparent Power Phase B (KVA)	0	6/20/2013 6:55 PM
Output Apparent Power Phase C (KVA)	0	6/20/2013 6:55 PM

Device Status Polling Interval

The Device Status Polling Interval option allows you to assign an interval between scheduled status polling.

To configure the status polling interval for a device:

1. In Portfolio or 2D Graphical View, select a monitored device.
2. Expand the *Monitoring Configuration* accordion and click *Device Status Polling Interval*.
3. Enter the time, select from the drop-down list of time units and click *Apply*.

Alarm Trigger for Escalation

The Alarm Trigger for Escalation option is used to escalate an alarm to a specified list of users.

To configure the alarm trigger for escalation:

1. In Portfolio or 2D Graphical View, select a monitored device.
2. Expand the *Monitoring Configuration* accordion and click *Alarm Trigger for Escalation*.
3. Enter the name, select the alarm type, assign the users and select the time.

Alarm Commands

The Alarm Commands option opens to display the list of existing Alarm Triggers and displays the Control Command Alarm Trigger for the device in the workspace. New alarm triggers can be created in the workspace.

To verify existing alarm triggers and create an alarm trigger:

1. In Portfolio or 2D Graphical View, select a monitored device.
2. Expand the *Monitoring Configuration* accordion and click *Alarm Commands* to display the list of existing commands.
3. In the workspace, click *New* and enter the name of the trigger.

-OR-

Select a trigger from the drop-down list.

- Use the drop-down lists to select the type, data point and value.

Alarm Type Drop-Down List

The screenshot displays the configuration interface for a Relative Humidity sensor. The page has tabs for Dashboard, Configuration, Additional Data Points, Control, and Dry Control. The main content area is titled "Relative Humidity (Relative Humidity)". A horizontal bar shows a yellow segment from 2 to 34 and a red segment from 34 to 42. A legend indicates "Normal" with a green square. A drop-down menu is open, listing various alarm types with checkboxes. The "Equal To Warning State" option is selected. Below the menu, the "Alarm Type" field is set to "Equal To Warning State". The "Device to Control" is "VEM-14, 101" and the "Data Point" is "Select a Data Point". The device ID "DS070ADA0E1495A" is visible at the bottom.

Dashboard Configuration Additional Data Points Control Dry C

Relative Humidity (Relative Humidity)

2 34 42

Normal

- All
- Device Communication Lost
- Equal To Critical State
- Equal To Warning State
- High Critical Threshold Exceeded
- High Warning Threshold Exceeded
- Humidity Sensor High Critical Threshold Alarm
- Humidity Sensor High Warning Threshold Alarm
- Humidity Sensor Low Critical Threshold Alarm
- Humidity Sensor Low Warning Threshold Alarm
- Low Critical Threshold Exceeded
- Low Warning Threshold Exceeded
- Temperature Sensor High Critical Threshold Alarm
- Temperature Sensor High Warning Threshold Alarm
- Temperature Sensor Low Critical Threshold Alarm
- Temperature Sensor Low Warning Threshold Alarm

* Trigger Name

* Alarm Type Equal To Warning State

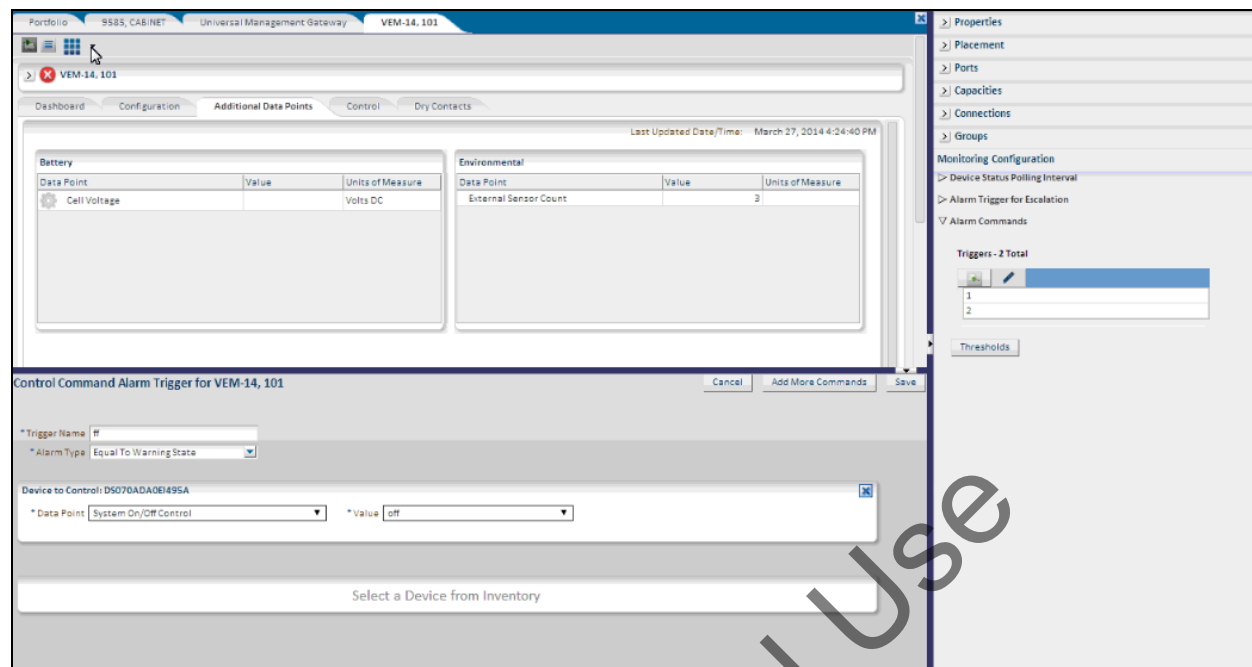
Device to Control: VEM-14, 101

* Data Point Select a Data Point

Device to Control: DS070ADA0E1495A

- Click *Save* and if desired, click *Add More Commands* and repeat this procedure.

Control Command Alarm Trigger



Understanding Service Processors (SPs)

A service processor is a separate, dedicated internal processor located on the motherboard of a server, a PCI card or on the chassis of a blade server or telecommunications platform. It operates independently from the CPU and operating system (OS) of the server, even if the CPU or OS is locked up or otherwise inaccessible. Service processors monitor the on-board instrumentation (temperature sensors, CPU status, fan speed, voltages) of a server, provide remote reset or power-cycle capabilities, enable remote access to basic input/output system (BIOS) configuration or OS console information, and in some cases, provide keyboard and mouse control.

Depending on the manufacturer, SPs may also provide console redirection capabilities to view server processes or to configure server parameters, system information on installed components, including ports used, devices connected, event logs, notifications and alarms.

With the *Trellis*™ Site Manager module, the data points of SPs can be monitored for ambient temperature and power consumption.

NOTE: The supported data points vary depending on the model of the SP. For more information about supported data points, check with the manufacturer of the SP.

With the *Trellis*™ Site Manager module and its engine or the Avocent® Universal Management Gateway appliance, you can monitor a device using an SP and use the stop monitoring feature. The Avocent® Universal Management Gateway appliance is required in order to discover and map an SP.

Monitoring a device using an SP

There are two ways to add and monitor a device using an SP. The SP can be added by manually entering the connection information or by discovery.

Before an SP can be added, the following must be completed:

- The SP must be added to the Avocent® Universal Management Gateway appliance.
- The appliance must be enrolled in the *Trellis*™ platform.
- The appliance symbol must be added to the rack.
- The appropriate element libraries must be uploaded to the appliance.
- The IP address of the Avocent® Universal Management Gateway appliance must be added to the monitoring range of the appliance.

To manually add an SP:

1. In Portfolio View, right-click the appliance, select *Monitor Connection Information* and on the *Protocol* drop-down list, select *UMG* or *SPM/IP*.
2. Enter the IP address of the appliance controlling the SP and click *Next*.
3. Enter the IP address of the SP, click *Connect* and enter a slot number if using blade servers.

NOTE: Some blade systems allow access to the SP via a chassis IP or blade IP. If the blade IP is used, enter **0** as the slot number.

Discovering and mapping an SP

The Discover Service Processor option is used to discover and map multiple devices to the platform so they can be monitored. This option also supports batch monitoring.

NOTE: The Avocent® Universal Management Gateway appliance is required for this feature.

To discover and map an SP:

1. In Portfolio View, right-click the Avocent® Universal Management Gateway appliance and click *Discovered Service Processors*.

Discovering Service Processors

The screenshot displays the TRELIS Site Manager interface. On the left, the 'Inventory' pane shows a list of 'UMG 6000' appliances. The main 'Portfolio' view shows a tree structure of devices, with a context menu open over a 'UMG 6000' device. The context menu includes options like 'One Line Diagram', 'View Downstream Devices', '2D Graphical View', '3D Graphical View', 'Refresh', 'Elevation View', 'Thermal View', 'Discovered Service Processors', 'Show Events', 'Replace Symbol', 'Show Connections', 'Network Configuration', 'Latest Readings', and 'Manual Validation'. The 'Discovered Service Processors' option is highlighted. On the right, the 'Properties' pane for the selected 'UMG 6000' device is visible, showing fields for Name, Manufacturer (AVOCEI), and Model (UMG 6000).

Name	Description	Location
UMG 6000	40P(AS), 102...	Enterprise1->Unplaced
UMG 6000	40P(AS), 102...	Enterprise1->Unplaced

- Using the Inventory Search, locate and click the device name and drag it to the column with the SP.
- Click the checkbox for the SP and click *Monitor*.
- Right-click the appliance and select *Discovered Service Processors* again to refresh the list of discovered SPs.

NOTE: If the device is not monitored, you can click *Unmap* to undo the drag and drop.

After the SP has been added, the properties can be viewed in the *Properties* accordion.

To view monitored data points:

- Double-click the SP to launch Device View.
 - or-
 - In Portfolio View, right-click the device.
- Select *Latest Readings* and select the Chart Type from the drop-down list.
- Select the time frame from the drop-down list and click *Chart*.

Viewing Monitored Data Points

Data Point	Value	Unit of Measure
Maximum Power Capacity	188	Watts
Minimum Power Capacity	68	Watts
System Real Power Consumption	100	Watts

Properties

UCS C210 M2, R210-2121605W

Normal

Property	Value
Owner	bob
Owner Email	
Name	UCS C210 M2, R210-2121605W
Depth (in.)	28.35
Width (in.)	19.0
Weight (lbs.)	50.7
Height (in.)	3.5
Manufacturer	CISCO
Model	UCS C210 M2
Model Qualifier	R210-2121605W
Notes	
RFID	
Licensing Tier	Tier 1
Category	Server
Lock Device Position	<input type="checkbox"/>

Placement
 Ports
 Capacities
 Connections
 Groups
 Monitoring Configuration

To change the collection settings:

- In Portfolio View, right-click the device, select *Latest Readings* and select *Collection Settings*.
- Click the arrow to expand the list of data points.
- Check the box next to the applicable data point and using the arrows on the interval and units columns, change the collection interval as needed and click *Apply*.

NOTE: The collection interval can be edited for each data point of the selected SP. The default collection interval is five minutes.

Using the Stop Monitoring feature for SPs

The Stop Monitoring feature allows you to stop receiving the data point values from a specified SP. This can be performed from the Network Configuration option or the Discover Service Processor option.

To stop monitoring an SP:

1. In Portfolio View, right-click the SP and select *Network Configuration*.
2. If the module's *Trellis™* Intelligence Engine is used, click *Stop Monitoring*.

-or-

If the embedded engine is used, right-click the Avocent® Universal Management Gateway appliance and click *Discovered Service Processors*, then click the checkbox for the SPs and click *Stop Monitoring*.

Monitoring iCOM-S Devices

The iCOM-S software integration feature is provided to allow you to monitor multiple rooms simultaneously. Site information to compare the Site values collected in the *Trellis™* platform and the values shown in this screen. You can select the rooms in the upper left corner to display its information. For example, you can view the data points for the rooms. The rooms are aggregated into the site level and can be expanded to display temperatures. The devices can be combined into groups in order to monitor a group of devices.

NOTE: This feature is only available in the *Trellis™* Intelligence Engine, version 4.6.1.5 or higher. It is not available in the Avocent Universal Management Gateway-based embedded engine.

iCOM-S Software User Interface With Site Information



To find iCOM-S symbols in the database and add the iCOM-S devices to your data center:

From the catalog in the left pane, enter **iCOM-S** to search for iCOM-S symbols and create a device in Portfolio view. In the following figure, the site, group and room are displayed as Site: SUP22K0000X, Group: SUP22K000XGROUP and Room: SUP22K000XROOM.

Searching for iCOM-S Symbols

Manufac	Model
PAND...	FAP3WEIDSC, FAP3WEIDSC
LIEBERT	ICOM-S, SUP22K0000X
LIEBERT	ICOM-S, SUP22K000XGROUP
LIEBERT	ICOM-S, SUP22K000XROOM

To monitor an iCOM-S device:

1. Make sure the applicable element library is pushed to the *Trellis*™ Intelligence Engine.
2. In the Network Configuration screen, click the Element Library drop-down arrow, select an iCOM-S device (for example, *liebert-icom-s*) and click *Continue*.
3. Select the *HTTP* protocol and enter the iCOM-S device's IP address.
4. Click *Next* and then use the default values for the communications properties.
5. Enter the Object Id of the iCOM-S Site device. See [To find the Object Id for the Site, Group and Room in the iCOM-S user interface](#): on page 187 to find the Object Id for the Site.

To monitor a room device:

1. Make sure the applicable element library is pushed to the *Trellis*™ Intelligence Engine.
2. In the Network Configuration screen, click the Element Library drop-down arrow, select the *liebert-icom-s* element library and click *Continue*.
3. Select the *HTTP* protocol and enter the iCOM-S device's IP address.
4. Enter the Object Id of the iCOM-S room device. See [To find the Object Id for the Site, Group and Room in the iCOM-S user interface](#): on page 187 to find the Object Id for the Room.
5. After you finish monitoring, you can compare the latest readings in the *Trellis*™ platform user interface to what is shown in the iCOM-S device software.

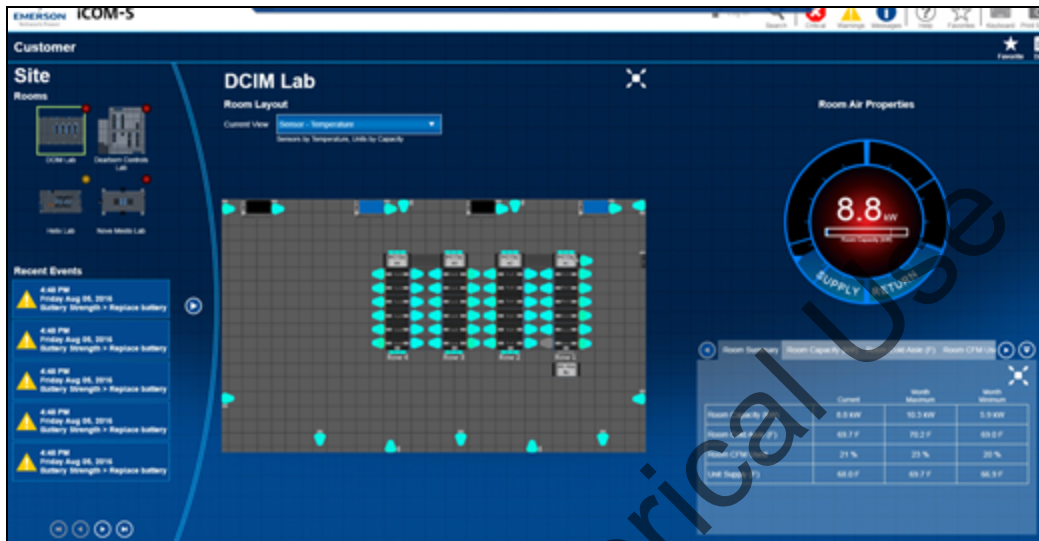
NOTE: To monitor a group, follow the procedure to monitor a room, replacing Room with Group.

To log in to the iCOM-S software UI:

1. Log in to the iCOM-S software using **admin** privileged user.
2. Select the Site, Rooms and Group data to be displayed.

The following example screen is displayed when the DCIM Lab room is clicked. The rooms you select during monitoring are displayed to allow you to compare the rooms. These are the same rooms mentioned earlier to get the Object Id during monitoring.

Comparing Rooms



To find the Object Id for the Site, Group and Room in the iCOM-S user interface:

1. Open the iCOM-S user interface and log in using **admin** privileged user.
2. Click the Settings icon located in the top-right corner.
3. In the System Settings pane, click **Settings**.
4. Click the *Trellis*™ tab to find the Object Id of the Site, Group and Room.

System Settings

The screenshot shows the 'System Settings' page in the iCOM-S interface. The 'Settings' tab is selected, and a table lists various system components. The table has columns for 'Id', 'Type', and 'Name'. The 'DCIM Group' is highlighted in green.

Id	Type	Name
1	Room	DCIM Lab
2	Room	Dearborn Controls Lab
4	Room	Helix Lab
3	Room	Novo Merits Lab
3	Group	CL NE Group
2	Group	CL SW Group
1	Group	DCIM Group
5	Group	Helix Group
4	Group	Novo Merits Group

Placing and Moving Sensors in Racks

Sensors are used to monitor the temperature in racks; however, placing or moving sensors can affect the temperature thresholds, depending on how the sensor is configured in the Configuration - Global Thresholds window. If the Reset option is selected on the *Global Thresholds - Global Sensor Thresholds* window when you place or move a monitored sensor from one location to another in Portfolio or Elevation View, the sensor's temperature thresholds are automatically assigned and updated. Also, when you click the sensor and drag it to a new location in Elevation View, the placement accordion is updated with the new type and/or location. If

To validate sensor changes:

1. In Portfolio or 2D Graphical View, open a floor and double-click the rack view.
2. From the rack view, select the monitored sensor.
3. Click *Thresholds* in the Monitoring Configuration accordion.
4. On the Sensor Thresholds pane, click the arrow next to the sensor name to expand the threshold settings for that specific device.

For information about using the *Trellis*™ RESTful API, see the *Trellis*™ RESTful API User Resources Guide.

For information about using the Bulk Data Processing tool to import sensor configurations, see [Data Management](#) on page 257.

Sensor Locations in Elevation View

The following table lists the sensor location changes that cause a temperature threshold change. The (X) indicates which changes cause the temperature to change and Not Applicable (NA) indicates the moves that do not cause the temperature to change.

Sensor Locations: Elevation View

Current Location	New Location	Placement Method			
		Drag/Drop		Accordion	
		Inlet	Exhaust	Inlet	Exhaust
Front left rail	Rear left rail	NA	NA	NA	X
Front left rail	Rear right rail	NA	NA	NA	X
Front right rail	Rear left rail	NA	NA	NA	X
Front right rail	Rear right rail	NA	NA	NA	X
Rear left Rail	Front left rail	NA	NA	X	NA
Rear left rail	Front right rail	NA	NA	X	NA
Rear right rail	Front left rail	NA	NA	X	NA
Rear right rail	Front right rail	NA	NA	X	NA
Top (Zero U)	Front left rail	X	NA	NA	NA
Top (Zero U)	Front right rail	X	NA	NA	NA
Top (Zero U)	RU location inside rack (front side)	X	NA	NA	NA
Top (Zero U)	Rear left rail	NA	X	NA	NA
Top (Zero U)	Rear right rail	NA	X	NA	NA

Current Location	New Location	Placement Method			
		Drag/Drop		Accordion	
		Inlet	Exhaust	Inlet	Exhaust
Top (Zero U)	RU location inside rack (rear side)	NA	X	NA	NA
Top (Zero U)	Front right rail	NA	NA	X	NA
Top (Zero U)	Front left rail	NA	NA	X	NA
Top (Zero U)	Rear right rail	NA	NA	NA	X
Top (Zero U)	Rear left rail	NA	NA	NA	X
Bottom (Zero U)	Front left rail	X	NA	NA	NA
Bottom (Zero U)	Front right rail	X	NA	NA	NA
Bottom (Zero U)	RU location inside rack (front side)	X	NA	NA	NA
Bottom (Zero U)	Rear left rail	NA	X	NA	NA
Bottom (Zero U)	Rear right rail	NA	X	NA	NA
Bottom (Zero U)	RU location inside rack (rear side)	NA	X	NA	NA
Bottom (Zero U)	Front right rail	NA	NA	X	NA
Bottom (Zero U)	Front left rail	NA	NA	X	NA
Bottom (Zero U)	Rear right rail	NA	NA	NA	X
Bottom (Zero U)	Rear left rail	NA	NA	NA	X
Any RU location inside rack (front side)	Rear	NA	NA	NA	X
Any RU location inside rack (rear side)	Front	NA	NA	X	NA
Unplaced Inventory (in fly-out)	Front left rail	X	NA	NA	NA
Unplaced Inventory (in fly-out)	Front right rail	X	NA	NA	NA
Unplaced Inventory (in fly-out)	RU location inside rack (front side)	X	NA	NA	NA
Unplaced Inventory (in fly-out)	Rear left rail	NA	X	NA	NA
Unplaced Inventory (in fly-out)	Rear right rail	NA	X	NA	NA
Unplaced Inventory (in fly-out)	RU location inside rack (rear side)	NA	X	NA	NA

Sensor Locations Portfolio View

The following table lists the sensor location changes that cause a temperature threshold change. The (X) indicates which changes cause the temperature to change and Not Applicable (NA) indicates the moves that do not cause the temperature to change.

Sensor Locations: Portfolio View

Current Location	New Location	Placement Method			
		Drag/Drop		Accordion	
		Inlet	Exhaust	Inlet	Exhaust
Front left rail	In same rack (rear side)	NA	X	NA	NA
Front left rail	In another rack (rear side) in same space, different space, or rack in unplaced inventory of space, floor, building or enterprise	NA	X	NA	NA
Front left rail	Rear left rail	NA	NA	NA	X
Front left rail	Rear right rail	NA	NA	NA	X
Front right rail	In same rack (rear side)	NA	X	NA	NA
Front right rail	In another rack (rear side) in same space, different space, or rack in unplaced inventory of space, floor, building or enterprise	NA	X	NA	NA
Front right rail	Rear left rail	NA	NA	NA	X
Front right rail	Rear right rail	NA	NA	NA	X
Rear left rail	In same rack (front side)	X	NA	NA	NA
Rear left rail	In another rack (front side) in same space, different space, or rack in unplaced inventory of space, floor, building or enterprise	X	NA	NA	NA
Rear left rail	Front left rail	NA	NA	X	NA
Rear left rail	Front right rail	NA	NA	X	NA
Rear right rail	In same rack (front side)	X	NA	NA	NA
Rear right rail	In another rack (front side) in same space, different space, or rack in unplaced inventory of space, floor, building or enterprise	X	NA	NA	NA
Rear right rail	Front left rail	NA	NA	X	NA
Rear right rail	Front right rail	NA	NA	X	NA
Top (Zero U)	In same rack (front side)	X	NA	NA	NA
Top (Zero U)	In same rack (rear side)	NA	X	NA	NA
Top (Zero U)	In another rack (front side) in same space, different space, or rack in unplaced inventory of space, floor, building or enterprise	X	NA	NA	NA
Top (Zero U)	In another rack (rear side) in same space, different space, or rack in unplaced inventory of space, floor, building or enterprise	NA	X	NA	NA
Top (Zero U)	Front right rail	NA	NA	X	NA

Current Location	New Location	Placement Method			
		Drag/Drop		Accordion	
		Inlet	Exhaust	Inlet	Exhaust
Top (Zero U)	Front left rail	NA	NA	X	NA
Top (Zero U)	Rear right rail	NA	NA	NA	X
Top (Zero U)	Rear left rail	NA	NA	NA	X
Bottom (Zero U)	In same rack (front side)	X	NA	NA	NA
Bottom (Zero U)	In same rack (rear side)	NA	X	NA	NA
Bottom (Zero U)	In another rack (front side) in same space, different space, or rack in unplaced inventory of space, floor, building or enterprise	X	NA	NA	NA
Bottom (Zero U)	In another rack (rear side) in same space, different space, or rack in unplaced inventory of space, floor, building or enterprise	NA	X	NA	NA
Bottom (Zero U)	Front right rail	NA	NA	X	NA
Bottom (Zero U)	Front left rail	NA	NA	X	NA
Bottom (Zero U)	Rear right rail	NA	NA	NA	X
Bottom (Zero U)	Rear left rail	NA	NA	NA	X
Front of rack	In another rack (front side) in same space, different space, or rack in unplaced inventory of space, floor, building or enterprise	NA	X	NA	NA
Any RU location inside rack (front side)	In another rack (rear side) in same space, different space, or rack in unplaced inventory of space, floor, building or enterprise	NA	X	NA	NA
Any RU location inside rack (front side)	Rear	NA	NA	NA	X
Any RU location inside rack (rear side)	In same rack (front side)	X	NA	NA	NA
Any RU location inside rack (rear side)	In another rack (front side) in same space, different space, or rack in unplaced inventory of space, floor, building or enterprise	X	NA	NA	NA
Any RU location inside rack (rear side)	Front	NA	NA	X	NA
Unplaced inventory of space, floor, building or enterprise	In any rack (front side)	X	NA	NA	NA

Current Location	New Location	Placement Method			
		Drag/Drop		Accordion	
		Inlet	Exhaust	Inlet	Exhaust
Unplaced inventory of space, floor, building or enterprise	In any rack (rear side)	NA	X	NA	NA

Configuring Alarms

With the *Trellis*™ Site Manager module, events can denote a transition in the state of one or more monitored devices or result from a user-defined threshold being crossed by one or more monitored devices. Device and threshold-generated events are considered as alarms by the platform software and are displayed in the Alarm Viewer. Device-generated alarms are received immediately, but threshold alarms are impacted by the polling rate because they rely on the last data sample. This information allows you to determine what systems/devices need immediate attention. A hierarchy for notifications can be created for escalating unattended alarms and users can be added within each level of the hierarchy.

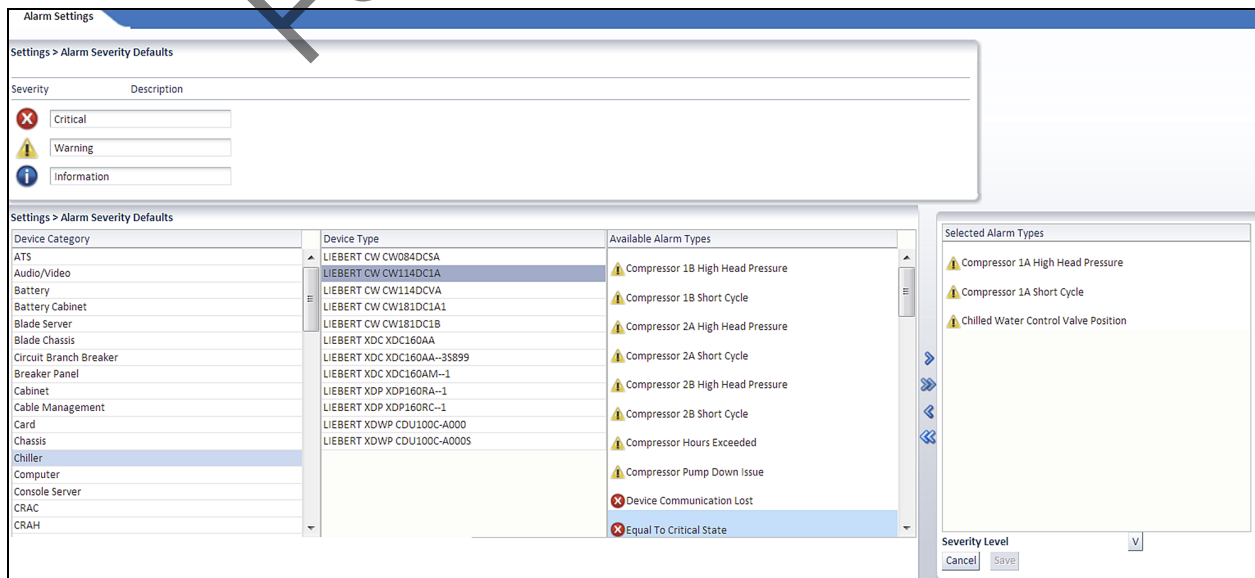
After selecting a device you can view a complete list of the alarms for that device from any of the following screens:

- Alarm Settings from the Administration menu
- Alarm Escalation Trigger from the Monitoring Configuration accordion
- Notification Rule from the Administration menu

Viewing and assigning alarm severity levels

Alarms can be assigned by severity and device type. Multiple alarms can be selected for a device category and you can change the severity level for all the selected alarms. Also, if alarms are normalized across device types, such as UPS device types, you can select from a list of normalized alarms to change mapping. For example, you can change critical to warning.

Alarm Severity Defaults Screen



To view alarms by severity:

1. From the Quick Launch menu, click *Alarm Viewer* and select the alarm.

NOTE: The default view contains the severity, start date/time, alarm description and subject name. The view is filtered by active alarms and sorted by the start date and time in descending order.

2. Click the column header to refresh the view.
-or-
Click the *Severity* column arrow to view alarms by severity.
3. Click the icons at the top left corner to filter alarms by severity.
-or-
Click to update the log by filtered alarms.

To assign/modify the severity level for one or more alarms:

1. From the Administration menu, under *System Configuration*, click *Alarm Settings*.
2. On the Alarm Settings screen, under *Settings - Alarm Severity Defaults*, select a device category.
3. Select a device type, then select one or more of the available alarm types and move them to the Selected Alarm Types column.
4. Click the V severity level icon, select the severity level from the drop-down list and click *Save*.

Renaming the default alarm severity

This global configuration allows you to rename the following default severity levels: critical, warning and informational. Any changes are applied to all managed equipment.

To modify the name of an alarm severity level:

Click the *Alarm Settings* tab in the Severity Description field, modify the description of the alarm and click away from the field to save.

Assigning active alarms

Alarms can be assigned to specific users. After an alarm has been assigned, an email or SMS message is sent and assignees are notified according to their notification schedule. Users can only view and manage alarms that have been assigned to them through roles and assign rights.

To assign active alarms:

1. From the Quick Launch menu, select *Alarm Viewer*, and in the Alarm Viewer screen, right-click an active alarm and select *Assign Alarm* to display a list of users.
2. From the Unassigned column, select one or more users, use the arrows to move them to the Assigned column, click *Save* and on the confirmation message, click *OK*.

NOTE: If the account notification profile has not been configured, a red icon is displayed next to the user.

Assigning alarms by floor or space

After selecting a floor or space, you can assign all alarms generated in those areas to specific users. Users must have a Facilities Admin or Operator role. If a floor is selected, alarms from all its containers are also assigned. If devices are added to the floor or space after alarms have been assigned, they are included. If a device is moved from the floor space, the assignment no longer applies.

To assign alarms by floor or space:

1. In Portfolio or 2D Graphical View, select the floor or space, right-click and select *Assign Alarm* to display a list of users.
2. From the Unassigned column, select one or more users, use the arrows to move them to the Assigned column and click *Save*.
3. On the confirmation message, click *OK*.

Assigning alarms by equipment

Alarms for one or more managed devices can be assigned to a user with the Facilities Admin or Operator role.

To assign alarms by devices:

1. In Portfolio or 2D Graphical View, select the device, then right-click and select *Assign Alarm* to display a list of users.
2. From the Unassigned column, select one or more users, use the arrows to move them to the Assigned column and click *Save*.
3. On the confirmation message, click *OK*.

To unassign an alarm:

1. From the Quick Launch menu, click *Portfolio* and expand the *Enterprise*, building, floor and space nodes.
2. Select and right-click the device with an assigned alarm, then select *Assign alarm* from the menu.
3. From the Assigned column, select one or more users, use the arrows to move them to the Unassigned column and click *Save*.

Acknowledging alarms

Active alarms can be acknowledged in the Alarm Summary list or calendar. When an alarm is acknowledged by a user, the name of the user and the date and time of the acknowledgment is recorded. After acknowledgment another user cannot acknowledge the same alarm.

To acknowledge alarms:

1. From the Quick Launch menu, click *Alarm Viewer* and select one or more alarms in the list or calendar.
2. Right-click and select *Action - Acknowledge*.
3. Click *View - Show All* and move to the Acknowledged by and Date and time columns (on the right) to display the acknowledged alarms.

Clearing alarms

If a resolved alarm is not automatically cleared by an event, it can be manually cleared.

To clear an alarm:

1. From the Quick Launch menu, click *Alarm Viewer* and select one or more alarms in the list or calendar.
2. Right-click and select *Actions - Manual Clear*.
3. Enter any comments and click *Add*.
-or-
Click *Skip* to skip the comment and clear the alarm.
4. In the Alarm State filter, select *Resolved* and click *Filter* to update the view.

Adding comments to alarms

Comments can be added to any of the alarms received in the Alarm Summary List or calendar. Comments by other users can also be viewed.

To add comments to an alarm:

1. In the list or calendar, right-click the alarm and select *Actions - Add Comments*.
2. Enter your comments and click *OK*.

To view comments in the alarm list columns:

Click *View - Columns - Show More Column*, select the columns to view and click *OK*.

Suppressing alarms

Alarms can be suppressed and these suppressed alarms can be viewed in a calendar. Alarms can also be suppressed for a specific device. If needed, you can also unsuppress an alarm before the specified time has lapsed.

NOTE: When a floor is in maintenance mode, all alarm notifications from all the devices on the floor are suppressed.

Suppressing individual alarms received from a device on a floor

Individual and multiple nuisance alarms that are triggered intermittently can be suppressed for a specified duration. Read and write access is required to view the floor and suppress alarms received from managed equipment.

To suppress individual alarms received from a device on a floor:

1. In Portfolio or 2D Graphical View, navigate to the floor with the monitored device.
2. Select and right-click the monitored device, then click *Action - Suppress Alarm*.
3. Select the alarm to be suppressed, click the right arrow, configure the duration to suppress the alarm and click *Suppress*.

NOTE: Time duration includes the start date and time and the end date and time.

4. Wait for the alarms to be generated, and in the State column of the Alarm Viewer, select *Suppressed Alarms* and view the suppressed alarms in the calendar.

To unsuppress an alarm:

1. From the Quick Launch menu, click Portfolio and expand the *Enterprise*, building, floor and space nodes.
2. Select and right-click the device having the suppressed alarm, then click *Action - Suppress Alarm*.
3. Select the alarm, click the left arrow and click *Suppress*.
4. Generate an alarm and verify the generated alarm is suppressed.

Managing threshold alarms

The six threshold alarm levels are High Critical, High Warning, Low Warning, Low Critical, Equal to Warning and Equal to Critical. The threshold values for any of these alarms can be defined so that when the values are exceeded, an alarm is generated and displayed in the Alarm Viewer.

To configure threshold alarms:

1. In Portfolio View, select a monitored device, expand the *Monitoring Configuration* accordion and click *Thresholds*.
2. On the Data Point Threshold table, select one of the groups to view and select from the alphabetical list of data points.
3. Enter the threshold and target values for one or more alarms, click *Save* and on the warning message, click *Save* again.

Configuring SNMP traps

Alarms received in any supported protocol, including SNMP traps from SNMP devices, can be translated into SNMP traps (v1, v2 or v3) before they are forwarded. Target/destination information must also be completed before the collected and generated active alarms can be forwarded. SNMP traps can be forwarded to third-party systems such as Network Management Systems (NMS).

NOTE: When configuring notification rules for SNMP traps, a Management Information Base (MIB) may be required. Please contact Customer Support to request the MIB database files.

SNMP Traps

New Edit Properties Remove				
Target Name	Target Address	Trap Port	Community	Trap Type
Demo Configuration	10.129.183.197	162	PUBLIC	SnmpV1
syed	10.129.197.28	162	PUBLIC	SnmpV2
nproddutPC	10.207.80.61	162	PUBLIC	SnmpV1
test	10.207.59.65	162	PUBLIC	SnmpV3

Configure SNMP Trap Cancel Save

* Target Name * Security Level

* Target Address * User Name

* Community * Password

* Trap Port * Auth Type

* Trap Type * Pass Phrase

To configure an SNMP trap:

1. From the Administration menu, under System Configuration, select *SNMP Trap Destination - New*.
2. In the Configure SNMP Trap fields, enter the target name, target address, community, trap port and SNMP type.
3. If SNMPv3 is selected as the trap type, select a security level, enter the required information and click *Save*.

Configuring Maintenance Mode

In Portfolio View, floors, spaces and devices can be placed in maintenance mode for a configured duration. When a device is in maintenance mode an icon is displayed next to the device. In 2D Graphical View, spaces and devices can be placed in maintenance mode and are signified by the icon on the rack or floor-mounted device. While a floor is in maintenance mode, all alarm notifications from all the devices on the floor are suppressed. Any maintenance changes are added to the event log.

To place a floor in maintenance mode:

1. In Portfolio View, select and right-click the floor.
 2. Select *Status - Place in Maintenance Mode* and select a start date and time.
 3. Select *Automatically Set Normal on End Date* and specify an end date and time.
- or-
- Select *In Maintenance Mode until Manual Update*.
4. Click *OK*.

To place a space in maintenance mode:

1. In 2D Graphical View, open a space on the toolbar and click *Select Mode*.
 2. Select and right-click a space and select *Place in Maintenance Mode*.
 3. Select *Automatically Set Normal on End Date* and specify an end date and time.
- or-

Select *In Maintenance Mode until Manual Update*.

4. Click *OK*.

To place a device in maintenance mode:

1. In Portfolio View, select and right-click a monitored device and select *Status - Place in Maintenance Mode*.

-or-

In 2D Graphical View, select and right-click a monitored device and select *Place in Maintenance Mode*.

2. Select a start date and time.
3. Select *Automatically Set Normal on End Date* and specify an end date and time.

-or-

Select *In Maintenance Mode until Manual Update*.

4. Click *OK*.

To change a device from maintenance mode to normal mode:

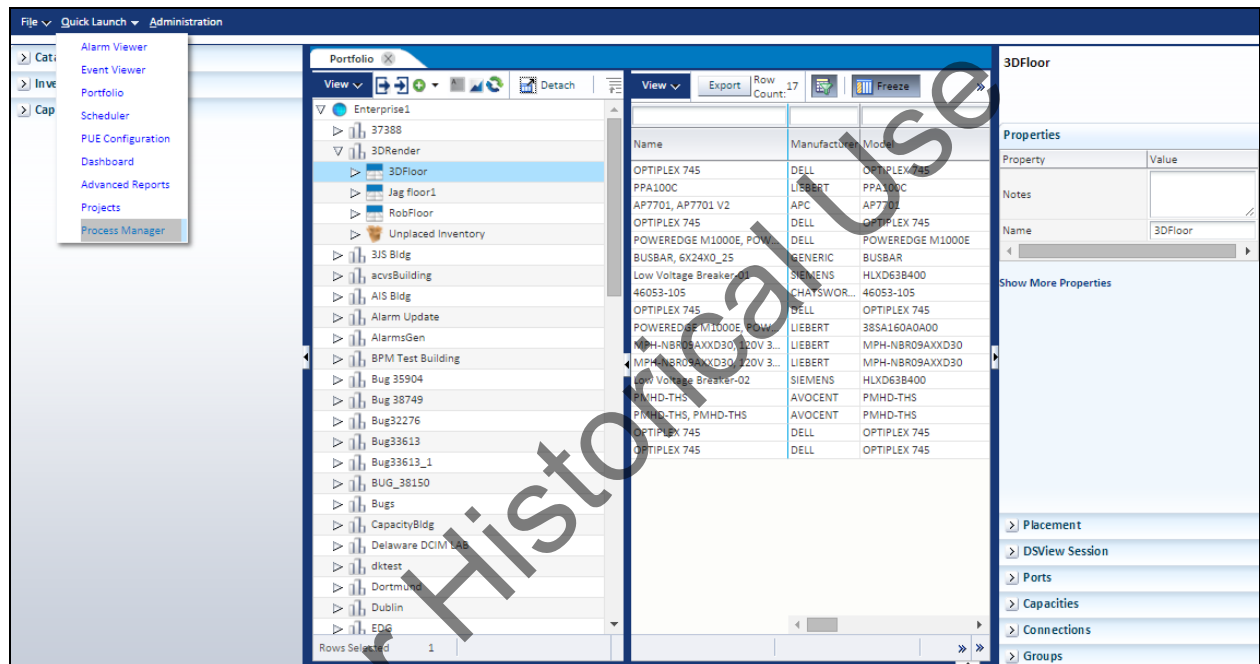
1. Select and right-click the monitored device.
2. Select *Return to normal*.

For Historical Use

The TRELIS™ Process Manager Module

With the *Trellis*™ Process Manager module, you can reduce errors and improve data center efficiency by organizing and tracking your process tasks. Creating a request is necessary to add, move, decommission or rename equipment in your data center. The request details the requirement for space, power, storage and network connections. The request follows a workflow and is forwarded to the roles who are responsible for completing the tasks. As tasks are completed, the *Trellis*™ Process Manager module tracks and automatically updates the status of each request. With Business Process Composer, you can create, model and deploy processes or customize workflows.

The *Trellis*™ Process Manager Module



The *Trellis*™ Process Manager module, indicated by the person icon in the top option bar, allows you to create tasks including the following default processes:

- Installing Equipment
- Moving Equipment
- Decommissioning Equipment
- Renaming Equipment

Each process is dependent on specific user roles, human tasks, business roles and objects. Dependencies for the processes are described later in the chapter.

Process Manager Administration

From the Administration menu, selecting *Process Manager* accesses the Process Manager administration menu with organization, flex fields and task administration menus. The sub-menus can also be categorized as the administrative, dashboard and workspace functions of the *Trellis*™ Process Manager module.

To allow external users access to the *Trellis*™ Process Manager module, [Adding an external authentication source](#) on page 40.

Organization

The organization menu is used for the administration of process and parametric roles, units, flex fields and task processes/roles.

Process Manager Roles

The Process Manager Roles workspace provides a list of tasks with the users or roles that are assigned to the tasks. A user must be assigned to a role to perform a task. There are three roles associated with the Process Manager module.

- BPMComposerAdmin - User has full access to BPM Composer and can customize, model and deploy a process. This role is required to log in to Business Process Manager Composer.
- ProcessAdministrator - User is the administrator for Process Manager and can set up users for approvals.
- ProcessOperatorRole - User is assigned tasks. Generally uses Process Manager daily.

Process Roles:

Process Roles are the user roles in a specific process. The Process Administrator can add any user with the Process Operator or Process Administrator role to one or any number of roles within each process. Each role is described under the Human tasks section for each process.

See [Process Workspace](#) on page 204 for the install process roles.

To add a user, group or role to a process role:

1. Click *Process Roles*, select the role name and in the Details screen, click the plus (+) icon to add a member.
2. Enter a name for the user, group or role and click the *Search* button.
3. Select the checkbox next to the ID name, click *OK* and click *Save*.

NOTE: To reset your changes, click *Revert* and on the confirmation message, click *Yes*.

Calendar

One or more sets of holidays can be created as a list and added to a calendar. The calendar adds the specified holidays when computing the duration of a task or process. You can create as many holiday rules as needed for different calendar rules.

To create a holiday list:

1. Create the list name, click the plus (+) icon and under Details, click the plus (+) icon to add.
 - or-
 - Click the pencil icon to edit.
 - or-
 - Click the delete (X) icon.

2. Enter the name, type and date and click *Save*.

To add a holiday list to the calendar:

1. Click the plus (+) icon and on the Add a Calendar pop-up box, enter the calendar name and click *OK*.
2. Under *Details*, select the time zone and holiday list from the drop-down menu, enable the applicable days and times and click *Save*.
3. On the confirmation message, click *Yes* to continue.

Organization Units

An organizational unit represents departments or divisions within an organization. Organizational units can contain child organizational units, creating a hierarchy that corresponds to your organization. When you create an organizational unit, you define the following:

- Organizational unit name
- Time zone
- Members of the organizational unit, which can include users, groups, application roles, or parametric roles
- Optional parent organizational unit
- Optional business calendar

When a process is associated with an organizational unit, only members of that organizational unit and its children can see that process and the tasks initiated by it. Root and child units can be created and added to represent your organization. Units can also be edited or deleted.

To add an organizational unit:

1. Select *New*, click the plus (+) icon and on the Create Organization Unit pop-up box, enter a name and click *OK*.
2. On the confirmation message click *OK*.

Parametric Roles

Parametric roles are groups of users logical roles created by the administrator that define either members of an organizational unit or task assignees. Members of parametric roles are dynamically evaluated at runtime by specifying them as a parametricised query in this workspace.

To create parametric roles:

1. Select *New*, click the plus (+) icon and under *Details*, enter a name and click *OK*.
2. Under *Define Parameters*, use the drop-down menus to select conditions for the parametric role.
3. If desired, you can enter an application name and click the search icon.

-or-

Click the search icon and on the Select Application Role pop-up box, use the drop-down menus to select the role and context for the application.

4. On the confirmation message, click *OK*, expand *Parameters*, click the plus (+) icon to add a parameter and enter the name.

5. Select *Number* or *String*, use the drop-down menus to select conditions for the parametric role and click *Save*.

Extended User Properties

Extended user properties are used to define parametric roles. Even when some properties have already been specified in the Oracle Internet Directory or some other LDAP directory, additional properties, specific to their organization and roles, may be necessary.

At times, these properties are added on demand when newer business processes are created. At that time, it might not be possible to extend the global LDAP directory of the company. In these cases, extended user properties are useful.

For example, you can specify that a given user with any representative role is located in a geographical region. From a functional point of view, there is only one role, but the individual user is associated with a property and that property has a value assigned for that user.

To add an extended user property:

1. Under Organization, click *Extended User Properties* and under Properties, click the plus (+) icon.
2. Enter a name, select a type, enter a value and click *Save*.

To map an Extended User Property:

1. Select a role from the drop-down menu, enter a description and click the search icon.
2. Click the plus (+) icon to add users and assign their properties.

Flex Fields - Public and Protected

Human workflow mapped flex fields store and query use case-specific custom attributes. These custom attributes typically come from the task payload values. Storing custom attributes in mapped attributes provides the following benefits:

- Displayed as a column in the task listing
- Filter tasks in custom views and advanced searches
- Used for a keyword-based search

Public and Protected Flex Fields are used for mappings. All or selected attributes such as number and date for Public Flex Fields, can be edited by task type. Administrators and users with the appropriate privileges can map both public and protected mapped attributes. They see both a Public Flex Fields node and a Protected Flex Fields node in the Administration menu.

To browse all mappings:

1. Click *Browse all mappings*.
2. Select a row in the label table to display all the payload attributes mapped to a particular label.

To edit mappings by task type:

1. Click *Edit mappings by task type*, enter a task type, and click *Search*.
2. Select a task type and click *OK*.
3. With the task type displayed in the Edit mappings by task type field, click *Go*.
4. Select a mapping label and click *Select*.

Task Administration

The Task Administration menu is used for creating approval groups, storing signature evidence for searches and managing task configuration rules.

Approval Groups

An approval group is a predefined set of users that are configured to act on a task in a certain pattern such as in serial or in parallel. You can create static or dynamic approval groups. An approval group also can contain a nested approval group in the pattern.

The name of an approval group is necessary when specifying the approval group list builder. The pattern is used by default to order the users who must act on the task. However, when creating the list builder, the default pattern can be overridden by specifying the voting method. After entering information you can click *Revert* to remove your most recent entries.

To create a static or dynamic approval group:

1. Click the plus (+) icon and select *Create Static or Dynamic* from the list.
2. Enter a new name for the group and click *Apply*.

To delete a member from an approval group:

1. Choose the appropriate member node from the approval group structure.
2. Click *Delete*. The approval group structure refreshes and the member node has been deleted.

Evidence Search

The evidence store service is used for digital signature storage and nonrepudiation of digitally signed human tasks.

Task Configurations

Business users and administrators can review and modify rules that are predefined by the workflow designer. The predefined rules can be changed for a specific customer based on the corporate policies.

You can edit the event and data-driven rules associated with an approval flow when the workflow has already been deployed.

The notification header in the task configuration screen can be changed by clicking the *Edit* icon.

Process Dashboard

Dashboards include graphic representations of metrics gathered during the execution of a process.

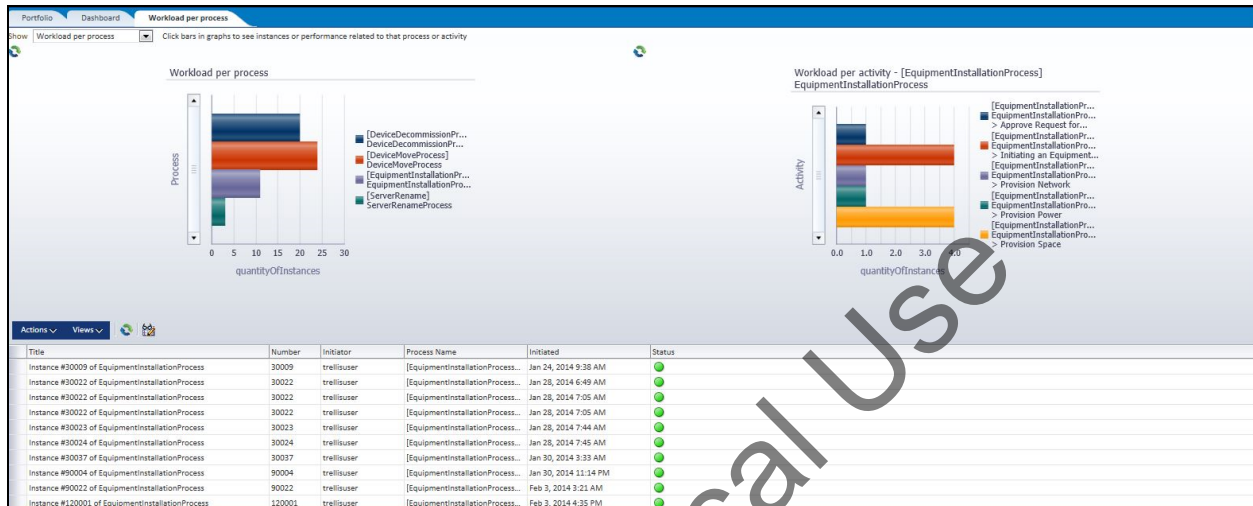
The following are process dashboards:

- Workload per process
- Performance per process
- Workload per participant
- Performance per participant

In each of the process dashboards, clicking the bar graph on the left displays a more specific bar on the right side of the workspace. Clicking the bar on the right displays more data in a table. This section explains how each type of dashboard operates. The dashboard data will be updated 30 minutes after any task action.

NOTE: Each time you change the selected graph, you must click the new graph to populate the table.

Process Dashboard



To access the Process Dashboard:

Click *Quick Launch - Dashboard*.

Process Workspace

In the process workspace, the Process Request, Process Tracker Views, Task List Views and Process Reports workspaces can be accessed. When you select a task in the top section the workspace for the selected task is displayed under the task list.

Process Request

From the Process Request accordion, you can initiate a request to add, move, decommission or rename equipment in the data center. The request form provides the requirements for space, power, storage and network connections. The request follows a workflow that is forwarded to the roles that are responsible for completing each of the tasks. As the tasks are completed, the *Trellis™* Process Manager module tracks each process and automatically updates the status of the request.

NOTE: Names are usually continuous without spaces. In the following tables, a line break is used to allow the table to fit on the page and is not an indication that there is a break in the name.

Equipment Install

The equipment install process provides end to end flow for installing a device in data center. A typical device installation requires provisions for space, power and network cabling. This business process provides separate roles for provisioning these requests. Once all the provision requests have been approved, the device is created in the *Trellis™* Inventory. When the task is complete, a notification is sent to the requester

indicating whether installation was successful or not. The installed device can then be viewed in Portfolio View.

NOTE: This process does not utilize web forms.

Process Details: Equipment Install

Name	Description
Process Name	EquipmentInstallationProcess
Service Oriented Architecture (SOA) Project Name	EquipmentInstallationProcess
UI Project Name	EquipmentInstallationUI

User roles

The equipment install process is dependent on the following user roles:

- EquipmentInstallationProcess.EquipmentRequestor: Initiates the process of equipment installation.
- EquipmentInstallationProcess.Approvers: Approves the equipment installation request. This role is used if the business rule dictates manual approval.
- EquipmentInstallationProcess.DataCenterTechnician: Provisions space for the device to be installed. This role allows a user to edit the placement and specify the exact location where a device is to be installed. This role is also responsible for final confirmation before the service call is made for device creation and placement.
- EquipmentInstallationProcess.PowerTechnician: Creates power connections for the selected devices and confirms the connections to ensure the system can proceed with device installation. This role is used if the initial request has a requirement for power provision.
- EquipmentInstallationProcess.StorageProvisioner: Provisions storage space and confirms the available space so the system can move ahead with device installation. This is used if the initial request has a requirement for storage provision.
- EquipmentInstallationProcess.NetworkProvisioner: Creates data connections for the selected devices and confirms the connections so the system can proceed with device installation. This role is used if the initial request has a requirement for network provision.
- EquipmentInstallationProcess.Administrator: Views and corrects all error scenarios.

Human tasks

The equipment install includes the following human task components.

Human Tasks: Equipment Install

Task Name	Role	Pattern	Title	Outcome	Description
EquipmentInstall Initiator_HT	EquipmentInstallation Process.Equipment Requestor	Initiator	Initiate Equipment Install	Submit	The starting point of the process and responsible for triggering the request for equipment install.

Task Name	Role	Pattern	Title	Outcome	Description
EquipmentInstall Approver_HT	EquipmentInstallation Process.Approvers	Simple	Approve Equipment Install	Approve, Reject	This role is used if manual approval is needed (as per the business rule DetermineInstall ApprovalRules_BR), when the request is submitted.
Provisioning Space_HT	EquipmentInstallation Process.DataCenter Technician	Simple	Provision Space For Equipment Install	Submit	Provisions space in data center for the specified device. When complete, approves the request for further actions.
Provisioning Power_HT	EquipmentInstallation Process.Power Technician	Simple	Provision Power For Equipment Install	Ok	Provisions power in data center for the specified device. When complete, approves the request for further actions.
Provisioning Network_HT	EquipmentInstallation Process.Network Provisioner	Simple	Provision Network For Equipment Install	Ok	Provisions network in data center for the specified device. When complete, approves the request for further actions.
Provisioning Storage_HT	EquipmentInstallation Process.Storage Provisioner	Simple	Provision Storage For Equipment Install	Ok	Provisions storage in data center for the specified device. When complete, approves the request for further actions.
Provisioning Cabling_HT	EquipmentInstallation Process.Network Cabler	Simple	Provision Network Cabling For Equipment Install	Ok	Provisions additional network cabling in data center for the specified device. When complete, approves the

Task Name	Role	Pattern	Title	Outcome	Description
					request for further actions.
Equipment Installer_HT	EquipmentInstallation Process.DataCenter Technician	Simple	Install Equipment	Ok	Installs the equipment. Once this task is completed by user, service calls are made by the process to create the device in the software.
TrellisIntegration ErrorResolution_ HT	EquipmentInstallation Process.Administrator	Simple	Trellis Integration Error Resolution	Ok	Admin role used to view and resolve all the integration errors which can happen while performing service calls or notifications.
Notify Administrator_HT	EquipmentInstallation Process.Administrator	Simple	Notify Administrator	Ok	Sends notification to the administrator.

Business rules

The following are the business rules for this component.

Business Rules: Equipment Install

Rule Name	Decision Function	Associated Data Object	Description
DetermineInstallApproval Rules_BR	DetermineInstallApprovalRules_ BR_DecisionService	EquipmentInstallDO, approvalOutcome	Determines if manual approval is needed for this installation.

Business objects

The following are the business objects for this component.

Business Objects: Equipment Install

Business Object Name	Module Name	Reference Resource	Purpose
ApprovalRuleBO	EquipmentInstall Module	ApprovalRuleBO.xsd	Determines whether manual approval is needed for the equipment install or not.
EquipmentInstallBO	EquipmentInstall Module	EquipmentCUDRequest.xsd	Required to store information related to creation of device such as symbol information and placement information.
TrellisIntegrationError	EquipmentInstall	TrellisIntegrationError	Stores any integration error related

Business Object Name	Module Name	Reference Resource	Purpose
SummaryBO	Module	SummaryBO.xsd	data
FaultBO	FaultModule	BPMFault.xsd	Describes the fault parameters and composite instance information where the fault happened while processing the request.

Data objects

The following are the data objects for this component.

Data Objects: Equipment Install

Data Object Name	Data Object Type	Reference Resource Data Objects	Description	Usage
approvalNeededOutcome	String	NA	Stores the business rule execution outcome	Used to decide if approval is needed or not based on business rule
EquipmentInstallIDO	EquipmentInstall Request	EquipmentCUD Request.xsd	Contains information of cost center, preferred location, and equipment information.	Used by human task components to transfer data across.
approvalOutcome	String	NA	Indicates the outcome of the approver.	Stores the approver outcome
errorList	TrellisIntegrationError SummaryBO	TrellisIntegrationError SummaryBO.xsd	Stores the integration errors.	Used for the flow of handling integration errors, by Process Manager admin
InitiatingUser	String	NA	Stores the initiating user	Used during notification flow to notify the initiating user about process outcome.
PowerProvisionOutCome	EquipmentInstall Request	EquipmentCUD Request.xsd	Stores outcome of power provisioning	Used in power provisioning flow
NetworkProvisionOutCome	EquipmentInstall Request	EquipmentCUD Request.xsd	Stores outcome of network provisioning	Used in network provisioning

Data Object Name	Data Object Type	Reference Resource Data Objects	Description	Usage
				flow
TaskOutcome	String	NA	Outcome of task	Used to check if task outcome is withdrawn.
taskPriority	Int	NA	Priority of the task	Used by all task components to set task priority
ApprovalRuleDO	ApprovalRuleBO	ApprovalRuleBO.xsd	Not used	Not used

Service Calls

The following table describes the service calls available for this component.

Service Calls: Equipment Install

Service name	WSDL name	Purpose
PreCannedProcessService	PreCannedProcessServiceV1.wsdl	Used to perform create device operation in asynchronous manner.

The WSDL is invoked in an asynchronous manner. Request port type is PreCannedProcessServicePortType which uses InstallEquipments as the operation and EquipmentInstallRequest as the message type. Callback port type is PreCannedProcessServiceCallBackPortType which uses InstallEquipmentsCallBack as operation and EquipmentInstallResponse as the message type. Both of these messages are constructed using element types which are defined in PreCannedMessagesBulk-v1.0.xsd. Core Elements are under "EquipmentAttributes" child element inside "Equipment" element which represents one instance of equipment. The following table describes the major elements in the request:

Core Elements: Equipment Install

Element Name	Description
BuildingName	Building name.
DesignPowerCapacity	Designed power capacity for this device.
DeviceName	Name of the device to be installed.
DeviceType	Type of device.
Id	Represents device ID. This is generated by the software after device is created.
Manufacturer	Device manufacturer.
Model	Device model.

The placement related elements provide placement related information. They are located inside the Placement child element of EquipmentAttributes. The following table describes the placement related elements

Placement Related Elements: Equipment Install

Element Name	Description
SpaceName	Space name.
SpaceId	The universally unique identifier (UUID) for the space.
ParentId	The UUID for the container device. Examples of parent containers are rack or switch gear.
Type	Parent device type. For example, a rack.
XCoordinate	Required when a device is placed directly inside space and specifies the X coordinate of the device from space origin.
YCoordinate	Required when a device is placed directly inside space and specifies the Y coordinate of the device from space origin.
ZCoordinate	Required when a device is placed directly inside space and specifies the Z coordinate of the device from space origin.
Rotation	Defines the degree of rotation with which the device would be placed on floor or inside a parent container. This rotation is with respect to the symbol image.
RackSide	The side of the rack where a device is to be placed; required if the parent container is rack. The possible values are front or rear.
RU	The number for the rack unit space where the device is located.
Location	The zero U location of a device; applicable if the zero U placement is inside a rack as parent container.
UHeight	The rack unit height inside the zero U space; applicable if a device is placed inside zero U.
XOffset	The X offset inside zero U placement; applicable if device is placed inside zero U.
X Position	Allows you to move a unit from side-to-side in an RU space. When a device is rotated to sit on its end, it can be moved horizontally to allow space for a side-by-side installation.

The connection related elements provide data connection and power connection related information. They are located inside the connections element which is part of DeviceAttributes. This element has zero or more occurrences based on the connections specified by the requestor.

Connection Related Elements: Equipment Install

Element Name	Description
ConnectedFromPort	Port name on device
ConnectedToDevice	Target device name
ConnectedToPort	Port name on target device
ConnectionType	Connection type (POWER_CONNECTION or DATA_CONNECTION)

Response contains connections related response and placement related response. If there is any error, it is populated as part of ErrorMessage and ErrorCode elements which are inside EquipmentInstallResponseMessage > PreCannedResponseStatus > Status.

Task Flows

This process has following task flows. These are part of "EquipmentInstallationUI" project:

- **EquipmentInstallApprover_HT_TaskFlow:** This task flow is associated with approver human task, which is responsible for approving or rejecting the device installation.
- **EquipmentInstallInitiator_HT_TaskFlow:** This task flow is associated with the initiator human task which submits the request for new device installation.
- **TrellisIntegrationErrorResolution_HT_TaskFlow:** This task flow is associated with the error resolution flow for handling BPM-Trellis Integration errors.

To initiate an equipment install request:

1. From the Quick Launch menu, click *Process Manager* and in the Process Request accordion, click *Install Equipment*.
2. Enter the project name, date for completion and cost center.
3. Using the radio buttons, select the provisioning requirements for power, network, storage and urgency.
4. From the drop-down menu, select a building and a floor.
5. Click the plus (+) icon to search the catalog, select the equipment and click *OK*.
6. If desired, enter the device name and any additional details.
7. Repeat steps 5 and 6 for any additional equipment to be added, attach any supporting documentation and click *Submit*.

After the process request is submitted, an email notification is sent to approve the request.

To approve an equipment install request:

1. From the Quick Launch menu, click *Process Manager*.
2. From the My Tasks list, double-click the *Approve Equipment Installation* request and select *Accept*, *Reject* or *Claim*. If the request is accepted, an email notification is sent to provision space for the equipment.

-or-

If the request is rejected, the approver enters a reason for rejection, clicks *OK* and *Reject*.

-or-

If the request is claimed, the task is assigned to the approver.

To provision space for an equipment install request:

1. From the Quick Launch menu, click *Process Manager*.
2. From the My Tasks list, double-click the *Provision space for Project* request.
3. Select *Edit Placement*, select placement details from the drop-down menus.
4. Enter the applicable RU and click *OK*.

After the space is provisioned, if applicable, an email notification is sent to provision power.

To provision power for an equipment install request:

1. From the Quick Launch menu, click *Process Manager*.
2. From the My Tasks list, double-click the *Provision power for Project* request.
3. Select *Edit Connection* and click *Add*.
4. Search for the device, select the port and click *OK*.
5. From the drop-down list, select the name of the port and click *OK*.

After the power is provisioned, if applicable, an email notification is sent to provision the network.

To provision a network for an equipment install request:

1. From the Quick Launch menu, click *Process Manager*.
2. From the My Tasks list, double-click the *Provision network for Project* request.
3. Select *Edit Connection*, click *Add*, search for the device, select the port and click *OK*.
4. From the drop-down list, select the name of the port and click *OK*.

When all provisioning is complete, a successful equipment install message is displayed to the user and an email notification is sent to all approvers.

When all provisions are complete, the Install Equipment Task is created and assigned to the Data Center Technician.

To confirm equipment install requests:

1. From the Quick Launch menu, click *Process Manager*.
2. From the My Tasks list, double-click the *Install Equipment for Project* request and click *OK*.

When the install is confirmed, the request is closed. If there are any errors during the process, the task will be assigned to the administrator for error resolution.

To resolve integration exceptions:

1. From the Quick Launch menu, click *Process Manager*.
2. From the My Tasks list, double-click the *Resolve integration Exceptions Equipment Install for Project* request.
3. Verify all device statuses and click *OK*.

After a task has been created, the task can be reassigned or withdrawn.

To reassign or withdraw a task:

1. From the Quick Launch menu, click *Process Manager*.
2. From the My Tasks list, double-click on the task.
3. Click *Actions*.
4. Select *Reassign* from the drop-down menu to reassign the task.

-or-

Select *Withdraw* from the drop-down menu to withdraw the request.

Decommission Equipment

Decommission Equipment is a process request to decommission equipment from the data center. After the process request is submitted, an email notification is sent to approve the request. When the decommission equipment request is approved, sub-tasks for decommissioning power, storage and network connections are created. After all of the tasks and sub-tasks are complete, the decommission is confirmed and the request is closed. When the physical decommission is complete, the selected device is removed from the *Trellis*™ platform.

If any errors occur during the decommission task, a notification is sent to the administrator with the error details.

Process Details

The following are the process details for this component.

Process Details: Equipment Decommission

Name	Description
Process Name	DeviceDecommissionProcess
SOA Project Name	EquipmentDecommissionProcess
UI Project Name	EquipmentDecommissionUI

User Roles

The equipment decommission process is dependent on the following user roles:

- EquipmentDecommissionProcess.Requestor: Initiates the process of equipment decommission, schedules the process and provides final confirmation for the action.
- EquipmentDecommissionProcess.Approver: Approves the equipment installation request. This role gets involved if a business rule dictates manual approval.
- EquipmentDecommissionProcess.PowerTech: Confirms power decommissioning.
- EquipmentDecommissionProcess.StorageProvisioner: Confirms storage decommissioning.
- EquipmentDecommissionProcess.NetworkCabler: Confirms decommissioning of network cabling.
- EquipmentDecommissionProcess.Administrator: Handles administration tasks such as resolving error scenarios, sending notifications, and so on.

Human tasks

The equipment decommission includes the following human task components.

Human Tasks: Equipment Decommission

Task Name	Role	Pattern	Title	Outcome	Description
Decommission Initiator_HT	EquipmentDecommissionProcess.Requestor	Initiator	Initiate Device Decommission	Submit	Is starting point of the process and is responsible for triggering the request for device decommissioning action.
Decommission Approver_HT	EquipmentDecommissionProcess.Approver	Simple	Approve Equipment Decommission Request	OK	When request is submitted, if manual approval is needed (as per the business rule DetermineDecommissionApprovalRules_BR), then this task comes into picture.
Schedule Decommission_HT	EquipmentDecommissionProcess.Requestor	Simple	Schedule Device Decommission	OK	Performs scheduling of decommission action.
Decommission Power_HT	EquipmentDecommissionProcess.PowerTech	Simple	Decommission Power	OK	Performs power decommissioning

Task Name	Role	Pattern	Title	Outcome	Description
Decommission Storage_HT	EquipmentDecommission Process.Storage Provisioner	Simple	Decommission Storage	OK	Performs storage decommissioning
Decommission NetworkCabling_HT	EquipmentDecommission Process.NetworkCabler	Simple	Decommission Network Cabling	OK	Performs network cabling decommissioning
Physical Decommission_HT	EquipmentDecommission Process.Requestor	Simple	Physical Decommission of Device	OK	Final approval for the process. Once this role confirms the action, process invokes the software for actual device deletion.
TrellisIntegration ErrorResolution_HT	EquipmentDecommission Process.Administrator	Simple	Device Decommission: Resolve Trellis Integration Errors	OK	The admin role is used to view and resolve all the integration errors which can happen while performing service calls or notifications.
Notify Administrator_HT	EquipmentDecommission Process.Administrator	Simple	Decommission Process Errors	OK	Sends notification to administrator.

Business rules

The following are the business rules for this component.

Business Rules: Equipment Decommission

Rule Name	Decision Function	Associated Data Object	Description
DetermineDecommission ApprovalRules_BR	DetermineDecommission ApprovalRules_BR_ DecisionService	DecommissionDO, approvalNeededOutcome	Determines if manual approval is needed for device decommissioning.

Business objects

The following are the business objects for this component.

Business Objects: Equipment Decommission

Business Object Name	Module Name	Reference Resource	Purpose
ConfigBRResponse	DecommissionModule	ConfigBRResponse.xsd	Indicates approver's approval outcome for the equipment move.
DecommissionBO	DecommissionModule	EquipmentCUD Request.xsd	Required to store information related to decommissioning of device such as cost center information and placement information.
TrellisIntegration ErrorSummaryBO	DecommissionModule	TrellisIntegrationError Summary.xsd	Stores any integration error related data

Business Object Name	Module Name	Reference Resource	Purpose
FaultBO	FaultModule	BPMFault.xsd	Describes the fault parameters and composite instance information where the fault happened while processing the request.

Data objects

The following are the data objects for this component.

Data Objects: Equipment Decommission

Data Object Name	Data Object Type	Reference Resource Data Objects	Description	Usage
DecommissionDO	EquipmentDecommission Request	EquipmentCUD Request	This stores device information	Stores device and placement information
approvalNeeded Outcome	String	NA	This stores outcome as string	Checks outcome of approval (REJECT, AUTOMATIC_APPROVE etc)
processCorrelationId	String	NA	Correlation ID for the process	Sets process correlation ID
errorList	TrellisIntegrationError Summary	TrellisIntegrationError SummaryBO.xsd	This stores the integration errors.	Flow of handling integration errors, by the admin
InitiatingUser	String	NA	User which has started the process	Stores value of the creator field. This is used in the To setting while sending notifications.
taskOutcome	String	NA	Stores the outcome of task	Displays task outcome
ApprovalOutput BRDO	ConfigBRResponse	ConfigBRResponse.xsd	Stores approval outcome for business rule	Indicates outcome of business rule evaluation for manual approval of decommissioning.
taskPriority	Int	NA	Priority of task	Sets priority for the tasks.

Service Calls

Service Calls: Equipment Decommission

Service name	WSDL name	Purpose
DeviceAsyncBulkServiceV10	DeviceAsyncBulkService-v1.0.wsdl	Performs the delete device operation in asynchronous manner.

The WSDL is invoked in an asynchronous manner. The request port type is DeviceServiceBulkPortType which uses DeleteDevices as operation and DeleteDevicesRequest as the message type. The callback port type is DeviceServiceBulkCallBackPortType which uses DeleteDevicesCallBack as operation and DeleteDevicesResponse as message type. For the request, following information is populated. These are part of common schema.

Common Elements: Equipment Decommission

Element Name	Description
correlationId	Correlation ID for the process. Note that this is not related to software Device ID, but is the correlation ID used in the Service Oriented Architecture (SOA).
ID	Device ID of the device to be deleted. (This ID element is declared as Request Message > Device > ID).

The response contains delete operation related responses. If there are any errors, they are populated as part of ErrorMessage and ErrorCode.

Task Flows

This process has following task flows.

- DecommissionInitiator_HT_Taskflow: This task flow is associated with decommissioning of equipment.
- TrellisIntegrationErrorResolution_HT_Taskflow: This task flow is associated with the error resolution flow for handling software integration errors.

To decommission equipment:

1. From the Quick Launch menu, click *Process Manager* and click *Decommission Equipment*.
2. Enter the proposed decommission date, reason for decommission, decommission power, decommission network and decommission storage.
3. Enter the project name, cost center, cost center manager and project comments.
4. Attach any supporting documentation, click the plus (+) icon, select the devices to be decommissioned and click *Submit*.

NOTE: When decommissioning devices with children, do not include the individual children because they are automatically decommissioned as their chassis are decommissioned.

To approve a decommission equipment request:

1. From the Quick Launch menu, click *Process Manager*.

- From the My Tasks list, click the *Approve Equipment Decommission* request and select one of the following: *Approve* or *Reject*. If the request is approved, an email notification is sent to decommission the space.

-or-

For a rejected request, enter a reason for rejection, click *OK* and *Reject*.

To schedule decommission:

- From the Quick Launch menu, click *Process Manager*.
- From the My Tasks list, click *Schedule Decommission* request and click *OK*.
- Upon successful completion of tasks, decommission power, decommission storage and decommission network cabling subtasks will be created and if applicable email notification is sent to the respective provisioner.

To decommission space, power or network:

- From the Quick Launch menu, click *Process Manager*.
- On the My Tasks list, click the decommission request and click *OK*. Upon completion of the sub-tasks for provisioning power, storage and network connections, a request is sent to the initiator for the physical decommission.
- On the My Tasks list, click the physical decommission request and click *OK*.

To physically decommission a process request:

- From the Quick Launch menu, click *Process Manager*.
- From the My Tasks list, click the *Physical decommission* request and click *OK*.
- Upon successful completion of task email notification will be sent to requester.

Move Equipment

Move Equipment is a process for moving equipment from one location to another in your data center.

This process provides end to end flow for moving a device in a data center. A typical device move action requires provisions for space, power and network cabling. This business process provides separate roles for provisioning these requests. Once all the provision requests have been approved, application uses the Inventory Manager Application to move the device in Inventory. A separate notification is sent to the requestor and all approvals indicating whether movement was successful or not. The moved device can be verified in Portfolio View.

Process Details

Process Details: Equipment Move

Name	Description
Process Name	DeviceMoveProcess
SOA Project Name	DeviceMoveProcess
UI Project Name	DeviceMoveUI

User Roles

The move equipment process is dependent on the following user roles:

- DeviceMoveProcess.ProcessOwner: This role is responsible for creating request for move, provisioning for storage, power, network at new location and decommissioning storage, power and network at old location.
- DeviceMoveProcess.DataCenterTechnician: This role is used for final confirmation before making service call for the actual device movement.

Human Tasks

This process includes the following human task components.

Human Tasks: Equipment Move

Task Name	Role	Pattern	Title	Outcomes	Description
InitiateDevice Move_HT	DeviceMove Process. ProcessOwner	Initiator	Initiate Device Move	SUBMIT	Starting point for the process and is responsible for triggering the request for device move action.
ApproveEquipment MoveRequest_HT	DeviceMove Process. ProcessOwner	Simple	Approve Equipment Move Request	APPROVE, REJECT	Request is submitted, if manual approval is needed (as per the business rule "DetermineApproval_BR"), then this role comes into picture.
ProvisionSpace_HT	DeviceMove Process. ProcessOwner	Simple	Provision Space For Equipment Move	SUBMIT	Performs action of provisioning space in data center for the specified device. One done, it approves the request for further actions.
ProvisioningPower_HTDeviceMoveProcess. ProcessOwner	DeviceMove Process. ProcessOwner	Simple	Provision Power For Equipment Install	OK	Performs action of provisioning power in data center for the specified device. One done, it approves the request for further actions.
ProvisioningNetwork_HT	DeviceMove Process. ProcessOwner	Simple	Provision Network For Equipment Move	OK	Performs action of provisioning network in data center for the specified device. One done, it approves the request for further actions.
ProvisioningStorage_HT	DeviceMove Process. ProcessOwner	Simple	Provision Storage For Equipment Move	OK	Performs action of provisioning storage in data center for the specified device. One done, it approves the request for further actions.
ProvisionNetwork Cabling_HT	DeviceMove Process. ProcessOwner	Simple	Provision Network Cabling For	OK	Performs action of provisioning additional network cabling in data

Task Name	Role	Pattern	Title	Outcomes	Description
			Equipment Move		center for the specified device. One done, it approves the request for further actions.
MoveDevice Physically_HT	DataCenter Technician	Simple	MoveDevice Physically	OK	Performs action of moving the equipment. This is last human task in the flow. Once this task is completed by user, service calls are made by the process to move the device in the software.
Decommission Power_HT	DeviceMove Process. ProcessOwner	Simple	Decommission Power	OK	Performs action of decommissioning of the existing power cabling which was used at device's old location.
Decommission storage_HT	DeviceMove Process. ProcessOwner	Simple	Decommission Storage	OK	Performs action of decommissioning of the existing storage which was used at device's old location.
Decommission Network Cabling_HT	DeviceMove Process. ProcessOwner	Simple	Decommission Cabling	OK	Performs action of decommissioning of the existing network cabling which was used at device's old location.
ResolveIntegration Exceptions_HT	DeviceMove Process. ProcessOwner	Simple	Software Integration Error Resolution	OK	The admin role is used to view and resolve all the integration errors which can happen while performing service calls or notifications.
NotifyAdministrator_HT	DeviceMove Process. ProcessOwner	Simple	Notify Administrator	OK	Sends notification to administrator.

Business Rules

This process includes the following business rule components.

Business Rules: Equipment Move

Rule Name	Decision Function	Associated Data Object	Description
DetermineApproval_BR	DetermineApproval_BR_DecisionService	MoveDO, ApprovalOutcome	Determines if manual approval is needed for device movement.

Business Objects

This process includes the following business objects components.

Business Objects: Equipment Move

Business Object Name	Module Name	Reference Resource	Purpose
BusinessRuleOutputBO	MoveModule	BusinessRuleOutputBO.xsd	Indicates approver approval outcome for the equipment move.
MoveBO	MoveModule	MoveBO.xsd	Required to store information related to movement of device such as symbol information, cost center information and placement information.
TrellisIntegrationErrorSummaryBO	MoveModule	TrellisIntegrationErrorSummaryBO.xsd	Stores any integration error related data
FaultBO	FaultModule	BPMFault.xsd	Describes the fault parameters and composite instance information where the fault happened while processing the request.

Data objects

The following are the data objects for this component.

Data Objects: Equipment Move

Data Object Name	Data Object Type	Reference Resource for data objects	Description	Usage
MoveDOe	EquipmentMove Request	EquipmentCUD Request	This stores device information	Stores device and placement information
ApprovalOutcome	String	NA	This stores outcome as string	Checks the outcome of approval (REJECT, AUTOMATIC_APPROVE etc)
NetworkProvision Outcome	String	NA	This stores outcome of network provisioning	Used in network provisioning flow
PowerProvision Outcome	String	NA	This stores outcome of power provisioning	Used in power provisioning flow
StorageProvision Outcome	String	NA	This stores outcome of storage provisioning	Used in storage provisioning flow
NetworkCabling ProvisionOutcome	String	EquipmentCUD Request.xsd	This stores outcome of network cabling provisioning	Used in network cabling provisioning flow
errorList	TrellisIntegrationError SummaryBO	TrellisIntegrationError SummaryBO.xsd	This stores the integration errors.	Used for the flow of handling integration errors, by the admin
PowerDO	EquipmentMove Request	EquipmentCUD Request.xsd	This stores device move related information which is used in power provisioning flow	Used in power provisioning flow (ProvisionPower human task)
DataDO	EquipmentMove Request	EquipmentCUD Request.xsd	This stores device move related information which is used in data	Used in network provisioning flow (ProvisionNetwork human task)

Data Object Name	Data Object Type	Reference Resource for data objects	Description	Usage
			provisioning flow	
BusinessRuleOutputDO	BusinessRule OutputBO	BusinessRule OutputBO.xsd	Stores outcome of business rule	Used to check if business rule implies to perform manual approval or not.
taskState	String	NA	Stores value of task state	Used to check if task has been withdrawn or not
taskPriority	String	NA	Priority of the task	Used by all components to set task priority

Service Calls

The following are the service calls for this component.

Service Calls: Equipment Move

Service name	WSDL name	Purpose
PreCannedProcessService	PreCannedProcessServiceV1.wsdl	WSDL is used to perform the move device operation in asynchronous manner.

The WSDL is invoked in asynchronous manner. The request port type is PreCannedProcessServicePortType which uses MoveEquipments as operation and

EquipmentMoveRequest as the message type. The callback port type is PreCannedProcessServiceCallBackPortType which uses MoveEquipmentsCallback as operation and EquipmentMoveResponse as the message type. Both of these messages are constructed using element types which are defined in PreCannedMessagesBulk-v1.0.xsd. The core elements are under EquipmentAttributes child element inside the Equipment element which represents one instance of equipment. The following table describes the major elements in this schema.

Core Elements: Equipment Move

Element Name	Description
BuildingName	Building name
DesignPowerCapacity	Designed power capacity for this device
DeviceName	Device name of the device to be installed
DeviceType	Device type
ID	This attribute represents device ID. This would be generated by software after device is created
Manufacturer	Device manufacturer
Model	Device model

The placement related elements provide placement related information. They are located inside the Placement child element of EquipmentAttributes.

Placement Related Elements: Equipment Move

Element Name	Description
SpaceName	Space name.
SpaceID	The UUID for the space.
ParentID	The UUID for the container device. Examples of parent containers are rack or switch gear.
Type	Parent device type. For example, a rack.
XCoordinate	Required when a device is placed directly inside space and specifies the X coordinate of the device from space origin.
YCoordinate	Required when a device is placed directly inside space and specifies the Y coordinate of the device from space origin.
ZCoordinate	Required when a device is placed directly inside space and specifies the Z coordinate of the device from space origin.
Rotation	Defines the degree of rotation with which the device would be placed on floor or inside a parent container. This rotation is with respect to the symbol image.
RackSide	The side of the rack where a device is to be placed; required if the parent container is rack. The possible values are front or rear.
RU	The number for the rack unit space where the device is located.
Location	The zero U location of a device; applicable if the zero U placement is inside a rack as parent container.
UHeight	The rack unit height inside the zero U space; applicable if a device is placed inside zero U.
XOffset	The X offset inside zero U placement; applicable if device is placed inside zero U.
X Position	Allows you to move a unit from side-to-side in an RU space. When a device is rotated to sit on its end, it can be moved horizontally to allow space for a side-by-side installation.

The connection related elements provide data connection and power connection related information. They are located inside the connections element which is part of DeviceAttributes. This element has zero or more occurrences based on the connections specified by the requestor.

Connection Related Elements: Equipment Move

Element Name	Description
ConnectedFromPort	Port name on device
ConnectedToDevice	Target device name
ConnectedToPort	Port name on target device
ConnectionType	Connection type (POWER_CONNECTION or DATA_CONNECTION)

Response contains connections related response and placement related response. If there is any error, it is populated as part of ErrorMessage and ErrorCode elements which are inside EquipmentInstallResponseMessage > PreCannedResponseStatus > Status.

Task Flows

This process has following task flows. These are part of "DeviceMove" project:

- **ApproveDeviceMoveTF:** This task flow is associated with approver device move, which is responsible for approving or rejecting the device move action.
- **DecomissionNetworkCablingTF:** This task flow is associated with decommissioning of network cabling.
- **DecomissionPowerTF:** This task flow is associated with decommissioning of power cabling
- **DecomissionStorageTF:** This task flow is associated with decommissioning of storage space.
- **DeviceDetailsTF:** This task flow is used to get device details and power and data connection related information.
- **DeviceMoveRequestTF:** This task flow is used to initiate device move action
- **MoveDevicePhysicallyTF:** This task flow is associated with device physical movement action page
- **ProvisionNetworkCablingTF:** This task flow is associated with network cabling provision.
- **ProvisionNetworkTF:** This task flow is associated with network provision.
- **ProvisionPowerTF:** This task flow is associated with power cabling provision.
- **ProvisionSpaceTF:** This task flow is associated with space provision.
- **ProvisionStorageTF:** This task flow is associated with storage provision.
- **ResolveIntegrationExceptionsTF:** This task flow is associated with the error resolution flow for handling software integration errors.

To initiate a move equipment request:

1. From the Quick Launch menu, click *Process Manager* and click *Move Equipment*.
2. Enter the project name, complete by date and cost center.
3. Using the radio buttons, select the provisioning requirements for power, network, storage and urgency.
4. Click the plus (+) icon to add the requested equipment, search the catalog, select the equipment and click *OK*.
5. If desired, enter the device name and any additional details.
6. Repeat steps for any additional equipment to be added.

NOTE: Power is configured separately for each device.

7. Attach any supporting documentation and click *Submit*.

After the process request is submitted, an email notification is sent to approve the request.

To approve a move request:

1. From the Quick Launch menu, click *Process Manager*.
2. From the My Tasks list, double-click the *Approve request for Equipment Move* and select *Accept*, *Reject* or *Claim*. If the request is accepted, an email notification is sent to provision space for the equipment.

-or-

For a rejected request, enter a reason for rejection, click *OK* and *Reject*.

-or-

For a claimed request, the task is assigned to the approver.

When the Move Equipment request is approved, sub-tasks for provisioning space, power, storage and network connections are created.

To provision space, storage, power or network:

1. From the My Tasks list, double-click the request and click *Claim*.
2. Enter the placement details and click *Approve*.
3. Repeat these steps for each sub-task, as required.

After all of the sub-tasks are complete, a request to physically move the equipment is created.

To approve the physical move:

1. From the My Tasks list, double-click the *Move Devices Physically* request and click *OK*.
2. Upon successful completion of task, decommission power, decommission storage and decommission network cabling sub-tasks will be created and if applicable email notification is sent to the respective provisioner

To decommission a moved device:

1. From the My Tasks list, double-click *Decommission power of the equipment move* and click *OK*.
2. Double-click *Decommission storage for the equipment move* and click *OK*.
3. Double-click *Decommission Network Cabling for the equipment move* and click *OK*.

When all tasks are completed, the decommission is confirmed and the request is closed.

Rename Equipment

Rename equipment is the process for requesting to change the equipment name. This process provides end to end flow for renaming a device in data center. A typical device equipment rename requires requester to submit a rename request and approver to approve or reject the same. This business process provides separate roles for these two actions. Once request has been approved, application uses the *Trellis™* Inventory Manager software to rename the device in the *Trellis™* platform inventory. A separate notification is sent to the requester indicating whether renaming was successful or not. The renamed device can be viewed in portfolio offered by the *Trellis™* Inventory Manager software.

NOTE: Even though the process name indicates server rename, the process is applicable for all device categories.

Process Details

The following are the process details for this component.

Process Details: Equipment Rename

Name	Description
Process Name	ServerRenameProcess
SOA Project Name	ServerRename
UI Project Name	ServerRenameUI

User Roles

The equipment rename process is dependent on following user roles.

- ServerRename.Requester: This role is used to initiate the process of equipment rename.
- ServerRename.DataCenterTechnician: This role is used to approve the equipment rename request.
- ServerRename.ProcessOwner: This role is used to view and fix all the error scenarios.

Human Tasks

The following are the human tasks for this component.

Human Tasks: Equipment Rename

Task Name	Role	Pattern	Title	Outcomes	Description
ServerRename Initiator_HT	ServerRename.Requester	Initiator	Initiate Server Rename	SUBMIT	The starting point of the process and responsible for triggering the request for equipment rename.
ChangeServer Name_HT	ServerRename.DataCenter Technician	Simple	Approve Equipment Install	APPROVE, REJECT	The user approves or rejects the request for renaming. If rejected, action is canceled.
TrellisIntegration ErrorResolution_HT	ServerRename.ProcessOwner	Simple	Trellis Integration Error Resolution	OK	An admin role used to view and resolve all the integration errors which can happen while performing service calls or notifications.
Notify Administrator_HT	ServerRename.ProcessOwner	Simple	Notify Administrator	OK	Notifies the administrator.

Business Objects

The following are the business objects for this component.

Business Objects: Equipment Rename

Business Object Name	Module Name	Reference Resource	Purpose
ServerRenameBO	ServerRenameModule	EquipmentCUDRequest.xsd	Determines if manual approval is needed for the equipment install or not.
TrellisIntegrationError SummaryBO	ServerRenameModule	TrellisIntegrationError SummaryBO.xsd	Stores any integration error related data
FaultBO	FaultModule	BPMFault.xsd	Describes the fault parameters and composite instance information where the fault happened while processing the request.

Data Objects

The following are the data objects for this component.

Data Objects: Equipment Rename

Data Object Name	Data Object Type	Reference Resource for Data Object	Description	Usage
ServerRenameDO	EquipmentRename Request	EquipmentCUD Request.xsd	Contains information of cost center, project name, and equipment rename information.	Used to decide if approval is needed or not based on business rule
renameOutcome	String	NA	Stores the string for approve or reject rename operation	Verifies if outcome is approve
errorList	TrellisIntegrationError SummaryBO	TrellisIntegrationError SummaryBO.xsd	Stores the integration errors.	Used for the flow of handling integration errors, by the admin
initiatingUser	String	NA	Stores the initiating user	Used during notification flow to notify the initiating user about process outcome.
taskOutcome	String	NA	Outcome of task	Used to check if task outcome is withdrawn.
taskPriority	Int	NA	Priority of the task	Used by all task components to set task priority

Service Calls

The following are the service calls for this component.

Service Calls: Equipment Rename

Service name	WSDL name	Purpose
DeviceAsyncBulkServiceV10	DeviceAsyncBulkService-v1.0.wsdl	Used to perform rename device operation in asynchronous manner.

The WSDL is invoked in asynchronous manner. The request port type is DeviceServiceBulkPortType which uses UpdateDevices as operation and UpdateDevicesRequest as the message type. The callback port type is DeviceServiceBulkCallBackPortType which uses UpdateDevicesCallBack as operation and UpdateDevicesResponse as message type.

For the request, following information is populated. These are part of common schema.

Service Calls: Common Schema: Equipment Rename

Element name	Description
ID	ID of equipment which is to be renamed. Note that this is device ID of the device in the software.

Element name	Description
Name	Suggested name for the device.

Response contains and operation related response. If there are any errors, they are populated as part of ErrorMessage and ErrorCode.

Task Flows

This process has the following task flows. These are part of “ServerRenameUI” project:

- ServerRenameInitiator_HT_TaskFlow – This task flow is associated with the initiator human task which submits the request for device rename.
- TrellisIntegrationErrorResolution_HT_TaskFlow – This task flow is associated with the error resolution flow for handling integration errors

To initiate a rename equipment request:

1. From the Quick Launch menu, click *Process Manager* and click *Rename Equipment*.
2. Enter the project name, complete by date and cost center.
3. Click the plus (+) icon to add the requested equipment, search the catalog, select the equipment and click *OK*.
4. Enter the suggested name change and click *Submit*.

After the process request is submitted, an email notification is sent for approval.

To rename a device:

1. From the My Tasks list, double-click *Approve Equipment Rename Request* and select *Approve*, *Reject* or *Claim*.
2. If the request is Approved, an email notification is sent to requester and the rename is confirmed and the request is closed.

-or-

For a rejected request, enter a reason for rejection, click *OK* and *Reject*.

-or-

For a claimed request, the task is assigned to the approver.

Process Tracker views

The Process Tracker Views enable you to interact with business processes based on the roles assigned to you. Drilling down into a process allows you to see which activities are completed or which activities are pending. It also displays the entire flow of the process from beginning to end.

The following functions can be performed with process tracking:

- Displaying all the instances for all the workflows
- Viewing the list of process instances pending in your Inbox
- Executing tasks
- Searching for instances by different criteria
- Saving the searches as a view

- Viewing the details of an instance, including the audit trail

Task list views

Depending on your role, when you click *Quick Launch - Process Manager*, Inbox options are displayed in the search panel accordions. The possible options are My Tasks, Initiated Tasks and Administrative tasks, which access task workspaces. Workspaces can be searched, sorted, filtered or customized and tasks can be reassigned to another role. You can also display the following historical views:

- Due Soon
- High Priority
- Past Day
- Past Week
- Past Month
- Past Quarter
- New Tasks

Using the pencil icon offers unique options for each view. All other modifications to the workspace are performed similarly.

My Tasks

The My Tasks list is the default view in the workspace which displays tasks that are assigned to you or your group. The assignments also depend on role assignments. From this workspace, you can view the status of a task with the drop-down menu and highlight a task to select an action such as Request Information, Reassign, Create Sub Task, Escalate, Suspend, Withdraw, Skip Current Assignment or Create To-Do Task and click *Submit* to apply to the task.

Initiated Tasks

Your initiated tasks can be displayed using Initiated Tasks. Selecting a specific task displays the details for that task.

Administrative Tasks

The Administrative Tasks workspace displays the tasks for which you are responsible.

Process reports

The following process reports provide status information of tasks that are being implemented in your data center.

Unattended Task reports

An Unattended Task report provides an analysis of tasks assigned to user groups or their assigned groups that have not yet been acquired.

Task Priority Report

A Task Priority report provides an analysis of the number of tasks assigned to a user, assignees, or their groups, by priority.

Tasks Cycle Time Report

The Tasks Cycle Time report provides an analysis of the time to complete tasks from start to finish, based on user groups or the assignee groups.

Tasks Productivity Report

A Tasks Productivity report provides an analysis of assigned and completed tasks in a given time period for a user, assignees, or their groups.

Tasks Time Distribution Report

A Tasks Time Distribution report provides the time an assignee takes to perform a task.

Smart Install

In the *Trellis*™ platform release 4.0.1 and later, the Process Manager module includes the Smart Install feature which permits you to add a single device in a rack and make the power connections from one screen. The Smart Install screen invokes the *Trellis*™ platform services in order to select a device, select a rack with the required available space and power capacities for the device and complete the device's placement and power connections in real time.

The following items are required for the Smart Install feature:

- The Administrator must define a user ID, assign a *Trellis*™ platform role to the user with Process Manager module permissions and the user must be associated with the Smart Install process rule.
- The role assigned to the user must have Process Manager permissions and one of the following permissions: FacilitiesEngineer or ITEngineer. This role must be granted Manage rights at the Enterprise level and View or Manage rights for the containers where placement needs to happen.
- The power capacity for the rack must be configured.
- The rack must have two PDUs installed with sufficient power capacity and available openings.

When the Smart Install feature is accessed, a series of sections are displayed to complete the installation. The Requested Equipment section is used to select the device to be placed. After the device is selected, this section includes helpful information about the device, such as the manufacturer and model number. Its space and power information is also provided to verify compatibility with the rack selected in a later step.

From the Preferred Location section, you have the option to save the configured device in your environment's unplaced inventory, or if you know the location you want to place the device, save it in your placed inventory.

If you know the location, you can proceed to select the building, floor and space where the rack is located.

After you select a space, the racks supporting the device's space and power requirements are displayed in the Available Racks section. The rack list is based on the following criteria:

- Sufficient space to place the device
- Available power capacity (kW) defined at the rack level
- Two PDUs installed in the rack for redundancy

- Each PDU has enough capacity (kW) to independently support the device
- Each PDU has sufficient available openings to independently support the device

The racks can be sorted using the arrows on the right side of each column header. The arrows are displayed when you hover over them. The racks can also be filtered by entering the device's requirements in the field above each column header. For example, to find the racks having PDUs with at least 10 openings, you would enter **>10** in the PDU1 # of Openings column. After you have created a manageable list of racks, you can compare the details of each rack and device in order to select a specific rack for the device.

After selecting a rack, the Rack Image, Rack Units and Power Connections sections are displayed to allow you to access additional rack information from the software. When you expand the Rack Image section, the front or rear elevation view of the rack can be displayed to view the available space. The Rack Units section provides the contiguous blocks that can support the device from the front or rear side of the rack. In the Power Connections section, you have the option to define the connections using the table or add the power connections manually at a later time. Both the Rack Units and Power Connections sections include hidden sorting arrows and filter fields like those in the Available Racks section.

If you decide to define the power connections from this screen, when you select the rack, the inputs listed in the Source Device Openings column are auto-populated with the input power openings from the symbol being added. For example, if a server has two input power openings, INPUT 1 and INPUT 2, these openings are listed in the power connections table. For each input, you can select a Target PDU name which correlates with the PDU 1 Name and PDU 2 Name lists in the Available Racks columns. After selecting the Target PDU, only the available ports for the selected PDU are listed under the PDU Openings column. Then, after selecting a port, the receptacle type is automatically displayed and the power connection's definition is complete.

NOTE: Always define one power connection at a time by selecting the PDU and PDU opening for a connection row before proceeding to define the next connection.

The Comments and Attachments sections are provided for additional details and to save relevant documentation about the install, such as such as approvals and e-mails. The comments are saved in the Completed task details.

An email notification is sent to confirm the install, however, you can also verify the task entries from the Task list and view the added device in Portfolio View. If there is an error, a message is displayed under the Project Details section on the Error task screen. An e-mail notification is also sent to you and an Error task is created in the task list. In this case, you can make the required corrections in the *Trellis*™ platform manually and click *OK* in the Error task list to acknowledge that the situation is resolved.

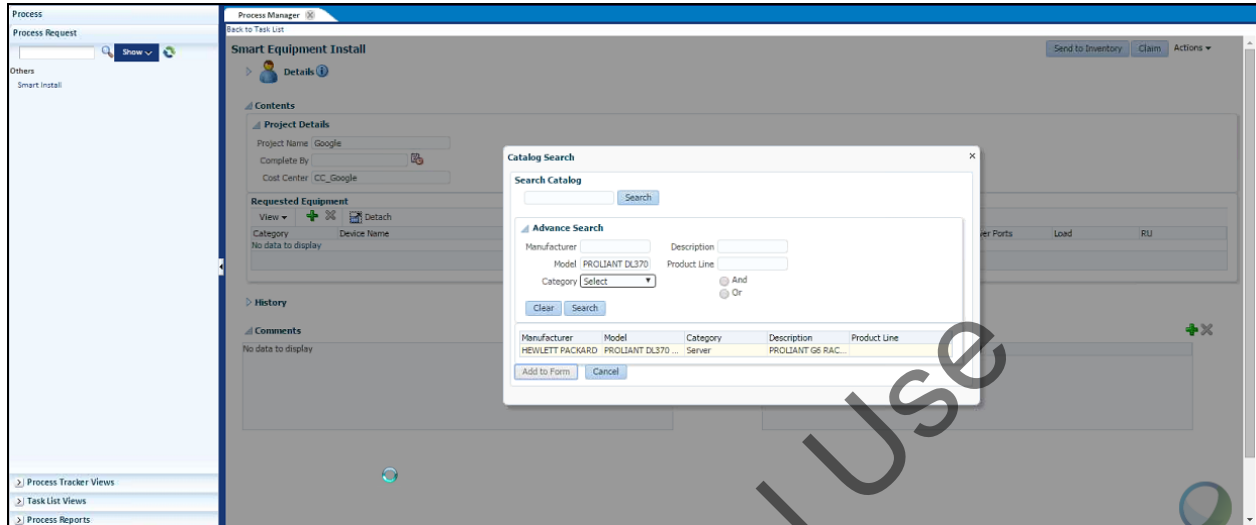
NOTE: The Smart Install feature works with real time placement and power availability/capacity information from the *Trellis*™ platform. Placement and power connection details are not retained for a saved task as these may become stale if you return to a saved task in future.

To use Smart Install to add a device:

1. Open the Process Manager module and in the left pane under Others, click *Smart Install*.
2. On the Smart Equipment Install screen, assign a project name and cost center, and if necessary, select the complete by date for the install.

3. In the Requested Equipment table, click the + (plus) icon to add a device.
4. On the Catalog Search pop-up screen, enter the relevant search criteria to search the database for a list of possible devices to be installed and click the *Add to Form* button.

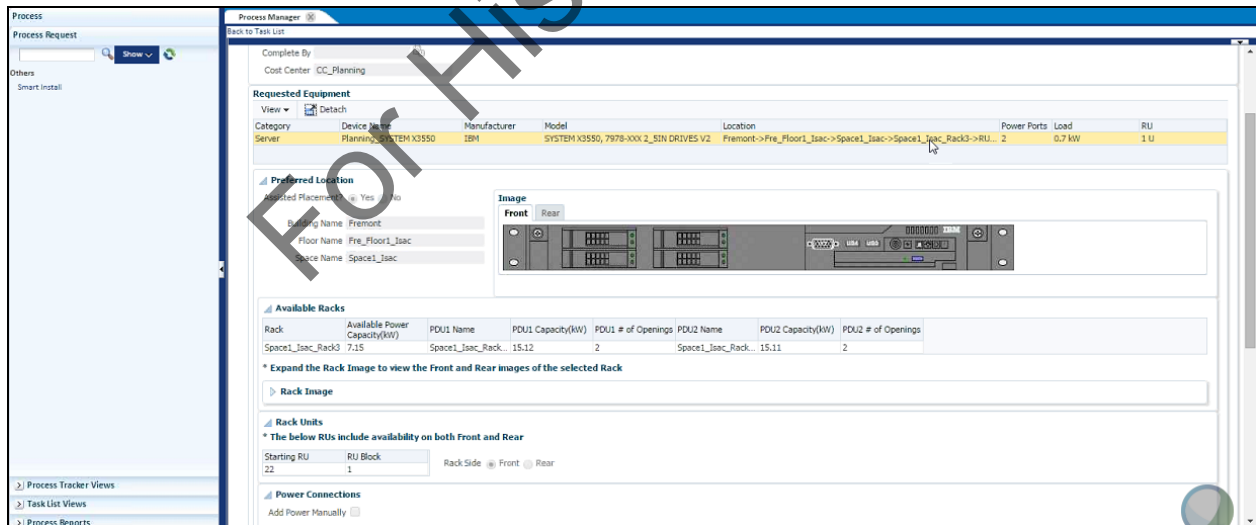
Selecting the Device to be Placed



NOTE: The Requested Equipment table displays useful information related to the symbol, such as the number of power ports, load and RU height, that are relevant to the installation.

5. In the Requested Equipment table, rename the device with a more specific identifying name.

Assigning the Device Details



6. After the image of the symbol is displayed in the Preferred Location section, you can toggle between the front and rear views of the symbol.
7. If you know where to place the device, for Assisted Placement, click the Yes radio button and use the drop-down arrows to select the building, floor and space for the device. After selecting the space, the Available Racks table is populated with a list of racks that can accommodate the device's space and power requirements.

-OR-

If you do not know where to place the device, click the No radio button and click *Send to Unplaced Inventory* to create the device and place it in the Unplaced Inventory for your enterprise.

8. In the Available Racks section, select a rack, and if desired, click to expand the *Rack Image* section to view the front and rear of the rack.

NOTE: Selecting a rack from the Available Racks table displays the contiguous available RU blocks in the rack that can accommodate the device. An RU block is considered available only if both the front and rear sections in the rack are available.

9. In the Rack Units section, select the side of the rack (Front or Rear) for placing the device, and then from the displayed available RU blocks, select the RU block. The Front radio button is the default selection.
10. In the Power Connections section, click to enable the Add Power Manually checkbox in order to enter the power connections manually at a later time from the *Trellis™* Power Systems Manager module.
-or-
Leave the Add Power Manually checkbox blank to continue with the power connection configuration using the Smart Install feature.
11. For each device input, click the Target PDU drop-down arrow and select the PDU for the device connection. Then click the PDU Openings drop-down arrow and select an available port on the PDU.

NOTE: The Receptacle Type field is populated to help you confirm compatibility of the connector with the receptacle.

12. In the Comments and Attachments sections, enter any additional information.
13. Click the *Send to Inventory* button to add the device in the rack with any power connections in the *Trellis™* platform.

NOTE: After the install request is submitted, the task is marked as Completed. All completed tasks can be accessed by filtering the task list.

To verify the task:

From Portfolio View, open your Placed or Unplaced Inventory folder for your enterprise to view the device.

-or-

From the Process Manager Task List screen, select *Completed* from the status drop-down menu and click the task for the device's installation.

Business Process Composer

The Business Process Composer tool allows you to create, model and deploy new processes. You can also modify the four default process workflows that are available for your use. After the process is deployed, they are created in Business Process Composer and are available in the *Trellis™* platform. For more details on the individual processes, see the [Process Workspace](#) on page 204.

Before a *Trellis*™ platform user starts using Business Process Composer tool to modify a process, it is essential that they meet the following prerequisites:

- Working knowledge of the *Trellis*™ software platform
- Strong understanding of the Process Manager module
- Java™ scripting experience
- Oracle® Business Process Management training
 - Oracle® BPM 11g Essentials
 - Oracle® BPM 11g Modeling

NOTE: For more information on Oracle training, go to www.oracle.com.

To log in to Business Process Composer:

NOTE: In order to access the composer tool, you must be a member of the BPMComposer role.

1. Open a web browser and navigate to the *Trellis*™ Business Process Composer tool URL: **http://<fully qualified domain name of the front machine>/bpm/composer**.
2. Enter your *Trellis*™ platform username and password and click *Log In*.

For more detailed information on using Business Process Composer, see Oracle® Business Process Management information at <https://docs.oracle.com/en/>.

NOTE: Before processes are deployed, they must be validated. It is highly recommended they are deployed in a test environment before deploying your production *Trellis*™ platform instance. Contact Professional Services for additional assistance.

NOTE: Processes started via web services must be deployed to the bpm_expose folder.

Process Service

The Business Process service includes the pre-canned process external service and a device async bulk external service.

Pre-canned process external service

Pre-Canned Process External Service Details

Name	Description
Service Name	PreCannedProcessService
WSDL Name	PreCannedProcessServiceV1.wsdl
Purpose	WSDL performs the move device operation in asynchronous manner
Request port	PreCannedProcessServicePortType
Callback port	PreCannedProcessServiceCallBackPortType
Invocation Type	asynchronous

Requests

- installEquipments(EquipmentInstallRequestMessage)
- moveEquipments(EquipmentMoveRequestMessage)

Callbacks

- installEquipmentsCallBack(EquipmentInstallResponseMessage)
- moveEquipmentsCallBack(EquipmentMoveResponseMessage)

Response contains connections related response and placement related response. If there are any errors, they are populated as part of ErrorMessage and ErrorCode elements which are inside Equipment Install/Move ResponseMessage, PreCannedResponseStatus and Status.

Device async bulk external service**Device Async Bulk External Service Details**

Name	Description
Service Name	DeviceAsyncBulkServiceV10
WSDL Name	DeviceAsyncBulkService-v1.0.wsdl
Purpose	This operation performs delete device operation in asynchronous manner.
Request port	DeviceServiceBulkPortType
Callback port	DeviceServiceBulkCallBackPortType
Invocation Type	asynchronous
Message Definition XSD	DeviceMessagesBulk-v1.0.xsd

Requests

- createDevices(CreateDevicesRequestMessage)
- deleteDevices (DeleteDevicesRequestMessage)
- updateDevices (UpdateDevicesRequestMessage)

Callbacks

- createDevicesCallBack (CreateDevicesResponseMessage)
- deleteDevicesCallBack (DeleteDevicesResponseMessage)
- updateDevicesCallBack (UpdateDevicesResponseMessage)

The response contains create/update/delete and operation related responses. If there are any errors, they are populated as part of ErrorMessage and ErrorCode.

For Historical Use

The TRELIS™ Thermal Systems Manager Module

The *Trellis*™ Thermal Systems Manager module allows you to reduce thermal-related power costs and improve data center efficiency. With this module, you can verify and balance heat loads from the room level to the device level in order to optimize your environment. Graphical views allow you to see the overall thermal aspects of your data center (space, cooling units, racks and servers) and identify the exact location of hotspots in real-time. This allows you to eliminate overheating issues in specific areas and also helps to reduce wasteful overcooling. The collected data can be printed or saved to track progress, and can help you to communicate any issues in your data center to others. The collected data can be printed or saved to track progress, can help you to communicate any issues in your data center personnel or can be used to create reports.

The *Trellis*™ Thermal Systems Manager module provides the following benefits:

- Visualizing hot and cold temperatures in 3D graphical views
- Monitoring thermal energy coming from your devices
- Managing conditions to optimize capacity and system up-time
- Making informed decisions to optimize temperature and humidity
- Lowering energy costs without sacrificing system up-time
- Collecting data to plan for future deployments and manage capital expenditures

Working With Thermal Views

From the Thermal View screen you can access the Rack Values, Sensors, Servers and Cooling Unit tabs for data point values of each of the types of devices. The following table describes the data points that are supported for each type of device.

Thermal Data Descriptions

Displayed Data	Description
Rack Values tab	
Device Name	Name of the rack
Average Inlet Temperature	Average temperature of all the sensors returning temperature values that are placed on the front of the rack.
Average Exhaust Temperature	Average temperature of all the sensors returning temperature values that are placed on the rear of the rack.
Temperature Difference	The difference between exhaust temperature minus the inlet temperature.
Average Power Consumed	Sum of actual power consumed by all rack PDUs placed inside the rack. The actual power consumed is a data point value.
Aggregated Design Power	Sum of designed/rated power capacity of all rack PDUs placed inside the rack. Power capacity value is available in a symbol. Designed capacity value takes precedence over the rated capacity value.
Placement	The location at which the rack is placed on a space. If the tile system is defined for a space, it is displayed as Tile = <Tile Name>. If the tile system is not defined for a space, it is displayed as X=<value> and Y=<value> UOM.

Displayed Data	Description
Sensors tab	
Status	Normal operation or alarm (critical, warning, info)
Device Name	Name of the sensor unit
Inlet Temperature	Air temperature measured at the front of the rack
Exhaust Temperature	Air temperature measured at the rear of the rack
Rack Side	Side of rack the sensor is on
RU Height	RU number where the sensor is placed on the rack
Servers tab	
Status	Normal operation or alarm (critical, warning, info)
Device Name	Name of the server unit
Temperature	Name of the server unit
Power Consumed (kW)	Consumed power by the server in kW
Low Critical Threshold	Low critical threshold setting
Low Warning threshold	Low warning threshold setting
High Warning threshold	High warning threshold setting
High Critical threshold	High critical threshold setting
Rack Side	Location of the server unit on the rack
RU Height	RU number where the server is placed on the rack
Cooling Unit Values tab	
Status	Normal operation or alarm (critical, warning, info)
Device Name	Name of the cooling unit
Supply Air Temperature	Air temperature measured at the outlet of the unit
Return Air Temperature	Inlet air temperature
Net Sensible Cooling Capacity	Calculated cooling capacity value
Dew Point	Dew point temperature measured at the inlet of the unit
Cooling Compressor Utilization %	Present compressor utilization is shown as a percentage of the maximum rated capacity
Cooling Efficiency %	Ratio of cooling energy provided to the amount of total energy being used for cooling units
Evaporator Fan Speed %	Fan speed shown as a percentage of the maximum rated speed
Placement	Location at which the cooling unit is placed in a space. If the tile system is defined for

Displayed Data	Description
	a space, it is displayed as Tile = <Tile Name>. If the tile system is not defined for a space, it is displayed as X = <Value><UOM> and Y = <Value><UOM>
Additional data points for thermal readings of cooling units	
Chilled Water Pressure Difference	Pressure difference between chilled water supply and return lines
Derived Total Real Power Consumed	Total real power consumed by the device derived from one or more of its power measurement values
Evaporator Water Flow Rate	Rate of water flow through the evaporator
Heat Designed	Designed heat capacity
Heat Rated	Rated heat capacity
Return Air Temperature Set Point	Desired air temperature at the vent inlet of the unit
Return Humidity	Relative humidity measured at the inlet of the unit
Supply Air Temperature Set Point	Desired air temperature at the vent outlet of the unit
deltaTAir	Calculated value based on return air temperature and supply air temperature
deltaTWater	Calculated value based on return chilled water temperature and supply chilled water temperature

To display capacity and data point values:

1. In Portfolio View, right-click a space and select *Thermal View*. Click an individual rack to see the thermal view.
2. Click one of the following tabs to view the read-only information specified in the previous table.
 - Rack Values
 - Sensors
 - Servers
 - Cooling Unit Values

NOTE: The current date and time displays when the view was last opened or refreshed. Click Refresh to display the latest data point values.

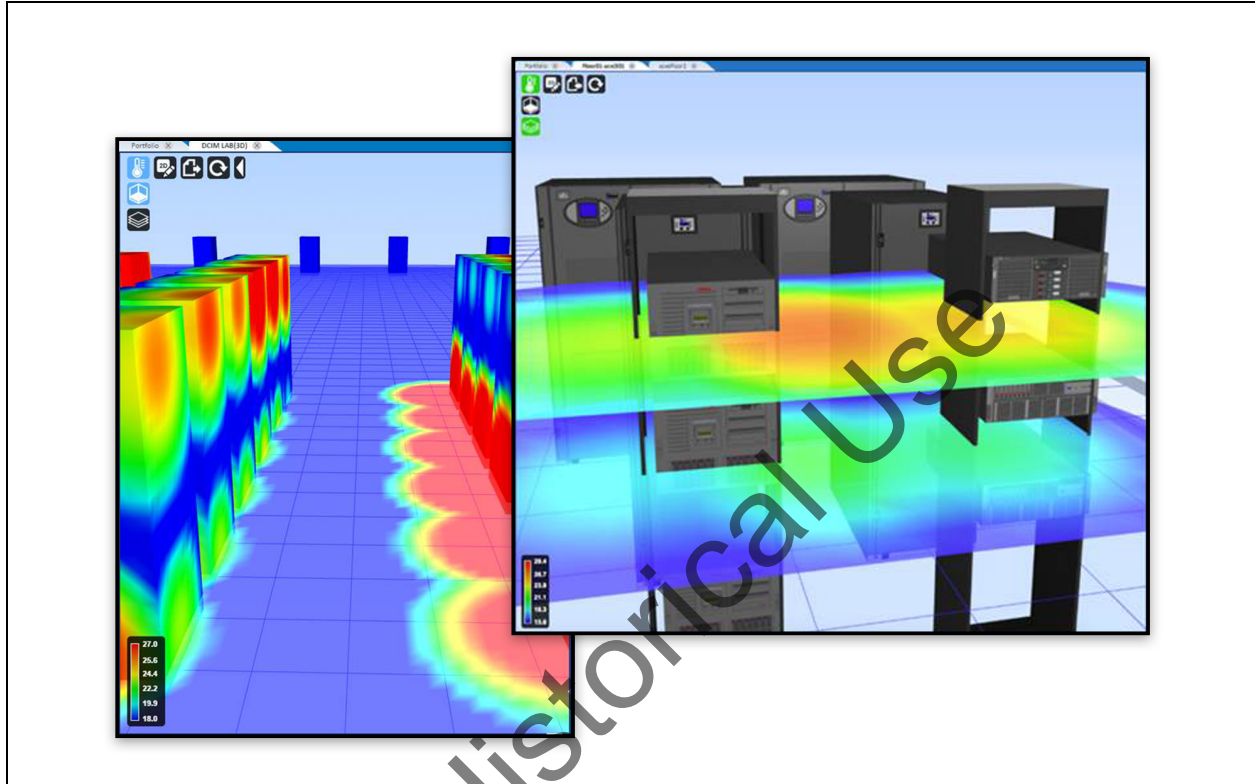
NOTE: Multiple racks can be viewed from the space.

Displaying Thermal Heat Maps

Thermal heat maps are available with the licensed Thermal System Manager module. When temperature data is available, you can view the Thermal Maps icon in 3D Graphical View. If selected, you can display two types of thermal heat maps of your data center. One view is the Thermal Cover Map that shows overall connected temperatures and the second option is the Thermal Layer Map that shows temperatures as they exist at the

bottom, middle and top of the racks on your data center floor. From these maps you can also change the perspective to see specific areas. A color scale is used to identify or modify the colors used to represent temperatures. See [Heat Map Legend](#) on page 64 for the default temperature values and the procedure to modify the color values.

Thermal Heat Map Views



To view Thermal Heat Maps:

1. From the Portfolio View, select and right-click a floor and select *3D Graphical View*.
2. Click the *Thermal Maps* icon to display the cover and layer map icons.

NOTE: If no temperature data is available, the Thermal Maps icon is not enabled.

3. Click the *Thermal Cover Map* icon to show the overall visual thermal temperatures of equipment in the data center.
-or-
Click the *Thermal Layer Map* icon to show more detail of each visual thermal layer of temperatures in a rack.
4. Use the standard keyboard and mouse controls to see specific areas of your data center. For more about keyboard and mouse controls, see [3D Graphical View](#) on page 27.

Reports

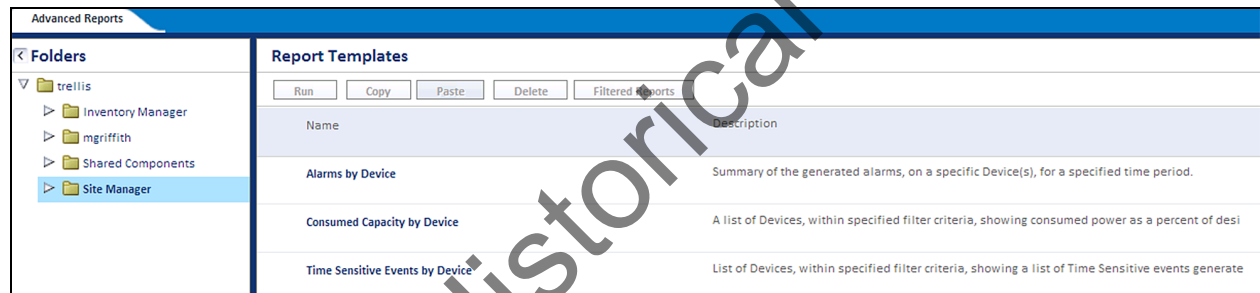
The Reports feature, which is accessed from the launchpad or the Quick Launch menu, provides the following functionality:

- Enhanced, interactive reporting capabilities using interactive charts
- Assigning each user a personal workspace to copy, save, schedule and customize reports
- Interactive sorting, filtering, hiding or unhiding columns and customizing formats
- Multi-selecting optional prompts with the ability to focus on specific filters for faster access to data
- Automatic purging of reports after 48 hours

Report templates are available based on your module licenses and permissions. This chapter provides information about running the *Trellis*™ Inventory Manager, *Trellis*™ Site Manager and *Trellis*™ Thermal Systems Manager reports. Process reports, available with the *Trellis*™ Process module, are discussed in [Process reports](#) on page 229.

For creating custom reports, see [Ad Hoc Reports](#) on page 249.

Reports Screen with Site Manager Templates Selected



Report Permissions

The Report Administrator role and Report User role have permissions for the following tasks.

Report Permissions

Task	Report Administrator	Report User
Assigning permissions to the user folder	X	X
Scheduling and running reports	X	X
Saving filters to user folders	X	X
Copying and pasting reports	X	X
Creating folders within private user folders	X	X
Sharing reports with other users	X	X
Customizing reports (filters, sort columns, hide/unhide columns, change fonts and colors)	X	X
Exporting reports [PDF, XLS, CSV, XLSX, XLS (paginated), XLSX (paginated)]	X	X
Publishing custom reports using iReport or the UI wizard	X	N/A

Using the Folders Menu

When *Reports* is selected, the Folders side bar and Report Templates workspace display.

The Folders side bar includes the templates, sources and resources for standard and ad hoc reports. It also includes shared components for reports and is used to store personal folders for reports. After selecting a report from the side bar, it is displayed in the Report Templates workspace.

Using Report Templates and Folders

The Report Templates workspace allows you to run, copy and delete reports, as well as filter reports, to display only the information you need. Clicking the space next to the report template name enables the buttons for these features. You can also right-click a template name to select report options.

Report Templates Listed by Module

Folder	Report	Report Contents
Inventory Manager	Cable Route	Allows users to search for a device and show the connected devices. Lists ports, cable route, and each path belonging to an end-to-end data connection.
	Device Changes By Rack	Lists details of changes to rack content.
	Device Inventory	Overview of the devices based on specified filter criteria such as the name, serial number, category, manufacture, model and location of the device.
	Device Visual	Shows device information with elevation drawings. Views device information such as building, floor, space, rack name, device name, manufacturer, model, serial number, asset number, device category, card modules, capacities and UDP values. It also includes device front and rear elevation drawings.
	Inventory Metrics	Overview of Space or Zone container on user-specified filter criteria.
	Network Path Connections	Lists all external data connection paths from a device to a switch in a data center. The network connectivity view lists of all device connections. It also assists with device connection problems and status of connectivity in planning of network changes.
	Network and Power Connections	Designed to show all network and power connections on a specified device. Used to check both power and network connections on devices, troubleshooting device network and power connection problems. Shows only external connections (both power and data).
	Rack Inventory	All racks and child devices based on user-specified filter criteria.
	Rack Visual	Shows rack information with elevation drawings. Provides rack information such as manufacturer, model, weight, description, front, rear and other rack mounted devices, positions of devices based on the top

Folder	Report	Report Contents
		and bottom of the rack space, device model information, and it also displays images for rack front and rear elevation. Allows multiple rack list selections.
	Switch Port Status	Shows count of status (total, used and available) switch ports in a data center. Views available port capacity in a data center and assists in planning new switch port installation. Switches reported include: Telecom, network, SAN and KVM connections.
	Trace Switch Connections	Provides a list of data connections from a specified switch. View connection paths on switches, troubleshooting switch connection problems, show status on connected devices and assists in planning network changes.
	UDP by Device	User-defined properties of each device based on user-specified filter criteria.
Site Manager	Alarms by Device	All alarms for each device are based on user-specified filter criteria for a specified time range.
	Consumed Capacity by Device	Total power consumption of each device based on user-specified filter criteria for a specified time range.
	Datapoints by Device	A list of devices within a specified filter criteria, showing all related data points. Each device is based on user-specified filter criteria for a specified start and end time frame.
	Energy Consumption (kWH) by Device	Energy consumption of each device based on user-specified filter criteria for a specified time range.
	Events by Date	A list of device events by date.
	Latest power consumed by device	Displays a list of devices with their current power consumption in kW. Includes device details such as name, manufacturer and model information, latest timestamp and consumption value.
	Power Trend Based on Capacity	<p>Details of changes to power consumed within a space over time.</p> <hr/> <p>NOTE: The designed power must be configured at the floor and space level. This report will be blank if the floor has no designed power value specified in the capacities accordion.</p> <hr/>
	Stranded Capacity by Rack	Displays the stranded power, based on actual loads against design loads for racks.
Time Sensitive Events by Device	A list of time-sensitive events of each device based on user-specified filter criteria for a specified time range.	
Thermal Systems Manager	Room Cooling Capacity	Designed and consumed cooling capacity trends.
	Cooling Capacity Factor	Comparison of the total available capacity with actual required cooling capacity for the data center.

NOTE: All data values for *Trellis*™ Site Manager module reports are aggregated hourly, therefore, results displayed on reports may not match the real-time data. Only authorized resources are shown in the reports.

Creating a personal folder under a user folder for reports

A personal folder under the user folder can be created to store custom filter options and reports that you run often.

To create a personal folder under a user folder:

1. In the Folders accordion, right-click the *User* folder and select *Add Folder*.
2. Enter the new folder's report name and description and click *Add*.
3. After a folder is added, right-click one of the following available options:
 - *Copy* to copy a folder and paste it in a user/personal folder.
 - *Cut* to cut a folder and paste it in a user/personal folder.
 - *Delete* to delete a user/personal folder.
 - *Permissions* to change user or role permissions.
 - *Properties* to change the report name and description.
4. Click *Submit* to save changes.

Adding a report template to a personal folder

Report templates can be added to your personal folder to access reports you run often.

To add a report template to a folder:

1. Click a folder such as *Inventory Manager* or *Site Manager* to view the report templates, right-click a report template and select *Copy*.
2. Right-click your folder, select *Paste* and click the template to open the Filters accordion.
3. Select data from the available fields in the following filter options: Building, Floor, Space, Zone, Group and Category.
4. Click *Save* enter the name of the created template and click *Save*.
5. Click *Back* to return to the report templates window.
6. On the Reports Template window, the new template will be added to the folder, which will have a drop-down arrow.

NOTE: If the filter option is blank, there is no data available. Some filter options may have required start and end dates. If you do not select specific data in each field, the report is generated for all data in the list. For example, if you only select a building and not a floor and a space, the report will include all floors and all spaces. If you select a building, a floor and a space, the report is generated for the values selected.

NOTE: Press **Ctrl** and click to select multiple options in the filter fields or press **Shift** and click to select all options in a field.

Using Report Filters

Many of the reports can be filtered by buildings, floors, spaces, zones, groups or categories. The Filter fields are displayed or hidden when you click the toggle arrow icon in the top left corner of the left side bar. Each of the filter levels is optional and one or more levels can be utilized at a time. Each report runs using the lowest level of the selected filters. For example, if you select a building and a floor, but no space or zone, the report is run for the selected floor, subject to other input.

The following levels are sorted in ascending order.

The All, None and Inverse options are provided to select items in the filter lists. In order to use the Inverse option, select the items you do not want to include, then select *Inverse* to select the remaining items.

The Sort By: selections in the top right corner allow you to display information by name or by the modified date.

Report Filters

Filter Type	List Description
Start and End dates	Required selections for the start and end times for data collection.
Building	Buildings in the Enterprise node.
Floor	Floors based on the buildings selected.
Space	Spaces based on the floors selected.
Zone	Zones based on the spaces selected.
Group Input	Device groups are displayed based on the selected building, floor, space and zone. Only assigned groups for the selected criteria are displayed.
Category Input	Categories of devices in the database are displayed based on the selected building, floor, space and zone. Only available categories for the selected criteria are displayed.

Creating a custom filter

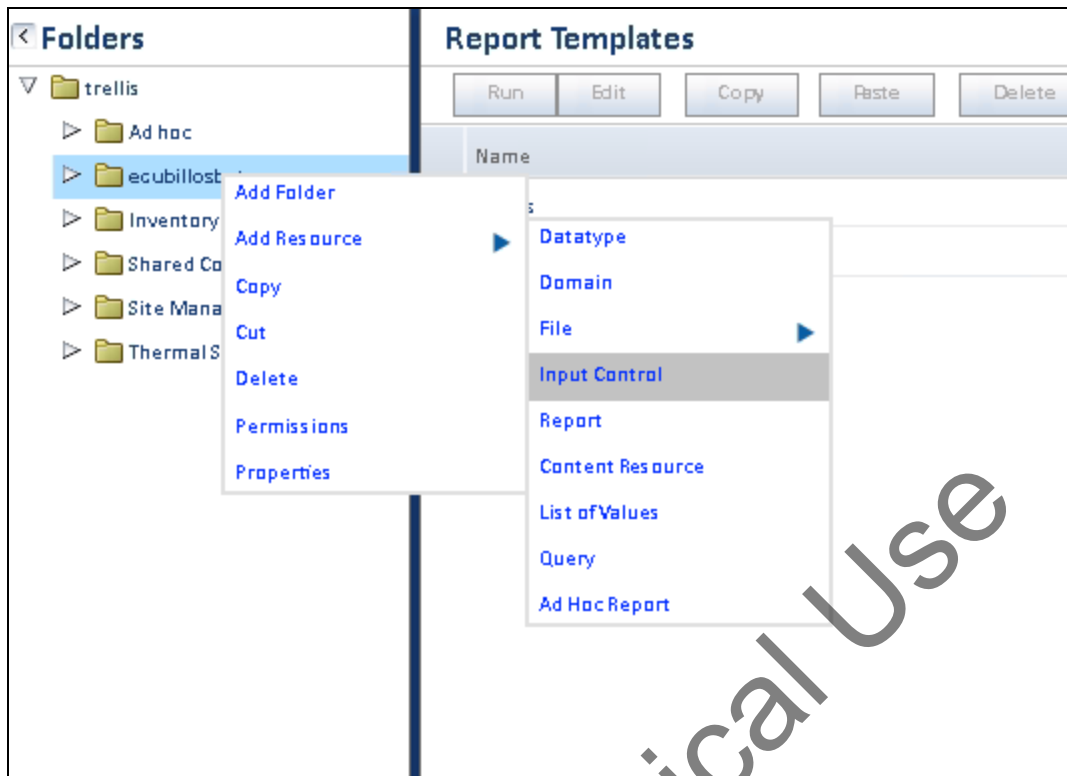
Custom filters can be created to run reports for different floors, spaces or zones in a building.

NOTE: The input control must be configured and added to the report.

To create a custom filter:

1. Click *Reports*, and in the Folders side bar, select a folder (usually a personal folder).
2. Under Report Templates, right-click *Add Resource - Input Control*.

Adding an Input Control



3. In the Add Input Control window, select the type of input control from the drop-down menu.

NOTE: For more information about creating input controls, see www.jaspersoft.com.

4. Enter the prompt text for the label displayed next to the type of input control, the parameter name value to match the name of the parameter in your report and a description.
5. Select the Visible checkbox and click *Next*.
6. Click *Add Resource - List of Values*, and in the Locate List of Values window, enable the Define a List of Values in the next step checkbox and click *Next*.
7. In the Edit List of Values window, enter a name, resource ID and description for the filter.
8. In the area on the right, enter a name and value for each item and click the *Add* button to add a new item.
-or-
Click the *Remove* button to remove a row.
9. After all values are added, click *Submit*.
10. Select and run a report to verify the new filter is applied and functioning.

To save a group of filters for a specific report:

1. Click *Reports*, and in the Folders side bar, select a folder.
2. In the Reports Templates workspace, select a report and click *Copy*.
3. In the Folders side bar, navigate to a personal folder and click *Paste*.
4. In the workspace, select a report
5. In the Filters side bar, select the data in each field, select the report type and click *Save*.

6. In the Save Values window, enter a name for the filter and click *Save*.

To select a group of filters for a specific report:

1. Under Use saved values:, click the arrow to display the saved filters.
2. In the saved filters drop-down list, select a filter and click *Run*.
3. Click *Reset* to refresh the filter options to default to None.

Running a Report

When loading a report, at any time you can click *Cancel Loading Data* to stop the report or click *Back* to return to the Folder accordion.

To run a report:

1. In the left side bar, click Folders, and select the applicable folder.
2. In the Report Templates workspace, click the name of the report.
3. In the left side bar, select the applicable filters and click *Run*.

NOTE: As the report is generating, you can use the page forward and page back icons to see the report as it loads.

Editing a Report

To edit a report:

1. On the Report Templates window, select the report and click the *Edit* button.

-or-

Right-click the report and select *Edit* from the drop-down menu.

Editing a Report

The screenshot shows the 'Report Templates' window. On the left is a 'Folders' pane with a tree view containing 'trellis', 'Ad hoc', 'scubillosbeta', 'Inventory Manager', 'Shared Components', 'Site Manager', and 'Thermal System Manager'. The main workspace displays a table of reports with columns for Name, Description, Type, and Modified Date. The 'ColorsReport' row is selected, and a context menu is open over it, listing actions: Run, Run in Background, Schedule, Edit, Copy, Cut, Delete, Permissions, and Properties.

Name	Description	Type	Modified Date
Colors	List of colors as input control (Filter)	Input Control	Today
ColorsReport	Demo usage of custom input control (Filter)	Report	Today

2. In the left panel options, select *Controls & Resources-Set Up*, and in the Set Up the Report workspace, enter the report's name and description.
 3. Select the Upload a Local File radio button and click *Browse*.
- or-
- Select the Select a JRXML from the repository radio button and click *Browse*.
4. Click *Submit*.

5. If you selected to get the input control from the repository, in the Select Resource From Repository pop-up window, select the resource and click *Select*.
6. (Optional) If additional criteria is required, in the Add Input Control workspace, enter the criteria and click *Submit*.
7. Select and run a report to verify the new filter is applied and functioning.

Exporting a Report

To export a report:

1. After a report is run, hover over the Export arrow beside the Back button and select a report format, such as PDF, to save the report.
2. On the dialog box, enable the desired information and click *OK*.

Formatting a Report

After a report is generated, its columns can be moved and sized. By clicking a column's header, additional icons are displayed from left to right to format or hide the column, filter the column or sort each column individually in ascending or descending order. If you select the leftmost icon's format option, the following additional settings are presented:

- Headings - Format the header text and table cells
- Values - Format the values and table cells
- Conditional Formatting - Adds conditions to the tables

The following procedures begin in an opened report.

To move a column to a new location:

1. Click and hold a column header to display the column's format options.
2. Click the header again, and while holding the mouse button down, drag the column to the new column position and release it.

To change a column's width:

Place your cursor over the vertical line between each column and drag the line.

To hide or show a column:

1. Click a column header.
2. In the displayed bar, click the Column options drop-down arrow and select the *Hide/Show* option.

To format the column header text and cells:

1. Click a column header.
2. In the displayed bar, click the Column options drop-down arrow and select the *Formatting* option.
3. In the Format column window, click the *Headings*, *Values* and *Conditional Formatting* tabs and select or enter the applicable formatting options.
4. Click *OK* for each window.

To filter a column:

1. Click a column header.

2. In the displayed bar, click the *Column filters* icon.
3. In the Filter column window, select the Show all rows or Show only rows where radio button.
4. Click the drop-down arrow and select the applicable rule.
5. Enter the value and click *OK*.

To sort a column:

1. Click a column header.
2. In the displayed bar, click the Ascending or Descending icon.

Scheduling a Report

Reports can be scheduled to run automatically, periodically or at a future date. When scheduling a report to run periodically, the following values are available:

- Minutes (1-59)
- Hours (1 to 24)
- Days (only one)
- Weeks (only one)

To schedule a report:

1. Click the desired folder, right-click the report and select *Schedule*.
2. Enter a name and description, enable the start date and time and click the calendar icon to select a date.
3. Slide the Hour and Minute bars to the desired time.
4. Click *Run Once*.

-or-

Click *Repeat* and enable one of the following:

- No end date
- End After and enter the number of counts
- End by and enter or select a date

5. Click *Next* and under Set the Parameter Values, select the filter options and click *Save*.

-or-

Click *Next* to continue.

6. Enter a name and description for the scheduled report, enable one or more file formats and click *Submit*.
7. After the report is generated and you have received a notification, you can open your folder to view the report.

Ad Hoc Reports

The Ad hoc reports function allows you to create customized reports, quickly communicate data and view resource utilization. Ad hoc reports are web-based, drag-and-drop reports that can be viewed as a table, chart or in a cross-tab format. Any report can be modified to create an Ad hoc report. Reports are either saved in the Ad hoc folder for public use or in a user folder for private use.

When built-in domains do not have the fields you are looking for, additional views are available with a new domain. New domains can be created for Adhoc reports; however, in order to create a domain, you must be knowledgeable of the database schemas and the intended purpose of the report domain. Table names ending in LITE are recommended for better performance; however, if there is no applicable LITE option, any domain table can be used.

NOTE: A Domain/Domain Editor is required in the *Trellis*™ platform user interface to connect to a pre-defined AnalyticsDS Data Source and Database Schema CDMR in order to get the available views for the Ad hoc reports.

For faster report generation, there are four default domains:

- Device and Containers domain - Contains information about all devices, device placements and capacities. Container capacities are available for aggregations wherever required; also contains a summary of daily data from the Time Series Domain (TSD) for designed versus measured comparisons.
- UDP domain - Contains information about devices, their placements and UDPs; also contains an instance of connection to UDPs.
- Connections domain - Contains information about all the devices, device placements and power and data connections in the system.
- Weekly Time Series domain - Contains weekly historical data of the device data points and the device placement information of the devices.

NOTE: CDMR and TSD are the only available schemas to be used when creating a domain for reports.

To create an Ad hoc report:

1. In the left side bar, right-click the *Ad hoc* folder name and select *Add Resource – Ad hoc Report*.
2. In the Data Chooser: Source window, select *Topics*.
-or-
Select *Domains*.
3. If *Domains* is selected, click *Ad hoc* in the Data Chooser window, select the desired domain and click *Choose Data*.
4. Under Source, select the fields that you want in your report and drag-and-drop or click the arrow to move the fields to the Selected Fields area.

NOTE: More than one field can be selected by clicking the first selection, then scrolling and holding the **Shift** key while selecting the second or last in the list of fields.

5. Click *Table*, *Chart* or *Crosstab* to select the report's format.
6. Under Fields in the side bar, drag-and-drop the fields in the Column or Rows fields to define the report.
7. Where applicable to assign fields as measures, right-click a field name and select *Use as Measure*.
8. If desired, click in the title field and enter the title for the report.
9. Under New Ad Hoc View, hover over and click the disk (Save) icon, then select *Save Ad Hoc View and Create Report*.

10. In the Save Ad Hoc View and Create Report pop-up window, enter any additional information, select a folder to save the report and click *Save*.
11. Click the gears icon to select specific chart types or format parameters.
12. Click *Back* to go back to the Reports Templates main window to select and view the created report.
13. In the Reports Templates window, click the *Report* type to view, run, edit, schedule or delete the report data.
-or-
Click the *Ad Hoc View* type to open, copy, delete or modify the report.

To access an Ad hoc report:

From the launchpad or Quick Launch menu, click *Reports - Ad Hoc*, click the applicable folder containing the report and click the report name.

To create a domain:

1. In the left side bar, right-click the *Ad hoc* folder name and select *Add Resource - Domain*.
2. In the Add New Domain: New Domain window, enter a name.
3. Keep or change the resource identification information and enter a description or leave the Description field blank.
4. Click *Browse*, select a destination folder for the domain, such as a personal folder, and click *Select*.
5. Click *Browse*, select the data source and click *Select*.
6. Under Domain Design, select the Create with Domain Designer radio button.
-or-
Click the Upload radio button and click *Choose File* to download a domain.
7. Click *Choose File*.
8. In the Select Database Schemas pop-up window, select *CDMR* and/or *TSD* from the list of schemas and click *OK*.

NOTE: Only the CDMR and/or TSD schemas are available for creating a domain.

9. Under Domain Designer: New Domain, select the applicable tables
10. Under Data Sources, select the tables with LITE in the name and click the arrow to move your selections to the Selected table.

NOTE: The number of tables selected affects the time it takes for reports to run. At any time, you can click the *Tables* tab to return to the Data Sources window to select different tables.

11. Click *Display* to display the resources to be used in the report.
12. Under Resources, select one or more resources and click the arrow to move your selections to the Sets and Items list.
13. In the Properties pane, enter any details and click *Submit*.

Ad hoc Report Views Example

View Name	Column Name	Description
COMPLEXOBJCAPACITYVIEW LITE: View of Object Capacities, each row represents a specific capacity for owner object.	OBJOID	The object identifier (OID) of the owner object, such as device, rack, building, floor, space, zone and data center.
	CAPACITYNAME	Display name of the capacity.
	CAPACITYTAG	Capacity tag for this capacity.
	CAPACITYVALUETYPE	Value type of the Capacity object.
	CAPACITYVALUE	Actual capacity value stored for the owner/programmatic name.
	BEGINS	The start time that this record is valid for. This is always going to be 0 (means the closest or now context.)
	ENDS	The end time that this record is valid for. This is going to be a value greater than 0 and less than 9223372036854775807.
	UOMNAME	The display name of the unit of measure associated with the capacity.
	UOMTAG	Programmatic name or tag for the unit of measure.
CONNECTIONUDPVIEWLITE: View showing the User Defined Properties (UDP) on connections.	CONNECTIONOID	The connection object identifier (OID).
	OPENINGOID	This value is never populated (deprecated).
	UPDVALUEOID	The UDP object identifier (OID).
	UDPNAME	The display name of the UDP.
	UDPPROGRAMMATICNAME	The programmatic name or tag for the UDP.
	UDPDTYPE	The UDP type.
	VALUETYPE	Value type of the UDP.
	STRINGUDPVALUE	If the value type is STRING, this is going to store the UDP value.
	TIMEUDPVALUE	If the value type is not STRING, then the value can be represented as numeric (FLOAT, BIGDECIMAL, or TIME)

View Name	Column Name	Description
<p>CONTAINERVIEWLITE: Overall view of containers (floors, spaces, buildings, datacenters, zones). It exposes very basic information about these types of containers, also makes reference to the parent container in the case the whole parent hierarchy is needed. This view is the result of joining the tables DCIMCOMPLEXOBJECT, ABSTRACTCONTAINER and PHYSICALPLACEMENT.</p>	CONTAINEROID	The container object identifier (OID).
	CONTAINERNAME	The name of the container.
	CONTAINERTYPE	Type of the container.
	CONTAINERALARMSTATUS	Overall alarm status for the container.
	CONTAINERMAINTENANCE MODE	Determine if the container is in maintenance mode (if maintenance activities are being carried out in the container.)
	PARENTOID	The object identifier (OID) of the parent container this container is placed in.
	PARENTNAME	ame of the parent container where this container is located.
<p>DATACENTERVIEWLITE: Overall view of the datacenters. It exposes very basic information about datacenters. This view is the result of joining the tables DCIMCOMPLEXOBJECT and ABSTRACTCONTAINER.</p>	DATACENTEROID	The data center object identifier (OID).
	DATACENTERNAME	The name of the data center.
	DATACENTERALARMSTATUS	Overall alarm status for the data center.
	DATACENTERMAINTENANCE MODE	Determines if the data center is in maintenance mode.
<p>DEVICELOCATIONVIEWLITE: Overall view of the devices. It performs all necessary joins to maintain basic device information along with device location. This view is the result of joining the tables: DCIMCOMPLEXOBJECT, PHYSICALOBJECT, DEVICE, OBJECTCATEGORY. Also joins in the names of the denormalized placement information such as Building, Floor, Space and Zone.</p>	DEVICEOID	The device object identifier (OID).
	DEVICETYPE	Type of device.
	DEVICENAME	The name of the device.
	DEVICEMANUFACTURER	Device manufacturer.
	DEVICEMODEL	The manufacturer model number or model name for the device.
	DEVICEMODELQUALIFIER	An additional model qualifier that differentiates two different versions of the model.
	DEVICECOMMENTS	Comments made for the device.
	DEVICEOWNER	Name of the owner of this device, entered by the user.
	DEVICEDESCRIPTION	The device description.
DEVICEFULLCATEGORYNAME	The device's main category	

View Name	Column Name	Description
		name.
	DEVICECATEGORYNAME	Programmatic name of the main category of the device.
	DEVICEWEIGHT	Device weight.
	DEVICEHEIGHT	Device height.
	DEVICewidth	Device width.
	DEVICEDEPTH	Device depth.
	ENTERPRISEOID	The object identifier (OID) of the Enterprise the device is placed in.
Continued	BUILDINGOID	The object identifier (OID) of the Building the device is placed in.
	FLOOROID	The object identifier (OID) of the Floor the device is placed in.
	SPACEOID	The object identifier (OID) of the Space the device is placed in.
	ZONEOID	The object identifier (OID) of the Zone the device is placed in.
	DATACENTEROID	The object identifier (OID) of the Data center the device is placed in.
	RACKOID	The object identifier (OID) of the Rack the device is placed in.
Continued	DEVICERACKPOSITION	If the device is placed in a rack, this will be the position inside the rack that the device is located in.
	DEVICEISPLACED	Determines if a device is placed on a space with X, Y coordinates. It may pertain to the device directly or to a device placed in or on another device that meets the criteria. For example a server in a rack is placed if the rack is placed.
	RFID	Radio Frequency Identification

View Name	Column Name	Description
		(RFID) tag for a device.
	RFIDPOSITION	Position of the RFID tag in the device.
	DEVICETYPEOID	Reference to the DeviceType (symbol) that the device is associated with and from which this device was created.
	DEVICEURL	URL for the main web page of the device. Could be the device portal or main console URL.
Continued	DEVICELICENSETIERTAG	License tier associated to this device.
	DEVICEPRODUCTLINE	Product line defined by the manufacturer. This may be null if not defined by the manufacturer.
	DEVICE_DATACENTER	Name of the data center where the device is located.
	DEVICE_ENTERPRISE	Name of the enterprise where the device is located.
	DEVICE_BUILDING	Name of the building where the device is located.
	DEVICE_FLOOR	Name of the floor where the device is located.
	DEVICE_SPACE	Name of the space where the device is located.
	DEVICE_ZONE	Name of the zone where the device is located.
	DEVICE_RACK	Name of the rack where the device is located.
FLOORVIEWLITE: Overall view of the floors. It exposes very basic information about floors. This view is the result of joining the tables DCIMCOMPLEXOBJECT and ABSTRACTCONTAINER.	FLOOROID	The floor object identifier (OID).
	FLOORNAME	The name of the floor.
	FLOORALARMSTATUS	Overall alarm status for the floor.
	FLOORMAINTENANCEMODE	Determine if the floor is in maintenance mode.
SPACEVIEWLITE: Overall view of the spaces. It exposes very basic information about spaces. This view is the result of joining the tables	SPACEOID	The space object identifier (OID).

View Name	Column Name	Description
DCIMCOMPLEXOBJECT and ABSTRACTCONTAINER.	SPACENAME	The name of the space.
	SPACEALARMSTATUS	Overall alarm status for the space.
	SPACEMAINTENANCEMODE	Determine if the space is in maintenance mode.
ZONEVIEWLITE: Overall view of the zones. It exposes very basic information about zones. This view is the result of joining the tables DCIMCOMPLEXOBJECT and ABSTRACTCONTAINER.	ZONEOID	The zone object identifier (OID).
	ZONENAME	The name of the zone.
	ZONEALARMSTATUS	Overall alarm status for the zone.
	ZONEMAINTENANCEMODE	Determine if the zone is in maintenance mode.

For Historical Use

Data Management

The Bulk Data Processing tool provided with the *Trellis*™ platform is an application that allows you to create, update and delete large quantities of data in the platform's database. Data that can be bulk loaded includes containers, device categories, connections and ports. Containers are buildings, floors, rectangular and polygon spaces (using x/y coordinates) and zones. Devices can be floor or rack mounted and include racks, servers, components, panels, breakers and so on. Connections include power and data.

The tool includes an Excel™ template for each operation (create, update and delete), and also includes a sample spreadsheet file for each template. The sample can be used as a guide when designing and filling in your spreadsheet. After the required data is entered and loaded into the *Trellis*™ platform, the platform outputs an Excel™ spreadsheet with status messages to confirm that each container, device category, connection or port is successfully loaded into the platform database. When the bulk load process is complete, the processed data can be viewed from the *Trellis*™ platform software. After all the objects are successfully loaded in the platform database, an administrator can enable/disable the restricted access feature on the Property accordion for each object.

The system requirements for this tool are within the requirements for the *Trellis*™ workstation. These requirements are listed in The TRELLIS™ Real-Time Infrastructure Optimization Platform Pre-Installation Installer/User Guide.

NOTE: The recommended chunkSize is the default setting 5. If items on a spreadsheet tab are independent, they must not be within the same chunk.

NOTE: Java version 7 or 8 is required to use the Bulk Data Processing tool.

NOTE: Red highlighted columns in the tables do not require an entry.

Understanding Spreadsheets

The Bulk Data Processing tool provides the following templates for bulk operations:

- *trellisCreateTemplate.xlsx*
- *trellisUpdateTemplate.xlsx*
- *trellisDeleteTemplate.xlsx*

When you click one of these template files, the Introduction window opens with a row of bulk loading spreadsheet tabs on the bottom bar. The arrows on the bottom-left side of the bar and the vertical slider on the bottom-right side of the bar are used to access the different types of spreadsheets. A color-coded legend at the top of the window provides the requirements for the different types of spreadsheet columns. The scroll bar on the bottom-right is used to adjust the spreadsheet to display all the columns after a spreadsheet is open.

The following table provides the different types of spreadsheets. As shown in the table, the Create, Update and Delete bulk load operations are possible for each spreadsheet with the exception of Zones, which can only be updated using the tool. The Required Data column lists the items that must be included in the spreadsheet before the tool can process the data.

Spreadsheet Operations and Data Requirements

Spreadsheet	Operations	Required Data
Buildings	Create, Update and Delete	N/A
Floors	Create, Update and Delete	Buildings
Rectangular Spaces	Create, Update and Delete	Floors
Flexible Spaces	Create, Update and Delete	Floors
Zones	Update	Spaces
Racks and Cabinets	Create, Update and Delete	Spaces
Rack Mounted Devices	Create, Update and Delete	Racks
Floor Mounted Devices	Create, Update and Delete	Floors and spaces
Blades	Create, Update and Delete	Rack mounted devices
Components	Create, Update and Delete	Rack mounted devices
Rack Mounted Devices (Zero U)	Create, Update and Delete	Racks
Power Strips (FMD)	Create, Update and Delete	Floors and spaces
Generators	Create, Update and Delete	Buildings
UPS	Create, Update and Delete	Floors and spaces
PDU's	Create, Update and Delete	Floors and spaces
RPP	Create, Update and Delete	Floors and spaces
Panels	Create, Update and Delete	PDU and or RPP
Breakers	Create, Update and Delete	Panels
Breaker to PowerStrip	Create, Update and Delete	Power strips and rack mounted devices
Breaker to Device	Create, Update and Delete	Breakers and power strips
PowerStrip to Device	Create, Update and Delete	Breakers and rack mounted devices
Data Connections	Create, Update and Delete	Rack mounted devices
Update Port Names	Update	Port names
Update Slot Names	Update	Slot names

When you click one of the spreadsheet tabs on the bottom bar, it opens the selected spreadsheet with the default, color-coded column headers to guide you. The first 27 rows in each spreadsheet contain formulas and data validations to make entries intuitive. If additional rows are needed, rows 3-27 can be copied and pasted (using the Insert Copied Cells option) into the spreadsheet beginning with row 28. See [Spreadsheet Types](#) on page 263 for descriptions of the information that can be added in each column of each spreadsheet.

Data received from the server

The spreadsheet columns with red text on a yellow background are the Status, id, timestamp, Object, ErrorCode and ErrorMessage columns. These columns do not require any input and are populated by the server during the loading process. After a spreadsheet is processed, you can check these columns for blank fields or error and status messages to verify the process is successful. Any rows with blank fields or returned messages can be resubmitted.

Connection spreadsheets

Power connections can be bulk loaded into the *Trellis*[™] platform database using the Breaker to PowerStrip, Breaker to Device and PowerStrip to Device spreadsheets. Data connections can be bulk loaded using the Data Connections spreadsheet.

User-defined properties

The columns in each spreadsheet can be customized. You can also add user-defined property (UDP) values to be associated with devices, connections and containers that are previously defined in the *Trellis*[™] platform.

The following conditions must be met when using user-defined properties:

- The values must be a string, date or numeric value consistent with the UDP type.
- The user-defined property name must include the container, device category, connection or port it applies to.

Update Port and Slot Names

You can use the Update Port and Slot Names spreadsheets to rename the data and power ports of a device as well as any available slot names.

Using the Tool

The following procedures describe how to download the Bulk Data Processing files, populate the customer data file spreadsheets, create user-defined properties in the spreadsheets and run the tool. User-defined properties must be previously created in the *Trellis*[™] platform software. To create user-defined properties, see [Configuring user-defined properties for a device category](#) on page 59.

To download the tool:

1. Log in to the *Trellis*[™] platform and from the launch pad, click *Portfolio*.
2. From the main menu, select *File - Download - Bulk Data Processing Tool*.
3. Extract the *trellisbulkdataprocessing.zip* file to the desired location on your system.

NOTE: After the files are unzipped, you cannot rename or change the structure or location of the Bulk Data Processing files. These files are only supported from the original download location.

To populate customer data file spreadsheets:

1. Browse to the *bulkdataprocessing/trellis Templates* folder and copy the applicable template and corresponding *.yaml* file to the *bulkdataprocessing/datasource* folder.

NOTE: The new spreadsheet and yaml files must be saved to the */datasource* folder in order to run the tool.

2. Rename the template files by removing *Template* from the name, for example **trellisCreate.xlsx**.
3. If you need additional rows, before entering data, copy rows 3 to 27 and paste (using the *Insert Copied Cells* option) the copied rows starting with row 28, and then repeat as needed.

NOTE: Copying rows is done by clicking the first row to be copied, clicking and holding the **Shift** key while selecting the last row to be copied and then right-clicking *Copy*.

- Populate the new spreadsheet with your data as shown in the following example. See the create, update or delete sample spreadsheet in the tool's files and select the applicable container, device or connection type from the tabs on the bottom of the spreadsheet. Also, see [Spreadsheet Types](#) on page 263 for the definitions of the values that can be added in each column of the spreadsheets.

Example: PDU Spreadsheet

Process	Building	Floor	Space	PDUName	Manufacturer	Model	ModelQualifier	SymbolTypeIdentifier	PlacementType	LayerName	XCoordinate	YCoordinate	Rotation	ZCoordinate	InputVolts	OutputVolts	Owner	OwnerEmail
FALSE																		
Example: Create a PDU with some optional parameters and capacities																		
FALSE	Building_1	Floor_1	Space_1	PDU01	LIEBERT	PPA125C	PPA125C	LIEBERTPPA125CPPA125C	inSpace		60	11	0		200	110		

- Under the PROCESS column, click the drop-down arrow for each row and select *TRUE* to manually assign each row to be processed.
-or-
Click the drop-down arrow and select *FALSE* to prevent the data on the same row from being processed and proceed to process the next row.

NOTE: Selecting *FALSE* allows you to process only the rows that you are ready to process and prevents an error response due to an incomplete row.

- Verify only the required sheets are included for processing. Otherwise, all sheets included in the spreadsheet will be processed.

NOTE: Rows in a spreadsheet and whole spreadsheets that are after a blank field or a field with an error will not be processed.

NOTE: Unnecessary spreadsheets can be deleted to improve performance when processing.

To reference a component placed directly in a device:

Sheets referencing components require input for DeviceName, ParentComponent and ComponentName. However, to reference a component placed directly in a device, the DeviceName must be ignored (using '@ignore') and the name should be entered as the ParentComponent. Either the device or the parent component must correspond to an item mounted directly in the rack.

Example: Creating a Card to Place Directly in a CISCO Appliance Using @ignore for the DeviceName

Process	Building	Floor	Space	RackName	DeviceName	ParentComponent	ComponentName	Manufacturer	Model	ModelQualifier	SymbolTypeIDentifier
FALSE											
FALSE											
FALSE											
FALSE	Building_1	Floor_Space_Rack1a			@ignore	CISCO01	BROADCOM01	BROADCOM	57800S 430-4428		BROADCOM57800S430-4428
FALSE	Building_1	Floor_Space_Rack1a			CISCO01	BROADCOM01	SFP1	CISCO	SFP-10 SFP-10G-LR		CISCO SFP-10G-LRSFP-10G-LR
FALSE											

To reference a device slot in a rack mounted device:

The update slot names sheet requires input for ParentDevice and DeviceName. However, to reference a device placed directly in a rack, the ParentDevice must be ignored (using '@ignore' and the name should be entered as the DeviceName. Either the device or the parent component must correspond to an item mounted directly in the rack.

Example: Renaming a Slot in a Blade Chassis Using @ignore for the ParentDevice

Process	Building	Floor	Space	RackName	ParentDevice	DeviceName	Type	SlotName
FALSE								
FALSE								
FALSE								
FALSE								
FALSE	Building_1	Floor_1	Space_1	Rack1a	@ignore	Blade Chassis	slot	1
FALSE								

To add previously defined user-defined properties and the UDP value to the object being created:

1. Go to the last column header on the right side of the spreadsheet and enter the prefix **UDP:** or **udp:**.
2. Without any spaces after the colon, enter the user-defined property category assignment followed by another colon, such as **UDP:udpCategory:** or **udp:udpCategory**, where **udpCategory** is a previously assigned category assignment.
3. Without any spaces after the colon, enter the user-defined property name, such as **UDP:udpCategory:udpName** or **udp:udpCategory:udpName**, where **udpName** is a previously defined property name.
4. For each row with the added property name (for the container, device category, connection or port), enter the desired value for the UDP under the appropriate column header.

Adding the User Defined Properties Value

Property Name	Input Type	Default Value	Category Assignment
PO	String	test	Power Opening

U	V	W	X	Y	Z	AA
Status	id	timestamp	Object	ErrorCode	ErrorMessage	UDP:poweropening:PO

- After the tool is run, check the ErrorMessage column to verify all the UDPs are processed.

NOTE: If any UDPs are not processed, check for an incorrect UDP syntax.

To run the tool:

- For Windows®, double-click the *BulkDataProcessing.bat* file and keep the displayed Bulk Data Processing Command window open during the process.
- or-
- For Linux®, run the *BulkDataProcessing.sh* script. (The Linux® client must have graphical interface capabilities to run the tool.)

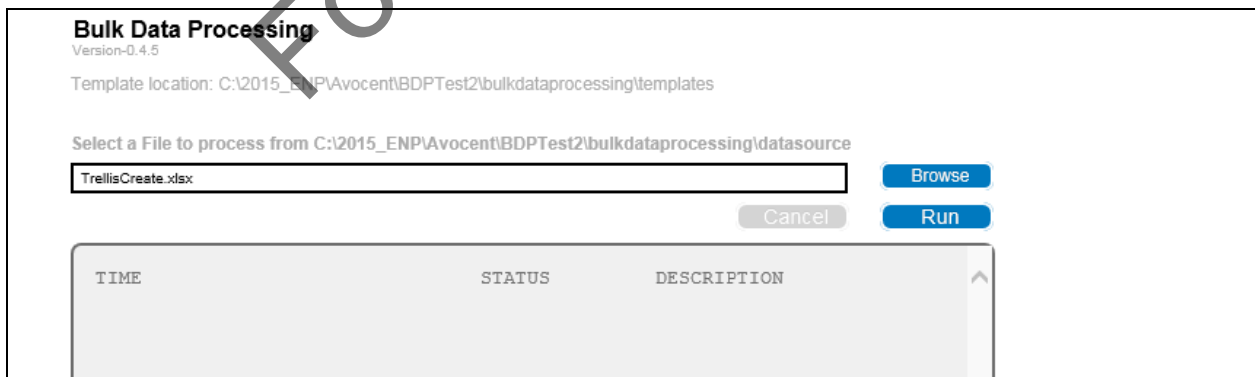
NOTE: Only one instance of the tool can be run from a workstation at a time.

- On the opening page, enter your username, password and the *Trellis*™ platform Hostname or IP address to be authorized, then click *Authorize*.

NOTE: The account information used must have the correct permissions.

- On the Bulk Data Processing window, click *Browse* to locate the *bulkdataprocessing/datasource* folder and double-click a spreadsheet to process.

Bulk Data Processing GUI



NOTE: Always execute a single entity. Executing multiple entities and/or multiple types of spreadsheets (create, update and delete) for an entity may display unexpected results.

- Click *Run* to start the tool and update the *Trellis*™ platform database. See [Bulk Data Processing Error and Status Codes](#) on page 315 for status message descriptions.

NOTE: If you click *Cancel* during a process, any updates completed before the process is terminated are applied to the platform.

Bulk Data Processing Completed

Fri Sep 11 11:28:34 EDT 2015	STARTED	Data Connections
Fri Sep 11 11:28:34 EDT 2015	COMPLETED	Data Connections
Fri Sep 11 11:28:34 EDT 2015	COMPLETED	Completed processing sheets
Fri Sep 11 11:28:34 EDT 2015	COMPLETED	Bulk Data Processing Job

Output Directory: C:\2015_ENP\Avocent\BDPTest2\bulkdataprocessing\outputFiles\TrellisCreate_out_09.11.2015_11.26.51.xlsx

- After the process is complete, using the output directory path displayed at the bottom of the window, browse to the *outputFiles* folder.
- Locate the file with the same name as the source spreadsheet and the extension *_out.xlsx*.
- In the Status column of the spreadsheet, verify the data is processed successfully from the spreadsheet to the *Trellis™* platform database.

Bulk Data Processing Output

	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL
1	Status	id	timestamp	Object	ErrorCode	ErrorMessage								
2														
3														
4	SUCCESS	1bdfdbba-c	Sep 11, 201	{id=1bdfdbba-c703-44b1-bac3-f575222c806c, returnCode=0, entity={name=Floor_1, comment=null, displayCategoryProgramm										
5														
6	SUCCESS	ad77467a-	Sep 11, 201	{id=ad77467a-a0e3-426a-a50c-529b5bfe4ba7, returnCode=0, entity={name=Floor_2, comment=B1 > F2, displayCategoryProgr										
7														
8														

NOTE: If re-running the same spreadsheet, exit and run the tool again.

- For Windows®, click *Exit* to close the tool's browser window and the command window.
-or-
For Linux®, enter **Ctrl+C** to close the tool.

Spreadsheet Types

The tables in this section provide a description of the information that must be added in each column of the different types of spreadsheets.

Buildings

The following table describes each column in the Buildings spreadsheet.

Building Spreadsheet Descriptions

Column	Description
Process	Value must be true to process a row or false to skip the row
NewBuilding	New building name provided in the updated spreadsheet

Column	Description
Building	Building name
Owner	Owner name
Notes	Comments
ContactName	Contact name
PhoneNumber	Contact phone numbers
Address	Street address
Address2	Additional street address
City	City
State	State
ZipCode	Zip code
Country	Country
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed)
id	ObjectID of the new building
timestamp	Date and time the building record is created in the database
Object	HTTP response from the server
ErrorCode	HTTP status and error codes from the server
ErrorMessage	Error messages from the server

Floors

The following table describes each column in the Floors spreadsheet.

Floors Spreadsheet Descriptions

Column	Description
Process	Value must be true to process a row or false to skip the row
NewFloor	New floor name provided in the updated spreadsheet
Building	Building name
Floor	Floor name
Owner	Owner name
Notes	Comments
Altitude	Altitude value of the floor
PowerRated	Value of the rated power capacity in KW
POWER-RATED-KW	Programmatic name of the rated power capacity
PowerDesigned	Value of the designed power capacity in KW
POWER-DESIGNED-KW	Programmatic name of the designed power capacity
PowerReserved	Value of the reserved power capacity in KW
POWER-RESERVED-KW	Programmatic name of the reserved power capacity
HeatRated	Value of the rated heat capacity in KW

Column	Description
COOLING-RATED	Programmatic name of the rated cooling capacity
HeatDesigned	Value of the designed heat capacity in KW
COOLING-DESIGNED	Programmatic name of the designed cooling capacity
HeatReserved	Value of the reserved heat capacity in KW
COOLING-RESERVED	Programmatic name of the reserved cooling capacity
FloorSpaceRated	Value of the rated floor space in square feet capacity
FLOORSPACE-RATED	Programmatic name of the rated floor space capacity
FloorSpaceDesigned	Value of the designed floor space capacity in square feet
FLOORSPACE-DESIGNED	Programmatic name of the floor space designed capacity
FloorSpaceReserved	Value of the reserved floor space capacity in square feet
FLOORSPACE-RESERVED	Programmatic name of the floor space reserved capacity
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed)
id	ObjectID of the new floor
timestamp	Date and time the floor record is created in the database
Object	HTTP response from the server
ErrorCode	HTTP status and error codes from the server
ErrorMessage	Error messages from the server

Rectangular Spaces

The following table describes each column in the Rectangular Spaces spreadsheet.

Spaces Spreadsheet Descriptions

Column	Description
Process	Value must be true to process a row or false to skip the row.
NewSpace	New space name provided in the updated spreadsheet.
Building	Building name.
Floor	Floor name.
Space	Space name.
CeilingHeight	Height of the ceiling.
DropCeilingHeight	Height of the drop ceiling.
RaisedFloorHeight	Height of the raised floor.
OriginX	X coordinate for absolute placement on the floor. To produce an unplaced space use '@ignore for this and all ordinal values.
OriginY	Y coordinate for absolute placement on the floor. To produce an unplaced space use '@ignore for this and all ordinal values.
RectangleWidth	The width of the rectangle in inches.
RectangleHeight	The height of the rectangle in inches.
OneX	X coordinate of the first polygon ordinal, specified in inches. Use '@ignore if

Column	Description
	not specifying.
TwoX	X coordinate of the second polygon ordinal, specified in inches. Use '@ignore if not specifying.
TwoY	Y coordinate of the second polygon ordinal, specified in inches. Use '@ignore if not specifying.
ThreeY	Y coordinate of the third polygon ordinal, specified in inches. Use '@ignore if not specifying.
GridLength	Length of grid square, specified in inches. Use '@ignore if not specifying.
GridWidth	Width of grid square, specified in inches. Use '@ignore if not specifying.
Owner	Owner name.
Notes	Comments.
PowerRated	Value of the rated power capacity in KW.
POWER-RATED-KW	Programmatic name of the rated power capacity.
PowerDesigned	Value of the designed power capacity in KW.
POWER-DESIGNED-KW	Programmatic name of the designed power capacity.
PowerReserved	Value of the reserved power capacity in KW.
POWER-RESERVED-KW	Programmatic name of the reserved power capacity.
HeatRated	Value of the rated heat capacity in KW.
COOLING-RATED	Programmatic name of the rated cooling capacity.
HeatDesigned	Value of the designed heat capacity in KW.
COOLING-DESIGNED	Programmatic name of the designed cooling capacity.
HeatReserved	Value of the reserved heat capacity in KW.
COOLING-RESERVED	Programmatic name of the reserved cooling capacity.
SpaceReserved	Value of the reserved floor space capacity in square feet.
FLOORSPACE-RESERVED	Programmatic name of the floor space reserved capacity.
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed).
id	ObjectID of the new floor.
timestamp	Date and time the floor record is created in the database.
Object	HTTP response from the server.
ErrorCode	HTTP status and error codes from the server.
ErrorMessage	Error messages from the server.

Flexible Spaces

The following table describes each column in the Flexible Spaces spreadsheet.

Spaces Spreadsheet Descriptions

Column	Description
Process	Value must be true to process a row or false to skip the row.
NewSpace	New space name provided in the updated spreadsheet.
Building	Building name.
Floor	Floor name.
Space	Space name.
CeilingHeight	Height of the ceiling.
DropCeilingHeight	Height of the drop ceiling.
RaisedFloorHeight	Height of the raised floor.
OriginX	X coordinate for absolute placement on the floor. To produce an unplaced space use '@ignore for this and all ordinal values.
OriginY	Y coordinate for absolute placement on the floor. To produce an unplaced space use '@ignore for this and all ordinal values.
OneX	X coordinate offset for the first polygon ordinal, specified in inches. Use '@ignore if not specifying.
OneY	Y coordinate offset for the first polygon ordinal, specified in inches. Use '@ignore if not specifying.
TwoX	X coordinate offset for the second polygon ordinal, specified in inches. Use '@ignore if not specifying.
TwoY	Y coordinate offset for the second polygon ordinal, specified in inches. Use '@ignore if not specifying.
ThreeX	X coordinate offset for the third polygon ordinal, specified in inches. Use '@ignore if not specifying.
ThreeY	Y coordinate offset for the third polygon ordinal, specified in inches. Use '@ignore if not specifying.
FourX	X coordinate offset for the fourth polygon ordinal, specified in inches. Use '@ignore if not specifying.
FourY	Y coordinate offset for the fourth polygon ordinal, specified in inches. Use '@ignore if not specifying.
FiveX	X coordinate offset for the fifth polygon ordinal, specified in inches. Use '@ignore if not specifying.
FiveY	Y coordinate offset for the fifth polygon ordinal, specified in inches. Use '@ignore if not specifying.
SixX	X coordinate offset for the sixth polygon ordinal, specified in inches. Use '@ignore if not specifying.
SixY	Y coordinate offset for the sixth polygon ordinal, specified in inches. Use '@ignore if not specifying.
SevenX	X coordinate offset for the seventh polygon ordinal, specified in inches. Use

Column	Description
	'@ignore if not specifying.
SevenY	Y coordinate offset for the seventh polygon ordinal, specified in inches. Use '@ignore if not specifying.
EightX	X coordinate offset for the eighth polygon ordinal, specified in inches. Use '@ignore if not specifying.
EightY	Y coordinate offset for the eighth polygon ordinal, specified in inches. Use '@ignore if not specifying.
NineX	X coordinate offset for the ninth polygon ordinal, specified in inches. Use '@ignore if not specifying.
NineY	Y coordinate offset for the ninth polygon ordinal, specified in inches. Use '@ignore if not specifying.
GridLength	Length of grid square, specified in inches. Use '@ignore if not specifying.
GridWidth	Width of grid square, specified in inches. Use '@ignore if not specifying.
Owner	Owner name.
Notes	Comments.
PowerRated	Value of the rated power capacity in KW.
POWER-RATED-KW	Programmatic name of the rated power capacity.
PowerDesigned	Value of the designed power capacity in KW.
POWER-DESIGNED-KW	Programmatic name of the designed power capacity.
PowerReserved	Value of the reserved power capacity in KW.
POWER-RESERVED-KW	Programmatic name of the reserved power capacity.
HeatRated	Value of the rated heat capacity in KW.
COOLING-RATED	Programmatic name of the rated cooling capacity.
HeatDesigned	Value of the designed heat capacity in KW.
COOLING-DESIGNED	Programmatic name of the designed cooling capacity.
HeatReserved	Value of the reserved heat capacity in KW.
COOLING-RESERVED	Programmatic name of the reserved cooling capacity.
SpaceReserved	Value of the reserved floor space capacity in square feet.
FLOORSPACE-RESERVED	Programmatic name of the floor space reserved capacity.
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed).
id	ObjectID of the new floor.
timestamp	Date and time the floor record is created in the database.
Object	HTTP response from the server.
ErrorCode	HTTP status and error codes from the server.
ErrorMessage	Error messages from the server.

Zones

The following table describes each column in the Zones spreadsheet.

NOTE: Zones cannot be created or deleted, but can be updated using the tool.

Zones Spreadsheet Descriptions

Column	Description
Process	Value must be true to process a row or false to skip the row
NewZone	New zone name provided in the updated spreadsheet
Building	Building name
Floor	Floor name
Space	Space name
Zone	Zone name
Owner	Owner name
Notes	Comments
ZoneType	Type of zone
ZoneColor	Color of zone
PowerRated	Value of the rated power capacity in KW
POWER-RATED-KW	Programmatic name of the rated power capacity
PowerReserved	Value of the reserved power capacity in KW
POWER-RESERVED-KW	Programmatic name of the reserved power capacity
HeatRated	Value of the rated heat capacity in KW
COOLING-RATED	Programmatic name of the rated cooling capacity
HeatReserved	Value of the reserved heat capacity in KW
COOLING-RESERVED	Programmatic name of the reserved cooling capacity
SpaceDesigned	Value of the designed space capacity
FLOORSPACE-DESIGNED	Programmatic name of the designed floor space capacity
SpaceReserved	Value of the reserved space capacity
FLOORSPACE-RESERVED	Programmatic name of the reserved floor space capacity
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed)
id	Identification of the device
timestamp	Date and time of the bulk data process
Object	HTTP response messages
ErrorCode	HTTP status and error codes
ErrorMessage	HTTP status and error messages

Racks and Cabinets

The following table describes each column in the Racks and Cabinets spreadsheet.

Racks and Cabinets Spreadsheet Descriptions

Column	Description
Process	Value must be true to process a row or false to skip the row
NewBuilding	New building name provided in the updated spreadsheet
NewFloor	New floor name provided in the updated spreadsheet
NewSpace	New space name provided in the updated spreadsheet
NewRackName	New rack name provided in the updated spreadsheet
Building	Building name
Floor	Floor name
Space	Space name
RackName	Rack name
Manufacturer	Manufacturer name
Model	Model name
ModelQualifier	Model qualifier name
SymbolTypeIdentifier	String containing the manufacturer, model and model qualifier names
PlacementType	Type of placement within a container; see Placement Types on page 291
LayerName	Layer name
XCoordinate	X coordinate of the physical placement
YCoordinate	Y coordinate of the physical placement
Rotation	Rotation
ZCoordinate	Z coordinate of the physical placement
RUStartNumber	RU start number of the rack
RackUnitsStartAtTop	True if the rack unit starts at top, otherwise, the value is false
Owner	Owner name
OwnerEmail	Owner email address
Notes	Comments
SerialNumber	Serial number of the rack
AssetNumber	Asset number of the rack
BarcodeNumber	Bar code number of the rack
PowerRated	Rated power of the rack
POWER-RATED-KW	Programmatic name of the rated power capacity in KW
PowerDesigned	Value of the designed power capacity
POWER-DESIGNED-KW	Programmatic name of the designed power capacity in KW
HeatRated	Value of the rated heat capacity
COOLING-RATED	Programmatic name of the rated cooling capacity
HeatDesigned	Value of the designed heat capacity
COOLING-DESIGNED	Programmatic name of the designed cooling capacity
WeightRated	Value of the rated weight capacity

Column	Description
WEIGHT-RATED	Programmatic name of the rated weight
WeightDesigned	Value of the designed weight capacity
WEIGHT-DESIGNED	Programmatic name of the designed weight
RackSpaceDesigned	Value of the designed rack space capacity
RACKSPACE-DESIGNED	Programmatic name of the designed rack space
SpaceDesigned	Value of the designed space capacity
FLOORSPACE-DESIGNED	Programmatic name of the designed floor space
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed)
id	ObjectID of the new rack and cabinet
timestamp	Date and time the rack or cabinet record is created in the database
Object	HTTP response from the server
ErrorCode	HTTP status and error codes from the server
ErrorMessage	Error messages from the server

Rack Mounted Devices

The following table describes each column in the Racks spreadsheet.

Racks Spreadsheet Descriptions

Column	Description
Process	Value must be true to process a row or false to skip the row
NewBuilding	New building name provided in the updated spreadsheet
NewFloor	New floor name provided in the updated spreadsheet
NewSpace	New space name provided in the updated spreadsheet
NewRackName	New rack name provided in the updated spreadsheet
NewDeviceName	New device name
Building	Building name
Floor	Floor name
Space	Space name
RackName	Rack name
DeviceName	Device name
Manufacturer	Manufacturer name
Model	Model name
ModelQualifier	Model qualifier name
SymbolTypeIdentifier	String containing the manufacturer, model and model qualifier names
PlacementType	Type of placement within a container; see Placement Types on page 291
Side	Side name
FrontFacing	Front face of the physical placement

Column	Description
Uposition	U position of the physical placement
Xposition	X position of the physical placement
Rotation	Rotation
InputVoltage	Input voltage amount
Owner	Owner name
OwnerEmail	Owner email address
Notes	Comments
SerialNumber	Serial number of the rack mounted devices
AssetNumber	Asset number of the rack mounted devices
BarcodeNumber	Bar code number of the rack mounted devices
PowerDesigned	Value of the designed power capacity
POWER-DESIGNED-KW	Programmatic name of the designed power capacity in KW
HeatDesigned	Value of the designed heat capacity
COOLING-DESIGNED	Programmatic name of the designed cooling capacity
WeightDesigned	Value of the designed weight capacity
WEIGHT-DESIGNED	Programmatic name of the designed weight
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed)
id	ObjectID of the new rack mounted devices
timestamp	Date and time the rack mounted device record is created in the database
Object	HTTP response from the server
ErrorCode	HTTP status and error codes from the server
ErrorMessage	Error messages from the server

Floor Mounted Devices

The following table describes each column in the Floor Mounted Devices spreadsheet.

Floor Mounted Devices Spreadsheet Descriptions

Column	Description
Process	Value must be true to process a row or false to skip the row
NewBuilding	Building name provided in the updated spreadsheet
NewFloor	New floor name provided in the updated spreadsheet
NewSpace	New space name provided in the updated spreadsheet
NewDeviceName	New device name provided in the updated spreadsheet
Building	Building name
Floor	Floor name
Space	Space name
DeviceName	Device name

Column	Description
Manufacturer	Manufacturer name
Model	Model name
ModelQualifier	Model qualifier name
SymbolTypeIdentifier	String containing the manufacturer, model and model qualifier names
PlacementType	Type of placement within a container; see Placement Types on page 291
LayerName	Layer name
XCoordinate	X coordinate of the physical placement
YCoordinate	Y coordinate of the physical placement
Rotation	Rotation
ZCoordinate	Z coordinate of the physical placement
Owner	Owner name
OwnerEmail	Owner email address
Notes	Comments
SerialNumber	Serial number of the floor mounted devices
AssetNumber	Asset number of the floor mounted devices
BarcodeNumber	Bar code number of the floor mounted devices
PowerDesigned	Value of the designed power capacity
POWER-DESIGNED-AMPS	Programmatic name of the total designed power capacity in AMPS
HeatDesigned	Value of the designed heat capacity
COOLING-DESIGNED	Programmatic name of the designed cooling
WeightDesigned	Value of the designed weight capacity
WEIGHT-DESIGNED	Programmatic name of the designed weight
SpaceDesigned	Value of the designed space capacity
FLOORSPACE-DESIGNED	Programmatic name of the designed floor space
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed)
id	ObjectID of the new floor mounted devices
timestamp	Date and time the floor mounted device record is created in the database
Object	HTTP response from the server
ErrorCode	HTTP status and error codes from the server
ErrorMessage	Error messages from the server

Blades

The following table describes each column in the Blades spreadsheet.

Blades Spreadsheet Descriptions

Column	Description
Process	Value must be true to process a row or false to skip the row

Column	Description
NewBuilding	New building name provided in the updated spreadsheet
NewFloor	New floor name provided in the updated spreadsheet
NewSpace	New space name provided in the updated spreadsheet
NewRackName	New rack name provided in the updated spreadsheet
NewChassisName	New chassis name provided in the updated spreadsheet
NewBladeName	New blade name provided in the updated spreadsheet
Building	Building name
Floor	Floor name
Space	Space name
RackName	Rack name
ChassisName	Chassis name
BladeName	Blade name
Manufacturer	Manufacturer name
Model	Model name
ModelQualifier	Mode qualifier name
SymbolTypeIdentifier	String containing the manufacturer, model and model qualifier names
PlacementType	Type of placement within a container; see Placement Types on page 291
Rotation	Rotation
SlotNumber	Slot number
Owner	Owner name
OwnerEMail	Owner email address
Notes	Comments
SerialNumber	Serial number of the blade servers
AssetNumber	Asset number of the blade servers
BarcodeNumber	Bar code number of the blade servers
WeightDesigned	Value of the designed weight capacity
WEIGHT-DESIGNED	Programmatic name of the designed weight
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed)
id	ObjectID of the new blade servers
timestamp	Date and time the blade servers are created in the database
Object	HTTP response from the server
ErrorCode	HTTP status and error codes from the server
ErrorMessage	Error messages from the server

Components

The following table describes each column in the Components spreadsheet.

Components Spreadsheet Descriptions

Column	Description
Process	Value must be true to process a row or false to skip the row
NewBuilding	New building name provided in the updated spreadsheet
NewFloor	New floor name provided in the updated spreadsheet
NewSpace	New space name provided in the updated spreadsheet
NewRackName	New rack name provided in the updated spreadsheet
NewDeviceName	New device name provided in the updated spreadsheet
NewParentComponent	New parent component provided in the updated spreadsheet
NewComponentName	New component name provided in the updated spreadsheet
Building	Building name
Floor	Floor name
Space	Space name
RackName	Rack name
DeviceName	Device name; see To reference a component placed directly in a device: on page 260
ParentComponent	Parent component; see To reference a component placed directly in a device: on page 260
ComponentName	Component name
Manufacturer	Manufacturer name
Model	Model name
ModelQualifier	ModelQualifier name
SymbolTypeIdentifier	String containing the manufacturer, model and model qualifier names
PlacementType	Type of placement within a container; see Placement Types on page 291
Rotation	Rotation
SlotNumber	Slot number
Owner	Owner name
OwnerEmail	Owner email address
Notes	Comments
SerialNumber	Serial number of the rack
AssetNumber	Asset number of the rack
BarcodeNumber	Bar code number of the rack
WeightDesigned	Value of the designed weight capacity
WEIGHT-DESIGNED	Programmatic name of the designed weight
SpaceDesigned	Value of the designed space capacity
FLOORSPACE-DESIGNED	Programmatic name of the designed floor space
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed)

Column	Description
id	ObjectID of the new components
timestamp	Date and time the new component record is created in the database
Object	HTTP response from the server
ErrorCode	HTTP status and error codes from the server
ErrorMessage	Error messages from the server

Rack Mounted Devices (Zero U)

The following table describes each column in the Rack Mounted Devices (Zero U) spreadsheet.

Rack Mounted Devices (Zero U) Spreadsheet Descriptions

Column	Description
Process	Value must be true to process a row or false to skip the row
NewBuilding	New building name provided in the updated spreadsheet
NewFloor	New floor name provided in the updated spreadsheet
NewSpace	New space name provided in the updated spreadsheet
NewRackName	New rack name provided in the updated spreadsheet
NewDeviceName	New device name provided in the updated spreadsheet
Building	Building name
Floor	Floor name
Space	Space name
RackName	Rack name
DeviceName	Device name
Manufacturer	Manufacturer name
Model	Model name
ModelQualifier	Model qualifier name
SymbolTypeIdentifier	String containing the manufacturer, model and model qualifier names
PlacementType	Type of placement within a container; see Placement Types on page 291
ZUlocation	ZUlocation of the physical placement
ZUuHeight	ZUuHeight of the physical placement
ZUxPosition	ZUxPosition of the physical placement
ZURotation	ZURotation of the physical placement
ZUzOrder	ZUzOrder of the physical placement
ZUfrontFacing	ZUfrontFacing of the physical placement
InputVolts	Voltage input amount
OutputVolts	Voltage output amount
Owner	Owner name
OwnerEmail	Owner email address
Notes	Comments
SerialNumber	Serial number of the power strips

Column	Description
AssetNumber	Asset number of the power strips
BarcodeNumber	Bar code number of the power strips
PowerDesigned	Value of the designed power capacity
POWER-TOTAL-DESIGNED-AMPS	Programmatic name of the designed total power in AMPS
PowerReserved	Value of the reserved power capacity
POWER-TOTAL-RESERVED-AMPS	Programmatic name of the reserved total power in AMPS
WeightDesigned	Value of the designed weight capacity
WEIGHT-DESIGNED	Programmatic name of the designed weight
SpaceDesigned	Value of the designed space capacity
FLOORSPACE-DESIGNED	Programmatic name of the designed floor space
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed)
id	ObjectID of the new power strips
timestamp	Date and time the power strip record is created in the database
Object	HTTP response from the server
ErrorCode	HTTP status and error codes from the server
ErrorMessage	Error messages from the server

Power Strips for Floor-Mounted Devices (FMD)

The following table describes each column in the power strips for floor mounted devices spreadsheet.

Power Strips (FMD) Spreadsheet Descriptions

Column	Description
Process	Value must be true to process a row or false to skip the row
NewBuilding	New building name provided in the updated spreadsheet
NewFloor	New floor name provided in the updated spreadsheet
NewSpace	New space name provided in the updated spreadsheet
NewStripName	New power strip name provided in the updated spreadsheet
Building	Building name
Floor	Floor name
Space	Space name
StripName	Power strip name
Manufacturer	Manufacturer name
Model	Model name
ModelQualifier	Model qualifier name
SymbolTypeIdentifier	String containing the manufacturer, model and model qualifier names
PlacementType	Type of placement within a container; see Placement Types on page 291

Column	Description
LayerName	Layer name
XCoordinate	X coordinate of the physical placement
YCoordinate	Y coordinate of the physical placement
Rotation	Rotation
ZCoordinate	Z coordinate of the physical placement
InputVolts	Voltage input amount
OutputVolts	Voltage output amount
Owner	Owner name
OwnerEmail	Owner email address
Notes	Comments
SerialNumber	Serial number of the power strip floor mounted device
AssetNumber	Asset number of the power strip floor mounted device
BarcodeNumber	Bar code number of the power strip floor mounted device
PowerDesigned	Value of the designed power capacity
POWER-TOTAL-DESIGNED-AMPS	Programmatic name of the designed total power in AMPS
PowerReserved	Value of the reserved power capacity
POWER-TOTAL-RESERVED-AMPS	Programmatic name of the reserved power total in AMPS
WeightDesigned	Value of the designed weight capacity
WEIGHT-DESIGNED	Programmatic name of the designed weight
SpaceDesigned	Value of the designed space capacity
FLOORSPACE-DESIGNED	Programmatic name of the designed floor space
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed)
id	ObjectID of new power strips
timestamp	Date and time the power strip floor mounted device record is created in the database
Object	HTTP response from the server
ErrorCode	HTTP status and error codes from the server
ErrorMessage	Error messages from the server

Generators

The following table describes each column in the Generators spreadsheet.

Generators Spreadsheet Descriptions

Column	Description
Process	Value must be true to process a row or false to skip the row
NewBuilding	New building name provided in the updated spreadsheet

Column	Description
NewFloor	New floor name provided in the updated spreadsheet
NewSpace	New space name provided in the updated spreadsheet
NewGeneratorName	New generator name provided in the updated spreadsheet
Building	Building name
Floor	Floor name
Space	Space name
GeneratorName	Generator name
Manufacturer	Manufacturer name
Model	Model name
ModelQualifier	Model qualifier name
SymbolTypeIdentifier	String containing the manufacturer, model and model qualifier names
PlacementType	Type of placement within a container; see Placement Types on page 291
LayerName	Layer name
XCoordinate	X coordinate of the physical placement
YCoordinate	Y coordinate of the physical placement
Rotation	Rotation
ZCoordinate	Z coordinate of the physical placement
InputVolts	Voltage input amount
OutputVolts	Voltage output amount
Owner	Owner name
OwnerEmail	Owner email address
Notes	Comments
SerialNumber	Serial number of the generator
AssetNumber	Asset number of the generator
BarcodeNumber	Bar code number of the generator
PowerDesigned	Value of the designed power capacity
POWER-TOTAL-DESIGNED-AMPS	Programmatic name of the designed total power in AMPS
PowerReserved	Value of the reserved power capacity
POWER-TOTAL-RESERVED-AMPS	Programmatic name of the reserved power total in AMPS
WeightDesigned	Value of the designed weight capacity
WEIGHT-DESIGNED	Programmatic name of the designed weight
SpaceDesigned	Value of the designed space capacity
FLOORSPACE-DESIGNED	Programmatic name of the designed floor space
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed)
id	ObjectID of the new generator

Column	Description
timestamp	Date and time the generator record is created in the database
Object	HTTP response from the server
ErrorCode	HTTP status and error codes from the server
ErrorMessage	Error messages from the server

UPS

The following table describes each column in the UPS spreadsheet.

UPS Spreadsheet Descriptions

Column	Description
Process	Value must be true to process a row or false to skip the row
NewBuilding	New building name provided in the updated spreadsheet
NewFloor	New floor name provided in the updated spreadsheet
NewSpace	New space name provided in the updated spreadsheet
NewUPSName	New UPS name provided in the updated spreadsheet
Building	Building name
Floor	Floor name
Space	Space name
UPSName	UPS name
Manufacturer	Manufacturer name
Model	Model name
ModelQualifier	Model qualifier name
SymbolTypeIdentifier	String containing the manufacturer, model and model qualifier names
PlacementType	Type of placement within a container; see Placement Types on page 291
LayerName	Layer name
XCoordinate	X coordinate of the physical placement
YCoordinate	Y coordinate of the physical placement
Rotation	Rotation
ZCoordinate	Z coordinate of the physical placement
InputVolts	Voltage input amount
OutputVolts	Voltage output amount
Owner	Owner name
OwnerEmail	Owner email address
Notes	Comments
SerialNumber	Serial number of the UPS
AssetNumber	Asset number of the UPS
BarcodeNumber	Bar code number of the UPS
PowerDesigned	Value of the designed power capacity

Column	Description
POWER-TOTAL-DESIGNED-AMPS	Programmatic name of the designed total power in AMPS
PowerReserved	Value of the reserved power capacity
POWER-TOTAL-RESERVED-AMPS	Programmatic name of the the reserved total power in AMPS
WeightDesigned	Value of the designed weight capacity
WEIGHT-DESIGNED	Programmatic name of the designed weight
SpaceDesigned	Value of the designed space capacity
FLOORSPACE-DESIGNED	Programmatic name of the designed floor space
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed)
id	ObjectID of the new UPS
timestamp	Date and time the UPS record is created in the database
Object	HTTP response from the server
ErrorCode	HTTP status and error codes from the server
ErrorMessage	Error messages from the server

PDU's

The following table describes each column in the PDU's spreadsheet.

PDU's Spreadsheet Descriptions

Column	Description
Process	Value must be true to process a row or false to skip the row
NewBuilding	New building name provided in the updated spreadsheet
NewFloor	New floor name provided in the updated spreadsheet
NewSpace	New space name provided in the updated spreadsheet
NewPDUName	New PDU name provided in the updated spreadsheet
Building	Building name
Floor	Floor name
Space	Space name
PDUName	PDU name
Manufacturer	Manufacturer name
Model	Model name
ModelQualifier	Model qualifier name
SymbolTypeIdentifier	String containing the manufacturer, model and model qualifier names
PlacementType	Type of placement within a container; see Placement Types on page 291
LayerName	Layer name
XCoordinate	X coordinate of the physical placement
YCoordinate	Y coordinate of the physical placement

Column	Description
Rotation	Rotation
ZCoordinate	Z coordinate of the physical placement
InputVolts	Voltage input amount
OutputVolts	Voltage output amount
Owner	Owner name
OwnerEmail	Owner email address
Notes	Comments
SerialNumber	Serial number of the PDU
AssetNumber	Asset number of the PDU
BarcodeNumber	Bar code number of the PDU
PowerDesigned	Value of the designed power capacity
POWER-TOTAL-DESIGNED-AMPS	Programmatic name of the designed total power in AMPS
PowerReserved	Value of the reserved power capacity
POWER-TOTAL-RESERVED-AMPS	Programmatic name of the reserved power total in AMPS
WeightDesigned	Value of the designed weight capacity
WEIGHT-DESIGNED	Programmatic name of the designed weight
SpaceDesigned	Value of the designed space capacity
FLOORSPACE-DESIGNED	Programmatic name of the designed floor space
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed)
id	ObjectID of the new PDU
timestamp	Date and time the PDU record is created in the database
Object	HTTP response from the server
ErrorCode	HTTP status and error codes from the server
ErrorMessage	Error messages from the server

Remote Power Panel (RPP)

The following table describes each column in the RPP spreadsheet.

RPP Spreadsheet Descriptions

Column	Description
Process	Value must be true to process a row or false to skip the row
NewBuilding	New building name provided in the updated spreadsheet
NewFloor	New floor name provided in the updated spreadsheet
NewSpace	New space name provided in the updated spreadsheet
NewRPPName	New remote power panel name provided in the updated spreadsheet
Building	Building name

Column	Description
Floor	Floor name
Space	Space name
RPPName	Remote power panel name
Manufacturer	Manufacturer name
Model	Model name
ModelQualifier	Model qualifier name
SymbolTypeIdentifier	String containing the manufacturer, model and model qualifier names
PlacementType	Type of placement within a container; see Placement Types on page 291
LayerName	Layer name
XCoordinate	X coordinate of the physical placement
YCoordinate	Y coordinate of the physical placement
Rotation	Rotation
ZCoordinate	Z coordinate of the physical placement
InputVolts	Voltage input amount
OutputVolts	Voltage output amount
Owner	Owner name
OwnerEmail	Owner email address
Notes	Comments
SerialNumber	Serial number of the remote power panel
AssetNumber	Asset number of the remote power panel
BarcodeNumber	Bar code number of the remote power panel
PowerDesigned	Value of the designed weight capacity
POWER-TOTAL-DESIGNED-AMPS	Programmatic name of the designed power total in AMPS
PowerReserved	Value of the reserved power capacity
POWER-TOTAL-RESERVED-AMPS	Programmatic name of the reserved power total in AMPS
WeightDesigned	Value of the designed weight capacity
WEIGHT-DESIGNED	Programmatic name of the designed weight
SpaceDesigned	Value of the designed space capacity
FLOORSPACE-DESIGNED	Programmatic name of the designed floor space
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed)
id	ObjectID of the new remote power panel
timestamp	Date and time the remote power panel record is created in the database
Object	HTTP response from the server
ErrorCode	HTTP status and error codes from the server
ErrorMessage	Error messages from the server

Panels

The following table describes each column in the panels spreadsheet.

Panels Spreadsheet Descriptions

Column	Description
Process	Value must be true to process a row or false to skip the row
NewPanelName	New panel name provided in the updated spreadsheet
Building	Building name
Floor	Floor name
Space	Space name
PDURPPName	PDU remote power panel name
PanelName	Panel name
Manufacturer	Manufacturer name
Model	Model name
ModelQualifier	Model qualifier name
SymbolTypeIdentifier	String containing the manufacturer, model and model qualifier names
PlacementType	Type of placement in a container; see Placement Types on page 291
InputVolts	Voltage input amount
OutputVolts	Voltage output amount
Owner	Owner name
OwnerEmail	Owner email address
Notes	Comments
SerialNumber	Serial number of the panel
AssetNumber	Asset number of the panel
BarcodeNumber	Bar code number of the panel
PowerRated	Value of the rated power capacity
POWER-TOTAL-RATED-AMPS	Programmatic name of the rated power total in AMPS
PowerDesigned	Value of the designed power capacity
POWER-TOTAL-DESIGNED-AMPS	Programmatic name of the designed power total in AMPS
PowerReserved	Value of the reserved power capacity
POWER-TOTAL-RESERVED-AMPS	Programmatic name of the reserved power total in AMPS
WeightDesigned	Value of the designed weight capacity
WEIGHT-DESIGNED	Programmatic name of the designed weight
SpaceDesigned	Value of the designed space capacity
FLOORSPACE-DESIGNED	Programmatic name of the designed floor space
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed)
id	ObjectID of the new panels

Column	Description
timestamp	Date and time the panel record is created in the database
Object	HTTP response from the server
ErrorCode	HTTP status and error codes from the server
ErrorMessage	Error messages from the server

Breakers

The following table describes each column in the Breakers spreadsheet.

Breakers Spreadsheet Descriptions

Column	Description
Process	Value must be true to process a row or false to skip the row
NewBreakerName	New breaker name provided in the updated spreadsheet
Building	Building name
Floor	Floor name
Space	Space name
PDURPPName	PDU remote power panel name
PanelName	Panel name
BreakerName	Breaker name
Manufacturer	Manufacturer name
Model	Model name
ModelQualifier	Model qualifier name
SymbolTypeIdentifier	String containing the manufacturer, model and model qualifier names
PlacementType	Type of placement within a container; see Placement Types on page 291
PanelPosition	Position of the panel
InputVolts	Voltage input amount
OverCurrentProtectionRating	Rating of overcurrent protection; defaults to 80 if it is left blank
CurrentRating	Rating of current rating
InputVolts	Voltage input amount
OutputVolts	Voltage output amount
Owner	Owner name
OwnerEmail	Owner Email address
Notes	Comments
SerialNumber	Serial number of breakers
AssetNumber	Asset number of breakers
BarcodeNumber	Bar code number of breakers
PowerRated	Value of the rated power capacity
POWER-TOTAL-RATED-AMPS	Programmatic name of the rated power total in AMPS

Column	Description
PowerDesigned	Value of the designed power capacity
POWER-TOTAL-DESIGNED-AMPS	Programmatic name of the designed power total in AMPS
PowerReserved	Value of the reserved power capacity
POWER-TOTAL-RESERVED-AMPS	Programmatic name of the reserved power total in AMPS
WeightDesigned	Value of the designed weight capacity
WEIGHT-DESIGNED	Programmatic name of the designed weight
SpaceDesigned	Value of the designed space capacity
FLOORSPACE-DESIGNED	Programmatic name of the designed floor space
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed)
timestamp	Date and time the breaker record is created in the database
Object	HTTP response from the server
ErrorCode	HTTP status and error codes from the server
ErrorMessage	Error messages from the server

Breaker to PowerStrip

The following table describes each column in the Breaker to PowerStrip spreadsheet.

Breaker to PowerStrip Spreadsheet Descriptions

Column	Description
Process	Value must be true to process a row or false to skip the row
Id	Object identifier for devices
ConnectionName	Connection name
ConnectionType	Type of connection
CFBuilding	Connection from the building
CFFloor	Connection from the floor
CFSpace	Connection from the space
CFPDURPPName	Connection from the PDU remote power panel name
CFPanelName	Connection from the panel name
CFBreakerName	Connection from the breaker name
CFOutputName	Connection from the output name
CTBuilding	Connection to the building
CTFloor	Connection to the floor
CTSpace	Connection to the space
CTRackName	Connection to the rack name
CTDeviceName	Connection to the device name
CTOpening	Connection to the opening
Owner	Owner name

Column	Description
MaintenanceDate	Date the maintenance occurred
CableID	Identification of the cable
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed)
id	ObjectID of the new breaker connections to power strip
timestamp	Date and time the breaker connections to power strip record is created in the database
Object	HTTP response from the server
ErrorCode	HTTP status and error codes from the server
ErrorMessage	Error messages from the server

Breaker to Device

The following table describes each column in the Breaker to Device spreadsheet.

Breaker to Device Spreadsheet Descriptions

Column	Description
Process	Value must be true to process a row or false to skip the row
Id	Object identifier for devices
ConnectionType	Type of connection
CFBuilding	Connection from the building
CFFloor	Connection from the floor
CFSpace	Connection from the space
CFPDURPPName	Connection from the PDU remote power panel name
CFPanelName	Connection from the panel name
CFBreakerName	Connection from the breaker name
CFOutputName	Connection from the output name
CTBuilding	Connection to the building
CTFloor	Connection to the floor
CTSpace	Connection to the space
CTRackName	Connection to the rack name
CTDeviceName	Connection to the device name
CTOpening	Connection to the opening
ConnectionName	Connection name
Owner	Owner name
MaintenanceDate	Date the maintenance occurred
CableID	Identification of the cable
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed)
id	ObjectID of the new breaker connections to devices

Column	Description
timestamp	Date and time the breaker connections to device record is created in the database
Object	HTTP response from the server
ErrorCode	HTTP status and error codes from the server
ErrorMessage	Error messages from the server

PowerStrip to Device

The following table describes each column in the PowerStrip to Device spreadsheet.

PowerStrip to Device Spreadsheet Descriptions

Column	Description
Process	Value must be true to process a row or false to skip the row
Id	Object identifier for devices
ConnectionType	Type of connection
CFBuilding	Connection from the building
CFFloor	Connection from the floor
CFSpace	Connection from the space
CFRackName	Connection from the rack name
CFStripName	Connection from the strip name
CFReceptacleName	Processes the connection from the receptacle name
CTBuilding	Name of the building where a device connection is located
CTFloor	Connection to the floor
CTSpace	Connection to the space
CTRackName	Connection to the rack name
CTDeviceName	Connection to the device name
CTOpening	Connection to the opening
ConnectionName	Connection name
Owner	Owner name
MaintenanceDate	Date the maintenance occurred
CableID	Identification of the cable
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed)
id	ObjectID of the new power strip connections to devices
timestamp	Date and time the power strip connections to device record is created in the database
Object	HTTP response from the server
ErrorCode	HTTP status and error codes from the server
ErrorMessage	Error messages from the server

Data Connections

The following table describes each column in the Data Connections spreadsheet.

Data Connections Spreadsheet Descriptions

Column	Description
Process	Value must be true to process a row or false to skip the row
Id	Object identifier for devices
CFBuilding	Connection from the building
CFFloor	Connection from the floor
CFSpace	Connection from the space
CFRackName	Connection from the rack name
CFDeviceName	Connection from the device name
CFParentComponent	Connection from the parent component
CFPort	Connection from the port
CTBuilding	Name of the building where a device connection is located
CTFloor	Connection to the floor
CTSpace	Connection to the space
CTRackName	Connection to the rack name
CTDeviceName	Connection to the device name
CTParentComponent	Connection to the parent component
CTPort	Connection to the port
ConnectionName	Connection name
Owner	Owner name
MaintenanceDate	Date the maintenance occurred
CableID	Identification of the cable
CableType	Type of cable
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed)
id	ObjectID of the new data connections
timestamp	Date and time the data connection record is created in the database
Object	HTTP response from the server
ErrorCode	HTTP status and error codes from the server
ErrorMessage	Error messages from the server

Update Port Names

The following table describes each column in the Update Port Names spreadsheet.

Update Port Names Spreadsheet Descriptions

Column	Description
Process	Value must be true to process a row or false to skip the row
Building	Building name
Floor	Floor name
Space	Space name
RackName	Rack name
DeviceName	Device name; see To reference a component placed directly in a device: on page 260
ParentComponent	Parent component under device; see To reference a component placed directly in a device: on page 260
ComponentName	Component name under the parent component
PortType	Power or data
PortName	Current name of the port
NewPortName	New name of the port
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed)
Timestamp	Date and time the update is created in the database
Object	HTTP response from the server
ErrorCode	HTTP status and error codes from the server
ErrorMessage	Error messages from the server

Update Slot Names

The following table describes each column in the Update Slot Names spreadsheet.

Update Slot Names Spreadsheet Descriptions

Column	Description
Process	Value must be true to process a row or false to skip the row
Building	Building name
Floor	Floor name
Space	Space name
RackName	Rack name
ParentDevice	Parent device; see To reference a device slot in a rack mounted device: on page 261
DeviceName	Device name under the parent device
Type	Slot
SlotName	Current name of the slot
NewSlotName	New name of the slot
Status	Results can be success (row passed), failure (row failed) or blank (row was not processed)

Column	Description
Timestamp	Date and time the update is created in the database
Object	HTTP response from the server
ErrorCode	HTTP status and error codes from the server
ErrorMessage	Error messages from the server

Placement Types

The following table describes the fields for each Placement Type column in the spreadsheets.

Placement Type Column Descriptions

Placement	Placement Type	Required Fields	Values	Comments
Device in building	inBuilding	Building name	N/A	N/A
Device on floor	onFloor	Floor	N/A	Name of the floor where the device is placed
Device in space as an unplaced device	inSpace	space	N/A	Name of the space where the device is placed
Device in space at a specific location	inSpace	Layer Name	FLOOR RAISED-FLOOR DROP-CEILING CEILING @ignore	Layer where the device is placed
Device in space at specific location	inSpace	X Coordinate Y Coordinate Rotation	Any number	N/A
Server in rack	inRack	Side	FRONT REAR LEFT RIGHT TOP BOTTOM	N/A
Server in rack	inRack	Front facing	True or False	N/A
Server in rack	inRack	Uposition Xposition Rotation	Any number	N/A
Device in rack at Zero U	inZeroU	ZULocation	BOTTOM TOP FRONT_LEFT_RAIL FRONT_RIGHT_RAIL REAR_RIGHT_RAIL REAR_LEFT_RAIL	N/A

Placement	Placement Type	Required Fields	Values	Comments
Device in rack at Zero U	inZeroU	ZUuHeight	Any number	N/A
Blade server in chassis	inSlot	Slot Number	Any number	N/A
Blade server in chassis	inSlot	rotation	Any number	N/A
Component in Device	inSlot	DeviceName	Any device	N/A
Breaker panel in a floor PDU	onDevice	Parent device	Any device	Identified by the building, floor, space and device name
Circuit breaker in breaker panel	inPanel	Panel Position	Any number	N/A

For Historical Use

Appendices

Appendix A: CAC Certification

After enabling CAC authentication, you are provided a valid CAC to gain access to the *Trellis*™ platform log-in screen. The following are required to enable the two-way SSL (Secure Sockets Layer) on the Oracle HTTP Server (OHS) front machine:

- The SSL Refresh process needs to be applied on the target *Trellis*™ platform environment. See <http://avct-eng/support/techpub/releasenotes> for instructions to run the SSL Refresh utility.
- A signed certificate, signed by the same CA used on the SSL Refresh, needs to be installed in the card.

Originally, the *Trellis*™ platform is shipped with one-way SSL on the OHS front machine, such as <https://X.X.X.X/trellis>. You can force the browser to present the certificate to the platform by activating the two-way SSL on the OHS machine by modifying the `/u02/OHS/ui01/config/OHS/ohs01/ssl.conf` file.

To activate the CAC on the server side:

1. Access the *Trellis*™ platform front machine and edit the `/u02/OHS/ui01/config/OHS/ohs01/ssl.conf` file.
2. Change `SSLVerifyClient None` to **`SSLVerifyClient require`**.
3. Save the changes.
4. Enter the following commands to stop and restart the OHS server:
`/etc/init.d/trellis stop ohs`
`/etc/init.d/trellis start ohs`

To deactivate the CAC on the server side:

1. Access the *Trellis*™ platform front machine and edit the `/u02/OHS/ui01/config/OHS/ohs01/ssl.conf` file.
2. Change `SSLVerifyClient require` to **`SSLVerifyClient None`**.
3. Save the changes.
4. Enter the following commands to stop and restart the OHS server:
`/etc/init.d/trellis stop ohs`
`/etc/init.d/trellis start ohs`

Appendix B: Platform Shut Down and Restart

If you are applying security patches, upgrading or performing maintenance on the *Trellis*™ platform back and front machines a system restart is required. The following procedures can be performed on a Microsoft® Windows® or a Red Hat® Linux operating system.

Windows operating systems

To shut down the back and front machines:

NOTE: Notify the system administrator prior to completing this procedure. After shut down, the machines will need to be manually restarted.

1. Access the front machine as a system administrator via Remote Desktop Protocol (RDP).
2. At the command prompt, enter the `c:\u01\trellis\trellis stop` command to stop the *Trellis*™ platform:
3. After the platform stops, repeat steps 1 for the back machine.
4. Shut down the front machine by entering one of the following commands:
Shut down the complete Windows operating system by entering `shutdown -s -f -t 0`.
-or-
Shut down and restart the Windows operating system by entering `shutdown -r -f -t 0`.
5. Repeat step 4 on the back machine.

To apply patches or hot fixes:

1. Access the front machine as a system administrator via Remote Desktop Protocol (RDP).
2. At the command prompt, enter the `c:\u01\trellis\trellis stop` command to stop the *Trellis*™ platform.
3. Enter the `sc stop "OracleServiceORCL"` command to shut down Oracle on the back machine.
4. Enter the `sc stop "ServedLicenseInterface"` command to shut down license on back machine.
5. Stop the back machine via batch scripts.
6. Apply patches or hot fixes to the front and back machine.
7. Reboot the operating system for the front and back machine.
8. Enter the `sc start "OracleServiceORCL"` command to start Oracle on the back machine.
9. Enter the `sc start "ServedLicenseInterface"` command to start the License server on the back machine.
10. Start the *Trellis*™ platform on the back machine and then the front machine via batch scripts.

To restart the *Trellis*™ platform:

1. Turn on the back machine, then the front machine.
2. On the back machine, enter the `c:\u01\trellis\trellis start` command to start the *Trellis*™ platform:

NOTE: The Oracle® database will automatically start up with the system.

3. After the *Trellis*™ platform is running, verify that the ports listed in the following table are listening.

NOTE: If you choose to not run the following commands individually, ensure you do not run more than three at a time. If the commands do not generate a listening response, enter **service trellis stop**, then **service trellis start** to restart the platform. Contact Technical Support if you have further issues.

Back Machine Port Verification Commands

Port Type	Service	Commands
External	JDBC (non SSL)	<code>netstat -ano find "0.0.0.0" find ":1521"</code>
Internal	Node Manager	<code>netstat -ano find "0.0.0.0" find ":5556"</code>
Internal	OID / OVD AdminServer (Non SSL)	<code>netstat -ano find "0.0.0.0" find ":7021"</code>
Internal	OVD (HTTPS)	<code>netstat -ano find "0.0.0.0" find ":7022"</code>
Internal	OVD (LDAPS)	<code>netstat -ano find "0.0.0.0" find ":7023"</code>
External	OVD (LDAP)	<code>netstat -ano find "0.0.0.0" find ":7024"</code>
External	OID (LDAP)	<code>netstat -ano find "0.0.0.0" find ":7026"</code>
External	OID (LDAPS)	<code>netstat -ano find "0.0.0.0" find ":7028"</code>
External	OID / OVD AdminServer (SSL)	<code>netstat -ano find "0.0.0.0" find ":7031"</code>
External	SLI Licensing (HTTP)	<code>netstat -ano find "0.0.0.0" find ":8080"</code>

- Repeat step 2 on the front machine.
- After the *Trellis*[™] platform is running, verify that the ports listed in the following table are listening.

NOTE: If you choose to not run the following commands individually, ensure you do not run more than three at a time. If the commands do not generate a listening response, enter **service trellis stop**, then **service trellis start** to restart the platform. Contact Technical Support if you have further issues.

Front Machine Port Verification Commands

Port Type	Service	Commands
External	Oracle® HTTP Server (HTTP)	<code>netstat -ano find "0.0.0.0" find ":80"</code>
External	Oracle® HTTP Server (HTTPS)	<code>netstat -ano find "0.0.0.0" find ":443"</code>
Internal	Node Manager	<code>netstat -ano find "0.0.0.0" find ":5556"</code>
External	OSB Proxy (SSL)	<code>netstat -ano find "0.0.0.0" find ":6443"</code>
Internal	AdminServer (Non SSL)	<code>netstat -ano find "0.0.0.0" find ":7001"</code>
Internal	AdminServer (SSL)	<code>netstat -ano find "0.0.0.0" find ":7002"</code>
Internal	Jasper Server (Non SSL)	<code>netstat -ano find "0.0.0.0" find ":7005"</code>
Internal	ADF Server (Non SSL)	<code>netstat -ano find "0.0.0.0" find ":7011"</code>
Internal	ADF Server (SSL)	<code>netstat -ano find "0.0.0.0" find ":7012"</code>
Internal	SOA Server (Non SSL)	<code>netstat -ano find "0.0.0.0" find ":8001"</code>
Internal	SOA Server (SSL)	<code>netstat -ano find "0.0.0.0" find ":8002"</code>
Internal	OSB Server (Non SSL)	<code>netstat -ano find "0.0.0.0" find ":8011"</code>
Internal	OSB Server (SSL)	<code>netstat -ano find "0.0.0.0" find ":8012"</code>

6. From the <https://<frontserverIP>> URL, launch the *Trellis*™ platform user interface.

Linux operating systems

To shut down the front and back machines:

NOTE: Notify the system administrator prior to completing this procedure. After shutdown, the machines need to be manually restarted.

1. Stop the *Trellis*™ platform on the front machine by launching a PuTTY session, and as **oracle**, entering **service trellis stop** or **/etc/init.d/trellis stop**.
2. On the front machine, find and kill the process ID servicing port 5556 to stop the NodeManager service.
 - a. Enter **netstat -anp | grep 5556** to find the process ID servicing port 5556.
 - b. Enter **kill-1 <processid>** to re-execute the **netstat -anp | grep 5556** command and check if the process ID still exists.
 - c. If the process ID still exists, execute the command **kill -9 <processid>**.
3. After the *Trellis*™ platform stops, repeat step 1 for the back machine.
4. On the back machine, find and kill the process ID servicing port 5556 to stop the NodeManager service.
5. On the back machine, stop the database and enter the following commands:

```
sqlplus/as sysdba
```

```
shutdown immediate;
```

```
exit
```

```
lsnrctl stop
```

6. After the *Trellis*™ platform stops on both the front and back machines, either shut down the complete Linux operating system by entering:

```
su -
```

```
poweroff
```

```
-or-
```

Shut down and restart the Linux operating system by entering:

```
su -
```

```
reboot
```

To restart the *Trellis*™ platform:

1. Turn on the back machine, then the front machine.
2. On the back machine, launch a PuTTY session and enter **service trellis start** or **/etc/init.d/trellis start** at the command prompt to start the *Trellis*™ platform.

NOTE: The Oracle® database will automatically start up with the system.

3. After the *Trellis*™ platform is running, verify that the ports listed in the following table are listening.

NOTE: If you choose to not run the following commands individually, ensure you do not run more than three at a time. If the commands do not generate a listening response, enter **service trellis stop**, or **/etc/init.d/trellis stop** then **service trellis start** or **/etc/init.d/trellis start** to restart the platform. Contact Technical Support if you have further issues.

Back Machine Port Verification Commands

Port Type	Service	Commands
External	JDBC (non SSL)	<code>netstat -an grep :* grep -w 1521 -m 1</code>
Internal	Node Manager	<code>netstat -an grep :* grep -w 5556 -m 1</code>
Internal	OID / OVD AdminServer (Non SSL)	<code>netstat -an grep :* grep -w 7021 -m 1</code>
Internal	OVD (HTTPS)	<code>netstat -an grep :* grep -w 7022 -m 1</code>
External	OVD (LDAPS)	<code>netstat -an grep :* grep -w 7023 -m 1</code>
Internal	OVD (LDAP)	<code>netstat -an grep :* grep -w 7024 -m 1</code>
External	OID (LDAP)	<code>netstat -an grep :* grep -w 7026 -m 1</code>
External	OID (LDAPS)	<code>netstat -an grep :* grep -w 7027 -m 1</code>
Internal	Web Logic	<code>netstat -an grep :* grep -w 7028 -m 1</code>
External	OID / OVD AdminServer (SSL)	<code>netstat -an grep :* grep -w 7031 -m 1</code>
External	SLI Licensing (HTTP)	<code>netstat -an grep :* grep -w 8080 -m 1</code>

- Repeat step 2 on the front machine.
- After the *Trellis*™ platform is running, verify that the ports listed in the following table are listening.

Front Machine Port Verification Commands

Port Type	Service	Command
External	Oracle® HTTP Server (OHS) (HTTP)	<code>netstat -an grep :* grep -w 80 -m 1</code>
External	Oracle® HTTP Server (OHS) (HTTP)	<code>netstat -an grep :* grep -w 443 -m 1</code>
Internal	Node Manager	<code>netstat -an grep :* grep -w 5556 -m 1</code>
External	OSB Proxy (SSL)	<code>netstat -an grep :* grep -w 6443 -m 1</code>
Internal	AdminServer (Non SSL)	<code>netstat -an grep :* grep -w 7001 -m 1</code>
Internal	AdminServer (SSL)	<code>netstat -an grep :* grep -w 7002 -m 1</code>
Internal	Jasper Server (Non SSL)	<code>netstat -an grep :* grep -w 7005 -m 1</code>
Internal	ADF Server (Non SSL)	<code>netstat -an grep :* grep -w 7011 -m 1</code>
Internal	ADF Server (SSL)	<code>netstat -an grep :* grep -w 7012 -m 1</code>
Internal	SOA Server (Non SSL)	<code>netstat -an grep :* grep -w 8001 -m 1</code>
Internal	SOA Server (SSL)	<code>netstat -an grep :* grep -w 8002 -m 1</code>
Internal	OSB Server (Non SSL)	<code>netstat -an grep :* grep -w 8011 -m 1</code>
Internal	OSB Server (SSL)	<code>netstat -an grep :* grep -w 8012 -m 1</code>

NOTE: It is recommended that these commands are run individually or approximately three at a time in order to see the responses clearly. It is very important that each of these produce a “listening” response. If any do not show a response, this means the service is not running. Try restarting the *Trellis*™ platform service again by entering **service trellis stop** or **/etc/init.d/trellis stop** then **service trellis start** or **/etc/init.d/trellis start** to restart the platform. Contact Technical Support if you have further issues.

6. Launch the *Trellis*™ platform user interface.

<https://<frontserverIP>>

For Historical Use

Appendix C: Certificate (SSL/TLS) Replacement

Two utilities are available to update *Trellis*[™] platform certificates. The Secure Socket layer (SSL) Certificate Update utility allows you to update the SSL certificates being used for two-way SSL communication between the *Trellis*[™] platform back and front machines. The Intelligence Engine SSL Certificate Update utility allows you to update the SSL certificates being used for two-way SSL communication between the *Trellis*[™] platform and the *Trellis*[™] Intelligence Engine after the engine is enrolled to the *Trellis*[™] platform. Both utilities are run via command line.

NOTE: Multi-tier Certificate Authority (CA) structures are supported for *Trellis*[™] platform version 4.0.1 and higher.

NOTE: In *Trellis*[™] platform 4.0.2 and after, SSLv3 is disabled and Transport Layer Security (TLS) 1.0 is enabled.

Process overview

The following is a high level overview of what is being accomplished during a platform certificate update. The following occurs on both the front and back machines in the provided order:

- Key pairs and Certificate Signing Requests (CSR) are generated.
- The Certificate Authority (CA) uses the CSRs to create signed certificates, which are returned along with a certificate for the CA that is called the root CA certificate.
- The signed certificates and the root CA certificate are imported into data files that are used to establish server identity during an SSL session.
- The certificates are exchanged between the front and back machines and imported into data files that are used to establish trust during an SSL session.
- If the data collection engine is enrolled, a process is run to import the necessary certificates into the data files to establish identity and trust.

Pre-Requisites

Prior to running the update utilities, verify the following:

- *Trellis*[™] platform version 3.2 or higher is installed with the back machine running.
- The front machine is shut down to prevent users from using the system while the utility is being executed.
- The user running the utility has the same privilege as the user who ran the *Trellis*[™] platform installer (clean/patch).
- The `/u02/trelliskeys` folder on the *Trellis*[™] platform front machine is backed up.
- The following folders on the *Trellis*[™] platform back machine are backed up:
 - `/u02/trelliskeys`
 - `/u01/fm/11.1.1.7/asinst_1/config/OVD/ovd1/keystores`
 - `/u01/fm/11.1.1.7/asinst_1/OID/admin`

- The SSL Refresh utility has been run from the command line on both the front and back machine.
- By default, the utility and the properties files for the CSRs are all located at /u01/trellis/support/ssl for Linux® or C:\u01\trellis\support\ssl for Microsoft® Windows®. (The utilities can be run from this default location, or the utilities can be moved to any desired location from which the utility can be run. In this document, the location where the utility is being run is <utility-execution-location>.)

NOTE: When running, the utility will prompt for a location to create a folder structure. If you do not enter a location, the software creates the folder structure under <utility-execution-location >/sslRefresh. In this document, this is the location used for the folder structure.

- The CA server used for signing CSRs is configured with the SHA256 signing algorithm.
- Signed certificates are in p7b format.

SSL Refresh utility

The SSL Refresh utility is used to update the certificates on both the back and front machine. The following is a summary of the steps to complete the SSL Refresh procedures.

To run the refresh utility:

1. Run the Platform utility on the back machine and then run it on the front machine.
2. Submit the generated CSRs to the CA for the signed CA certificates.
3. When you receive the signed certificates, save them in the Base64 format.
4. Run the Platform utility on the back machine and then run it on the front machine for certificate replacement.
5. Transfer the files between the front and back machine.
6. Run the Platform utility on the back machine and then run it on the front machine for the Peer Machine certificate.
7. After the SSL Refresh utility is run successfully on both the back and front machine, keep a copy of the backup of the original key store/trust store (performed by the SSL Refresh utility and placed in the <LoggedInUser-directory>/sslRefresh/backup_archives folder. The file name must be in the format: back-sslrefresh-MM-dd-yyyy HH:mm:ss.zip).
8. Start the front machine and then start the back machine.
9. For Linux®, **cd** to /u01/trellis to execute the shell script.

-or-

For Windows®, enter the following:

C:\u01\trellis -

configureTrellis.sh -x

Then when prompted, enter the **https://trellis-hostname** *Trellis*™ platform URL, for example, https://hostname.

***Trellis*™ Intelligence Engine SSL Certificate update utility:**

SSL Certificate update utility allows you to update the SSL certificates being used to communicate between the *Trellis*™ platform and the *Trellis*™ Intelligence Engine for 2-way SSL communication after the *Trellis*™

Intelligence Engine has been registered to *Trellis*™.

NOTE: The utility also allows to you update the UMG OBWI certificate.

The following are general requirements:

- The new *Trellis*™ public certificate is already available (CAroot.pem).
- The new *Trellis*™ Intelligence Engine public certificate is already available (mss-engine-cert.pem).
- The new *Trellis*™ Intelligence Engine private key is already available (mss-engine-priv.pem).
- The new UMG OBWI pkcs12 certificate is already available (OBWI.pkcs12).
- Generation of the above 4 files will be covered in the SSL Refresh document for *Trellis*™ Platform.
- All the files mentioned above are stored in a staging area (this staging area location can be changed through the /mss-db/SSLRefresh/SSLCertificateUpdate.json configuration file).
- The SSL Certificate update utility cannot proceed further until all four files are present in the staging area.
- This utility is run via command line.

To apply or revert the DDL certificate updates:

1. The /mss-db/SSLRefresh/SSLCertificateUpdate.json configuration file has the following JSON structure.

```
//This is an example
// StagingDirectory - Location where all the 4 files are stored on the engine.
// BackupDirectory - Backup location of all the existing certificates
// NewPrivateKey - This is the Engine private key
// NewPublicCert- This is the Engine public certificate
// NewCA - This is the CA cert if the certs are CA signed. Otherwise, it's the Trellis public cert.
// OBWIpks12 - This is UMG OBWI pkcs12 certificate
// SilentMode - If it is "no", utility prompts the user if he wants to proceed.
// If "yes", utility does not prompt.
{
  "StagingDirectory" : "/mss-db/SSLRefresh/CertFiles",
  "BackupDirectory" : "/mss-db/SSLRefresh/CertBackup",
  "NewPrivateKey" : "mss-engine-priv.pem",
  "NewPublicCert" : "mss-engine-cert.pem",
  "NewCA" : "CAroot.pem",
  "OBWIpks12" : "OBWI.pkcs12",
  "SilentMode" : "no"
}
```

2. Backup location ("BackupDirectory") of all the existing certificates is /mss-db/SSLRefresh/CertBackup, this location can not be changed.

To import new certificates:

1. Log in to the appliance using SSH and create a folder by name mentioned in the "StagingDirectory" of the configuration file, for example, /mss-db/SSLRefresh/CertFiles.

2. Copy *trellis-system-cert.pem*, *mss-engine-cert.pem*, *mss-engine-priv.pem* and *OBWI.pkcs12* files in the `/mss-db/SSLRefresh/CertFiles` folder.

3. Verify the following file structure for the utility:

```
/mss-db/SSLRefresh/CertFiles/mss-engine-priv.pem
/mss-db/SSLRefresh/CertFiles/mss-engine-cert.pem
/mss-db/SSLRefresh/CertFiles/trellis-system-cert.pem
/mss-db/SSLRefresh/CertFiles/OBWI.pkcs12
```

4. Execute the following command **\$ /usr/bin/mss-run SSLCertificateUpdate**.

-or-

If `silentMode` is `yes`, execute the following command with the password **Intelligence Engine Private Key Pass Phrase** to run the utility:

```
$ /usr/bin/mss-run SSLCertificateUpdate import <password>
```

5. Select option **1** Import New Certificates.
6. When the utility finishes executing (all services should be up and running), create the backup tarball of the older certificates using the following commands and store it in a safe place outside the appliance.

```
$ cd /mss-db/SSLRefresh/CertBackup
$ tar czvf /var/log/mss/CertBackup.tar.gz *
```

To restore to old certificates:

1. Execute **\$ /usr/bin/mss-run SSLCertificateUpdate**.

-or-

If `silentMode` is `"yes"`, execute **\$ /usr/bin/mss-run SSLCertificateUpdate restore**.

2. Select option **2** Recovery: Restore Certificates.

When the utility finishes executing (all services are up and running), it is complete.

Running the Platform utility on the back machine for CSR generation

The platform utility defines properties to generate CSRs on the back machine.

To generate CSRs on the back machine:

1. Verify the properties file for CSR generation is located in the same location as the utility.
2. While running the CSR generation for the back machine, modify the **trellis-back.properties** file.

NOTE: The utility uses values defined in this properties file to generate CSRs. The file has a placeholder named `${MACHINE_FQDN}` in the CN. By default, the system replaces this placeholder with the fully qualified domain name of the machine. If satisfied with this default behavior, leave the properties file unmodified, or delete them. If the property file does not exist, the utility still uses the FQDN of the machine name CN.

3. If desired, you can change the CN for any given CSR; however, you must also modify the **trellis-back.properties** property file before proceeding to the following steps to generate the CSRs.

4. Open the command line on the back machine and log in as **oracle** on Linux® systems and as **administrator** on Windows® systems, then enter **cd utility-execution-location** to change the directory folder.
5. On Linux®, run the *./CertsReplacementUtility.bin* utility binary file.
-or-
On Windows®, run the *CertsReplacementUtility.exe* file.
6. Enter a new location for the installation folder or accept the default. (The default location is under *utility-execution-location /sslRefresh*.)
7. Enter option **1** Generate CSRs and wait for the status message. If the utility fails, an error message is recorded in the logs at < utility-execution-location >/logs/csr.log.

Running the Platform utility on the front machine for CSR generation

The platform utility defines properties to generate CSRs on the front machine.

To generate CSRs on the front machine:

1. Verify the properties file for CSR generation is located in the same location as the utility.
2. While running the CSR generation for the front machine, modify the **trellis-back.properties** file. (The property files for CSR generation are named: *TrellisSystem.properties*, *TrellisUI.properties* and *Mss-engine.properties*.)

NOTE: The utility uses values defined in these properties files to generate CSRs. The files have a placeholder named `{MACHINE_FQDN}` in the CN. By default, the system replaces the placeholder with the fully qualified domain name of the front machine. If you are satisfied with this default behavior, leave the properties files unmodified, or delete them. If the property file does not exist, the utility still uses the FQDN of the front machine name CN.

3. If desired, you can change the CN for any given CSR; however, you must also modify the **trellis-back.properties** property file before proceeding to the following steps to generate the CSRs.
4. Open the command line on the front machine and log in as **oracle** on Linux® systems and as **administrator** on Windows® systems, then enter **cd utility-execution-location** to change the directory folder.
5. On Linux®, run the *./CertsReplacementUtility.bin* utility binary file.
-or-
On Windows®, run the *CertsReplacementUtility.exe* file.
6. Enter a new location for the installation or accept the default. (The default location is under *utility-execution-location /sslRefresh*.)
7. Enter option **1** Generate CSRs and wait for the status message. If the utility fails, an error message is recorded in the logs at < utility-execution-location >/logs/csr.log.

Verifying the multi-tier CA

The multi-tier CA verification must be performed prior to running the platform utility on the back machine for certificate replacement. The CSRs must be signed first because these steps modify the *Trellis*™ platform

configuration.

To verify the multi-tier CA hierarchy:

1. In a Windows® environment, enter **C:\u01\openssl\bin\openssl.exe** to locate the openssl utility on the *Trellis*™ platform back machine.
-or-
In a Linux® environment, verify the command is already in the path on the back machine when logged in as the **oracle** user.
2. Enter the **openssl x509 -fingerprint -in RootCA-base64.cer -text > CA_FILE.txt** command to decode the RootCA certificate in to the CA_FILE.txt file.
3. Enter the **openssl x509 -noout -fingerprint -text -in trellis-system-cert-base64.p7b > trellis-system.txt** command to decode the *Trellis*™ system certificate in to the trellis-system.txt file.
4. Verify the RootCA certificate is a self-signed root CA certificate by comparing the values under the Subject Key Identifier and the Authority Key Identifier in the CA_FILE.txt file. As shown in the following example, when the value under the X509v3 Authority Key Identifier in the trellis-system.txt file is equal to the value under the Subject Key Identifier in the CA_file.txt file, it verifies the certificate was issued by the Root CA and there is one tier in the CA hierarchy. The values in your files may be different.

From the CA_FILE.txt:

```
X509v3 extensions:
X509v3 Subject Key Identifier:
76:D7:1D:A8:41:D9:80:A0:95:A8:11:C8:11:48:96:BB:3C:AF:E8:46
X509v3 Authority Key Identifier:
keyid:76:D7:1D:A8:41:D9:80:A0:95:A8:11:C8:11:48:96:BB:3C:AF:E8:46
```

From the trellis-system.txt:

```
WARNING: can't open config file: /usr/local/ssl/openssl.cnf
subject=/C=US/ST=FL/L=Sunrise/O=Avocent/OU=Trellis/CN=hsv-str-20207.systemtest.com
issuer=/DC=com/DC=SystemTest/CN=SystemTest-SUN-ST-DC4-CA
subject=/DC=com/DC=SystemTest/CN=SystemTest-SUN-ST-DC4-CA
issuer=/DC=com/DC=SystemTest/CN=SystemTest-SUN-ST-DC3-CA
subject=/DC=com/DC=SystemTest/CN=SystemTest-SUN-ST-DC3-CA
issuer=/DC=com/DC=SystemTest/CN=SUN-STDC2-CA
subject=/DC=com/DC=SystemTest/CN=SUN-STDC2-CA
issuer=/DC=com/DC=SystemTest/CN=SUN-STDC2-CA
```

Running the Platform utility on the back machine for certificate replacement

The Platform utility is used to replace certificates on the back machine.

To replace a certificate on the back machine:

1. Verify the CSRs are generated on both the back and front machine and the CSRs are signed by the CA.

2. Copy the signed certificates to the `<utility-execution-location>/sslRefresh/input_cacertificates_keystores` location. The `trellis-oid.p7b` file is expected to be in this location. If this file is missing, the utility fails with the message "`<File-name> file not present.`"
3. After the certificates are signed by the CA, verify the filenames match the `trellis-oid.cer` filename.
4. Place the signed CSRs, the root CA and any of its child certificates in the `<utility-execution-location>/sslRefresh/input_cacertificates_keystores` folder.
5. Rename the certificate created using the `oidshaalias.P10` CSR to `trellis-oid.p7b`:
 - **trellis-ovd.p7b**
 - **trellis-db.p7b**
6. Rename the certificate created using the `trellis-back.P10` CSR to `trellis-db.p7b`:
 - **RootCA-base64.cer**
 - **oidshaalias.jks**
 - **keys.jks**
 - **trellis-back.jks**
7. On Linux®, log in as **oracle** and run the `./CertsReplacementUtility.bin` utility binary file.
-or-
On Windows®, log in as **administrator** and run the `CertsReplacementUtility.exe` file.
8. Enter option **2** - Import New Certificates and wait for the status message. If the utility fails, an error message is recorded in the logs at `<utility-execution-location>/logs` folder.
9. If an error occurs and the option needs to be run again, enter the following commands to restart the OID machine:
 - `/u01/fm/11.1.1.7/asinst_1/bin/opmnctl stopall`
 - `/u01/fm/11.1.1.7/asinst_1/bin/opmnctl startall`
10. If this option is interrupted, delete the "`_sslRefresh_installation`" under the `<LoggedInUserdirectory>/sslRefresh` temporary folder and run this option again.

Running the SSL Refresh Utility for a certificate update on the appliance

The Platform utility is used to replace certificates on the back machine.

To replace certificates on the front machine:

1. Verify the CSRs are generated on both the back and front machine and the CSRs are signed by the CA.
2. Copy the signed certificates to the `<utility-execution-location>/sslRefresh/input_cacertificates_keystores` location. The `trellis-oid.p7b` file is expected to be in this location. If this file is missing, the utility fails with the message "`<File-name> file not present.`"
3. After the certificates are signed by the CA, verify the filenames match the `trellis-oid.p7b` filename.
4. Place the signed CSRs, the root CA and any of its child certificates in the `<utility-execution-location>/sslRefresh/input_cacertificates_keystores` folder.
5. Rename the certificates by inserting **–cert-base64** before the `.p7b` extension as follows:
 - `mss-engine-cert-base64.p7b`
 - `RootCA-cert-base64.cer`

- `trellis-system-cert-base64.p7b`
 - `trellis-ui-cert-base64.p7b`
6. On Linux®, log in as **oracle** and run the `./CertsReplacementUtility.bin` utility binary file.
-or-
On Windows®, log in as **administrator** and run the `CertsReplacementUtility.exe` file.
 7. Enter option **2** - Import New Certificates and wait for the status message. If the utility fails, an error message is recorded in the logs at `< utility-execution-location >/logs/update_identity.log` folder.

Transferring files between the back and front machines

The back machine files must be copied to the front machine and the front machine files must be copied to the back machine.

To copy the files on the back and front machine:

1. On the back machine, go to the `< utility-execution-location >/sslRefresh/generated_certificates` folder and copy the following files to the `< utility-execution-location >/sslRefresh/input_cacertificates_keystores` folder on the front machine:
 - `oid-cert.pem`
 - `ovd-cert.pem`
 - `trellis-db-cert.pem`
2. On the front machine, go to the `< utility-execution-location >/sslRefresh/generated_certificates` folder and copy the following files to the `< utility-execution-location >/sslRefresh/input_cacertificates_keystores` folder on the back machine:
 - `trellis-keys.jks`
 - `trellis-trust.jks`
 - `CAroot.pem`
 - `mss-engine-cert.pem`
 - `mss-engine-priv.pem`
 - `trellis-system1-cert.pem`
 - `trellis-system-cert.pem`
 - `trellis-ui-cert.pem`
 - `trellis-front-cert.pem`

Running the Platform utility on the back machine to import the Peer Server Certificate

The Platform utility is used to import Peer Server Certificates on the back machine.

To import Peer Server certificates on the back machine:

1. Verify the following files are available on the back machine in the `<utility-execution-location >/sslRefresh/input_cacertificates_keystores` folder. If these files are not in the folder, the utility will fail.
 - `trellis-keys.jks`
 - `trellis-trust.jks`

- CAroot.pem
 - mss-engine-cert.pem
 - mss-engine-priv.pem
 - trellis-system1-cert.pem
 - trellis-system-cert.pem
 - trellis-ui-cert.pem
 - trellis-front-cert.pem
2. On Linux®, log in as **oracle** and run the `./CertsReplacementUtility.bin` utility binary file.
-or-
On Windows®, log in as **administrator** and run the `CertsReplacementUtility.exe` file.
 3. Enter option **3** - Import Peer Server Certificates and wait for the status message. If the utility fails the error message is recorded in the `<utility-execution-location>/logs` folder.

Running the Platform utility on the front machine to import the Peer Server Certificate

The Platform utility is used to import Peer Server certificates on the front machine.

To import Peer Server certificates on the front machine:

1. Verify the following files are available on the front machine in the `<utility-execution-location>/sslRefresh/input_cacertificates_keystores` folder. If these files are not in the folder, the utility will fail.
 - oid-cert.pem.pem
 - ovd-cert.pem.pem
 - trellis-db-cert.pem
2. If you are accessing the *Trellis*™ platform via a web services API, rename your API certificate (signed or self-signed) to **api-client.p7b** and rename your API root certificate (signed) to **api-root.pem**.
3. If the `api-client.cer` file is not available, enter the `/u01/jvm/jrr.../jre/bin/keytool -exportcert -alias api-client -keystore /u02/trelliskeys/api-client.jks -storepass <autogenerated pwd>` command to export the API certificate from the `api-client.jks` folder to the `<utility-execution-location>/sslRefresh/input_cacertificates_keystores` folder.
4. For Linux®, log in as **oracle** and run the `./CertsReplacementUtility.bin` utility binary file.
-or-
For Windows®, log in as **administrator** and run the `CertsReplacementUtility.exe` file.
5. Enter option **3** - Import Peer Server Certificates and wait for the status message. If the utility fails, the error message is recorded in the `<utility-execution-location>/logs/import_certificates.log` folder.

Running the Platform utility on the back machine for recovery

After running the SSL Refresh utility, if the *Trellis*™ platform is not functioning properly, perform the following recovery process.

To recover the back machine:

1. Verify there is only one back up file in the `<utility-execution-location >/sslRefresh/backup_archives` folder. If more than one file is present, the recovery process will abort with the message, "There is more than 1 archive file available at this location `< utility-execution-location >/sslRefresh/backup_archives`, please select one."
2. On Linux®, log in as **oracle** and run the `./CertsReplacementUtility.bin` utility binary file.
-or-
On Windows®, log in as **administrator** and run the `CertsReplacementUtility.exe` file.
3. Enter option **4** – Restore Certificates.
4. After the procedure is completed successfully and the original SSL settings are restored, restart the back machine.

Running the Engine utility for a certificate update

An SSL certificate update requires the Engine utility and the data collection engine OBWI. The following files must be available in a staging directory:

- The new *Trellis*™ public certificate (CAroot.pem).
- The new *Trellis*™ Intelligence Engine public certificate (mss-engine-cert.pem).
- The new *Trellis*™ Intelligence Engine private key (mss-engine-priv.pem).
- The new Avocent Universal Management Gateway OBWI pkcs12 certificate (OBWI.pkcs12).

The staging directory is typically in the `/mss-db/SSLRefresh/SSLCertificateUpdate.json` configuration file and has the following JSON structure:

```
//This is an example
// StagingDirectory - Location where all the 4 files are stored on the engine.
// BackupDirectory - Backup location of all the existing certificates
// NewPrivateKey - This is the Engine private key
// NewPublicCert - This is the Engine public certificate
// NewCA - This is the CA cert if the certs are CA signed. Otherwise, it's the Trellis public cert.
// OBWIpkcs12 - This is UMG OBWI pkcs12 certificate
// SilentMode - If it is "no", utility prompts the user if he wants to proceed.
// If "yes", utility does not prompt.
{
  "StagingDirectory" : "/mss-db/SSLRefresh/CertFiles",
  "BackupDirectory" : "/mss-db/SSLRefresh/CertBackup",
  "NewPrivateKey" : "mss-engine-priv.pem",
  "NewPublicCert" : "mss-engine-cert.pem",
  "NewCA" : "CAroot.pem",
  "OBWIpkcs12" : "OBWI.pkcs12",
  "SilentMode" : "no"
}
```

The back up (BackupDirectory) location of all the existing certificates is `/mss-db/SSLRefresh/CertBackup`. This location cannot be changed. The backup is automatically created when you run the SSLRefresh utility.

To update the certificate:

1. Log in to the Avocent® Universal Management Gateway appliance using **SSH** and create a folder using the name mentioned in StagingDirectory in the configuration file, for example, /mss-db/SSLRefresh/CertFiles.
2. Copy the *trellis-system-cert.pem*, *mss-engine-priv.pem*, *mss-engine-cert.pem* and *OBWI.pkcs12* files to the staging directory, for example, /mss-db/SSLRefresh/CertFiles.
3. Verify the following file structure exists in the utility:
 - /mss-db/SSLRefresh/CertFiles/mss-engine-priv.pem
 - /mss-db/SSLRefresh/CertFiles/mss-engine-cert.pem
 - /mss-db/SSLRefresh/CertFiles/CAroot.pem
 - /mss-db/SSLRefresh/CertFiles/OBWI.pkcs12
4. Execute the **\$ /mss/engine/bin/mss-run SSLCertificateUpdate** command to run the utility and enter option **1** Import New Certificates.
5. If silentMode is yes (enabled), execute the **\$ /mss/engine/bin/mss-run SSLCertificateUpdate import <password>** command with the password **Intelligence Engine Private Key Pass Phrase** to run the utility.
6. After the utility finishes executing, verify all services are up and running.
7. Enter the following commands to create the backup tarball of the older certificates and store it in a safe location that is external to the Avocent Universal Management Gateway appliance.
 - **\$ cd /mss-db/SSLRefresh/CertBackup**
 - **\$ tar czvf /var/home/CertBackup.tar.gz ***

Running the Platform utility on the front machine for recovery

After running the SSL Refresh utility on the front machine, if the *Trellis*™ platform is not functioning properly, perform the following recovery process.

To recover the front machine:

1. Verify there is only one backup file in the <utility-execution-location >/sslRefresh/backup_archives folder. If more than one file is present, the recovery process will abort with the message, "There is more than 1 archive file available at this location <utility-execution-location >/sslRefresh/backup_archives, please select one".
2. On Linux®, log in as **oracle** and run the *./CertsReplacementUtility.bin* utility binary file.
-or-
On Windows®, log in as **administrator** and run *CertsReplacementUtility.exe* file.
3. Enter option **4** – Restore Certificates and wait for the original SSL settings to be restored.
4. After the recovery is complete and the logs are located in the < utility-execution-location >/logs/recover.log folder, restart the front machines.

Running the Engine utility for certificate recovery

This procedure allows you to recover and restore previous certificates.

To recover and restore older certificates:

1. Execute the `$ /mss/engine/bin/mss-run SSLCertificateUpdate` command to recover/restore older certificates.
2. Enter option **2** Recovery: Restore Certificates.
3. If `silentMode` is yes (enabled), execute the `$ /mss/engine/bin/mss-run SSLCertificateUpdate restore` command.
4. After the utility finishes executing, verify all services are up and running.

Considerations

The following must be considered when running the SSL refresh utility:

- The certificates signed by the CA, need to be saved in the Base64 format.
- On Linux®, the utility must be run by a user having the same privilege as the user who ran the *Trellis*™ platform installer (clean/patch). Running the utility with root privileges could potentially render the entire system inoperable and irrecoverable.
- After successful execution of the SSL refresh utility, followed by a successful restart of the front machine, the `configureTrellis.sh` script must be run on the front machine in order for Reports to work properly.
- If an error occurs while running option **2** (Import New Certificate) on the back machine, run option **2** again and restart the OID machine manually using the following commands:
 - `/u01/fm/11.1.1.7/asinst_1/bin/opmnctl stopall`
 - `/u01/fm/11.1.1.7/asinst_1/bin/opmnctl startall`
- If there is an interruption while running option **2** (Import New Certificate) on the back machine, delete the “`_sslRefresh_installation`” under `<utility-execution-location >/sslRefresh` temporary folder before attempting to run this option again.
- If recovery is run on the front machine, the `configureTrellis.sh` script has to be executed on the front machine, otherwise, Reports will not work.

To run the configureTrellis.sh script:

1. On Linux®, `cd` to `/u01/trellis`.

-or-

On Windows®, enter the following:

C:\u01\trellis

configureTrellis.sh -x

2. When prompted, enter the `https://trellis-hostname Trellis`™ platform URL. For example, `https://hostname`.

Appendix D: Supported Service Processor Profiles

The following table lists the supported SP profiles.

Supported Service Processor Profiles

Vendor	Service Processor	Product Name	Current Version
Dell	Dell C Series	PowerEdge C6220	2.53
	DRAC 5	PowerEdge 1850	1.65 (12.08.16)
	iDRAC blades	PowerEdge M805	1.65
	iDRAC6 blade	PowerEdge M710	3.80
	iDRAC6 monolithic	PowerEdge R710	2.85
	iDRAC7 blade	PowerEdge M520	2.30.30.30
	iDRAC7 monolithic	PowerEdge M320	2.32.31.30
	iDRAC8 blade	PowerEdge M630	2.30.30.30
	iDRAC8 monolithic	PowerEdge M630	2.30.30.30
	M1000E Chassis	PowerEdge M1000e	5.12
HP	iLO2	ProLiant BL480c G1	2.29
	iLO3	ProLiant DL380 G7	1.87(C)
	iLO4	ProLiant DL360p G8	2.40
IBM	IMM	System x3650 M2	YUOOH2B
	IMM2	System x3250 M4	1A0072H
Cisco	UCS-C	UCS C210 M2	1.4(3y)
Fujitsu	FSC iRMC_S2	Primergy RX300 S4	5.76A
	FSC iRMC_S4	Primergy RX200 S8	8.24F
Sun	iLOM3	Sun Fire X4170 M3	3.2.4.76a

Appendix E: Intelligence Engine Firewall Ports

The following are the firewall ports and configuration for the *Trellis*™ Intelligence Engine.

Intelligence Engine Firewall Ports

Source	Destination	Protocol	Transport	Port	Notes
loopback	loopback	N/A	N/A	N/A	Configure loopback to ACCEPT: loopback 127.0.0.1/32
<i>Trellis</i> ™ Platform Front Server (OHS)	Intelligence Engine (Linux)	HTTPS	TCP	4440	Communication is one direction and is over two-way SSL
Intelligence Engine (Linux)	<i>Trellis</i> ™ Front Machine	HTTPS	TCP	6443	Communication is one direction and is over two-way SSL
Administrator Workstation	Linux	SSH	TCP	22	Installation/maintenance access
Intelligence Engine	Target Devices	SNMP	UDP	161	Default port; Set/Get operation; requires customer confirmation
		Modbus	TCP	502	Default port; requires customer confirmation
		OPC UA	TCP	21381	Default port; requires customer confirmation
		BACNet	UDP	47808	Default port; requires customer confirmation
		Velocity (Emerson Protocol)	UDP	47808	Default port; requires customer confirmation
		Telnet	TCP	23	Default port; requires customer confirmation
Target Devices	Intelligence Engine (Linux)	Velocity and BACNet	UDP	47777-48117	For BACNet/IP and Velocity return traffic
SNMP traps	Intelligence Engine	SNMP	UDP	162	SNMP Traps
Intelligence Engine	PostgreSQL (Internal)	PostgreSQL	TCP	4321	PostgreSQL database Admin

Source	Destination	Protocol	Transport	Port	Notes
Service Processors	Service Processor Manager (SPM)	IPMI	TCP	623	N/A
		Telnet	TCP	23	Default port
		HTTPS	TCP	443	Used for discovery
		HTTP	TCP	80	Used for discovery
		SSH	TCP	23	Default port
		N/A	UDP	623	Return IPMI traffic
Service Processor Manage	Service Processors	N/A	IPMI	50000-59999	SP access
Service Processor Manager	Redis Server (Internal)	RESP	TCP	6379	Message transportation between SPM processes
Service Processor Manager	PostgreSQL (Internal)	PostgreSQL	TCP	4322	SPM PostgreSQL database Admin

Firewall Configuration

Direction	Interface	Source	Destination	Service	Action	Use-Case Recommendations
Input	Any	Any	Any	SNMP Trap (162)	Allow	Used to monitor SNMP devices for the Intelligence Engine
Input	Any	Any	Any	Front machine (OHS 6443)	Allow	Used for <i>Trellis</i> TM platform management and monitoring support
Input	Any	Any	Any	Intelligence Engine (4440)	Allow	Used by the Intelligence Engine for management and monitoring support of the <i>Trellis</i> TM platform
Input	Any	Any	Any	Velocity and BACNet Incoming	Allow	Used to monitor BACNet over IP devices for the Intelligence Engine
Input	Any	Any	Any	Modbus	Allow	Used to monitor

Direction	Interface	Source	Destination	Service	Action	Use-Case Recommendations
						Modbus over IP devices for the Intelligence Engine
Input	Any	Any	Any	OPC UA	Allow	Used to monitor OPC UA over IP devices for the Intelligence Engine
Input	Any	Any	Any	SNMP	Allow	Used to monitor SNMP over IP devices for the Intelligence Engine
Input	Any	Any	Any	BACNet	Allow	Used to monitor SNMP over IP devices for the Intelligence Engine
Input	Any	Any	Any	Velocity (Emerson protocol)	Allow	Used to monitor Velocity (Emerson Protocol) devices for the Intelligence Engine

Appendix F: Bulk Data Processing Error and Status Codes

User Interface Errors

The Bulk Data Processing tool supports the following user interface errors. These errors may appear when running the tool.

Errors and Descriptions

Errors	Descriptions
Must provide a Username	Username field is blank on login
Must provide a Password	Password field is blank on login
Must provide a Hostname	Hostname field is blank on login
Username/Password are incorrect	Username or Password are incorrect on login
Must provide a File	User attempted to run a job with no file specified
Incorrect Host or IP	Name is entered incorrectly or server is down
Host Rejected Connection	Server does not contain clients certificate
Invalid Certificate	Client's certificate is not recognize by the host
Not a valid File type	File selected is not .xlsx or .xls
Incorrect Directory	The selected file to run is not in the correct path
No corresponding YAML found	The YAML file in the datasource folder does not match the selected spreadsheet to run

Error Codes

The *Trellis*™ platform supports the following error codes. These errors may be shown when running the tool.

Error Codes and Descriptions

Error Codes	Descriptions
1000	The <i>Trellis</i> ™ platform system encountered an unexpected condition which prevented it from fulfilling the request.
1001	Could not complete the creation of a device due to an error.
1002	Could not complete the device update due to an error.
1003	Could not complete the connection creation due to an error.
1004	Could not complete the connection update due to an error.
1005	Could not complete the connection delete due to an error.
1036	Device cannot be placed because it is a member of the wrong category.
2001	Unsupported content type.
2002	Unsupported request method.

Error Codes	Descriptions
2003	Invalid method arguments.
2004	There is no handler method available.
2005	Incomplete request - missing servlet request part.
2006	Incomplete request - missing servlet request parameter.
2007	Request not valid - type mismatch.
2008	System is not licensed to perform this operation.
2011	The request could not be completed due to a fine grained authorization violation.
2012	A resource that was needed to complete the request does not exist.
2013	Request not valid - invalid method arguments.
2014	Staled resource - there is a newer version of the resource.
2015	Missing task - the provided planner task does not exist.
2016	Commit out of order - planner tasks have to be committed in the correct order.
2017	Dependency out of order - the request was trying to create dependencies out of the proper order.
2018	Request not valid - the provided effective time and task combination are incorrect.
2020	Invalid symbol version - there is a newer version for the provided symbol.
2021	Symbol does not exist.
2022	Unable to place device - the parent field for placement cannot be null.
2023	Unable to place device in rack due to collision, It may be overlapping with other devices or crossing the rack boundary.
2024	Placement type is not supported.
2026	Device cannot be placed in container device because the device width and/or height is larger than container device width and/or height.
2027	Device cannot be placed because it does not fit in the specified location.
2028	Device cannot be placed in space because the device is not in space boundaries.
2029	Device cannot be placed because it falls into unusable zone.
2030	No effective task ID - please provide a task ID in the effectiveTaskId request parameter.
2041	Unable to Update Device, unable to move device to a slot due to collision.

Status Codes

The *Trellis*™ platform supports the following HTTP status codes in the output spreadsheet.

HTTP Status Codes and Descriptions

Code	HTTP Error	Description
200	OK	The request successfully completed and will include a representation in its response body.
201	Created	A request that created a new resource completed successfully.
400	Bad Request	A request could not be processed because it contains missing or invalid information. For example, a validation error on an input field, a missing required value.
401	Unauthorized	The authentication credentials included with this request are missing or invalid.

For Historical Use

Technical Support Site

If you encounter any installation or operational issues with your product, check the pertinent section of this manual to see if the issue can be resolved by following outlined procedures. For additional assistance, visit www.vertivco.com/en-us/support.

Avocent Community Support Site

To search product knowledge content, visit <https://vertivco-eng.custhelp.com/app/community/page/1>.

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Emerson Network Power, a business of Emerson (NYSE:EMR), delivers software, hardware and services that maximize availability, capacity and efficiency for data centers, healthcare and industrial facilities. A trusted industry leader in smart infrastructure technologies, Emerson Network Power provides innovative data center infrastructure management solutions that bridge the gap between IT and facility management and deliver efficiency and uncompromised availability regardless of capacity demands. Our solutions are supported globally by local Emerson Network Power service technicians. Learn more about Emerson Network Power products and services at www.EmersonNetworkPower.com.

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