



BC|Enterprise Version 11 User Guide



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BC|Enterprise Version 11 User Guide

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Document Revision History

Revision	Date	Changes
11.13 Rev A	11/01/2016	Initial document
11.13 Rev B	01/25/2017	Supported browsers, graph options
11.13 Rev C	02/01/2017	Update intro
11.13 Rev D	02/02/2017	Update images, profile menu
11.13 Rev E	02/02/2017	Fix software revision
11.13 Rev F	06/06/2017	Revise expected disk usage
11.15 Rev A	11/27/2017	Initial document
11.15 Rev B	11/28/2017	Update plain email example
11.15 Rev C	11/28/2017	Windows install autostart setup
11.15 Rev D	11/29/2017	Messaging settings text update
11.15 Rev E	11/30/2017	Notices retention time, shutdown
11.15 Rev F	04/02/2018	Edit incorrect button out of image
11.15 Rev G	04/02/2018	Added Exporting History Data by M.S
11.15 Rev H	11/26/2018	Build 11.15.2. Added how to back up data
11.15 Rev I	08/14/2018	Build 11.15.3. Update Messaging settings
11.15 Rev J	08/27/2019	Build 11.15.3. Update History Gear Icon text
11.15 Rev K	09/30/2019	Build 11.15.4. Data migration needed
11.24 Rev A	02/07/2022	Initial document
11.25 Rev A	09/23/2022	Initial document. Publish user guide as a PDF file.

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Preface

Purpose

This BC|Enterprise Version 11 User Guide describes the Rajant BC|Enterprise software product that enables a user to obtain real-time performance data and historical data for Rajant Corporation's BreadCrumb® Wireless Network devices ("BreadCrumbs®") in a Rajant Kinetic Mesh™ network and present that data as tables and charts in a web browser.

Scope

This user guide describes how to install, configure and use BC|Enterprise.

Available features for BC|Enterprise vary for each software version and the version of firmware installed on each BreadCrumb.

Audience

The primary audience for this user guide is a network administrator for a wireless mesh network comprised of Rajant BreadCrumbs. This network administrator should have a working knowledge of Transmission Control Protocol/Internet Protocol (TCP/IP), including Dynamic Host Configuration Protocol (DHCP), Network Address Translation (NAT) and Domain Name System (DNS). Certain advanced features require in-depth knowledge of network security, Virtual Local Access Networks (VLANs) and traffic prioritization.

Rajant recommends that an experienced network administrator perform initial planning, setup and configuration tasks for a new installation or upgrade of the BC|Enterprise software. A less-experienced network administrator may be qualified to perform some administrative tasks during BC|Enterprise operation.

A non-administrative user may use BC|Enterprise to view real-time performance data and historical data for BreadCrumbs and investigate any issues in BreadCrumb or network operation.

How to use this guide

To open this user guide from the BC|Enterprise user interface, on the [Main Menu](#), click **User Guide**. A new tab opens in the current web browser window used by BC|Enterprise. This tab contains this user guide opened to the title page. Use the expanding Table of Contents in the left panel to locate individual topics.

This user guide is available for download as a Portable Document Format (PDF) file from the [Rajant Support web site](#).

Support

To contact Rajant Support, log in to the [Rajant Support web site](#).

Your Feedback Is Welcome

Rajant welcomes any reader of this guide to submit comments and recommended changes to improve any Rajant user guide or Rajant product. Please send your feedback to feedback@rajant.com. For a BreadCrumb, please include the BreadCrumb model, firmware version and relevant configuration settings. For a Rajant software product, please include the product name and version number. For a Rajant user guide, please include the title, software version or firmware version and document revision.

Rajant Technology Glossary

APT Master: The BreadCrumb that converts all Ethernet traffic into InstaMesh packets on ingress to a wired network and back again on egress from a wired network. All other APT-connected BreadCrumbs are APT slaves. In BreadCrumb configurations, InstaMesh settings and Ethernet settings define the APT Master and APT Slave behavior.

Automatic Protocol Tunneling (APT): Rajant's proprietary technology that allows for multiple points of ingress to and egress from a wired local area network (LAN), eliminating the possibility of a single point of failure. To accomplish APT, Rajant automatically uses a proprietary encapsulation of packets entering and exiting the mesh via an existing LAN, preventing packet loops. BreadCrumb configuration settings can be used to tune APT behavior, such as compatibility with existing Spanning Tree architectures.

BCAPI Query Language (BQL): Rajant's custom query language used to create filter expressions to view BreadCrumbs of interest in BC|Commander. For details, refer to the *BC|Commander Version 11 User Guide*, Appendix BCAPI Query Language.

BC|Commander®: Rajant standard primary software application for managing and monitoring components in an active mesh network in real-time. BC|Commander provides a graphical user interface view an entire mesh network and configure individual BreadCrumbs.

BC|Connector: Rajant application that acts as an intermediary between BC|Commander instances and BreadCrumbs to provide a single connection point for accessing mesh statistics. BC|Connector runs as a Windows Service or Linux daemon.

BC|Enterprise: Rajant platform of software modules that enables a user to obtain real-time performance data and historical data for BreadCrumbs in a Rajant Kinetic mesh network and present that data in tables and charts in a web browser.

BreadCrumb®: Any model of a Rajant networking device that can connect to other BreadCrumbs or networking devices to form a BreadCrumb network. Most BreadCrumb models include wireless radios that use the IEEE 802.11 (Wi-Fi) wireless networking standard protocols. Some BreadCrumb models support the Long-Term Evolution (LTE) standard. Some BreadCrumb models provide only wired connectivity through a local area network (LAN) to the Ethernet. Many BreadCrumb models provide both wireless and wired Ethernet connections. Each BreadCrumb model includes different hardware and firmware features to support specific operational and administrative capabilities.

BreadCrumb Application Programming Interface (BCAPI): Rajant's custom Application Programming Interface (API) used to communicate with Rajant BreadCrumbs. For more information, refer to the BCAPI documentation on the Rajant Support website.

InstaMesh®: Rajant's patented networking software that can dynamically optimize performance as network characteristics change, whether nodes are added or subtracted, frequencies are opened or blocked or the connected assets move over large areas. When a user changes, moves or disables a device in the network, that change can be managed locally without needing to be propagated throughout the network or centrally managed.

Kinetic Mesh™: Rajant network in which every node can act independently because the InstaMesh® protocol seamlessly networks fixed, wireless and mobile BreadCrumbs together. If any one peer is compromised or obstructed, Kinetic Mesh will dynamically redirect traffic between the best available remaining points. Traditional meshing technologies rely on a single stationery controller node to manage decisions across the network.

Remote Protocol Tunneling (RPT): Rajant's proprietary communication technology that may be used to connect two BreadCrumb meshes that are not in the same IPv6 broadcast domain. RPT uses Stream Control Transmission Protocol (SCTP) or User Datagram Protocol (UDP) to stream the

BreadCrumb InstaMesh protocol over SCTP port 2210 or UDP port 2211 on an IPv4 or IPv6 connection between two compatible BreadCrumb mesh networks. For more information about RPT, refer to the Remote Protocol Tunneling (RPT) document on the Rajant Support web site.

Tactical Radio over Internet Protocol (TRoIP): Rajant's proprietary communication protocol built into all BreadCrumbs that support audio input/output (I/O) via Universal Serial Bus (USB). TRoIP enables voice communications over InstaMesh and provides tactical radio features, such as call groups.

Introduction

Contents

[BC|Enterprise Capabilities](#)

[Software Release Notes](#)

[References](#)

BC|Enterprise Capabilities

Purpose

The Rajant BC|Enterprise software product enables a user to interactively view real-time performance data and historical data for BreadCrumbs and the Rajant Kinetic Mesh network as tables and charts in a web browser.

Requirements

BC|Enterprise is an optional software component in a functioning Rajant Kinetic Mesh network. Without BC|Enterprise, users can use the Rajant BC|Commander software product to monitor BreadCrumb activity in real-time.

BC|Enterprise requires the Rajant BC|Connector software product to access mesh statistics from BreadCrumbs.

New for 11.24 One instance of BC|Enterprise can support any number of BC|Connector instances in the mesh network.

Because BC|Enterprise resides on a locally-hosted web server, no internet connection is required and no data ever leaves the network.

Capabilities

BC|Enterprise collects real-time data from BreadCrumbs and stores that data in a time series database. BC|Enterprise then presents the data in graphs and charts for individual BreadCrumbs, BreadCrumb groups and the entire mesh network. A user can interactively customize a view to show a designated time period of interest or show long-term trends.

BC|Enterprise can be configured to send reports to designated users via email on a predefined schedule.

A user can define metrics to cause BC|Enterprise to send a custom notification message to designated users when a predefined condition occurs on designated BreadCrumbs.

Time Series Database

The BC|Enterprise Metrics Service uses the Prometheus monitoring and metrics service to store metrics in a time series database.

User Interface

The BC|Enterprise Graph Service uses Grafana to generate charts and graphs to present historical data and metrics in dashboards. For more information about Grafana, refer to the Grafana documentation at [Grafana Docs](#).

Software Release Notes

BC|Enterprise software version 11.25.1 reflects the following changes from the previous version:

New Feature

- Published BC|Enterprise User Guide as a PDF file (T20821)

Enhancements

- Improved error messages when testing an alert message that fails (T9796)
- Added a noise graph to BreadCrumb dashboards (T15889)
- Improved the display of APT status on All BreadCrumbs dashboard and Group dashboards (T18810)
- Fixed an issue where a change to Email From field was not reflected in the sent email (T18859)
- Addressed a problem where dashboards were not created correctly when a BreadCrumb name contained a backslash character (T18931)
- Fixed a defect where BreadCrumb and Group dashboards were not automatically updated to their current definitions (T19243)
- Corrected display of information in the Connection State bar graph on Overview dashboard (T20246)
- Updated Iframe scrolling to resize a dashboard without cutting off the bottom of the dashboard (T20571)
- Removed "Status" column from Triggered Notifications tab. Triggered notification status is always "firing" (T20829)
- Corrected sizing of images in BC|Enterprise User Guide to improve readability (T20832)
- Updated installation files to use the latest Java 11 JRE (T20957)
- Updated the Graphics service, Grafana, to the latest 7.x release (T21180)
- Updated the time series database software, Prometheus, to the latest version (T21182)
- Added missing peer BreadCrumb name on Peer Details dashboards (T21462)
- Synchronized time ranges on detail panels viewed from Overview or Monitor dashboard (T21525)
- Added a Wired Peer Cost chart to the Peer Details dashboards for BreadCrumbs that have wired peer connections (T21549)
- Added HTML tables, links and descriptive text to daily, weekly and monthly reports (T21672)
- Corrected voltage reported for FE1 BreadCrumbs on daily, weekly and monthly reports (T21778)
- Email reports now preview the top 5 entries for each report type (T21833)

References

The following related documentation is referenced in this user guide:

- *BC|Commander Version 11 User Guide* (on the [Rajant Support web site](#))
- *BC|Connector Version 11 User Guide* (on the [Rajant Support web site](#))
- *BC|Enterprise Data Migration Instructions* (on the [Rajant Support web site](#))
- *BC|Enterprise Version 11 User Guide* (this document) (on the [Rajant Support web site](#))
- Caddy server (<https://caddyserver.com>)
- Grafana documentation at [Grafana Docs](#)
- Prometheus documentation
- Let's Encrypt (<https://letsencrypt.org>)

User Interface

Contents

[User Interface Layout](#)

[Banner Overview](#)

[Dashboard Overview](#)

[Panel Overview](#)

[Help Features](#)

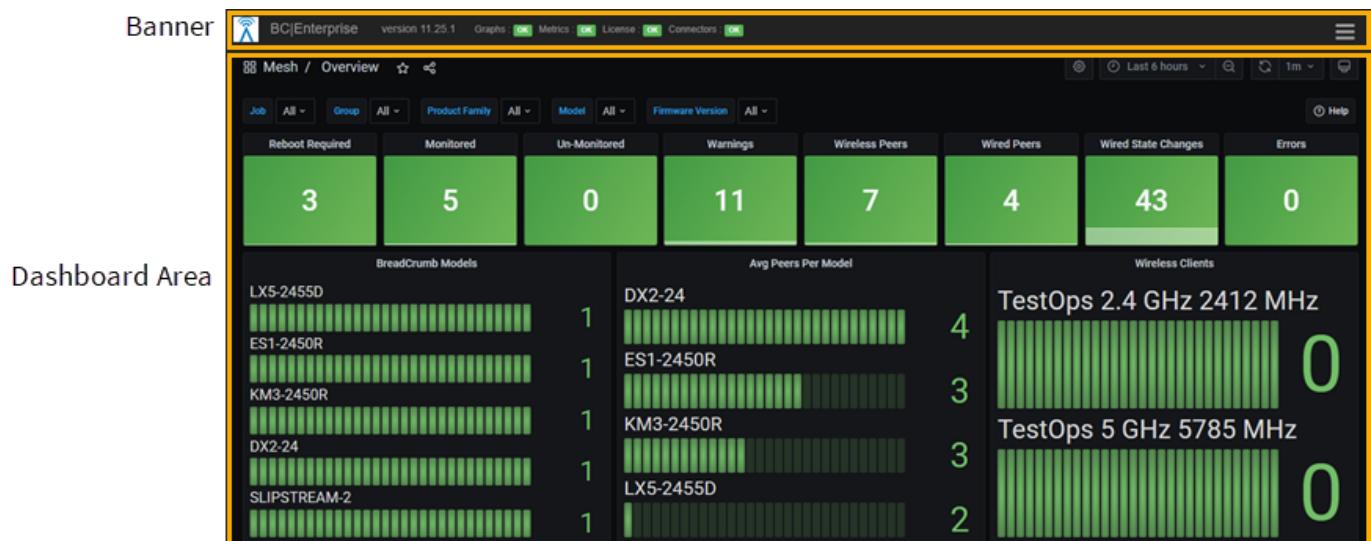
User Interface Layout

Description

New for 11.24 The BC|Enterprise user interface is displayed in a [web browser](#) window and always includes a [Banner](#) and a [Dashboard Area](#).

Illustration

This illustration identifies the Banner and the Dashboard Area in the user interface.



Banner

New for 11.24 The user interface always shows the [Banner](#) at the top.

Dashboard Area

New for 11.24 The entire display area below the Banner is the [Dashboard Area](#), where the dashboard selected by the [user](#) is displayed.

Banner Overview

Contents

- [Banner Layout](#)
- [Services Status Indicators](#)
- [Main Menu](#)

Banner Layout

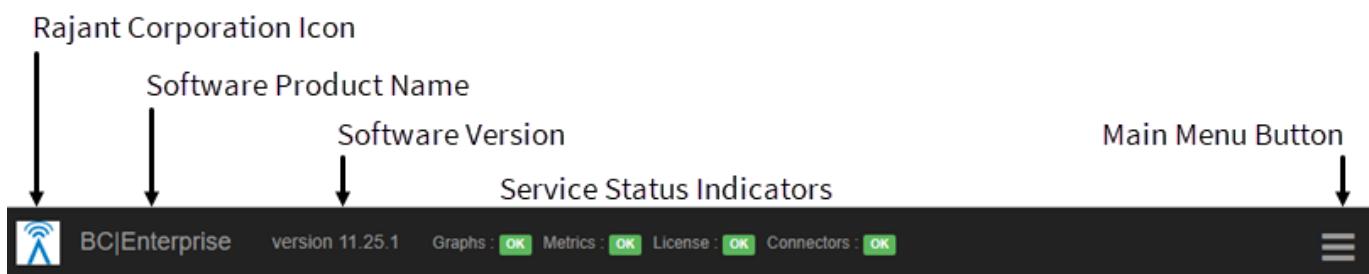
Description

The Banner at the top of the [user interface](#) includes the following items:

- Rajant Corporation icon
- Software product name
- Software version
- [Service Status Indicators](#)
- [Main Menu button](#)

Illustration

The following illustration identifies each item in the Banner:



Rajant Icon

The Rajant icon is the letter "A" used in the Rajant Corporation logo.

Software Product Name

"BC|Enterprise" is the software product name.

Software Version

The version of the [BC|Enterprise software](#) that is installed on the [BC|Enterprise server](#) is shown after the software product name.

Service Status Indicators

The [Service Status Indicators](#) are badges that show the status for each of the following:

- **Graphs**: Grafana graphing service
- **Metrics**: Prometheus metrics service
- **License**: License for the BC|Enterprise software
- **Connectors**: Instances of [BC|Connector](#) that have been [added](#) to BC|Enterprise

Main Menu Button

Click to open the [Main Menu](#).

Service Status Indicators

Description

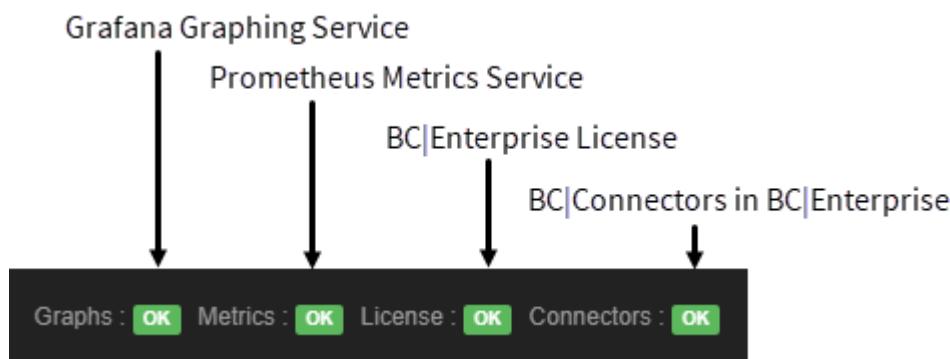
The [Rajant BC|Enterprise Service](#) polls services at regular intervals to determine the current status of each service.

The [Banner](#) at the top of the [user interface](#) includes the following service status indicators:

- **Graphs:** Grafana graphing service
- **Metrics:** Prometheus metrics service
- **License:** License service for the BC|Enterprise software
- **Connectors:** Instances of [BC|Connector](#) that BC|Enterprise is using

Illustration

The following illustration indicates the purpose of each service status indicator:

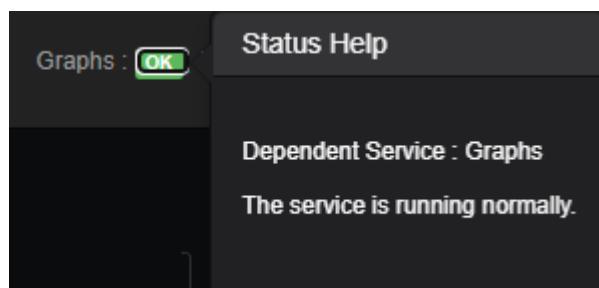


Help

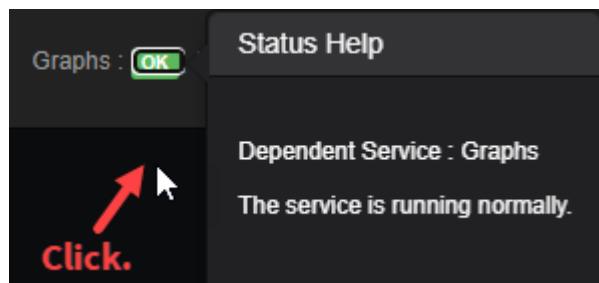
To view Help text for a service status indicator, click the status indicator.



Help text for the service status indicator is displayed.

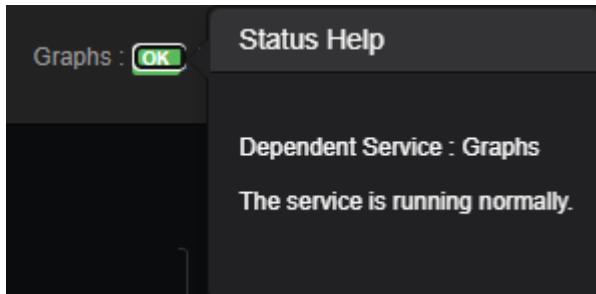


To close the Help text for a service status indicator, click anywhere outside the Help text area.



Graphs

Click **Graphs** to view the current status of the Grafana graphing service.



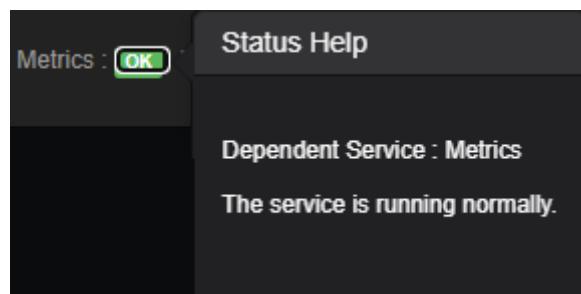
The possible status indicators for **Graphs** are the following:

Status	Description
OK	Grafana is running normally.
Pending	BC Enterprise is waiting for Grafana to start. Pending status should change to OK within 30 seconds of startup.
Terminating	BC Enterprise is waiting for Grafana to stop.
Terminated	Grafana is not running. This would be unusual. Stop the Rajant BC Enterprise Service on Windows or Linux , wait at least 15 seconds, and then start the Rajant BC Enterprise Service on Windows or Linux .

If **Pending** status persists for several minutes, a startup problem may have occurred. [Download snapshot files](#) to be sent to Rajant Support.

Metrics

Click **Metrics** to view the current status of the Prometheus metrics service.



The possible status indicators for **Metrics** are the following:

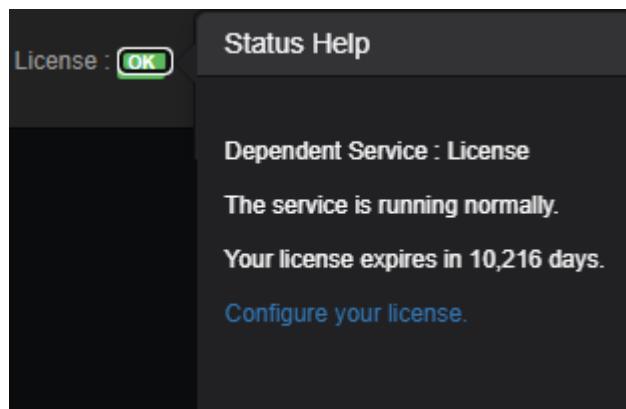
Status	Description
OK	Prometheus is running normally.
Pending	BC Enterprise is waiting for Prometheus to start. Pending status should change to OK within 30 seconds of startup. After a hard reset or partial shutdown, restart can take up to two minutes.
Recovering	BC Enterprise is waiting for Prometheus to process the data that Prometheus had previously written to disk. Reading saved data is part of the normal startup process for Prometheus.

Impaired	Prometheus is responding slowly. Prometheus is taking more than half the number of seconds configured for the Time Series Polling Interval to respond to a metrics request. Consider increasing the number of seconds configured for the Time Series Polling Interval.
Terminating	BC Enterprise is waiting for Prometheus to stop.
Terminated	Prometheus is not running. This would be unusual. Stop the Rajant BC Enterprise Service on Windows or Linux , wait at least 15 seconds, and then start the Rajant BC Enterprise Service on Windows or Linux .

If **Pending**, **Recovering** or **Impaired** status persists for several minutes, a startup problem may have occurred. [Download snapshot files](#) to be sent to Rajant Support.

License

Click **License** to view the current status of the BC|Enterprise License Service and the number of days until the current license key will expire.



Possible status indicators for **License** depend upon the current [licensing option](#).

The possible status indicators for **License** are the following:

Status	Description
OK	BC Enterprise is running with a configured license key that will not expire in the next 30 days.
Unlicensed	An unlicensed copy of BC Enterprise is running. The maximum number of monitored BreadCrumbs is five. Contact an Rajant re-seller to purchase a license.
Expiring Soon	BC Enterprise is running with a trial license that will expire within 30 days. Contact a Rajant reseller to purchase a new license.
Invalid	BC Enterprise is configured with a license key in an invalid format. Contact a Rajant re-seller to obtain a valid license key.

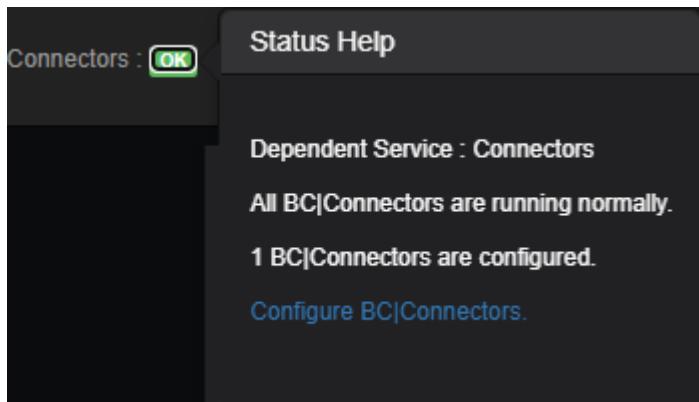
To [configure](#) a license key or [view](#) current license information, click **Configure your license**. The [Rajant / Configuration](#) dashboard is displayed. Click the [License tab](#).

On the [Rajant / Configuration](#) dashboard, the **BreadCrumbs** tab indicates the current number of monitored BreadCrumbs and the maximum number of monitored BreadCrumbs permitted by the current license.

Connectors

Click **Connectors** to view the status of the BC|Connectors that have been [added](#) to BC|Enterprise.

The status may indicate that all BC|Connectors are running normally, the number of BC|Connectors that have been configured in (added to) BC|Enterprise and the number of BC|Connectors that are not running normally.



The possible status indicators for **Connectors** are the following:

Status	Description
OK	BC Enterprise has recently received updates from all BC Connectors configured in BC Enterprise, which are listed in the BC Connectors table on the Rajant / BC Connector Management dashboard.
Impaired	BC Enterprise cannot communicate with at least one BC Connector that is listed in the BC Connectors table on the Rajant / BC Connector Management dashboard.
Unknown	BC Enterprise has not yet tried to communicate with at least one BC Connector listed in the BC Connectors table on the Rajant / BC Connector Management dashboard. This transient state is normal when BC Enterprise starts or when a BC Connector is added to BC Enterprise.
Unconfigured	No BC Connectors are listed in the BC Connectors table on the Rajant / BC Connector Management dashboard. Add at least one BC Connector to operate with BC Enterprise.
Down	BC Enterprise cannot communicate with any BC Connector that is listed in the BC Connectors table on the Rajant / BC Connector Management dashboard. Ensure that each BC Connector is reachable through a designated port and appropriate firewall ports are open. In BC Commander , in the Details Panel, on the BC Connectors tab, ensure that the Connection Status column for each BC Connector contains Connected . If the BC Connector is not running, start the BC Connector (for instructions, refer to the <i>BC Connector Version 11 User Guide</i> (on the Rajant Support web site)).

To [add](#) or [remove](#) a BC|Connector used in BC|Enterprise, click **Configure BC|Connectors**. The [Rajant / BC|Connector Management](#) dashboard is displayed.

Main Menu

Description

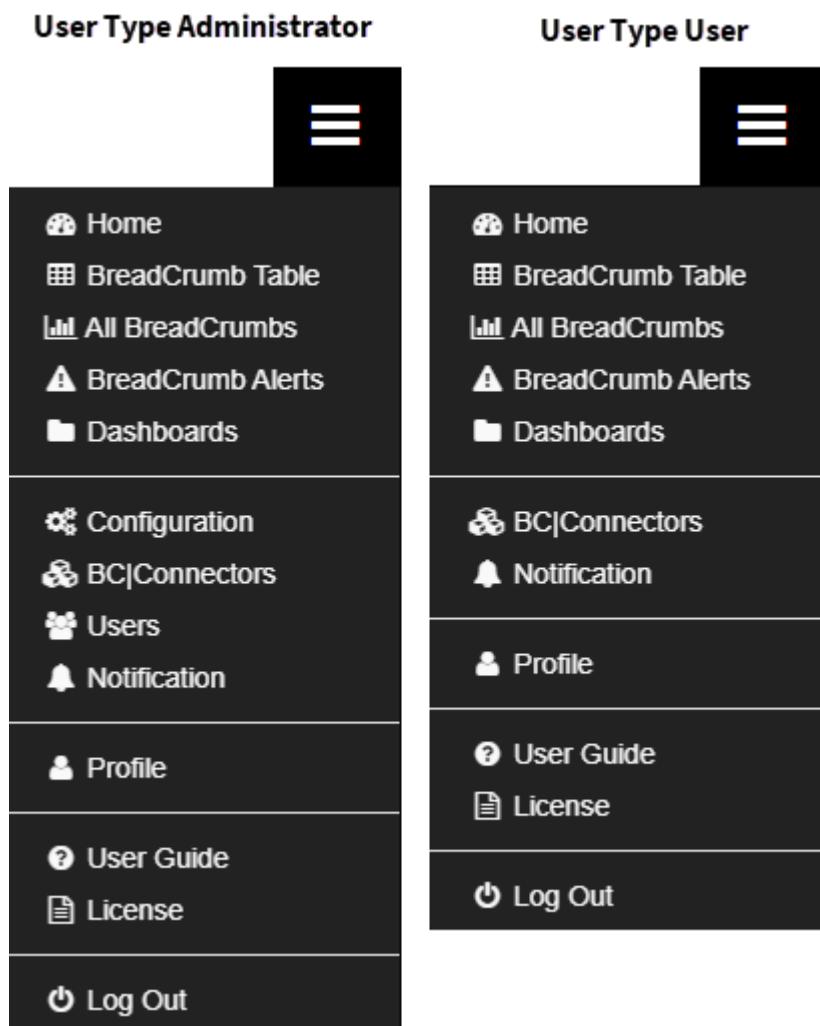
The Main Menu in the [Banner](#) in the [user interface](#) provides a [user](#) with direct access to the following:

- Primary [dashboards](#)
- BC|Enterprise Version 11 User Guide
- Rajant Corporation [End User License Agreement](#)
- Log Out button

The [user type](#) (**Administrator** or **User**) associated with the [user name](#) supplied when a user [logs in](#) determines the primary dashboards that are available from the Main Menu until that user [logs out](#).

Illustration

The following illustration shows the Main Menu for user type **Administrator** and user type **User**:



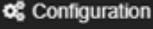
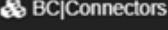
Main Menu button

To open the Main Menu, click the Main Menu button  in the Banner.

To close the Main Menu, click a selection or click the Main Menu button again.

Selections

The following table describes the result of clicking each selection in the Main Menu:

Selection	Result
 Home	Go to the Mesh / Overview dashboard.
 BreadCrumb Table	Go to the Mesh / BreadCrumb Table dashboard.
 All BreadCrumbs	Go to the Mesh / All BreadCrumbs dashboard.
 BreadCrumb Alerts	Go to the Rajant / BreadCrumb Alerts dashboard.
 Dashboards	Go to the Dashboards dashboard.
 Configuration	Go to the Rajant / Configuration dashboard (Administrator only).
 BC Connectors	Go to the Rajant / BC Connector Management dashboard.
 Users	Go to the Rajant / User Management dashboard (Administrator only).
 Notification	Go to the Rajant / Notification dashboard.
 Profile	Go to the Rajant / User Profile dashboard.
 User Guide	Open this user guide at the title page on new tab.
 License	Open the Rajant Corporation End User License Agreement on a new tab.
 Log Out	Log out of BC Enterprise.

Dashboard Overview

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- [View the JSON Model for a Dashboard](#)
- [Share the Current Dashboard](#)

Dashboards

Description

A dashboard is a predefined set of one or more [panels](#) displayed in the [Dashboard Area](#) in the [user interface](#).

Each dashboard is defined in a JavaScript Object Notation (JSON) file using Grafana.

Reference

For information about Grafana, refer to the Grafana documentation at [Grafana Docs](#).

Standard dashboards

Standard dashboards are provided with the [BC|Enterprise software](#).

[Help features](#) are available to view a description of the content and features for each standard dashboard.

Custom dashboards

To create a custom dashboard, a user may use Grafana to do the following:

- [Add a custom dashboard](#)
- [Copy, rename](#), and then edit a dashboard
- [Import a JSON file for a dashboard](#)

Important: Rajant does not provide support for custom dashboards.

Access

The [user type \(User or Administrator\)](#) associated with the user name supplied when a user [logs in](#) determines the standard dashboards that are available from the [Main Menu](#) during the session. The user must [navigate](#) to a dashboard of interest.

Each user with user type **Administrator** is granted permissions for the Admin role in Grafana.

Each user with user type **User** is granted permissions for the Editor role in Grafana.

Dashboard folders

Dashboards are organized for convenient access in [dashboard folders](#) on the [Dashboards](#) dashboard.

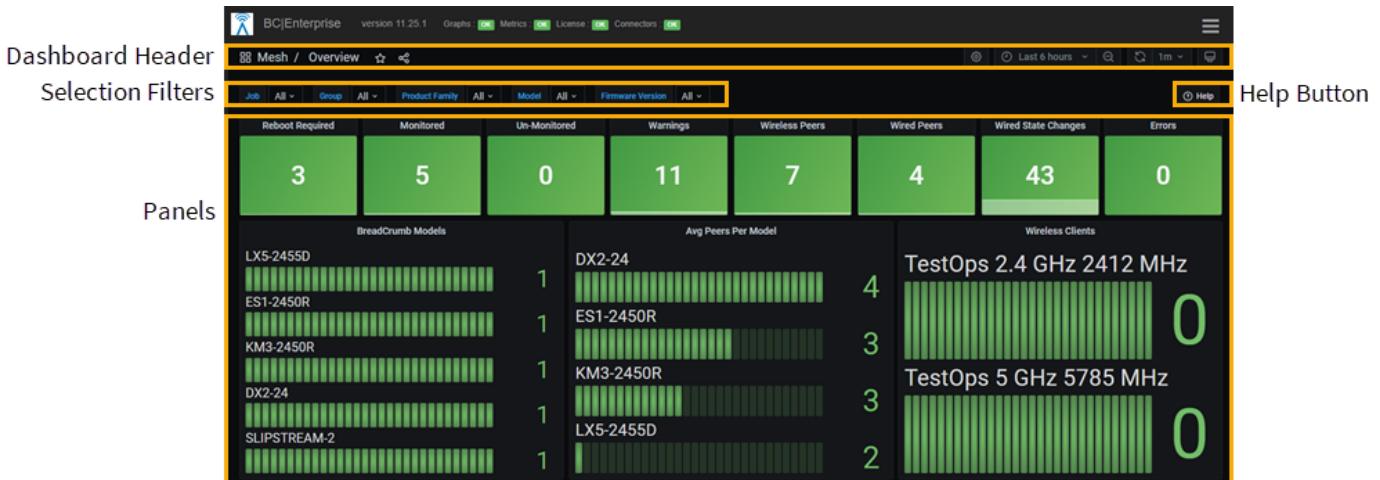
Dashboard Area

Description

In the [user interface](#), the Dashboard Area is the entire display area below the [Banner](#).

Illustration

This illustration identifies common features shown in the Dashboard Area.



Dashboard Area

The predefined [JavaScript Object Notation \(JSON\)](#) model for each [dashboard](#) defines the content of the Dashboard Area.

The Dashboard Area typically includes the following items:

- [Dashboard Header](#)
- [Selection Filters](#)
- [Help button](#)
- [Panels](#)

Dashboard Header

The Dashboard Header contains the dashboard name, Star, Settings icon, selected time range, Time Range Zoom Out icon, Refresh icon and Refresh Interval selection.

Selection Filters

Any dashboard that presents data from the time series database provides selection filters. A [user](#) can set [selection filters](#) to filter the data by attribute values.

Help Button

To view help for the displayed dashboard, click at the top right corner. A new tab opens in the current [web browser](#) window. The new tab contains the *BC|Enterprise Version 11 User Guide* opened to a description of the displayed dashboard. The dashboard description includes links to related topics.

Panels

The content of each dashboard is presented in one or more separate panels. The available panels vary for each dashboard.

Dashboard Header

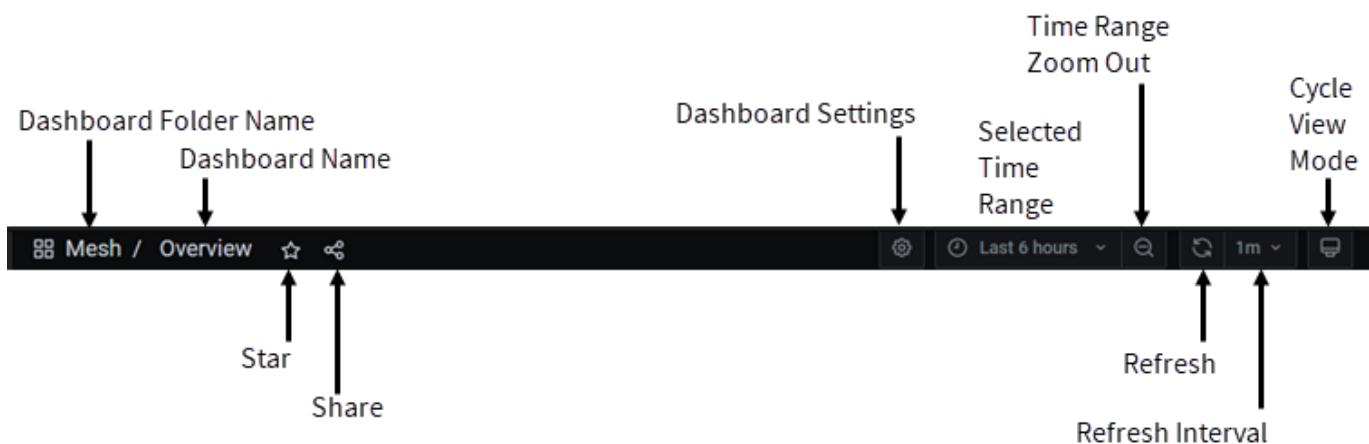
Description

In the [user interface](#), the Dashboard Header is the top of the [Dashboard Area](#).

The Dashboard Header contains the dashboard folder name, dashboard name, Star, dashboard Settings icon, selected time range, Time Range Zoom Out icon, Refresh icon and Refresh Interval.

Illustration

This illustration identifies the features in the Dashboard Header.



Dashboard folder name

The dashboard folder name identifies the [dashboard folder](#) on the [Dashboards](#) dashboard that contains a link to the displayed [dashboard](#).

To [go to a dashboard](#) in the same dashboard folder, click the dashboard folder name. The [folder:current](#) dialog box opens.

Tip: If the dashboard folder name is not shown in the Dashboard Header, increase the width of the browser window.

Dashboard name

The dashboard name identifies the displayed dashboard.

To go to another dashboard, click the dashboard name. The [Search dashboards by name](#) dialog box opens.

Star

Click (Mark as favorite) to star the dashboard. The star symbol is selected ().

To clear a selected star symbol () click the selected star symbol.

Links to starred dashboards can be filtered for convenience on the [Dashboards](#) dashboard.

To go to a starred dashboard, click the dashboard name. The [Search dashboards by name](#) dialog box opens. Starred dashboards are shown under the **Starred** heading.

Share

New for 11.25 To share the current dashboard with Grafana users, click (Share dashboard or panel). The **Share** dialog box opens.

Dashboard settings

Click  (Dashboard settings) do the following:

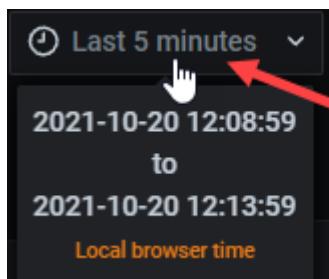
- [View the JavaScript Object Notation \(JSON\) model definition for the dashboard](#)
- [Copy and rename a dashboard](#)

Selected time range

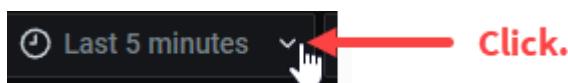
The selected time range indicates the time range for the data shown in the displayed dashboard.

The default time range is defined in the JSON model definition for the dashboard.

To view the exact date and time stamps for the start and end of a relative time range, point to the relative time range.



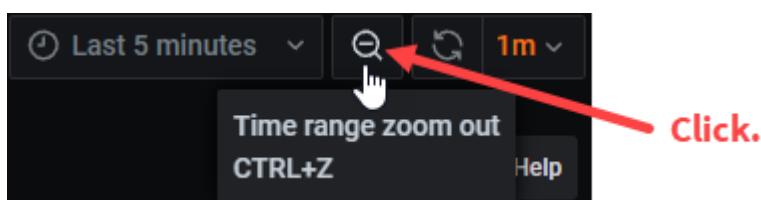
To change the selected time range, click the arrow to the right of the Selected Time Range.



The time range controls pane opens. [Select a time range](#) for the dashboard.

Time range zoom out

To increase the time span for a Selected Time Range that is a relative time range, click  (Time range zoom out CTRL+Z).



The relative time range is replaced by the date and time stamps for the start time and end time for twice the time span of the relative time range.

The date and time stamp format is yyyy-mm-dd hh:mm:ss.



Click  to set the start time back by the time span of the relative time range.

Click  to set the end time forward by the time span of the relative time range.

Refresh dashboard

Click  (Refresh dashboard) to refresh the dashboard immediately. Queries to the time series database will run to update the data presented on the dashboard.

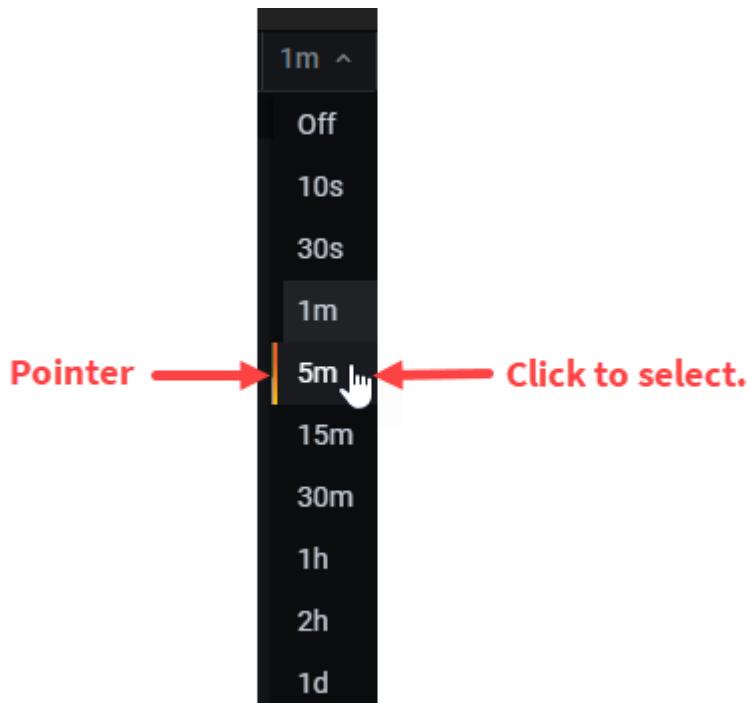
Refresh interval

The refresh Interval is the amount of time between each automatic refresh of the dashboard content.

To change the refresh interval, click the arrow to the right of the current value to open the list of available values.



To select a refresh Interval, click an amount of time in the list. The list varies for each dashboard.



To turn off automatic refresh of the dashboard content, select **Off**.

Cycle view mode

New for 11.25 Click (Cycle view mode) to show only dashboard content and hide other dashboard features such as a navigation menus. For more information, refer to the Grafana documentation at [Grafana Docs](#).

Select a Time Range for a Dashboard

Purpose

Select a time range for the data in the time series data base that is to be shown in [panels](#) on the dashboard.

Tip: When the selected time range for a dashboard that includes panels for historical graphs is **Last 24 hours** (default), data for the first 30 minutes in the time range may not be visible. Decrease the selected time range to **Last 6 hours**.

Reference

For instructions, refer to [Time range controls](#) in the Grafana documentation.

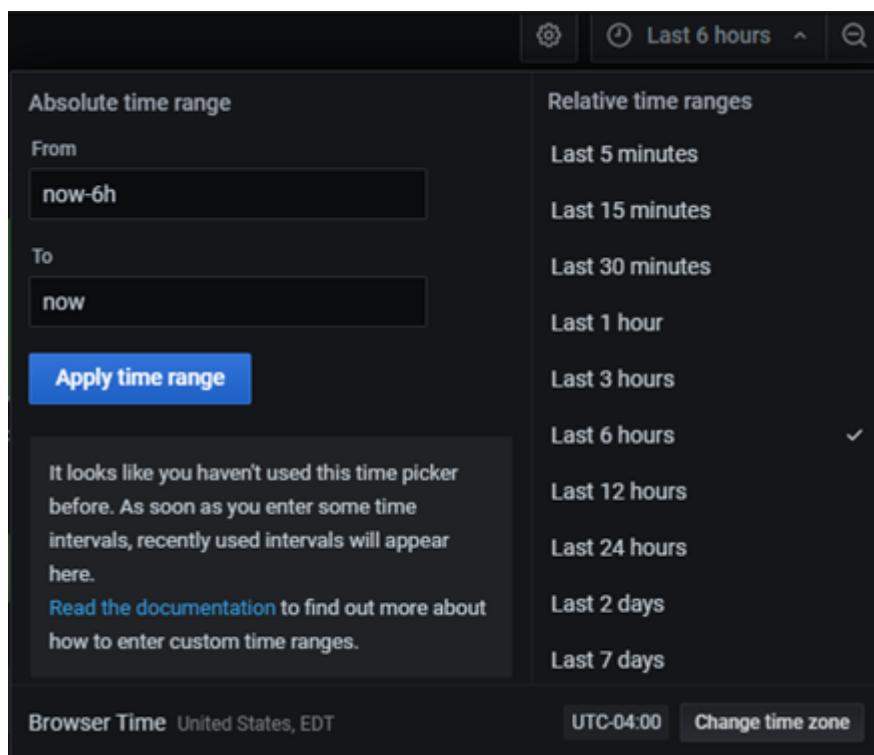
Procedure

To select a time range for the displayed dashboard, do the following:

1. In the [Dashboard Header](#), click the arrow to the right of the selected time range.



The time range controls pane opens.



2. Use the time range controls pane to set the time range for the displayed dashboard.

Result

The content of each panel in the dashboard is refreshed to reflect the new selected time range.

Follow-up procedure

Enlarge a Time Range in a Panel

Set Selection Filters for a Dashboard

Purpose

Set [selection filters](#) at the top of the [Dashboard Area](#) to filter the data from the time series database to be shown in [panels](#) on the displayed [dashboard](#) based on the [selected time range](#) shown in the [Dashboard Header](#).

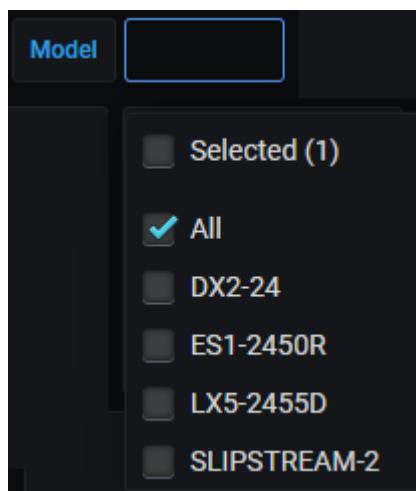
Procedure

To set a selection filter for a dashboard, do the following:

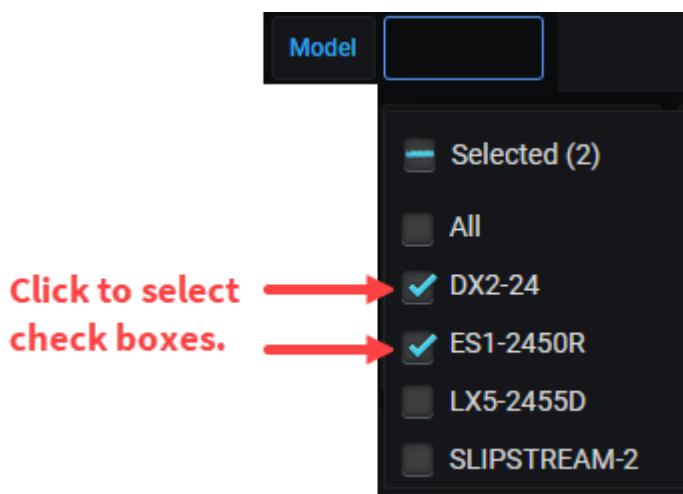
1. In the Dashboard Area, click the arrow to the right of the current setting for the selection filter.



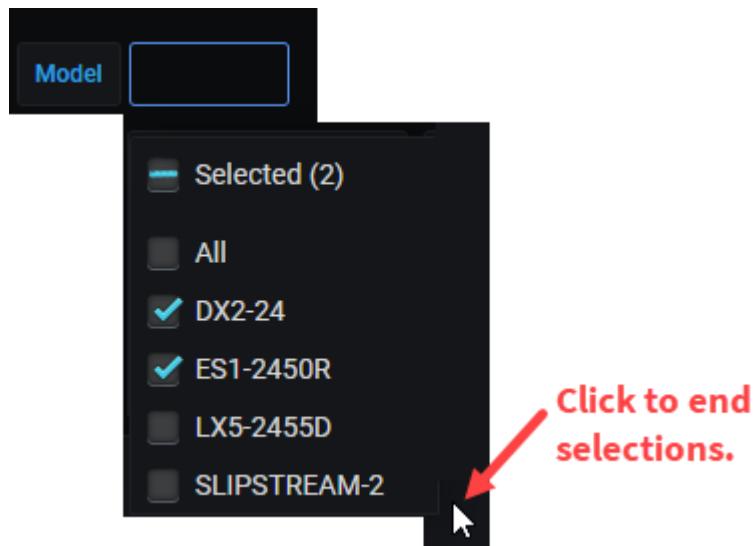
The list of available values for the selection filter opens. The check box for the current value is selected.



2. Click to select each check box for a value of interest.



3. After selecting every value of interest, click outside the list of values to end the selection step.



The selected values are shown as the new selection filter.



The dashboard is refreshed to reflect the new values for the selection filter.

Result

The data presented in each panel in the Dashboard Area is filtered based on the selected values in the selection filter.

Selection Filters

Description

Selection filters are settings provided at the top of the [Dashboard Area](#) on any [dashboard](#) that presents data from the time series database. A [user](#) can [set selection filters](#) to filter the data shown in the dashboard by attribute values.

The [JSON model](#) for a dashboard defines the available selection filters for that dashboard.

Illustration

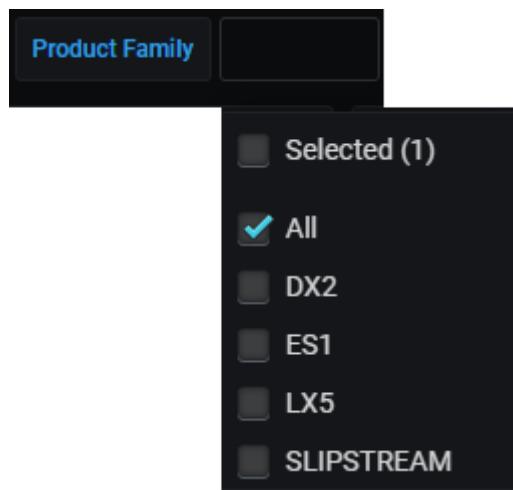
The following illustration shows an example of the selection filters provided on a dashboard with the default value selected for each selection filter:



Values

Each selection filter represents an attribute and provides a list of check boxes for available values for that attribute on the current dashboard. Most selection filters provide an **All** check box as the default selection.

The following illustration shows an example of the available values for the Product Family selection filter with the **All** check box selected:



Procedure

[Set Selection Filters for a Dashboard](#)

Reference

[Selection Filter Descriptions](#)

Selection Filter Descriptions

Description

The following list provides a description of each [selection filter](#) that may be available to filter data on a displayed [dashboard](#).

* This setting is in the BreadCrumb configuration for the BreadCrumb in [BC|Commander](#).

Alert Code

On the [Rajant / BreadCrumb Alerts](#) dashboard only, the **Alert Code** filter selects data by a three-digit Alert Code. For a definition of each code number, refer to the Appendix Error and Warning Codes in the BreadCrumb User Guide for the BreadCrumb model and the *BC|Commander Version 11 User Guide*, both on the [Rajant Support web site](#).

Alert Type

On the [Rajant / BreadCrumb Alerts](#) dashboard only, the **Alert Type** filter selects data by the Alert Type (**WARNING** or **ERROR**) on the **Alerts** tab in BC|Commander.

APT State

On the [Mesh / Wired Table](#) dashboard only, the **APT State** filter selects data by the Advanced Protocol Tunnel (APT) state for each wired Ethernet interface. Available values are **All** (default), **master**, **slave**, **none** and **link**.

Band

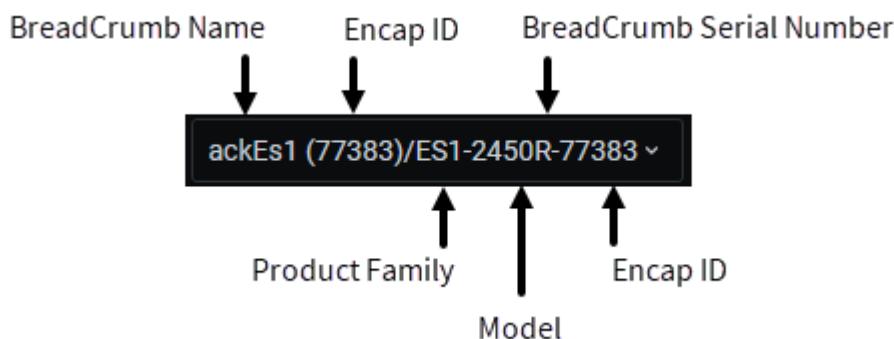
The **Band** filter selects each wireless radio on a BreadCrumb by radio frequency band (for example, 2.4 GHz or 5 GHz).

BreadCrumb

The **BreadCrumb** filter selects data by the BreadCrumb identification.

The BreadCrumb identification is comprised of the BreadCrumb name (BreadCrumb Name*), the encapsulation ID (Encap ID) portion of the BreadCrumb serial number enclosed in parentheses, a forward slash (/) character, and then the complete BreadCrumb serial number.

The BreadCrumb serial number is comprised of the BreadCrumb product family, a hyphen (-) character, BreadCrumb model, a hyphen (-) character, and then the Encap ID, as follows:



Channel

The **Channel** filter selects each wireless radio on a BreadCrumb by the channel number (Channel Number*).

encap

On the [Mesh / All BreadCrumbs](#) dashboard only, the **encap** filter selects data by the encapsulation ID (Encap ID) portion of the BreadCrumb serial number. The only selection is **All**.

Eth

The **Eth** filter selects data by the wired Ethernet interface (eth0 or eth1) on a BreadCrumb by interface number (**0** or **1**).

Firmware Version

The **Firmware Version** filter selects data by the BreadCrumb firmware version installed on a BreadCrumb.

Frequency

The **Frequency** filter selects each wireless radio on a BreadCrumb by operating frequency (Channel Number*).

Group

The **Group** filter selects data by the name of a BreadCrumb group (Group*) associated with a BreadCrumb.

Instance

On the [Rajant / Historical Metrics Support](#) dashboard only, the **Instance** filter selects data by the host name and [designated port number](#) for the BC|Enterprise Time-Series Database Service.

Interface

On a [Peers Details](#) dashboard only, the **Interface** filter selects data for a BreadCrumb by the interface to a peer BreadCrumb. The only selection is **All**.

Interval

On the [Rajant / Historical Metrics Support](#) dashboard only, the **Interval** filter selects data by the scrape interval in Prometheus.

Job

The **Job** filter selects data by jobs known to the time series database.

Each [BC|Connector](#) that is [added](#) to BC|Enterprise is created as a job with the job name in the format **bce-address**, where *address* is the Internet Protocol (IP) address for a [BC|Connector](#) server shown in the **Address** column in the BC|Connectors table on the [Rajant / BC|Connector Management](#) dashboard.

Important: When two BC|Connectors are connected to the same BreadCrumbs, BC|Enterprise will treat each BC|Connector as a separate Job. Each Job will store the same BreadCrumb data in the time series database. To prevent showing duplicate BreadCrumb data in BC|Enterprise, do not select both BC|Connectors in the **Job** filter at the same time.

Tip: Select only one job for a BC|Connector at a time to limit the volume of data shown in the dashboard.

The Java Virtual Machine (JVM) job for BC|Enterprise is named **bce-jvm**.

The JVM job for a BC|Connector is named in the format **bce-jvm-address**, where *address* is the IP address for a BC|Connector server.

Other jobs exist for tasks, such as BC|Enterprise self-monitoring features.

JVM Memory Pools Heap

On [Rajant /JVM Monitor dashboard](#) only, to use the **JVM Memory Pools Heap** filter, work with Rajant Support personnel.

JVM Memory Pools Non-Heap

On [Rajant /JVM Monitor dashboard](#) only, to use the **JVM Memory Pools Non-Heap** filter, work with Rajant Support personnel.

Mesh Class

On the [Mesh / Mesh Density dashboard](#) only, the **Mesh Class** filter selects data by mesh class, a set of inter-operable radio bandwidths for InstaMesh.

Model

The **Model** filter selects data by BreadCrumb product family and model, such as ES1_2450R.

Network

The **Network** filter selects data by network name (Network Name*).

Product Family

The **Product Family** filter selects data by BreadCrumb product name, such as ES1.

Rate Interval

The **Rate Interval** filter selects the granularity of time to be used to present data rates in dashboard panels based on the time span of the [selected time range](#).

For example, when the selected time range is three months and the selected Rate Interval is **1d** (one day), each panel will provide a graph that shows the average rate for each day during the last three months. When the selected time range is three hours and the selected Rate Interval is **10m** (ten minutes), each panel will provide a graph that shows the average rate for every ten minutes for the last three hours.

Available values for the **Rate Interval** filter are **auto** (default), **10m** (ten minutes), **30m** (30 minutes), **1h** (one hour), **6h** (six hours), **12h** (12 hours), **1d** (one day), **7d** (seven days) and **14d** (14 days).

The Rate Interval **auto** (default) displays the average rate at each point in a graph based on the number of displayed pixels in the graph divided by the time span of the selected time range.

Wlan

The **Wlan** filter selects each wireless radio on a BreadCrumb by wireless LAN (Wlan) interface number (**0**, **1**, **2**, or **3**) (wlann*).

View the JSON Model for a Dashboard

Purpose

View the JavaScript Object Notation (JSON) model for the displayed [dashboard](#).

The JSON model is the data structure that defines the dashboard.

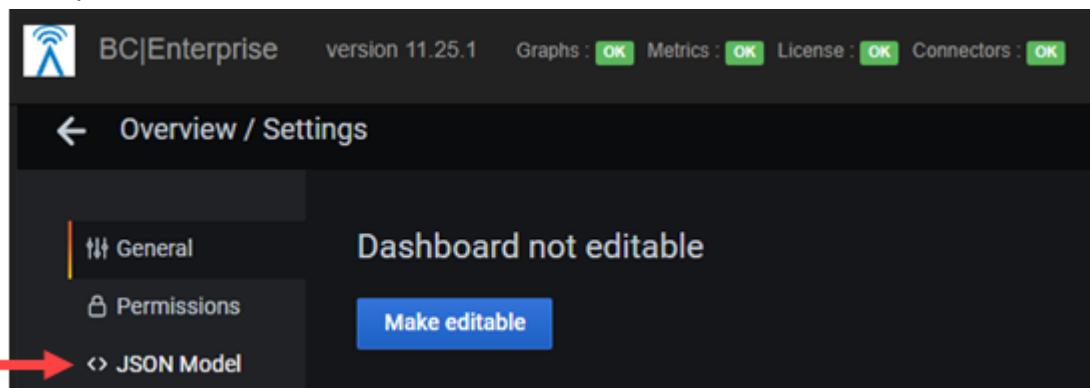
Tip

New for 11.25 In the [Dashboard Header](#), click  (Share dashboard or panel) to [download the JSON file](#) or [view and then copy the JSON file to the Clipboard](#).

Procedure

To view the JSON model for the displayed dashboard, do the following:

1. In a [Dashboard Header](#), click  (Dashboard settings). The **Settings** navigation pane and display pane are displayed in the [Dashboard Area](#).
2. In the navigation pane, click **JSON Model**.



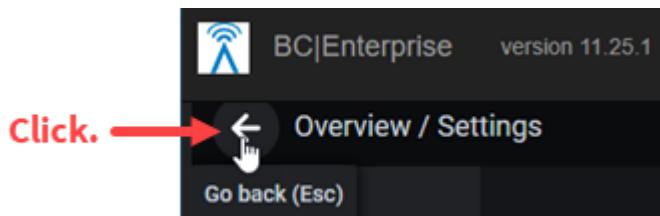
The JSON model for the dashboard is displayed in the Display Pane.

```

{
  "annotations": {
    "list": [
      {
        "builtin": 1,
        "datasource": "-- Grafana --",
        "enable": true,
        "hide": true,
        "iconColor": "rgba(0, 211, 255, 1)",
        "name": "Annotations & Alerts",
        "type": "dashboard"
      }
    ],
    "editable": false,
    "gnetId": null,
    "graphTooltip": 0,
    "id": 183638,
    "iteration": 1660766626666,
    "links": [
      {
        "icon": "question",
        "tags": [],
        "targetBlank": true,
        "title": "Help",
        "type": "link"
      }
    ]
  }
}

```

3. To return to the dashboard, click the return arrow in the Dashboard Header.



The dashboard is displayed.

Share the Current Dashboard

Purpose

New for 11.25 Share the currently displayed [dashboard](#) with Grafana users.

Methods

The following methods are available to share the currently displayed dashboard:

- [Share a direct link](#) to the Universal Resource Locator (URL) for the current dashboard
- [Share a snapshot image](#) for the current dashboard
- [Download the JavaScript Object Notation \(JSON\) file](#) for the current dashboard
- [Copy the JSON file](#) for the current dashboard to the Clipboard

Reference

For information about Grafana, refer to the Grafana documentation at [Grafana Docs](#).

Share a direct link to the URL for the current dashboard

Purpose

Share a direct link to the URL for the current dashboard with Grafana users.

Procedure

To share a direct link to the URL for the current dashboard, do the following:

1. In the [Dashboard Header](#), click  (Share dashboard or panel). The **Share** dialog box opens.
2. Click the **Link** tab (default).
3. Do one of the following:
 - (Default) To change the current relative time range to an absolute time range, enable the **Lock time range** toggle.
 - To keep the current relative time range, disable the **Lock time range** toggle.
4. To select the theme for the dashboard, click **Current** (default), **Dark** or **Light**.
5. Notice that the **Link URL** box initially contains the complete URL for the current dashboard.
6. (Optional) To share a shortened URL, select the **Shorten URL** icon. In the **Link URL** box, a shortened URL replaces the complete URL.
7. When all selections in the **Share** dialog box are correct, click  **Copy**. The content of the **Link URL** box is copied to the Clipboard. A confirmation message, "Content copied to clipboard" is displayed for a few seconds.
8. Close the **Share** dialog box.

Follow-up action

Paste (Ctrl+V) the copied URL into a message to be sent to Grafana users.

Share a snapshot image for the current dashboard

Purpose

Publicly share a snapshot image for the current dashboard. This image will contain only the visible data shown in the dashboard. Links, annotations, metrics will be stripped from the dashboard.

Procedure

To share a snapshot image for the current dashboard, do the following:

1. In the **Dashboard Header**, click  (Share dashboard or panel). The **Share** dialog box opens.
2. Click the **Snapshot** tab.
3. In the **Snapshot name** box, supply a name for the snapshot. The default snapshot name is the dashboard name from the Dashboard Header.
4. In the **Expire** list, select a time period (**Never** (default), **1 Hour**, **1 Day** or **7 Days**) after which the snapshot image will expire and no longer be available at the shared URL.
5. In the **Timeout (seconds)** box, set the number of seconds (default 4) to wait after **Local Snapshot** is clicked before capturing the dashboard metrics shown in the snapshot image.
6. When all selections on the **Snapshot** tab are correct, click **Local Snapshot**.
7. Wait for the snapshot image to be captured. The hyperlink for the snapshot image is displayed.
Example: <http://localhost:8888/graph/dashboard/snapshot/aFTxBKEJd2RuNOWdOeWeZ0rP397LgYAX>.
8. Click **Copy Link**. The displayed hyperlink is copied to the Clipboard. A confirmation message, "Content copied to clipboard" is displayed for a few seconds.
9. Close the **Share** dialog box.

Follow-up action

Paste (Ctrl+V) the copied hyperlink into a message to be sent to Grafana users.

Download the JSON file for the current dashboard

Purpose

Download the JSON file for the current dashboard.

Procedure

To download the JSON file for the current dashboard, do the following:

1. In the **Dashboard Header**, click  (Share dashboard or panel). The **Share** dialog box opens.
2. Click the **Export** tab.
3. Do one of the following:
 - (Default) To share the JSON file internally only, disable the **Export for sharing externally** toggle.
 - To share the JSON file externally, enable the **Export for sharing externally** toggle.
4. Click **Save to file**. The JSON file is downloaded to the local **Downloads** folder.
5. Close the **Share** dialog box.

Follow-up action

Open the **Downloads** folder to obtain the downloaded JSON file for the current dashboard.

Copy the JSON file for the current dashboard to the Clipboard

Purpose

Copy the JSON file for the current dashboard to the Clipboard.

Procedure

To share the JSON file for the current dashboard, do the following:

1. In the [Dashboard Header](#), click  (Share dashboard or panel). The **Share** dialog box opens.
2. Click the **Export** tab.
3. Do one of the following:
 - (Default) To share the JSON file internally only, disable the **Export for sharing externally** toggle.
 - To share the JSON file externally, enable the **Export for sharing externally** toggle.
4. To view the JSON file, click **View JSON**. A **JSON** dialog box opens to show the JSON file.
5. To copy the JSON file to the Clipboard, scroll to the bottom of the **JSON** dialog box, and then click **Copy to Clipboard**. A confirmation message, "Content copied to clipboard" is displayed for a few seconds.
6. Close the **JSON** dialog box.

Follow-up action

Paste (Ctrl+V) the copied JSON file for the current dashboard from the Clipboard to a destination.

Panel Overview

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Panels

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[Toggle the Legend for a Panel \(More...Toggle\)](#)

Data Tables

[Administrative Tables](#)

[Missing Data in Historical Drafts](#)

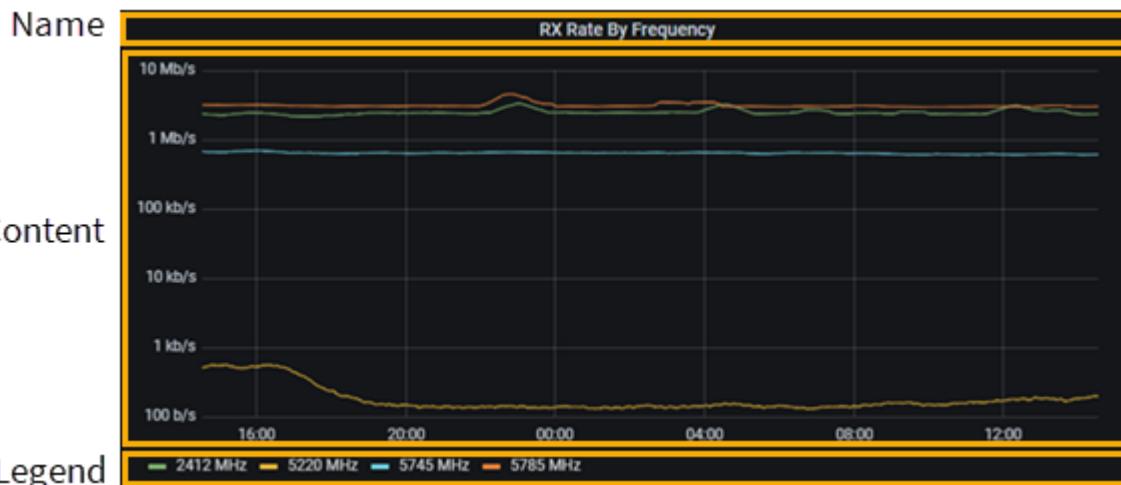
Panels

Description

In the [user interface](#), in the [Dashboard Area](#), the content of a [dashboard](#) is arranged in panels. The [JSON model](#) for a dashboard defines the available panels for that dashboard.

Illustration

This illustration identifies the common features of a panel.



Name

The name shown at the top of a panel identifies the type of data that is shown in that panel.

To [examine the definition](#) for the content of a panel, click to the right of the panel name to open the Panel Interaction Menu.

Content

The content and format for each panel in each dashboard is predefined in the JSON model for the dashboard.

A panel may contain a chart, graph or [data table](#) that represents specific data from the time series database based on the [selected time range](#) and [selection filters](#) for the dashboard. To obtain a more detailed view of data for a time range of interest, [enlarge a time range](#) shown within the panel. In a panel that contains a line graph, point to a location on a line to [view details](#) for that location. In a panel that contains a graph, click in the graph to [add an annotation](#) for that location in the graph. To [go to a related dashboard](#) for a panel, click in the panel to open the Data Links menu provided for that panel.

A panel may contain an [administrative table](#) presents information that has been manually supplied by a [user](#).

Legend

A panel may include a legend that identifies the data represented by each element in the panel.

(Optional) [Use the legend](#) to view data of interest within the panel.

Tips

An  (i (information)) indicator in the top left corner of a panel indicates an available [Tip](#) that describes the content of the panel.

Related Topics

The following topics are related to panels:

- [Data Tables](#)
- [Administrative Tables](#)
- [Go to a Related Dashboard for a Panel](#)
- [Enlarge a Time Range in a Panel](#)
- [View Details in a Line Graph](#)
- [Add an Annotation to a Panel](#)
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- [Explore Dashboard](#)
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- [Use a Legend in a Panel](#)
- [Missing Data in Historical Graphs](#)

Go to a Related Dashboard for a Panel

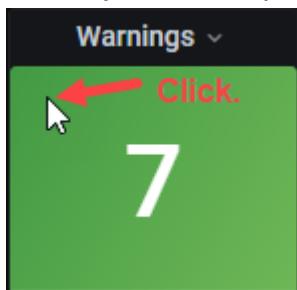
Purpose

Go to a related dashboard for a **panel** in a **dashboard**.

Procedure

To go to a related dashboard for a panel, do the following:

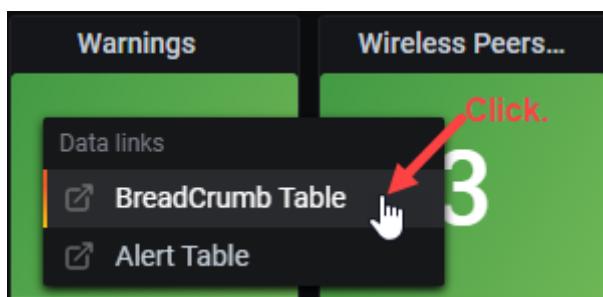
1. Click anywhere in a panel.



A **Data links** menu opens to show links to related dashboards.

2. Do one of the following:

- To close the **Data links** menu, click anywhere outside the panel.
- To go to a related dashboard, click a menu item.



The selected dashboard opens.

Enlarge a Time Range in a Panel

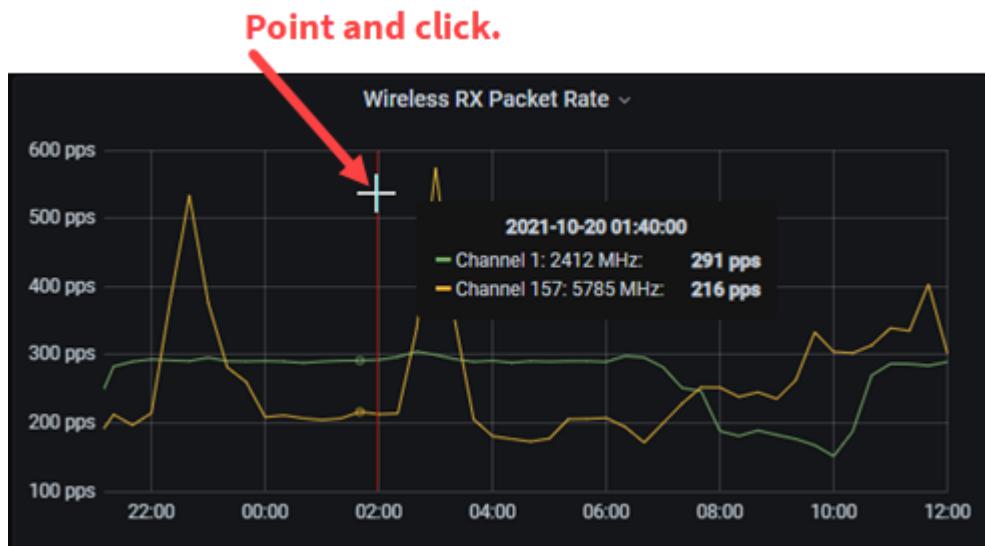
Purpose

Enlarge a time range shown in a [panel](#) on a displayed [dashboard](#) to show a more detailed view for a time range of interest. All panels in the dashboard will be refreshed to show the time range of interest. The [selected time range](#) in the [Dashboard Header](#) will be set to the time range of interest.

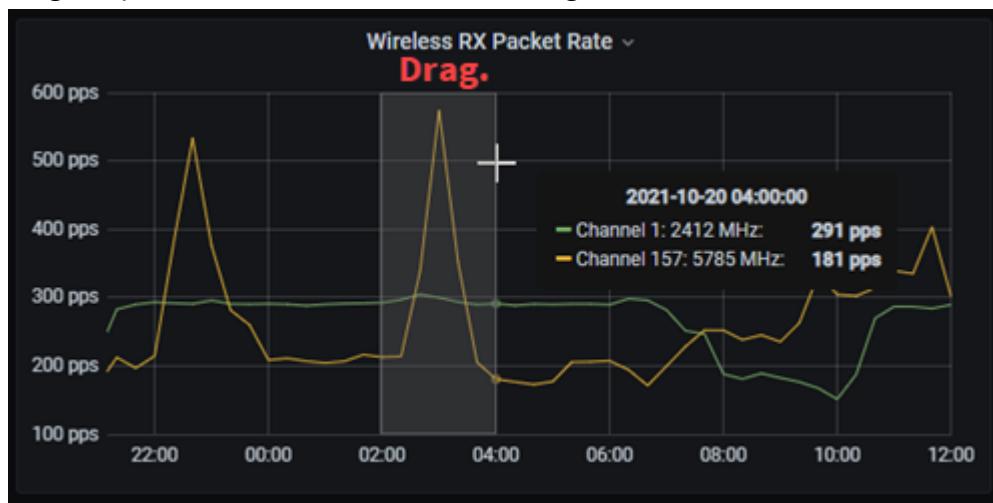
Procedure

To enlarge a time range shown in a panel, do the following:

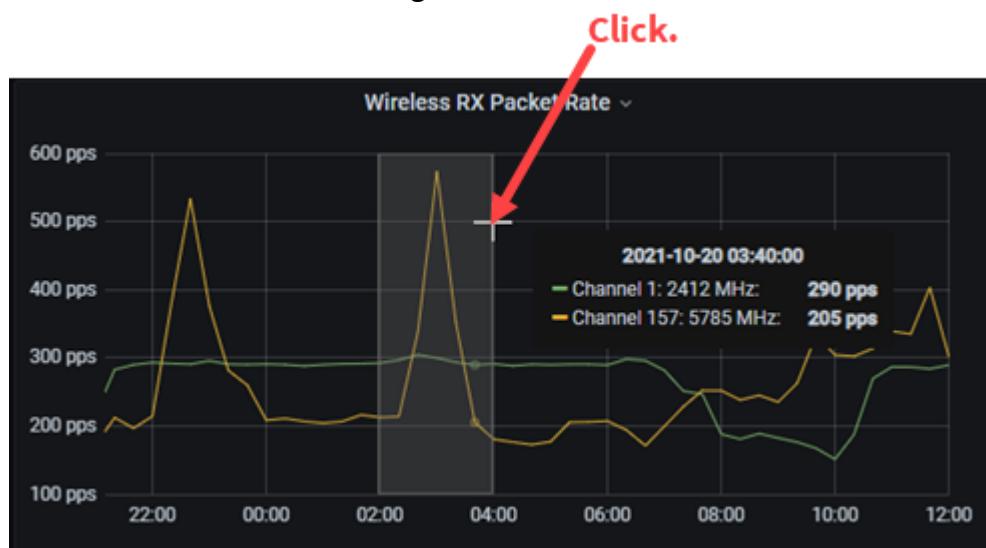
1. In the panel, point and click at the start time for the time range of interest.



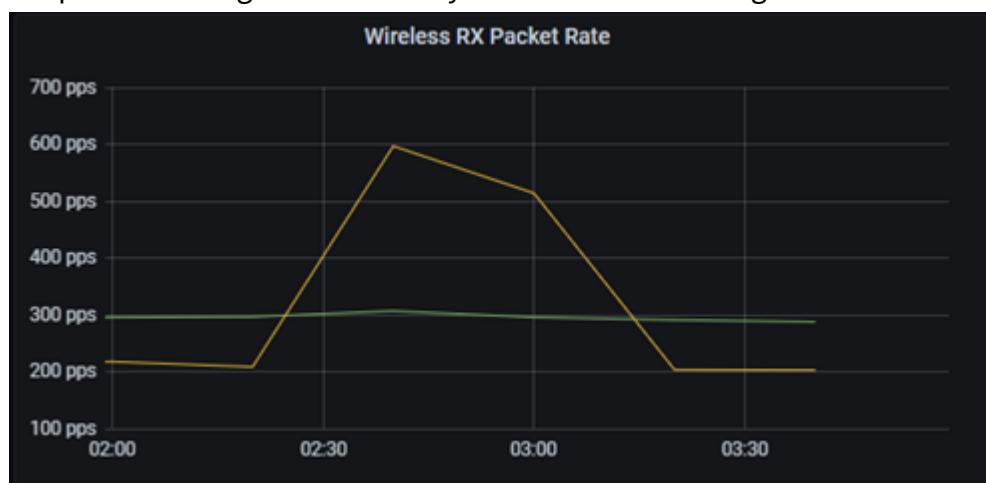
2. Drag the pointer to the end of the time range of interest.



3. Click at the end of the time range of interest.



The panel is enlarged to show only the selected time range.



All panels in the dashboard are refreshed to show the time range of interest.
The selected time range in the Dashboard Header is set to the time range of interest.

Use a Legend in a Panel

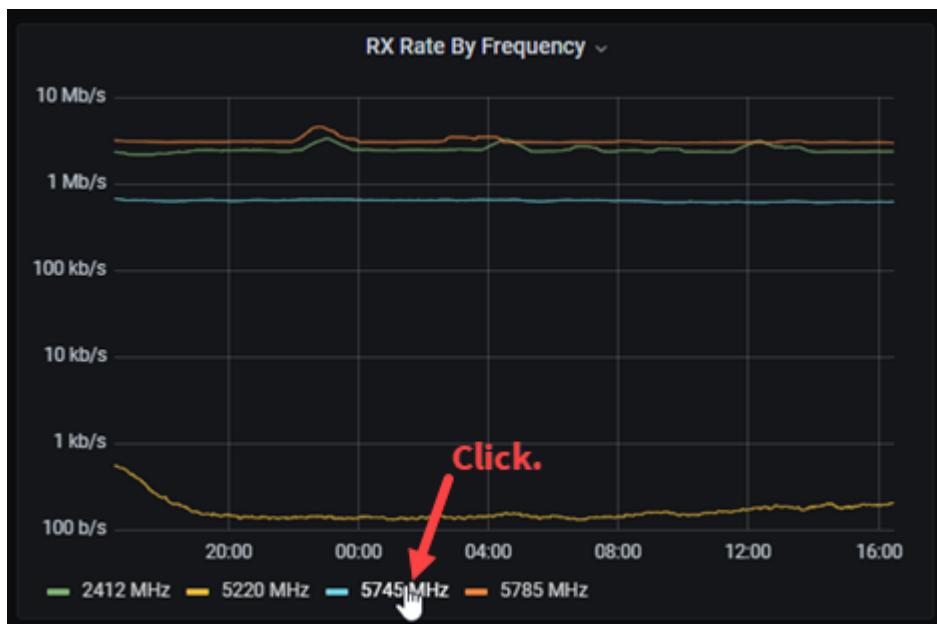
Purpose

Use a legend in a panel, as follows:

- View only one element of data
- Scroll within a legend
- Re-sequence rows in a legend

View only one element of data

To view only one element of data in a panel, in the legend, click the element of interest.



To return to the original panel, in the legend, click the element of interest again.

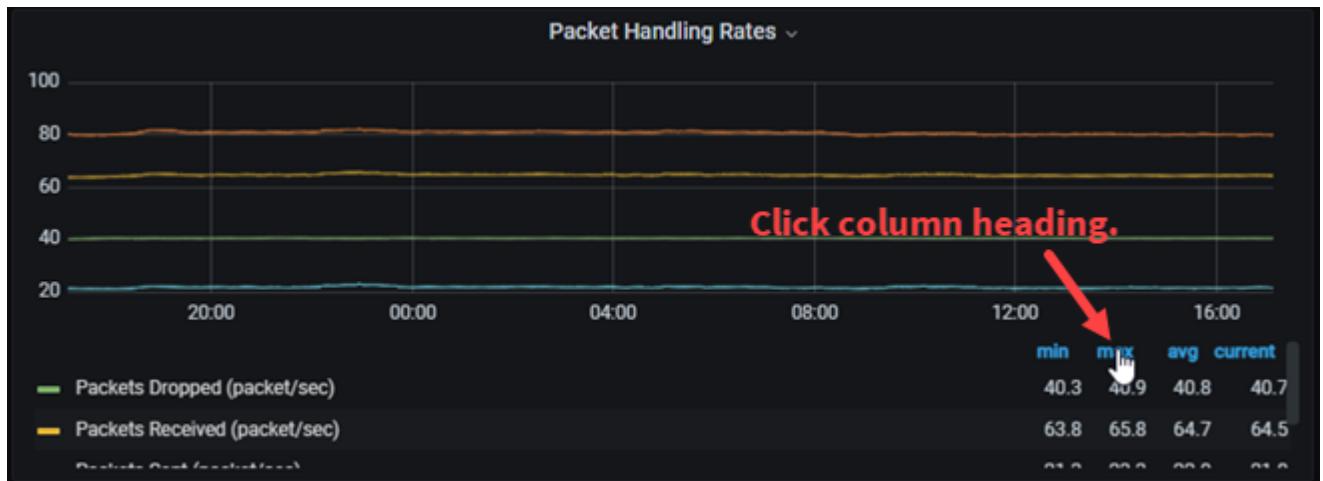
Scroll within in a legend

To scroll within a legend that contains multiple rows, at the far right of the legend, click the scroll bar.



Re-sequence rows in legend

If a legend that contains multiple rows and columns, to re-sequence the rows by the value in one column, click the column heading.



View Details in a Line Graph

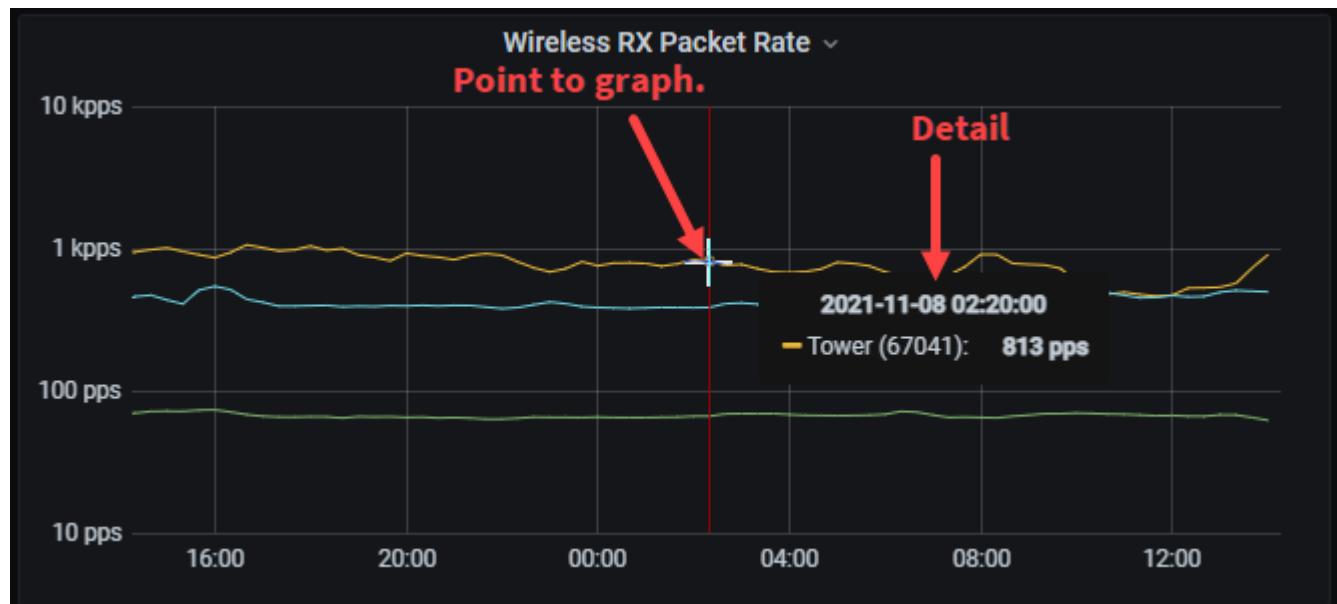
Purpose

View detail information for a point in a graph in a [panel](#) on a displayed [dashboard](#).

Procedure

To view detailed information for points in a graph, do the following:

place the cursor at that point in the graph. A cross-hair is displayed with the detail information.



Add an Annotation to a Panel

Purpose

Add an annotation (text description) to a marked location of interest in a graph in a [panel](#) on a displayed [dashboard](#).

In the time series database, this text will be associated with the data point at that location.

Any [user](#) who later views that location in a graph can point to that location to see the annotation.

Reference

For information about Grafana, refer to the Grafana documentation at [Grafana Docs](#).

Prerequisites

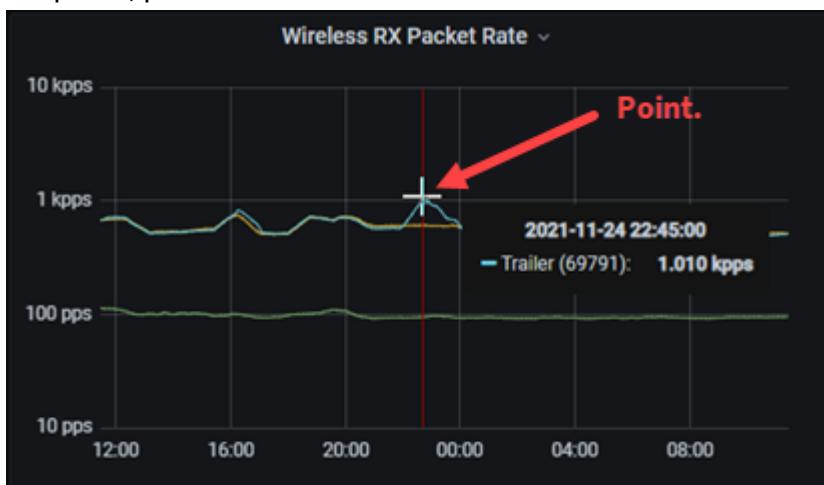
To determine the location for an annotation in a panel, do the following, as needed

- [View detail in the graph](#).
- [Enlarge the time range in the panel](#).

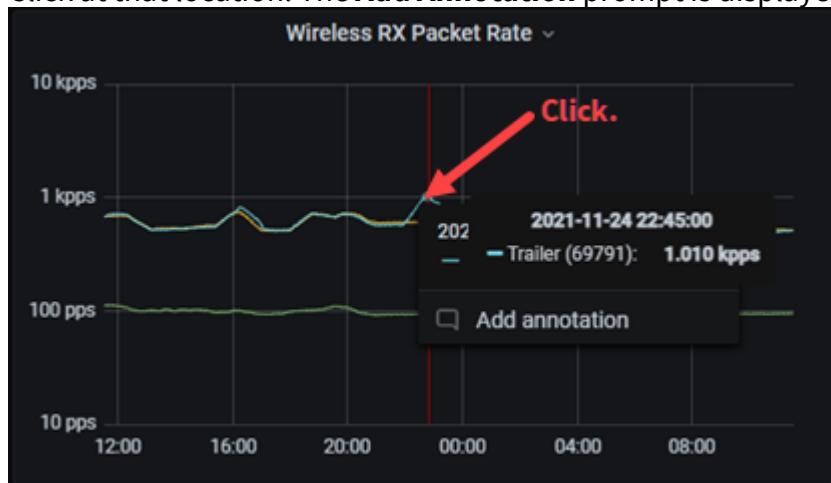
Procedure

To enlarge a panel in a dashboard, do the following:

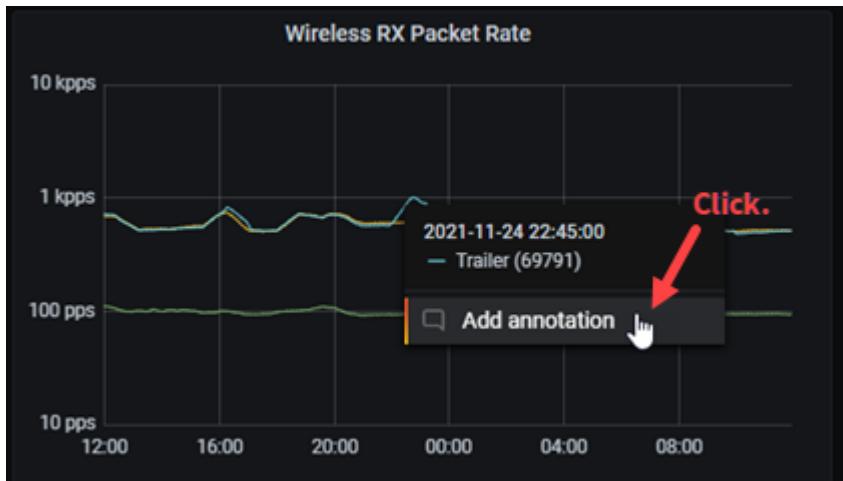
1. In a panel, point to the location where the annotation is to be added.



2. Click at that location. The **Add Annotation** prompt is displayed.

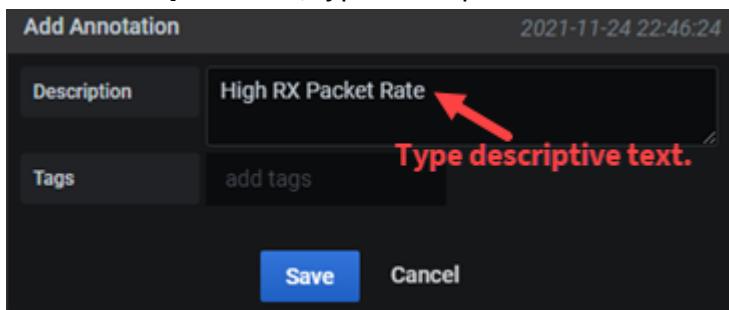


3. Click **Add Annotation**.

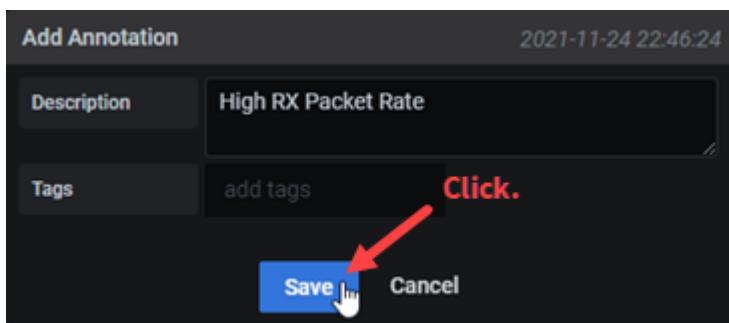


The **Add Annotation** dialog box opens.

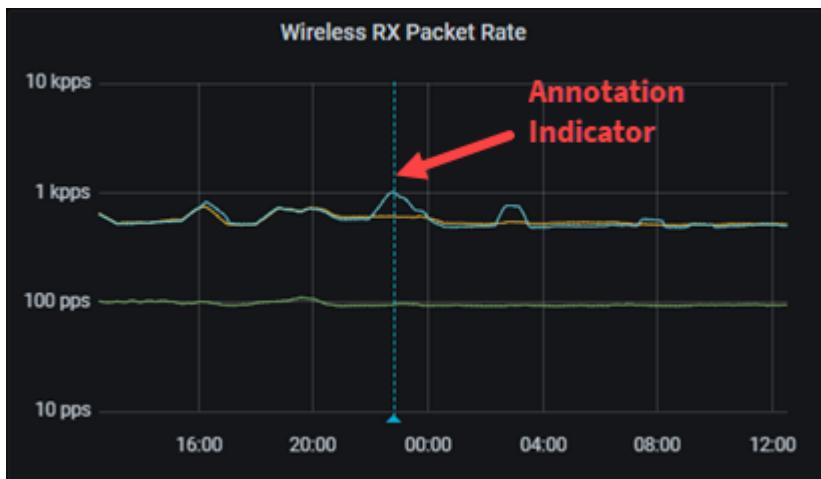
4. In the **Description** box, type descriptive text for the annotation.



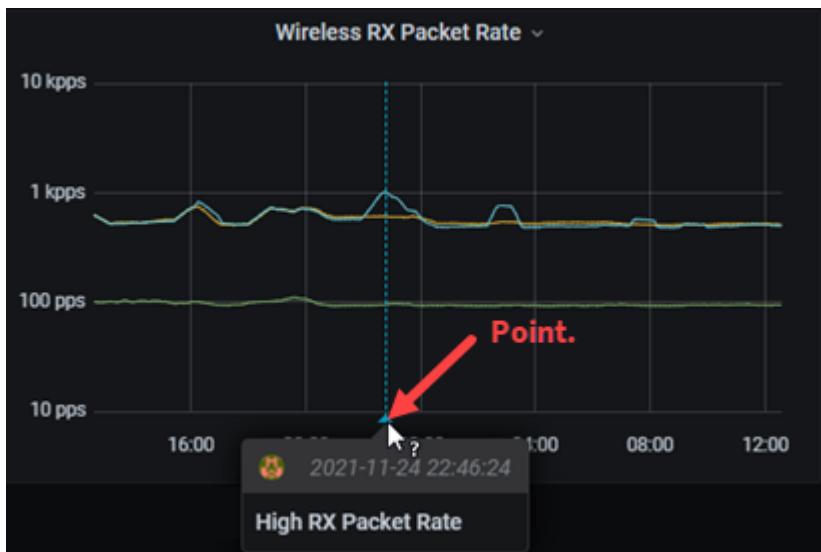
5. Click **Save**.



The **Add Annotation** dialog box closes. A dashed line indicates the location of the annotation in the graph.



6. To view the annotation, point to the bottom of the annotation indicator.



Examine a Panel Definition

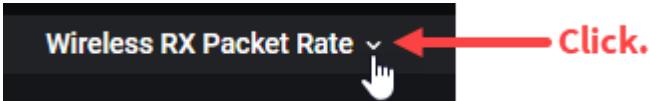
Purpose

Examine the Grafana definition for the predefined content of a [panel](#) in a [dashboard](#).

Procedure

To examine the Grafana definition for a panel, do the following:

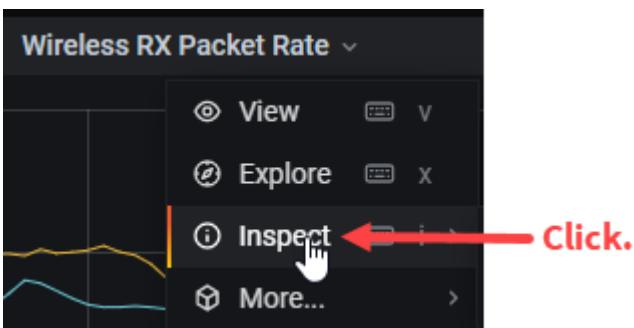
1. In a panel, point to the right of the name for the panel, and then click the arrow.



The Panel Interaction Menu for that panel opens.

The selections in the Panel Interaction Menu will vary for each panel.

2. Click a menu item.



3. Complete the steps for a selection in the Panel Interaction Menu, as follows:

- **View**: Enlarge the view of a panel
- **Explore**: Open the [Explore dashboard](#) to view or modify the database query used to generate the content of the panel
- **Inspect**: Inspect the individual data series and values in a panel
- **More...Toggle Legend**: Show or hide the legend for a graph in a panel

Enlarge the View of a Panel (View)

Purpose

Display an enlarged view of a [panel](#) in a [dashboard](#).

Procedure

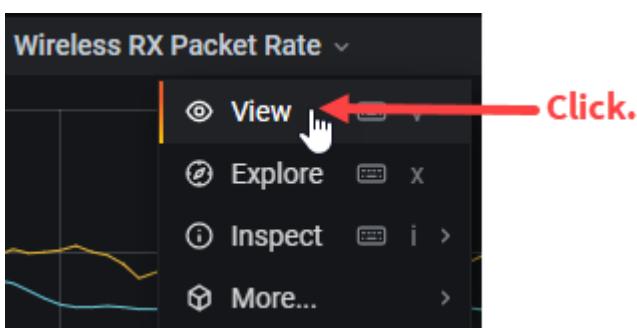
To enlarge a panel in a dashboard, do the following:

1. In a panel, point to the right of the name for the panel, and then click the arrow.



The Panel Interaction Menu for that panel opens.

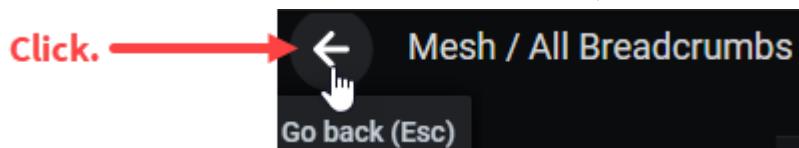
2. Click **View**.



An enlarged view of the panel replaces the [Dashboard Area](#) below the [Dashboard Header](#).



3. To return to the view of the entire dashboard, click the return arrow in the Dashboard Header.



The entire dashboard is displayed.

Explore a Database Query for a Panel (Explore)

Purpose

View or modify the time series database query used to generate the content of a [panel](#) in a [dashboard](#).

Reference

For instructions for exploring a query for a panel, refer to [Explore](#) in the Grafana documentation.

Procedure

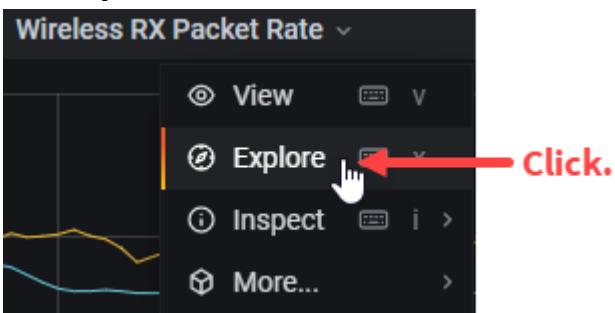
To view or modify the database query for a panel, do the following:

1. In a panel, point to the right of the name for the panel, and then click the arrow.



The Panel Interaction Menu for that panel opens.

2. Click **Explore**.



The [Explore](#) dashboard opens for the query.

3. Use the **Explore** dashboard to explore the query for the panel.

Explore Dashboard

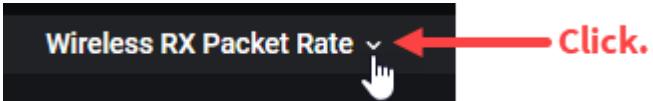
Purpose

Explore a database query for a [panel](#) in a [dashboard](#).

Navigation

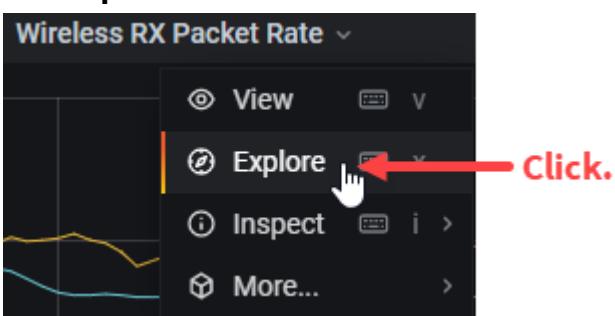
To go to the **Explore** dashboard, do the following:

1. In a panel, point to the right of the name for the panel, and then click the arrow.



The Panel Interaction Menu for that panel opens.

2. Click **Explore**.



The **Explore** dashboard opens for the query.

Procedure

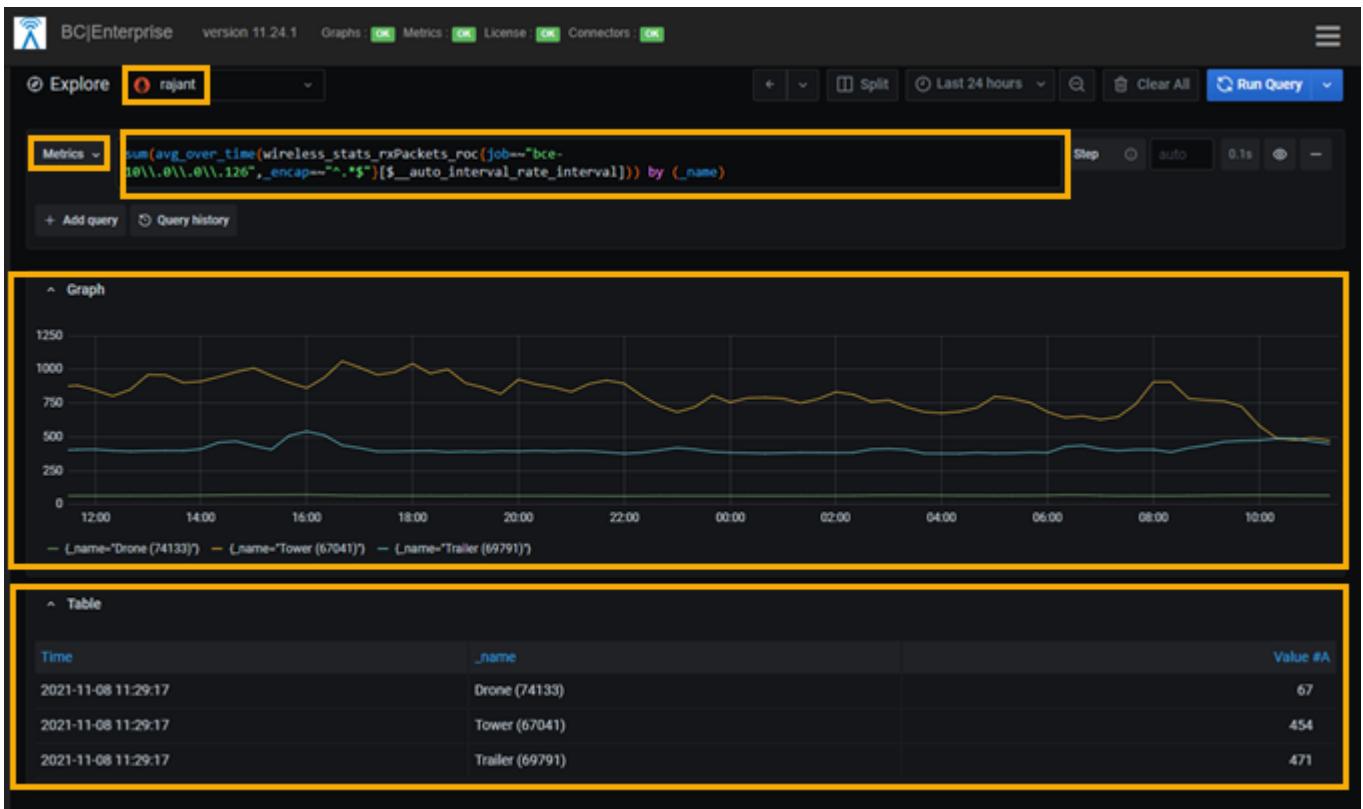
The [Explore a Database Query for a Panel](#) procedure applies to the **Explore** dashboard.

Reference

For instructions for using the **Explore** dashboard, refer to [Explore](#) in the Grafana documentation.

Illustration

The following illustration identifies the features of the **Explore** dashboard in BC|Enterprise:



Data source

In the **Dashboard Header**, identifies the Rajant time-series database for BC|Enterprise as the data source for the **Explore** dashboard.

Metrics menu

The **Metrics** menu lists prefixes for metrics used to produce the data presented in this panel.

Query field

To the right of the **Metrics** menu, the Query field contains the database query used to produce the panel.

Graph

The **Graph** area shows the graph shown in the panel.

Table

The **Table** area provides a table for the information presented in the **Graph** area.

The **Time** column contains the starting time for the data in the panel.

The **_name** column contains the BreadCrumb name for each BreadCrumb that provides data in the panel.

The **Value #A** column contains the value for each BreadCrumb at the end of the time range shown in the panel.

Inspect Data in a Panel (Inspect)

Purpose

Inspect the individual data series and values displayed in a [panel](#) in a [dashboard](#).

Inspecting data can provide a more precise understanding of the data for troubleshooting the panel.

Reference

For instructions for inspecting data in a panel, refer to [Inspect a panel](#) in the Grafana documentation.

Procedure

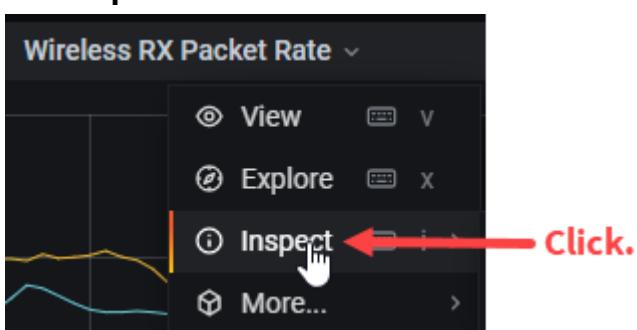
To inspect data in a panel, do the following:

1. In a panel, point to the right of the name for the panel, and then click the arrow.



The Panel Interaction Menu for that panel opens.

2. Click **Inspect**.



The panel inspector pane opens over the right side of the dashboard.

3. In the panel inspector pane, click each tab, as needed.
4. To close the panel inspector pane, click outside the Panel Interaction Menu.

Panel inspector pane

BC|Enterprise provides the following tabs on the panel inspector pane:

- **Data** tab: Shows the raw data returned by the query with transformations applied
- **Stats** tab: Shows the time required to complete the query and how much data is returned
- **JSON** tab: Enables viewing or copying the panel JSON, panel data JSON, and data frame structure JSON

Toggle the Legend for a Panel ([More...Legend](#))

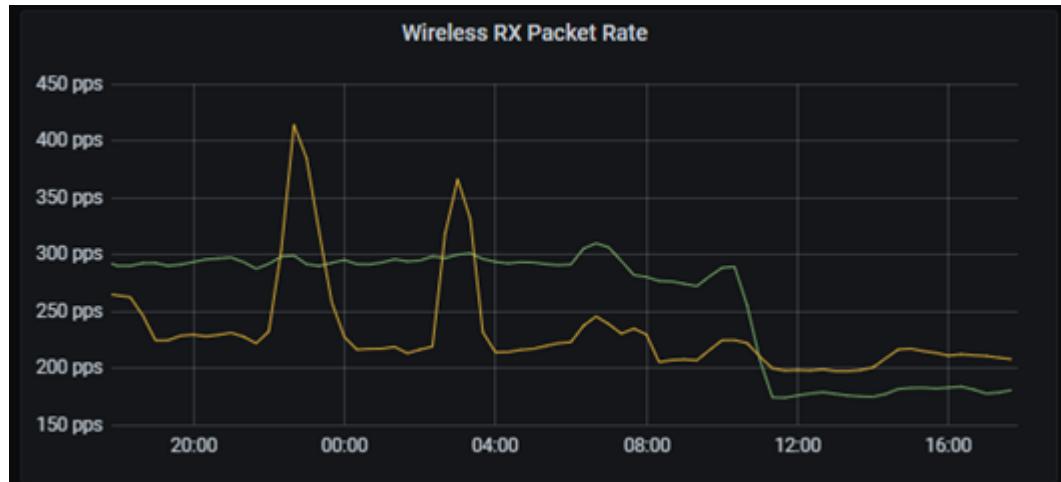
Purpose

Show or hide the legend for a graph in a [panel](#) in a [dashboard](#).

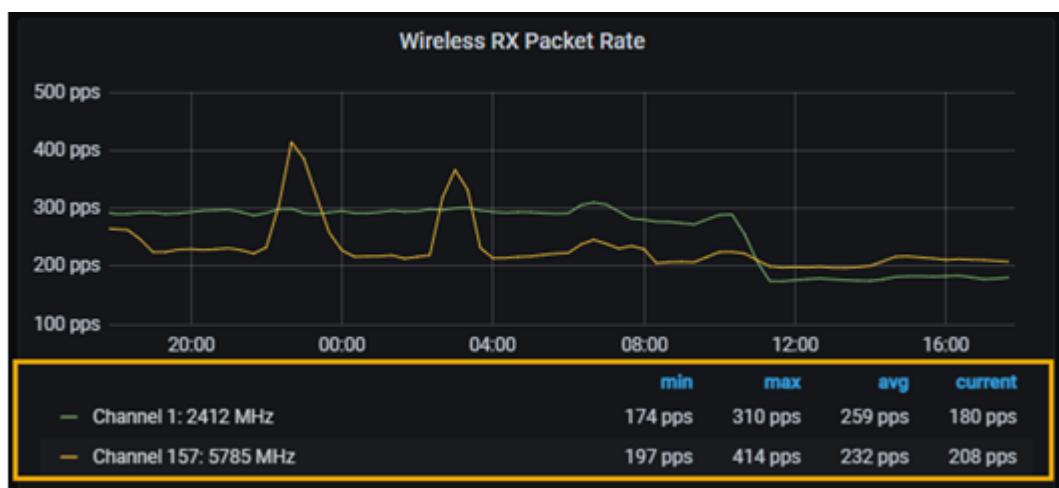
By default, the legend for a panel is hidden.

Examples

In the following illustration, the legend for a panel is hidden (default):



In the following illustration, the legend for a panel is shown:



Procedure

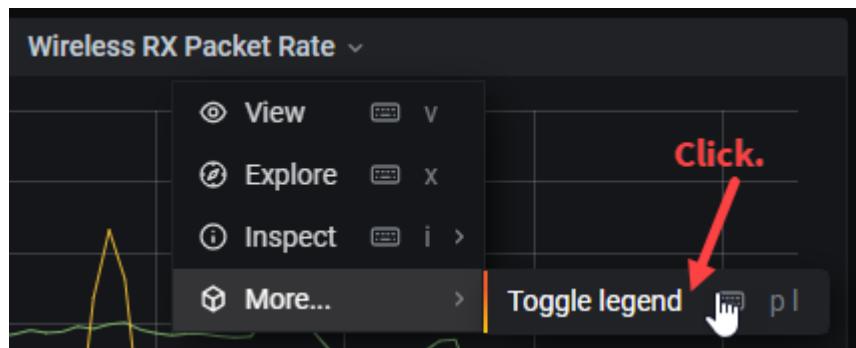
To show or hide the legend for a graph in a panel , do the following:

1. In a panel, point to the right of the name for the panel, and then click the arrow.



The Panel Interaction Menu for that panel opens.

2. Point to **More...**, and then click **Legend** to toggle the legend to be shown or hidden.



Data Tables

Description

A data table in a [panel](#) on a [dashboard](#) contains data obtained from the time series database at the end of the [selected time range](#).

Data tables provide fewer navigation features than [administrative tables](#).

Note: A user cannot customize a table view to show/hide or arrange selected columns or rows.

Illustration

The following illustration identifies the navigation features in a data table:

Groups	Model	Name	Version	Uptime	Temp	State	Reboot	Warn CPU%	Ping
fixed	LX5-245-D	Tower (67041)	11.25.0	314:29:07	37.7	Connected	true	1	9.9
fixed	ES1-245	Trailer (69791)	11.25.0	174:39:17	40.5	Connected	true	1	15.6
mobile	KM3-2450R	Truck Cabin (73052)	11.24.2	223:34:15	46.6	Connected		1	14.3
mobile	DX2-24	Drone (74133)	11.24.2	223:34:07	45.9	Connected		1	2.9
fixed	SLIPSTREAM-2	Datacenter (77081)	11.25.0	314:30:59	39.0	Connected	true	1	0

Column headings

Column headings are bold and blue.

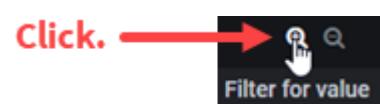
To sort all rows in descending order by the value in one column, click the column heading once. To sort all rows in ascending order by the value in that column, click the column heading again. To return rows to the natural order, click the column heading a third time.

Table text

Table text is white.

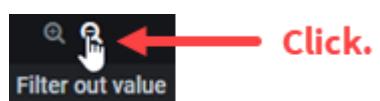
Filter for value

To filter rows that include a value in a column, point to the right of the value and then click **Filter for value**.



Filter out value

To filter rows that do not include a value in a column, point to the right of the value and then click **Filter out value**.



Underlined text

Underlined text indicates a link to a related dashboard.

Bold blue text

Bold blue text represents a value from the time series database that may change when the dashboard is refreshed.

Administrative Tables

Description

An administrative table in a [panel](#) on a [dashboard](#) contains information that is manually supplied by a user.

An administrative table contains navigation features to enable a user to view the table in pages with a selected number of rows on each page.

For examples of administrative tables, see the following:

- [Rajant / BC|Connector Management](#) dashboard
- [Rajant / User Management](#) dashboard
- [Notification Rules tab](#) on the [Rajant / Notification](#) dashboard
- [Breadcrumbs tab](#) on the [Rajant / Configuration](#) dashboard

Administrative tables provide more navigation features than [data tables](#).

Note: A user cannot customize a table view to show/hide or arrange selected columns or rows.

Illustration

The following illustration indicates the location of each navigation feature in an administrative table:

Target	TargetType	Name	Description	Duration	Creator	Notify	Enabled	Silence	Action
-	WEEKLY_REPORT	Steves report	testops	every day 16:30	admin	EMAIL	✓		edit copy trash
fixed	GROUP	HighTemp	High Temperature	5m	caroladmin	EMAIL	✓		edit copy trash
All BreadCrumb	MESH	Mesh_Wide_High_Temp	Mesh-wide test for high temperature	5m	caroladmin	EMAIL	✓		edit copy trash
-	WEEKLY_REPORT	Test	testing	every day 09:00	taylor	EMAIL	✓		edit copy trash
Drone (74133)	BREADCRUMB	disconnected	drone disconnected	5m	admin	EMAIL	✓		edit copy trash

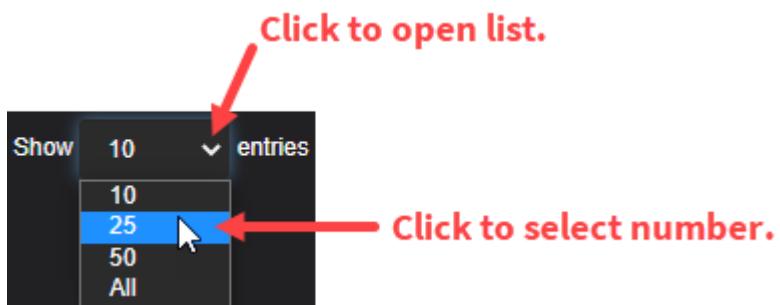
Show 10 entries Search: _____

Showing 1 to 5 of 5 entries Previous 1 Next

Show *n* entries

Select the number of entries (rows) to show per page.

Click the list arrow to open the list, and then click **All** or a number.



Search box

In the **Search** box, type a search string for the content of any column in the table. The column rows are filtered by the characters in the search string.

A search string may be one character or multiple contiguous characters. Any letter may be uppercase or lowercase.

Showing entries

If the **Search** box is empty, the **Showing** indicator identifies the sequential range of entries shown on the current page relative to the total number of entries in the table in the following format:

Showing n to m of t entries

where,

n to m is the sequential range of entries shown

t is the total number of entries in the table

If the **Search** box contains text, the **Showing** indicator identifies the sequential range of entries shown on the current page relative to all filtered entries and the total number of entries in the unfiltered table in the following format:

Showing n to m of f entries (filtered from t total entries)

where,

n to m is the sequential range of filtered entries shown

f is the total number of filtered entries

t is the total number of entries in the unfiltered table

Previous button

If there is a previous page, click **Previous** to go to the previous page.

Current page number

The current page number is shown between **Previous** and **Next**.

Next button

If there is a next page, click **Next** to go to the next page.

Column headings

Column headings are bold and blue.

Alphabetical sort icons

To the right of each column heading is an alphabetical sort icon. The alphabetical sort icon indicates the current alphabetical sequence for the column as (A-to-Z) or (Z-to-A). To reverse the sort, click the alphabetical sort icon.

Show/Hide Hidden columns icons

If the web browser window is not wide enough to show all columns in a table, the  (list hidden columns) icon is shown at the left of each row.

To show the hidden columns, increase the width of the [web browser](#) window until the  (list hidden columns) icons are no longer shown.

To view the content of hidden columns on a narrow viewing screen, do the following:

1. Click the  (list hidden columns) at the left of a row. A list opens to show each hidden column heading with the content for that row.
2. Click  (close hidden columns) to hide the list of hidden columns and content.

Links

Links within the table are blue. Refer to the dashboard description for information about each link.

Action icons

The right-most column in an administrative table may contain action icons. Refer to the dashboard description for information about each action icon.

Missing Data in Historical Graphs

Description

A [panel](#) that provides a historical graph may show missing data.

Reasons

Missing data can occur for the following reasons:

- A [Breadcrumb](#) is disconnected.
- A [BC|Connector](#) was stopped and restarted.
- The [Rajant BCEnterprise Service](#) was stopped or restarted.
- [Prometheus](#) was stopped or restarted.

Help Features

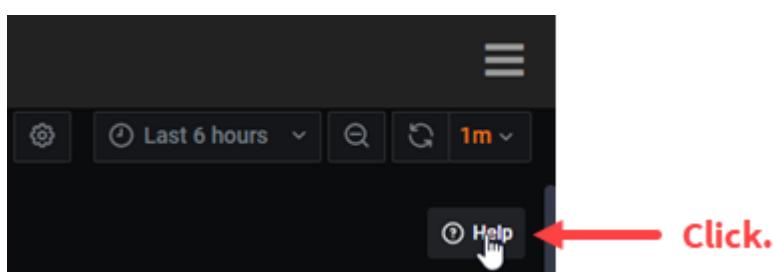
Description

The [user interface](#) provides the following interactive help features:

- [Dashboard help](#)
- [Contextual help](#)
- [Tips](#)
- [User guide](#)

Dashboard help

To view a description of a displayed [dashboard](#), click  at the top right corner of the [Dashboard Area](#).



A new tab opens in the current [web browser](#) window. The new tab contains the *BC|Enterprise Version 11 User Guide* opened to a description of the displayed dashboard with links to related topics.

Contextual help

Click  to open a message box that contains Help text for a particular element on a dashboard.

Help Text

Action 

Click.

Actions

Clicking on the action icons in this column will allow you to perform actions on a Notification.

Available actions are:

- ➡ Test messaging. Sends a test message using the defined notification type and recipients.
- ➕ Create a new message rule by copying the existing.
- ➖ Delete the message rule.

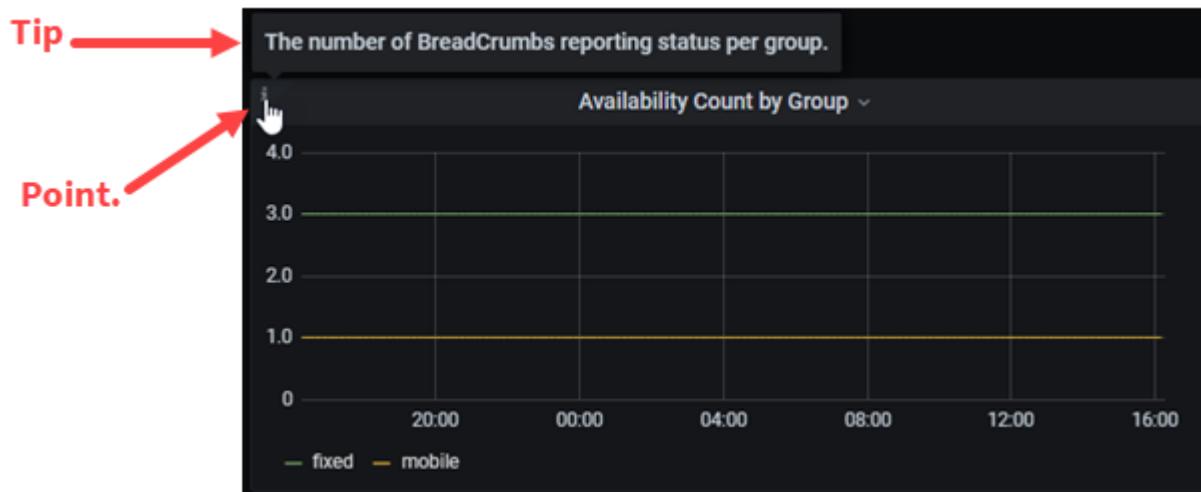
To close the message box, click  again.

Clicking  may open a new tab in the current web browser window that contains the *BC|Enterprise Version 11 User Guide* opened to a description of that particular element on a dashboard with links to related topics.

Tips

An  (i (information)) indicator in the top left corner of a **panel** indicates an available Tip that describes the content of the panel.

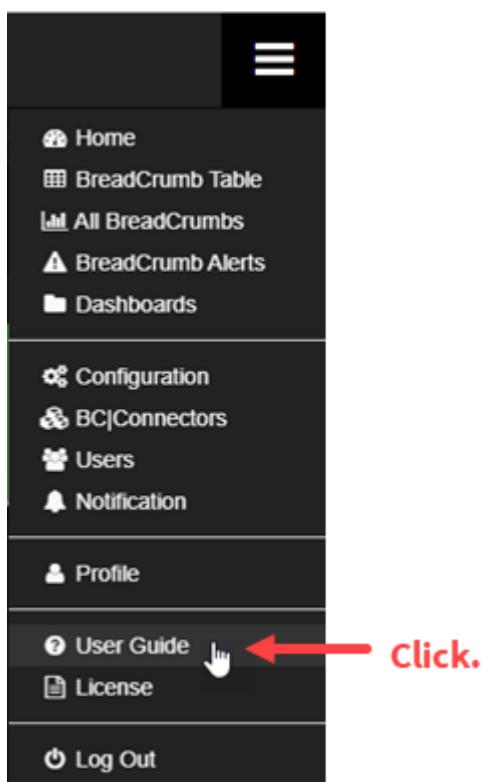
To view the Tip, point to the indicator. The Tip is displayed above the panel.



To hide the Tip, move the pointer away from the  (i (information)) indicator.

User guide

To open the BC|Enterprise User Guide, on the **Main Menu**, click **User Guide**.



A new tab opens in the current web browser window used by BC|Enterprise. This tab contains the *BC|Enterprise Version 11 User Guide* opened to the title page. Use the expanding Table of Contents in the left panel to locate individual topics.

This user guide is available for download as a Portable Document Format (PDF) file from the Rajant Support web site at <https://secure.rajant.com/>.

Use BC|Enterprise

Contents

- [Get Started with BC|Enterprise](#)
- [Open BC|Enterprise](#)
- [Log In to BC|Enterprise](#)
- [Log Out to BC|Enterprise](#)
- [Close BC|Enterprise](#)
- [Change the Password for Your User Name](#)
- [Change the Display Name for Your User Name](#)
- [Rajant / User Profile Dashboard](#)
- [Enable Viewing of Historical Data from the BreadCrumb Table](#)
- [View Historical Data from the BreadCrumb Table](#)

Get Started with BC|Enterprise

Purpose

Start using the BC|Enterprise software and become familiar with the [user interface](#).

Prerequisites

From a [user](#) with user type **Administrator**, obtain the following:

- The correct Universal Resource Locator (URL) to [open BC|Enterprise](#) in a [web browser](#) on a given [BC|Enterprise Client Workstation](#).
- User name and initial password to log in the BC|Enterprise with user type **User**.
- (Optional) User name and initial password to log in the BC|Enterprise with user type **Administrator**.

Procedure

To get started with BC|Enterprise, do the following:

Step	Action
1.	Open BC Enterprise in a web browser on a BC Enterprise Client Workstation .
2.	Log in to BC Enterprise with your user name and initial password .
3.	Open and close the Main Menu .
4.	Change the password for your user name .
5.	(Optional) Change the display name for your user name .
6.	Experiment with Selection Filters .
7.	Experiment with selecting a time range for a dashboard .
8.	Experiment with navigating to a dashboard .
9.	Experiment with the Dashboards dashboard .
10.	Experiment with the viewing information in dashboard panels .
11.	Experiment with the Help features .
12.	Log out of BC Enterprise .
13.	Close BC Enterprise .

Open BC|Enterprise

Purpose

Open the BC|Enterprise [user interface](#) in a [web browser](#) on a BC|Enterprise Client workstation.

Prerequisites

A [user](#) with user type **Administrator** must supply the correct Universal Resource Locator (URL) to open BC|Enterprise in a web browser on a given BC|Enterprise Client workstation.

Procedure

To open BC|Enterprise, do the following:

1. Go to a BC|Enterprise Client workstation.
2. Open the [web browser](#).
3. In the web Address box, supply the URL to open BC|Enterprise.

In the browser window, a new tab for the BC|Enterprise user interface opens.



The new tab contains the **BC|Enterprise** login dialog box.

A screenshot of the BC|Enterprise login dialog box. It has a light gray background. At the top, it says "BC|Enterprise". Below that is a "User Name" input field with a blue border. Underneath it is a "Passphrase" input field with a small eye icon to its right. At the bottom is a large blue "Sign in" button. At the very bottom of the dialog box, it says "Version 11.24.5".

Note: If BC|Enterprise fails to open, BC|Enterprise may not be running on the [BC|Enterprise server](#). Contact a BC|Enterprise administrator.

Follow-up procedure

[Log in to BC|Enterprise](#).

Log In to BC|Enterprise

Purpose

Begin a BC|Enterprise session to perform [user](#) functions associated with a [user type \(User or Administrator\)](#).

Prerequisites

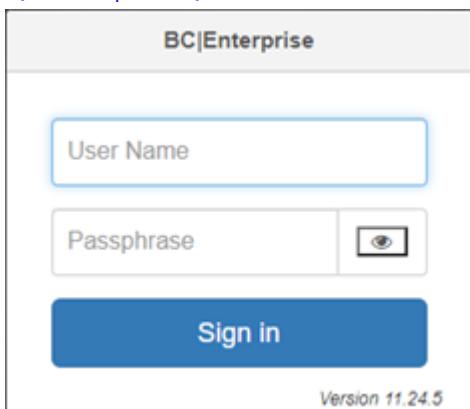
Determine the [user type \(User or Administrator\)](#) associated with the user functions needed during this BC|Enterprise session.

Determine the assigned [user name](#) and [password](#) associated with the user type.

Procedure

To log in to BC|Enterprise, do the following:

1. Open BC|Enterprise. A new tab contains the **BC|Enterprise** login dialog box.



2. In the User Name box, type an assigned user name associated with the user type needed for the BC|Enterprise session.
3. In the Passphrase box, type the password associated with the assigned user name.
4. Click **Sign In**. The BC|Enterprise session begins. The BC|Enterprise [user interface](#) opens to the [Mesh / Overview](#) dashboard.

Follow-up procedures

After logging in for the first time with a new user name, a user can do the following:

1. (Required) Immediately [change the password](#) (Passphrase) for the user name.
2. (Optional) [Change the display name](#) for the new user name.

A new user may use a suggested procedure to [get started with BC|Enterprise](#).

Use the [Mesh / Overview](#) dashboard, as needed.

In the [Main Menu](#), click a selection to go to a primary dashboard. The available selections in the Main Menu are determined by the user type associated with the user name used to log in to this BC|Enterprise session.

To end the BC|Enterprise session, [log out of BC|Enterprise](#).

Log Out of BC|Enterprise

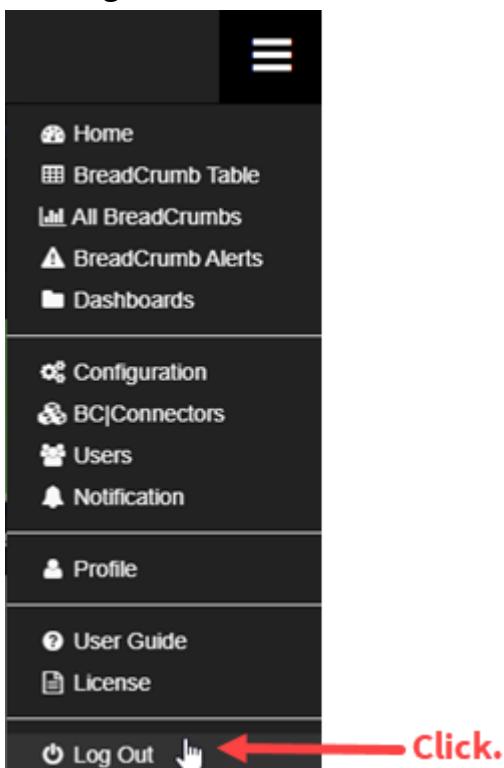
Purpose

End the BC|Enterprise session.

Procedure

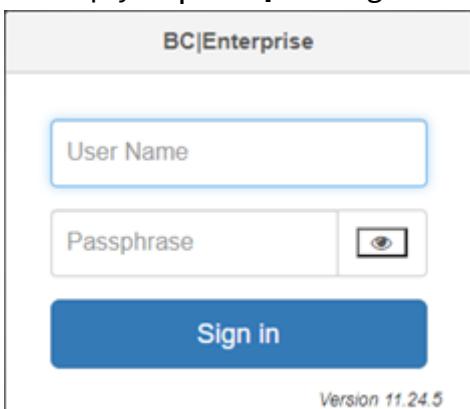
To log out of BC|Enterprise, do the following:

1. In the [Banner](#), click . The [Main Menu](#) opens.
2. Click **Log Out**.



The BC|Enterprise session ends.

The empty **BC|Enterprise** login dialog box is displayed on the tab for BC|Enterprise.



Follow-up procedures

Do one of the following:

- [Log in to BC|Enterprise](#) to start a new session.
- [Close BC|Enterprise](#).

Close BC|Enterprise

Purpose

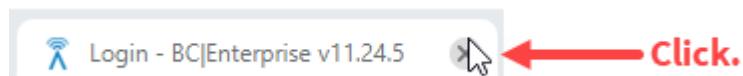
Close the BC|Enterprise tab in a [web browser](#) window.

Prerequisite

[Log out of BC|enterprise.](#)

Procedure

In the browser window, close the BC|Enterprise tab.



The BC|enterprise tab closes.

Change the Password for Your User Name

Purpose

Change the [password](#) associated with the [user name](#) that was used to [log in](#) to the current session.

Recommendation

A strong password contains at least 8 characters with a combination of uppercase letters (A to Z), lowercase letters (a to z), numeric characters (0 to 9) and special characters (such as, @#\$%&).

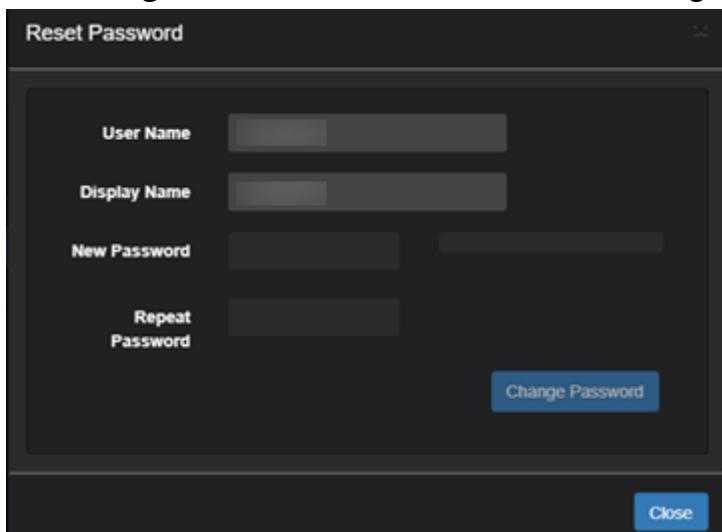
Prerequisite

[Log in](#) with the user name for which the password is to be changed.

Procedure

To change the password for the user name for the current session, do the following:

1. On the [Main Menu](#), click **Profile**. The [Rajant / User Profile](#) dashboard is displayed. The **User Name** box contains the current user name. The **Display Name** box contains the current display name for the current user name.
2. Click **Change Password**. The **Reset Password** dialog box opens.



3. In the **New Password** box, type a new password for current user name. The security strength of the new password is indicated to the right. **Strong** (**Strong**) or **Medium** (**Medium**) is acceptable; **Weak** (**Weak**) is not acceptable.
4. (Optional) To improve the security strength, change the new password.
5. In the **Repeat Password** box, type the new password again.
6. If the indicator to the right of the **Repeat Password** box is **Passwords do not match** (**Passwords do not match**), type the new password again.
7. To confirm the change, click **Change Password**.
8. Click **Close**. The **Reset Password** dialog box closes.
9. Click **Update User**.

Result

The new password is associated with the user name that was used to log in to the current session.

The new password will remain in effect for this user name until one of the following occurs:

- The same user changes the password for this user name again.
- A [user](#) with a user name associated with [user type Administrator](#) resets this password.

Change the Display Name for Your User Name

Purpose

Change the [display name](#) that represents the [user name](#) that you used to [log in](#) to the current session.

Prerequisite

[Log in](#) with the user name that is associated with the display name that is to be changed.

Procedure

To change the display name for the current user name, do the following:

1. On the [Main Menu](#), click **Profile**. The **Rajant / User Profile** dashboard is displayed.
2. In the **Display Name** box, replace the current display name with a new display name.
3. Click **Update User**. A **Saved** message for the current user name is briefly displayed.

Result

The new display name now represents the user name that you used to log in to the current session.

The new display name will remain in effect for this user name until one of the following occurs:

- The same user changes the display name for this user name again.
- A [user](#) with a user name associated with [user type Administrator](#) [resets this password](#).

Rajant / User Profile Dashboard

Purpose

Maintain the [display name](#) and [password](#) for a user's own [user name](#).

Navigation

To go to the **Rajant / User Profile** dashboard, on the [Main Menu](#), click **Profile**. The **Rajant / User Profile** dashboard is displayed.

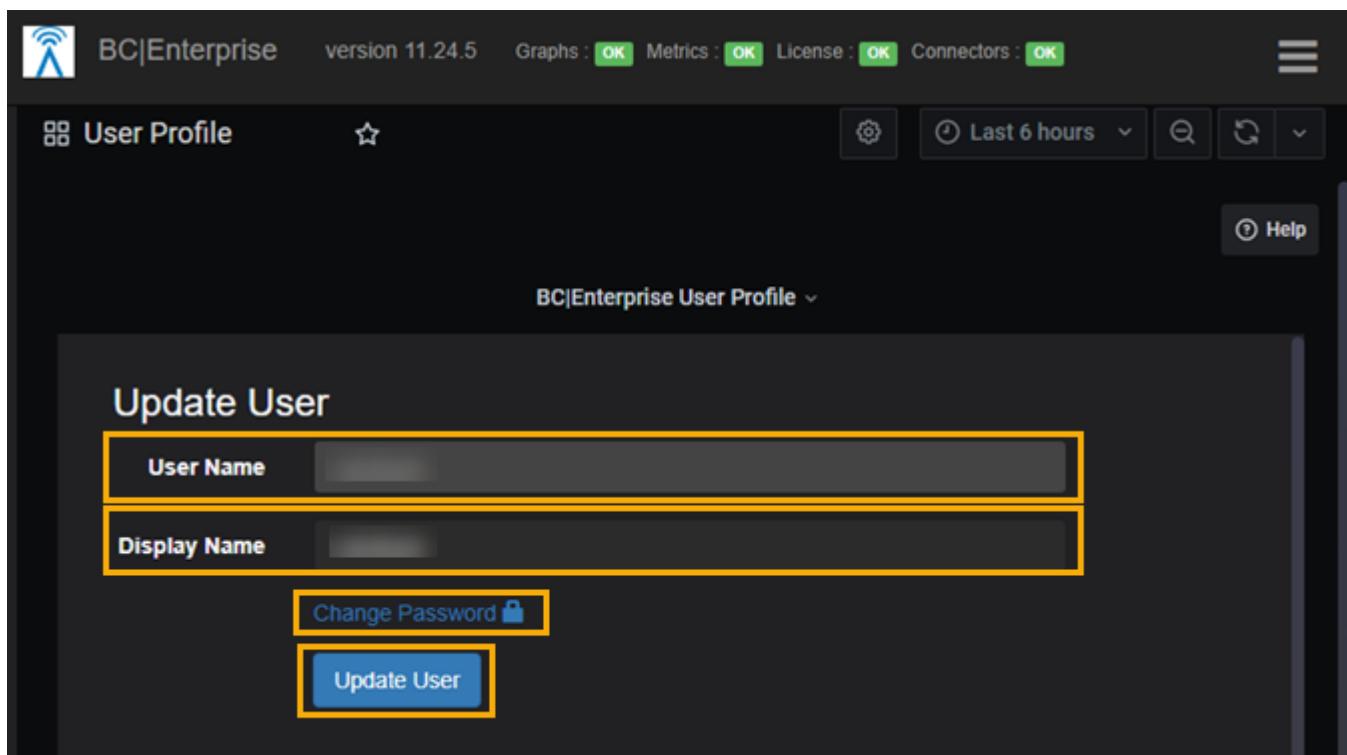
Procedures

The following procedures use the **Rajant / User Profile** dashboard:

- [Change the Display Name for Your User Name](#)
- [Change the Password for Your User Name](#)

Illustration

The following illustration of the **Rajant / User Profile** dashboard indicates the major features on the **BC|Enterprise User Profile** panel:



BC|Enterprise User Profile panel

The **BC|Enterprise User Profile** panel contains the **Update User** area where a user is to maintain the display name and password for a user's own user name.

User Name box

(Read-only) The **User Name** box contains the user name associated with this user profile.

Display Name box

In the **Display Name** box, supply a visible name that is to represent the user name in the **User Name** box on dashboards, screens and reports.

Change Password link

To [change the password](#) for the user name in the **User Name** box, click **Change Password**. The **Reset Password** dialog box opens.

Update User button

To apply the supplied changes for the display name or password, click **Update User**.

Enable Viewing of Historical Data from the BreadCrumb Table

Purpose

New for 11.24 In BC|Commander, enable viewing of historical data from BC|Enterprise for up to 10 BreadCrumbs selected in the BreadCrumb Table.

Reference

To set Preferences in BC|Commander, refer to the *BC|Commander Version 11 User Guide* on the [Rajant Support web site](#).

Procedure

To enable viewing of BreadCrumb historical data in BC|Commander, do the following:

1. In BC|Commander, on the **File** menu, click **Preferences....** The **Preferences** window opens.
2. In the Selection Tree, select **External Services**.
3. In the Settings Panel, under **External Services**, in the **BC|Enterprise Address** box, supply the Universal Resource Locator (URL) to be used to [log in](#) to BC|Enterprise.



4. Click **Save**. The **Preferences** window closes.
5. On the **BreadCrumb** menu, verify that **View History** is enabled.

Follow-up Procedure

In BC|Commander, [view](#) historical data for BreadCrumbs selected in the BreadCrumb Table.

View Historical Data from the BreadCrumb Table

Purpose

New for 11.24 In BC|Commander, view historical data from BC|Enterprise for up to 10 BreadCrumbs selected in the BreadCrumb Table.

Reference

For instructions for connecting to the Live Mesh or a BC|Connector in BC|Commander, refer to the *BC|Commander Version 11 User Guide* on the [Rajant Support web site](#).

Prerequisites

In BC|Commander, [enable](#) viewing of BreadCrumb historical data from the BreadCrumb Table.

The BreadCrumbs to be selected in the BreadCrumb Table must be accessed through a [BC|Connector](#) that is listed on [Rajant / BC|Connector Management](#) dashboard.

Procedure

To view historical data for BreadCrumbs selected in the BreadCrumb Table, do the following:

1. [Log in](#) to BC|Enterprise,
2. In the [Banner](#), in the [Service Status Indicators](#), verify that the **Connectors** badge is .
3. In BC|Commander, connect to the Live Mesh or the BC|Connector that is used to access the BreadCrumbs of interest.
4. In the BreadCrumb Table, select up to 10 BreadCrumbs.
5. On the **BreadCrumb** menu, click **View history**. In the browser window for BC|Enterprise, a separate tab opens for each selected BreadCrumb. Each tab contains the [BreadCrumb dashboard](#) for a selected BreadCrumb.

Tip: If the Service Status Indicator for the **Connectors** badge is not **OK**, click the badge, and then click [Configure BC|Connectors](#). The [Rajant / BC|Connector Management](#) dashboard is displayed. In the **BC|Connectors** table, in the row for the BC|Connector that is used to access the BreadCrumbs of interest, verify that the **Status** column contains **Up**.

View Mesh Data

Contents

- [Mesh Data](#)
- [Mesh / Overview Dashboard](#)
- [Mesh / Monitor Dashboard](#)
- [Mesh / All BreadCrumbs Dashboard](#)
- [Mesh / Mesh Density Dashboard](#)
- [Rajant / BreadCrumb Alerts Dashboard](#)
- [Group Dashboard](#)

Mesh Data

Description

Mesh data summarizes the performance or operation of monitored BreadCrumbs across the mesh. Mesh data values that are shown in dashboards are usually averages or totals calculated from data in the time series database at the end of a selected time range.

Dashboards

The following dashboards present mesh data:

- [Mesh / Overview](#) dashboard
- [Mesh / Monitor](#) dashboard
- [Mesh / All BreadCrumbs](#) dashboard
- [Mesh / Mesh Density](#) dashboard
- [Rajant / BreadCrumb Alerts](#) dashboard
- Group dashboard

Mesh / Overview Dashboard

Purpose

View a summary of [mesh data](#) from the time series database filtered by the [selection filters](#) at the end of the [selected time range](#).

Navigation

To go to the [Mesh / Overview dashboard](#), do one of the following:

- In the [Banner](#), click the software product name, **BC|Enterprise**.
- On the [Main Menu](#), click **Home**.
- On the Main Menu, click **Dashboards**, expand the [Mesh dashboards folder](#), and then click **Overview**.

Procedures

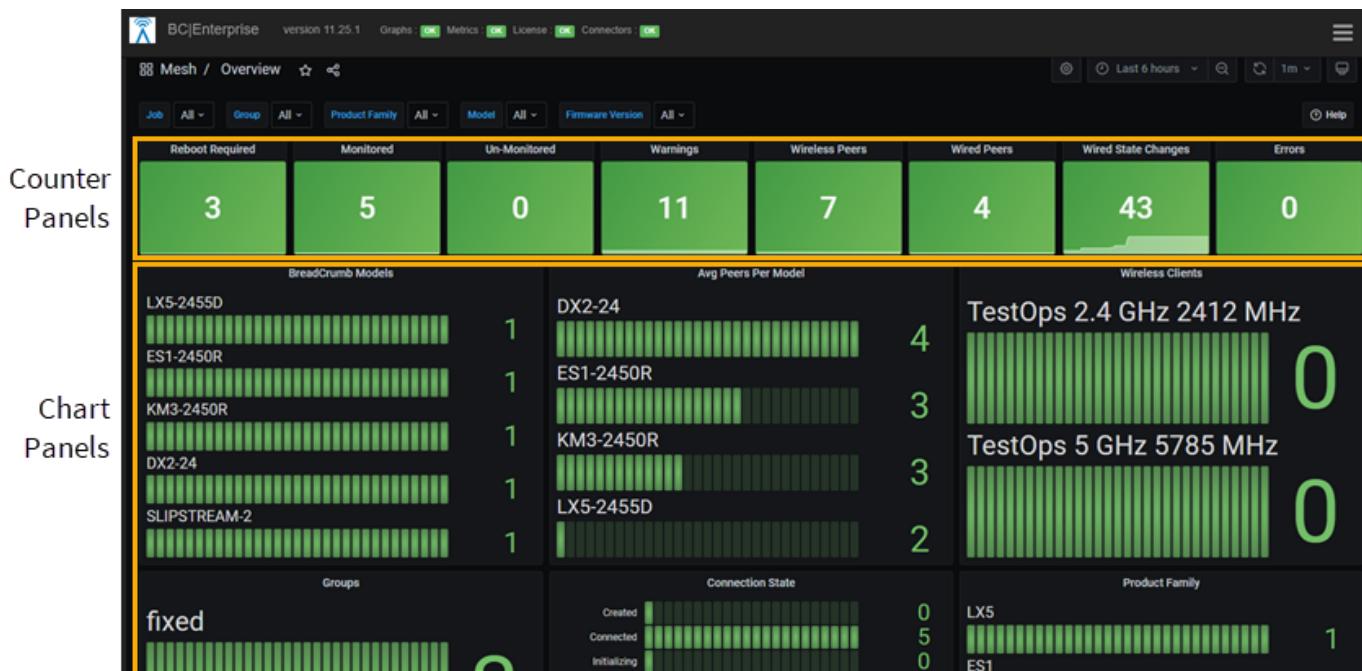
The following procedures apply to the [Mesh / Overview dashboard](#):

- [Set Selection Filters for a Dashboard](#)
- [Select a Time Range for a Dashboard](#)
- [Go to a Related Dashboard for a Panel](#)
- [Examine a Panel Definition](#)

Illustration

[Mesh / Overview and Mesh / Monitor Dashboards at Startup](#)

The following illustration identifies the major features on the [Mesh / Overview dashboard](#):



Selection filters

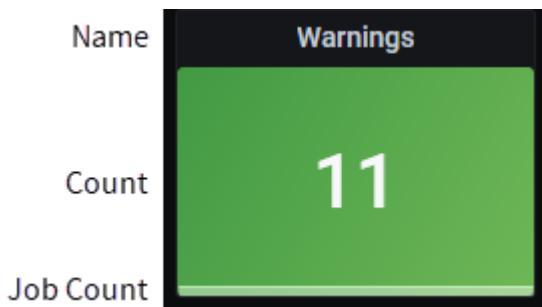
[Job](#) [Group](#) [Product Family](#) [Model](#) [Firmware Version](#)

Counter Panels

A separate counter [panel](#) indicates the count for each of the following:

- **Reboot Required:** BreadCrumbs that require reboot
- **Monitored:** [Discovered BreadCrumbs](#) that are currently being [monitored](#)
- **Un-Monitored:** Discovered BreadCrumbs that are not currently being monitored
- **Warnings:** Warnings reported on the **Alerts** tab in [BC|Commander](#)
- **Wireless Peers:** Active connections to peer BreadCrumbs through a radio for a Wireless Local Area Network (WLAN) interface
- **Wired Peers:** Active connections to peer BreadCrumbs through an Ethernet network interface to a wired Local Area Network (LAN)
- **Wired State Changes:** Linked state changes reported for a wired network interface
- **Errors:** Errors reported

The following illustration identifies the features of a counter panel:



A vertical bar graph represents the count associated with each BC|Connector selected in the [Job selection filter](#).

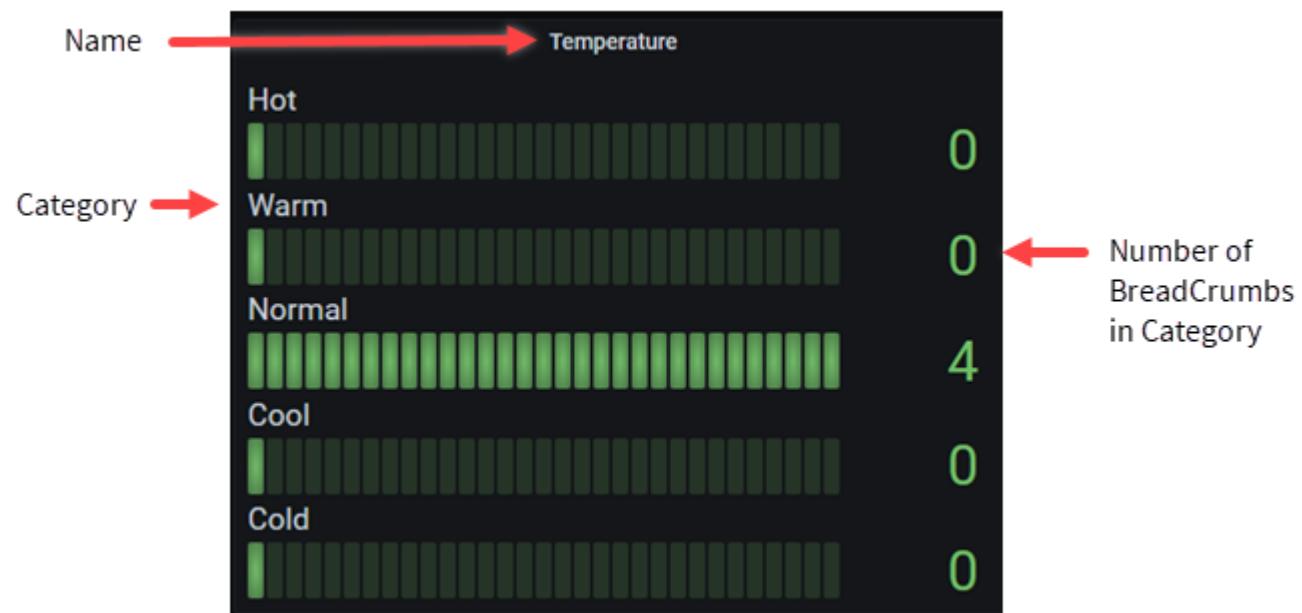
Chart Panels

A separate chart [panel](#) summarizes each category of mesh data, as follows:

- **BreadCrumb Models:** Number of [monitored](#) BreadCrumbs of each [BreadCrumb](#) model
- **Avg Peers Per Model:** Average number of active connections to peer BreadCrumbs for each BreadCrumb model
- **Wireless Clients:** Number of Wi-fi client devices that have been authenticated through each WLAN interface that is enabled as an Access Point (AP) (Enable Access Point*) in a BreadCrumb configuration
- **Groups:** Number of BreadCrumbs included in each BreadCrumb group (Group*)
- **Connection State:** Number of BreadCrumbs with each current status shown in the **Connection Status** column in the BreadCrumb Table in BC|Commander
- **Product Family:** Number of BreadCrumbs in each [BreadCrumb](#) product family
- **Uptimes (less than):** Number of BreadCrumbs with an uptime less than each time period indicated
- **Channel:** Number of BreadCrumb radios configured with each Channel Number (Channel Number*)
- **Firmware Versions:** Number of BreadCrumbs running each firmware version
- **Temperature:** Number of BreadCrumbs running at each temperature range
- **Recent Restarts:** Number of BreadCrumbs that have restarted within the last period of time indicated
- **Noise Floor:** Number of BreadCrumbs with each noise floor rating shown on the [Mesh / Wireless Table](#) dashboard

* This setting is in the BreadCrumb configuration for the BreadCrumb in [BC|Commander](#).

The following illustration identifies the features of a chart panel:



Mesh / Monitor Dashboard

Purpose

View a summary of performance data from the time series database for all monitored BreadCrums filtered by the [selection filters](#) at the end of the [selected time range](#).

Navigation

To go to the **Mesh / Monitor** dashboard, on the [Main Menu](#), click **Dashboards**, expand the **Mesh dashboard folder**, and then click **Monitor**.

Procedures

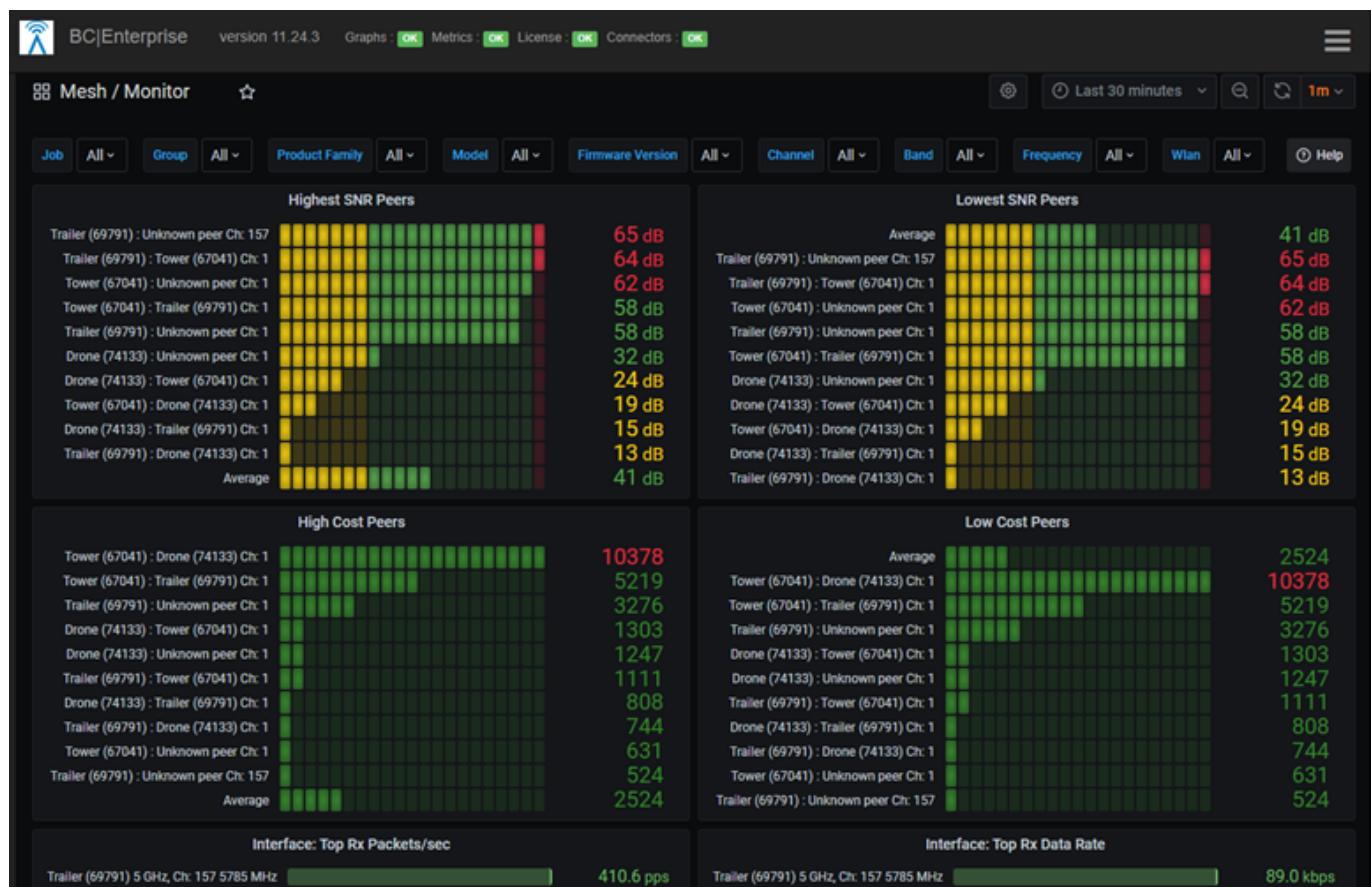
The following procedures apply to the **Mesh / Monitor** dashboard:

- [Set Selection Filters for a Dashboard](#)
- [Select a Time Range for a Dashboard](#)
- [Go to a Related Dashboard for a Panel](#)
- [Examine a Panel Definition](#)

Illustration

Mesh / Overview and Mesh / Monitor Dashboards at Startup

The following illustration shows the top of the **Mesh / Monitor** dashboard:



Selection filters

[Job](#) [Group](#) [Product Family](#) [Model](#) [Firmware Version](#) [Channel](#) [Band](#) [Frequency](#) [Wlan](#)

Peer performance panels

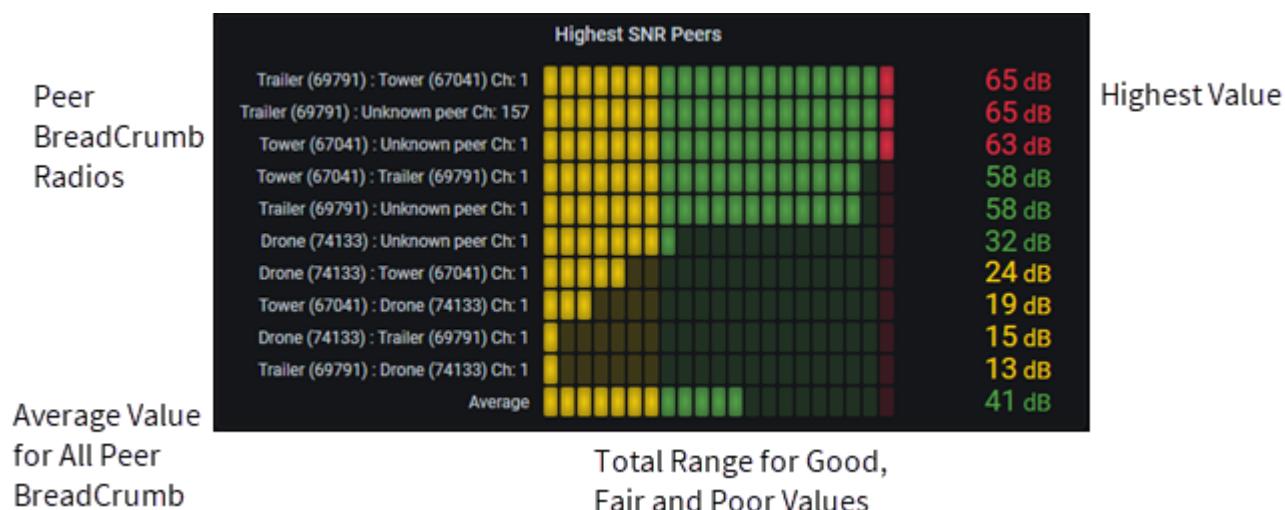
The following [panels](#) summarize a category of performance data for peer BreadCrumb radios:

- **Highest SNR Peers:** Peer BreadCrumb radios with the best signal-to-noise ratio (SNR) in decibels (dB)
- **Lowest SNR Peers:** Peer BreadCrumb radios with the worst SNR in decibels (dB)
- **High Cost Peers:** Peer BreadCrumb radios with the highest cost to and from each other
- **Low Cost Peers:** Peer BreadCrumb radios with the lowest cost to and from each other
- **Lowest Signal Peers:** Peer BreadCrumb radios with the lowest signal strength across the mesh in decibel-milliwatts (dBm)

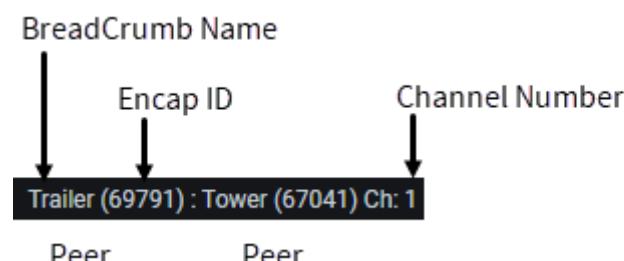
Important: The four SNR Peers and Cost Peers panels will reflect only peer BreadCrumbs that both have the **Enable Peer Statistics Reporting** setting enabled in the [BreadCrumb configuration](#) in BC|Commander.

Each panel presents the category of performance data for peer BreadCrumb radios as a histogram for the range of possible values.

The following illustration identifies the information in a panel:



Peer BreadCrumb radio information is shown in the following format:



Peer BreadCrumb radio information consists of the following values:

- BreadCrumb Name: Name of the BreadCrumb (BreadCrumb Name*)
- Encap ID: (Encapsulation ID) Part of the BreadCrumb serial number that uniquely identifies the BreadCrumb
- Channel Number: Channel number that uniquely identifies a radio on a BreadCrumb (Channel Number*)

* This setting is in the BreadCrumb configuration for the BreadCrumb in BC|Commander.

The following table indicates the threshold values for a Good, Fair or Poor rating in each category:

Category	Good (Green)	Fair (Yellow)	Poor (Red)
SNR Peers	> 30 dB	<= 30 dB	> 60 dB
Cost Peers	< 10000	N/A	=> 10000
Signal Strength	<= -60 dBm	<= -80 dBm	> -80 dBm
Noise	<= -80 dBm	<= -40 dBm	> -40 dBm

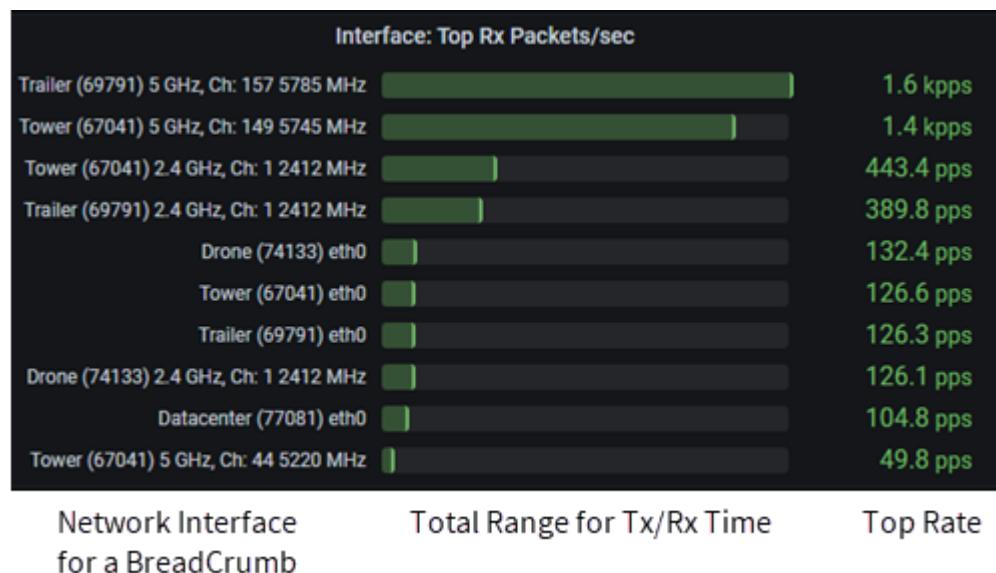
Interface performance panels

The following chart [panels](#) summarize a category of performance data for all BreadCrumb network interfaces:

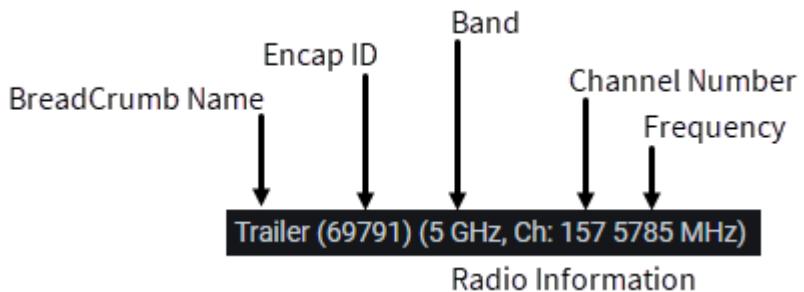
- **Interface: Top Rx Packets/sec:** Interfaces with fastest data receive rates in packets per second (pps)
- **Interface: Top Rx Data Rate:** Interfaces with fastest data receive rates in bytes per second (bps)
- **Interface: Top Tx Packets/sec:** Interfaces with fastest data transmit rates in packets per second (pps)
- **Interface: Top Tx Data Rate:** Interfaces with fastest data transmit rates in bytes per second (bps)
- **Interface: Highest Noise:** Interfaces that have the highest noise in decibel-milliwatts (dBm) on the mesh

Each panel presents the data as a histogram for the range of possible values.

The following illustration identifies the information in each panel:



Network interface information for a BreadCrumb is shown in the following format:



Network interface information for a BreadCrumb consists of the following values:

- BreadCrumb Name: Name for the BreadCrumb (BreadCrumb Name*)
- Encap ID: (Encapsulation ID) Part of the BreadCrumb serial number that uniquely identifies the BreadCrumb
- Band: Radio frequency band (Channel Number*)
- Channel Number: Channel number that uniquely identifies a radio on a BreadCrumb (Channel Number*)
- Frequency: Operating frequency for the radio (Channel Number*)

* This setting is in the BreadCrumb configuration for the BreadCrumb in BC|Commander.

Mesh / All BreadCrumbs Dashboard

Purpose

View trends for all [monitored BreadCrumb](#)s during the [selected time range](#) filtered by the [selection filters](#).

Navigation

To go to the **Mesh / All BreadCrumbs** dashboard, on the [Main Menu](#), click **All BreadCrumbs**.

Procedures

The following procedures apply to the **Mesh / All BreadCrumbs** dashboard:

- Set Selection Filters for a Dashboard
- Select a Time Range for a Dashboard
- Go to a Related Dashboard for a Panel
- Enlarge a Time Range in a Panel
- View Detail in a Graph
- Add an Annotation to a Panel
- Examine a Panel Definition

Illustration

The following illustration identifies the major features on the **Mesh / All BreadCrumbs** dashboard:



Selection Filters

[Job](#) [encap](#) [Rate Interval](#)

Category headings

Click the arrow to the left of each category heading to hide/show [panels](#) for that category.

Wireless Packet Rates per BreadCrumb

- Wireless RX Packet Rate: Data receive rate in packets per second (pps) on the wireless network interface on each BreadCrumb.
- Wireless TX Packet Rate: Data transmit rate in packets per second (pps) on the wireless network interface on each BreadCrumb.

Wireless Byte Rates per BreadCrumb

- Wireless RX Byte Rate: Data receive rate in bytes per second (bps) on the wireless network interface on each BreadCrumb.
- Wireless TX Byte Rate: Data transmit rate in bytes per second (bps) on the wireless network interface on each BreadCrumb.

RX/TX By Frequency

- RX Rate By Frequency: Data receive rate in bytes per second (bps) on BreadCrumbs for each radio frequency.
- TX Rate By Frequency: Data transmit rate in bytes per second (bps) on BreadCrumbs for each radio frequency.

Latency / Channel Activity

- Round-Trip Ping Latency: Number of milliseconds (ms) used by each BreadCrumb to respond to a ping from a [BC|Connector](#).
- Channel Activity By Frequency: Percentage of channel activity by type (receive, transmit, busy, noise) for each radio frequency.

System Info

- CPU Load: Percentage of Central Processing Unit (CPU) workload used by each BreadCrumb.
- Free Memory: Amount of available memory for each BreadCrumb shown in gibibytes (GiB) or mebibytes (MiB).

APT Info

- Slave Count By APT Master: Number of active Automatic Protocol Tunneling (APT) slave BreadCrumbs bridged to an Ethernet port per each APT master BreadCrumb.

Mesh Peer Cost

- Wireless Peers By Cost: Number of wireless peer relationships for BreadCrumbs shown by Cost value.
- Wired Peers By Cost: Number of wired peer relationships for BreadCrumbs shown by Cost value.

Cost values less than 5000 are Low.

Cost values from 5000 to 10000 are Medium.

Cost values greater than 10000 are High.

BreadCrumb Availability

- Availability Percent by Group: Percentage of BreadCrumbs reporting status for more than a 10-minute period during the past week shown by BreadCrumb Group.
- Availability Count by Group: Number of BreadCrumbs currently reporting status shown by BreadCrumb Group.

Radar Detections

- Radar Detection Rate: Number of times per second that each BreadCrumb detected radar on a configured radio channel in the selected time range.
- Radar Detection Count: Number of times each BreadCrumb has detected radar on its configured radio channel since the last reboot of the BreadCrumb.

Mesh / Mesh Density Dashboard

Purpose

View a summary of mesh density data for each wireless interface for all [monitored BreadCrumbs](#) by radio channel number during a [selected time range](#) filtered by the [selection filters](#).

Mesh density is a percentage value that reflects the density of the mesh by channel number. For example, if every radio on Channel 11 has a peer connection to every other radio on Channel 11, the mesh density is 100 percent.

For a highly-clustered mesh, the mesh density should be near 100 percent. For a linear mesh, the mesh density should be much lower than 100 percent. If the mesh density is less than 100%, some radios are not communicating with other radios on that channel. Corrective action may be needed for the BreadCrumb hardware or BreadCrumb configuration.

To investigate corrective actions, refer to the BreadCrumb configuration in [BC|Commander](#) and BreadCrumb User Guide for the BreadCrumb model on the [Rajant Support web site](#).

Navigation

To go to the **Mesh / Mesh Density** dashboard, on the [Main Menu](#), click **Dashboards**, expand the **Mesh** dashboard folder, and then click **Mesh Density**.

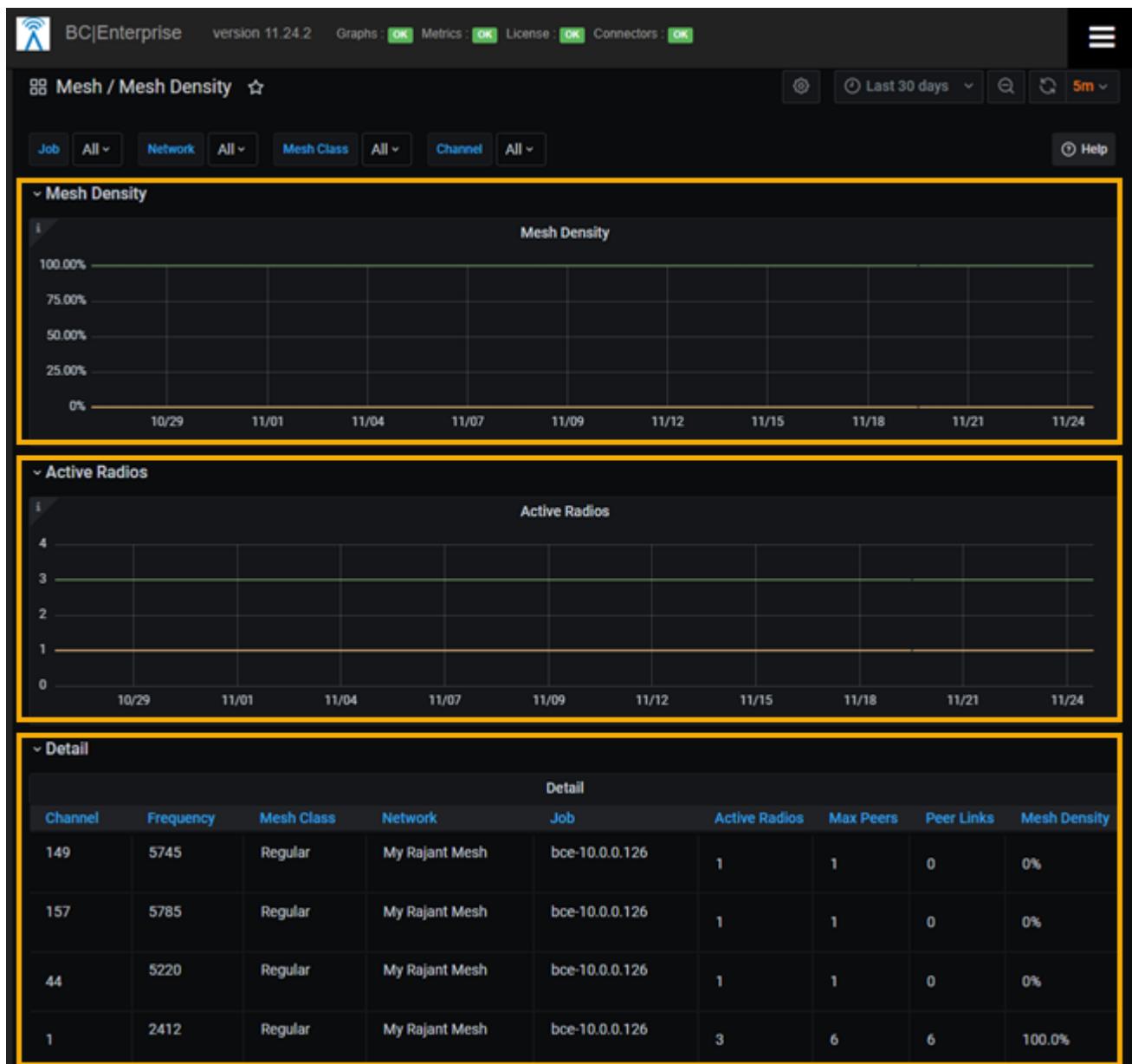
Procedures

The following procedures apply to the **Mesh / Density** dashboard:

- [Set Selection Filters for a Dashboard](#)
- [Select a Time Range for a Dashboard](#)
- [Examine a Panel Definition](#)
- [Enlarge a Time Range in a Panel](#)
- [Add an Annotation to a Panel](#)
- [View Detail in a Graph](#)

Illustration

The following illustration indicates the three [panels](#) on the **Mesh / Density** dashboard:



Selection filters

[Job](#) [Network](#) [Mesh Class](#) [Channel](#)

The **Channel** selection filter must indicate the radio channel numbers of interest.

Mesh Density panel

Click the arrow to the left of the **Mesh Density** heading to hide/show the **Mesh Density** panel.

The **Mesh Density** panel contains a graph that indicates the mesh density as a percentage for each channel during the selected time range.

Active Radios panel

Click the arrow to the left of the **Active Radios** heading to hide/show the **Active Radios** panel.

The **Active Radios** panel contains a graph that indicates the number of active radios on each channel during the selected time range.

Detail panel

Click the arrow to the left of the **Detail** heading to hide/show the **Detail** panel.

The **Detail** panel contains a [data table](#) that shows following the properties for each channel at the end of the selected time range:

- **Channel:** A radio channel number selected in the [Channel selection filter](#) (Channel Number*)
- **Frequency:** Operating frequency for the radio (Channel Number*)
- **Mesh Class:** A set of inter-operable radio bandwidths for InstaMesh.
- **Network:** Network Name for the mesh network (Network Name*)
- **Job:** In the time series database, the Job name for the [BC|Connector](#) instance that connects to the BreadCrumb for this radio
- **Active Radios:** Number of active radios at the end of the selected time range
- **Max Peers:** Maximum number of peer radios on this channel during the selected time range
- **Peer Links:** Number of links between peer radios in this channel at the end of the selected time range
- **Mesh Density:** Percentage of active peer BreadCrumb connections for the total number of radios on this channel

* This setting is in the BreadCrumb configuration for the BreadCrumb in BC|Commander.

Rajant / BreadCrumb Alerts Dashboard

Purpose

View trends for BreadCrumb alerts that occur during the [selected time range](#) and filtered by the [selection filters](#).

A BreadCrumb alert is a warning or error reported to [BC|Commander](#) by a BreadCrumb. Current BreadCrumb alerts are listed on the **Alerts** tab in BC|Commander.

Navigation

To go to the **Rajant / BreadCrumb Alerts dashboard**, on the [Main Menu](#), click **BreadCrumb Alerts**.

Procedures

The following procedures apply to the **Rajant / BreadCrumb Alerts** dashboard:

- [Set Selection Filters for a Dashboard](#)
- [Select a Time Range for a Dashboard](#)
- [Enlarge a Time Range in a Panel](#)
- [View Detail in a Graph](#)
- [Add an Annotation to a Panel](#)
- [Examine a Panel Definition](#)

Illustration

The following illustration identifies the two [panels](#) on the **Rajant / BreadCrumb Alerts** dashboard:



Selection filters

Job Group Product Family Model Firmware Version Alert Type Alert Code

Alert Trend panel

The **Alert Trend** panel contains a line graph that indicates the number of times each BreadCrumb alert occurred during the selected time range.

The legend identifies the BreadCrumb alert associated with each line in the graph.

A table at the right indicates the minimum, maximum and current count from most frequent to least frequent during the selected time range. To reverse the list by column, click the column heading.

Line Color	Alert Type	Alert Message	Alert Code	Number of Concurrent Alerts
				min max current ▾
				5 5 5
				0 2 0
				0 0 0

Legend:

- WARNING: Default password in use (421)
- WARNING: High cost APT link (531)
- WARNING: Taking over as APT master (53)

Current Alerts panel

The **Current Alerts** panel contains a [data table](#) that provides information about each active BreadCrumb alert at the end of the selected time range.

Each row in the table contains information for one active BreadCrumb alert for a given BreadCrumb. The same BreadCrumb may have more than one active BreadCrumb Alert.

All BreadCrumb alerts should be investigated to determine an appropriate corrective action.

Each column in the table contains information about the BreadCrumb alert, as follows:

- Code:** Code number. For a definition of each code number, refer to the Appendix Error and Warning Codes in the BreadCrumb User Guide for the BreadCrumb model and the *BC|Commander Version 11 User Guide*, both on the [Rajant Support web site](#).
- Encap ID:** (Encapsulation ID) Part of the BreadCrumb serial number in BC|Commander that uniquely identifies the BreadCrumb.
- LED:** The value is **true** if this Code is causing the status LED on the BreadCrumb to flash. The value is **false** if this Code is not causing the status LED on the BreadCrumb to flash. For information about the behavior of the BreadCrumb status LED(s), refer to the BreadCrumb User Guide for the BreadCrumb model on the [Rajant Support web site](#).
- Message:** Message associated with the BreadCrumb alert.
- BreadCrumb Name:** BreadCrumb name (BreadCrumb Name*) and Encap ID for the BreadCrumb in BC|Commander.
- Alert Type:** Type of BreadCrumb alert (**WARNING** or **ERROR**) in BC|Commander.

* This setting is in the BreadCrumb configuration for the BreadCrumb in BC|Commander.

Group Dashboard

Purpose

View historical data for a particular BreadCrumb group during the [selected time range](#) filtered by the [selection filters](#).

BreadCrumb groups are defined in [BC|Commander](#).

Navigation

To go to the [dashboard](#) for a BreadCrumb group, on the [Main Menu](#), click **Dashboards**, expand the **Groups dashboard folder**, and then click the name for a BreadCrumb group.

Procedures

The following procedures apply to the dashboard for a BreadCrumb group:

- [Set Selection Filters for a Dashboard](#)
- [Select a Time Range for a Dashboard](#)
- [Enlarge a Time Range in a Panel](#)
- [View Detail in a Graph](#)
- [Add an Annotation to a Panel](#)
- [Examine a Panel Definition](#)

Illustration

The following illustration identifies the major features on a dashboard for a BreadCrumb group:



Selection filters

[Job](#) [Group](#) [Rate Interval](#)

Category headings

Click the arrow to the left of each category heading to hide/show [panels](#) for that category.

Wireless Packet Rates

- Wireless RX Packet Rate: Data receive rate in packets per second (pps) on the wireless interface on each BreadCrumb
- Wireless TX Packet Rate: Data transmit rate in packets per second (pps) on the wireless interface on each BreadCrumb

Wireless Data Rates

- Wireless RX Data Rate: Data receive rate in bytes per second (bps) for the wireless interface on each BreadCrumb
- Wireless TX Data Rate: Data transmit rate in bytes per second (bps) for the wireless interface on each BreadCrumb

Data Rate By Frequency

- Wireless RX Data Rate By Frequency: Data receive rate in bytes per second (bps) for each radio frequency
- Wireless TX Data Rate By Frequency: Data transmit rate in bytes per second (bps) for each radio frequency

Wired Packet Rates

- Wired RX Packet Rate: Data receive rate in packets per second (pps) for the wired interface on each BreadCrumb
- Wired TX Packet Rate: Data transmit rate in packets per second (pps) for the wired interface on each BreadCrumb

Wired Date Rate

- Wired RX Packet Rate: Data receive rate in bytes per second (bps) for the wired interface on each BreadCrumb
- Wired TX Packet Rate: Data transmit rate in bytes per second (bps) for the wired interface on each BreadCrumb

System Info

- CPU Load: Percentage of Central Processing Unit (CPU) workload used by each BreadCrumb
- Free Memory: Amount of available memory for each BreadCrumb shown in gibibytes (GiB) or mebibytes (MiB)
- Temperature: Temperature in degrees Centigrade for each BreadCrumb

Latency & Channel Activity

- Round-Trip Ping Latency: Number of milliseconds (ms) used by each BreadCrumb to respond to a ping from a [BC|Connector](#)
- Channel Activity By Frequency: Percentage of channel activity by type (receive, transmit, busy, noise) for each radio frequency

Peer Cost

- Wireless Peers By Cost: Number of peer BreadCrumb relationships on wireless interfaces by Cost value
- Wired Peers By Cost: Number of peer BreadCrumb relationships on wired interfaces by Cost value

Cost values less than 5000 are Low.

Cost values from 5000 to 10000 are Medium.

Cost values greater than 10000 are High.

BreadCrumb Availability

- Availability By Percent: Percentage of BreadCrumbs reporting status for more than a 10-minute period during the past week shown by BreadCrumb Group
- Availability By Count: Number of BreadCrumbs currently reporting status shown by BreadCrumb Group

APT Info

- Slave Count By APT Master: Number of active Automatic Protocol Tunneling (APT) slave BreadCrumbs bridged to an Ethernet port per each APT master BreadCrumb

Radar Detections

- Radar Detection Rate: Number of times per second that each BreadCrumb detected radar on a configured radio channel in the selected time range
- Radar Detection Count: Number of times each BreadCrumb has detected radar on its configured radio channel since the last reboot of the BreadCrumb

View BreadCrumb Data

Contents

- [Breadcrumb Data](#)
- [Mesh/ BreadCrumb Table Dashboard](#)
- [Mesh/ Wired Table Dashboard](#)
- [Mesh/ Wireless Table Dashboard](#)
- [Dashboard for a Particular BreadCrumb](#)
- [Peer Details Dashboard](#)

BreadCrumb Data

Description

BreadCrumb data values that are shown in [dashboards](#) are related to a specific [monitored BreadCrumb](#) and any network connections from that BreadCrumb to a peer BreadCrumb.

Dashboards

The following dashboards present BreadCrumb data:

- [Mesh / BreadCrumb Table dashboard](#) for all monitored BreadCrumbs
- [Mesh / Wired Table dashboard](#) for each active Ethernet network interface (ethn) on a BreadCrumb
- [Mesh / Wireless Table dashboard](#) for each active radio for a wireless Local Area Network (WLAN) interface (wlanx) on a BreadCrumb
- The [dashboard for a particular BreadCrumb](#)
- [Peer Details dashboard](#) for each interface from a particular BreadCrumb to each connected peer BreadCrumb

References

For more information about BreadCrumb data, refer to the following:

- BreadCrumb Table chapter in the *BC|Commander Version 11 User Guide* (on the [Rajant Support web site](#))
- BreadCrumb User Guide for the [BreadCrumb](#) product family and model (on the [Rajant Support web site](#))

Mesh / BreadCrumb Table Dashboard

Purpose

View properties for [monitored BreadCrumbs](#) filtered by the [selection filters](#) at the end of the [selected time range](#).

Navigation

To go to the **Mesh / BreadCrumb Table** dashboard, on the [Main Menu](#), click **BreadCrumb Table**.

Procedures

The following procedures apply to the **Mesh / BreadCrumb Table** dashboard:

- Set Selection Filters for a Dashboard
- Select a Time Range for a Dashboard
- Examine a Panel Definition

Illustration

The following illustration of a **Mesh / BreadCrumb Table** dashboard indicates the [BreadCrumb Table panel](#):

Breadcrumb Table									
Groups	Model	Name	Version	Uptime	Temp	State	Reboot	Warn CPU%	
fixed	LX5-2455D	Tower (67041)	11.23.2	50:30:00	34.5	Connected	1	9.5	
fixed	ES1-2450R	Trailer (69791)	11.23.2	50:30:04	38.5	Connected	1	11.5	
mobile	DX2-24	Drone (74133)	11.23.2	50:29:59	42.2	Connected	1	2.8	
fixed	SLIPSTREAM-2	Datacenter (77081)	11.23.2	50:29:47	34.0	Connected	1	0	

Selection filters

[Job](#) [Group](#) [Product Family](#) [Model](#) [Firmware Version](#)

BreadCrumb Table panel

The **BreadCrumb Table** panel contains a [data table](#) that shows properties for monitored BreadCrumbs filtered by the [selection filters](#) at the end of the [selected time range](#).

Each row contains properties for one monitored BreadCrumb.

Each column contains the value for a BreadCrumb property, as follows:

- **Groups:** Name of each BreadCrumb group (*Groups) that includes this BreadCrumb with a colon (:) character as a separator. **No Groups** indicates that the BreadCrumb is not assigned to a BreadCrumb group.
- **Model:** BreadCrumb model name that identifies the product family and model for the BreadCrumb.

- **Name:** Descriptive BreadCrumb name (BreadCrumb Name*) or serial number for the BreadCrumb with the unique encapsulation ID (Encap ID) portion of the BreadCrumb serial number enclosed in parentheses. (Click the name to go to the [BreadCrumb dashboard](#).)
- **Version:** Firmware version installed on this BreadCrumb.
- **Uptime:** Length of time (*hh:mm:ss*) that this BreadCrumb has been running without interruption.
- **Temp:** Current internal temperature of this BreadCrumb in degrees Centigrade.
- **State:** State of the connection between BC|Commander and this BreadCrumb as shown for the **State** property on the **Details** tab in BC|Commander.
- **Reboot:** Blank if the BreadCrumb does not require a reboot.
- **Warn:** Number of warnings that occurred for this BreadCrumb during the selected time range. Click the number to go to the [Rajant / BreadCrumb Alerts dashboard](#).
- **CPU%:** Current percentage of the central processing unit (CPU) time being used by this BreadCrumb.

* This setting is in the BreadCrumb configuration for the BreadCrumb in BC|Commander.

Connection status

When viewing a dashboard for a particular BreadCrumb, on the **Mesh / BreadCrumb Table** dashboard in the BreadCrumb Table panel, verify that the Connection State of the BreadCrumb is **Connected**.

BC|Enterprise cannot collect data from a BreadCrumb that is disconnected, out-of-range or powered-off.

Mesh / Wired Table Dashboard

Purpose

View a summary of data for each active connection from a monitored BreadCrumb to a peer BreadCrumb through an Ethernet network interface to a wired Local Area Network (LAN) during the selected time range and filtered by the selection filters.

Navigation

To go to the **Mesh / Wired Table** dashboard, on the **Main Menu**, click **Dashboards**, expand the **Mesh** folder, and then click **Wired Table**.

Procedures

The following procedures apply to the **Mesh / Wired Table** dashboard:

- [Set Selection Filters for a Dashboard](#)
- [Select a Time Range for a Dashboard](#)
- [Examine a Panel Definition](#)

Illustration

The following illustration identifies the major feature on the **Mesh / Wired Table** dashboard:

The screenshot shows the BC|Enterprise dashboard interface with the title 'Mesh / Wired Table'. At the top, there are several status indicators: Graphs: OK, Metrics: OK, License: OK, and Connectors: OK. Below the title is a search bar with a dropdown for 'Last 6 hours' and a refresh button. The main area features a table titled 'Wired Interface Table' with the following columns: APT State, Groups, Model, Name, Version, Job, Eth, Peers, State Changes, Tx b/s, and Rx b/s. The table contains six rows of data, each representing a different connection or device. The rows are as follows:

APT State	Groups	Model	Name	Version	Job	Eth	Peers	State Changes	Tx b/s	Rx b/s
master	fixed	SLIPSTREAM-2	Datacenter (77081)	11.23.2	bce-10.0.0.126	0	4	3	44 K	26 K
slave	fixed	LX5-2455D	Tower (67041)	11.23.2	bce-10.0.0.126	0	1	3	2 K	26 K
slave	fixed	ES1-2450R	Trailer (69791)	11.23.2	bce-10.0.0.126	0	1	4	1 K	29 K
slave	mobile	DX2-24	Drone (74133)	11.23.2	bce-10.0.0.126	0	1	6	1 K	30 K
none	fixed	SLIPSTREAM-2	Datacenter (77081)	11.23.2	bce-10.0.0.126	1	0	5	0	0
none	fixed	LX5-2455D	Tower (67041)	11.23.2	bce-10.0.0.126	1	0	2	0	0

Selection filters

[Job](#) [APT State](#) [Group](#) [Product Family](#) [Model](#) [Firmware Version](#) [Eth](#)

Wired Interface Table panel

The **Wired Interface Table panel** contains a [data table](#) that provides information for each active connection from a monitored BreadCrumb to a peer BreadCrumb through an Ethernet network interface.

The Wired Interface table contains one row for each active Ethernet network interface.

The Wired Interface table contains a column for each of the following values:

- **APT State:** Current Automatic Protocol Tunneling (APT) state (**master**, **slave**, **link** or **none**) for the BreadCrumb
- **Groups:** Name of each BreadCrumb group (Groups*) that includes the BreadCrumb
- **Model:** Model name that identifies the product family and model for the [BreadCrumb](#).
- **Name:** Descriptive BreadCrumb name (BreadCrumb Name*) or serial number for the BreadCrumb with the unique encapsulation ID (Encap ID) portion of the BreadCrumb serial number enclosed in parentheses. (Click the name to go to the [BreadCrumb dashboard](#).)
- **Version:** Firmware version installed on the BreadCrumb
- **Job:** [Job name](#) for the [BC|Connector](#) instance that recorded the BreadCrumb
- **Eth:** Port number for an Ethernet network interface (ethn*) on the BreadCrumb
- **Peers:** Number of peer BreadCrumbs connected through this Ethernet network interface (ethn*)
- **State Changes:** Number of Ethernet state changes since the last reboot of the BreadCrumb
- **Tx b/s:** Data transmit rate in bytes per second
- **Rx b/s:** Data receive rate in bytes per second

* This setting is in the BreadCrumb configuration for the BreadCrumb in BC|Commander.

APT States

Possible APT State values are as follows:

- **master:** BreadCrumb is the current APT Master.
- **slave:** BreadCrumb is an APT Slave
- **link:** BreadCrumb is the current APT Master with no active connection to an Ethernet network interface on a peer APT BreadCrumb
- **none:** BreadCrumb is not an APT Master or APT Slave

The APT Master BreadCrumb converts all Ethernet traffic into InstaMesh packets on ingress to a wired network and back again on egress from a wired network.

All APT-connected BreadCrumbs other than the APT Master are APT slaves.

An APT Link BreadCrumb has only one point of ingress to and egress from a wired network.

In BreadCrumb configurations, InstaMesh settings and Ethernet settings define the APT Master and APT Slave behavior.

For more information about APT, refer to the [BC|Commander Version 11 User Guide](#) on the [Rajant Support web site](#).

Mesh / Wireless Table Dashboard

Purpose

View a summary of data for each active connection from a monitored BreadCrumb to a peer BreadCrumb through a radio for a wireless Local Area Network (WLAN) interface during the [selected time range](#) and filtered by the [selection filters](#).

Navigation

To go to the **Mesh / Wireless Table** dashboard, on the [Main Menu](#), click **Dashboards**, expand the [Mesh dashboard folder](#), and then click **Wireless Table**.

Procedures

The following procedures apply to the **Mesh / Wireless Table** dashboard:

- [Set Selection Filters for a Dashboard](#)
- [Select a Time Range for a Dashboard](#)
- [Examine a Panel Definition](#)

Illustration

The following illustration identifies the major feature on the **Mesh / Wireless Table** dashboard:

The screenshot shows the BC|Enterprise Mesh / Wireless Table dashboard. At the top, there are navigation links for 'Metrics', 'License', and 'Connectors'. Below that is a search bar and a date range selector set to '2022-08-23 07:58:29 to 2022-08-23 13:58:29'. The main area features a table titled 'Wireless Interface Table' with the following columns: Band, Channel, Frequency, Groups, Model, Name, Version, Wlan, Peers, Clients, Noise, Noise Floor, Noise%, Tx%, Tx b/s, Rx%, and Rx b/s. The table contains eight rows of data, each representing a different wireless interface setup. A yellow box highlights the first row of the table.

Wireless Interface Table																
Band	Channel	Frequency	Groups	Model	Name	Version	Wlan	Peers	Clients	Noise	Noise Floor	Noise%	Tx%	Tx b/s	Rx%	Rx b/s
5 GHz	157	5785	mobile	KM3-2450R	Truck Cabin (73052)	11.24.2	0	1	-	-108	Excellent	14.4	0	202	27.0	195 K
5 GHz	157	5785	fixed	ES1-2450R	Trailer (69791)	11.25.0	1	1	0	-90	Fair	0.4	0.3	23	42.2	174 K
2.4 GHz	1	2412	mobile	KM3-2450R	Truck Cabin (73052)	11.24.2	1	3	-	-95	Good	8.5	0.1	214	29.1	91 K
2.4 GHz	1	2412	fixed	ES1-2450R	Trailer (69791)	11.25.0	0	3	0	-88	Bad	1.7	3.2	130	26.1	86 K
2.4 GHz	1	2412	fixed	LX5-2455D	Tower (67041)	11.25.0	1	3	-	-95	Good	7.4	0.1	225	28.5	78 K
5 GHz	149	5745	fixed	LX5-2455D	Tower (67041)	11.25.0	2	0	-	-107	Excellent	0.4	0	156	8.0	66 K
2.4 GHz	1	2412	mobile	DX2-24	Drone (74133)	11.24.2	0	3	-	-99	Good	0.4	0.1	69	15.3	32 K
5 GHz	44	5220	fixed	LX5-2455D	Tower (67041)	11.25.0	0	0	-	-109	Excellent	0.1	0	162	0.5	78

Selection filters

[Job](#) [Group](#) [Product Family](#) [Model](#) [Firmware Version](#) [Channel](#) [Band](#) [Frequency](#) [Wlan](#)

Wireless Interface Table panel

The **Wireless Interface Table** panel contains a [data table](#) that provides information for each active connection from a monitored BreadCrumb to a peer BreadCrumb through a radio for a wireless Local Area Network (WLAN) interface.

The Wireless Interface table contains one row for each active wireless interface.

The Wireless Interface table contains a column for each of the following values:

- **Band:** Radio frequency band for a wireless interface (wlanx) on the BreadCrumb in the **Name** column
- **Channel:** Channel number (Channel Number*) for a radio on the BreadCrumb
- **Frequency:** Center operating frequency for the radio channel (Channel Number*)
- **Groups:** Name of each BreadCrumb group (Groups*) that includes the BreadCrumb
- **Model:** Model name that identifies the product family and model for the **BreadCrumb**.
- **Name:** Descriptive BreadCrumb name (BreadCrumb Name*) or serial number for the BreadCrumb with the unique encapsulation identifier (Encap ID) portion of the BreadCrumb serial number enclosed in parentheses. (Click the name to go to the [BreadCrumb dashboard](#).)
- **Version:** Firmware version installed on the BreadCrumb
- **Wlan:** Wireless interface number (wlanx*) for the radio frequency band on the BreadCrumb
- **Peers:** Number of peer BreadCrumb radios connected through the wireless interface (wlanx*)
- **Clients:** Number of Wi-fi client devices that have been authenticated through this wireless interface that is enabled as an Access Point (Enable Access Point*) in the BreadCrumb configuration
- **Noise:** Noise in decibel-milliwatts (dBm) reported on this wireless interface
- **Noise Floor:** A rating for the background noise in decibels (db) perceived by a radio
- **Noise %:** Percentage of time during the last polling interval that the radio could not transmit or receive data due to wireless noise
- **Tx %:** Percentage of time during the last polling interval that the radio spent transmitting data
- **Tx b/s:** Data transmit rate in bytes per second
- **Rx %:** Percentage of time during the last polling interval that the radio spent receiving data
- **Rx b/s:** Data receive rate in bytes per second

* This setting is in the BreadCrumb configuration for the BreadCrumb in BC|Commander.

Noise values

Noise values in decibel-milliwatts (dBm) are rated as follows:

- Noise < -95 dBm is Excellent.
- Noise between -90 and -95 dBm is Good.
- Noise between -80 and -90 dBm is Bad.
- Noise greater than -80 dBm is Terrible.

Noise Floor values

Noise Floor values in decibels (db) are rated as follows:

- Noise Floor -1000 to -100 db is Excellent.
- Noise Floor between -100 and -95 db is Good.
- Noise Floor between -95 and -90 db is Fair
- Noise Floor between -90 and -80 db is Bad.
- Noise Floor -80 to 1000 db is Terrible.

Dashboard for a Particular BreadCrumb

Purpose

View historical data from the time series database for a particular BreadCrumb during a [selected time range](#) filtered by the [selection filters](#).

Note: On the [Mesh / BreadCrumb Table](#) dashboard in the BreadCrumb Table panel, verify that the Connection State of the BreadCrumb is **Connected**.

Navigation

To go to the [dashboard](#) for a particular BreadCrumb, do one of the following:

- On the [Main Menu](#), click **BreadCrumb Table**. In the **BreadCrumb Table** panel, in the **Name** column, click a BreadCrumb name.
- [Navigate](#) to the dashboard for a particular BreadCrumb.

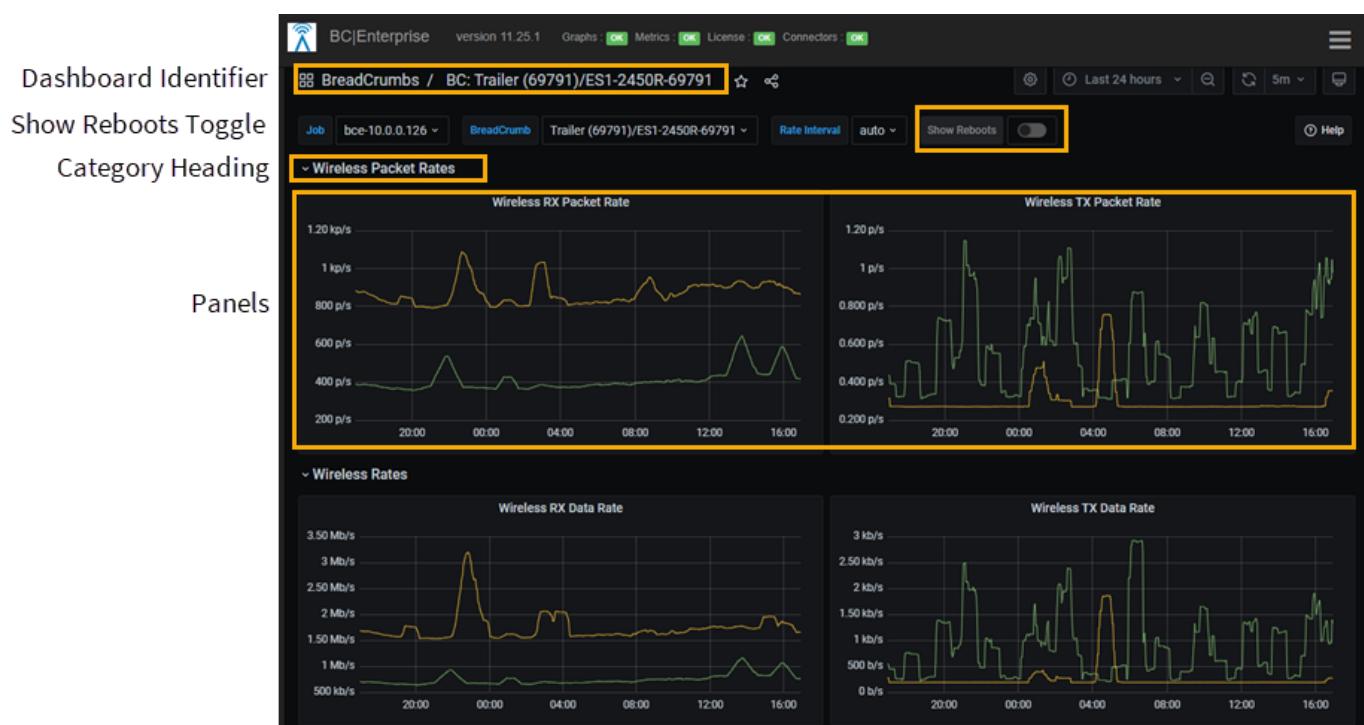
Procedures

The following procedures apply to a dashboard for a particular BreadCrumb:

- [Set Selection Filters for a Dashboard](#)
- [Select a Time Range for a Dashboard](#)
- [Enlarge a Time Range in a Panel](#)
- [View Detail in a Graph](#)
- [Add an Annotation to a Panel](#)
- [Examine a Panel Definition](#)
- [Go to a Related Dashboard for a Panel](#)

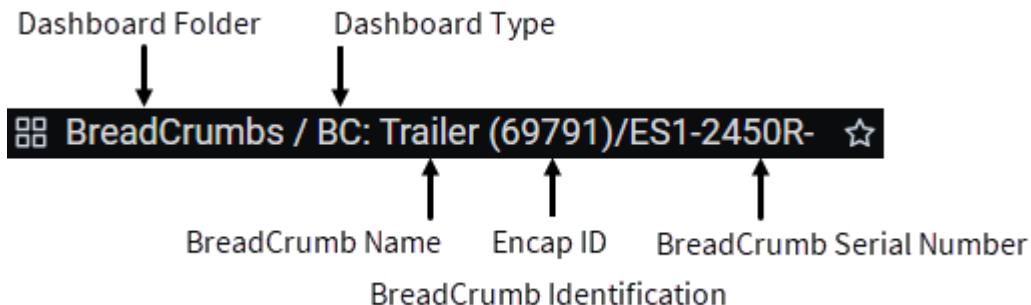
Illustration

The following illustration indicates the major features on a dashboard for a particular BreadCrumb:



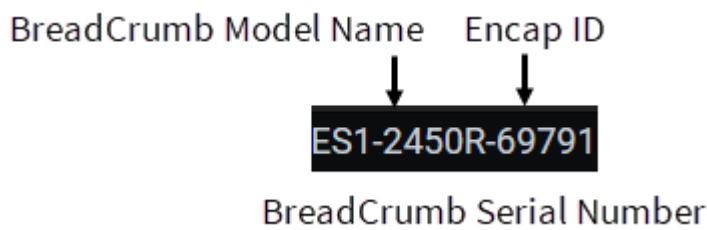
Dashboard identifier

In the [Dashboard Header](#), the dashboard identifier for a BreadCrumb dashboard contains the name of the dashboard folder, dashboard type "BC" for BreadCrumb, a colon (:) character, and the BreadCrumb identification in the following format:



The BreadCrumb identification is comprised of the BreadCrumb name (BreadCrumb Name*), the encapsulation ID (Encap ID) portion of the BreadCrumb serial number enclosed in parentheses, a forward slash (/) character, then the complete BreadCrumb serial number.

The BreadCrumb serial number is comprised of the BreadCrumb model name, a hyphen (-) character and Encap ID. For example, the complete BreadCrumb serial number for the illustrated dashboard identifier contains the BreadCrumb model name (ES1-2450R) and Encap ID, as follows:



* This setting is in the BreadCrumb configuration for the BreadCrumb in BC|Commander.

Selection filters

[Job](#) [BreadCrumb](#) [Rate Interval](#)

Show Reboots toggle

Click the **Show Reboots** toggle to show or hide (default) an annotation for each reboot of the BreadCrumb that occurred in the selected time range. The time interval for reboot detection is 10 minutes. If more than one reboot occurred within a 10-minute interval, only one annotation will be shown for that 10-minute interval.

Showing a high number of reboot annotations in a panel can impact dashboard performance and may cause the dashboard to become unresponsive. Therefore, the **Show Reboots** toggle should be turned off when many reboots have occurred during the selected time range.

If the dashboard becomes unresponsive, reload the [web browser](#).

Category headings

Click the arrow to the left of each category heading to hide/show [panels](#) for that category.

Wireless Packet Rates

- Wireless RX Packet Rate: Data receive rate in packets per second (pps) on the wireless network interface.
- Wireless TX Packet Rate: Data transmit rate in packets per second (pps) on the wireless network interface.

Wireless Rates

- Wireless RX Packet Rate: Data receive rate in bytes per second (bps) on the wireless network interface.
- Wireless TX Packet Rate: Data transmit rate in bytes per second (bps) on the wireless network interface.

Wired Rates

- Wired Data Rate: Data receive rate in bytes per second (bps) on the wired network interface.
- Wired Packet Rate: Data transmit rate in bytes per second (bps) on the wired network interface.

System Info

- CPU Load: Percentage of Central Processing Unit (CPU) workload used by this BreadCrumb.
- Free Memory: Amount of available memory for this BreadCrumb shown in gibibytes (GiB) or mebibytes (MiB).
- Temperature: Temperature in degrees Centigrade.
- Voltage: Input voltage to this BreadCrumb in volts.
- Round-Trip Ping Latency: Number of milliseconds (ms) used by this BreadCrumb to respond to a ping from a [BC|Connector](#).

Radios

- Channel Activity: Percentage of time that each channel on each radio on this BreadCrumb spent receiving data, transmitting data and waiting for noise.
- Wireless Noise: Noise in decibel-milliwatts (dBm) on the Wireless LAN (WLAN) interface for this BreadCrumb.

InstaMesh

Packet Handling Rates

Packet handling rates for this BreadCrumb, as follows:

- Packets dropped per second
- Packets received per second
- Packets sent per second
- Time waited (count/second)

ARP/ND/Multicast Rates

Address Resolution Protocol (ARP) / Neighbor Discovery Protocol (ND) / multicast rates for this BreadCrumb, as follows:

- Packets Multicast: Number of multicast packets sent
- ND Dropped: Number of dropped ND packets
- ND Req: Number of ND request packets sent or received
- ND Req Unicast: Number of ND unicast packets sent
- ND Total: Total number of ND request packets received or sent since the last reboot of this BreadCrumb
- ARP Dropped: Number of Address Resolution Protocol (ARP) packets dropped
- ARP Req: Number of ARP request packets received or sent
- ARP Unicast: Number of ARP unicast packets sent
- ARP Total: Total number ARP request packets received or sent since the last reboot

Discoveries/Undeliverables Rates

Discoveries/undeliverables rates for this BreadCrumb, as follows:

- Discoveries Sourced: Number of discovery packets originating from this BreadCrumb since the last reboot of this BreadCrumb
- Discoveries Passed: Number of discovery packets passed through this BreadCrumb since the last reboot of this BreadCrumb
- Undeliverable TX Fail: Number of undeliverable packets as a result of a transmit failure

Connections

Connections for this BreadCrumb, as follows:

- Wireless Peers: Number of peer radios on a wireless network interface for each channel on this BreadCrumb
- Wireless Clients: Number of wireless clients attached to configured WiFi Access Points (APs) on this BreadCrumb by frequency and channel
- Wired Peers: Number of peer BreadCrumbs on each Ethernet port on this BreadCrumb
- Wired State Changes: Number of state changes on an Ethernet port on this BreadCrumb

To go to the dashboard for a peer BreadCrumb, in a graph, point to the line for that peer BreadCrumb, click, and then click **Peer Details**.

Radar Detections

- Radar Detection Rate: Number of radar detection events per radio per second on this BreadCrumb during the selected time range
- Radar Detection Count: Number of radar detection events per radio since the last reboot of this BreadCrumb

Peer Details Dashboard

Purpose

View data for each active connection from a [monitored BreadCrumb](#) to a particular peer BreadCrumb during the [selected time range](#) and filtered by the selection filters.

Navigation

To go to **Peer Details** dashboard for a particular BreadCrumb, on the [Main Menu](#), click **Dashboards**, expand the **Peer Details** dashboard folder, and then click the name for the BreadCrumb.

Procedures

The following procedures apply to the **Peer Details** dashboard:

- [Set Selection Filters for a Dashboard](#)
- [Select a Time Range for a Dashboard](#)
- [Enlarge a Time Range in a Panel](#)
- [View Detail in a Graph](#)
- [Add an Annotation to a Panel](#)
- [Examine a Panel Definition](#)

Illustration

The following illustration identifies each [panel](#) on a **Peer Details** dashboard:



Selection filters

BreadCrumb Job Interface

Peer Trend panel

The **Peer Trend** panel shows any change in the number active connections between this BreadCrumb and another BreadCrumbs on each interface during the selected time range.

Each wireless Local Area Network (WLAN) interface (wlanx) is identified by radio frequency, channel number and operating frequency.

Each Ethernet network interface through a wired Local Area Network (LAN) is identified by Ethernet port (ethn) and Automatic Protocol Tunneling (APT) state (**master**, **slave** or blank (if **none**)).

SNR to Peer Trend panel

The **SNR to Peer Trend** panel contains a graph that shows any change in the Signal-to-Noise (SNR) ratio in decibels (dB) for each active interface from this BreadCrumb to another BreadCrumb during the selected time range.

SNR values are rated as follows:

- SNR values greater than 60 dB (>60) are High (Green)
- SNR values greater than or equal to 30 or less than or equal to 60 dB (30-60) are Good (Yellow)
- SNR values less than 30 dB (<30) are Fair (Red)

Cost to Best Peer Trend panel

The **Cost to Best Peer Trend** panel shows the best peer BreadCrumb relationships on each interface for this BreadCrumb.

Each WLAN interface (wlanx) is identified by radio frequency, channel number and operating frequency.

Each Ethernet network interface is identified by Ethernet port (ethn) and APT state (**master**, **slave**, **link** or blank (if **none**)).

Wired Peer Cost panel

New for 11.25 The **Wired Peer Cost** panel is shown only if an Ethernet network interface (ethn) on this BreadCrumb has had an active connection to a peer BreadCrumb during the last 24 hours.

The **Wired Peer Cost** panel shows any change in Cost for each active connection to a peer BreadCrumb during the selected time range.

The peer BreadCrumb for each active connection is identified by the descriptive BreadCrumb name (BreadCrumb Name*) or serial number for the BreadCrumb with the unique encapsulation identifier (Encap ID) portion of the BreadCrumb serial number enclosed in parentheses.

* This setting is in the BreadCrumb configuration for the BreadCrumb in BC|Commander.

Peer Detail panel

The **Peer Detail** panel contains a [data table](#) that shows properties for the interface from this BreadCrumb to each peer BreadCrumb.

Each row contains properties for one interface between this BreadCrumb and one peer BreadCrumb.

Each column contains the value for a property, as follows:

- **Interface:** Interface from this BreadCrumb to an interface on a peer BreadCrumb
- **Peer Name:** Descriptive BreadCrumb name (BreadCrumb Name*) or serial number for the peer BreadCrumb with the unique encapsulation identifier (Encap ID) portion of the BreadCrumb serial number enclosed in parentheses. (Click the name to go to the [Breadcrumb dashboard](#).)
- **Job:** [BC|Connector](#) instance that recorded this peer BreadCrumb
- **SNR:** Signal-to-Noise Ratio (SNR) in decibels (dB) for this interface
- **Cost:** Cost value for this interface

- **Signal:** Signal strength in decibel-milliwatts (dBm) for this interface
- **Rx Rate:** Data receive rate in bytes per second (bps) for this interface
- **Tx Rate:** Data transmit rate in bytes per second (bps) for this interface

* This setting is in the BreadCrumb configuration for the BreadCrumb in BC|Commander.

The following table indicates the threshold values in each category:

Category	Good (Green)	Fair (Yellow)	Poor (Red)
SNR Peers	> 30 dB	<= 30 dB	> 60 dB
Cost Peers	< 10000	N/A	=> 10000
Signal Strength	<= -60 dBm	<= -80 dBm	> -80 dBm

View Report Dashboards

Contents

- [Report Dashboards](#)
- [BreadCrumb Report Dashboards](#)
- [Radio Report Dashboards](#)
- [Wired Report Dashboards](#)
- [Wireless Report Dashboards](#)
- [Export Report Data](#)

Report Dashboards

Description

New for 11.24 A report dashboard provides a daily, weekly or monthly summary of data for monitored BreadCrumbs filtered by the selection filters.

There are report dashboards for each type of data, as follows:

- [Breadcrumb Report dashboards](#) for BreadCrumbs
- [Radio Report dashboards](#) for radios
- [Wired Report dashboards](#) for wired Ethernet (ethn) network interfaces
- [Wireless Report dashboards](#) for wireless radio network interfaces

Reporting periods

The selected time range for a report dashboard is one of the following:

- For a Daily report, **Last 1 day** (one day)
- For a Weekly report, **Last 1 week** (seven days)
- For a Monthly report, **Last 4 weeks** (28 days)

Selection filters

The selection filters available for each report depend on the types of data contained in the report.

Data export

Data from a report dashboard can be [exported](#) to a file in comma-separated values (CSV) format.

(Optional) An exported CSV file for a report dashboard can be included as custom content in an [email report](#).

Navigation

To go to a report dashboard, on the [Main Menu](#), click **Dashboards**, expand the **Reports** dashboard folder, and then click the report name.

BreadCrumb Report Dashboards

Purpose

View a daily, weekly or monthly summary of BreadCrumb data for monitored BreadCrumbs filtered by the [selection filters](#).

Navigation

To go to a BreadCrumb report dashboard, on the [Main Menu](#), click **Dashboards**, expand the **Reports dashboard folder**, and then click the Daily, Weekly or Monthly BreadCrumb report name.

Procedure

BreadCrumb report dashboards require use of the [Set Selection Filters for a Dashboard](#) procedure.

Illustration

The following illustration shows the initial display for the Daily BreadCrumb Report dashboard:

Selection filters

[Job](#) [Network](#) [Group](#) [Product Family](#) [Model](#) [Firmware Version](#)

Category headings

A BreadCrumb Report dashboard initially shows a heading for each category of data collected.

Click the arrow to the left of each category heading to show/hide the [panel](#) for that category.

Panels

The panel for each category of data contains a [data table](#) with one row of information for each monitored BreadCrumb. The first six columns each contain a value for a BreadCrumb property. The remaining columns contain data.

Property columns

In the data data, each column for a BreadCrumb property contains a value, as follows:

- **Groups:** Name of each BreadCrumb group (Groups*) that includes this BreadCrumb. The colon (:) character is a separator. **No Groups** indicates that the BreadCrumb is not assigned to a BreadCrumb group.
- **Model:** BreadCrumb model name.
- **Name:** BreadCrumb name (BreadCrumb Name*) followed by the Encap ID portion of the BreadCrumb serial number enclosed in parentheses. (Click the name to go to the [BreadCrumb dashboard](#).)
- **Network:** Network name (Network Name*) for the mesh network
- **Version:** Firmware version installed on this BreadCrumb
- **Job:** In the time series database, the Job name for the [BC|Connector](#) instance that connects to the BreadCrumb

* This setting is in the BreadCrumb configuration for the BreadCrumb in [BC|Commander](#).

Uptime data

- **Reboots:** Number of times the BreadCrumb rebooted
- **Uptime:** Amount of uptime (*hh:mm:ss*) as of the To time in the [selected time range](#)
- **Up %:** Observed percentage increase in time on the system clock on the BreadCrumb

Ping Response data

- **Min Resp:** Minimum response time in milliseconds (ms) to a ping from the [BC|Connector](#)
- **Avg Resp:** Average response time in milliseconds (ms) to a ping from the BC|Connector
- **Max Resp:** Maximum response time in milliseconds (ms) to a ping from the BC|Connector
- **Variance:** Variance in the response time in milliseconds (ms) to a ping from the BC|Connector

Total Peers data

- **Min Peers:** Minimum number of remote peer BreadCrumb radios
- **Avg Peers:** Average number of remote peer BreadCrumb radios
- **Max Peers:** Maximum number of remote peer BreadCrumb radios
- **Variance:** Variance in the number of remote peer BreadCrumb radios

Good Peers data

- **Min Good Peers:** Minimum number of remote peer BreadCrumb radios with a Good SNR peer relationship
- **Avg Good Peers:** Average number of remote peer BreadCrumb radios with a Good SNR peer relationship
- **Max Good Peers:** Maximum number of remote peer BreadCrumb radios with a Good SNR peer relationship
- **Variance:** Variance in the number of remote peer BreadCrumb radios with a Good SNR peer relationship

Signal-to-Noise (SNR) ratio values are rated as Fair, Good or High as follows:

- SNR values less than 30 are Fair
- SNR values less than 60 are Good
- SNR values greater than 60 are High

CPU Usage data

- **Min CPU%**: Minimum percentage of Central Processing Unit (CPU) workload on this BreadCrumb
- **Avg CPU%**: Average percentage of CPU workload on this BreadCrumb
- **Max CPU %**: Maximum percentage CPU workload on this BreadCrumb
- **Variance**: Variance in the percentage CPU workload on this BreadCrumb

Voltage data

- **Min Volt**: Minimum input voltage to this BreadCrumb in volts
- **Avg Volt**: Average input voltage to this BreadCrumb in volts
- **Max Volt**: Maximum input voltage to this BreadCrumb in volts
- **Variance**: Variance in input voltage to this BreadCrumb in volts

Temperature data

- **Min Temp**: Minimum temperature of this BreadCrumb in degrees Centigrade
- **Avg Temp**: Average temperature of this BreadCrumb in degrees Centigrade
- **Max Temp**: Maximum temperature of this BreadCrumb in degrees Centigrade
- **Variance**: Variance in the temperature of this BreadCrumb in degrees Centigrade

Radio Report Dashboards

Purpose

View a daily, weekly or monthly summary of radio data for monitored BreadCrumbs filtered by the [selection filters](#).

Navigation

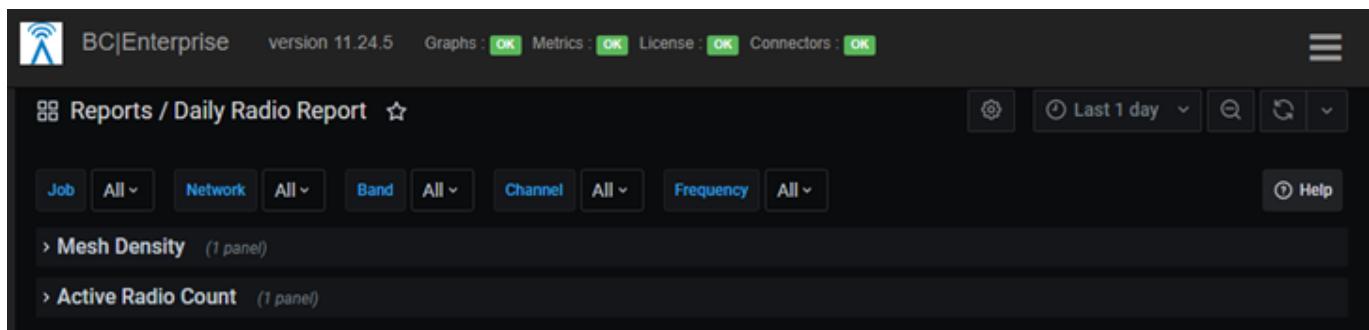
To go to a radio report dashboard, on the [Main Menu](#), click **Dashboards**, expand the **Reports dashboard folder**, and then click the Daily, Weekly or Monthly Radio report name.

Procedure

Radio report dashboards require use of the [Set Selection Filters for a Dashboard](#) procedure.

Illustration

The following illustration shows the initial display for the Daily Radio Report dashboard:



Selection filters

[Job](#) [Network](#) [Band](#) [Channel](#) [Frequency](#)

Category headings

A Radio Report dashboard initially shows a list of category headings.

Click the arrow to the left of each category heading to show/hide the [panel](#) for that category.

Panels

The panel for each category of data contains a [data table](#) with one row of information for each combination of channel and frequency for a radio. The first four columns each contain a value for a radio property. The remaining columns contain data.

Property columns

In the data data, each column for a radio property contains a value, as follows:

- **Channel:** Channel number for a radio on this BreadCrumb (Channel Number*)
- **Frequency:** Operating frequency for the radio (Channel Number*)
- **Network:** Network Name for the mesh network (Network Name*)
- **Job:** In the time series database, the Job name for the [BC|Connector](#) instance that connects to the BreadCrumb for this radio

* This setting is in the BreadCrumb configuration for the BreadCrumb in [BC|Commander](#).

Mesh Density data

- **Min:** Minimum percentage of active peer radio connections
- **Avg:** Average percentage of active peer radio connections
- **Max:** Maximum percentage of active peer radio connections
- **Variance:** Variance in the percentage of active peer radio connections

Active Radio Count data

- **Min:** Minimum number of active radios
- **Avg:** Average number of active radios
- **Max:** Maximum number of active radios
- **Variance:** Variance in the number of active radios

Wired Report Dashboards

Purpose

View a daily, weekly or monthly summary of data for wired Ethernet (*ethn*) network interfaces on [monitored BreadCrumbs](#) filtered by the [selection filters](#).

Navigation

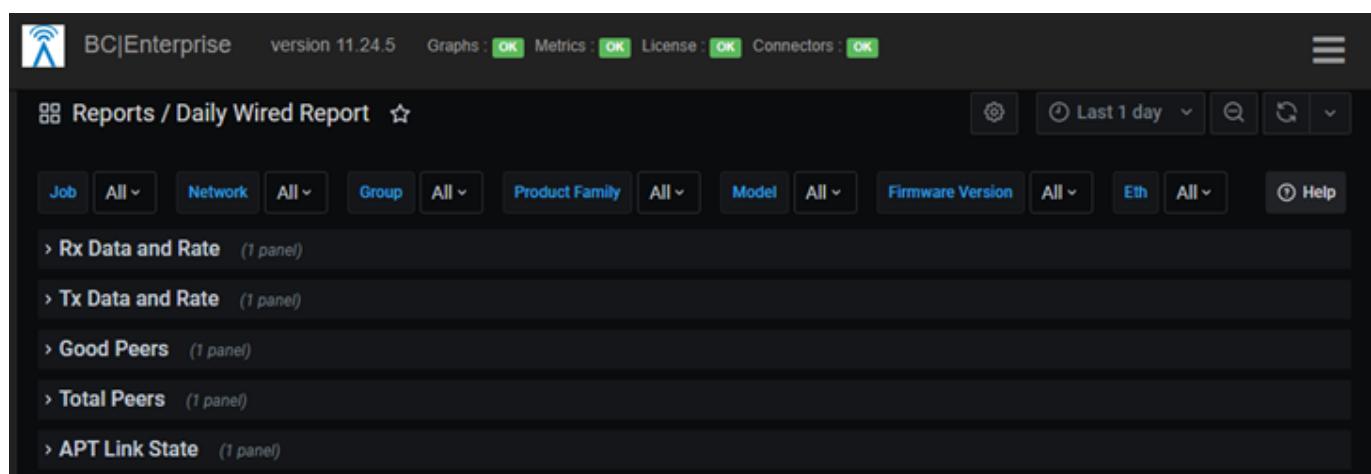
To go to a wired [report dashboard](#), on the [Main Menu](#), click **Dashboards**, expand the **Reports dashboard folder**, and then click the Daily, Weekly or Monthly Wired report name.

Procedure

Wired report dashboards require use of the [Set Selection Filters for a Dashboard](#) procedure.

Illustration

The following illustration shows the initial display for the Daily Wired Report dashboard:



Selection filters

[Job](#) [Network](#) [Group](#) [Product Family](#) [Model](#) [Firmware Version](#) [Eth](#)

Category headings

A Wired Report dashboard initially shows a list of category headings.

Click the arrow to the left of each category heading to show/hide the [panel](#) for that category.

Panels

The panel for each category of data contains a [data table](#) with one row of information for each wired Ethernet (*ethn*) network interface on a BreadCrumb. The first seven columns each contain a value for a BreadCrumb property. The remaining columns contain data.

Properties

In each data table, each column for a BreadCrumb property contains a value, as follows:

- **Groups:** Name of each BreadCrumb group (Groups*) that includes this BreadCrumb. The colon (:) character is a separator. **No Groups** indicates that the BreadCrumb is not assigned to a BreadCrumb group.
- **Model:** BreadCrumb model name.

- **Name:** BreadCrumb name followed by the Encap ID portion of the BreadCrumb serial number enclosed in parentheses. (Click the name to go to the [Breadcrumb dashboard](#).) (Breadcrumb Name*)
- **Network:** Network Name for the mesh network (Network Name*)
- **Version:** Firmware version installed on the BreadCrumb.
- **Job:** In the time series database, the Job name for the [BC|Connector](#) instance that connects to the BreadCrumb
- **Eth:** Ethernet connection (ethn*) on the BreadCrumb

* This setting is in the BreadCrumb configuration for the BreadCrumb in [BC|Commander](#).

Rx Data and Rate

- **Data:** Total number of bytes of data received
- **Min:** Minimum number of bytes of data received
- **Avg:** Average number of bytes of data received
- **Max:** Maximum number of bytes of data received
- **Variance:** Variance in the number of bytes of data received

Tx Data and Rate

- **Data:** Total number of bytes of data transmitted
- **Min:** Minimum number of bytes of data transmitted
- **Avg:** Average number of bytes of data transmitted
- **Max:** Maximum number of bytes of data transmitted
- **Variance:** Variance in the number of bytes of data transmitted

Good Peers

- **Min:** Minimum number of remote peer radios with a Good SNR peer relationship
- **Avg:** Average number of remote peer radios with a Good SNR peer relationship
- **Max:** Maximum number of remote peer radios with a Good SNR peer relationship
- **Variance:** Variance in the number of remote peer radios with a Good SNR peer relationship

Signal-to-Noise Ratio (SNR) values are rated as follows:

- SNR values greater than 30 dB are Good (Green)
- SNR values less than or equal to 30 dB are Fair (Yellow)
- SNR values greater than 60 dB are Poor (Red)

Total Peers

- **Min:** Minimum total number of remote peer radios
- **Avg:** Average total number of remote peer radios
- **Max:** Maximum total number of remote peer radios
- **Variance:** Variance in the total number of remote peer radios

APT Link State

- **State Changes:** Number of state changes for the Automatic Protocol Tunneling (APT) link
- **Master%:** Percentage for the number of times that this APT link reported being in the Master state
- **Slave%:** Percentage for the number of times that this APT link reported being in the Slave state
- **Link%:** Percentage for the number of times that this APT link reported being in the Link state
- **None%:** Percentage for the number of times that this APT link reported being in the None state

Rx Data and Rate

- **Data:** Total number of bytes of data received
- **Min:** Minimum observed data receive rate in bytes per second (B/s)
- **Avg:** Average observed data receive rate in bytes per second (B/s)
- **Max:** Maximum observed data receive rate in bytes per second (B/s)
- **Variance:** Variance in the observed data receive rate in bytes per second (B/s)

Tx Data and Rate

- **Data:** Total number of bytes of data transmitted
- **Min:** Minimum observed data transmit rate in bytes per second (B/s)
- **Avg:** Average observed data transmit rate in bytes per second (B/s)
- **Max:** Maximum observed data transmit rate in bytes per second (B/s)
- **Variance:** Variance in the observed data transmit rate in bytes per second (B/s)

Wireless Report Dashboards

Purpose

View a daily, weekly or monthly summary of data for wireless radio network interfaces on [monitored BreadCrumbs](#) filtered by the [selection filters](#).

Navigation

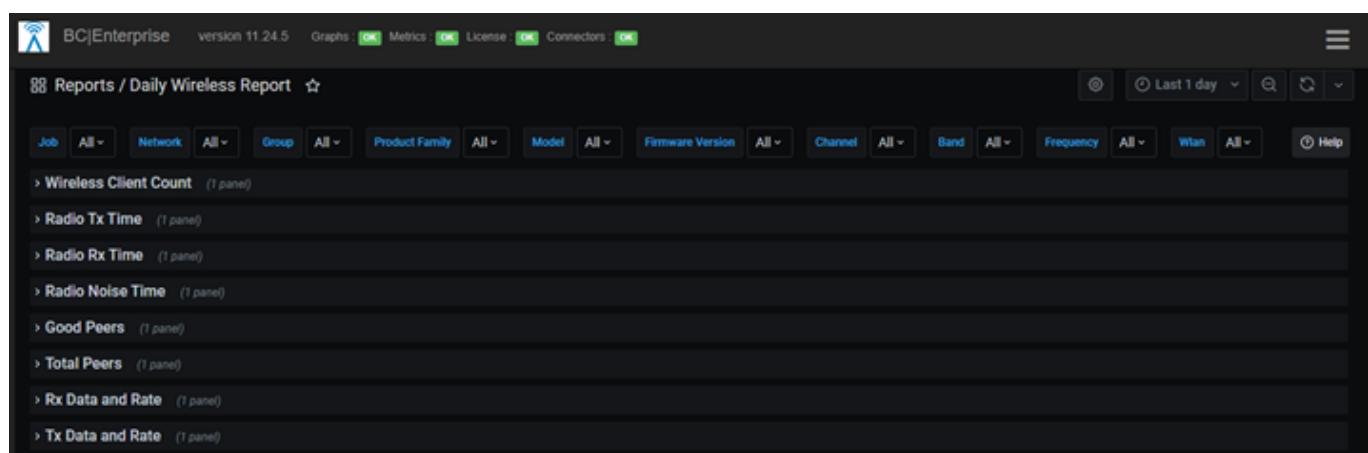
To go to a wireless report dashboard, on the [Main Menu](#), click **Dashboards**, expand the **Reports dashboard folder**, and then click the Daily, Weekly or Monthly Wireless report name.

Procedure

Wireless report dashboards require use of the [Set Selection Filters for a Dashboard](#) procedure.

Illustration

The following illustration shows the initial display for the Daily Wireless Report dashboard:



Selection filters

[Job](#) [Network](#) [Group](#) [Product Family](#) [Model](#) [Firmware Version](#) [Channel](#) [Band](#) [Frequency](#) [Wlan](#)

Category headings

The dashboard initially shows a list of category headings.

Click the arrow to the left of each category heading to show/hide the [panel](#) for that category.

Panels

The panel for each category of data contains a [data table](#) with one row of information for each wireless radio interface. The first three columns each contain a property value for a wireless radio interface on a BreadCrumb. The next seven columns each contain a value for the BreadCrumb. The remaining columns contain data.

Properties

In each data table, each column for a radio or BreadCrumb property contains a value, as follows:

- **Band:** Radio frequency band for the Wireless LAN (WLAN) interface for the radio
- **Channel:** Channel number for a radio on this BreadCrumb (Channel Number*)
- **Frequency:** Operating frequency for the radio (Channel Number*)

- **Groups:** Name of each BreadCrumb group (Groups*) that includes this BreadCrumb. The colon (:) character is a separator. **No Groups** indicates that the BreadCrumb is not assigned to a BreadCrumb group.
- **Model:** BreadCrumb model name.
- **Name:** BreadCrumb name followed by the Encap ID portion of the BreadCrumb serial number enclosed in parentheses. (Click the name to go to the [BreadCrumb dashboard](#).) (BreadCrumb Name*)
- **Network:** Network Name for the mesh network (Network Name*)
- **Version:** Firmware version installed on this BreadCrumb.
- **Job:** In the time series database, the Job name for the [BC|Connector](#) instance that connects to the BreadCrumb for this radio
- **Wlan:** WLAN interface number (wlanx*) for the radio

* This setting is in the BreadCrumb configuration for the BreadCrumb in [BC|Commander](#).

Wireless Client Count

- **Min:** Minimum number of wireless clients for this radio
- **Avg:** Average number of wireless clients for this radio
- **Max:** Maximum number of wireless clients for this radio
- **Variance:** Variance in the number of wireless clients for this radio

Radio Tx Time>

- **Min:** Minimum percentage of time the radio was transmitting data
- **Avg:** Average percentage of time the radio was transmitting data
- **Max:** Maximum percentage of time the radio was transmitting data
- **Variance:** Variance in the percentage of time the radio was transmitting data

Radio Rx Time

- **Min:** Minimum percentage of time the radio was receiving data
- **Avg:** Average percentage of time the radio was receiving data
- **Max:** Maximum percentage of time the radio was receiving data
- **Variance:** Variance in the percentage of time the radio was receiving data

Radio Noise Time

- **Min:** Minimum percentage of time that the radio could not transmit or receive data due to wireless noise
- **Avg:** Average percentage of time that the radio could not transmit or receive data due to wireless noise
- **Max:** Maximum percentage of time that the radio could not transmit or receive data due to wireless noise
- **Variance:** Variance in the percentage of time that the radio could not transmit or receive data due to wireless noise

Good Peers

- **Min:** Minimum number of remote peer radios with a Good SNR peer relationship
- **Avg:** Average number of remote peer radios with a Good SNR peer relationship
- **Max:** Maximum number of remote peer radios with a Good SNR peer relationship
- **Variance:** Variance in the number of remote peer radios with a Good SNR peer relationship

Signal-to-Noise Ratio (SNR) values are rated as follows:

- SNR values greater than 30 dB are Good (Green)
- SNR values less than or equal to 30 dB are Fair (Yellow)
- SNR values greater than 60 dB are Poor (Red)

Total Peers

- **Min:** Minimum total number of remote peer radios
- **Avg:** Average total number of remote peer radios
- **Max:** Maximum total number of remote peer radios
- **Variance:** Variance in the total number of remote peer radios

Rx Data and Rate

- **Data:** Total number of bytes of data received
- **Min:** Minimum observed data receive rate in bytes per second (B/s)
- **Avg:** Average observed data receive rate in bytes per second (B/s)
- **Max:** Maximum observed data receive rate in bytes per second (B/s)
- **Variance:** Variance in the observed data receive rate in bytes per second (B/s)

Tx Data and Rate

- **Data:** Total number of bytes of data transmitted
- **Min:** Minimum observed data transmit rate in bytes per second (B/s)
- **Avg:** Average observed data transmit rate in bytes per second (B/s)
- **Max:** Maximum observed data transmit rate in bytes per second (B/s)
- **Variance:** Variance in the observed data transmit rate in bytes per second (B/s)

Export Report Data

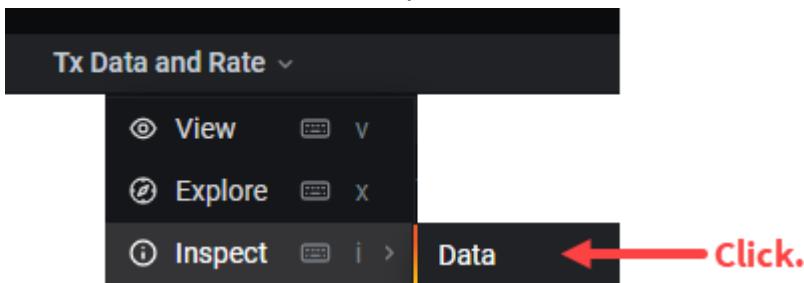
Purpose

Export content of a [data table](#) from a [panel](#) in a [report dashboard](#) to a comma-separated values (CSV) file.

Procedure

To export the content of data table from a report dashboard to a CSV file, do the following:

1. [View the report dashboard](#) of interest.
2. Scroll to the panel that contains the data table that is to be exported.
3. In the [Panel Interaction Menu](#), point to **Inspect**, and then click **Data**.



The **Inspect** panel opens. The **Data** tab shows the content of the data table that is to be exported.

4. On the **Data** tab (default), click **Download CSV**.



The CSV file is downloaded to the [BC|Enterprise client workstation](#).

5. Close the **Inspect** panel.

Follow-up procedure

(Optional) Include an exported CSV file for a reporting dashboard as custom content in an [email report](#).

Manage Dashboards

Contents

[Dashboards Dashboard](#)

[Find Dashboards](#)

[Manage Dashboard Folders](#)

[Create Dashboards](#)

[Import a Dashboard Definition](#)

Dashboards Dashboard

Purpose

Organize links to all [dashboards](#) in [dashboard folders](#) and view links to dashboards by dashboard name.

Navigation

To go to the **Dashboards** dashboard, on the [Main Menu](#), click **Dashboards**.

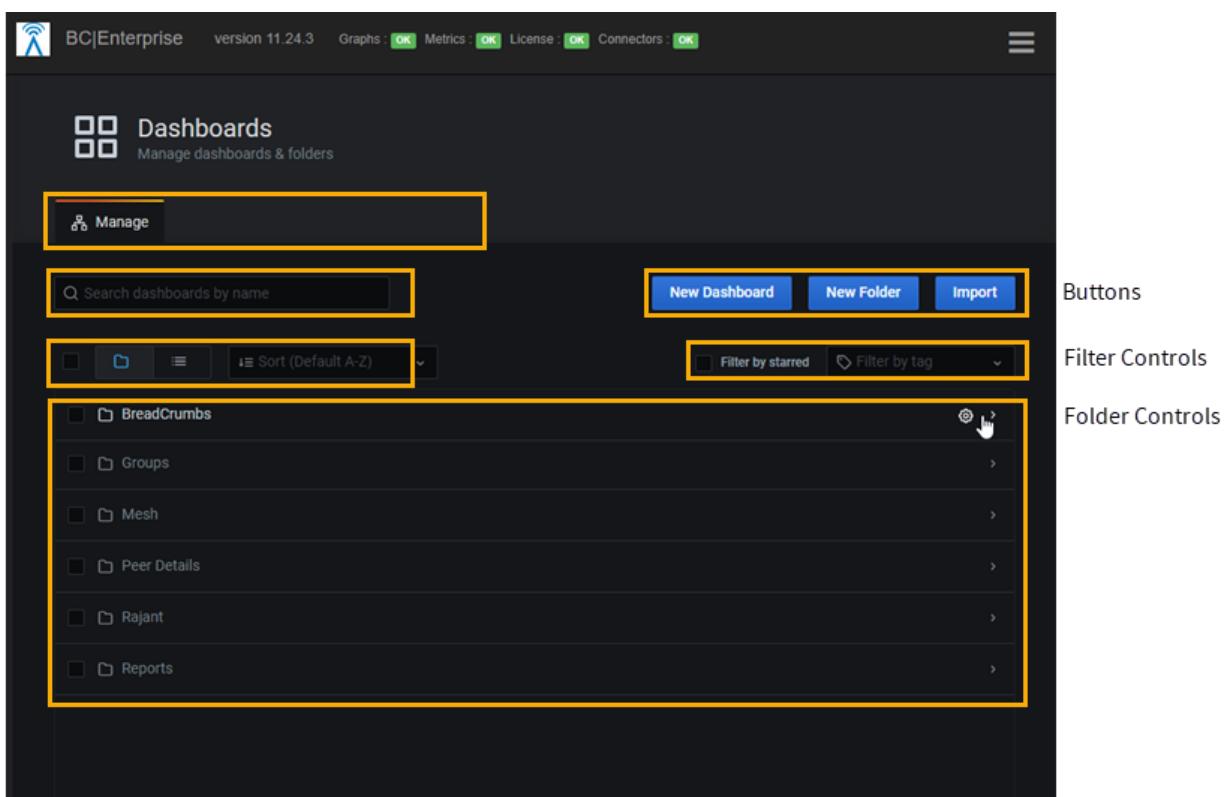
Procedures

The following procedures use the **Dashboards** dashboard:

- [Navigate to a Dashboard](#)
- [Add a Custom Dashboard \(Admin Only\)](#)
- [Import a JSON File for a Dashboard \(Admin Only\)](#)
- [Add a Dashboard Folder](#)
- [Move a Dashboard Folder](#)
- [Delete a Dashboard Folder](#)

Illustration

The following illustration identifies the features on the **Dashboards** dashboard:



Tab Area

The tab area provides tabs to access dashboard management functions.

The initial tab is the **Manage** tab that is used to manage dashboard folders.

To the right of a dashboard folder name, click the Settings icon (⚙) to show the following tabs:

- **Dashboards**: To manage dashboards within that dashboard folder
- **Permissions**: Not used for dashboards provided by Rajant
- **Settings**: To save changes to settings for the dashboard folder or delete a dashboard folder

Search box

To search for a dashboard by name, in the Search box, type a search string for the dashboard name. The dashboard links within each dashboard folder are filtered by the search string.

New Dashboard button

To use Grafana to [add](#) a new dashboard to a dashboard folder, click **New Dashboard**.

Important: Rajant does not provide support for user-created dashboards.

New Folder button

To [add a dashboard folder](#) to the **Manage** tab, click **New Folder**.

Import button

To [import](#) a JavaScript Object Notation (JSON) file for a dashboard definition from an [external source](#) into a dashboard folder, click **Import**.

Select All Folders check box

To select the check box for every dashboard folder, click the **Select All Folders** check box to the left of the Folder View icon. All dashboard folders are selected and the **Delete** button is enabled.

To clear the check box for a selected dashboard folder, click the selected check box.

To [delete](#) all selected dashboard folders from the **Manage** tab, click **Delete**.

Folder View icon

Click  (default) to show dashboard folders by folder name in alphabetical order.

List View icon

Click  to show links to dashboards by dashboard name in alphabetical order.

Sort Alphabetically list

To sort links to dashboards alphabetically by dashboard name, click the arrow, and then click one of the following:

- **Alphabetically (A-Z)** (default)
- **Alphabetically (Z-A)**

Filtered by starred check box

A starred dashboard was marked as a favorite by selecting the star symbol () in the [Dashboard Header](#).

To show links to starred dashboards only, select the **Filtered by starred** check box. Each starred dashboard is listed under the dashboard folder where that dashboard resides.

Filter by tag list

To filter links to dashboards by a search tag, select an assigned search tag in the **Filter by tag** list.

By default, every dashboard provided by Rajant has **rajant** as an assigned search tag.

A custom dashboard that has been [added](#) or [imported](#) may be assigned a custom search tag.

Dashboard folders

Dashboard folders are used to organize links to individual dashboards by category for convenient access.

To view a list of links to the dashboards in a folder, click the dashboard folder name.

Delete button

The red **Delete** button is visible and enabled only when a dashboard or dashboard folder is selected.

To delete every dashboard or dashboard folder with a selected check box, click **Delete**.

Move button

The black **Move** button is visible and enabled only when a dashboard is selected in a dashboard folder.

To move every dashboard with a selected check box to the same dashboard folder, click **Move**.

Find Dashboards

Contents

[Navigate to a Dashboard](#)

[Go to a Dashboard from the Dashboard Header](#)

[Search dashboards by name Dialog Box](#)

[folder:current Dialog Box](#)

Navigate to a Dashboard

Purpose

In the [user interface](#), navigate to a [dashboard](#) of interest.

Procedures

To navigate to a dashboard, do one of the following:

- [Log in to BC|Enterprise](#). The [Mesh / Overview dashboard](#) is displayed.
- On the [Main Menu](#), click a selection for a primary dashboard.
- On the [Dashboards dashboard](#), expand a [dashboard folder](#), and then click a link for a dashboard.
- On the [Dashboards](#) dashboard, supply a search string for the dashboard name.
- [Go to another dashboard](#) from the [Dashboard Header](#).
- To [go to a related dashboard for a panel](#), click anywhere in the [panel](#). A [Data Links](#) menu opens. Click the dashboard name for a related dashboard.
- In a panel that contains a [data table](#), click a link to a related dashboard.
- In a panel that contains an [administrative table](#), click a link to a related dashboard.

Related Topics

The following topics are related to navigating to dashboards:

- [User Interface Layout](#)
- [Dashboards](#)
- [Log In to BC|Enterprise](#)
- [Mesh / Overview Dashboard](#)
- [Main Menu](#)
- [Dashboards Dashboard](#)
- [Dashboard Folders](#)
- [Go to a Dashboard from the Dashboard Header](#)
- [Dashboard Header](#)
- [Go to a Related Dashboard for a Panel](#)
- [Panels](#)
- [Data Tables](#)
- [Administrative Table](#)

Go to a Dashboard from the Dashboard Header

Purpose

Click in the [Dashboard Header](#) to go to another dashboard.

These procedures refer to the following items in the Dashboard Header:



Procedures

Click one of the following links to go to a procedure in this topic:

- [Go to a dashboard in the same dashboard folder](#)
- [Go to a starred dashboard](#)
- [Go to a recent dashboard](#)
- [Go to a dashboard in a another dashboard folder](#)
- [Search for a dashboard by dashboard name](#)

Go to a dashboard in the same dashboard folder

To go to another dashboard in the same [dashboard folder](#) as the displayed dashboard, do the following:

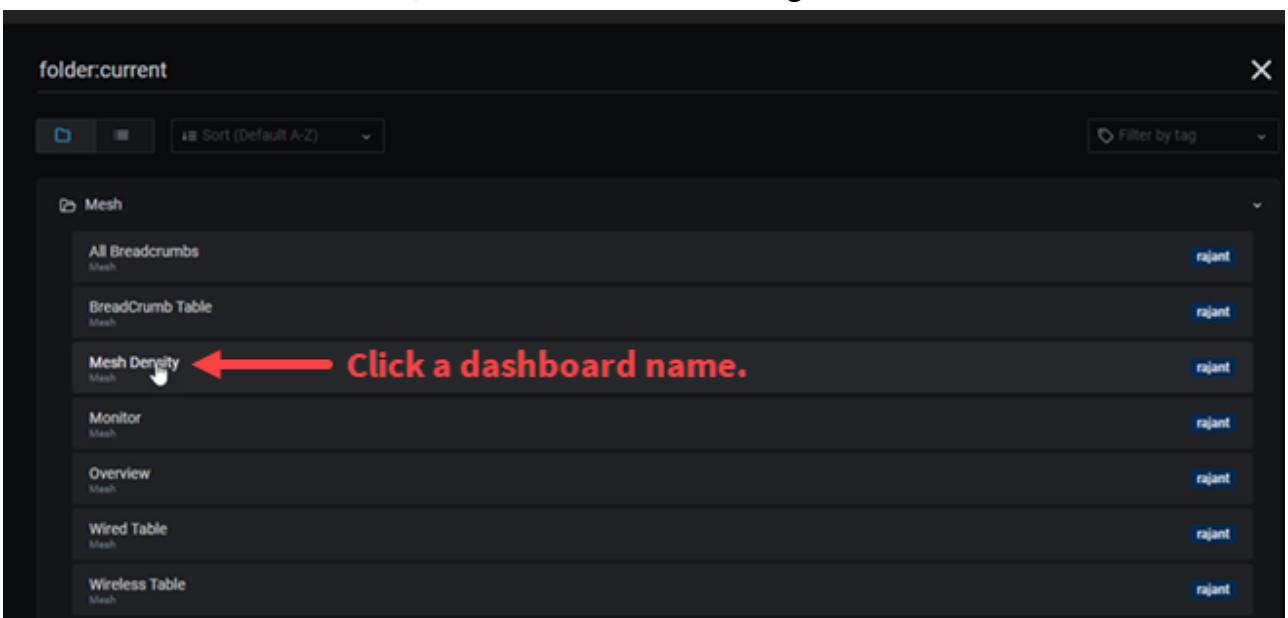
1. In the Dashboard Header, click the dashboard folder name.

Click.
↓



The [folder:current dialog box](#) opens for the current dashboard folder.

2. In the current dashboard folder, click a dashboard name to go to that dashboard.



The [folder:current dialog box](#) closes. The selected dashboard is displayed.

Go to a starred dashboard

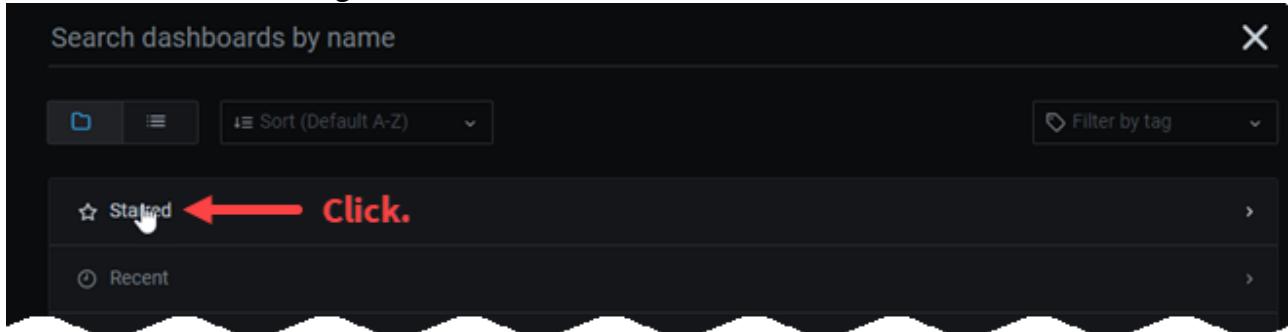
To go to a dashboard that has the favorite star selected (★), do the following:

1. In the Dashboard Header, click the dashboard name.



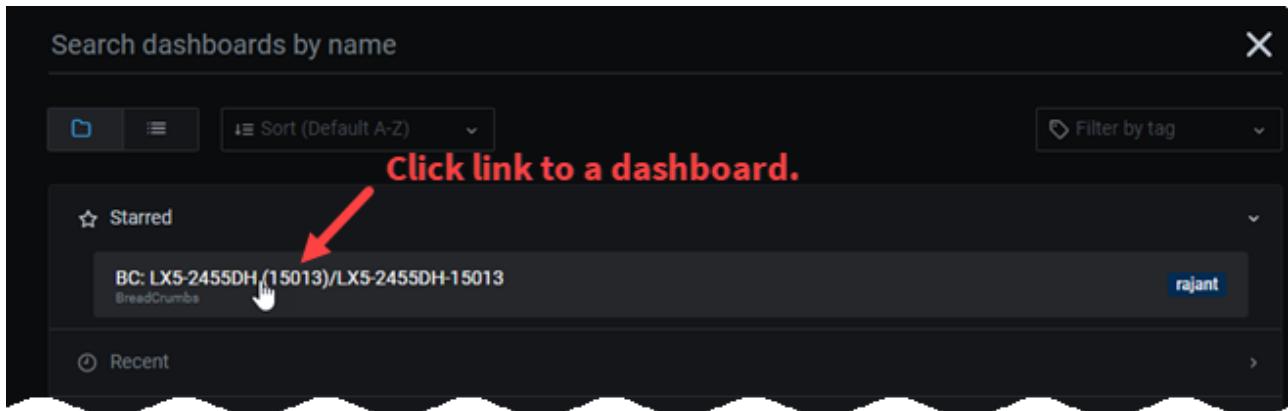
The **Search dashboards by name** dialog box opens.

2. Click the **Starred** heading.



Links to starred dashboards are shown below the **Starred** heading.

3. Click the link for a starred dashboard.



The selected dashboard is displayed.

Go to a recent dashboard

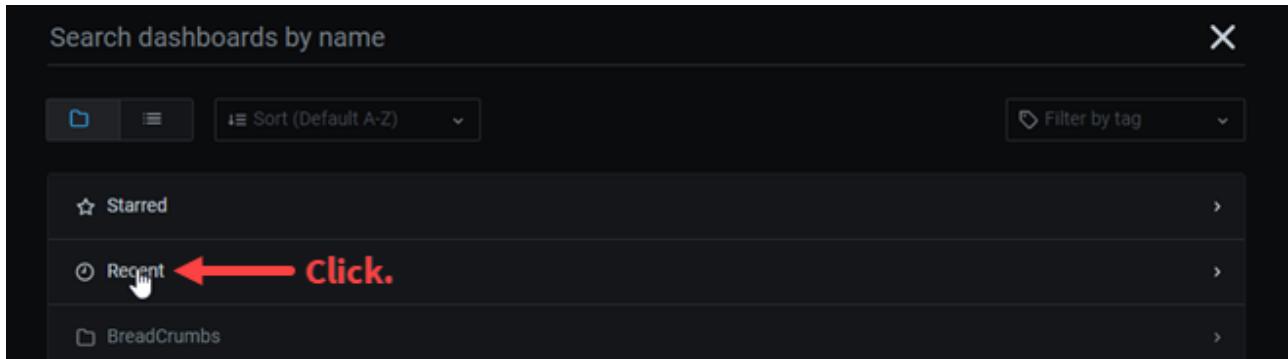
To go to a recently-displayed dashboard, do the following:

1. In the Dashboard Header, click the dashboard name.



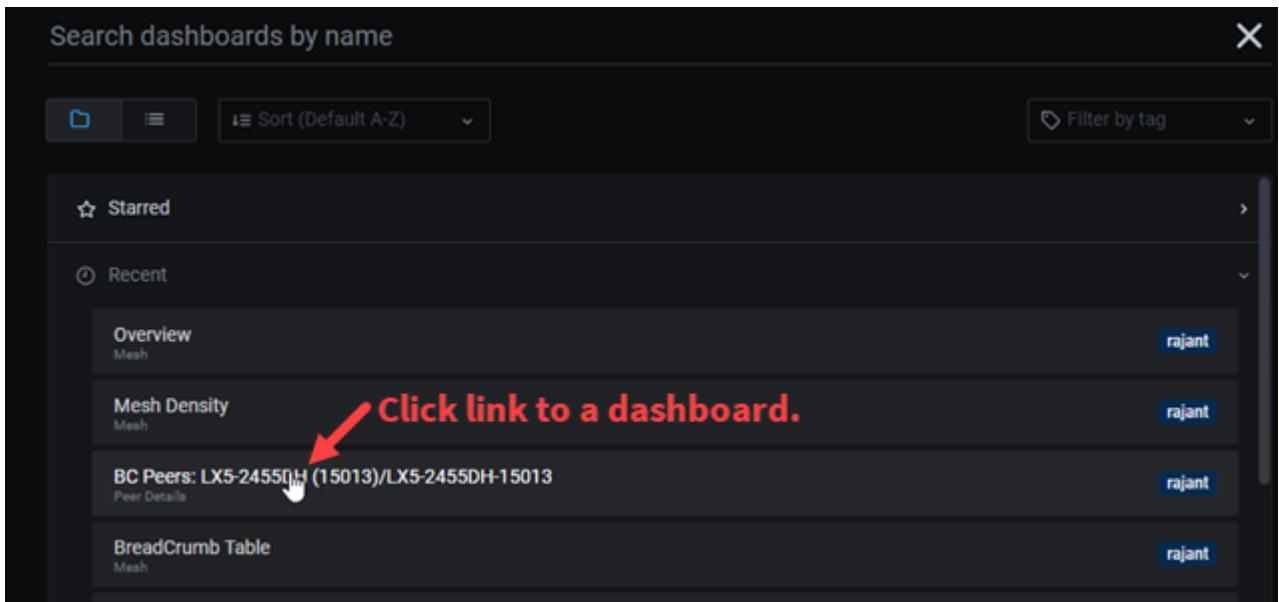
The **Search dashboards by name** dialog box opens.

2. Click the name of a dashboard folder.



The dashboard folder opens to show links to dashboards in that dashboard folder.

3. Click the link for a dashboard.



The selected dashboard is displayed.

Go to a dashboard in another dashboard folder

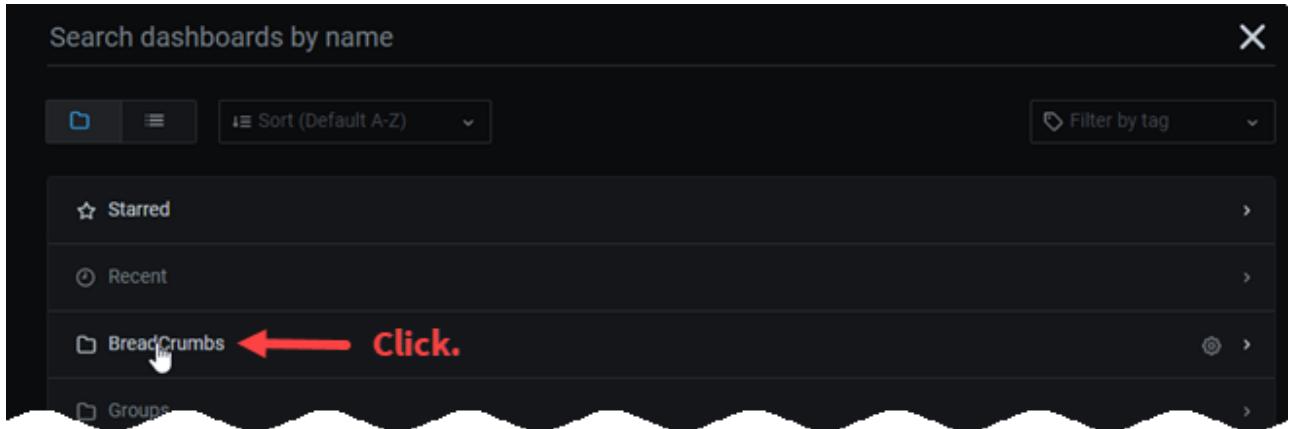
To go to a dashboard in another dashboard folder, do the following:

1. In the Dashboard Header, click the dashboard name.



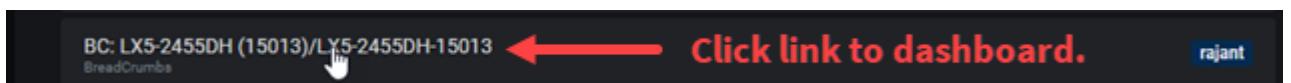
The **Search dashboards by name** dialog box opens.

2. Click the name for a dashboard folder.



The dashboard folder opens to show links to dashboards in that folder.

3. Scroll to the link for the dashboard of interest.
4. Click the link for the dashboard of interest.



The selected dashboard is displayed.

Search for a dashboard by dashboard name

To search for another dashboard by dashboard name, do the following:

1. In the Dashboard Header, click the dashboard name.



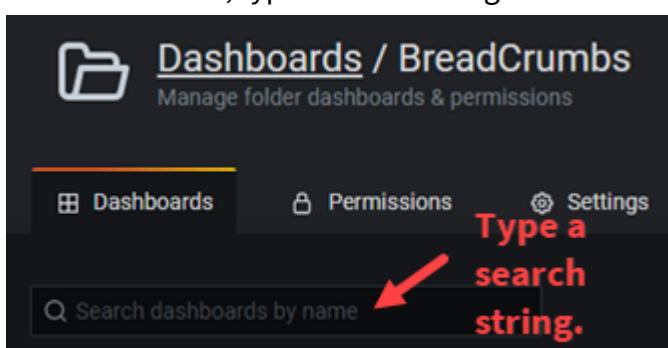
The **Search dashboards by name** dialog box opens.

2. To the far right of a dashboard folder, click the Settings icon (⚙).



The **Dashboards / folder-name** dashboard opens.

3. In the search box, type a search string to filter the dashboard links within the folder.



As you type, the links to dashboards in that folder are filtered by the search string.

4. Click the link for the dashboard of interest.

The screenshot shows a dark-themed user interface for managing dashboards. At the top left is a folder icon followed by the text "Dashboards / BreadCrums" and "Manage folder dashboards & permissions". Below the header are three navigation links: "Dashboards", "Permissions", and "Settings". A prominent search bar is centered with the placeholder text "Search String" and a magnifying glass icon. To the left of the search bar is a dropdown menu with the option "Q 2455DH" selected. On the right side of the search bar are two blue buttons: "New Dashboard" and "Import". Below the search bar are several filter and sorting options: "Sort (Default A-Z)", "Filter by starred", "Filter by tag", and a dropdown menu set to "BreadCrumb". The main content area displays a list of dashboards. The first item in the list is highlighted with a red arrow pointing to it. It consists of a small thumbnail icon, the text "BC: LX5-2455DH (15013)/LX5-2455DH-15013", and the word "BreadCrumb" below it. To the right of this item is a small blue box containing the name "rajant".

The selected dashboard is displayed.

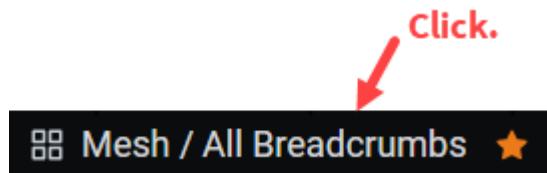
Search dashboards by name Dialog Box

Purpose

Search for a [dashboard](#) by the dashboard name.

Navigation

To open the **Search dashboards by name** dialog box, in a [Dashboard Header](#), click the dashboard name.



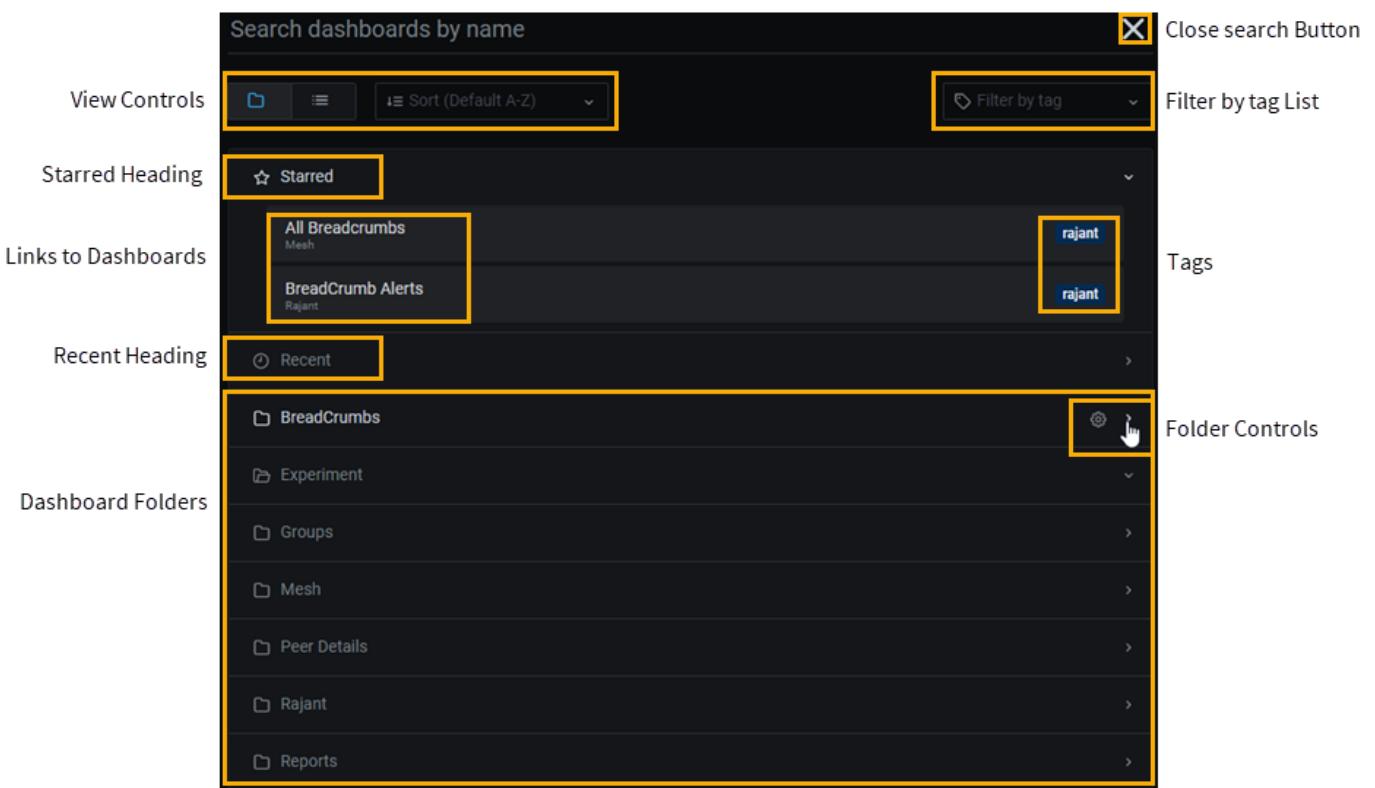
Procedures

The following procedures in [Go to a Dashboard from the Dashboard Header](#) use the **Search dashboards by name** dialog box:

- [Go to a starred dashboard](#)
- [Go to a recent dashboard](#)
- [Go to a dashboard in another dashboard folder](#)
- [Search for a dashboard by dashboard name](#)

Illustration

The following illustration identifies the features in the **Search dashboards by name** dialog box:



Close search button

Click (Close search) to close the **Search dashboards by name** dialog box.

Folder View icon



Click (default) to show the following headings for each category of dashboards for the user:

- **Starred**: Followed by the dashboard name for each favorite dashboard with a star symbol (★) in the Dashboard Header
- **Recent**: Click **Recent** to open a list of dashboard names for recently-viewed dashboards.
- **Dashboard folders** by name. Click the dashboard folder name to view a link for each dashboard in that dashboard folder.

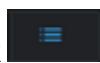
The following dashboard folders are provided by default for standard dashboards:

- **BreadCrumbs** - BreadCrumbs by name
- **Groups** - BreadCrumb groups
- **Mesh** - Mesh dashboards
- **Peer Details** - Peer BreadCrumb screens
- **Rajant** - Configuration and management screens
- **Reports** - Report screens

Users may add custom dashboard folders.

To view the contents of a dashboard folder, click the folder name. A list of dashboard names is shown below the folder. To go to a dashboard, click the dashboard name. To close a dashboard folder, click the folder name.

List View icon



Click to list all dashboards by dashboard name in alphabetical order.

Sort list

To sort dashboard names alphabetically, click one of the following:

- **Alphabetically (A-Z)** (default)
- **Alphabetically (Z-A)**

Filter by tag list

By default, every dashboard provided with BC|Enterprise has **rajant** as an assigned tag.

Starred heading

The **Starred** heading is shown only if one or more dashboards is marked as a favorite with a star (★) symbol in the [Dashboard Header](#).

Click the **Starred** heading to display a list of favorite dashboards.

To display a favorite dashboard, click the link for that dashboard.

Recent heading

Click the **Recent** heading to display a list of recently-displayed dashboards.

To display a recently-displayed dashboard, click the link for that dashboard.

Dashboard folders

The name of each dashboard folder as shown on the [Dashboards dashboard](#).

Click a dashboard folder name to view a list of links to dashboards in that dashboard folder. Click a link to a dashboard to display that dashboard.

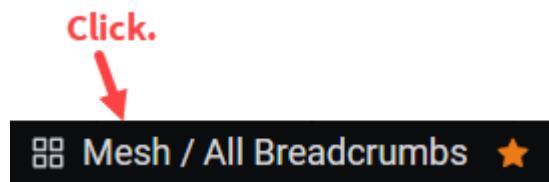
folder:current Dialog Box

Purpose

Search all [dashboards](#) in the same [dashboard folder](#) as the currently displayed dashboard.

Navigation

To open the **folder:current** dialog box, in a [Dashboard Header](#), click the name for the current dashboard folder.

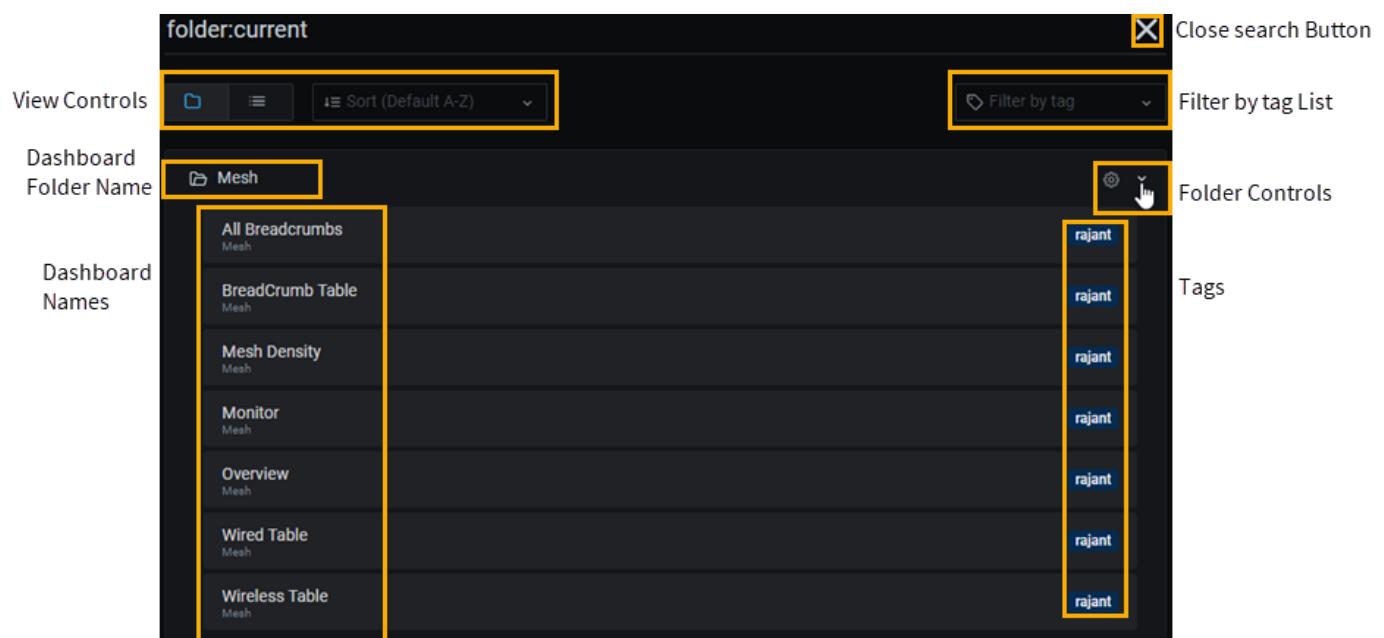


Procedure

The procedure [Go to a dashboard in the same dashboard folder](#) in [Go to a Dashboard from a Dashboard Header](#) uses the **folder:current** dialog box.

Illustration

The following illustration identifies the features in the **folder:current** dialog box:



Close search button

Click (Close search) to close the **folder:current** dialog box.

Folder View icon

Dashboard folders are used to organize links to dashboards by category for convenient access.

Click (default) to show the links to dashboards below the Dashboard Folder Name.

List View icon

Click  to list links to all dashboards in the current dashboard folder by dashboard name in alphabetical order without showing the Dashboard Folder Name.

Sort list

To sort links to dashboards alphabetically by dashboard name, click one of the following:

- **Alphabetically (A-Z)** (default)
- **Alphabetically (Z-A)**

Filter by tag list

By default, every dashboard provided with BC|Enterprise has **rajant** as an assigned tag.

Dashboard folder name

The name for the current dashboard folder as shown on the [Dashboards dashboard](#).

To the right of a dashboard folder name, click the Settings icon  to show the following tabs for only the current dashboard folder:

- **Dashboards** tab to manage dashboards within the dashboard folder
- **Settings** tab to save changes to settings for the dashboard folder or delete the dashboard folder

Dashboard names

Each dashboard name is a link to a dashboard in the current dashboard folder. To display a dashboard, click the dashboard name.

Tags

Tags assigned to each dashboard.

By default, every dashboard provided by Rajant has **rajant** as an assigned search tag.

Manage Dashboard Folders

Contents

[Dashboard Folders](#)

[Add a Dashboard Folder](#)

[Move Dashboards to Another Dashboard Folder](#)

[Delete Dashboards from a Dashboard Folder](#)

[Delete a Dashboard Folder](#)

Dashboard Folders

Description

Dashboard folders are used to organize links to individual [dashboards](#) by category on the [Dashboards dashboard](#).

Rajant dashboard folders

Links to dashboards provided by Rajant reside in the following dashboard folders:

- **BreadCrumbs:** [Dashboards for individual BreadCrumbs](#) by BreadCrumb name (BreadCrumb Name*)
- **Groups:** [Dashboards for individual BreadCrumb groups](#) (Groups*)
- **Mesh:** [Dashboards for mesh data](#)
- **Peer Details:** [Peer Details dashboards](#) for peer BreadCrumbs to each BreadCrumb
- **Rajant:** Rajant Internal dashboards ([Rajant / BC|Connector Management dashboard](#), [Rajant / BC|Enterprise Internal dashboard](#), [Rajant / BreadCrumb Alerts dashboard](#) and [Rajant / Configuration dashboard](#))
- **Reports:** [Report dashboards](#) for BreadCrumbs, radios and network interfaces on BreadCrumbs

* This setting is in the BreadCrumb configuration for the BreadCrumb in [BC|Commander](#).

A user cannot delete a Rajant dashboard folder.

Custom dashboard folders

When a [user](#) with user type **Administrator** adds or imports a custom dashboard definition, the user must select the name of the dashboard folder where the link to that dashboard is to reside.

Links to custom dashboards may reside in any of the following dashboard folders:

- **General** folder (default) (visible only if used)
- Custom dashboard folder
- Any Rajant dashboard folder

A user may [add](#) or [delete](#) a custom dashboard folder.

A user may [add](#), [delete](#) or [move](#) the link to any custom dashboard in a dashboard folder.

Add a Dashboard Folder

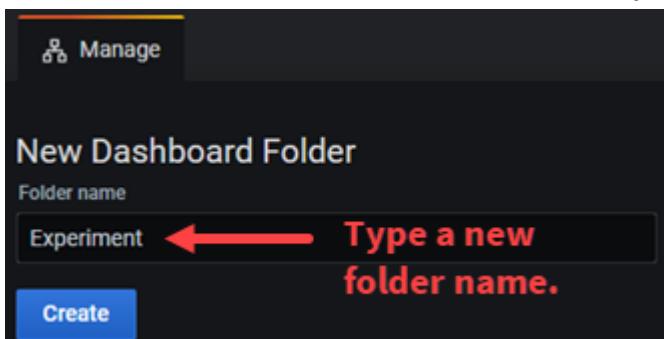
Purpose

Add a [Dashboard folder](#) with a unique name to the **Dashboards** dashboard.

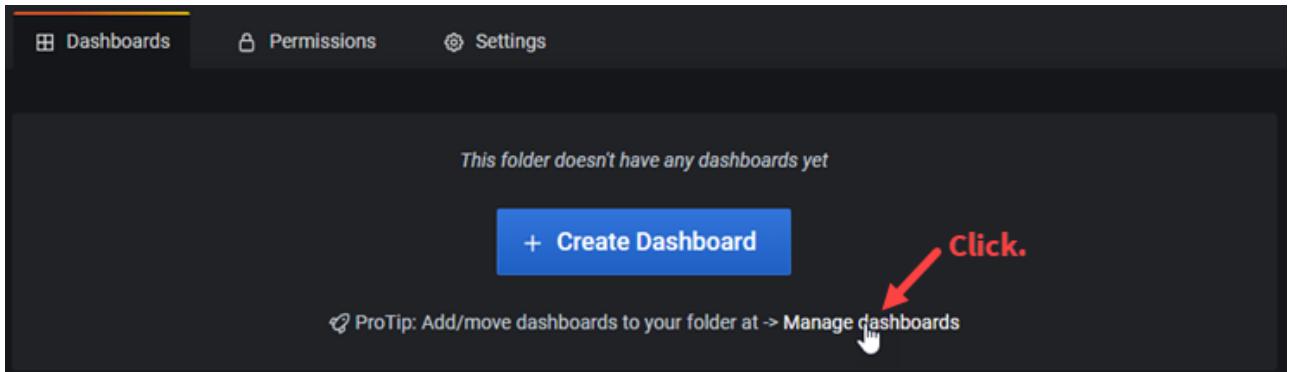
Procedure

To add a dashboard folder, do the following:

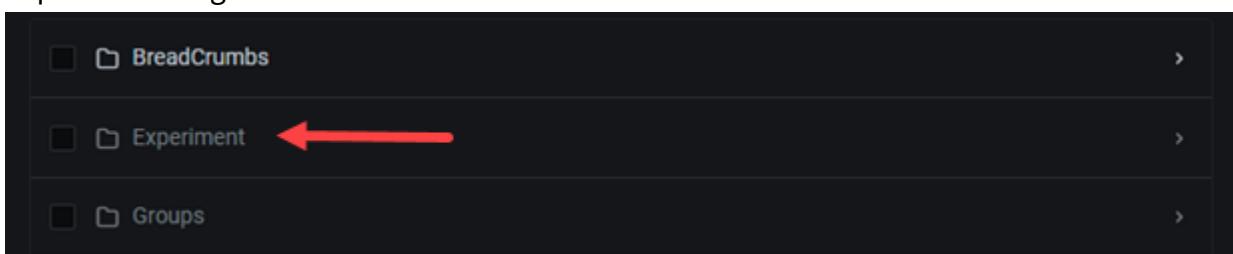
1. On the [Main Menu](#), click **Dashboards**. The **Dashboards** dashboard is displayed.
2. Click **New Folder**. The **Manage** tab for **New Dashboard Folder** is displayed.
3. In the **Folder name** box, type a unique name for the dashboard folder. (Click to view a list of custom dashboard folder names that are already used.)



4. Click **Create**. A confirmation message is displayed. The **Dashboards** tab with a **Create Dashboard** button is displayed.
5. Click [Manage dashboards](#).



The **Dashboards** dashboard is displayed. The new dashboard folder is visible in alphabetical sequence among the other dashboard folders.



Follow-up procedures

Do the following procedures, as needed:

- [Add](#) dashboards to the dashboard folder
- [Move](#) dashboards to the dashboard folder
- [Delete](#) the dashboard folder

Move Dashboards to Another Dashboard Folder

Purpose

Move links for custom [dashboards](#) to another [dashboard folder](#) on the [Dashboards dashboard](#).

Move one dashboard

To move a link for a custom dashboard to another a dashboard folder, do the following:

1. On the [Main Menu](#), click **Dashboards**. The [Dashboards dashboard](#) is displayed.
2. Click the dashboard folder that contains the link to the dashboard that is to be moved. The dashboard folder opens to show the links to dashboards in that folder.
3. Select the check box for each dashboard link that is to be moved. The black **Move** button is visible.
4. Click **Move**. The **Choose Dashboard Folder** dialog box opens.
5. In the list below **Move 1 selected dashboard to the following folder**: select the name of the destination dashboard folder to which the dashboard link is to be moved.
6. Click **Move**. The **Choose Dashboard Folder** dialog box closes. A message confirms the successful move.
7. Click the destination dashboard folder. Verify that the dashboard link has been moved to that dashboard folder.

Move all dashboards

To move all links for custom dashboards to another dashboard folder, do the following:

1. On the [Main Menu](#), click **Dashboards**. The [Dashboards dashboard](#) is displayed.
2. Click the dashboard folder that contains the link to the dashboard that is to be moved. The dashboard folder opens to show the links to dashboards in that folder.
3. Select the check box to the left of the dashboard folder that contains the dashboard links that are to be moved. The black **Move** button is visible.
4. Click **Move**. The **Choose Dashboard Folder** dialog box opens.
5. In the list below **Move 1 selected dashboard to the following folder**: select the name of the destination dashboard folder to which the dashboard links are to be moved.
6. Click **Move**. The **Choose Dashboard Folder** dialog box closes. A message confirms that the dashboard links have been moved. The check box to the left of the dashboard folder that contained the dashboard links that were moved is still selected.
7. Click the destination dashboard folder. Verify that all dashboard links have been moved to that dashboard folder.
8. Click the dashboard folder that contained the dashboard links that were moved. That dashboard folder opens and is now empty.
9. (Optional) [Delete](#) the empty dashboard folder.

Delete Dashboards from a Dashboard Folder

Purpose

Delete links to custom dashboards from a dashboard folder on the **Dashboards** dashboard.

Delete one dashboard

To delete a link for a custom dashboard from a dashboard folder, do the following:

1. On the **Main Menu**, click **Dashboards**. The **Dashboards** dashboard is displayed.
2. Click the dashboard folder that contains the link to a dashboard that is to be deleted. The dashboard folder opens to show any links to dashboards that exist in that folder.
3. Select the check box for the dashboard link that is to be deleted. The red **Delete** button is visible.
4. Click **Delete**. The **Delete** confirmation dialog box opens.
5. Click **Delete**. The **Delete** confirmation dialog box closes. The deleted dashboard link is no longer shown in the dashboard folder.

Delete all dashboards

To delete all links for custom dashboards from a dashboard folder, do the following:

1. On the **Main Menu**, click **Dashboards**. The **Dashboards** dashboard is displayed.
2. Select the check box to the left of the dashboard folder that contains the dashboard links that are to be deleted. The check box for every dashboard link in that dashboard folder is selected. The red **Delete** button is visible.
3. Click **Delete**. The **Delete** confirmation dialog box opens.
4. Click **Delete**. The **Delete** confirmation dialog box closes. A message confirms that the dashboard links have been deleted. The deleted dashboard links are no longer shown in the dashboard folder. The dashboard folder is not deleted.

Delete a Dashboard Folder

Purpose

Delete a custom [dashboard folder](#) and all custom dashboards in that folder from the [Dashboards dashboard](#).

Procedure

To delete a custom dashboard folder, do the following:

1. On the [Main Menu](#), click **Dashboards**. The **Dashboards** dashboard is displayed.
2. Click the custom dashboard folder that is to be deleted. The custom dashboard folder opens to show any links to custom dashboards that exist in that folder.
3. Select the check box to the left of the dashboard folder that is to be deleted. The check box for every dashboard link in that dashboard folder is selected. The red **Delete** button is visible.
4. Click **Delete**. The **Delete** confirmation message box opens.
5. Click **Delete**. The **Delete** confirmation message box closes. A confirmation message is displayed. On the **Dashboards** dashboard, the deleted dashboard folder is no longer visible.

Create Dashboards

Contents

- [Add a Custom Dashboard \(Admin Only\)](#)
- [Copy and Rename a Dashboard \(Admin Only\)](#)
- [New Dashboard Dashboard](#)
- [New Dashboard / Edit Panel Dashboard](#)
- [Save dashboard as Dialog Box](#)
- [BC|Enterprise Metrics](#)

Add a Custom Dashboard (Admin Only)

Purpose

Use Grafana to create a JavaScript Object Notation (JSON) file for a custom **dashboard** and create a link to this dashboard in a **dashboard folder** on the **Dashboards** dashboard.

Important: Rajant does not provide support for custom dashboards.

References

For instructions for using Gafana, refer to the Grafana documentation at [Grafana Docs](#).

New for 11.25 Definitions for [BC|Enterprise metrics](#) are available for use in a JSON file for a custom dashboard.

Prerequisites

Plan the layout of the custom dashboard as **panels** arranged in rows, where each panel has a name (Panel title) and each row has heading (Row title).

Create a JavaScript Object Notation (JSON) file for the dashboard definition.

Save the JSON file for the dashboard definition in a local folder on a [BC|Enterprise Client Workstation](#).

Determine the destination dashboard folder on the **Dashboards** dashboard where the link to the new custom dashboard is to be added. By default, the destination dashboard folder used for a new dashboard will be **General**. Any destination dashboard folder other than **General** must already exist. If necessary, [add a new destination dashboard folder](#).

Procedure

To create a new dashboard, to add each panel to the dashboard, do the following:

1. Go to the BC|Enterprise Client workstation.
2. [Log in](#) to BC|Enterprise with a user name and password for user type **Administrator**.
3. On the [Main Menu](#), click **Dashboards**. The **Dashboards** dashboard is displayed.
4. Click **New Dashboard**. The **New Dashboard** dashboard is displayed with an **Add panel** dialog box.
5. Add panels and rows to the dashboard definition, as needed.
6. To save the current dashboard definition in a dashboard folder, in the **Dashboard Header**, click  (Save dashboard). The [Save dashboard as...](#) dialog box opens.
7. In the **Dashboard name** box, supply a unique name for the dashboard.
8. In the **Folder** list, select the name of the dashboard folder that is to contain the link to this custom dashboard.
9. Click **Save**. The [Save dashboard as...](#) dialog box closes. A confirmation message is displayed. The new dashboard is displayed.

Results

The  (Add panel) and  (Save dashboard) buttons are available in the Dashboard Header for a custom dashboard.

On the **Dashboards** dashboard, in the dashboard folder that was selected in the **Folder** list, a link to the custom dashboard has been added for the dashboard name supplied in the **Name** box.

Copy and Rename a Dashboard (Admin Only)

Purpose

Copy and rename a [dashboard](#) in a [dashboard folder](#) on the [Dashboards](#) dashboard and then use Grafana to modify the copied dashboard to create a new custom dashboard.

Important: Rajant does not provide support for custom dashboards.

Reference

For instructions for using Gafana, refer to the Grafana documentation at [Grafana Docs](#).

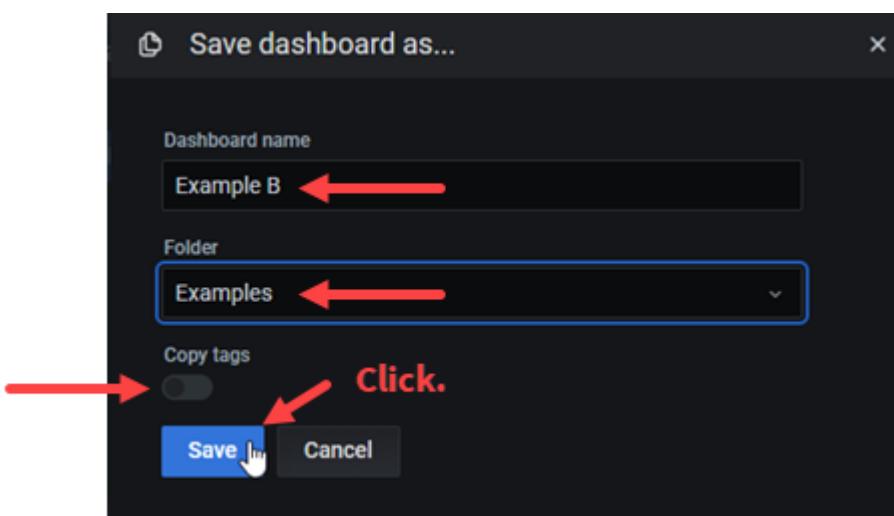
Prerequisite

Determine the dashboard folder on the [Dashboards](#) dashboard where the link to the new dashboard is to be added. The default dashboard folder used for custom dashboards is **General**.

Procedure

To copy and rename a dashboard to create a new custom dashboard, do the following:

1. [Log in](#) to BC|Enterprise with a user name and password for user type **Administrator**.
2. [Navigate](#) to the dashboard that is to be copied and saved.
3. In the [Dashboard Header](#), click (Dashboard settings). The **Settings** panel for that dashboard is displayed.
4. Click **Save as....** The [Save dashboard as...](#) dialog box opens.
5. In the **Dashboard name** box, supply a unique name for the new custom dashboard.
6. In the **Folder** list, select the dashboard folder where the link to the new custom dashboard is to be saved.
7. (Optional) to copy the search tags from the copied dashboard to the new custom dashboard, click to enable the **Copy tags** toggle.
8. Click **Save**.



The **Save dashboard as...** dialog box closes. The saved dashboard with the new dashboard name is displayed.

9. In the Dashboard Header, click (Dashboard settings). The **Settings** panel with the **General** settings (default) for the new custom dashboard is displayed.
10. In the **Description** box, supply a description for the new custom dashboard.
11. In the **Tags**
12. Modify other settings, as needed.
13. Click **Save Dashboard**. The **Save dashboard** dialog box opens.

14. (Optional) In the text box, add a comment to describe the changes made to the dashboard since the last Save.
15. Click **Save**. The **Save dashboard** dialog box closes.
16. In the dashboard header, click the (Go back). The custom dashboard is displayed.

Results

The  (Add panel) and  (Save dashboard) buttons are available in the Dashboard Header for the new custom dashboard.

On the **Dashboards** dashboard, in the dashboard folder that was selected in the **Folder** list, a link to the new custom dashboard has been added for the dashboard name supplied in the **Dashboard name** box.

Follow-up actions

Edit the custom dashboard, as needed. For instructions, refer to the Grafana documentation at [Grafana Docs](#).

New Dashboard Dashboard

Purpose

Use Gafana to create a new **dashboard** in a **dashboard folder** on the **Dashboards** dashboard.

If appropriate, plan the layout of the dashboard as **panels** arranged in rows, where each panel has a name (Panel title) and each row has heading (Row title).

Reference

For instructions for using Gafana, refer to the Grafana documentation at [Grafana Docs](#).

Navigation

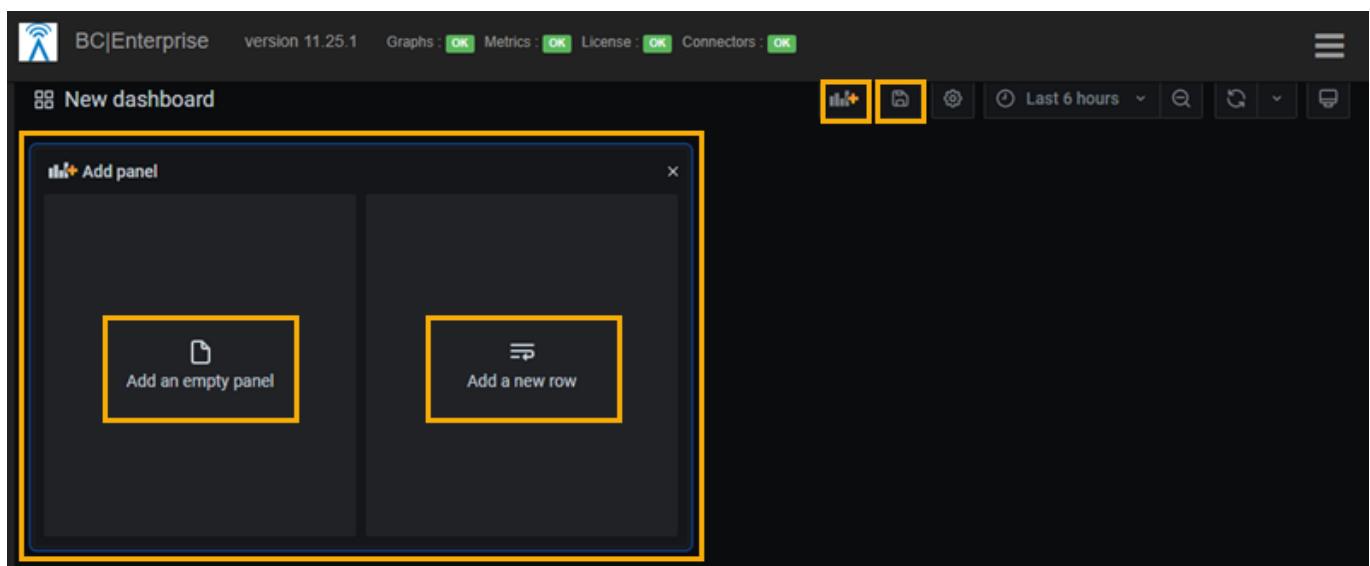
To go to the **New dashboard** dashboard, on the **Main Menu**, click **Dashboards**. On the **Dashboards** dashboard, click **Add Dashboard**.

Procedure

The [Add a Custom Dashboard \(Admin Only\)](#) procedure uses the **New dashboard** dashboard.

Illustration

The following illustration indicates the significant features on the **New dashboard** dashboard:



Add panel dialog box

A **New dashboard** dashboard opens with an **Add panel** dialog box.

In the initial **Add panel** dialog box, click **Add an empty panel**. The [New dashboard / Edit Panel](#) dashboard is displayed.

In a subsequent **Add panel** dialog box, click **Add an empty panel** or click **Add new row**, as needed to continue to create the new dashboard.

Add an empty panel button

To add a panel to the dashboard, do the following:

1. In the **Add panel** dialog box, click **Add an empty panel**. The **New dashboard / Edit Panel dashboard** is displayed.
2. Supply a panel definition.
3. Click **Apply**. The **New Dashboard** dashboard is displayed and contains the new panel.

Add a new row button

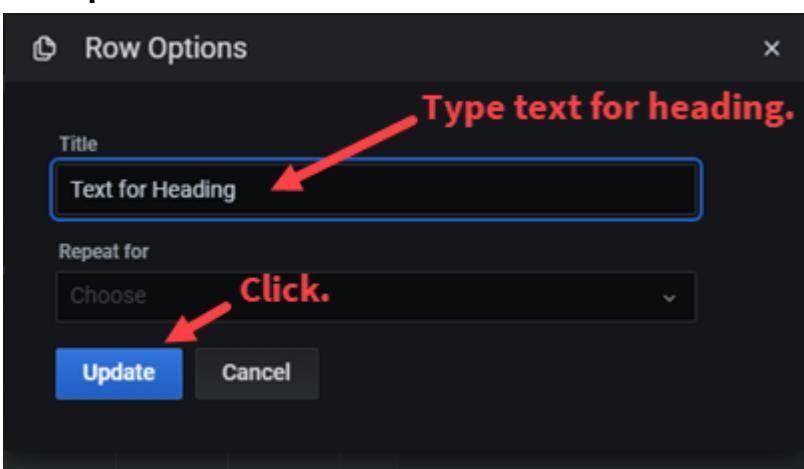
To add a heading (Row title) above a new panel in a dashboard in progress, do the following:

1. Click  (Add panel) to open an **Add panel** dialog box for a dashboard in progress.
2. In the **Add panel** dialog box, click **Add new row**. A **Row title** heading is displayed above the new panel.
3. Point to the right of the **Row title** heading, and then click 



The **Row Options** dialog box opens.

4. In the **Title** box, supply the text for the heading.
5. Click **Update**.



The **Row Options** dialog box closes. The text for the row title is displayed.

Add panel icon

Click  (Add panel) to open an **Add panel** dialog box for a dashboard in progress.

Save dashboard icon

Click  (Save dashboard) to save the current dashboard definition in a dashboard folder.

If the dashboard definition has not yet been saved in a dashboard folder, the **Save dashboard as...** dialog box opens.

If the dashboard has already been saved in a dashboard folder, any changes to the dashboard definition are saved.

New Dashboard / Edit Panel Dashboard

Purpose

Use Gafana to create a new panel in a custom [dashboard folder](#) on the [Dashboards dashboard](#).

Navigation

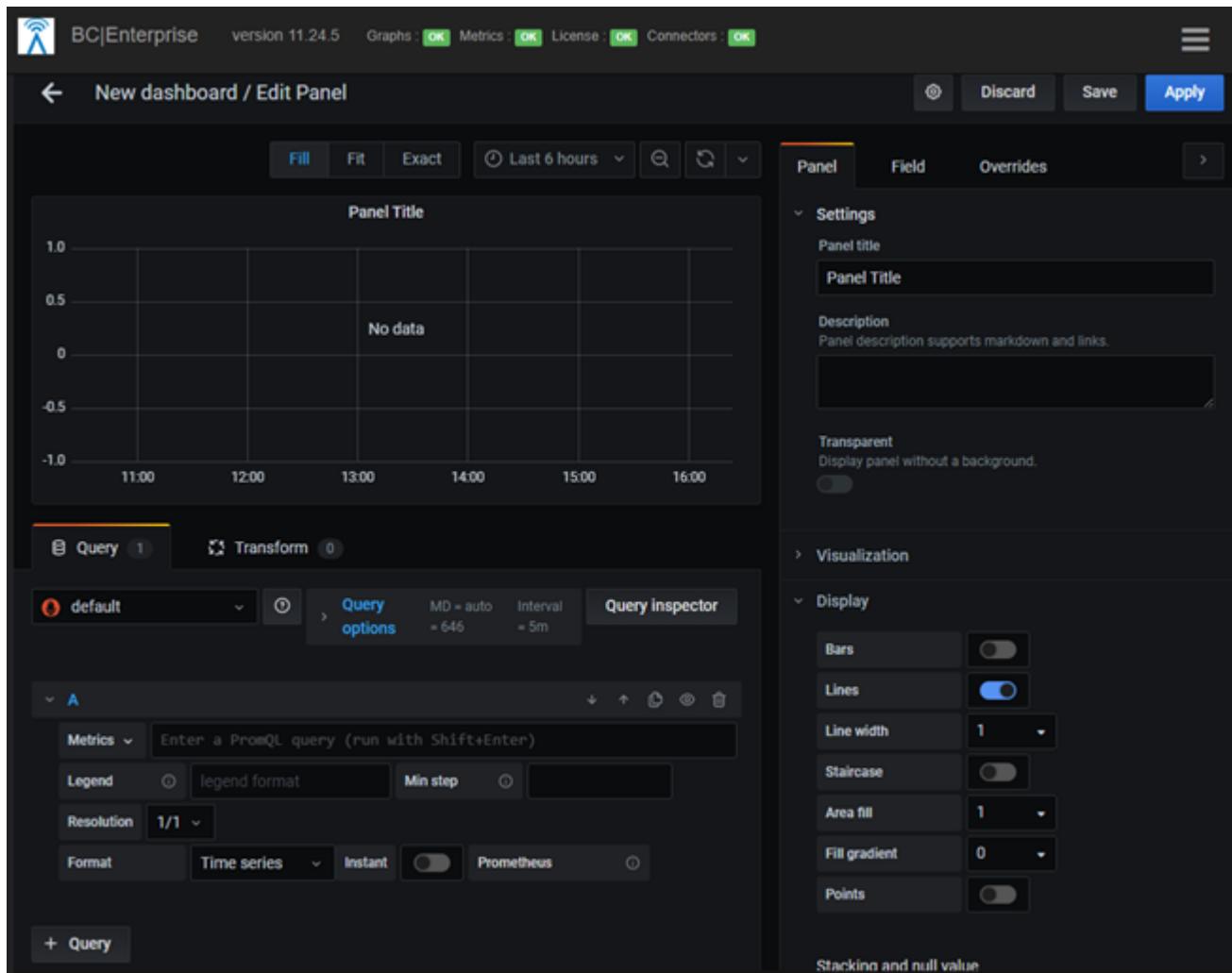
To go to the **New Dashboard / Edit Panel** dashboard, on the [Main Menu](#), click **Dashboards**. On the **Dashboards** dashboard, click **New Dashboard**. On the [New Dashboard](#) dashboard, click **Add new panel**.

Procedure

The [Add a Custom Dashboard \(Admin Only\)](#) procedure uses the **New Dashboard / Edit Panel** dashboard.

Illustration

The following illustration shows the initial **New Dashboard / Edit Panel** dashboard:



Reference

For instructions for using the **New Dashboard / Edit Panel** dashboard, refer to the Grafana documentation at [Grafana Docs](#).

Save dashboard as Dialog Box

Purpose

Save the dashboard definition for a new [dashboard](#) in a [dashboard folder](#) on the [Dashboards dashboard](#).

Navigation

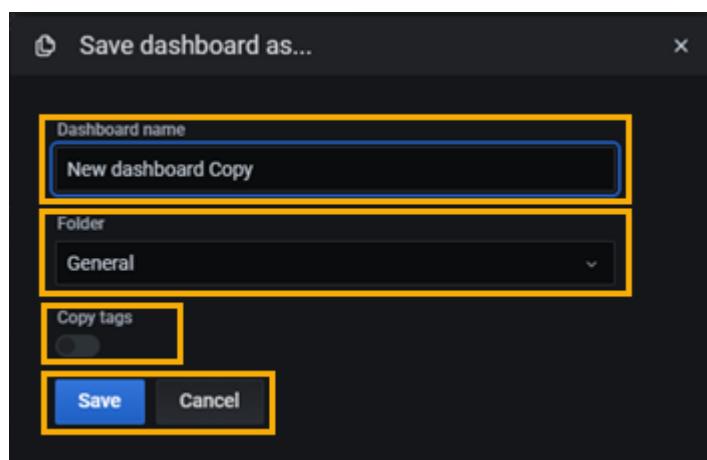
To open the **Save dashboard as...** dialog box, on the [New Dashboard dashboard](#), click  (Save dashboard).

Procedure

The [Add a New Dashboard](#) procedure uses the **Save dashboard as...** dialog box.

Illustration

The following illustration identifies the features on the **Save dashboard as...** dialog box:



Dashboard name box

In the **Dashboard name** box, supply a unique name for the dashboard. The dashboard name may not match the name of an existing dashboard or dashboard folder.

Folder list

In the **Folder** list, select the name of the dashboard folder on the [Dashboards dashboard](#) that is to contain the link to the new dashboard. The default dashboard folder for custom dashboards is **General**.

To add a new dashboard folder, click **Cancel**, and then [add a dashboard folder](#).

Copy tags toggle

Click **Copy tags** to enable or disable (default) the toggle. If the toggle is enabled, the tags from the existing dashboard are applied to the new dashboard.

Save button

To save the new dashboard definition, click **Save**.

Cancel button

To close the **Save dashboard as...** dialog box with no action, click **Cancel**.

BC|Enterprise Metrics

Contents

- [BC|Enterprise Metrics Overview](#)
- [BC|Enterprise Metrics Descriptions](#)
- [Labels for Groups of Metrics](#)
- [Rate-of-change Metrics](#)
- [_meshClass Values](#)
- [bceInternal Values](#)
- [Reset Rules for Counters or Statistics](#)
- [Lookup Keys in BreadCrumb State Data](#)
- [Undocumented Metrics](#)

BC|Enterprise Metrics Overview

Description

BC|Enterprise Data Services collects metrics from the time series database to calculate data values to be presented on dashboards in the BC|Enterprise user interface.

Documented metrics

New for 11.25 Rajant has documented definitions for some BC|Enterprise metrics.

A customer can use these documented metrics in a JavaScript Object Notation (JSON) file to create a custom dashboard with Grafana. The customer can then add the custom dashboard to the BC|Enterprise user interface.

Undocumented metrics

Definitions for some BC|Enterprise metrics are undocumented for customers.

BC|Enterprise Metrics Descriptions

Description

New for 11.25 Rajant has documented definitions for some BC|Enterprise metrics.

A customer can use these documented metrics in a JavaScript Object Notation (JSON) file to create custom [dashboard](#) with Grafana. The customer can then [add the custom dashboard](#) to the BC|Enterprise [user interface](#).

Conventions

The following conventions are used in these definitions:

- [Labels for groups](#) of metrics (\$COMMON, \$WIRED, \$WIRELESS, \$PEER)
- [Reset rules](#) for counters or statistics
- [Rate-of-change](#) metrics
- [_meshClass](#) values
- [Lookup keys](#) in BreadCrumb state data
- [bceInternal](#) value

Metrics

Metric: "active_radio_count"

Description: Number of active radios by channel number and network name.

Labels:

_channel - Channel number (Channel Number*) for a radio on the BreadCrumb

_frequency - Center operating frequency (Channel Number*) for the radio channel

_meshClass - See [_meshClass Values](#)

_network - Descriptive name for the mesh network (*Network Name) associated with the BreadCrumb

* This setting is in the BreadCrumb configuration for the BreadCrumb in BC|Commander.

Metric: "alertSystem_alerts"

Description: Number of BreadCrumb alerts reported in BC|Commander on the **Alerts** tab.

Labels:

code - Code number associated with the BreadCrumb alert

_led - BreadCrumb alert code will trigger the LED on the BreadCrumb (true/false)

_message - Message associated with the alert code number

_type - Alert type (ERROR or WARNING)

For the definition of each available code number, refer to Appendix Error and Warning Codes in the *BC|Commander Version 11 User Guide* or the BreadCrumb Version 11 User Guide for the [BreadCrumb](#) product.

Metric: "alertSystem_alerts_code"

Description: Code number associated with a BreadCrumb alert reported in BC|Commander on the **Alerts** tab.

Labels:

code - Code number associated with the BreadCrumb alert

For the definition of each available code number, refer to Appendix Error and Warning Codes in the *BC|Commander Version 11 User Guide* and the BreadCrumb User Guide for the [BreadCrumb](#) product.

Metric: "**bc_peerCount**"

Description: Number of peer BreadCrumbs with an active connection to the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**bc_quality_peerCount**"

Description: Number of peer BreadCrumb connections with a specific connection quality (High, Good or Fair) based on the Signal-to-Noise (SNR) in decibels (dB) for the BreadCrumb.

Labels:

[\\$COMMON](#)

_quality - Connection quality (High, Good or Fair)

Metric: "**cpuLoad**"

Description: Percentage of central processing unit (CPU) usage on the BreadCrumb. This value is represented as 0.0 (0 percent) through 1.0 (100 percent).

Labels:

[\\$COMMON](#)

Metric: "**icmp_rtt**"

Description: Internet Control Message Protocol (ICMP) Round Trip Time (ping time) in milliseconds between a BC|Connector and the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_arpDropped**"

Description: Number of Address Resolution Protocol (ARP) requests dropped by the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_arpDropped_roc**"

Description: [Rate of change](#) for the number of ARP requests dropped by the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_arpRequests**"

Description: Number of ARP requests received by the BreadCrumb. An instantaneus query will return the most recent value. A range query will return a list of values.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_arpRequests_roc**"

Description: [Rate of change](#) for the number of ARP requests received by the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_arpRequestsAnswered**"

Description: Rate of ARP requests answered by the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_arpRequestsAnswered_roc**"

Description: [Rate of change](#) for the number of ARP requests answered by the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_arpRequestsUnicast**"

Description: Rate of unicast ARP requests received by the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_arpRequestsUnicast_roc**"

Description: [Rate of change](#) for the number of unicast ARP requests received by the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_arpTotal**"

Description: Total number of ARP requests of all types sent and received on any interface on the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_arpTotal_roc**"

Description: [Rate of change](#) in the number of ARP requests of all types sent and received on any interface on the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_broadcastIntroPassed**"

Description: Total number of InstaMesh introduction packets broadcasted from a remote source that arrived at the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_broadcastIntroSourced**"

Description: Total number of InstaMesh introduction packets broadcasted from a local source that arrived at the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_discoveriesPassed**"

Description: Total number of InstaMesh discovery packets that were received from a remote source and then forwarded by the BreadCrumb.

Labels:
\$COMMON

Metric: "**instamesh_discoveriesPassed_roc**"

Description: [Rate of change](#) in the number of InstaMesh discovery packets that were received from a remote source and then forwarded by the BreadCrumb.

Labels:
\$COMMON

Metric: "**instamesh_discoveriesSourced**"

Description: Total number of InstaMesh discovery packets that were received from a local source and then forwarded by the BreadCrumb.

Labels:
\$COMMON

Metric: "**instamesh_discoveriesSourced_roc**"

Description: [Rate of change](#) in the number of InstaMesh discovery packets that were received from a local source and then forwarded by the BreadCrumb.

Labels:
\$COMMON

Metric: "**instamesh_floodsDropped**"

Description: Number of multicast packets dropped by the BreadCrumb due to exceeding the InstaMesh : Max Flood setting in the BreadCrumb configuration.

Labels:
\$COMMON

Metric: "**instamesh_ndDropped**"

Description: Number of Neighbor Discovery Protocol (ND) requests dropped by the BreadCrumb.

Labels:
\$COMMON

Metric: "**instamesh_ndDropped_roc**"

Description: [Rate of change](#) for the number of ND requests dropped by the BreadCrumb.

Labels:
\$COMMON

Metric: "**instamesh_ndRequests**"

Description: Number of Neighbor ND requests received by the BreadCrumb.

Labels:
\$COMMON

Metric: "**instamesh_ndRequests_roc**"

Description: [Rate of change](#) for the number of ND requests received by the BreadCrumb.

Labels:
\$COMMON

Metric: "**instamesh_ndRequestsAnswered**"

Description: Number of ND requests answered by the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_ndRequestsUnicast**"

Description: Number of unicast ND requests received by the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_ndRequestsUnicast_roc**"

Description: [Rate of change](#) for the number of unicast ND requests received by the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_ndTotal**"

Description: Total number of ND packets of all types received by the BreadCrumb on any interface.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_ndTotal_roc**"

Description: [Rate of change](#) for in the number of ND packets of all types received on any interface on the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_overflows**"

Description: Total number of InstaMesh queue overflows on the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_packetsDropped**"

Description: Number of InstaMesh packets dropped by the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_packetsDropped_roc**"

Description: [Rate of change](#) for the number of InstaMesh packets dropped by the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_packetsMulticast**"

Description: Number of InstaMesh multicast packets processed by the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_packetsMulticast_roc**"

Description: [Rate of change](#) for the number of InstaMesh multicast packets processed by the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_packetsReceived**"

Description: Number of InstaMesh packets received by the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_packetsReceived_roc**"

Description: [Rate of change](#) for the number of InstaMesh packets received by the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_packetsSent**"

Description: Number of InstaMesh packets sent by the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_packetsSent_roc**"

Description: [Rate of change](#) for the number of InstaMesh packets sent by the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_sourceFloodsDropped**"

Description: Total number of multicast packets that were dropped by the BreadCrumb due to exceeding the InstaMesh : Flood : Max Flood per Source setting and the InstaMesh : Flood : Flood Limits setting by MAC address in the BreadCrumb configuration.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_timeWaited**"

Description: Total number of times InstaMesh waited for data.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_timeWaited_roc**"

Description: [Rate of change](#) for the total number of times InstaMesh waited for data.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_undeliverableTransmitFailures**"

Description: Total number of transmit failures from the BreadCrumb to another BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_undeliverableTransmitFailures_roc**"

Description: [Rate of change](#) for the total number of transmit failures for the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_undeliverablesReceived**"

Description: Total number of undeliverable InstaMesh packets received by the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_undeliverablesReceived_roc**"

Description: [Rate of change](#) for the total number of undeliverable InstaMesh packets received by the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_unicastDropped**"

Description: Total number of unicast packets that were dropped by the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_unicastIntroRespPassed**"

Description: Total number of unicast introduction response packets received from a remote source and then forwarded by the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_unicastIntroRespSourced**"

Description: Total number of unicast introduction response packets that were received from a local source and then forwarded by the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**instamesh_unicastIntroSourced**"

Description: The total number of unicast introduction packets received from a local source and forwarded by the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**max_peers**"

Description: Maximum number of possible peer BreadCrumbs on a mesh by channel, frequency, meshClass and network name.

Labels:

_channel - Channel number (Channel Number*) for a radio on the BreadCrumb

_frequency - Center operating frequency for the radio channel (Channel Number*)

_meshClass - See [_meshClass Values](#)

_network - Network (Network Name*) associated with the BreadCrumb.

* This setting is in the BreadCrumb configuration for the BreadCrumb in BC|Commander.

Metric: "**mesh_density**"

Description: Density of a channel on a mesh network as a percentage. This value is represented as 0.0 (0 percent) through 1.0 (100 percent). A density of 100 percent (1.0) means that every radio on a channel is connected to every other radio that is using the same channel.

Labels:

_channel - Channel number (Channel Number*) for a radio on the BreadCrumb

_frequency - Center operating frequency for the radio channel (Channel Number*)

_meshClass - See [_meshClass Values](#)

_network - Network (Network Name*) associated with the BreadCrumb.

* This setting is in the BreadCrumb configuration for the BreadCrumb in BC|Commander.

Metric: "**rajant_bcelicense**"

Description: Identifies each BreadCrumb by Encapsulation Identifier (Encap ID) as licensed to be monitored (**1=true**) or unlicensed (**0=false**).

Labels:

_encap - EncapID

licensed - true/false

Metric: "**samples_added**"

Description: ([bcelInternal](#)) Number of BC|Enterprise metrics that Rajant added to the time series database over a given period of time.

Metric: "**sessionState**"

Description: [bcelInternal](#) _sessionState value (int).

Labels:

[\\$COMMON](#)

_sessionState - Integer value (0 through 10) representing the state of the connection between BC|Commander and the BreadCrumb, as follows:

0 - CREATED: The BreadCrumb has been discovered; but a session has not been initiated.

1 - INITIALIZING: The session has been initiated.

2 - CONNECTING: The connection between BC|Commander and the BreadCrumb is being attempted. This includes only setup of the Transmission Control Protocol (TCP) connection and Transport Layer Security (TLS) handshaking. After the connection has been established, login must be accomplished via a BCAPIMessage.

3 - CONNECTION_FAILED: The connection attempt has failed.

4 - HANDSHAKING: The attempted TLS connection is in the handshaking phase.

5 - LOGGING_IN: The TLS connection has been established and the login process has started.

6 - LOGIN_FAILED: The login process has failed.

7 - READING: Initial information is being read from the BreadCrumb

8 - CONNECTED: The successful connection between BC|Commander and the BreadCrumb has been completed. BCAPIMessages may now be sent and received between BC|Commander and the BreadCrumb.

9 - CONNECTION_LOST: connection between BC|Commander and the BreadCrumb has been lost.

10 - NOT_CONNECTED: The session has been disconnected normally or due to an exception. A disconnected session may not be reused.

Metric: "**system_bootCounter**"

Description: Number of reboots that occurred since the last zeroize action occurred for the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**system_bootCounter_roc**"

Description: [Rate of change](#) for the system_bootCounter value for the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**system_freeMemory**"

Description: Number of bytes of free memory on the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**system_idle**"

Description: Idle time (in milliseconds) for the central processing unit (CPU) on the BreadCrumb.

Labels:

[\\$COMMON](#)

Metric: "**system_reboot**"

Description: Indicates whether the BreadCrumb needs to be rebooted due to a change in the BreadCrumb configuration (**1=true 0=false**).

Labels:

[\\$COMMON](#)

Metric: "**system_running**"

Description: Indicates whether the BreadCrumb is in the "running" state (**1=true 0=false**), not rebooting or installing new software. This value is not used in BC|Enterprise.

Labels:

[\\$COMMON](#)

Metric: "**system_sensors_temperature_value_current**"

Description: Current temperature read by BreadCrumb sensors in 100ths of degrees Celsius.

Labels:

[\\$COMMON](#)

system_sensors_temperature - [Lookup key](#) in the BreadCrumb state data.

temperature_name - Name of temperature sensor being reported, as follows:

Name starting with "MB": Motherboard temperature sensor on SlipStream or FE1 product family BreadCrumb.

Name starting with "Core": CPU temperature sensor on SlipStream or FE1 product family BreadCrumb.

imx_thermal_zone: Temperature sensor on DX2 product family BreadCrumb.

default: The only temperature sensor on any other BreadCrumb.

Metric: "**system_sensors_voltage_value_current**"

Description: Voltage (in centi-volts) read by voltage sensors on the BreadCrumb.

Labels:

\$COMMON

system_sensors_voltage - [Lookup key](#) in the BreadCrumb state data.

voltage_name - Name of voltage sensor being reported for the BreadCrumb. Only the voltage sensor named "input" should be monitored. Other voltage sensors can be ignored.

Metric: "**system_temperature**"

Description: Temperature of the overall BreadCrumb in 100ths of degrees Celsius.

Labels:

\$COMMON

Metric: "**system_uptime**"

Description: Number of milliseconds since the last reboot of the BreadCrumb. This value is the value for the [lookup key](#) under state > system > uptime on the **BCAPI Explorer** tab in BC|Commander.

Labels:

\$COMMON

Wired metrics

Metric: "**wired_aptState**"

Description: Automatic Protocol Tunneling (APT) state (**0** = master, **1** = slave, **2** = link and **3** = none) of a specific Ethernet interface (ethn) on the BreadCrumb.

Labels:

\$COMMON,

\$WIRED

Metric: "**wired_peerCount**"

Description: Number of wired peer BreadCrumbs on a specific Ethernet interface (ethn) on the BreadCrumb.

Labels:

\$COMMON,

\$WIRED

_quality - Quality of link from the BreadCrumb to a peer BreadCrumb based on Cost.

Metric: "**wired_peer_cost**"

Description: Cost of a wired peer connection from the BreadCrumb to a specific Ethernet interface (ethn) on a peer BreadCrumb.

Labels:

\$COMMON,

\$WIRED,

\$PEER,

_peer_wired - [\(bceInternal\) Lookup key](#) for a specific Ethernet interface (ethn) on a remote BreadCrumb

wired_peer - MAC address for a specific Ethernet interface (ethn) on a remote peer BreadCrumb

Metric: "wired_stateChanges"

Description: Number of link state changes that occurred on the BreadCrumb since the last reboot for the BreadCrumb.

Labels:

[\\$COMMON](#),
[\\$WIRED](#)

Metric: "wired_stats_rxBytes"

Description: Number of bytes received since the last reset for the Ethernet interface (ethn) or reboot for the BreadCrumb.

Labels:

[\\$COMMON](#),
[\\$WIRED](#)

Metric: "wired_stats_rxBytes_roc"

Description: [Rate of change](#) for the number of bytes received since the last reset for the Ethernet interface (ethn) or reboot for the BreadCrumb.

Labels:

[\\$COMMON](#),
[\\$WIRED](#)

Metric: "wired_stats_rxCrcErrors"

Description: Number of Cyclic Redundancy Check (CRC) errors in Received packets since the last reset of the Ethernet interface (ethn) for the BreadCrumb. A CRC error indicates that received data is corrupted.

Labels:

[\\$COMMON](#),
[\\$WIRED](#)

Metric: "wired_stats_rxDroppedPackets"

Description: Number of dropped Receive packets since the last reset of the Ethernet interface (ethn) or reboot for the BreadCrumb.

Labels:

[\\$COMMON](#),
[\\$WIRED](#)

Metric: "wired_stats_rxErrors"

Description: Number of Receive errors since the last reset of the Ethernet interface (ethn) or reboot for the BreadCrumb.

Labels:

[\\$COMMON](#),
[\\$WIRED](#)

Metric: "wired_stats_rxPackets"

Description: Number of Receive packets since the last reset of the Ethernet interface (ethn) or reboot for the BreadCrumb.

Labels:

[\\$COMMON](#),
[\\$WIRED](#)

Metric: **"wired_stats_rxPackets_roc"**

Description: [Rate of change](#) for the number of Receive packets since the last reset of the Ethernet interface (ethn) or reboot for the BreadCrumb.

Labels:

[\\$COMMON](#),

[\\$WIRED](#)

Metric: **"wired_stats_txBytes"**

Description: Number of transmitted bytes since the last reset of the Ethernet interface (ethn) or reboot for the BreadCrumb.

Labels:

[\\$COMMON](#),

[\\$WIRED](#)

Metric: **"wired_stats_txBytes_roc"**

Description: [Rate of change](#) for the number of transmitted bytes since the last reset of the Ethernet interface (ethn) or reboot for the BreadCrumb.

Labels:

[\\$COMMON](#),

[\\$WIRED](#)

Metric: **"wired_stats_txDroppedPackets"**

Description: Number of dropped Transmit packets since the last reset of the Ethernet interface (ethn) or reboot for the BreadCrumb.

Labels:

[\\$COMMON](#),

[\\$WIRED](#)

Metric: **"wired_stats_txErrors"**

Description: Number of Transmit errors since the last reset of the Ethernet interface (ethn) or reboot for the BreadCrumb.

Labels:

[\\$COMMON](#),

[\\$WIRED](#)

Metric: **"wired_stats_txPackets"**

Description: Number of Transmit packets since the last reset of the Ethernet interface (ethn) or reboot for the BreadCrumb.

Labels:

[\\$COMMON](#),

[\\$WIRED](#)

Metric: **"wired_stats_txPackets_roc"**

Description: [Rate of change](#) for the number of Transmit packets since the last reset of the Ethernet interface (ethn) or reboot for the BreadCrumb.

Labels:

[\\$COMMON](#),

[\\$WIRED](#)

Metric: "wired_total_peerCount"

Description: Total number of connections to peer BreadCrumbs on an Ethernet interface (ethn).

Labels:

\$COMMON,

\$WIRED

Wireless metrics**Metric: "wireless_ap_client_rssi"**

Description: Received Signal Strength Indicator (RSSI) or signal-to-noise ratio (SNR) from a wlanx interface on the BreadCrumb to a client device.

Labels:

\$COMMON,

\$WIRELESS,

wireless_ap_client - MAC address of a client device for a wireless application

wireless_ap - ([bceInternal](#)) [Lookup key](#) in BreadCrumb state data

Metric: "wireless_channelActiveTime"

Description: Total time the radio for a wlanx interface on the BreadCrumb was running.

Labels:

\$COMMON,

\$WIRELESS

Metric: "wireless_channelBusyRatio"

Description: Percentage of time the radio for a wlanx interface on the BreadCrumb was transmitting or receiving.

Labels:

\$COMMON,

\$WIRELESS

Metric: "wireless_channelBusyTime"

Description: Amount of time the radio for a wlanx interface on the BreadCrumb was transmitting or receiving.

Labels:

\$COMMON,

\$WIRELESS

Metric: "wireless_channelOtherRatio"

Description: Percentage of Active time the radio for a wlanx interface on the BreadCrumb was neither sending nor receiving (noise) (activeTime - busyTime = idle time).

Labels:

\$COMMON,

\$WIRELESS

Metric: "wireless_channelReceiveRatio"

Description: Percentage of time the radio for a wlanx interface on the BreadCrumb was receiving.

Labels:

\$COMMON,

\$WIRELESS

Metric: "wireless_channelReceiveTime"

Description: Amount of time the radio for a wlanx interface on the BreadCrumb was receiving.

Labels:

\$COMMON,
\$WIRELESS

Metric: "wireless_channelTransmitRatio"

Description: Percentage of time the radio for a wlanx interface on the BreadCrumb was transmitting.

Labels:

\$COMMON,
\$WIRELESS

Metric: "wireless_channelTransmitTime"

Description: Amount of time the radio for a wlanx interface on the BreadCrumb was transmitting.

Labels:

\$COMMON,
\$WIRELESS

Metric: "wireless_clientCount"

Description: Number of client devices connected to all Access Points (APs) on a radio for a wlanx interface on the BreadCrumb.

Labels:

\$COMMON,
\$WIRELESS

Metric: "wireless_noise"

Description: Noise Floor in dBm for a wlanx interface on the BreadCrumb.

Labels:

\$COMMON,
\$WIRELESS

Metric: "wireless_txpower"

Description: Transmit Power setting in the BreadCrumb configuration for the radio for a wlanx interface on the BreadCrumb.

Labels:

\$COMMON,
\$WIRELESS

Wireless Peer Metrics

Metric: "wireless_peerCount"

Description: Number of connections from each radio on this BreadCrumb to a peer BreadCrumb by Cost.

Labels:

\$COMMON,
\$WIRELESS

_quality - Cost (good, fair or poor) for the connection

Metric: "wireless_total_peerCount"

Description: Number of connections from each radio on this BreadCrumb to a peer BreadCrumb.

Labels:

[\\$COMMON](#),
[\\$WIRELESS](#)

Metric: "wireless_peer_cost"

Description: Cost of a connection from this BreadCrumb to a peer BreadCrumb.

Labels:

[\\$COMMON](#),
[\\$WIRELESS](#),
[\\$PEER](#)

wireless_peer - MAC address of a radio on a peer BreadCrumb

_peer_wireless - ([bceInternal](#)) [Lookup key](#) in BreadCrumb state data

Metric: "wireless_peer_rate"

Description: Connection rate (in Mbps) between the peer radios for a wlanx interface on the BreadCrumb.

Labels:

[\\$COMMON](#),
[\\$WIRELESS](#),
[\\$PEER](#)

wireless_peer - MAC address of a radio on a peer BreadCrumb

_peer_wireless - ([bceInternal](#)) [Lookup key](#) in BreadCrumb state data

Metric: "wireless_peer_rssi"

Description: RSSI or SNR (in dB) between the peer radios for a wlanx interface on the BreadCrumb.

Labels:

[\\$COMMON](#),
[\\$WIRELESS](#),
[\\$PEER](#)

wireless_peer - MAC address of a radio on the peer BreadCrumb

_peer_wireless - ([bceInternal](#)) [Lookup key](#) in BreadCrumb state data

Metric: "wireless_peer_signal"

Description: Signal power (in dBm) between the peer radios for a wlanx interface on the BreadCrumb.

Labels:

[\\$COMMON](#),
[\\$WIRELESS](#),
[\\$PEER](#)

wireless_peer - MAC address of a radio on a peer BreadCrumb

_peer_wireless - ([bceInternal](#)) [Lookup key](#) in BreadCrumb state data

Metric: "wireless_peer_stats_rxBytes"

Description: Number of bytes received from a peer radio on a remote BreadCrumb to a radio for a wlanx interface on this BreadCrumb.

Labels:

[\\$COMMON](#),
[\\$WIRELESS](#),
[\\$PEER](#)

wireless_peer - MAC address of a radio on a peer BreadCrumb
_peer_wireless - ([bceInternal](#)) [Lookup key](#) in BreadCrumb state data

Metric: "**wireless_peer_stats_rxBytes_roc**"

Description: [Rate of change](#) for the number of bytes received from a peer radio on a remote BreadCrumb to a radio for a wlanx interface on this BreadCrumb.

Labels:

[\\$COMMON](#)

[\\$WIRELESS](#)

[\\$PEER](#)

wireless_peer - MAC address of a radio on a peer BreadCrumb

_peer_wireless - ([bceInternal](#)) [Lookup key](#) in BreadCrumb state data

Metric: "**wireless_peer_stats_rxPackets**"

Description: Number of packets received from a peer radio on a remote BreadCrumb to a radio for a wlanx interface on this BreadCrumb.

Labels:

[\\$COMMON](#),

[\\$WIRELESS](#),

[\\$PEER](#)

wireless_peer - MAC address of a radio on a peer BreadCrumb

_peer_wireless - ([bceInternal](#)) [Lookup key](#) in BreadCrumb state data

Metric: "**wireless_peer_stats_txBytes**"

Description: Number of bytes transmitted from a radio for a wlanx interface on this BreadCrumb to a peer radio on a remote BreadCrumb.

Labels:

[\\$COMMON](#),

[\\$WIRELESS](#),

[\\$PEER](#)

wireless_peer - MAC address of a radio on a peer BreadCrumb

_peer_wireless - ([bceInternal](#)) [Lookup key](#) in BreadCrumb state data

Metric: "**wireless_peer_stats_txBytes_roc**"

Description: [Rate of change](#) for the number of bytes transmitted from a radio for a wlanx interface on this BreadCrumb to a peer radio on a remote BreadCrumb.

Labels:

[\\$COMMON](#),

[\\$WIRELESS](#),

[\\$PEER](#)

wireless_peer - MAC address of a radio on a peer BreadCrumb

_peer_wireless - ([bceInternal](#)) [Lookup key](#) in BreadCrumb state data

Metric: "**wireless_peer_stats_txPackets**"

Description: Number of packets transmitted from a radio for a wlanx interface on this BreadCrumb to a peer radio on a remote BreadCrumb.

Labels:

[\\$COMMON](#),

[\\$WIRELESS](#),

[\\$PEER](#)

wireless_peer - MAC address of a radio on a peer BreadCrumb
_peer_wireless - Interface lookup key in BreadCrumb state data

Metric: "**wireless_peer_txpower**"

Description: Transmit power (in dBm) used between a radio for a wlanx interface on this BreadCrumb to a peer radio on a remote BreadCrumb.

Labels:

\$COMMON,
\$WIRELESS,
\$PEER

wireless_peer - MAC address of a radio on a peer BreadCrumb

_peer_wireless - ([bceInternal](#)) Lookup key in BreadCrumb state data

Wireless Interface Statistics

Metric: "**wireless_stats_beaconInterrupts**"

Description: The number of interrupts that trigger the BreadCrumb to send an 802.11 beacon.

Labels:

\$COMMON,
\$WIRELESS

Metric: "**wireless_stats_beaconInterrupts_roc**"

Description: [Rate of change](#) for the number of interrupts that trigger the BreadCrumb to send an 802.11 beacon.

Labels:

\$COMMON\$COMMON,
\$WIRELESS

Metric: "**wireless_stats_pulseEvents**"

Description: Number of detected radar pulses in the configured frequency.

Labels:

\$COMMON,
\$WIRELESS

Metric: "**wireless_stats_pulseEvents_roc**"

Description: [Rate of change](#) for the number of detected radar pulses in the configured frequency.

Labels:

\$COMMON,
\$WIRELESS

Metric: "**wireless_stats_radarDetections**"

Description: Number of detected licensed radar pulses that caused the interface to shut down.

Labels:

\$COMMON,
\$WIRELESS

Metric: "**wireless_stats_radarDetections_roc**"

Description: [Rate of change](#) for the number of licensed radar pulses that caused the interface to shut down.

Labels:

\$COMMON,
\$WIRELESS

Metric: "**wireless_stats_rxBytes**"

Description: Number of bytes received on a wlanx interface on the BreadCrumb.

Labels:

\$COMMON,
\$WIRELESS

Metric: "**wireless_stats_rxBytes_roc**"

Description: [Rate of change](#) for the number of bytes received on a wlanx interface on the BreadCrumb.

Labels:

\$COMMON,
\$WIRELESS

Metric: "**wireless_stats_rxInterrupts**"

Description: Number of receive interrupts that occurred on a wlanx interface on the BreadCrumb.

Labels:

\$COMMON,
\$WIRELESS

Metric: "**wireless_stats_rxPackets**"

Description: Number of packets received on a wlanx interface on the BreadCrumb.

Labels:

\$COMMON
\$WIRELESS

Metric: "**wireless_stats_rxPackets_roc**"

Description: [Rate of change](#) for the number of packets received on a wlanx interface on the BreadCrumb.

Labels:

\$COMMON,
\$WIRELESS

Metric: "**wireless_stats_rxPhyErrors**"

Description: The number of physical layer errors that occurred on the BreadCrumb while trying to receive packets.

Labels:

\$COMMON,
\$WIRELESS

Metric: "**wireless_stats_txBytes**"

Description: Number of bytes transmitted on a wlanx interface on the BreadCrumb.

Labels:

\$COMMON,
\$WIRELESS

Metric: "**wireless_stats_txBytes_roc**"

Description: [Rate of change](#) for the number of bytes transmitted on a wlanx interface on the BreadCrumb.

Labels:

[\\$COMMON](#),
[\\$WIRELESS](#)

Metric: "**wireless_stats_txInterrupts**"

Description: Number of transmission interrupts that occurred on a wlanx interface on the BreadCrumb.

Labels:

[\\$COMMON](#),
[\\$WIRELESS](#)

Metric: "**wireless_stats_txPackets**"

Description: Number of packets transmitted from a wlanx interface on the BreadCrumb.

Labels:

[\\$COMMON](#),
[\\$WIRELESS](#)

Metric: "**wireless_stats_txPackets_roc**"

Description: [Rate of change](#) for the number of packets transmitted from a wlanx interface on the BreadCrumb.

Labels:

[\\$COMMON](#),
[\\$WIRELESS](#)

BC|Connector and BC|Enterprise internal metrics

These metrics can help determine how well a [BC|Connector server](#) or the [BC|Enterprise server](#) is operating.

Metric: "**system_cpu_count**"

Description: Number of central processing units (CPUs) on a BC|Connector server and BC|Enterprise server.

Metric: "**system_cpu_usage**"

Description: Percentage of CPU usage by BC|Connector server and BC|Enterprise server.

Metric: "**system_load_average_1m**"

Description: Average system load on a BC|Connector server and BC|Enterprise server during the last 1 minute.

Labels for Groups of Metrics

Description

In the [description](#) for a BC|Enterprise metric, a label represents a group of elements from the time series database.

A label is comprised of a dollar sign (\$) character followed by uppercase letters.

Each label represents a group of elements, as follows:

- **\$COMMON:** Common metrics that identify a BreadCrumb or a mesh network
- **\$WIRED:** Common metrics for an Ethernet network interface (*ethn*) on a [Breadcrumb](#)
- **\$WIRELESS:** Common metrics for a wireless LAN interface (*wlanx*) on a [Breadcrumb](#)
- **\$PEER:** Common metrics for a [peer BreadCrumb](#)

\$COMMON group

The \$COMMON label represents a group of metrics that identify a BreadCrumb or a mesh network.

The \$COMMON label represents the following group of metrics:

_encap - Encapsulation ID (Encap ID) portion of the BreadCrumb serial number
 _groups - List of BreadCrumb groups (*Groups) that include the BreadCrumb with a colon (:) character as a separator or **No Groups** for a BreadCrumb not assigned to a BreadCrumb group
 _model - BreadCrumb model name that identifies the product family and model for the [Breadcrumb](#)
 _name - BreadCrumb name (Breadcrumb Name*) (if assigned) or BreadCrumb serial number (*model-encapID*)
 _network - Mesh network name for the BreadCrumb
 _platform - Product family for the BreadCrumb
 _version - BreadCrumb firmware version (for example, 11.25.1) installed on the BreadCrumb
 instance - Internet Protocol (IP) [address](#) and port number (*ip-address:port*) for the [Metrics Port](#) on the [BC|Connector server](#) that provided metrics for the BreadCrumb
 job - Job name in the format bce-*address*, where *address* is the IP address for a BC|Connector server [configured](#) in BC|Enterprise

* This setting is in the BreadCrumb configuration for the BreadCrumb in BC|Commander.

\$WIRED group

The \$WIRED label represents a group of metrics for an Ethernet network interface through a wired Local Area Network (LAN) on a [wired BreadCrumb](#).

The name of the port (*ethn*) for each Ethernet network interface on a BreadCrumb is shown in BC|Commander in the BreadCrumb Configuration window for the BreadCrumb in the Selection Tree.

The \$WIRED label represents the following group of metrics:

_aptState - Automatic Protocol Tunneling (APT) state (**0** = master, **1** = slave, **2** = link or **3** = none) in text format for the BreadCrumb
 interface - Name of the port (*ethn*) for an Ethernet network interface on the BreadCrumb
 wired - [Lookup key](#) in BreadCrumb state data

\$WIRELESS group

The \$WIRELESS label represents a group of metrics for a radio for a wireless Local Area Network (WLAN) interface on a [wireless BreadCrumb](#).

Name for each WLAN interface (wlanx) on a BreadCrumb is shown in BC|Commander in the BreadCrumb Configuration window for the BreadCrumb in the Selection Tree.

The \$WIRELESS label represents the following group of metrics:

- _band - Radio frequency band for a wireless interface (wlanx) on the BreadCrumb
- _bandwidth - Channel bandwidth (Channel Bandwidth*) or a wireless interface (wlanx) on the BreadCrumb
- _channel - Channel number (Channel Number*) for a radio on the BreadCrumb
- _frequency - Center frequency for the radio channel (Channel Number*)
- _interface - Radio frequency with channel number (Channel Number*) and center frequency (Channel Number*) (for example, 5 GHz, Ch: 157 5785 MHz)
- _meshClass - See [meshClass values](#)
- wireless - [Lookup key](#) in BreadCrumb state data

* This setting is in the BreadCrumb configuration for the BreadCrumb in BC|Commander.

\$PEER group

The \$PEER label represents a group of metrics for a [peer BreadCrumb](#) that is connected to the BreadCrumb.

The \$PEER label represents the following group of metrics:

- _peer_encap - Encapsulation Identifier (Encap ID) portion of the BreadCrumb serial number for a peer BreadCrumb
- _peer_model - Model for a peer BreadCrumb
- _peer_name - BreadCrumb name (BreadCrumb Name*) (if assigned) or serial number (*model-encapID*) for the peer BreadCrumb

* This setting is in the BreadCrumb configuration for the BreadCrumb in BC|Commander.

Rate-of-change Metrics

Description

In a [description](#) for a [BC|Enterprise metric](#), a rate-of-change metric represents a value for the rate of change for another metric in a specified time period (default is 5 minutes).

Naming convention

The naming convention for a rate-of-change metric is to append the characters "_roc" to the name of the metric for which the rate of change is to be calculated.

Requirements

At least two metrics must be reported to calculate a rate-of-change value. A rate-of-change value is the difference between the current value and the previously-reported value.

Missing data and counters that have reset are accounted for when generating the rate-of-change value.

_meshClass Values

Description

In a [description](#) for a [BC|Enterprise metric](#), a _meshClass value represents the available interoperability for a radio on a BreadCrumb.

Rajant radios that are configured to be on the same channel but with different bandwidth settings are able to connect and communicate. However, this is only true for specific bandwidth settings.

The _meshClass value is used to calculate the percentage value shown in the **Mesh Density** panel on the [Mesh / Mesh Density dashboard](#).

Examples

A 2.4 GHz radio with bandwidth setting 20 MHz can mesh with another 2.4 GHz radio with bandwidth setting 40 MHz on the same channel. This interoperability is identified by _meshClass="Regular".

Conversely, a 2.4 GHz radio with bandwidth setting 10 MHz cannot mesh with another 2.4 GHz radio with bandwidth setting 20 MHz. In this case, the _meshClass for the 2.4 GHz radio with bandwidth setting 10 MHz is identified as _meshClass="10 MHz".

Values

Possible values for _meshClass are the following:

- 5MHz
- 10MHz
- 40MHz
- Regular

Reference

For a description of radio interoperability, refer to the [BC|Commander Version 11 User Guide](#) on the [Rajant Support web site](#), BreadCrumb Configuration chapter, BreadCrumb configuration setting Ports: wlanX: Radio: Channel Bandwidth.

bceInternal Values

Description

In the [description](#) for a BC|Enterprise metric, the term "bceInternal" refers to a value that is stored for internal use only.

Requirements

values identified as "bceInternal" are not for use by customers.

Reset Rules for Counters or Statistics

Description

Counters and statistics in the BreadCrumb firmware are used to generate values for [BC|Enterprise metrics](#). During BreadCrumb operation, these counters and statistics reset according to predefined rules.

Reset rules

During BreadCrumb operation, metrics for counters and statistics reset according to the following predefined rules:

- All counters on a BreadCrumb reset on a reboot or power-up cycle for that BreadCrumb.
- InstaMesh statistics reset on a [Mesh Restart](#) operation.
- Statistics for a specific radio on a wireless LAN interface (wlan) reset on a [Radio Reset](#) operation.
- Statistics for a connection from a particular BreadCrumb to a peer BreadCrumb reset when that peer connection is lost.
- Statistics for all peer BreadCrumbs reset on a [Mesh Restart](#) operation.
- In BC|Enterprise metric [descriptions](#), counters identified as **bceInternal** are the reset when a [BC|Connector](#) instance restarts.

Mesh Restart operation

A Mesh Restart operation is a restart of the software that controls the BreadCrumb.

A Mesh Restart occurs when the BreadCrumb is powered off, then powered on.

A Mesh Restart occurs when an unrecoverable software fault (error Code 51: Internal error, system will restart) occurs.

Radio Reset operation

A Radio Reset operation occurs when one of the following occurs:

- The BreadCrumb hardware detects and handles an error condition.
- A change to the radio settings in the BreadCrumb configuration is saved.

In BC|Commander, for a selected BreadCrumb in the BreadCrumb table, in the BreadCrumb Configuration window, in the Selection Tree, under **Ports**, select the wireless LAN interface (wlanx) for a radio. The Settings Panel shows the radio settings.

Lookup Keys in BreadCrumb State Data

Description

In a [description](#) for a BC|Enterprise metric, a lookup key is a [bcInternal value](#) that is stored for internal use only.

a lookup key in BreadCrumb state data is value found in BC|Commander on the **BCAPI Explorer** tab under the **state** folder.

The description for a BC|Enterprise metric provides the path to the lookup key on the **BCAPI Explorer** tab.

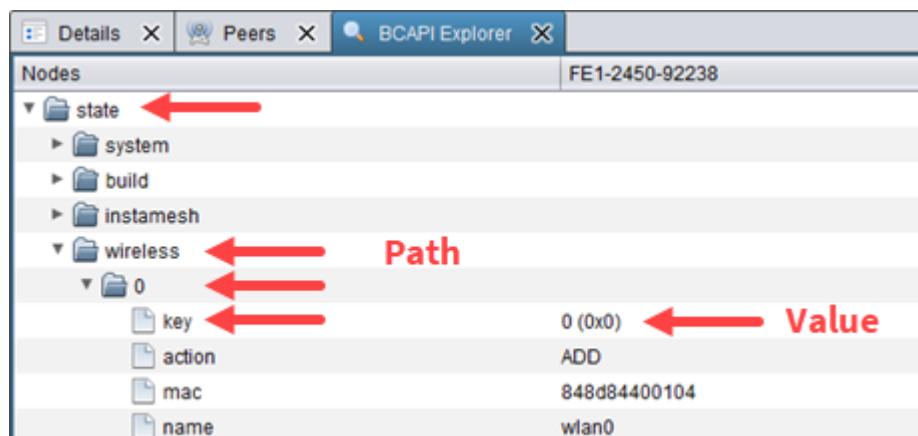
Example in metric definition

The [\\$WIRELESS group](#) of metrics includes the "wireless" lookup key, described as follows:

wireless - Lookup key in BreadCrumb state data

Example on BC|Explorer tab

The following illustration shows the path to the value for the "wireless" lookup key on the **BCAPI Explorer** tab.



Requirements

Lookup keys are internal and are not for use by customers.

Undocumented Metrics

Rajant does not document descriptions for the following BC|Enterprise metrics:

```
"rajant_bcapicache_entries"
"rajant_bcapicache_operations_total"
"rajant_breadcrumb_session_events_total"""
"rajant_breadcrumb_update_count_total"
"rajant_client_ops_total"
"rajant_connector_apikeys_gauge"
"rajant_connector_metrics_requests_total"""
"rajant_eventstream_operations_total"
"rajant_eventstream_queuedEvents"
"rajant_http_request_total"
"rajant_mesh_manager_events_total"
"rajant_mesh_runner_events_total"
"rajant_network_traffic_bytes_total"
"rajant_operation_duration_seconds_count"
"rajant_operation_duration_seconds_max"""
"rajant_operation_duration_seconds_sum"
"rajant_operation_exception_count_total"
"rajant_ping_events_total"
"rajant_ping_manager_events_total"
""rajant_proxy_session_events_total"
"rajant_sup_error_total"
"rajant_sup_received_total"
"rajant_sup_server_event_total"
"rajant_update_publisher_events_total"
rajant_bc360_dashboardmanager_dashboards
```

Import a Dashboard Definition

Contents

[Imported Dashboards](#)

[Import a JSON File for a Dashboard \(Admin Only\)](#)

[Import Screen](#)

[Import Options Screen](#)

Imported Dashboards

Description

An imported [dashboard](#) is a JavaScript Object Notation (JSON) file for a dashboard definition that is obtained from an external source and then [imported](#) into BC|Enterprise.

Sources

The external source of an imported dashboard may be any of the following:

- Rajant
- Rajant partner
- Rajant customer

Important: Rajant does not provide support for imported dashboards. Rajant supports only dashboards provided with the BC|Enterprise software.

Edit capability

To edit an imported dashboard, refer to the Grafana documentation at [Grafana Docs](#) for instructions.

Import a JSON File for a Dashboard (Admin Only)

Purpose

Use Grafana to import a JavaScript Object Notation (JSON) file for a **dashboard** definition that was obtained from an [external source](#) into BC|Enterprise. Create a link to this dashboard in a **dashboard folder** on the **Dashboards** dashboard.

Important: Rajant does not provide support for imported dashboards.

Reference

For instructions for using Gafana, refer to the Grafana documentation at [Grafana Docs](#).

Prerequisites

Provide a JSON file (with a .json filename extension) for a dashboard definition in a local folder on a [BC|Enterprise Client Workstation](#).

Determine the destination dashboard folder on the **Dashboards** dashboard where the link to the imported dashboard is to be added. The default destination dashboard folder for an imported dashboard will be **General**. Any destination dashboard folder other than **General** must already exist. If necessary, [add](#) a new destination dashboard folder.

Procedure

To import a JSON file for a dashboard, do the following:

1. Go to the BC|Enterprise Client workstation.
2. [Log in](#) to BC|Enterprise with a user name and password for user type **Administrator**.
3. On the [Main Menu](#), click **Dashboards**. The **Dashboards** dashboard is displayed.
4. Click **Import**. The [Import screen](#) is displayed.
5. Click **Upload JSON file**. A browse window opens for local folders.
6. Browse to and open the JSON file that contains the dashboard definition that is to be imported. The [Import Options screen](#) for the JSON file is displayed.
7. (Optional) In the **Name** box, change the dashboard name to be shown in the [Dashboard Header](#) for the imported dashboard.
8. In the **Folder** list, select the name of the destination dashboard folder.
9. (Recommended) Keep the supplied unique identifier (uid) for the imported dashboard.
10. Click **Import**. The imported dashboard is displayed.

Results

The  (Add panel) and  (Save dashboard) buttons are available in the Dashboard Header for the imported dashboard.

On the **Dashboards** dashboard, in the destination dashboard folder that was selected in the **Folder** list, a link to the imported dashboard has been added for the dashboard name supplied in the **Name** box.

Import Screen

Purpose

Use Grafana to import a JavaScript Object Notation (JSON) file for a [dashboard definition](#) from an [external source](#) into BC|Enterprise.

Navigation

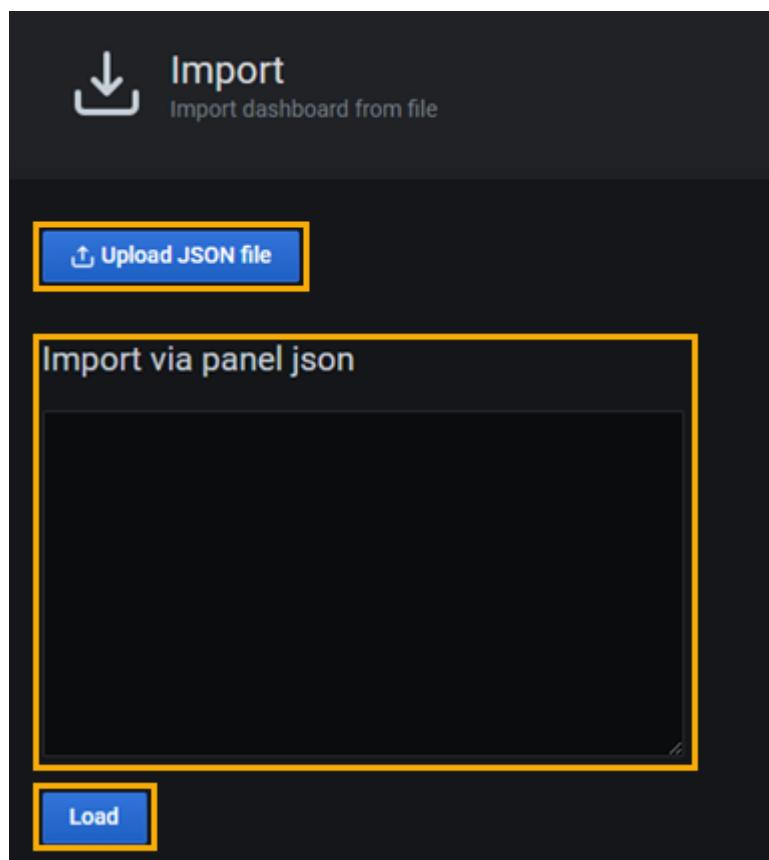
To go to the **Import** screen, on the [Main Menu](#), click **Dashboards**, and then on the [Dashboards dashboard](#), click **Import**.

Procedures

The [Import a JSON File for a Dashboard](#) procedure uses the **Import Dashboard** screen.

Illustration

The following illustration indicates the features on the **Import Dashboard** screen:



Upload JSON file button

To upload a JSON file for a dashboard definition from a local folder on a [BC|Enterprise Client Workstation](#) for import into BC|Enterprise, click **Upload JSON file**. Browse to and open the JSON file.

Import via panel json box

Instead of uploading a JSON file, Copy and Paste a dashboard definition into the **Import via panel json** box for import into BC|Enterprise.

Load button

Click **Load** to load the JSON file into BC|Enterprise. The [Import Options](#) screen is displayed.

Import Options Screen

Purpose

Supply information for a JavaScript Object Notation (JSON) file for [dashboard](#) definition that is to be imported.

Navigation

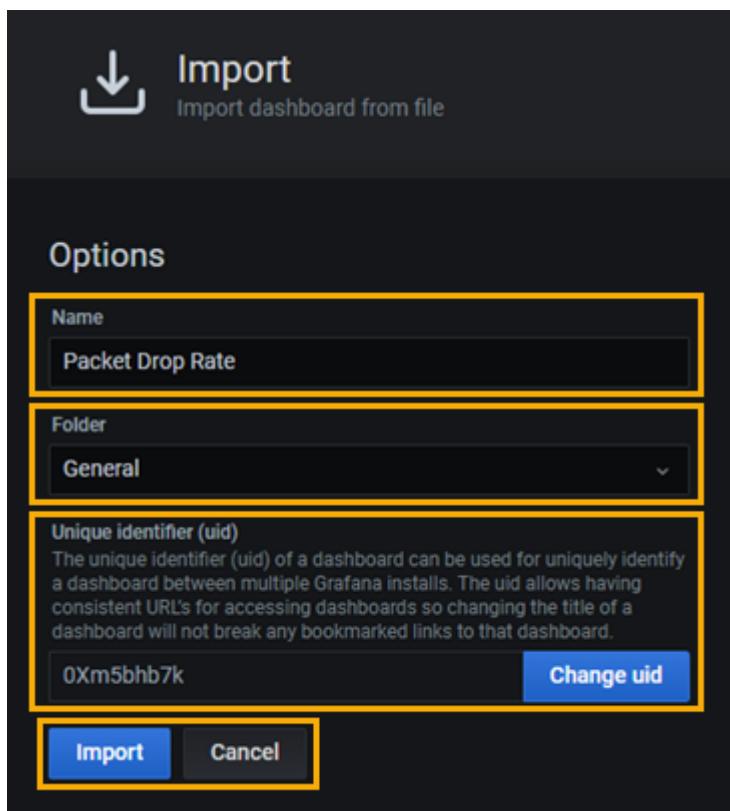
To go to the **Import Options** screen, on the [Import screen](#), click **Load**.

Procedures

The [Import a JSON File for a Dashboard](#) procedure uses the **Import Options** screen.

Illustration

The following illustration indicates the features on the **Import Options** screen:



Name box

The **Name** box contains the dashboard name supplied for the dashboard in the JSON file for the dashboard definition. This dashboard name will be shown in the [Dashboard Header](#) for the imported dashboard. Change the dashboard name, if necessary.

Folder list

In the **Folder** list, select the name of the destination dashboard folder on the [Dashboards](#) dashboard where the link to the imported dashboard is to be added. By default, the destination dashboard folder used for an imported dashboard will be **General**. Any destination dashboard folder other than **General** must already exist.

To add a new destination dashboard folder, click **Cancel**, and then [add](#) the dashboard folder.

Unique identifier (uid) box

(Recommended) In the **Unique identifier (uid)** box, keep the unique identifier (uid) supplied for the imported dashboard.

(Not recommended) To change the uid supplied for the imported dashboard, click **Change uid**. In the **Unique identifier (uid)** box, replace the supplied uid with another uid.

Import button

When the **Options** dialog box has been completed, click **Import**. The dashboard definition is imported. The **Import Options** screen closes. The imported dashboard is displayed.

Cancel button

To close the **Import Options** screen with no action, click **Cancel**.

Manage Notifications

Contents

[Rajant / Notification Dashboard](#)

[Manage Triggered Notifications](#)

[Manage Notification Rules](#)

[Manage Alerts](#)

[Manage Templates for Alerts](#)

[Manage Silent Periods for Alerts](#)

[Manage Email Reports](#)

[Reset Template Files](#)

Rajant / Notification Dashboard

Purpose

Manage [notification rules](#) that are used to generate [alerts](#) and [email reports](#).

View alerts that were generated during the [selected time range](#).

Navigation

To go to the **Rajant / Notification** dashboard, on the [Main Menu](#), click **Notification**.

Procedures

The [Clear All Alerts from the Historical Database](#) procedure uses the **Triggered Notifications** tab on the **Rajant / Notification** dashboard.

The following procedures for alerts use the **Notification Rules** tab on the **Rajant / Notification** dashboard:

- [Test Message Delivery for an Alert](#)
- [Create an Alert](#)
- [Copy and Modify an Alert](#)
- [Update an Alert](#)
- [Delete an Alert](#)
- [Enable an Alert](#)
- [Disable an Alert](#)

The following procedures for email reports use the **Notification Rules** tab on the **Rajant / Notification** dashboard:

- [Test Message Delivery for an Email Report](#)
- [Create an Email Report](#)
- [Copy and Modify an Email Report](#)
- [Enable an Email Report](#)
- [Disable an Email Report](#)
- [Update an Email Report](#)
- [Delete an Email Report](#)

Illustration

The following is an illustration indicates the major features on the **Rajant / Notification** dashboard:

The screenshot shows the BC|Enterprise Notifications panel. At the top, there's a header bar with the BC|Enterprise logo, version information (version 11.24.3), and status indicators for Graphs, Metrics, License, and Connectors, all showing 'OK'. Below the header is a navigation bar with a user icon, the name 'Rajant / Notification' with a star icon, and several filter and search options. A yellow box highlights the main content area. The main area has a title 'BC|Enterprise Notifications' and a sub-section 'Notification (Alerts and Reports)'. It contains two tabs: 'Triggered Notifications' (selected) and 'Notification Rules'. Below the tabs are buttons for 'Recently Triggered' and 'Refresh', and a 'Clear All' button. A time range selector shows 'Triggered in:' with options like 'Last 1 hour', 'Last 12 hours', etc. There are also 'Show' and 'Search' filters. A table header follows with columns: Target, Type, BreadCrumb, Name, Description, Status, Triggered, and Last. A message 'No Current Alerts' is displayed. At the bottom, it says 'Showing 0 to 0 of 0 entries' and has 'Previous' and 'Next' buttons.

BC|Enterprise Notifications panel

The [BC|Enterprise Notifications panel](#) contains a **Notification (Alerts and Reports)** area with two tabs.

Triggered Notifications tab

Click the [Triggered Notifications tab](#) (default) to view alerts that were generated during the [selected time range](#).

Notification Rules tab

Click the [Notification Rules tab](#) to manage notification rules that are used to generate alerts and email reports.

Manage Triggered Notifications

Contents

[Triggered Notifications](#)

[Triggered Notifications Tab](#)

[Clear All Alerts from the Historical Database](#)

Triggered Notifications

Description

A triggered notification is a message that is generated by the occurrence of a condition specified in a [notification rule](#) for an [alert](#) that was enabled when the condition occurred.

Results

A triggered notification produces the following results:

- The alert is listed on the [Rajant / Notification](#) dashboard on the [Triggered Notifications](#) tab.
- Notification messages are sent to users or the syslog server as defined in the notification rule for the alert.
- The triggered notification message is saved in the historical database.

Related topics

The following topics are related to triggered notifications:

- [Create an Alert](#)
- [Copy and Modify an Alert](#)
- [Enable an Alert](#)
- [Disable an Alert](#)
- [Update an Alert](#)
- [Delete an Alert](#)
- [Rajant / Notification Dashboard](#)
- [Notification Rules Tab](#)
- [Notification Rules](#)
- [Test Message Delivery for an Alert](#)
- [Silent Periods for Alerts](#)
- [Triggered Notifications Tab](#)
- [Clear All Alerts from the Historical Database](#)
- [Templates for Alerts](#)
- [Variables in Templates for Alerts](#)

Triggered Notifications Tab

Purpose

View triggered notification messages for [alerts](#) that occurred during a [selected time range](#).

Navigation

To go to the **Triggered Notifications** tab, on the [Main Menu](#), click **Notification**, and then click the **Triggered Notifications** tab (default).

Procedures

The [Clear All Alerts from the Historical Database](#) procedure uses the **Triggered Notifications** tab.

Illustration

The following is an illustration of the **Triggered Notifications** tab:

Triggered Notifications tab

The **Triggered Notifications** tab shows any notification messages for [alerts](#) that were triggered during a [selected time range](#) as specified in a [notification rule](#).

Recently Triggered table

The **Recently Triggered** table is an [administrative table](#) that contains one row for each alert that was triggered during the time period for the selected **Triggered In** button.

Refresh button

To refresh the **Recently Triggered** table to show the latest alerts, click **Refresh**.

Clear All button

To permanently [clear all alerts](#) from the historical database, click **Clear All**.

Triggered In buttons

To the right of **Triggered In**, click a time period for the alerts to be listed in the **Recently Triggered** table. The default time period is the [selected time range](#) in the [Dashboard Header](#).

Target column

The **Type** column indicates the **TargetType** value shown for the alert on the [Notification Rules](#) tab, as follows:

Content of Type Column on Triggered Notifications Tab	Content of TargetType Column on Notification Rules Tab
Name of BreadCrumb in Name or Serial column in the BreadCrumb Table in BC Commander	Name of BreadCrumb in Name or Serial column in the BreadCrumb Table in BC Commander
MESH (All BreadCrumbs)	ALL (All BreadCrumbs)
Name of BreadCrumb group shown in the Groups column in the BreadCrumb Table in BC Commander	Name of BreadCrumb group shown in the Groups column in the BreadCrumb Table in BC Commander

Type column

The **Type** column indicates the **TargetType** value shown for the alert on the [Notification Rules](#) tab, as follows:

Content of Type Column on Triggered Notifications Tab	Content of TargetType Column on Notification Rules Tab
Name of BreadCrumb in Name or Serial column in the BreadCrumb Table in BC Commander	BREADCRUMB
MESH (All BreadCrumbs)	MESH
Name of BreadCrumb group shown in the Groups column in the BreadCrumb Table in BC Commander	GROUP

BreadCrumb column

The **BreadCrumb** column contains the name for the BreadCrumb that triggered the alert.

Name column

The **Name** column contains the name of the notification rule that triggered the alert. This name is shown in the **Name** column in the [Notify Rules](#) table on the [Notification Rules](#) tab.

Description column

The **Description** column contains a description of the notification rule that triggered the alert. This description is shown in the [Notify Rules](#) table on the [Notification Rules](#) tab.

Triggered column

The **Triggered** column contains the time when the alert was first triggered during the time period for the selected **Triggered In** button. If no **Triggered In** button is selected, the default time period is the [selected time range](#) in the Dashboard Header.

Last column

The **Last** column contains the time that the alert was last triggered.

Clear All Alerts from the Historical Database

Purpose

In the historical database, clear all [triggered notification](#) messages that were generated by currently enabled or disabled notification rules for [alerts](#). The [notification rules](#) that triggered these messages will not be affected.

Procedure

To clear all notification messages for alerts from the historical database, do the following:

1. On the [Main Menu](#), click **Notification**. The [Rajant / Notification](#) dashboard is displayed.
2. On the **Triggered Notifications** tab (default), click **Clear All**.

Result

All notification messages for triggered alerts are cleared from the historical database.

Manage Notification Rules

Contents

[Notification Rules](#)

[Notification Rules Tab](#)

Notification Rules

Description

A notification rule defines specifications for triggering an [alert](#) or issuing an [email report](#).

Maintenance

Any [user](#) can maintain any number of notification rules on the [Notification Rules tab](#) on the [Rajant / Notification dashboard](#).

Related topics

The following topics are related to all notification rules:

- [Rajant / Notification dashboard](#)
- [Notification Rules Tab](#)

The following topics are related to notification rules for alerts:

- [Alerts](#)
- [Create an Alert](#)
- [Create Alert Dialog Box](#)
- [Copy and Modify an Alert](#)
- [Enable an Alert](#)
- [Disable an Alert](#)
- [Update an Alert](#)
- [Update Alert Dialog Box](#)
- [Delete an Alert](#)
- [Test Message Delivery for an Alert](#)
- [Silent Periods for Alerts](#)
- [Save a Custom Default Silent Period for Alerts](#)
- [Apply the Current Default Silent Period for an Alert](#)
- [Templates for Alerts](#)
- [Variables in Templates for Alerts](#)

The following topics are related to notification rules for email reports:

- [Email Reports](#)
- [Create an Email Report](#)
- [Create Email Report Dialog Box](#)
- [Copy and Modify an Email Report](#)
- [Enable an Email Report](#)
- [Disable an Email Report](#)
- [Update an Email Report](#)
- [Update Email Report Dialog Box](#)
- [Delete an Email Report](#)
- [Test Message Delivery for an Email Report](#)
- [Template for an Email Report](#)

Notification Rules Tab

Purpose

Manage notification rules that are used to trigger [alerts](#) or issue [email reports](#) as defined by a [user](#).

Navigation

To go to the **Notification Rules** tab, on the [Main Menu](#), click **Notification**, and then click the **Triggered Notification Rules** tab.

Procedures

The following procedures for alerts use the **Notification Rules** tab:

- [Create an Alert](#)
- [Copy and Modify an Alert](#)
- [Enable an Alert](#)
- [Disable an Alert](#)
- [Update an Alert](#)
- [Delete an Alert](#)
- [Test Message Delivery for an Alert](#)

The following procedures for email reports use the **Notification Rules** tab:

- [Create an Email Report](#)
- [Copy and Modify an Email Report](#)
- [Enable an Email Report](#)
- [Disable an Email Report](#)
- [Update an Email Report](#)
- [Delete an Email Report](#)
- [Test Message Delivery for an Email Report](#)

Illustration

The following is an illustration of the **Notification Rules** tab:

The screenshot shows the BC|Enterprise Notifications interface. At the top, there are status indicators for Graphs, Metrics, License, and Connectors, all showing 'OK'. The title bar says 'Rajant / Notification ☆'. On the right, there are filters for 'Last 6 hours' and a search bar. A 'Help' button is also present.

The main area is titled 'BC|Enterprise Notifications' and contains a sub-section titled 'Notification (Alerts and Reports)'. There are two tabs: 'Triggered Notifications' and 'Notification Rules', with 'Notification Rules' being the active tab. The 'Notify Rules' table is displayed, with a yellow box highlighting the 'Refresh' button and the 'Add Report' and 'Add Alert' buttons at the top right of the table area.

Target	TargetType	Name	Description	Duration	Creator	Notify	Enabled	Silence	Action
-	WEEKLY_REPORT	Steves report	testops	every day 16:30	admin	EMAIL	✓		edit copy delete
Datacenter (77081)	BREADCRUMB	TestAlertm1	Test BreadCrumb Alert	5m	caroladmin	NONE	✓		edit copy delete
fixed	GROUP	HighTemp	High Temperature	5m	caroladmin	EMAIL	✓		edit copy delete
All Breadcrumbs	MESH	Mesh_Wide_High_Temp	Mesh-wide test for high temperature	5m	caroladmin	EMAIL	✓		edit copy delete
-	WEEKLY_REPORT	Test	testing	every day 09:00	taylor	EMAIL	✓		edit copy delete

At the bottom left, it says 'Showing 1 to 5 of 5 entries'. At the bottom right, there are buttons for 'Previous', '1', and 'Next'.

Notification Rules tab

The **Notification Rules** tab contains the Notify Rules table that contains one row for each available enabled or disabled [notification rule](#) for an [alert](#) or [email report](#).

Refresh button

To refresh notification rules listed in the **Notify Rules** table, click **Refresh**.

Add Report button

To [create an email report](#) to the **Notify Rules** table, click **Add Report**.

Add Alert button

To [create an alert](#) to the **Notify Rules** table, click **Add Alert**.

Notify Rules table

The **Notify Rules** table contains one row for each available enabled or disabled notification rule.

Target column

For an email report, the **Target** column contains a hyphen (-) character.

For an alert, the content of **Target** column corresponds to the content of the **TargetType** column. The **Target** column identifies the value selected in the **Target** list in the [Create Alert dialog box](#) or [Update Alert dialog box](#), as follows:

Content of TargetType Column	Content of Target Column
MESH	All BreadCrumbs
BREADCRUMB	Name of a BreadCrumb shown in Name or Serial column in the BreadCrumb Table in BC Commander
GROUP	Name of a BreadCrumb group shown in the Groups column in the BreadCrumb Table in BC Commander

TargetType column

For an email report, the **TargetType** column identifies the reporting period for the report supplied in the **Report Period** box in the [Create Email Report dialog box](#) or [Update Email Report dialog box](#), as follows:

Content of Report Period Box	Content of TargetType Column
Daily	DAILY_REPORT
Weekly	WEEKLY_REPORT
Monthly	MONTHLY_REPORT

For an alert, the **TargetType** column identifies the value selected in the **Target Type** list in the [Create Alert dialog box](#) or [Update Alert dialog box](#), as follows:

Value in Target Type List for the Alert	Content of TargetType Column
Mesh Wide	MESH
BreadCrumb	BREADCRUMB
Group	GROUP

Name column

For an email report, the **Name** column contains the name that was supplied in the **Report Name** box in the [Create Email Report dialog box](#) or [Update Email Report dialog box](#).

For an alert, the **Name** column contains the name that was supplied in the **Alert Name** box in the [Create Alert dialog box](#) or [Update Alert dialog box](#).

Description column

For an email report, the **Description** column contains the text supplied in the **Custom Content** box in the [Create Email Report dialog box](#) or [Update Email Report dialog box](#).

For an alert, the **Description** column contains a short description for the alert. This description was supplied in the **Alert Description** box in the [Create Alert dialog box](#) or [Update Alert dialog box](#).

Duration column

For an email report, the **Duration** column contains value supplied in the **Schedule** box in the [Create Email Report dialog box](#) or [Update Email Report dialog box](#).

For an alert, the **Duration** column indicates length of time the condition associated with this alert must persist to trigger a notification for the alert. This length of time was supplied in the **Duration** box in the [Create Alert dialog box](#) or [Update Alert dialog box](#).

Creator column

The **Creator** column contains the [user name](#) for the user who created the notification rule for the alert or email report.

Notify column

For an email report, the **Notify** column contains **EMAIL**, the only available notification method for a report. The first line in the [template for an email report](#) must provide **EMAIL** as the notification method.

For an alert, the **Notify** column identifies the [notification method](#) used for the alert, as supplied in the **Notification** box in the [Create Alert dialog box](#) or [Update Alert dialog box](#). Available values are:

- **EMAIL:** Email message is sent to specified [recipients](#) through the **SMTP** server defined on the [Rajant / Configuration dashboard](#) on the **SMTP** tab
- **HTTP:** HTTP Post is sent to a messaging application
- **SYSLOG:** Message is sent to the [syslog server](#) defined on the [Rajant / Configuration dashboard](#) on the **Syslog** tab
- **NONE:** Alert is saved in the historical database only

Enabled column

The **Enabled** column indicates whether the notification rule is enabled or disabled, as follows:

- Check mark () : Enabled
- Blank: Disabled

For an email report, the notification rule was [enabled](#) or [disabled](#) by selecting or clearing the **Enabled** check box in the [Create Email Report dialog box](#) or [Update Email Report dialog box](#).

For an alert, the notification rule was [enabled](#) or [disabled](#) by selecting or clearing the **Alert Enabled** check box in the [Create Alert dialog box](#) or [Update Alert dialog box](#).

Silence column

For an email report, the **Silence** column is always blank.

For an alert, the content of the **Silence** column indicates whether [silent periods](#) are defined in the notification rule, as follows:

- Check mark () : Silent periods are defined.
- Blank: No silent period is defined.

Silent periods are defined in the [Create Alert dialog box](#) or [Update Alert dialog box](#).

Action column

In the **Action** column, click the appropriate icon to perform an action, as follows:

- Click  (Test Notification Message) to [test message delivery](#) for an email report.
- Click  (Test Notification Message) to [test message delivery](#) for an alert.

- Click  (Copy Report) to [copy and modify](#) a notification rule for an email report.
- Click  (Copy Alert) to [copy and modify](#) a notification rule for an alert.
- Click  (Delete Report) to [delete](#) a notification rule for an email report.
- Click  (Delete Alert) to [delete](#) a notification rule for an alert.

Manage Alerts

Contents

- [Alerts](#)
- [Recipients for an Alert](#)
- [Examples of Alert Expressions](#)
- [Create an Alert](#)
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- [Copy and Modify an Alert](#)
- [Update an Alert](#)
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- [Delete an Alert](#)
- [Test Message Delivery for an Alert](#)

Alerts

Description

An alert is a notification message that is sent to designated recipients when a predefined condition occurs on designated [monitored BreadCrumbs](#) as specified in a [notification rule](#).

Predefined conditions

A notification rule for an alert must specify a predefined condition that is to trigger an alert. A predefined condition is defined by a Prometheus Query Language (PromQL) expression that must resolve to a value of True or False.

For information and examples for PromQL expressions, refer to the [Prometheus documentation](#).

Methods of notification

The following methods of notification are available for an alert:

- **Email:** Email message is sent to specified recipients through the [SMTP server](#) defined on the [Rajant / Configuration dashboard](#) on the [SMTP tab](#)
- **HTTP Post:** HTTP Post is sent to a messaging application
- **Syslog:** Message is sent to the [syslog server](#) defined on the [Rajant / Configuration dashboard](#) on the [Syslog tab](#)
- **None:** Alert is saved in the historical database only

Important: If using a SMTP server with a limit on the number of messages per day, it may be prudent to limit textng of alerts to more serious conditions.

Recipients

A [recipient](#) for an alert is a destination of a notification message defined when the notification rule for the alert is [created](#) or [updated](#).

The format for supplying the recipients for an alert depends upon the method of notification for the alert, as follows:

- **Email:** Space-separated list of email addresses for each recipient
- **HTTP Post:** Universal Resource Locator (URL) for a configured web server, such as a Short Message Service (SMS) gateway, for a messaging application
- **Syslog:** Blank
- **None:** Blank

Templates

The notification rule for an alert must specify a predefined [template](#) used to format the content of the message.

Tip: An email notification message for an alert is a multi-part message that includes an ASCII text version that an SMTP server can send as SMS text.

Enabled or disabled notification rules

A notification rule for an alert will trigger alerts only while the notification rule is enabled.

A user may enable or disable the notification rule for an alert when [creating](#) or [updating](#) the notification rule for the alert.

Silent periods

A [silent period](#) is a predefined period of time during the week when notification messages for alerts are to be suppressed. A silent period may apply to all alerts or an individual alert.

Initially, by default, no silent periods exist.

Triggered alerts

When an alert for an [enabled](#) notification rule is triggered, the alert is listed on the [Rajant / Notification](#) dashboard on the [Triggered Notifications](#) tab.

If the notification rule for a triggered alert is later [disabled](#), the alert is no longer shown on the [Triggered Notifications](#) tab.

History

All triggered alerts are saved in the historical database until all triggered alerts are [cleared](#) from the historical database.

Trends

Trends for triggered alerts for monitored BreadCrumbs are shown on the [Rajant / BreadCrumb Alerts](#) dashboard.

Related topics

The following topics are related to alerts:

- [Rajant / BreadCrumb Alerts Dashboard](#)
- [Create an Alert](#)
- [Copy and Modify an Alert](#)
- [Enable an Alert](#)
- [Disable an Alert](#)
- [Recipients for an Alert](#)
- [Examples of Alert Expressions](#)
- [Update an Alert](#)
- [Delete an Alert](#)
- [Rajant / Notification Dashboard](#)
- [Notification Rules Tab](#)
- [Notification Rules](#)
- [Test Message Delivery for an Alert](#)
- [Silent Periods for Alerts](#)
- [Triggered Notifications](#)
- [Clear All Alerts from the Historical Database](#)
- [Templates for Alerts](#)
- [Variables in Templates for Alerts](#)
- [Example Template File for an Alert](#)
- [Variables in Templates for an Alert](#)
- [Syslog Server Requirements](#)
- [Configuration Screen](#)
- [Syslog Tab](#)
- [Configure Syslog Settings](#)
- [SMTP Tab](#)
- [Simple Mail Transfer Protocol \(SMTP\) Server Requirements](#)

Recipients for an Alert

Description

A recipient for an [alert](#) is a destination of a notification message defined when the [notification rule](#) for the alert is [created](#) or [updated](#).

Formats

The format for supplying recipients for an alert depends upon the [method of notification](#) for the alert, as follows:

- **Email:** Space-separated list of email addresses for each recipient
- **HTTP Post:** Universal Resource Locator (URL) for a configured web server, such as a Short Message Service (SMS) gateway, for a messaging application
- **Syslog:** None
- **None:** None

Email

The recipient list for an email notification is a space-separated list of email addresses for each recipient.

HTTP Post to a Slack account

For alerts to be sent to a Slack account, the HTTP Post is a Slack webhook URL.

Example:

`https://hooks.slack.com/services/T00000000/B00000000/XXXXXXXXXXXXXXXXXXXXXX`

To create a Slack webhook URL, refer to <https://api.slack.com/incoming-webhooks>.

HTTP Post to a cell phone

Most SMTP servers can forward an SMS text message to a cell phone as an HTTP Post. The cellular service provider of the cell phone number for the recipient will determine the correct URL for the HTTP Post.

The format of the URL is the following:

`number@sms-gateway`

where:

`number` is the digits only for the area code and cell phone number for the recipient

`sms-gateway` is the URL for the SMS gateway for the cellular service provider for the recipient

For a list of SMS gateways for United States and international cellular service providers, refer to the web site <https://martinfitzpatrick.name/list-of-email-to-sms-gateways/>.

If this web site offers multiple choices for a cellular service provider, then that provider probably uses a different underlying cellular carrier based on the cell phone hardware and the home location of the cell phone owner. The cell phone owner may contact the cellular service provider to determine the carrier. Alternatively, try to send an email message to each suggested SMS gateway for the cellular service provider. In the Subject: line for the email message, identify the SMS Gateway. Determine which message is delivered successfully.

Example:

The cellular service provider for the recipient is Verizon. The SMS gateway for Verizon is **vtext.com**. The area code and phone number for the recipient cell phone is **(123) 456-7890**. Therefore, the URL for an HTTP Post is **1234567890@vtext.com**.

Important: Sending a text message via email to a cell phone may incur charges or deduct from minutes and/or text balance for that call phone, depending on the cellular service plan for that phone. Send SMS texts only to a cell phone that has a cellular service plan that includes texting.

Examples of Alert Expressions

Description

In the [notification rule](#) for an [alert](#), an expression in Prometheus Query Language (PromQL) represents a condition that is to trigger that alert. This expression must resolve to a value of True or False.

Requirements

At a minimum, an expression for an alert must include a metric name, a comparison operator and a value (Example: **cpuload > .35**).

References

For information and examples for PromQL expressions, refer to the [Prometheus documentation](#).

To determine an appropriate value in an expression, refer to values of interest for [Breadcrumb](#) data shown in BC|Enterprise [dashboards](#) and the **Details** panel in the [BC|Commander](#) window.

For error and warning codes, refer to the Appendix Error and Warning Codes in the *BC|Commander Version 11 User Guide* (on the [Rajant Support web site](#)).

Example 1: Trigger an alert based on a metric value

```
cpuload > .35
```

Example 2: Trigger an alert when an error or warning occurs

```
alertSystem_alerts_code == 381
```

Example 3: Supply an actual value for a variable in an expression

In a metric, a word enclosed in # characters indicates where an actual value must be substituted for a variable.

In the following metric, the variable **#CHANNEL#** must be replaced with an actual value (in this case, a Channel Number value):

```
wireless_stats_txBytes_roc{channel=~"#CHANNEL#"}  
wireless_stats_txBytes_roc{channel=~"11"}
```

In the following metric, the value **11** has been supplied in place of **#CHANNEL#**:

```
wireless_stats_txBytes_roc{channel=~"11"}
```

To form a complete expression, this metric requires a comparison operator and a value, for example:

```
wireless_stats_txBytes_roc{channel=~"11"} > 1000
```

Example 4: Supply an application variable in an expression

In a metric, an application variable enclosed in % characters indicates where a value obtained from the running BC|Enterprise application will be substituted for a variable when BC|Enterprise compiles the notification rule.

For example,

- %INTERVAL% represents the minimum time interval that is compatible with the current value supplied in the **Time-Series Polling Interval** box on the [Services](#) tab on the [Rajant / Configuration](#) dashboard.

- %ENCAP% represents the Encap ID for the BreadCrumb Name supplied in the **Target** list when the selection in the **Target Type** list is **BreadCrumb**.
- %GROUPS% represents the name of the BreadCrumb Group supplied in the **Target** list when the selection in the **Target Type** list is **Group**.

Note: The variable %INTERVAL% may be replaced by an actual length of time, such as 10m; however, any length of time that is less than twice the value supplied in the **Time-Series Polling Interval** box on the **Services** tab on the **Rajant / Configuration** dashboard may return erratic results.

Create an Alert

Purpose

Create a notification rule for an [alert](#).

Prerequisites

Configure syslog settings.

Refer to [Create Alert](#) dialog box to prepare the information required to create a notification rule for an alert.

Procedure

To create a notification rule for an alert, do the following:

1. On the [Main Menu](#), click **Notification**. The [Rajant / Notification](#) dashboard is displayed.
2. Click the **Notification Rules** tab.
3. Click **Add Alert**. The **Create Alert** dialog box opens.
4. In the **Target Type** list, click one selection to identify the scope of this alert.
5. In the **Target** list, click one selection to identify the scope of this alert based on the selection in the **Target Type** list.
6. In the **Connectors** list, click the name and status of the [BC|Connector\(s\)](#) associated with the selection in the **Target Type** list.
7. In the **Alert Name** box, supply a unique name for this alert.
8. In the **Alert Description** box, supply descriptive text for this alert.
9. In the **Expression** field, supply a complete expression in Prometheus Query Language (PromQL) that represents the condition that is to trigger this alert.
10. When the expression in the **Expression** field is complete, click **Test Expression**. The test result is displayed to the right of the **Test Expression** button.
11. In the **Duration** box, supply the length of time (default 5m) that the condition must persist to generate an alert.
12. In the **Notification** list, click the method of notification for this alert.
13. If the **Email** is selected in the **Notification** list, in the **Subject** box, supply a Subject: line for the email notification message.
14. If the **Email** is selected in the **Notification** list, in the **Recipients** box, supply [recipients](#) for the notification message for this alert.
15. In the **Template** list, click the template name from the [template file](#) for the notification message for this alert.
16. Select or clear (default) the **Alert Enabled** check box.
17. For **Silent Period**, supply a [silent period](#) definition for this alert.
18. Click **Create Alert**.

If the **Alert Enabled** check box is selected, the information supplied for this notification rule is validated. One of the following occurs:

- If the notification rule is complete and syntactically correct, the **Create Alert** dialog box closes and the new notification rule for this alert is added to the Notify Rules table. The **Enabled** column contains a check mark () to indicate that this notification rule is enabled.
- Any missing or invalid information is outlined in red. A red error message is displayed. Correct any errors or clear the **Alert Enabled** check box, and then click **Create Alert** again.

If the **Alert Enabled** check box is cleared, the **Create Alert** dialog box closes and the new notification rule for this alert is added to the Notify Rules table. The **Enabled** column is blank.

Follow-up actions

(Recommended) [Test message delivery](#) for the notification rule for this alert.

As needed, [enable](#), [disable](#), [copy and modify](#), [update](#) or [delete](#) the notification rule for this alert.

Create Alert Dialog Box

Purpose

Create a notification rule for an [alert](#).

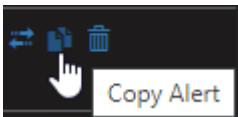
Navigation

To create a new notification rule for an alert, do the following:

1. On the [Main Menu](#), click **Notification**. The [Rajant / Notification](#) dashboard is displayed.
2. Click the **Notification Rules tab**. The **Notification Rules** tab is displayed.
3. Click **Add Alert**. The **Create Alert** dialog box opens.

To copy and then modify a notification rule for an alert, do the following:

1. On the [Main Menu](#), click **Notification**. The [Rajant / Notification](#) dashboard is displayed.
2. Click the **Notification Rules tab**.
3. In the Notify Rules table, search for the notification rule for the alert that is to be copied and then modified.
4. In the **Action** column, click  (Copy Alert).



The **Create Alert** dialog box opens.

Procedures

The following procedures use the **Create Alert** dialog box:

- [Create an Alert](#)
- [Copy and Modify an Alert](#)

Illustration

The following illustration indicates the major features on the **Create Alert** dialog box:

The screenshot shows the BC|Enterprise Notifications interface. At the top, there are status indicators for Graphs (OK), Metrics (OK), License (OK), and Connectors (OK). Below the header, a navigation bar includes 'Rajant / Notification' with a star icon, a search bar, and a 'Last 6 hours' time filter. A 'Help' button is also present. The main area is titled 'BC|Enterprise Notifications' and contains a sub-section titled 'Notification (Alerts and Reports)'. Two tabs are visible: 'Triggered Notifications' (selected) and 'Notification Rules'. A large 'Create Alert' dialog box is open, outlined in yellow. It contains the following fields:

- Target Type:** Mesh Wide
- Target:** All BreadCrumbs
- Connectors:** Connector(s)
- Alert Name:** Alert Name
- Alert Description:** Alert Description
- Expression:** Expression
- Duration:** 5m
- Notification:** Email
- Subject:** short description
- Recipients:** space seperated list
- Template:** (dropdown menu)
- Options:** Alert Enabled
- Silent Period:** Show Silent Period (dropdown menu)

At the bottom right of the dialog box are 'Cancel' and 'Create Alert' buttons.

Target Type list

In the **Target Type** list, click one of the following selections to identify the scope of this alert:

- **Mesh Wide:** (Most common) All BreadCrumbs.
- **BreadCrumb:** An individual BreadCrumb.
- **Group:** A BreadCrumb group.

When this alert is triggered, the selected Target Type will be shown in the **Type** column on the **Triggered Notifications** tab on the **Rajant / Notification** dashboard.

Target list

In the **Target** list, do one of the following to identify the scope of this alert based on the selection in the **Target Type** list:

- If Target Type is **Mesh Wide**, keep **ALL BreadCrumbs** (default).
- If Target Type is **BreadCrumb**, click the BreadCrumb name (BreadCrumb Name*) followed by the Encap ID portion of the BreadCrumb serial number enclosed in parentheses.
- If Target Type is **Group**, click the name of a BreadCrumb group (Groups*).

* This setting is in the BreadCrumb configuration for the BreadCrumb in BC|Commander.

When this alert is triggered, the selected Target will be shown in the **Target** column on the **Triggered Notifications** tab on the **Rajant / Notification** dashboard.

Connectors list

In the **Connectors** list, click the name and status of the **BC|Connector(s)** associated with the selection in the **Target Type** list, as follows:

- If Target Type is **Mesh Wide**, click one or more BC|Connectors.
- If Target Type is **BreadCrumb**, click the BC|Connector associated with this BreadCrumb.
- If Target Type is **Group**, click the BC|Connector associated with this BreadCrumb group (Groups*).

* This setting is in the BreadCrumb configuration for the BreadCrumb in BC|Commander.

Available BC|Connectors are listed in the BC|Connectors table on the **Rajant / BC|Connector Management** dashboard.

Alert Name box

In the **Alert Name** box, supply a unique name for this alert. An alert name must start with a letter and must not contain a space character. An alert name may contain alphanumeric characters and + (plus sign), - (hyphen), _ (underscore), % (percent sign) or = (equal sign) characters.

Note: This is a character limitation of the BC|Enterprise Metrics Service (Prometheus).

When this alert is triggered, this **Alert Name** value will be shown in the **Name** column on the **Triggered Notifications** tab on the **Rajant / Notification** dashboard.

Alert Description box

In the **Alert Description** box, supply descriptive text for this alert.

When this alert is triggered, this descriptive text will be shown in the **Description** column on the **Triggered Notifications** tab on the **Rajant / Notification** dashboard.

Expression field

In the **Expression** field, supply a complete expression in Prometheus Query Language (PromQL) that represents the condition that is to trigger this alert. This expression must resolve to a value of True or False. At a minimum, this expression must include a metric name, a comparison operator and a value (Example: **cpuload > .35**).

(Optional) To get started, in the **Expression** list, click an appropriate selection for the condition. The format for a proposed expression is shown in the **Expression** field. Edit the proposed expression, as needed. Refer to [Examples of alert expressions](#).

To determine an appropriate value in an expression, refer to values of interest for BreadCrumb data shown in BC|Enterprise [dashboards](#) and the **Details** panel in the **BC|Commander** window.

For information and examples for PromQL expressions, refer to the [Prometheus documentation](#).

Metrics button

To look up available metric names for use in the **Expression** field, click **Metrics**. The **Available Metrics** dialog box opens and contains a searchable [administrative table](#) that lists each available metric name for use in the **Expression** field.

Tip: A metric may be Copied from the **Available Metrics** dialog box, and then Pasted in the **Expression** field.

Test Expression button

To evaluate the syntax of an expression in the **Expression** field, click **Test Expression**. The test result is displayed to the right of the **Test Expression** button.

The test result will be one of the following:

- **Success: valid expression - no data:** This expression is syntactically correct; but no records in the time series data base satisfy this expression.
- **Success: value = xxx:** This expression is syntactically correct. The last reported value for the metric that satisfies the expression is xxx.
- **Failed: 'error-message':** The expression is not valid. The text, *error-message* provides a description of the error.

Note: An expression that contains an unknown metric name, but is syntactically correct, will be reported as a valid expression. For example, the expression **unknown_metric > 0** will be reported as a valid expression, even though the metric named "unknown_metric" is not present in the time series database.

Duration box

In the **Duration** box, supply the length of time (default 5m) that the condition must persist to generate an alert.

Notification list

In the **Notification** list, click one of the following methods of notification for this alert:

- **Email:** (Default) Email message is sent to specified recipients through the [SMTP server](#) defined on the [Rajant / Configuration dashboard](#) on the [SMTP tab](#)
- **HTTP Post:** Universal Resource Locator (URL) for a configured web server, such as a Short Message Service (SMS) gateway, for a messaging application
- **Syslog:** Message is sent to the [syslog server](#) defined on the [Rajant / Configuration dashboard](#) on the [Syslog tab](#)
- **None:** Alert is saved in the historical database only

Important: If using a SMTP server with a limit on the number of messages per day, it may be prudent to limit texting of alerts to more serious conditions.

Subject box

If the **Email** is selected in the **Notification** list, in the **Subject** box, supply a Subject: line for the email notification message for this alert.

Recipients box

If **Email** is selected in the **Notification** list, in the **Recipients** box, supply [recipients](#) for the email notification message for this alert.

Template list

In the **Template** list, click the template name from the [template file](#) for the notification message for this alert.

Alert Enabled check box

If this new notification rule for an alert is complete and ready to be enabled, select the **Alert Enabled** check box.

(Default) If this new notification rule for an alert is to be saved without being enabled, clear the **Alert Enabled** check box.

Silent Period

For **Silent Period**, to show the grid for a [silent period](#) definition, click **Show Silent Period**. The grid for a silent period definition opens.

To modify or apply a silent period definition, do the following, as needed:

- [Apply the default silent period to this alert.](#)
- [Apply a custom silent period to this alert.](#)
- [Save a custom default silent period for alerts.](#)
- [Reset the default silent period for alerts.](#)

To hide the grid for a silent period definition, click **Hide Silent Period**. The grid closes.

Cancel button

To close the **Create Alert** dialog box with no action, click **Cancel**.

Create Alert button

If the **Alert Enabled** check box is selected, click **Create Alert**. The information supplied for this notification rule is validated. One of the following occurs:

- If the notification rule is complete and syntactically correct, the **Create Alert** dialog box closes and the new notification rule for this alert is added to the Notify Rules table. The **Enabled** column contains a check mark () to indicate that this notification rule is enabled.
- Any missing or invalid information is outlined in red. A red error message is displayed. Correct any errors or clear the **Alert Enabled** check box, and then click **Create Alert** again.

If the **Alert Enabled** check box is cleared, click **Create Alert**. The **Create Alert** dialog box closes and the new notification rule for this alert is added to the Notify Rules table.

Copy and Modify an Alert

Purpose

Copy a [notification rule](#) for an [alert](#), and then modify the copy to create a new alert.

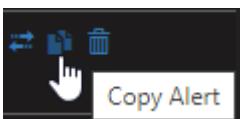
Prerequisites

Refer to [Create Alert](#) dialog box to prepare changes required to the copied notification rule for an alert.

Procedure

To copy, and then modify a notification rule for an alert, do the following:

1. On the [Main Menu](#), click **Notification**. The [Rajant / Notification](#) dashboard is displayed.
2. Click the [Notification Rules](#) tab.
3. In the Notify Rules table, search for the notification rule for the alert that is to be copied and then modified.
4. In the **Action** column , click  (Copy Alert).



The [Create Alert](#) dialog box opens.

5. In the **Alert Name** box, supply a unique name for this alert.
6. In the **Alert Description** box, supply descriptive text for this alert.
7. Make other changes to the copied notification rule, as needed.
8. Select or clear the **Alert Enabled** check box.
9. Click **Create Alert**.

If the **Alert Enabled** check box is selected, the information supplied for this notification rule is validated. One of the following occurs:

- If the notification rule is complete and syntactically correct, the [Create Alert](#) dialog box closes and the new notification rule for this alert is added to the Notify Rules table. The **Enabled** column contains a check mark () to indicate that this notification rule is enabled.
- Any missing or invalid information is outlined in red. A red error message is displayed. Correct any errors or clear the **Alert Enabled** check box, and then click **Create Alert** again.

If the **Alert Enabled** check box is cleared, the [Create Alert](#) dialog box closes and the new notification rule for this alert is added to the Notify Rules table. The **Enabled** column is blank.

Follow-up actions

(Recommended) [Test message delivery](#) for the notification rule for this alert.

As needed, [enable](#), [disable](#), [copy and modify](#), [update](#) or [delete](#) the notification rule for this email report.

Update an Alert

Purpose

Update a [notification rule](#) for an [alert](#).

Prerequisites

Refer to [Update Alert](#) dialog box to prepare the information required to update a notification rule for an alert.

Procedure

To update a notification rule for an alert, do the following:

1. On the [Main Menu](#), click **Notification**. The [Rajant / Notification](#) dashboard is displayed.
2. Click the [Notification Rules](#) tab.
3. In the Notify Rules table, search for the notification rule for the alert that is to be updated.
4. In the Notify Rules table, in the **Name** column, click the name of the alert that is to be updated. The [Update Alert](#) dialog box opens and contains the current information for that alert.
5. In the **Target Type** list, click one selection to identify the scope of this alert.
6. In the **Target** list, click one selection to identify the scope of this alert based on the selection in the **Target Type** list.
7. In the **Connectors** list, click the name and status of the [BC|Connector\(s\)](#) associated with the selection in the **Target Type** list.
8. In the **Alert Name** box, supply a unique name for this alert.
9. In the **Alert Description** box, supply descriptive text for this alert.
10. In the **Expression** field, supply a complete expression in Prometheus Query Language (PromQL) that represents the condition that is to trigger this alert.
11. When the expression in the **Expression** field is complete, click **Test Expression**. The test result is displayed to the right of the **Test Expression** button.
12. In the **Duration** box, supply the length of time (default 5m) that the condition must persist to generate an alert.
13. In the **Notification** list, click the method of notification for this alert.
14. If the **Email** is selected in the **Notification** list, in the **Subject** box, supply a Subject: line for the email notification message.
15. If the **Email** is selected in the **Notification** list, in the **Recipients** box, supply [recipients](#) for the notification message for this alert.
16. In the **Template** list, click the template name from the [template file](#) for the notification message for this alert.
17. Select or clear the **Alert Enabled** check box.
18. For **Silent Period**, supply a [silent period](#) definition for this alert.
19. Click **Update Alert**.

If the **Alert Enabled** check box is selected, the information supplied for this notification rule is validated. One of the following occurs:

- If the notification rule is complete and syntactically correct, the [Update Alert](#) dialog box closes and the updated notification rule for this alert is shown in the Notify Rules table. The **Enabled** column contains a check mark () to indicate that this notification rule is enabled.
- Any missing or invalid information is outlined in red. A red error message is displayed. Correct any errors or clear the **Alert Enabled** check box, and then click **Update Alert** again.

If the **Alert Enabled** check box is cleared, click **Update Alert**. The [Update Alert](#) dialog box closes and the updated notification rule for this alert is shown in the Notify Rules table.

Follow-up actions

(Recommended) [Test message delivery](#) for the notification rule for this alert.

As needed, [enable](#), [disable](#), [copy and modify](#), [update](#) or [delete](#) the notification rule for this alert.

Update Alert Dialog Box

Purpose

Update, enable or disable a [notification rule](#) for an [alert](#).

Navigation

To go to the **Update Alert** dialog box, do the following:

1. On the [Main Menu](#), click **Notification**. The [Rajant / Notification](#) dashboard is displayed.
2. Click the **Notification Rules tab**. The **Notification Rules** tab is displayed.
3. In the Notify Rules table, in the **Name** column, click the name of the alert that is to be updated. The **Update Alert** dialog box opens and contains the current definition for that alert.

Procedure

The following procedures use the **Update Alert** dialog box:

- [Update an Alert](#)
- [Enable an Alert](#)
- [Disable an Alert](#)

Illustration

The following illustration indicates the major features on the **Update Alert** dialog box:

The screenshot shows the BC|Enterprise Notifications interface. At the top, there are status indicators for Graphs (OK), Metrics (OK), License (OK), and Connectors (OK). Below the header, a navigation bar includes 'Rajant / Notification' with a star icon, a gear icon, a search bar set to 'Last 6 hours', and a help button.

The main area is titled 'BC|Enterprise Notifications' and contains a sub-section titled 'Notification (Alerts and Reports)'. Two tabs are visible: 'Triggered Notifications' and 'Notification Rules'. The 'Notification Rules' tab is active, showing a modal dialog titled 'Update Alert'.

The 'Update Alert' dialog contains the following fields:

- Target Type:** BreadCrumb
- Target:** Datacenter (77081)
- Connectors:** testops.eng.rajant.com (Up)
- Alert Name:** TestAlertm1
- Alert Description:** Test BreadCrumb Alert
- Expression:** changes(system_bootCounter{_encap="%ENCAP%", job=~"%CONNECTORS%"}[%INTERVAL%]) > 0
- Duration:** 5m
- Notification:** None
- Subject:** short description
- Recipients:** space seperated list
- Template:** (dropdown menu)
- Options:** Alert Enabled
- Silent Period:** Show Silent Period (dropdown menu)

At the bottom right of the dialog are 'Cancel' and 'Update Alert' buttons.

Target Type list

In the **Target Type** list, click one of the following selections to identify the scope of this alert:

- **Mesh Wide:** (Most common) All BreadCrumbs
- **BreadCrumb:** An individual BreadCrumb
- **Group:** A BreadCrumb group

When this alert is triggered, the selected Target Type will be shown in the **Type** column on the **Triggered Notifications** tab on the **Rajant / Notification** dashboard.

Target list

In the **Target** list, do one of the following to identify the scope of this alert based on the selection in the **Target Type** list:

- If Target Type is **Mesh Wide**, keep **ALL BreadCrumbs** (default).
- If Target Type is **BreadCrumb**, click the BreadCrumb name followed by the Encap ID portion of the BreadCrumb serial number enclosed in parentheses (BreadCrumb Name*).
- If Target Type is **Group**, click the name of a BreadCrumb group (Groups*).

* This setting is in the BreadCrumb configuration for the BreadCrumb in BC|Commander.

When this alert is triggered, the selected Target will be shown in the **Target** column on the **Triggered Notifications** tab on the **Rajant / Notification** dashboard.

Connectors list

In the **Connectors** list, click the name and status of the **BC|Connector(s)** associated with the selection in the **Target Type** list, as follows:

- If Target Type is **Mesh Wide**, click one or more BC|Connectors.
- If Target Type is **BreadCrumb**, click the BC|Connector associated with this BreadCrumb.
- If Target Type is **Group**, click the BC|Connector associated with this BreadCrumb group (Groups*).

* This setting is in the BreadCrumb configuration for the BreadCrumb in BC|Commander.

Available BC|Connectors are listed in the BC|Connectors table on the **Rajant / BC|Connector Management** dashboard.

Alert Name box

In the **Alert Name** box, supply a unique name for this alert. An alert name must start with a letter and must not contain a space character. An alert name may contain alphanumeric characters and + (plus sign), - (hyphen), _ (underscore), % (percent sign) or = (equal sign) characters.

Note: This is a character limitation of the BC|Enterprise Metrics Service (Prometheus).

When this alert is triggered, this Alert Name value will be shown in the **Name** column on the **Triggered Notifications** tab on the **Rajant / Notification** dashboard.

Alert Description box

In the **Alert Description** box, supply descriptive text for this alert. When this alert is triggered, this descriptive text will be shown in the **Description** column on the **Triggered Notifications** tab on the **Rajant / Notification** dashboard.

Expression field

In the **Expression** field, supply a complete expression in Prometheus Query Language (PromQL) that represents the condition that is to trigger this alert. This expression must resolve to a value of True or False. At a minimum, this expression must include a metric name, a comparison operator and a value (Example: **cpuload > .35**).

(Optional) To get started, in the **Expression** list, click an appropriate selection for the condition. The format for a proposed expression is shown in the **Expression** field. Edit the proposed expression, as needed. Refer to [Examples of alert expressions](#).

To determine an appropriate value in an expression, refer to values of interest for BreadCrumb data shown in BC|Enterprise dashboards and the **Details** panel in the BC|Commander window.

For information and examples for PromQL expressions, refer to the [Prometheus documentation](#).

Metrics button

To look up available metric names for use in the **Expression** field, click **Metrics**. The **Available Metrics** dialog box opens and contains a searchable [administrative table](#) that lists each available metric name for use in the **Expression** field.

Tip: A metric may be Copied from the **Available Metrics** dialog box, and then Pasted in the **Expression** field.

Test Expression button

To evaluate the syntax of an expression in the **Expression** field, click **Test Expression**. The test result is displayed to the right of the **Test Expression** button.

The test result will be one of the following:

- **Success: valid expression - no data:** This expression is syntactically correct; but no records in the time series data base satisfy this expression.
- **Success: value = xxx:** This expression is syntactically correct. The last reported value for the metric that satisfies the expression is xxx.
- **Failed: 'error-message':** The expression is not valid. The text, *error-message* provides a description of the error.

Note: An expression that contains an unknown metric name, but is syntactically correct, will be reported as a valid expression. For example, the expression **unknown_metric > 0** will be reported as a valid expression, even though the metric named "unknown_metric" is not present in the time series database.

Duration box

In the **Duration** box, supply the length of time (default 5m) that the condition must persist to generate an alert.

Notification list

In the **Notification** list, click one of the following methods of notification for this alert:

- **Email:** (Default) Email message is sent to specified recipients through the [SMTP server](#) defined on the [Rajant / Configuration dashboard](#) on the [SMTP tab](#)
- **HTTP Post:** Universal Resource Locator (URL) for a configured web server, such as a Short Message Service (SMS) gateway, for a messaging application
- **Syslog:** Message is sent to the [syslog server](#) defined on the [Rajant / Configuration dashboard](#) on the [Syslog tab](#)
- **None:** Alert is saved in the historical database only

Important: If using a SMTP server with a limit on the number of messages per day, it may be prudent to limit textng of alerts to more serious conditions.

Subject box

If the **Email** is selected in the **Notification** list, in the **Subject** box, supply a Subject: line for the email notification message for this alert.

Recipients box

If **Email** is selected in the **Notification** list, in the **Recipients** box, supply [recipients](#) for the email notification message for this alert.

Template list

In the **Template** list, click the template name from the [template file](#) for the notification message for this alert.

Alert Enabled check box

The **Alert Enabled** check box is initially selected or cleared as in the original notification rule that is being updated.

If this updated notification rule for an alert is complete and ready to be enabled, select the **Alert Enabled** check box.

If this updated notification rule for an alert is to be saved without being enabled, clear the **Alert Enabled** check box.

Silent Period

For **Silent Period**, to show the grid for a [silent period](#) definition, click **Show Silent Period**. The grid for a silent period definition opens.

To modify or apply a silent period definition, do the following, as needed:

- [Apply the default silent period to this alert.](#)
- [Apply a custom silent period to this alert.](#)
- [Save a custom default silent period for alerts.](#)
- [Reset the default silent period for alerts.](#)

To hide the grid for a silent period definition, click **Hide Silent Period**. The grid closes.

Cancel button

To close the **Update Alert** dialog box with no action, click **Cancel**.

Update Alert button

If the **Alert Enabled** check box is selected, click **Update Alert**. The information supplied for this notification rule is validated. One of the following occurs:

- If the notification rule is complete and syntactically correct, the **Update Alert** dialog box closes and the updated notification rule for this alert is shown in the Notify Rules table. The **Enabled** column contains a check mark () to indicate that this notification rule is enabled.
- Any missing or invalid information is outlined in red. A red error message is displayed. Correct any errors or clear the **Alert Enabled** check box, and then click **Update Alert** again.

If the **Alert Enabled** check box is cleared, click **Update Alert**. The **Update Alert** dialog box closes and the updated notification rule for this alert is shown in the Notify Rules table.

Enable an Alert

Purpose

Enable a [notification rule](#) for an [alert](#).

Prerequisite

Do one of the following procedures to create or update the notification rule that is to be enabled:

- [Create an Alert](#)
- [Update an Alert](#)
- [Copy and Modify an Alert](#)

Procedure

To enable a notification rule for an alert, do the following:

1. On the [Main Menu](#), click **Notification**. The **Rajant / Notification** dashboard is displayed.
2. Click the **Notification Rules** tab.
3. In the Notify Rules table, search for the notification rule for the alert that is to be enabled. The **Enabled** column is blank to indicate that the notification rule is currently disabled.
4. In the **Name** column, name of the alert that is to be enabled. The [Update Alert](#) dialog box opens.
5. Verify that the information for the notification rule for this alert is correct.
6. Select the **Alert Enabled** check box.
7. Click **Update Alert**. The [Update Alert](#) dialog box closes. In the Notify Rules table, the **Enabled** column now contains a check mark () to indicate that the notification rule is enabled.

Result

When an alert is [triggered](#) for this enabled notification rule, the notification is listed on the **Rajant / Notification** dashboard on the **Triggered Notifications** tab.

Follow-up actions

[Disable](#) or [delete](#) the notification rule for this alert, as needed.

Disable an Alert

Purpose

Disable a [notification rule](#) for an [alert](#).

Prerequisite

The notification rule for this alert must currently be [enabled](#).

Procedure

To disable a notification rule for an email report, do the following:

1. On the [Main Menu](#), click **Notification**. The **Rajant / Notification** dashboard is displayed.
2. Click the [Notification Rules tab](#).
3. In the Notify Rules table, search for the notification rule for the alert that is to be disabled. The **Enabled** column contains a check mark () to indicate that the notification rule is enabled.
4. In the **Name** column, click the name of the alert that is to be disabled. The [Update Alert](#) dialog box opens.
5. Clear the **Alert Enabled** check box.
6. Click **Update Alert**. The [Update Alert](#) dialog box closes. In the Notify Rules table, the **Enabled** column is blank.

Result

Alerts will no longer be [triggered](#) for this notification rule.

Follow-up actions

[Enable](#) or [delete](#) the notification rule for this alert, as needed.

Delete an Alert

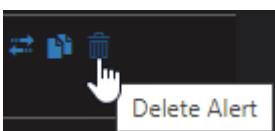
Purpose

Delete a notification rule for an alert.

Procedure

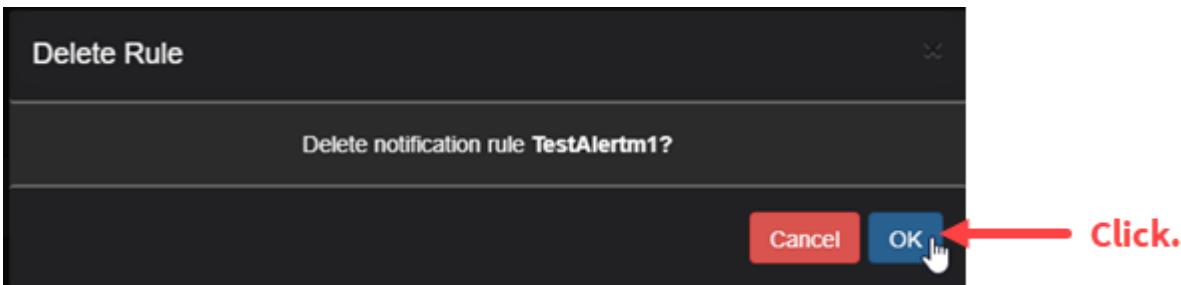
To delete a notification rule for an alert, do the following:

1. On the [Main Menu](#), click **Notification**. The **Rajant / Notification** dashboard is displayed.
2. Click the **Notification Rules** tab.
3. In the Notify Rules table, search for the notification rule for the alert that is to be deleted.
4. If the **Enabled** column contains a check mark (), [disable](#) the notification rule for the alert that is to be deleted.
5. In the **Action** column, click  (Delete Alert).



The **Delete Rule** confirmation message box opens.

6. Click **OK**.



The **Delete Rule** confirmation message box closes. In the Notify Rules table, the notification rule for this alert is no longer shown.

Result

Alerts are no longer [triggered](#) for this notification rule.

Test Message Delivery for an Alert

Purpose

Test message delivery for a [notification rule](#) for an alert.

Prerequisites

Satisfy the requirements for the notification method for this notification rule, as shown in the **Notify** column on the [Notification Rules tab](#), on the [Rajant / Notification](#) dashboard, as follows:

- **Email:** Email account settings for the [Simple Mail Transfer Protocol \(SMTP\)](#) server
- **HTTP Post:** Messaging application requirements
- **Syslog:** [Syslog server requirements](#)
- **NONE:** No notification requirements

Do one of the following procedures to create or update the notification rule that is to be tested:

- [Create an Alert](#)
- [Update an Alert](#)
- [Copy and Modify an Alert](#)

The notification rule that is being tested must be [enabled](#). On the [Rajant / Notification](#) dashboard, on the [Notification Rules tab](#), the **Enabled** column must contain a check mark ().

Test message delivery during an activated time period, not during a [silent period](#), for the notification rule that is to be tested.

Procedure

To test message delivery for a notification rule for an alert, do the following:

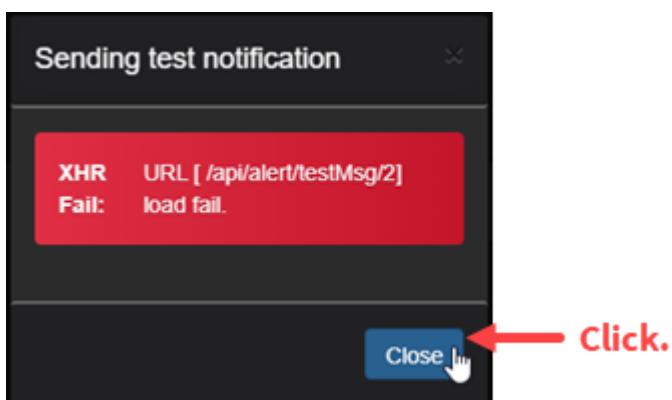
1. On the [Main Menu](#), click **Notification**. The [Rajant / Notification](#) dashboard is displayed.
2. Click the [Notification Rules tab](#).
3. In the Notify Rules table, search for the notification rule for the alert that is to be tested.
4. In the **Action** column, click  (Test Notification Message).



A test notification message is sent.

If the message delivery is successful, a **Message Sent** message box is briefly displayed.

If the message delivery fails, a **Sending test notification** message box indicates the result. Click **Close**.



The **Sending test notification** message box closes.

Follow-up action

If the test notification failed, in Notify Rules table, in the **Name** column, click the name for the notification rule that was tested. The [**Update Alert dialog box**](#) opens. Check the content of the **Update Alert** dialog box for errors and make changes, as needed.

Manage Templates for Alerts

Contents

[Templates for Alerts](#)

[Example Template File for an Alert](#)

[Variables in Templates for Alerts](#)

Templates for Alerts

Description

The [notification rule](#) for an [alert](#) must specify a predefined template to be used to format the content of the notification message for an alert.

Note: BC|Enterprise uses the [Apache FreeMarker™ Template Engine](#).

Template files

Tip: An email notification message for an alert is a multi-part message that includes an ASCII text version that an SMTP server can send as SMS text.

A template file for an alert specifies the content and format for a notification message designed for a particular notification method.

A template for an alert is a file written in Hypertext Markup Language (HTML). A template file for an alert must have a unique file name with **.ftl** as the filename extension.

The first line in a template file for an alert must be a comment that provides the template name and notification method for the alert. When a notification rule for an alert is [created](#) or [updated](#), the template name will be listed as the name of an available template in the **Template** list in the [Create Alert dialog box](#) or [Update Alert dialog box](#). When this template name is selected in the **Template** list, this notification method must be selected in the **Notification** list in the [Create Alert dialog box](#) or [Update Alert dialog box](#).

A template file may include [variables](#) that are to be replaced by corresponding values obtained from BC|Enterprise.

Example template file

Default template files

A default template is available for each of the following methods of notification for an alert:

- **Email:** Email message is sent to specified recipients through the [SMTP server](#) defined on the [Rajant / Configuration dashboard](#) on the [SMTP tab](#)
- **HTTP Post:** HTTP Post is sent to a messaging application
- **Syslog:** Message is sent to the [syslog server](#) defined on the [Rajant / Configuration dashboard](#) on the [Syslog tab](#)
- **None:** Alert is saved in the historical database only

These default template files are created the first time the [Rajant BC|Enterprise Service](#) starts on [Windows](#) or [Linux](#). Each time the Rajant BC|Enterprise Service starts, any missing template files will be restored.

A [user](#) with user type **Administrator** may edit each default template file for an alert at the storage location.

The template file named **email.txt.ftl** is a plain text template that is automatically included in a multi-part email notification message for an alert.

Custom template files

A [user](#) with user type **Administrator** may add or edit a custom template file for an alert at the storage location.

Storage location

All available template files for alerts must reside in a subfolder in the path identified in the **Data Directory** box on the [Services tab](#) on the [Rajant /Configuration](#) dashboard.

For Windows, the name of the subfolder is as follows:

`.\var\conf\templates\messaging`

For Linux, the name of the subfolder is as follows:

`./var/conf/templates/messaging`

For example, for Linux, if the path in the **Data Directory** box is `/opt/bcenterprise/data`, the template files for alerts must reside in the following subfolder:

`.data/var/conf/templates/messaging`

Backup recommendation

Important: BC|Enterprise is not expected to overwrite existing template files for alerts. However, as a precaution, it is important to maintain a backup copy of the **messaging** subfolder in another location.

Reset procedure

When the [Rajant BC|Enterprise Service](#) starts on [Windows](#) or [Linux](#), any missing default template for an [alert](#) or email report is automatically re-created.

If necessary, to reset the original default template files for alerts and [email reports](#), see [Templates Need to Be Reset](#).

Reset process

When the [Rajant BC|Enterprise Service](#) starts on [Windows](#) or [Linux](#), any missing default template file for an alert or [email report](#) is automatically re-created.

If necessary, all original default template files for alerts and [email reports](#) can be [manually reset](#).

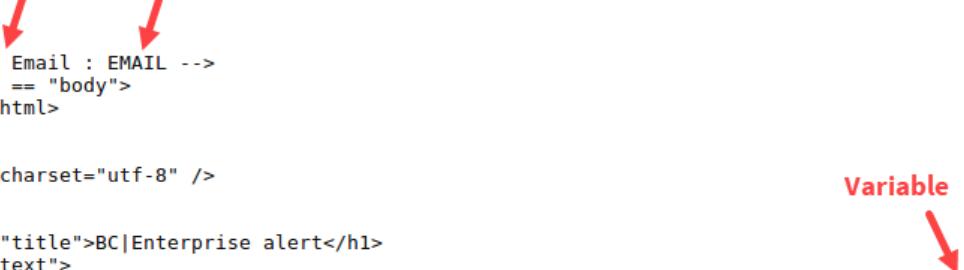
Example Template File for an Alert

Purpose

This example [template file](#) in Hypertext Markup Language (HTML) format can be used to [create](#) or [update](#) a [notification rule](#) for an [alert](#) where the notification method is [Email](#).

Tip: An email notification message for an alert is a multi-part message that includes an ASCII text version that an SMTP server can send as SMS text.

Example template file

Template Name	Notification Method
<pre><!-- Plain Email : EMAIL --> <if phase == "body"> <!DOCTYPE html> <html> <head> <meta charset="utf-8" /> </head> <body> <h1 class="title">BC Enterprise alert</h1> <p class="text"> <h3>\${_name} (\${_platform} \${_encap}) has raised \${alertName} at \${formattedDateTime}: \${desc} (\${value}) <if bcalertmessage??>\${bcalertmessage}</if></h3> </p> </body> </html> </if> <if phase == "text">\${_name} (\${_platform} \${_encap}) has raised \${alertName} at \${formattedDateTime}: \${desc} (\${value}) <if bcalertmessage??>\${bcalertmessage}</if> </if></pre>	Variable 

Template name

The first line in a template file for an alert must identify the template name. In this example, the template name is **Plain Email**.

When a notification rule for an alert is [created](#) or [updated](#), the template name will be listed as an available template in the **Template** list in the [Create Alert dialog box](#) or [Update Alert dialog box](#).

Notification method

The first line in a template file for an alert must identify the notification method associated with this template file. In this example, the notification method is **EMAIL**. When the template name **Plain Email** is selected in the **Template** list, **Email** must be selected in the **Notification** list in the [Create Alert dialog box](#) or [Update Alert dialog box](#).

Variables

For a description of the variables used in this example template file, see [Variables in Templates for Alerts](#).

Variables in Templates for Alerts

Description

Variables may be used in a [template file](#) for an [alert](#). If appropriate, each variable will be replaced with a value obtained from BC|Enterprise.

Variables

The following table contains a variable name, an example value and a description of the value for each variable available for use in a template file for an alert.

Table: Available Variables for Template Files for Alerts

* This setting is in the BreadCrumb configuration for the BreadCrumb in BC|Commander.

Variable Name	Example Value	Description
_encap	12550	Encap ID portion of a BreadCrumb serial number (BreadCrumb Name*)
_groups	don't auto-update, trop	BreadCrumb groups (Groups*)
_method	POST	Method of notification in notification rule for the alert
_model	ME4-249	BreadCrumb model
_name	Fred ME4	BreadCrumb name (BreadCrumb Name*)
_network	My Company Network	Rajant mesh network name
_platform	ME4	BreadCrumb product family
_subject	BreadCrumb Overheating	Subject line for alert message
_template	slack.txt.ftl	Template file name for alert
_url	5555555555@vtext.com	Universal Resource Locator (URL) for a configured web server for a messaging application
_version	11.24.3	BC Enterprise software version
#CODE#	38	Numeric error code from a BreadCrumb
#CHANNEL#	149	Channel number on a BreadCrumb (Channel*)
#FREQUENCY#	5745 MHz	Operating frequency for a radio on a BreadCrumb (Channel*)
alertId	1	System-generated identifier for the notification rule for the alert
alertname	BCAlertSlack	Alert Name in notification rule for the alert

alertSystem_alerts	333	Code number for an alert that originates in a BreadCrumb
bcalertmessage	Low Battery	Message text for an alert that originates in a BreadCrumb
creator	admin	User type (admin or user) for creator of notification rule for the alert
formattedDateTime	2021-09-13T15:01:37.836-4:00	Date and time that alert notification was triggered
desc	Low Battery Warning	Alert Description in notification rule for the alert
duration	1m	Length of time the condition must persist to trigger an alert
enabled	true	Enabled state (true or false) for the notification rule for the alert
instance	localhost:8888	hostname:port for Rajant BC Enterprise Service on the BC Enterprise server
Job	bc360	Job name in time series database
notifyType	EMAIL	Method of notification in notification rule for the alert
recipients	support@mycompany.com	Recipients for alert notification in notification rule for the alert
targetType	MESH	Target type (MESH, BREADCRUMB or GROUP) for the notification rule for the alert
value	421	Value for the metric in the Expression that triggered this alert

Manage Silent Periods for Alerts

Contents

[Silent Periods for Alerts](#)

[Save a Custom Default Silent Period for Alerts](#)

[Apply the Default Silent Period to an Alert](#)

[Reset the Default Silent Period for Alerts](#)

[Apply a Custom Silent Period to an Alert](#)

Silent Periods for Alerts

Description

A silent period is a predefined period of time during the week when notification messages for [alerts](#) are to be suppressed.

Methods of notification

A silent period can apply only to an alert for which the [method of notification](#) is one of the following:

- **Email:** Email message sent to specified recipients through the SMTP server
- **HTTP Post:** HTTP Post sent to a messaging application
- **Syslog:** Message sent to the syslog server

No silent periods apply to saving notification messages for alerts in the historical database.

Silent period definitions

The following silent period definitions are available:

- **Initial default:** None. No silent periods exist. A notification message is sent for every triggered alert that occurs at any time.
- **Custom default:** (Optional) Default silent period definition other than the initial default. Only one custom default silent period definition may be [saved](#). The custom default silent period definition may be [reset](#) to the initial default.
- **Custom:** (Optional) Non-default silent period definition.

Silent period selection

When the [notification rule](#) for that alert is [created or updated](#), the [default silent period](#) or a [custom silent period](#) can be applied to the alert.

Time period grid

Time blocks that apply to a silent period definition are selected in a grid. This grid contains a row for each half-hour increment (**12:00 AM** to **11:30 PM**) in a 24-hour time period. The grid contains a column for each day of the week (**Sun** through **Sat**).

Within the grid, indicates a silent half-hour and indicates an active half-hour. To toggle the color for a cell in the grid, click the cell.

To create a silent period definition, click each of the following buttons below the grid, as needed:

Button	Action
Silence All	Show in every cell in the grid.
Activate All	Show in every cell in the grid.
Use Default	Apply the current custom default silent period definition to this alert.
Use Custom	Apply the displayed custom silent period definition to this alert.
Save as Custom	Save the displayed silent period definition as the custom default silent period definition.

Related topics

The following topics are related to silent period definitions:

- [Save a Custom Default Silent Period for an Alert](#)
- [Apply the Default Silent Period to an Alert](#)
- [Reset the Default Silent Period for an Alert](#)
- [Apply a Custom Silent Period to an Alert](#)

Save a Custom Default Silent Period for Alerts

Purpose

Save a custom default [silent period](#) definition for new [notification rules](#) for alerts.

Procedure

While [creating](#) or [updating](#) the notification rule for an alert, to save a custom default silent period definition, do the following:

1. For **Silent Period**, click **Show Silent Period**. The time period grid opens.
2. In the grid, supply a custom silent period definition.
3. Click **Save as Custom**.
4. Click **Hide Silent Period**. The time period grid closes.

Result

After the notification rule for an alert is created or updated, the custom silent period applies to that notification rule. Also, this custom silent period definition is now the default silent period definition in any new notification rule for an alert.

Follow-up procedures

Do the following, as needed:

- To change the custom default silent period definition, do this procedure again.
- Reset the default silent period definition for alerts to the initial default definition, where no silent periods exist.

Apply the Default Silent Period to an Alert

Purpose

Apply the current default silent period definition to the [notification rule](#) for an [alert](#).

Procedure

While [creating](#) or [updating](#) the notification rule for an alert, to apply the current default silent period definition, do the following:

1. For **Silent Period**, click **Show Silent Period**. The time period grid opens.
2. Click **Use Default**.
3. Click **Hide Silent Period**. The time period grid closes.

Result

After the notification rule for an alert is created or updated, the current default silent period applies to that notification rule.

Reset the Default Silent Period for Alerts

Purpose

Reset the default [silent period](#) definition for [alerts](#) to the initial default definition, where no silent periods exist.

This procedure creates a new notification rule only to reset the default silent period definition and then deletes that new notification rule.

This procedure copies and modifies an existing notification rule for alert to create a new notification rule only to reset the default silent period definition and then deletes that new notification rule.

Recommendation

The [user](#) who performs this procedure should copy and modify an alert created by that user.

Procedure

To reset the default silent period definition for [alerts](#) to the initial default definition, do the following:

1. On the [Main Menu](#), click **Notification**. The [Rajant / Notification](#) dashboard is displayed.
2. Click the **Notification Rules** tab.
3. Click **Add Alert**. The [Create Alert](#) dialog box opens.
4. In the **Target Type** list, click **Mesh Wide**.
5. In the **Target** list, keep **ALL BreadCrumbs**.
6. In the **Connectors** list, click the name and status of all [BC|Connector\(s\)](#).
7. In the **Alert Name** box, supply the name to **Reset_Silent_Period**.
8. In the **Alert Description** box, supply the description **Reset silent periods to none**.
9. Leave the **Expression** field blank.
10. In the **Duration** box, keep the value **5m** (default).
11. In the **Notification** list, click **None** (default).
12. Select the **Alert Enabled** check box.
13. For **Silent Period**, click **Show Silent Period**. The time period grid opens.
14. Click **Activate All**. Every cell in the time period grid contains  (active).
15. Click **Save as Custom**.
16. Click **Hide Silent Period**. The time period grid closes.
17. Click **Create Alert**. The [Create Alert](#) dialog box closes and the new notification rule for this alert is added to the Notify Rules table. The **Enabled** column contains a check mark () to indicate that this notification rule is enabled.
18. [Delete](#) the notification rule for the alert named **Reset_Silent_Period**.

Result

By default, no silent period exists in any new notification rule for an alert.

Follow-up procedure

If necessary, [save a custom default silent period](#) for any new notification rule for an alert.

Apply a Custom Silent Period to an Alert

Purpose

Apply a custom [silent period](#) definition to the [notification rule](#) for an [alert](#).

Procedure

While [creating](#) or [updating](#) the notification rule for an alert, to apply a custom silent period definition, do the following:

1. For **Silent Period**, click **Show Silent Period**. The time period grid opens.
2. In the grid, supply a custom silent period definition.
3. Click **Use Custom**.
4. Click **Hide Silent Period**. The time period grid closes.

Result

After the notification rule for an alert is created or updated, the custom silent period applies only to that notification rule.

Manage Email Reports

Contents

- [Email Reports](#)
- [Template for an Email Report](#)
- [Create an Email Report](#)
- [Create Email Report Dialog Box](#)
- [Copy and Modify an Email Report](#)
- [Enable an Email Report](#)
- [Disable an Email Report](#)
- [Update an Email Report](#)
- [Delete an Email Report](#)
- [Test Message Delivery for an Email Report](#)

Email Reports

Description

An email report is a scheduled email message that is to be sent to designated recipients as specified in a [notification rule](#).

Content

An email report may contain the following:

- Custom content
- Data from a [reporting dashboard](#) that has been [exported](#) to a file in comma-separated values (CSV) format

Recipients

The notification rule for each email report must include a space-separated list of recipients. This list must include an email address for each [user](#) who is to receive the email report.

Report Template

The notification rule for each email report must specify the predefined [template](#) to be used to format the content of the email report.

Enabled or Disabled Email Reports

A notification rule for an email report will issue email messages only while the notification rule is enabled.

A user may enable or disable the notification rule for an email report when [creating](#) or [updating](#) the notification rule.

Related topics

The following topics are related to email reports:

- [Breadcrumb and Radio Reports](#)
- [Export Report Data](#)
- [Create an Email Report](#)
- [Copy and Modify an Email Report](#)
- [Update an Email Report](#)
- [Delete an Email Report](#)
- [Template for an Email Report](#)
- [Test Message Delivery for an Email Report](#)
- [Simple Mail Transfer Protocol \(SMTP\) Server Requirements](#)

Template for an Email Report

Description

The [notification rule](#) for every [email report](#) must specify the predefined report template to be used to format the content of the email report.

Template file

The template file for an email report is written in Hypertext Markup Language (HTML). The name of this file is email.txt.ftl.

The template file for an email report is created the first time the [BC|Enterprise service](#) starts on [Windows](#) or [Linux](#). This file will be restored, if missing, each time the BC|Enterprise service starts.

A [user](#) with user type **Administrator** may edit the template file for an email report at the storage location.

Storage location

The template file for an email report must reside in a subfolder in the path identified in the **Data Directory** box on the [Services tab](#) on the [Rajant /Configuration](#) dashboard.

For Windows, the name of the subfolder in the **data** folder is as follows:

```
.\var\conf\templates\reporting
```

For Linux, the name of the subfolder in the **data** folder is as follows:

```
./var/conf/templates/reporting
```

For example, for Linux, if the path in the **Data Directory** box is /opt/bcenterprise/data, the template file for email reports must reside in the following subfolder:

```
.data/var/conf/templates/reporting
```

Backup recommendation

Important: BC|Enterprise is not expected to overwrite the template file for an email report. However, as a precaution, it is important to maintain a backup copy of the **reporting** subfolder in another location.

Reset process

When the [Rajant BC|Enterprise Service](#) starts on [Windows](#) or [Linux](#), any missing default template file for an [alert](#) or email report is automatically re-created.

If necessary, all original default template files for [alerts](#) and email reports can be [manually reset](#).

Create an Email Report

Purpose

Create a notification rule for an [email report](#).

Prerequisites

Refer to [Create Email Report](#) dialog box to prepare the information required to create a notification rule for an email report.

Procedure

To create a notification rule for an email report, do the following:

1. On the [Main Menu](#), click **Notification**. The [Rajant / Notification](#) dashboard is displayed.
2. Click the [Notification Rules](#) tab.
3. Click **Add Report**. The [Create Email Report](#) dialog box opens.
4. In the **Report Name** box, supply a unique name for this email report.
5. In the **Custom Content** box, supply any custom text for this email report.
6. In the **Email Subject** box, supply a Subject: line for the email notification message.
7. In the **Recipients** box, supply recipients for the notification message for this email report.
8. In the **Report Template** list, click **Formatted Report** (default).
9. Select or clear (default) the **Enabled** check box.
10. Click **Create Report**.
11. If the **Enabled** check box is selected, the information supplied for this notification rule is validated. One of the following occurs:
 - If the notification rule is complete and syntactically correct, the [Create Email Report](#) dialog box closes and the new notification rule for this email report is added to the Notify Rules table. The **Enabled** column contains a check mark () to indicate that this notification rule is enabled.
 - Any missing or invalid information is outlined in red. A red error message is displayed. Correct any errors or clear the **Enabled** check box, and then click **Create Report** again.

If the **Enabled** check box is cleared, the [Create Email Report](#) dialog box closes and the new notification rule for this email report is added to the Notify Rules table. The **Enabled** column is blank.

Follow-up actions

(Recommended) [Test message delivery](#) for the notification rule for this email report.

As needed, [enable](#), [disable](#), [copy and modify](#), [update](#) or [delete](#) the notification rule for this email report.

Create Email Report Dialog Box

Purpose

Create a notification rule for an [email report](#).

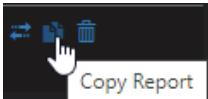
Navigation

To create a new notification rule for an email report, do the following:

1. On the [Main Menu](#), click **Notification**. The [Rajant / Notification](#) dashboard is displayed.
2. Click the [Notification Rules tab](#). The **Notification Rules** tab is displayed.
3. Click **Add Report**. The **Create Email Report** dialog box opens.

To copy and then modify a notification rule for an email report, do the following:

1. On the [Main Menu](#), click **Notification**. The [Rajant / Notification](#) dashboard is displayed.
2. Click the [Notification Rules tab](#). The **Notification Rules** tab is displayed.
3. In the Notify Rules table, search for the notification rule for the email report that is to be copied and then modified.
4. In the **Action** column, click  (Copy Report).



The **Create Report** dialog box opens.

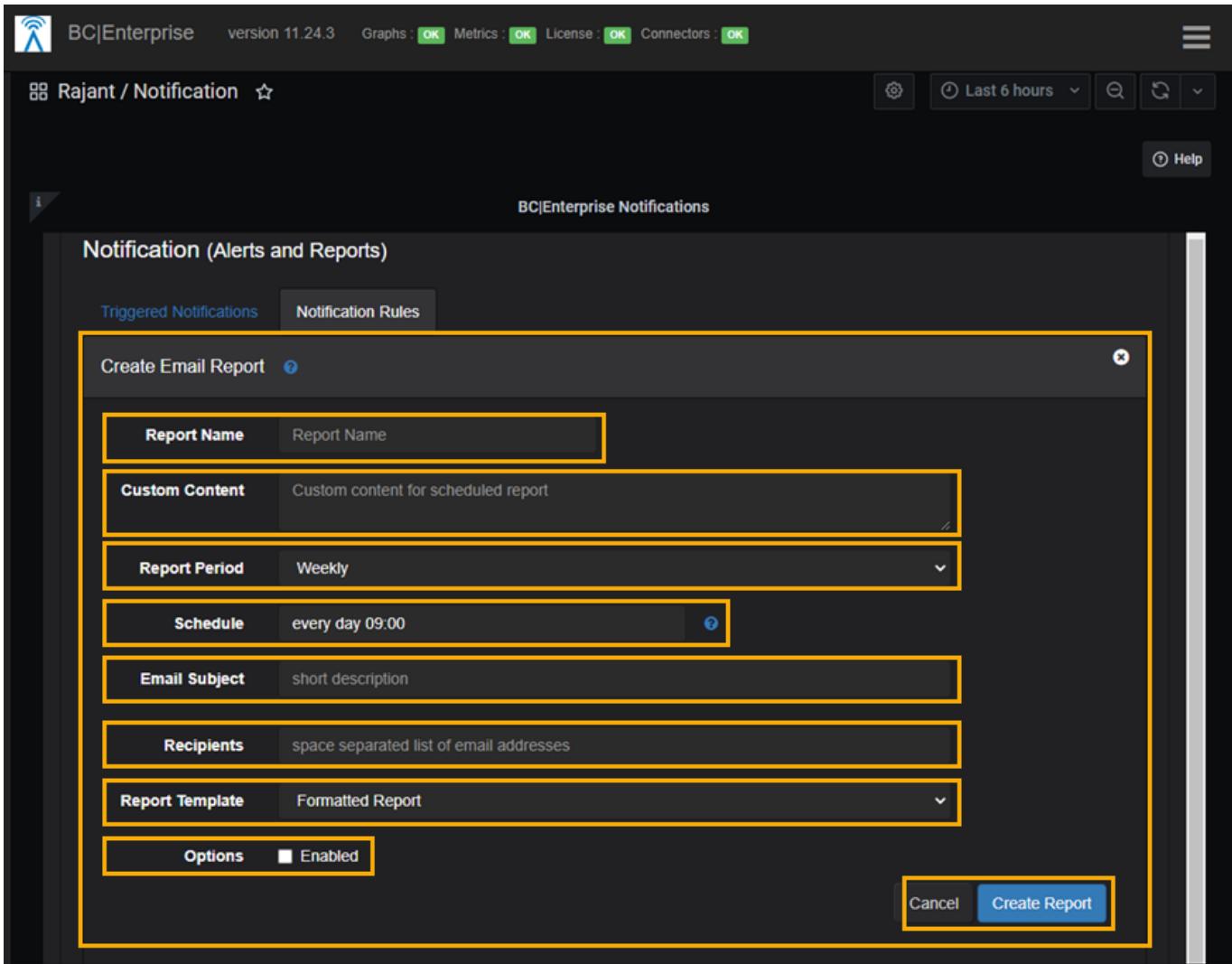
Procedures

The following procedures use the **Create Email Report** dialog box:

- [Create an Email Report](#)
- [Copy and Modify an Email Report](#)

Illustration

The following illustration indicates the major features on the **Create Email Report** dialog box:



Report Name box

In the **Report Name** box, supply a unique name for this email report. An email report name must start with a letter and may contain space characters. An email report name may contain alphanumeric characters and + (plus sign), - (hyphen), _ (underscore), % (percent sign) or = (equal sign) characters.

Note: This is a character limitation of the BC|Enterprise Metrics Service (Prometheus).

When this email report is triggered, this **Report Name** value will be shown in the **Name** column on the **Triggered Notifications** tab on the **Rajant / Notification** dashboard.

Custom Content box

In the **Custom Content** box, supply any custom text for this email report.

When this email report is triggered, this custom text will be shown in the **Description** column on the **Triggered Notifications** tab on the **Rajant / Notification** dashboard.

Report Period list

In the **Report Period** list, select a period of time to be covered in the report. Available choices are **Daily**, **Weekly** and **Monthly**.

Schedule box

In the **Schedule** box, describe a scheduled time in the reporting period when the report to be issued. Click to view Help text for defining the schedule.

Email Subject box

In the **Email Subject** box, supply the content for the Subject: line for the email notification message for this report.

Recipients box

In the **Recipients** box, supply a space-separated list of email addresses for each recipient for the email notification message for this email report.

Report Template list

In the **Report Template** list, select **Formatted Report** to use the only available predefined template for an email report.

Enabled check box

If this new notification rule for an email report is complete and ready to be enabled, select the **Enabled** check box.

(Default) If this new notification rule for an email report is to be saved without being enabled, clear the **Enabled** check box.

Cancel button

To close the **Create Email Report** dialog box with no action, click **Cancel**.

Create Report button

If the **Enabled** check box is selected, click **Create Report**. The information supplied for this notification rule is validated. One of the following occurs:

- If the notification rule is complete and syntactically correct, the **Create Email Report** dialog box closes and the new notification rule for this email report is added to the Notify Rules table. The **Enabled** column contains a check mark () to indicate that this notification rule is enabled.
- Any missing or invalid information is outlined in red. A red error message is displayed. Correct any errors or clear the **Enabled** check box, and then click **Create Email Report** again.

If the **Enabled** check box is cleared (default), click **Create Email Report**. The **Create Email Report** dialog box closes and the new notification rule for this email report is added to the Notify Rules table.

Copy and Modify an Email Report

Purpose

Copy a [notification rule](#) for an [email report](#), and then modify the copy to create a new alert.

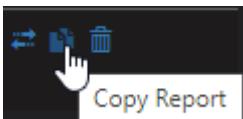
Prerequisites

Refer to [Create Email Report](#) dialog box to prepare changes required to the copied notification rule for an email report.

Procedure

To copy, and then modify a notification rule for an alert, do the following:

1. On the [Main Menu](#), click **Notification**. The [Rajant / Notification](#) dashboard is displayed.
2. Click the [Notification Rules](#) tab.
3. In the Notify Rules table, search for the notification rule for the email report that is to be copied and then modified.
4. In the **Action** column, click  (Copy Report).



The [Create Email Report](#) dialog box opens.

5. In the **Report Name** box, supply a unique name for this email report.
6. In the **Custom Content** box, supply any custom text for this email report.
7. Make other changes to the copied notification rule, as needed.
8. Select or clear the **Enabled** check box.
9. Click **Create Report**.

If the **Enabled** check box is selected, the information supplied for this notification rule is validated. One of the following occurs:

- If the notification rule is complete and syntactically correct, the [Create Email Report](#) dialog box closes and the new notification rule for this email report is added to the Notify Rules table. The **Enabled** column contains a check mark () to indicate that this notification rule is enabled.
- Any missing or invalid information is outlined in red. A red error message is displayed. Correct any errors or clear the **Enabled** check box, and then click **Create Report** again.

If the **Enabled** check box is cleared, the [Create Email Report](#) dialog box closes and the new notification rule for this email report is added to the Notify Rules table. The **Enabled** column is blank.

Follow-up actions

(Recommended) [Test message delivery](#) for the notification rule for this email report.

As needed, [enable](#), [disable](#), [copy and modify](#), [update](#) or [delete](#) the notification rule for this alert.

Enable an Email Report

Purpose

Enable a [notification rule](#) for an [email report](#).

Prerequisite

The notification rule for this email report must have already been [created](#).

Procedure

To enable a notification rule for an email report, do the following:

1. On the [Main Menu](#), click **Notification**. The **Rajant / Notification** dashboard is displayed.
2. Click the [Notification Rules tab](#).
3. In the Notify Rules table, search for the notification rule for the email report that is to be enabled. The **Enabled** column is blank to indicate that the notification rule is currently disabled.
4. In the **Name** column, name of the email report that is to be enabled. The [Update Email Report](#) dialog box opens.
5. Verify that the information for the notification rule for this email report is correct.
6. Select the **Enabled** check box.
7. Click **Update Report**. The [Update Email Report](#) dialog box closes. In the Notify Rules table, the **Enabled** column now contains a check mark () to indicate that the notification rule is enabled.

Follow-up actions

[Disable](#) or [delete](#) the notification rule for this alert, as needed.

Disable an Email Report

Purpose

Disable a [notification rule](#) for an [email report](#).

Prerequisite

The notification rule for this alert must have already been [created](#).

Procedure

To disable a notification rule for an alert, do the following:

1. On the [Main Menu](#), click **Notification**. The **Rajant / Notification** dashboard is displayed.
2. Click the [Notification Rules tab](#).
3. In the Notify Rules table, search for the notification rule for the email report that is to be disabled. The **Enabled** column contains a check mark () to indicate that the notification rule is enabled.
4. In the **Name** column, click the name of the email report that is to be disabled. The [Update Email Report](#) dialog box opens.
5. Clear the **Enabled** check box.
6. Click **Update Report**. The [Update Email Report](#) dialog box closes. In the Notify Rules table, the **Enabled** column is blank.

Follow-up actions

[Enable](#) or [delete](#) the notification rule for this email report, as needed.

Update an Email Report

Purpose

Update a [notification rule](#) for an [email report](#).

Prerequisites

Refer to [Update Email Report](#) dialog box to prepare the information required to update a notification rule for an email report.

Procedure

To update a notification rule for an email report, do the following:

1. On the [Main Menu](#), click **Notification**. The [Rajant / Notification](#) dashboard is displayed.
 2. Click the **Notification Rules** tab.
 3. In the Notify Rules table, search for the notification rule for the email report that is to be updated.
 4. In the Notify Rules table, in the **Name** column, click the name of the email report that is to be updated. The [Update Email Report](#) dialog box opens and contains the current information for that email report.
 5. In the **Report Name** box, supply a unique name for this email report.
 6. In the **Custom Content** box, supply any custom text for this email report.
 7. In the **Email Subject** box, supply a Subject: line for the email notification message.
 8. In the **Recipients** box, supply recipients for the notification message for this email report.
 9. In the **Report Template** list, click **Formatted Report** (default).
 10. Select or clear the **Enabled** check box.
 11. Click **Update Report**.
 12. If the **Enabled** check box is selected, the information supplied for this notification rule is validated. One of the following occurs:
 - If the notification rule is complete and syntactically correct, the [Update Email Report](#) dialog box closes and the updated notification rule for this email report is shown in the Notify Rules table. The **Enabled** column contains a check mark () to indicate that this notification rule is enabled.
 - Any missing or invalid information is outlined in red. A red error message is displayed. Correct any errors or clear the **Enabled** check box, and then click **Update Report** again.
- If the **Enabled** check box is cleared, click **Update Report**. The [Update Email Report](#) dialog box closes and the updated notification rule for this email report is shown in the Notify Rules table.

Follow-up actions

(Recommended) [Test message delivery](#) for the notification rule for this email report.

As needed, [enable](#), [disable](#), [copy and modify](#), [update](#) or [delete](#) the notification rule for this email report.

Update Email Report Dialog Box

Purpose

Update a [notification rule](#) for an [email report](#).

Navigation

To update a notification rule for an email report, do the following:

1. On the [Main Menu](#), click **Notification**. The [Rajant / Notification](#) dashboard is displayed.
2. Click the **Notification Rules tab**. The **Notification Rules** tab is displayed.
3. In the Notify Rules table, in the **Name** column, click the name of the email report that is to be updated. The **Update Alert** dialog box opens and contains the current information for that email report.

Procedures

The following procedures use the **Update Email Report** dialog box:

- [Update an Email Report](#)
- [Enable an Email Report](#)
- [Disable an Email Report](#)

Illustration

The following illustration indicates the major features on the **Update Email Report** dialog box:

The screenshot shows the BC|Enterprise Notifications interface. At the top, there's a header with the BC|Enterprise logo, version information (version 11.24.3), and status indicators for Graphs, Metrics, License, and Connectors, all showing 'OK'. Below the header is a navigation bar with tabs for 'Triggered Notifications' and 'Notification Rules', and a search bar with filters for 'Last 6 hours' and 'Help'. The main content area is titled 'BC|Enterprise Notifications' and contains a sub-section titled 'Notification (Alerts and Reports)'. A modal window titled 'Update Email Report' is open, containing fields for 'Report Name' (set to 'Test'), 'Custom Content' (set to 'testing'), 'Report Period' (set to 'Weekly'), 'Schedule' (set to 'every day 09:00'), 'Email Subject' (set to 'testing'), 'Recipients' (set to 'tpelfrey@rajant.com'), 'Report Template' (set to 'Formatted Report'), and 'Options' (with 'Enabled' checked). At the bottom right of the modal are 'Cancel' and 'Update Report' buttons, with 'Update Report' being highlighted by a yellow border.

Report Name box

In the **Report Name** box, supply a unique name for this email report. An email report name must start with a letter and may contain space characters. An email report name may contain alphanumeric characters and + (plus sign), - (hyphen), _ (underscore), % (percent sign) or = (equal sign) characters.

Note: This is a character limitation of the BC|Enterprise Metrics Service (Prometheus).

When this email report is triggered, this **Report Name** value will be shown in the **Name** column on the **Triggered Notifications** tab on the **Rajant / Notification** dashboard.

Custom Content box

In the **Custom Content** box, supply any custom text for this email report.

When this email report is triggered, this custom text will be shown in the **Description** column on the **Triggered Notifications** tab on the **Rajant / Notification** dashboard.

Report Period list

In the **Report Period** list, select a period of time to be covered in the report. Available choices are **Daily**, **Weekly** and **Monthly**.

Schedule box

In the **Schedule** box, describe a scheduled time in the reporting period when the report to be issued. Click to view Help text for defining the schedule.

Email Subject box

In the **Email Subject** box, supply the content for the Subject: line for the email notification message for this report.

Recipients box

In the **Recipients** box, supply a space-separated list of email addresses for each recipient for the email notification message for this email report.

Report Template list

In the **Report Template** list, select **Formatted Report** to use the only available predefined template for an email report.

Enabled check box

The **Enabled** check box is initially selected or cleared as in the original notification rule that is being updated.

If this updated notification rule for an email report is complete and ready to be enabled, select the **Enabled** check box.

If this updated notification rule for an email report is to be saved without being enabled, clear the **Enabled** check box.

Cancel button

To close the **Update Email Report** dialog box with no action, click **Cancel**.

Update Report button

If the **Enabled** check box is selected, click **Update Report**. The information supplied for this notification rule is validated. One of the following occurs:

- If the notification rule is complete and syntactically correct, the **Update Email Report** dialog box closes and the new notification rule for this email report is added to the Notify Rules table. The **Enabled** column contains a check mark () to indicate that this notification rule is enabled.
- Any missing or invalid information is outlined in red. A red error message is displayed. Correct any errors or clear the **Enabled** check box, and then click **Update Email Report** again.

If the **Enabled** check box is cleared (default), click **Update Email Report**. The **Update Email Report** dialog box closes and the new notification rule for this email report is added to the Notify Rules table.

Delete an Email Report

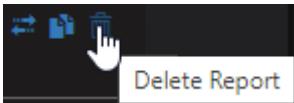
Purpose

Delete a notification rule for an [email report](#).

Procedure

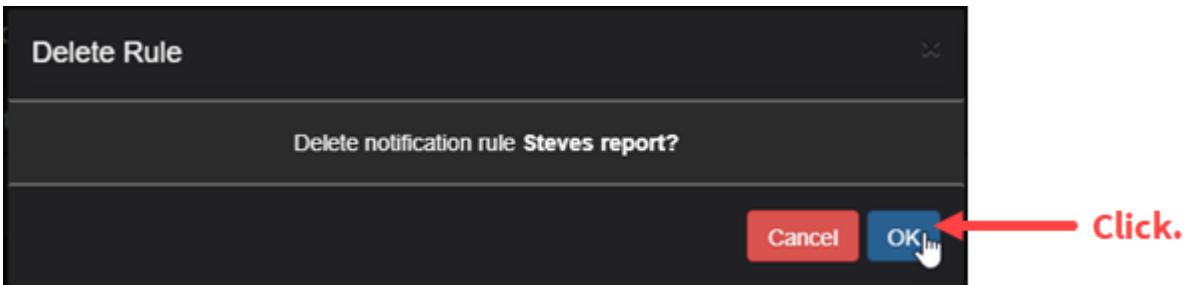
To delete a notification rule for an email report, do the following:

1. On the [Main Menu](#), click **Notification**. The [Rajant / Notification](#) dashboard is displayed.
2. Click the **Notification Rules** tab.
3. In the Notify Rules table, search for the notification rule for the email report that is to be deleted.
4. If the **Enabled** column contains a check mark ()[, disable](#) the notification rule for the email report that is to be deleted.
5. In the **Action** column, click  (Delete Report).



The **Delete Rule** confirmation message box opens.

6. Click **OK**.



The **Delete Rule** confirmation message box closes. In the Notify Rules table, the notification rule for this email report is no longer shown.

Result

Email Reports are no longer [triggered](#) for this notification rule.

Test Message Delivery for an Email Report

Purpose

Test message delivery for a [notification rule](#) for an [email report](#).

Prerequisites

Check the email account settings for the [Simple Mail Transfer Protocol \(SMTP\)](#) server.

Do one of the following procedures to create or update the notification rule that is to be tested:

- [Create an Email Report](#)
- [Update an Email Report](#)
- [Copy and Modify an Email Report](#)

To define the notification rule that is to be tested, do the following:

- For **Schedule**, select a schedule that will send the message at a convenient time for the tester to observe the test result.
- For **Recipients**, supply the email address for the tester.
- For **Options**, select the **Enabled** check box.

Procedure

To test message delivery for a notification rule for an email report, do the following:

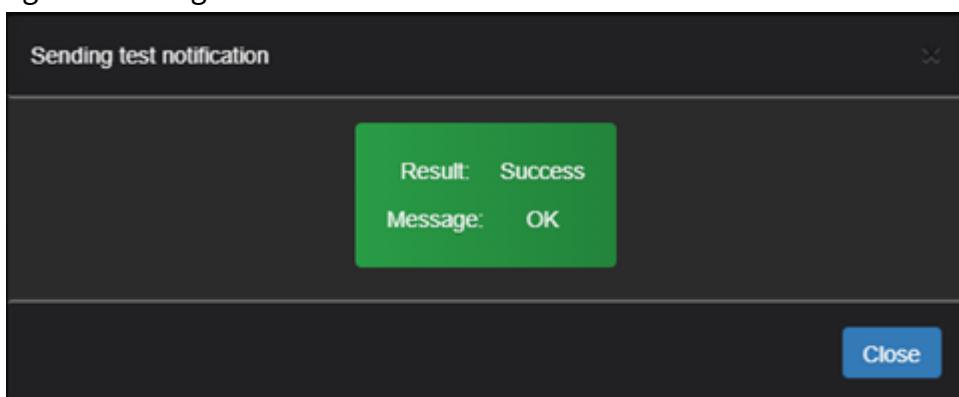
1. On the [Main Menu](#), click **Notification**. The [Rajant / Notification](#) dashboard is displayed.
2. Click the [Notification Rules](#) tab.
3. In the Notify Rules table, search for the notification rule for the email report that is to be tested. The **Enabled** column must contain a check mark ().
4. In the **Action** column, click  (Test Notification Message).



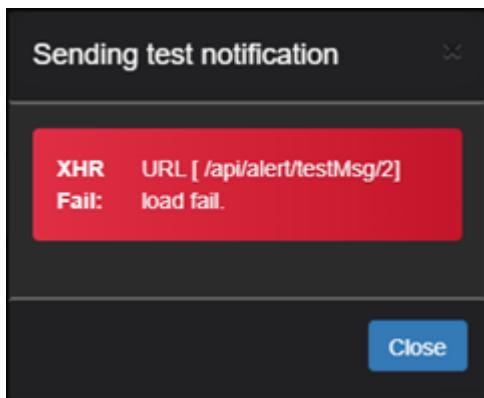
A test notification message is sent.

A **Sending test notification** message box opens to indicate the result.

A green message indicates a successful result.



A red message indicates a failed result.



5. Click **Close**. The **Sending test notification** message box closes.

Follow-up actions

If the test notification was successful, do the following:

1. View the email notification message that was sent to the test recipient.
2. Determine any changes required in the content of the email notification message.
3. [Update the email report](#) that was tested to reflect the requirements for the actual delivery of the report.

If the test notification failed, do the following:

1. [Update the email report](#) that was tested to correct any errors.
2. Test delivery of the notification message again.

Reset Template Files

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[Templates Need to Be Reset](#)

[Reset Template Files on Windows Service](#)

[Reset Template Files on Linux .rpm Service](#)

[Reset Template Files on Any Linux Service](#)

Templates Need to Be Reset

Purpose

When the [Rajant BC|Enterprise Service](#) starts on [Windows](#) or [Linux](#), any missing default template file for an alert or email report is automatically re-created.

If necessary, the original default template files for [alerts](#) and [email reports](#) can be manually reset.

Procedures

To reset the template files to the original default files, use the procedure for the operating system that is running on the [BC|Enterprise server](#), as follows:

- [Reset Template Files on Windows](#)
- [Reset Template Files on Linux.rpm Service](#)
- [Reset the Template Files on Any Linux Service](#)

Reset Template Files on Windows Service

Purpose

When the [Rajant BC|Enterprise Service](#) starts on [Windows](#), any missing default template file for an alert or email report is automatically re-created.

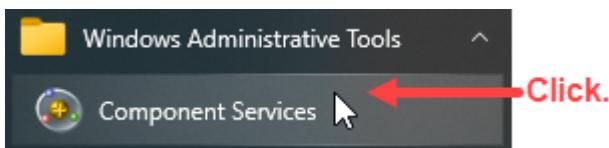
If necessary, the original default template files for alerts and email reports can be manually reset.

Procedure

To reset the template files on a Windows server, pass one-time start parameters to the Rajant BC|Enterprise Service.

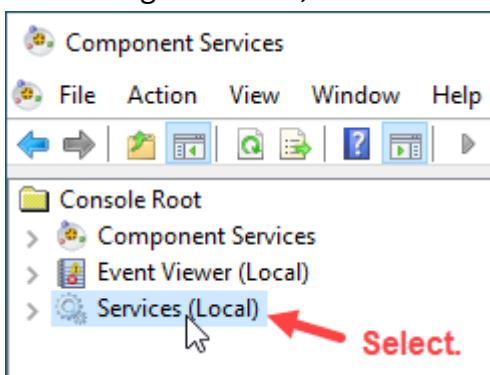
To reset the default template files on a Windows server, do the following:

1. On the [BC|Enterprise Client workstation](#) connected to the [BC|Enterprise server](#), on the Start menu, expand the **Windows Administrative Tools** folder.
2. Click **Component Services**.



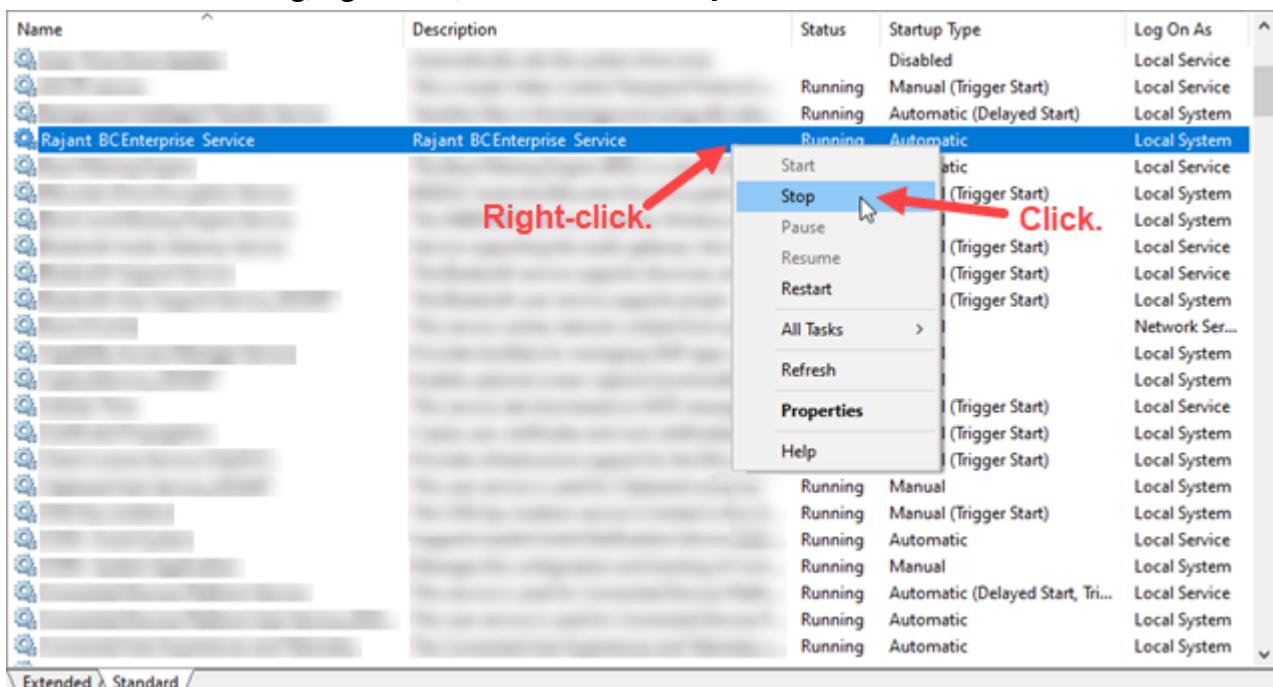
The **Component Services** window opens.

3. In the Navigation Pane, select **Services (Local)**.



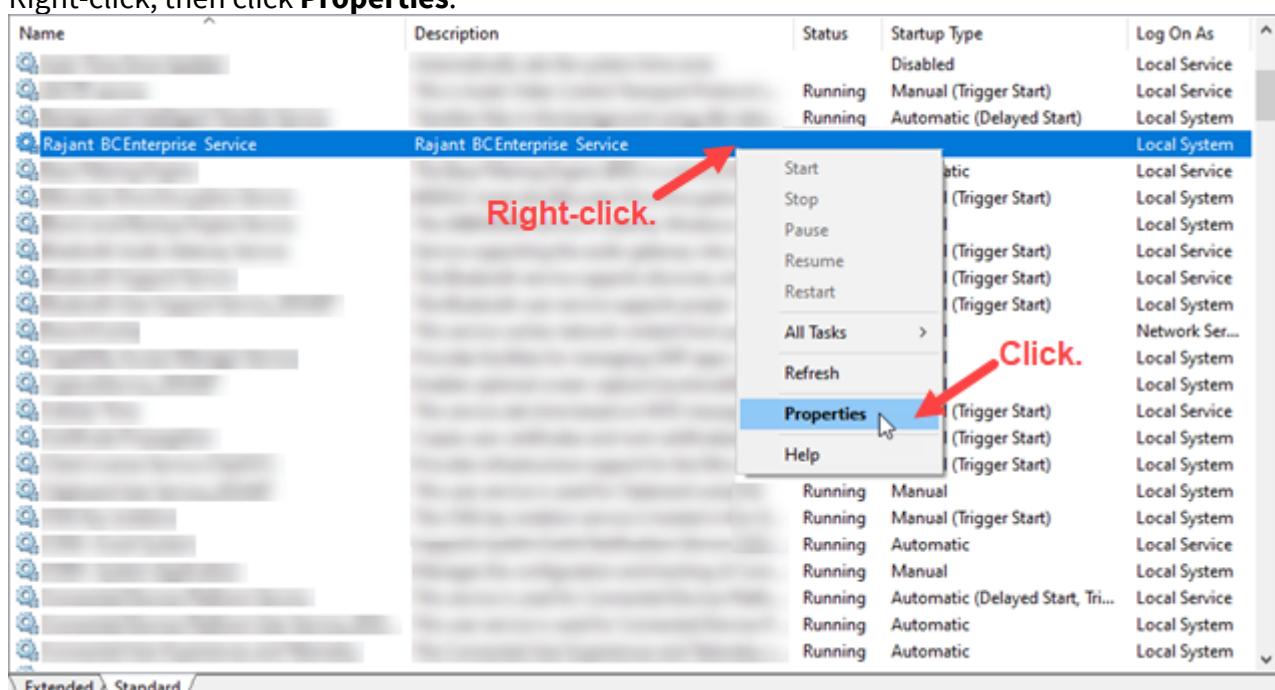
4. At the bottom of the service list, click the **Extended** tab (default) or the **Standard** tab.
5. In the service list, select **Rajant BC|Enterprise Service**.

6. If the service is running, right-click, and then click **Stop**.



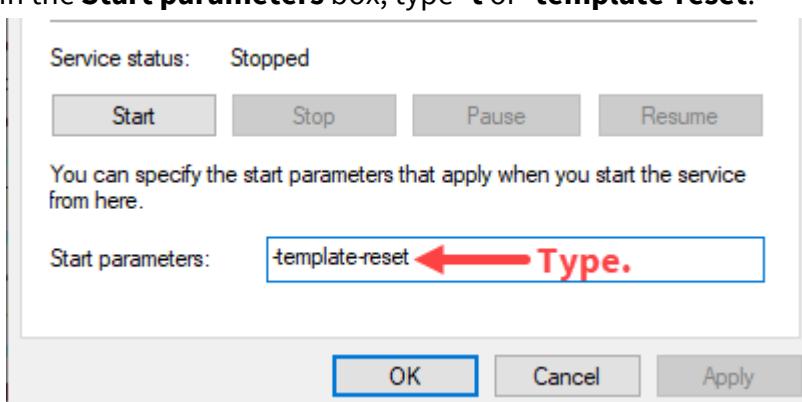
7. Wait for the Rajant BCEnterprise Service to stop. The **Status** column is blank.

8. Right-click, then click **Properties**.



The **Rajant BCEnterprise Service Properties (Local Computer)** dialog box opens.

9. In the **Start parameters** box, type **-t** or **-template-reset**.



10. Click **Start**. The Rajant BCEnterprise Service starts with the **-template-reset** parameter.
11. Click **OK**. The **Rajant BCEnterprise Service Properties (Local Computer)** dialog box closes.

Result

The template files for alerts and email reports are reset to the original default template files.

Note: The Start parameters are not saved. Therefore, the next time the **Rajant BCEnterprise Service Properties (Local Computer)** dialog box opens, the **Start parameters** box will be empty.

Reset Template Files on Linux .rpm Service

Purpose

When the [Rajant BC|Enterprise Service](#) starts on [Linux](#), any missing default template file for an [alert](#) or [email report](#) is automatically re-created. If necessary, the original default template files for alerts and email reports can be manually reset.

Procedure

To reset the template files on the Linux.rpm Service, refer to the distro documentation for instructions to modify the provided systemd or sysv scripts. The **-t** flag should be passed to cause the template files to be recreated.

Alternatively, use the procedure on [any Linux service](#).

Reset Template Files on Any Linux Service

Purpose

When the [Rajant BC|Enterprise Service](#) starts on [Linux](#), any missing default template file for an [alert](#) or [email report](#) is automatically re-created. If necessary, the original default template files for alerts and email reports can be manually reset.

Prerequisite

Confirm the directory path to the Data Directory, as follows:

1. [Log in](#) to BC|Enterprise with a user name and password for [user type Administrator](#).
2. On the [Main Menu](#), click **Configuration**. The [Rajant / Configuration](#) dashboard is displayed.
3. Click the [Services tab](#) (default).
4. In the **Data Directory** box, confirm the directory path to the Data Directory.

For example, if the path in the **Data Directory** box is `/opt/bcenterprise/data`, the template file for email reports must reside in the following subfolder:

`.data/var/conf/templates/reporting`

and the template files for alerts must reside in the following subfolder:

`.data/var/conf/templates/messaging`

Restore default template files only

Note: Use this procedure no custom template files exist for alerts or email reports.

To restore default template files when there are no custom template files, do the following:

1. [Stop the Rajant BC|Enterprise Service](#).
2. Navigate (by shell or window) to the location of the Data Directory.
3. At the Data Directory location, delete the contents of the templates subfolder.
4. [Start the BC|Enterprise Service](#).

Preserve custom template files

Note: Use this procedure if custom template files exist for alerts or email reports.

To restore default template files when there are no custom template files, do the following:

1. [Stop the Rajant BC|Enterprise Service](#).
2. Navigate (by shell or window) to the location of the Data Directory.
3. At the Data Directory location, in the templates subfolder, delete the default template files only.
Keep all custom user-created template files or content.
4. [Start the BC|Enterprise Service](#).

Alternatively, do the following:

1. Back up all custom user-created template files or content.
2. [Stop the Rajant BC|Enterprise Service](#).
3. Navigate (by shell or window) to the location of the Data Directory.
4. At the Data Directory location, delete the contents of the templates subfolder.
5. [Start the BC|Enterprise Service](#).
6. Replace all custom user-created template files or content.

Manage Users

Contents

Users

- [Rajant / User Management Dashboard \(Admin Only\)](#)
- [Add a User Name \(Admin Only\)](#)
- [Create User Screen \(Admin Only\)](#)
- [Update Information for a User Name \(Admin Only\)](#)
- [Update User Screen \(Admin Only\)](#)
- [Reset the Password for a User Name \(Admin Only\)](#)
- [Remove a User Name \(Admin Only\)](#)
- [Provide a URL for the User Interface \(Admin Only\)](#)

Users

Description

A user is a person who can [log in](#) to BC|Enterprise with an assigned user name and password.

User names

A user must supply a unique assigned user name to log in to BC|Enterprise.

User types

A user type identifies a set of available functions that are associated with a user name.

There are two user types, **User** and **Administrator**.

Every user must have a user name associated with user type **User**.

A user who logs in with a user name associated with user type **User** can do the following:

- View [mesh data](#)
- View [Breadcrumb data](#)
- Manage [reports provided by BC|Enterprise](#)
- Manage [alerts](#) and [email reports](#)
- Manage [dashboards](#)

Any user who is to perform administrative functions must be assigned another user name associated with user type **Administrator**.

A user who logs in with a user name associated with user type **Administrator** can do the following:

- [Configure BC|Enterprise](#)
- Manage users in BC|Enterprise
- Backup BC|Enterprise data
- Work with [Rajant Support](#)

Passwords

To log in, a user must supply an assigned user name and the password associated with that user name.

User profiles

A user profile represents the following information associated with a user name:

- Display name: Visible name that represents the user name on dashboards, screens and reports
- Password: Password associated with the user name when the user logs in to BC|Enterprise

Only the person who is assigned a user name can [change the display name](#) or [change the password](#) for that user name.

Related topics

The following topics are related to users:

- [Provide a URL for the User Interface](#)
- [Log In to BC|Enterprise](#)
- [Change a User Display Name](#)
- [Change a User Password](#)
- [User Profile Screen](#)

- Add a User Name (Admin Only)
- Remove a User Name (Admin Only)
- Rajant / User Management Dashboard (Admin Only)
- Reset a User Password (Admin Only)

Rajant / User Management Dashboard (Admin Only)

Purpose

Manage the user names and display names associated with each [user](#).

Navigation

To go to the **Rajant / User Management** dashboard, do the following:

1. [Log in](#) with a user name associated with [user type Administrator](#).
2. On the [Main Menu](#), click **Users**. The **Rajant / User Management** dashboard is displayed.

Procedures

The following procedures use the **Rajant / User Management** dashboard:

- [Add a User Name \(Admin Only\)](#)
- [Remove a User Name \(Admin Only\)](#)
- [Update Information for a User Name \(Admin Only\)](#)
- [Reset the Password for a User Name \(Admin Only\)](#)

Illustration

The following illustration indicates the major features of the **Rajant / User Management** dashboard:

The screenshot shows the BC|Enterprise User Management interface. At the top, there's a header bar with the BC|Enterprise logo, version information (version 11.24.3), and various system status indicators (Graphs: OK, Metrics: OK, License: OK, Connectors: OK). Below the header is a navigation bar with a back arrow, a search bar, and a help icon. The main title is "Rajant / User Management". The dashboard has a dark theme with light-colored text and buttons. A prominent yellow box highlights the central user management table. The table has columns for "User Name", "Display Name", "Admin", and includes icons for edit and delete. The table shows six entries: admin, caroladmin, caroluser, steven, taylor, and taylor2. At the bottom of the table, it says "Showing 1 to 6 of 6 entries". Above the table, there's a header "BC|Enterprise Users (as of 01/04/2022 11:30:45)" with a refresh button, and a blue "Add User" button. The top right corner of the dashboard has a "Help" button.

User Name	Display Name	Admin
admin	Administrator	<input checked="" type="checkbox"/>
caroladmin	caroladmin	<input checked="" type="checkbox"/>
caroluser	caroluser	<input type="checkbox"/>
steven	steven	<input checked="" type="checkbox"/>
taylor	Taylor	<input checked="" type="checkbox"/>
taylor2	Tayloruser	<input type="checkbox"/>

BC|Enterprise User Management panel

The **BC|Enterprise User Management** panel contains features to manage BC|Enterprise user names.

BC|Enterprise Users table

The BC|Enterprise Users table is an [administrative table](#) that contains one row for each assigned user name.

(as of mm/dd/yyyy hh:mm:ss) indicator

The as of date and time indicator indicates the date and time that the BC|Enterprise Users table was last refreshed.

Refresh button

To update the BC|Enterprise Users table with the latest information, click **Refresh**.

Add User button

To [add a user name](#) to the BC|Enterprise Users table, click **Add User**.

User Name column

The **User Name** column contains an active user name.

In the first row contains the default user name, **admin**. Immediately after BC|Enterprise is installed, only the default user name **admin** is available.

Display Name column

The **Display Name** column contains the [display name](#) associated with the user name in the **User Name** column.

Admin column

The **Admin** column contains a check mark () only if [user type Administrator](#) is associated with the user name in the **User Name** column.

Delete icon

Warning: In the BC|Enterprise Users table, do not delete the first row for the default user name **admin**.

To [remove a user name](#) from the BC|Enterprise Users table, in the row for that user name, click  (Delete user-name). The **Remove User** confirmation dialog box opens. Do one of the following:

- To remove the user, click **OK**. The **Remove User** confirmation dialog box closes. The row for that user name is no longer shown in the BC|Enterprise Users table.
- To cancel the remove request, click **Cancel**. The **Remove User** confirmation dialog box closes. In the BC|Enterprise Users table, the user information is unchanged.

Change Password icon

To [reset the password for a user name](#), click  (Change Password). The **Reset Password** dialog box opens.

Add a User Name (Admin Only)

Purpose

Add a new **user name** for a **user**, associate that user name with a **user type**, and supply a default **display name** and default **password** for the new user name.

Procedure

To add a user name, do the following:

1. [Log in](#) to BC|Enterprise with a user name and password for user type **Administrator**.
2. On the [Main Menu](#), click **Users**. The **Rajant / User Management** dashboard is displayed. The BC|Enterprise Users table lists information for each assigned user name.
3. Search for the proposed user name to verify that the user name is not already assigned.
4. Click **Add User**. The [Create User](#) screen is displayed.
5. For **User Type**, click the user type (**User** or **Administrator**) to be associated with the new user name.
6. In the **User Name** box, supply a user name to be associated with the user type.
7. In the **Display Name** box, supply a default display name for the user name.
8. In the **Password** box, type a default password for the user name. The security strength of the new password is indicated to the right. **Strong** (**Strong**) or **Medium** (**Medium**) is acceptable; **Weak** (**Weak**) is not acceptable.
9. (Optional) To improve the security strength, change the new password in the **Password** box.
10. In the **Repeat Password** box, type the password in the **Password** box again.
11. If the indicator to the right of the **Repeat Password** box is **Passwords do not match** (**Passwords do not match**), type the new password again.
12. Click **Create User**. The [Create User](#) screen is no longer displayed. The BC|Enterprise Users table includes a row for the new user name.

Result

The new user name is now enabled for a [log in](#) procedure.

Follow-up procedures

Provide the user with the correct [Universal Resource Locator \(URL\)](#) to open BC|Enterprise in a [web browser](#).

(Required) The user associated with the new user name can do the following:

1. [Open BC|Enterprise](#) in a [web browser](#).
2. [Log in](#) with the new user name.
3. Immediately [change the password](#) for the new user name.
4. (Optional) [Change the display name](#) for the new user name.

Create User Screen (Admin Only)

Purpose

Add a new **user name** for a **user**, associate that user name with a **user type**, and supply a default **display name** and default **password** for the new user name.

Navigation

To go to the **Create User** screen, do the following:

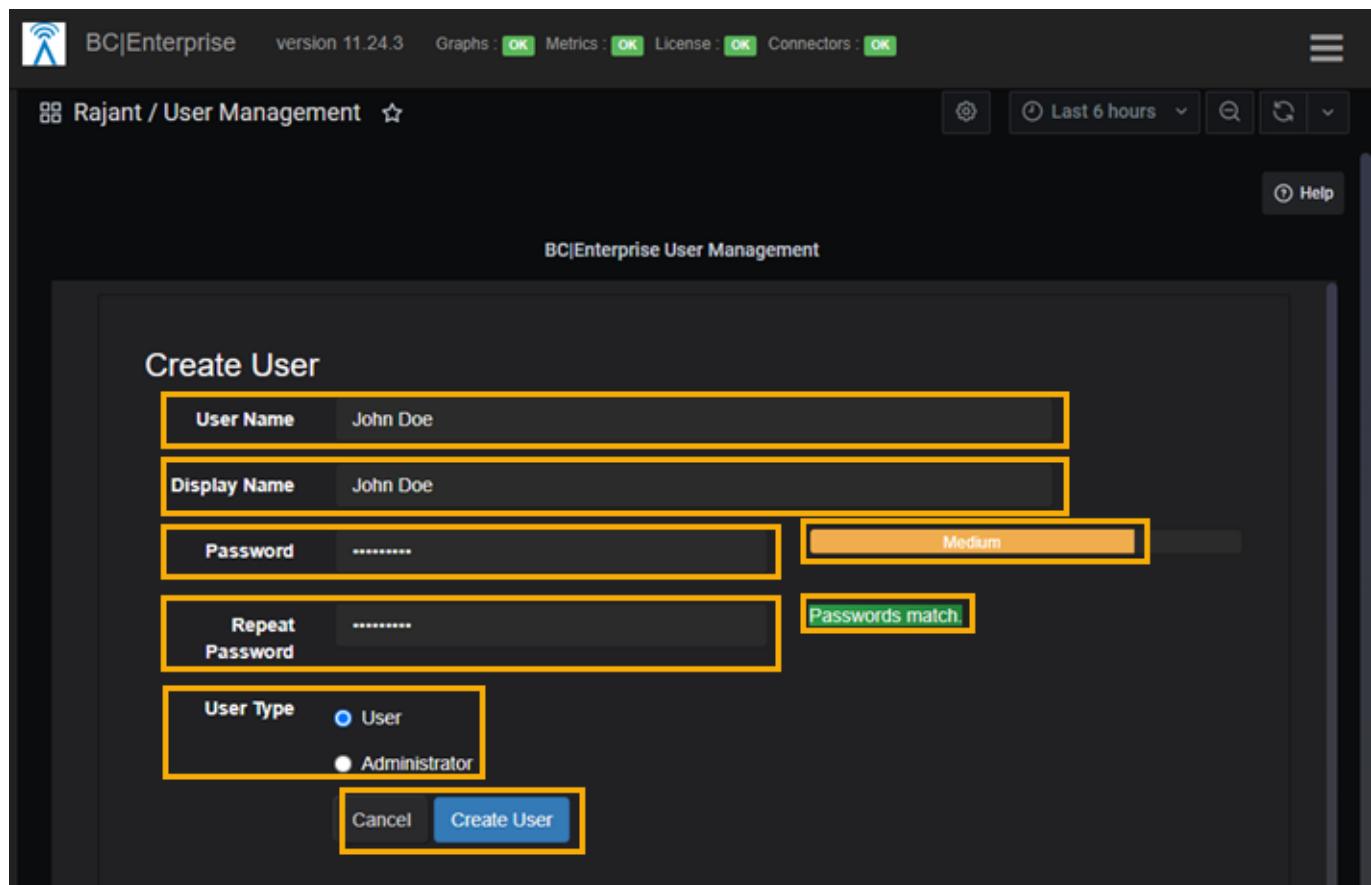
1. [Log in](#) with a user name associated with user type **Administrator**.
2. On the [Main Menu](#), click **Users**. The **Rajant / User Management** dashboard is displayed.
3. Click **Add User**. The **Create User** screen is displayed.

Procedure

The procedure [Add a User Name \(Admin Only\)](#) uses the **Create User** screen.

Illustration

The following illustration indicates the major features on the **Create User** screen:



User Name box

In the **User Name** box, supply a unique user name to be associated with the selected **User Type**.

Display Name box

In the **Display Name** box, supply a default display name for the user name in the **User Name** box.

Password box

In the **Password** box, supply a default password for the user name in the **User Name** box. The user will [change the default password](#) for the user name.

Password strength indicator

After a password is supplied in the **Password** box, the security strength of the password is indicated to the right. **Strong** (**Strong**) or **Medium** (**Medium**) is acceptable; **Weak** (**Weak**) is not acceptable.

(Optional) To improve the security strength of the password, change the password in the **Password** box.

Repeat Password box

When the password supplied in the **Password** box is acceptable, type that password again in the **Repeat Password** box.

Password match indicator

After a password is supplied in the **Repeat Password** box, take appropriate action based on the indicator shown to the right, as follows:

- **Passwords do not match** (**Passwords do not match**). Supply the password again in the **Password** box and **Repeat Password** box.
- **Passwords match**. (**Passwords match**). The **Create User** button is enabled. When the screen is complete, click **Create User**.
- Password is insecure (**Password is insecure**). Supply a stronger password in the **Password** box and **Repeat Password** box.

User Type options

Click the user type (**User** (default) or **Administrator**) to be associated with the user name in the **User Name** box.

Cancel button

To close the **Create User** screen, without adding a user name, click **Cancel**. The **Create User** screen closes. The BC|Enterprise Users table is unchanged.

Create User button

When the **Create User** screen is complete, click **Create User**. The **Create User** screen closes. The **Rajant / User Management** dashboard is displayed. The BC|Enterprise Users table includes a row for the new user name.

Update Information for a User Name (Admin Only)

Purpose

Update the [display name](#), [password](#) or [user type](#) for an assigned user name.

Procedure

To update information for a user name, do the following:

1. [Log in](#) with a user name associated with user type **Administrator**.
2. On the [Main Menu](#), click **Users**. The **Rajant / User Management** dashboard is displayed. The BC| Enterprise Users table lists information for each assigned user name.
3. Search for the user name that is to be updated.
4. In the **User Name** column, click the affected user name. The [Update User](#) screen opens.
5. To change the user type, for **User Type**, click the new user type (**User** or **Administrator**).
6. To change the display name, in the **Display Name** box, type a new display name for the user name.
7. To change the password for the user name, do the following:
 - a. Click **Change Password**. The **Reset Password** dialog box opens.
 - b. In the **New Password** box, type a new password for the user name. The security strength of the new password is indicated to the right. **Strong (Strong)** or **Medium (Medium)** is acceptable; **Weak (Weak)** is not acceptable.
 - c. (Optional) To improve the security strength, change the password in the **New Password** box.
 - d. In the **Repeat Password** box, type the password in the **New Password** box again.
 - e. If the indicator to the right of the **Repeat Password** box is **Passwords do not match. (Passwords do not match.)**, type the new password again.
 - f. When the indicator to the right of the **Repeat Password** box is **Passwords match. (Passwords match.)**, to confirm the change, click **Change Password**. The new password is now in effect for the affected user name.
 - g. Click **Close**. The **Reset Password** dialog box closes.
8. When changes are complete, click **Update User**. The **Update User** screen closes. In the BC| Enterprise Users table, the row for the affected user name is updated.

Follow-up procedures

Inform the user who is assigned the affected user name of all changes made to the display name, password or user type for that user name.

If the password has been changed, tell the user to [log in](#) using the affected user name and the new password and then immediately [change the password](#) for the affected user name.

Update User Screen (Admin Only)

Purpose

Update the [display name](#), [password](#) or [user type](#) for an assigned [user name](#).

Navigation

To go to the **Update User** screen, do the following:

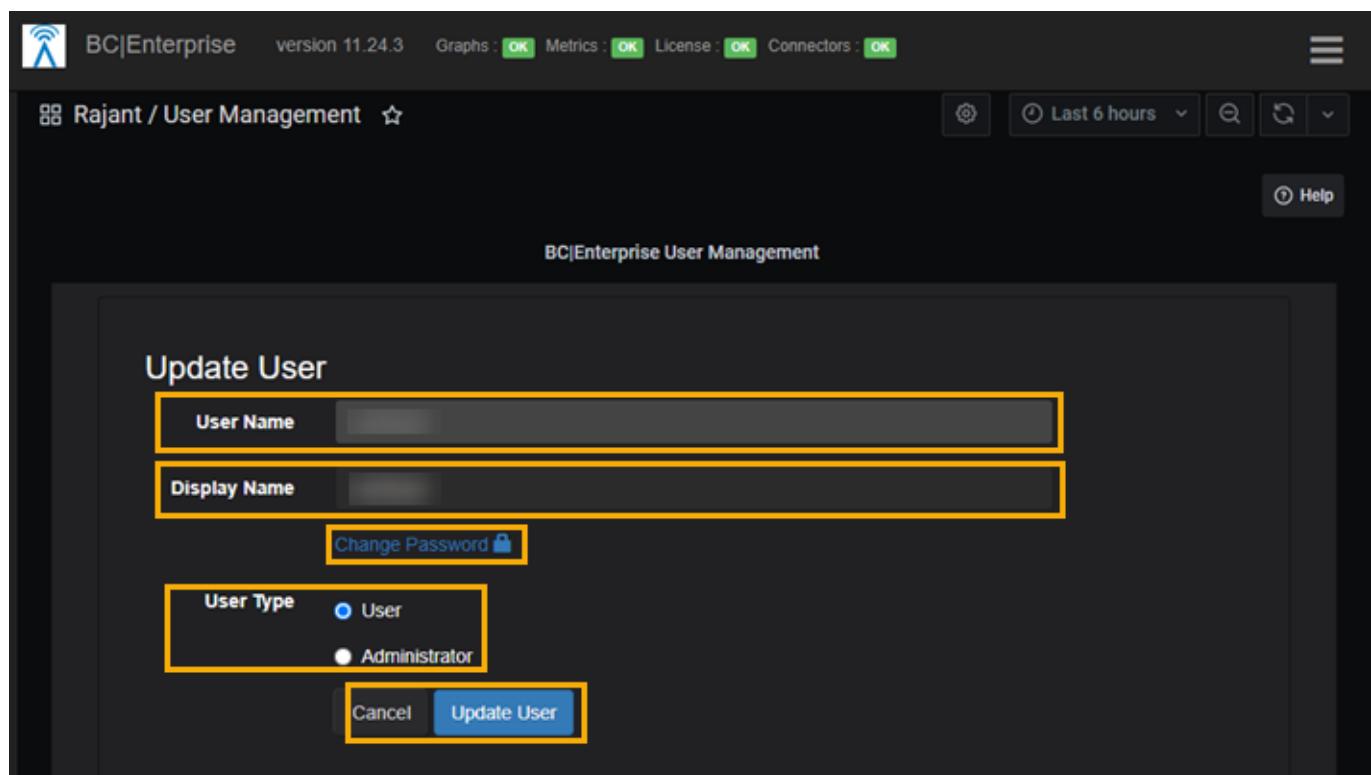
1. [Log in](#) with a user name associated with user type **Administrator**.
2. On the [Main Menu](#), click **Users**. The **Rajant / User Management** dashboard is displayed.
3. In the **User Name** column, click a user name. The **Update User** screen is displayed.

Procedure

The procedure [Update Information for a User Name \(Admin Only\)](#) uses the **Update User** screen.

Illustration

The following illustration indicates the major features of the **Update User** screen:



User Name box

To update the user name, in the **User Name** box, supply a unique user name to be associated with the selected user type (**User** or **Administrator**).

Display Name box

To update the display name, in the **Display Name** box, supply a unique display name for the user name supplied in the **User Name** box.

Change password hyperlink

To change the password for the user name supplied in the **User Name** box, click **Change password**. The **Reset Password** dialog box opens. [Reset the password](#).

User Type options

Click the user type (**User** (default) or **Administrator**) to be associated with the user name supplied in the **User Name** box.

Cancel button

To close the **Update User** screen, without applying any changes, click **Cancel**. The **Update User** screen closes. The BC|Enterprise Users table is unchanged.

Update User button

To apply any changes to the user information on the **Update User** screen, click **Update User**. The BC|Enterprise Users table reflects any changes to the user information.

Reset the Password for a User Name (Admin Only)

Purpose

Reset the [password](#) for an assigned [user name](#).

Prerequisites

[Log in](#) with a user name associated with user type **Administrator**.

Procedure

To reset the password for a user name, do the following:

1. On the [Main Menu](#), click **Users**. The **Rajant User Management** dashboard is displayed. The BC|Enterprise Users table lists information for each assigned user name.
2. Search for the affected user name.
3. In the row for the affected user name, click  (Change Password). The **Reset Password** dialog box opens.
4. To reset the password for the user name, do the following:
 - a. In the **New Password** box, type a new password for the user name. The security strength of the new password is indicated to the right. **Strong** (**Strong**) or **Medium** (**Medium**) is acceptable; **Weak** (**Weak**) is not acceptable.
 - b. (Optional) To improve the security strength, change the password in the **New Password** box.
 - c. In the **Repeat Password** box, type the password in the **New Password** box again.
 - d. If the indicator to the right of the **Repeat Password** box is **Passwords do not match**. (**Passwords do not match**), type the new password again.
 - e. When the indicator to the right of the **Repeat Password** box is **Passwords match**. (**Passwords match**), to confirm the change, click **Change Password**. The new password is now in effect for the affected user name.
 - f. Click **Close**. The **Reset Password** dialog box closes.

Follow-up procedure

Inform the user who is assigned the affected user name that the password for that user name has been changed. Tell the user to [log in](#) using the affected user name and the new password and then [change the password](#) for the affected user name.

Remove a User Name (Admin Only)

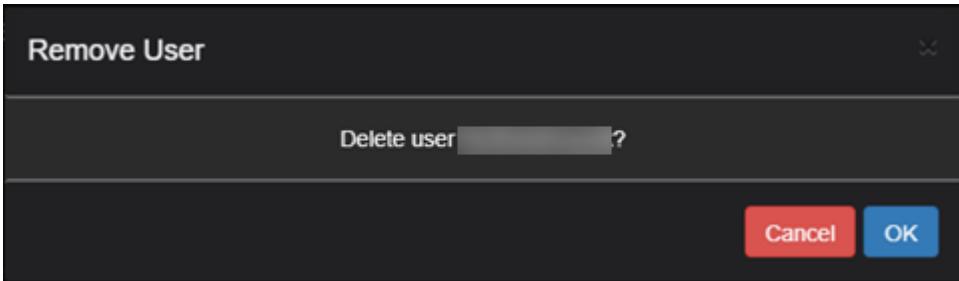
Purpose

Remove a [user name](#) that is assigned to a [user](#).

Procedure

To remove a user name, do the following:

1. [Log in](#) to BC|Enterprise with a user name and password for [user type Administrator](#).
2. On the [Main Menu](#), click **Users**. The **Rajant User Management** dashboard is displayed. The BC|Enterprise Users table lists information for each assigned user name.
3. Search for the user name that is to be removed.
4. In the row for the affected user name, click  (Delete user-name). The **Remove User** confirmation dialog box opens.
5. To remove the user name, click **OK**.



The **Remove User** confirmation dialog box closes.

Result

The row for the affected user name is no longer shown in the BC|Enterprise Users table.

Provide a URL for the User Interface (Admin Only)

Purpose

Provide a [user](#) with the correct Universal Resource Locator (URL) to [open BC|Enterprise](#) in a [web browser](#) on a given [BC|Enterprise Client workstation](#).

Prerequisites

To enable user access to BC|Enterprise, Information Technology (IT) support personnel must do the following:

- Provide each user with access to a [web browser](#) supported for BC|Enterprise.
- On the BC|Enterprise server, [designate](#) the port number for the Hypertext Transfer Protocol (HTTP) port on the [BC|Enterprise server](#) that the [Rajant BC|Enterprise Service](#) uses to communicate with the web browser for the BC|Enterprise [user interface](#) on BC|Enterprise Client workstations.
- Determine the Internet Protocol (IP) address for the BC|Enterprise server.
- Determine the host name for the BC|Enterprise web site hosted on the [BC|Enterprise server](#).
- To enable user access from a remote computer that resides outside the LAN for the BC|Enterprise server, map the external network Transport Control Protocol (TCP) port to be used for remote access from the remote computer to the designated port for the Rajant BC|Enterprise Service on the BC|Enterprise server.

Requirements

The host name and port number value in the URL must be in one of the following formats:

hostname:bce-port

ip-address:bce-port

where,

hostname is the host name for the BC|Enterprise web site hosted on the [BC|Enterprise server](#).

ip-address is the Internet Protocol (IP) address for the BC|Enterprise server.

bce-port is the [designated port](#) for the BC|Enterprise Service on the BC|Enterprise server.

Examples:

`bcenterprise.mycompany.com:8888`

`167.212.226.204:8888`

Provide a URL from the BC|Enterprise Server

To enable a user to open BC|Enterprise from a BC|Enterprise Client workstation connected to the BC|Enterprise server, provide the user with a URL in the following format:

`http://localhost:bce-port`

Provide a URL from another computer on the LAN

To enable a user to open BC|Enterprise from a BC|Enterprise Client workstation that resides on the same LAN as the BC|Enterprise server, provide the user with a URL in one of the following formats:

`http://hostname:bce-port`

`http://ip-address:bce-port`

Provide a URL from a computer outside the LAN

Map the external network TCP port to be used for remote access from the remote computer to the designated port for the Rajant BC|Enterprise Service on the BC|Enterprise server.

To enable a user to open BC|Enterprise from a remote computer that resides outside the LAN, provide the user with a URL in one of the following formats:

`http://hostname:bce-port`

`http://ip-address:bce-port`

Result

Each user can supply the provided URL [open BC|Enterprise](#) in a web browser on a BC|Enterprise Client workstation.

Manage BC|Connectors

Contents

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- [Discover BC|Connectors](#)
- [Configure BC|Connectors](#)
- [Rajant / BC|Connector Management Dashboard](#)
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BC|Connectors

Description

A BC|Connector is an instance of a [BC|Connector server](#) that is running [BC|Connector software](#) in a network.

References

The following documents contain information about BC|Connectors:

- [BC|Commander Version 11 User Guide](#) (on the [Rajant Support web site](#))
- [BC|Connector Version 11 User Guide](#) (on the [Rajant Support web site](#))

Management

Each instance of [BC|Commander](#) in the network must [discover](#) the IP Address for each BC|Connector in the network. Each discovered BC|Connector will be listed on the **BC|Connectors** tab in the Details Panel in BC|Commander. Each discovered BC|Connector must be configured to operate with BC|Commander, as described in the [BC|Commander Version 11 User Guide](#).

Any BC|Connectors that are configured to operate with BC|Commander may then be [configured](#) to operate with [BC|Enterprise](#). Each BC|Connector that is to operate with BC|Enterprise must be [added](#) to BC|Enterprise. Any BC|Connector that is added to BC|Enterprise will be listed in the BC|Connectors table on the [Rajant / BC|Connector Management](#) dashboard.

BC|Enterprise will use all BC|Connectors listed in the BC|Connectors table on the [Rajant / BC|Connector Management](#) dashboard to discover, monitor and access mesh statistics for BreadCrumbs connected through that BC|Connector.

If necessary, any BC|Connector that has been added to BC|Enterprise may be [removed](#) from BC|Enterprise.

Jobs

Each BC|Connector that is added to BC|Enterprise is created as a job with the job name prefix **bce-** in BC|Enterprise. The job name format is **bce-address**, where *address* is the Internet Protocol (IP) address for the BC|Connector server shown in the BC|Connectors table on the [Rajant / BC|Connector Management](#) dashboard.

A [dashboard](#) that displays [mesh data](#) or [Breadcrumb data](#) will display data associated with the BreadCrumbs accessed through each BC|Connector selected in the [Job selection filter](#).

Status

In the [user interface](#), in the [Banner](#), the service status indicator **Connectors** shows the status of BC|Connectors that have been [added](#) to BC|Enterprise.

Related Topics

The following topics are related to BC|Connectors:

- [Rajant Software Requirements](#)
- [BC|Connector Server Requirements](#)
- [Discover BC|Connectors](#)
- [Configure BC|Connectors](#)
- [Rajant / BC|Connector Management Dashboard](#)
- [Add a BC|Connector \(Admin Only\)](#)

- Remove a BC|Connector (Admin Only)
- Dashboards
- Mesh Data
- BreadCrumb Data
- Service Status Indicators
- Selection Filters

Discover BC|Connectors

Purpose

In each instance of BC|Commander software in the network, discover the IP Address for each BC|Connector in the network.

Requirements

To discover BC|Connectors in BC|Commander, do one of the following:

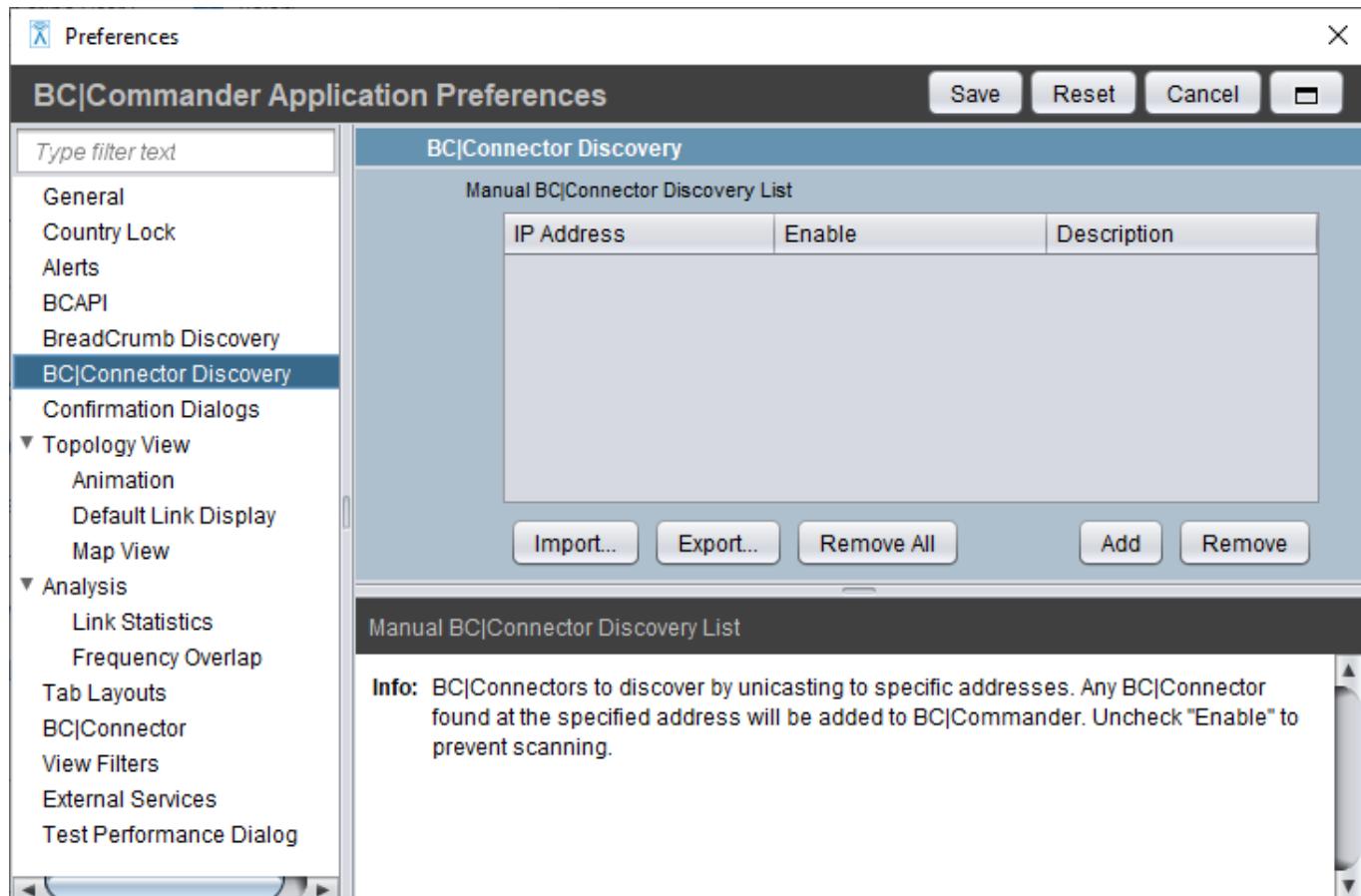
- (Recommended) Manually supply the Internet Protocol (IP) address for each BC|Connector in the network.
- Automatically discover BC|Connectors in the network.

Manual discovery procedure

To manually supply the IP address of any undiscovered BC|Connectors, do the following:

1. In BC|Commander, on the **File** menu, click **Preferences....** The **Preferences** window opens.
2. In the Selection Tree, click **BC|Connector Discovery**.
3. In the Settings Panel, in the **BC|Connector Discovery** area, click **Add**. In the **Manual BC|Connector Discovery List** table, a new row is added and enabled.
4. In the **IP Address** column, supply the IP address for an undiscovered BC|Connector.
5. If necessary, to add undiscovered another BC|Connector, go to Step 3.
6. Click **Save**. The **Preferences** window closes.

The following figure illustrates the BC|Connector Discovery settings in the **Preferences** window:



Automatic discovery process

When manual discovery is not enabled for a BC|Connector, BC|Commander will multicast a User Datagram Protocol (UDP) query over port 350057 to automatically discover the IP Address for every BC|Connector in the network.

The automatic discovery process results in more network traffic than the manual discovery process.

Results

In BC|Commander, in the Details Panel, the **BC|Connectors** tab lists each discovered BC|Connector.

Follow-up procedures

For each discovered BC|Connector in the network, do the following:

1. In each instance of BC|Commander, configure each discovered BC|Connector to operate with BC|Commander. For instructions, refer to the *BC|Commander Version 11 User Guide* on the [Rajant Support web site](#).
2. To enable a discovered BC|Connector in the network to operate with BC|Enterprise, [configure](#) that BC|Connector to operate with BC|Enterprise.

Configure BC|Connectors

Purpose

Configure a [discovered BC|Connector](#) in the network to operate with [BC|Enterprise](#).

References

The following documents contain information about BC|Connector configuration:

- *BC|Commander Version 11 User Guide* (on the [Rajant Support web site](#))
- *BC|Connector Version 11 User Guide* (on the [Rajant Support web site](#))

Prerequisites

In each instance of BC|Commander software, do the following:

1. In BC|Commander, [discover](#) the IP Address for each BC|Connector server in the network.
2. In BC|Commander, configure each discovered BC|Connector server in the network to operate with BC|Commander.
3. Determine which discovered BC|Connectors in the network are to operate with BC|Enterprise.
4. Determine the [port number](#) for the port on the BC|Connector servers to be used to listen for metrics requests from BC|Enterprise (default 23002).

Procedure

To configure a BC|Connector to operate with BC|Enterprise, in each instance of BC|Commander, do the following:

1. In BC|Commander, set Default Login Credentials to User Role **co (Crypto Officer)**.
2. In the **View** menu, show the **BC|Connectors** tab in the Details Panel.
3. On the **BC|Connectors** tab, right-click a BC|Connector that is to be configured to operate with BC|Enterprise, and then click **Connect**. The Connection Status for that BC|Connector is now **Connected**.
4. On the **BC|Connectors** tab, right-click the BC|Connector, and then click **Configure**. The **BC|Connector Configuration** window opens.
5. In the Navigation Pane, select **General**.
6. In the Setting Panel, select the **Enable Ping Manager**.
7. In the **Metrics Port** box, supply the port number for the port to be used to listen for metrics requests from BC|Enterprise (default 23002).
8. Select the **Enable Metrics** check box to enable publishing of metrics to the Metrics Port.
9. To save changes in the **BC|Connector Configuration** window, click **Save**. The BC|Connector restarts. The BC|Connector is now configured to operate with BC|Enterprise.

Follow-up procedure

After a BC|Connector is configured to operate with BC|Enterprise, that BC|Connector may be [added](#) to BC|Enterprise.

Rajant / BC|Connector Management Dashboard

Purpose

Manage each [BC|Connector](#) to be used by [BC|Enterprise](#) to discover, monitor and access mesh statistics for BreadCrumbs connected to [BC|Commander](#) through that BC|Connector in the network.

References

The following documents contain information about BC|Connector configuration:

- [BC|Commander Version 11 User Guide](#) (on the [Rajant Support web site](#))
- [BC|Connector Version 11 User Guide](#) (on the [Rajant Support web site](#))

Navigation

To go to the **Rajant / BC|Connector Management** dashboard, on the [Main Menu](#), click **BC|Connectors**.

Procedures

The following procedures use the **Rajant / BC|Connector Management** dashboard:

- [Add a BC|Connector \(Admin Only\)](#)
- [Remove a BC|Connector \(Admin Only\)](#)

Illustration

The following illustration identifies the major features on the **Rajant / BC|Connector Management** dashboard:

The screenshot shows the BC|Enterprise BC|Connector Management panel. At the top, there's a header bar with the BC|Enterprise logo, version 11.24.3, and status indicators for Graphs (OK), Metrics (OK), License (OK), and Connectors (OK). Below the header is a navigation bar with a back arrow, a title 'Rajant / BC|Connector Management' with a star icon, and filter options for 'Last 6 hours'. On the right of the navigation bar are 'Help' and 'Logout' buttons. The main content area has a title 'BC|Enterprise BC|Connector Management'. Below it is a sub-header 'BC|Connectors (as of 01/04/2022 10:50:29)' with a 'Refresh' button. To the right of this is a blue 'Add Connector' button. The central part of the screen is a table titled 'BC|Connectors' with a yellow border. The table has columns: Name, Group Name, Address, BCAPi Port, Metrics Port, Status, Last Scrape, and Scrape Error. A single row is visible, showing 'testops.eng.rajant.com' under 'Name', 'My Rajant Mesh' under 'Group Name', '10.0.0.126' under 'Address', '23000' under 'BCAPi Port', '23002' under 'Metrics Port', 'Up' under 'Status', '3m 40s ago' under 'Last Scrape', and an empty 'Scrape Error' field. The table includes pagination controls at the bottom: 'Showing 1 to 1 of 1 entries', 'Previous', '1', and 'Next'.

BC|Enterprise BC|Connector Management panel

The **BC|Enterprise BC|Connector Management panel** is used to manage BC|Connectors in BC|Enterprise.

BC|Connectors table

The BC|Connectors table is an [administrative table](#) that contains one row for each BC|Connector that has been [added](#) to BC|Enterprise.

(as of mm/dd/yyyy hh:mm:ss) indicator

The as of date and time indicator indicates the date and time when the BC|Connectors table was last refreshed. The BC|Connectors table is refreshed when the **Rajant / BC|Connector Management** dashboard is displayed and when the **Refresh** button is clicked.

Refresh button

To refresh the BC|Connectors table with the latest information, click **Refresh**.

Add Connector button

To [add](#) a BC|Connector to the BC|Connectors table, click **Add Connector**. The [Create BC|Connector screen](#) is displayed.

Name column

The **Name** column contains the Connector Name value defined in the [BC|Connector configuration](#). In BC|Commander, the Connector Name value is shown in the Details Panel on the **Details** tab in the **ID** column.

Group Name column

The **Group Name** column contains the Connector Group value defined in the BC|Connector configuration. In BC|Commander, the Connector Group value is shown in the Details Panel on the **Details** tab in the **Group** column.

Address column

The **Address** column contains the Internet Protocol (IP) address of the [BC|Connector server](#). This IP address was selected in the **Connector Address** box on the [Create BC|Connector screen](#) when the BC|Connector was [added](#) to BC|Enterprise.

BCAPI Port column

The **BCAPI Port** column contains the API Port value defined in the BC|Connector configuration. This value is the [port number](#) (default 23000) for the port on the BC|Connector server to be used to listen for BC|Commander clients.

In BC|Commander, the API Port value is shown on the **BC|Connectors** tab in the **Port** column.

Metrics Port column

The **Metrics Port** column contains the Metrics Port value defined in the BC|Connector configuration. This is the port number (default 23002) for the port on the BC|Connector server to be used to listen for metrics requests from BC|Enterprise.

Status column

The **Status** column shows the current status indicator for the BC|Connector.

Click **Refresh** to update the column.

The possible status indicators for a BC|Connector are the following:

Status	Description
	This BC Connector is running normally.
	BC Enterprise cannot communicate with this BC Connector.
	BC Enterprise has not yet tried to communicate with this BC Connector. This transient state is normal when BC Enterprise starts or when a BC Connector is added to BC Enterprise.
	BC Enterprise cannot communicate with this BC Connector. Ensure that this BC Connector is reachable through the designated port and appropriate firewall ports are open. In BC Commander , in the Details Panel, on the BC Connectors tab, ensure that the Connection Status column for each BC Connector contains Connected . If this BC Connector is not running, start the BC Connector (for instructions, refer to the BC Connector Version 11 User Guide (on the Rajant Support web site)).

Last Scrape column

The **Last Scrape** column contains the length of time (*hh mm ss ago*) since BC|Enterprise collected metrics from this BC|Connector.

Click **Refresh** to update the column.

Scrape Error column

The **Scrape Error** column indicates any errors that were reported the last time that BC|Enterprise collected metrics from this BC|Connector.

Delete icon

To delete a BC|Connector from the BC|Connectors table, click  (Delete). The row is removed from the BC|Connectors table.

Add a BC|Connector (Admin Only)

Purpose

In BC|Enterprise, add a BC|Connector that is to operate with BC|Enterprise.

References

The following documents contain information about BC|Connectors:

- *BC|Commander Version 11 User Guide* (on the [Rajant Support web site](#))
- *BC|Connector Version 11 User Guide* (on the [Rajant Support web site](#))

Prerequisites

In BC|Commander, for the BC|Connector to be added, do the following:

1. [Discover](#) the IP Address for the BC|Connector.
2. [Configure](#) the BC|Connector to operate with BC|Enterprise.
3. In the BC|Connector configuration, determine the value of the **View Passphrase** setting.

Procedure

To add a BC|Connector to BC|Enterprise, do the following:

1. [Log in](#) to BC|Enterprise with a [user name](#) and password for user type **Administrator**.
2. On the [Main Menu](#), click **BC|Connectors**. The **Rajant / BC|Connector Management** dashboard is displayed. The BC|Connectors table contains one row for each BC|Connector.
3. Click **Add Connector**. The [Create BC|Connector](#) screen is displayed.
4. In the **Connector Address** list, click the address for the BC|Connector that is to be added.
5. In the **User** box, supply **view** (default).
6. In the **Password** box, supply the value of the **View Passphrase** setting in the BC|Connector configuration.
7. Click **Create Connector**. The **Create Connector** screen is no longer displayed. The added BC|Connector is listed in the BC|Connectors table.

Result

BC|Enterprise can use the BC|Connector to discover, monitor and access mesh statistics for BreadCrumbs within the same broadcast domain as a BC|Connector.

Follow-up procedures

In the [Banner](#), refer to the [status indicator](#) **Connectors** to monitor the status of BC|Connectors that have been added to BC|Enterprise.

Use the **Rajant / BC|Connector Management** dashboard to manage each BC|Connector that has been added to BC|Enterprise.

On each displayed [dashboard](#), in the [Dashboard Header](#), in the [Job selection filter](#), select the job name for each BC|Connector of interest.

Create BC|Connector Screen (Admin Only)

Purpose

Supply information required to add a BC|Connector to BC|Enterprise.

References

The following documents contain information about BC|Connectors:

- *BC|Commander Version 11 User Guide* (on the [Rajant Support web site](#))
- *BC|Connector Version 11 User Guide* (on the [Rajant Support web site](#))

Navigation

To go to **Create BC|Connector** screen, do the following:

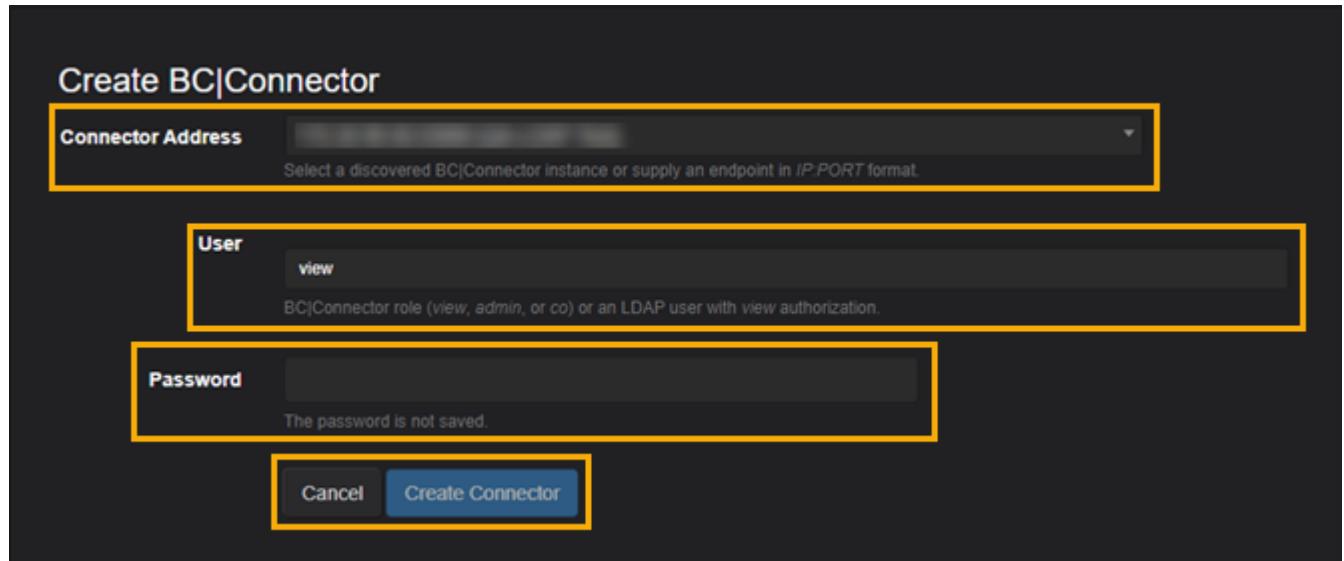
1. On the [Main Menu](#), click **BC|Connectors**. The [Rajant / BC|Connector Management](#) dashboard is displayed.
2. Click **Add Connector**. The **Create BC|Connector** screen is displayed.

Procedures

The [Add a BC|Connector \(Admin Only\)](#) procedure uses the **Create BC|Connector** screen.

Illustration

The following is an illustration indicates the major features on the **Create BC|Connector** screen:



Connector Address list

The **Connector Address** list is automatically populated with the connector address for each [discovered BC|Connector server](#) that is in the same broadcast domain as the [BC|Enterprise server](#).

Each connector address is in the following format:

address:port (name)

where,

address is the Internet Protocol (IP) address of the BC|Connector server.

port is the port number (default 23000) for the BC|API port on the BC|Connector server. This port number is the API Port value supplied in the BC|Connector configuration. In BC|Commander, the API Port value is shown on the **Details** tab in the **Port** column.

name is the BC|Connector name. This name is the Connector Name value supplied in the BC|Connector configuration. In [BC|Commander](#), the Connector Name value is shown on the **Details** tab in the **ID** column.

User box

In the **User** box, supply a value for the BC|Connector user role (**view** (default), **admin** or **co**) in the [BC|Connector software](#) configuration.

Password box

In the **Password** box, supply one of the following:

- Passphrase for the user role supplied in the **User** box, as defined in the BC|Connector configuration.
- Password for the user name supplied in the **User** box.

When a value is supplied in the **Password** box, the **Create Connector** button is enabled.

Cancel button

To cancel the creation of the BC|Connector, click **Cancel**. The **Create User** screen closes.

Create Connector button

When the **Create BC|Connector** screen is complete, click **Create Connector**. The **Create BC|Connector** screen closes. The BC|Connector is added to the BC|Connectors table on the **Rajant / BC|Connector Management** dashboard.

Remove a BC|Connector (Admin Only)

Purpose

Remove a BC|Connector from BC|Enterprise. BC|Enterprise will no longer use this BC|Connector to discover, monitor and access mesh statistics for BreadCrumbs.

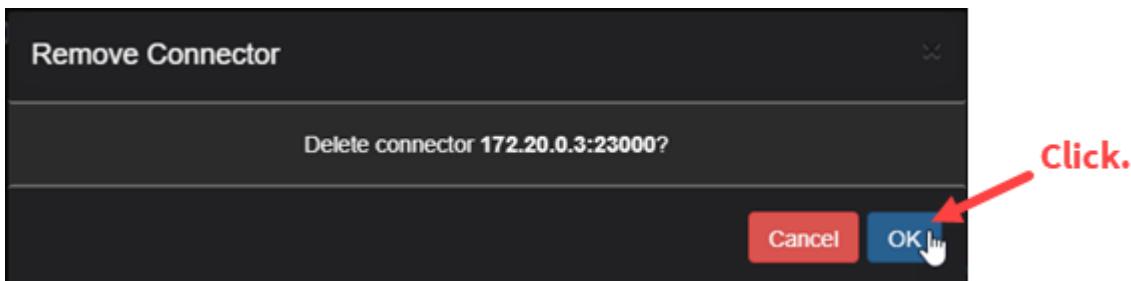
Prerequisite

The BC|Connector has been [added](#) to BC|Enterprise and is listed in the BC|Connectors table on the [Rajant / BC|Connector Management](#) dashboard.

Procedure

To remove a BC|Connector from BC|Enterprise, do the following:

1. [Log in](#) to BC|Enterprise with a [user name](#) and password for user type **Administrator**.
2. On the [Main Menu](#), click **BC|Connectors**. The [Rajant / BC|Connector Management](#) dashboard is displayed. The BC|Connectors table contains one row for each BC|Connector in BC|Enterprise.
3. In the row for the BC|Connector that is to be removed, click  (Delete). The **Remove Connector** confirmation message box opens.
4. Click **OK**.



The **Remove Connector** confirmation message box closes. That BC|Connector is no longer listed in the BC|Connectors table.

Result

Current [data](#) for any BreadCrumb associated with the removed BC|Connector is no longer reflected in dashboards. Historical information associated with these BreadCrumbs is retained in the time series database.

Set up BC|Enterprise

Contents

[Setup Procedures](#)

[Update the BC|Enterprise Software](#)

[Set up a New BC|Enterprise Installation](#)

[Set up BC|Enterprise for a Trial License](#)

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Setup Procedures

Description

A setup procedure lists each step required to set up a BC|Enterprise operating environment based on the [licensing option](#) selected by the customer for the [BC|Enterprise software](#).

Each step in a setup procedure includes links to the topics in this user guide that provide instructions or information required to complete that step.

Procedures

This user guide provides a setup procedure for each of the following objectives:

- [Update the BC|Enterprise software](#)
- [Set up a new BC|Enterprise installation](#)
- [Set up BC|Enterprise for a trial license](#)
- [Set up BC|Enterprise for evaluation](#)

Related Topics

The following topics are related to setup procedures:

- [Licensing Options](#)
- [Rajant Software Requirements](#)
- [Update the BC|Enterprise Software](#)
- [Set up a New BC|Enterprise Installation](#)
- [Set up BC|Enterprise for a Trial License](#)
- [Set up BC|Enterprise for Evaluation](#)

Update the BC|Enterprise Software

Purpose

Update the [BC|Enterprise software](#) that is running in a Rajant network from a previous version to the latest version on the same [BC|Enterprise server](#). Retain the BC|Enterprise configuration settings, dashboards, user names and passwords and notification rules from the previous version.

References

The following documents contain information required in this procedure:

- *BC|Commander Version 11 User Guide* on the [Rajant Support web site](#)
- *BC|Connector Version 11 User Guide* on the [Rajant Support web site](#)
- *Rajant BC|Enterprise Data Migration from Version Prior to 11.15.4* on the [Rajant Support web site](#)

Prerequisites

Satisfy the [installation requirements](#) to operate the latest version of the BC|Enterprise software.

Important: BC|Enterprise versions prior to version 11.25.1 supported only one instance of BC|Connector. Starting with version 11.25.1, BC|Enterprise can support one or more instances of BC|Connector.

To purchase a license to update the BC|Enterprise software, do the following:

1. Review the [licensing options](#) for BC|Enterprise.
2. Decide to purchase a license to update BC|Enterprise for operation in the Rajant network.
3. Determine the license requirements for BC|Enterprise based on the number of BreadCrumbs to be monitored in the Rajant network.
4. Purchase a license for the latest version of BC|Enterprise for the Rajant network from a Rajant re-seller.

Update from a version prior to 11.15.4

To update the BC|Enterprise software from a version prior to 11.15.4 requires a database migration prior to the software update.

For instructions, refer to *Rajant BC|Enterprise Data Migration from Version Prior to 11.15.4* on the [Rajant Support web site](#). Search for "Migration."

Note: Migration from 11.15.1 to 11.15.2 does not require database migration.

Update from version 11.15.4 or later

To update the BC|Enterprise software from version 11.15.4 or later to the latest version, do the following:

Step	Action
1.	On each BC Commander host in the network, install and configure the latest version of the BC Commander software .
2.	On each BC Connector server in the network, install and configure the latest version of the BC Connector software to operate with BC Commander.
3.	On the BC Enterprise server , download and install the installer package for the BC Enterprise software.
4.	Configure the BC Connectors in the network that are to operate with BC Enterprise.
5.	Configure secure login capability.
6.	At the BC Enterprise Client workstation connected to the BC Enterprise server , start the Rajant BC Enterprise Service on Windows or Linux .
7.	To open BC Enterprise , open a web browser and, in the web Address box, supply the Universal Resource Locator (URL) localhost: bce-port , where <i>bce_port</i> is the designated port number for the Rajant BC Enterprise Service (default 8888).
8.	Log in to BC Enterprise with a user name and password for user type Administrator for the previous release of BC Enterprise.
9.	Configure the Data Directory location .
10.	Configure BC Connectors to operate with BC Enterprise.
11.	Configure BC Enterprise Data Services .
12.	Configure the License key for BC Enterprise.
13.	Select monitored BreadCrumbs.
14.	Add BC Enterprise users .
15.	Configure settings for the Simple Mail Transfer Protocol (SMTP) server.
16.	Configure settings for the Syslog server.

Set up a New BC|Enterprise Installation

Purpose

Set up the BC|Enterprise software for the first time in a Rajant network and configure the basic functions required to run BC|Enterprise.

References

The following documents contain information required in this procedure:

- *BC|Commander Version 11 User Guide* on the [Rajant Support web site](#)
- *BC|Connector Version 11 User Guide* on the [Rajant Support web site](#)

Prerequisites

Satisfy the [installation requirements](#) to operate the BC|Enterprise software in the network.

To purchase a license to operate BC|Enterprise in a Rajant network, do the following:

1. Review the [licensing options](#) for BC|Enterprise.
2. Decide to purchase a license for BC|Enterprise for operation in a Rajant network.
3. Determine the license requirements for BC|Enterprise based on the number of BreadCrumbs to be monitored in the Rajant network.
4. Purchase a license for the latest version of BC|Enterprise for the Rajant network from a Rajant re-seller.

Procedure

To set up BC|Enterprise for operation, do the following:

Step	Action
1.	On each BC Commander host in the network, install and configure the latest version of the BC Commander software .
2.	On each BC Connector server in the network, install and configure the latest version of the BC Connector software to operate with BC Commander.
3.	On the BC Enterprise server , download and install the installer package for the BC Enterprise software.
4.	Configure the BC Connectors in the network that are to operate with BC Enterprise.
5.	Configure secure login capability.
6.	At the BC Enterprise Client workstation connected to the BC Enterprise server , start the Rajant BC Enterprise Service on Windows or Linux .
7.	To open BC Enterprise , open a web browser and, in the web Address box, supply the Universal Resource Locator (URL) localhost: bce-port , where <i>bce_port</i> is the designated port number for the Rajant BC Enterprise Service (default 8888).
8.	Log in to BC Enterprise for the first time. Supply the default user name admin and the default password admin .
9.	Configure the Data Directory location .

10.	<p>Important: Change the default password for user name admin.</p>
11.	Configure BC Connectors to operate with BC Enterprise.
12.	Configure BC Enterprise Data Services .
13.	Configure the License key for BC Enterprise.
14.	Select monitored BreadCrumbs .
15.	Add BC Enterprise users .
16.	Configure settings for the Simple Mail Transfer Protocol (SMTP) server.
17.	Configure settings for the Syslog server.

Set up BC|Enterprise for a Trial License

Purpose

Set up the [BC|Enterprise software](#) for use with a trial license in a Rajant network and configure the basic functions required to run BC|Enterprise.

References

The following documents contain information required in this procedure:

- [BC|Commander Version 11 User Guide](#) on the [Rajant Support web site](#)
- [BC|Connector Version 11 User Guide](#) on the [Rajant Support web site](#)

Prerequisites

Satisfy the [installation requirements](#) to operate the BC|Enterprise software for the trial license.

To obtain a trial license for BC|Enterprise software, do the following:

1. Review the [licensing options](#) for BC|Enterprise.
2. Decide to run BC|Enterprise with a trial license.
3. Determine the license requirements for BC|Enterprise based on the number of BreadCrumbs to be monitored in the Rajant network.
4. Request a trial license for BC|Enterprise for the Rajant network from a Rajant re-seller.

Procedure

To set up BC|Enterprise for use with a trial license, do the following:

Step	Action
1.	On the BC Enterprise server , download and install the installer package for the BC Enterprise software.
2.	Configure the BC Connectors in the network that are to operate with BC Enterprise.
3.	Configure secure login capability.
4.	At the BC Enterprise Client workstation connected to the BC Enterprise server, start the Rajant BC Enterprise Service on Windows or Linux .
5.	To open BC Enterprise , open a web browser and, in the web Address box, supply the Universal Resource Locator (URL) localhost: bce-port , where <i>bce_port</i> is the designated port number for the Rajant BC Enterprise Service (default 8888)..
6.	Log in to BC Enterprise for the first time. Supply the default user name admin and the default password admin .
7.	Configure the Data Directory location .
8.	<p>Important: Change the default password for user name admin.</p>
9.	Configure BC Connectors to operate with BC Enterprise.

10.	Configure BC Enterprise Data Services.
11.	Configure the License key for BC Enterprise.
12.	Manually select monitored BreadCrumbs.
13.	Add BC Enterprise users.
14.	Configure settings for the Simple Mail Transfer Protocol (SMTP) server.
15.	Configure settings for the Syslog server.

Set up BC|Enterprise for Evaluation

Purpose

Set up an unlicensed copy of the [BC|Enterprise software](#) for evaluation in a Rajant network and configure the basic functions required to run BC|Enterprise.

References

The following documents contain information required in this procedure:

- [BC|Commander Version 11 User Guide](#) on the [Rajant Support web site](#)
- [BC|Connector Version 11 User Guide](#) on the [Rajant Support web site](#)

Prerequisites

Satisfy the [installation requirements](#) to operate the BC|Enterprise software for evaluation.

Designate up to five BreadCrumbs that are associated with a designated BC|Connector to be monitored by BC|Enterprise.

To obtain unlicensed copy of the BC|Enterprise software for evaluation, do the following:

1. Review the [licensing options](#) for BC|Enterprise.
2. Decide to run an unlicensed copy of BC|Enterprise for evaluation.
3. To obtain an unlicensed copy of BC|Enterprise software, do one of the following:
 - On the Rajant Support site, log in to the customer account, then download an unlicensed copy of the BC|Enterprise software.
 - Contact an authorized Rajant re-seller to request an unlicensed copy of BC|Enterprise software.

Procedure

To set up BC|Enterprise for evaluation, do the following:

Step	Action
1.	On the BC Enterprise server , download and install the installer package for the unlicensed copy of BC Enterprise software.
2.	Configure the BC Connectors in the network that are to operate with BC Enterprise.
3.	Configure secure login capability.
4.	At the BC Enterprise Client workstation connected to the BC Enterprise server, start the Rajant BC Enterprise Service on Windows or Linux .
5.	To open BC Enterprise , open a web browser and, in the web Address box, supply the Universal Resource Locator (URL) localhost: bce-port , where <i>bce_port</i> is the designated port number for the Rajant BC Enterprise Service (default 8888).
6.	Log in to BC Enterprise for the first time. Supply the default user name admin and the default password admin .
7.	Configure the Data Directory location .

8.	<p>Important: Change the default password for user name admin.</p>
9.	Configure BC Connectors to operate with BC Enterprise.
10.	Configure BC Enterprise Data Services.
11.	Manually select up to five monitored BreadCrumbs.
12.	Add BC Enterprise users.
13.	Configure settings for the Simple Mail Transfer Protocol (SMTP) server.
14.	Configure settings for the Syslog server.

Installation Requirements

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- [Satisfy Installation Requirements](#)
- [Rajant Software Requirements](#)
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- [BC|Enterprise Server Requirements](#)
- [BC|Enterprise Client Workstation Requirements](#)
- [Designated Ports for BC|Connector and BC|Enterprise](#)
- [Rajant BreadCrumb Requirements](#)
- [Web Browser Requirements](#)
- [Login Requirements](#)
- [Simple Mail Transfer Protocol \(SMTP\) Requirements](#)
- [Syslog Server Requirements](#)

Satisfy Installation Requirements

Purpose

Satisfy the hardware, software and BreadCrumb installation requirements to operate the latest version of BC|Enterprise in the mesh network.

References

The following documents contain information required in this procedure:

- *BC|Commander Version 11 User Guide* on the [Rajant Support web site](#)
- *BC|Connector Version 11 User Guide* on the [Rajant Support web site](#)

Hardware requirements

Determine the following hardware installation requirements to support BC|Enterprise operation:

- [BC|Commander host requirements](#)
- [BC|Connector server requirements](#)
- [BC|Enterprise server requirements](#)
- [BC|Enterprise client workstation requirements](#)

Software requirements

Determine the following software requirements to support BC|Enterprise operation:

- [Rajant software requirements](#)
- [Web browser requirements](#)
- [Syslog server requirements](#)
- [Hypertext Transfer Protocol \(HTTP\) server requirements](#)
- [Simple Mail Transfer Protocol \(SMTP\) server requirements](#)
- [Secure Login Requirements](#)

BreadCrumb requirements

Install and configure the [Rajant BreadCrumbs](#) that BC|Enterprise is to [monitor](#) in the mesh network.

Rajant Software Requirements

Important: All instances of BC|Commander, BC|Connector and BC|Enterprise in a Rajant mesh network should be run at the same version number.

BC|Enterprise software

The BC|Enterprise software that runs on the [BC|Enterprise server](#) enables users to interactively view real-time performance data and historical data for BreadCrumbs and the Rajant Kinetic Mesh network as tables and charts in a web browser.

The BC|Enterprise software provides the following data services:

- [Rajant BCEnterprise Service](#) on Windows or the [Rajant BC|Enterprise Service](#) on Linux that runs as a background service to provide the [user interface](#) in a web [browser](#) on a [BC|Enterprise Client workstation](#)
- BC|Enterprise Metrics Service (Prometheus) to provide a time-series data base to store metrics for the Rajant mesh network
- Graph Service (Grafana) to generate charts and graphs to present historical data and metrics in dashboards
- Time-Series Service for data storage

Grafana and Prometheus run as external services\daemons to the Rajant BCEnterprise Service on Windows or Rajant BC|Enterprise Service on Linux.

BC|Connector software

The BC|Connector software provides network management services to a Rajant Kinetic Mesh network. BC|Connector acts as an intermediary between instances of BC|Commander and BreadCrumbs in the mesh network.

The BC|Enterprise software uses BC|Connector software that resides on each [BC|Connector server](#) to discover, monitor and access mesh statistics for BreadCrumbs within the same broadcast domain as that BC|Connector server.

New for 11.24 One instance of BC|Enterprise software can support one or more BC|Connectors. Each instance of BC|Connector software must reside on a separate BC|Connector server.

Each BC|Connector must already be running in the network after having been installed, [discovered](#), configured and tested with each instance of BC|Commander software in the network.

In BC|Commander, each BC|Connector may be [configured](#) to operate with BC|Enterprise. Each BC|Connector that is to operate with BC|Enterprise must be [added](#) to BC|Enterprise.

BC|Commander software

The Rajant BC|Commander software is the primary application for managing and monitoring components in a Rajant Mesh network. BC|Commander provides a graphical user interface to help users visualize an entire mesh network in real time and configure and monitor individual BreadCrumbs. The BC|Commander software is a client to each BC|Connector in the network.

BC|Commander directly discovers BreadCrumbs and BC|Connector servers that are bridged to the same network.

The latest version of BC|Commander software must be installed, configured and tested on each [BC|Commander host](#).

A BC|Commander user who has logged in to BC|Commander with User role co (Crypto Officer) can use BC|Commander to remotely perform administrative tasks for each instance of BC|Connector.

New for 11.24 In BC|Commander, a user can set a Preference to [enable viewing](#) of BreadCrumb historical data from BC|Enterprise for up to 10 BreadCrumbs selected in the BreadCrumb Table in BC|Commander.

References

The following documents contain information about Rajant software:

- *BC|Commander Version 11 User Guide* on the [Rajant Support web site](#)
- *BC|Connector Version 11 User Guide* on the [Rajant Support web site](#)
- (This user guide) *BC|Enterprise Version 11 User Guide* on the [Rajant Support web site](#)

Related topics

The following topics are related to Rajant software requirements:

- [BC|Enterprise Server Requirements](#)
- [BC|Enterprise Client Workstation Requirements](#)
- [BC|Connector Server Requirements](#)
- [BC|Commander Host Requirements](#)
- [Web Browser Requirements](#)
- [Users](#)
- [Log In to BC|Enterprise](#)
- [Discover BC|Connectors](#)
- [Configure BC|Connectors](#)
- [Rajant / BC|Connector Management Dashboard](#)
- [Add a BC|Connector \(Admin Only\)](#)
- [Remove a BC|Connector \(Admin Only\)](#)
- [Set up a New BC|Enterprise Installation](#)
- [Update the BC|Enterprise Software](#)
- [Set up BC|Enterprise for a Trial License](#)
- [Set up BC|Enterprise for Evaluation](#)

BC|Commander Host Requirements

Description

A BC|Commander host is a personal computer or laptop where [BC|Commander software](#) is installed.

Requirements

A Rajant Kinetic Mesh network must include at least one BC|Commander host.

Operating System

The operating system for the BC|Commander host may be any one of the following:

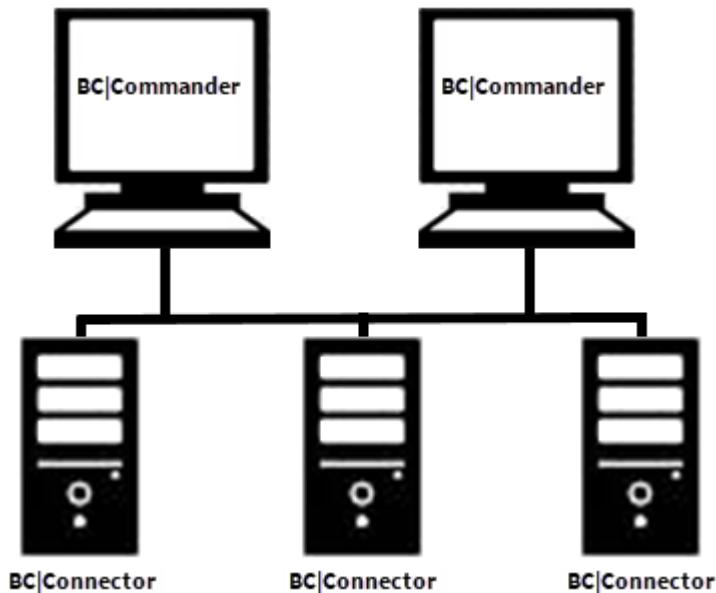
- Windows Server 2012 x64 or later
- Red Hat Enterprise Linux (RHEL) x64 7.x
- CentOS x64 7.x
- Debian

Note: Beginning with BC|Commander version 11.23.0, Rajant has discontinued support for the 32-bit x86 version of BC|Commander for Windows.

Network Requirements

BC|Commander can communicate with [BC|Connector servers](#) through network routers. A BC|Connector server may also be the [BC|Enterprise server](#).

Figure: Connections between BC|Commander Hosts and BC|Connector Servers



References

For BC|Commander host requirements, refer to the [BC|Commander Version 11 User Guide](#) on the [Rajant Support web site](#).

For information about BC|Commander communication with BC|Connector servers through network routers, refer to the [BC|Connector Version 11 User Guide](#) on the [Rajant Support web site](#).

BC|Connector Server Requirements

Description

A BC|Connector server is where [BC|Connector software](#) resides.

A BC|Connector server provides a network connection point to all [BC|Commander hosts](#) and the BreadCrumbs that reside in a particular broadcast domain in a Rajant Kinetic Mesh network.

Operating System

The operating system for a BC|Connector server may be any one of the following:

- Windows Server 2012 x64 or later
- Red Hat Enterprise Linux (RHEL) x64 7.x
- CentOS x64 7.x
- Debian

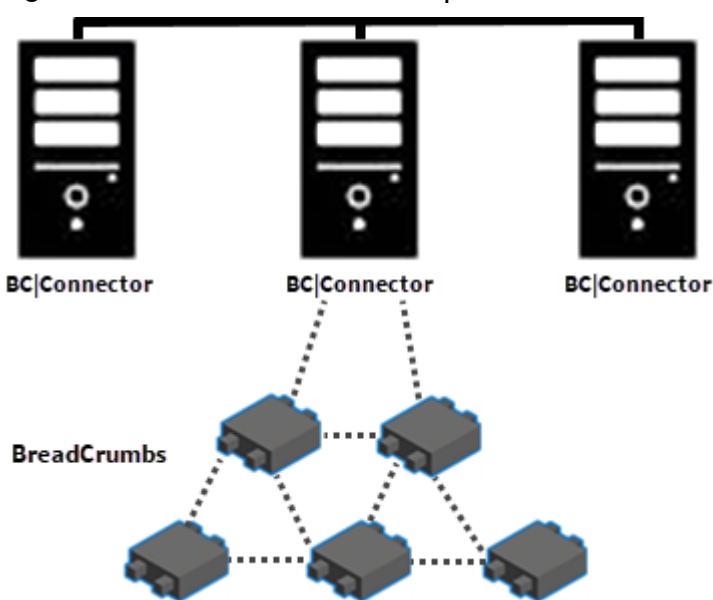
Note: Beginning with BC|Connector version 11.23.0, Rajant has discontinued support for 32-bit x86 versions of BC|Connector for Windows.

Network requirements

Each BC|Connector server in the network must be bridged to the BreadCrumb mesh through an Ethernet connection.

To enable the [BC|Enterprise software](#) to discover, monitor and access mesh statistics for any BreadCrumbs that have a network connection to a particular BC|Connector server, a Transmission Control Protocol (TCP) connection is required between that BC|Connector server and the [BC|Enterprise server](#).

Figure: Connections between BC|Connector Servers and BreadCrumbs



Recommendations

Two BC|Connector servers may be connected to the same Rajant Kinetic Mesh network to avoid the risk of a BC|Connector being a single point of failure.

Important: Configuring BC|Enterprise to operate with multiple BC|Connectors will increase Solid State Disk (SSD) usage on the BC|Enterprise server.

Port requirements

BC|Enterprise must communicate with each BC|Connector server through [designated ports](#) on the BC|Connector server.

References

The following documents contain information about BC|Connectors:

- *BC|Commander Version 11 User Guide* (on the [Rajant Support web site](#))
- *BC|Connector Version 11 User Guide* (on the [Rajant Support web site](#))

Related Topics

The following topics are related to BC|Connector server requirements:

- [BC|Enterprise Server Requirements](#)
- [Rajant Software Requirements](#)
- [Designated Ports for BC|Connector and BC|Enterprise](#)
- [BC|Connectors](#)
- [Configure BC|Connectors](#)
- [Rajant / BC|Connector Management Dashboard](#)
- [Add a BC|Connector \(Admin Only\)](#)
- [Remove a BC|Connector \(Admin Only\)](#)

BC|Enterprise Server Requirements

Description

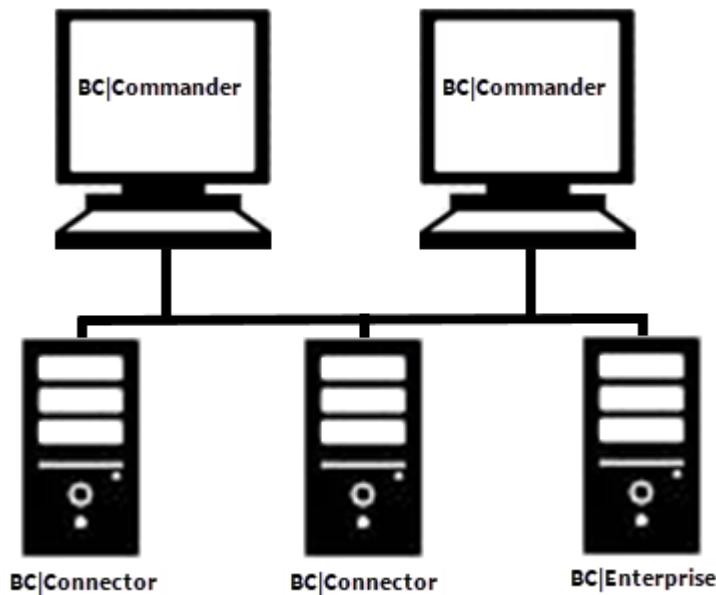
The BC|Enterprise server is a locally-hosted web server where the [BC|Enterprise software](#) resides.

Requirements

A Rajant mesh network requires only one BC|Enterprise server.

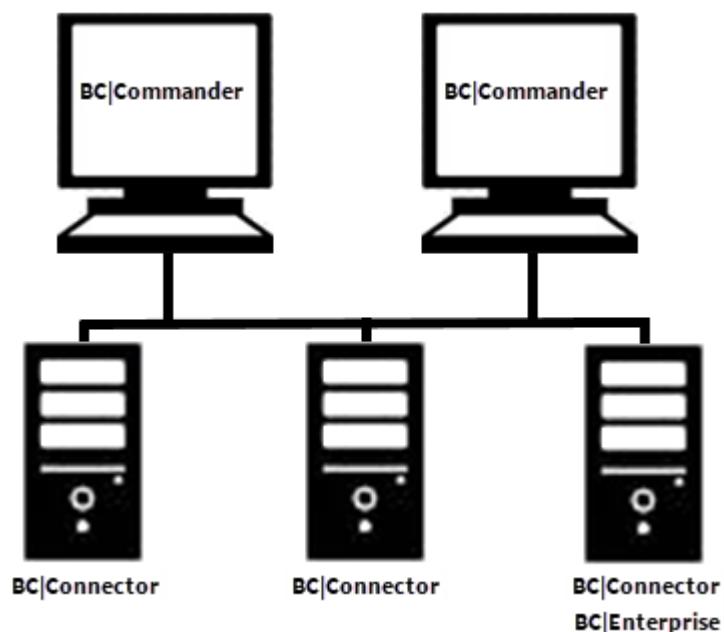
The BC|Enterprise software may reside on a separate server.

Figure: BC|Enterprise Software on a Separate BC|Enterprise Server



The BC|Enterprise software may reside on one of the [BC|Connector servers](#) used by BC|Enterprise.

Figure: BC|Enterprise Software on a BC|Connector Server



Operating System

The operating system for a BC|Enterprise server may be any one of the following:

- Windows Server 2012 x64 or later
- Red Hat Enterprise Linux (RHEL) x64 7.x
- CentOS x64 7.x
- Debian

Note: Beginning with BC|Enterprise version 11.24.3, Rajant has discontinued support for 32-bit x86 versions of BC|Enterprise for Windows.

Random Access Memory (RAM)

A fast personal computer with at least 8 GB of RAM is recommended for a BC|Enterprise server. At least 16 GB of RAM is recommended for a mesh with a large number of BreadCrumbs. Beta test systems included a Windows Virtual Machine (VM) with 32 GB of RAM and a 16-core processor and a Linux system with 16 GB of RAM and a quad-core 3 GHz processor.

Solid State Disk (SSD)

A large Solid State Disk (SSD) is recommended for the Data Directory that is used to store historical data. With a large SSD, the available disk storage space can keep pace with incoming data. Universal Serial Bus (USB) storage and network storage are too slow and are not supported for BC|Enterprise.

The required amount of disk space will depend on the number BreadCrumbs being monitored, network topology and the [polling interval for BreadCrumb statistics](#) and [retention time for historical data](#) configured for the time series database for BC|Enterprise. A mesh with 130 BreadCrumbs could generate over 1 Terabyte (TB) of data per year when sampling at 300-second intervals. Disk space requirements may be higher in a network where BreadCrumbs have a high number of peer BreadCrumbs.

Important:

Configuring BC|Enterprise to operate with multiple instances of BC|Connector will increase disk usage on the BC|Enterprise server.

Exclusion from Virus Detector Monitoring

Important:

To keep pace with incoming data, BC|Enterprise requires undelayed access to the network and the SSD for the Data Directory. Therefore, BC|Enterprise and its component services Prometheus and Grafana should be excluded from any virus detector "active," "live" or "real-time" monitoring of network data and disk reads/writes.

To preserve general system performance, the BC|Enterprise data directory should be excluded from any virus scanning or indexing operations (such as Windows Search Service operations).

Network Requirements

Each [BC|Connector server](#) that BC|Enterprise is to use to access [Rajant BreadCrumbs](#) in the mesh network requires a Transmission Control Protocol (TCP) connection to the [BC|Enterprise server](#).

Port Requirements

BC|Enterprise data services must communicate through [designated ports](#) on the BC|Enterprise server.

BC|Enterprise must communicate with each BC|Connector through [designated ports](#) on the BC|Connector server.

Firewall Requirements

Any [designated ports](#) used for BC|Enterprise operation must be allowed through any configured firewall.

Changes to designated ports may require changes to the firewall configuration.

Refer to the operating system documentation for the BC|Enterprise server for information about configuring firewalls.

Related Topics

The following topics are related to BC|Enterprise server requirements:

- [BC|Commander Host Requirements](#)
- [BC|Connector Server Requirements](#)
- [Rajant Software Requirements](#)
- [Designated Ports for BC|Connector and BC|Enterprise](#)
- [BC|Enterprise Data Services](#)
- [Configure the Retention Time for Historical Data](#)
- [Configure the Polling Interval for BreadCrumb Statistics](#)

BC|Enterprise Client Workstation Requirements

Description

A BC|Enterprise client workstation provides [user](#) access to BC|Enterprise through a [web browser](#).

Requirements

Each BC|Enterprise Client workstation must be connected to one of the following:

- The [BC|Enterprise server](#)
- Another computer that resides on the same Local Area Network (LAN) as the BC|Enterprise server
- A remote computer that resides outside the LAN for the BC|Enterprise server

Required Port

The web browser on a BC|Enterprise Client workstation must access BC|Enterprise through the [designated port 8888](#) on the BC|Enterprise server.

Related Topics

The following topics are related to BC|Enterprise Client workstation requirements:

- [Rajant Software Requirements](#)
- [Web Browser Requirements](#)
- [Designated Ports for BC|Connector and BC|Enterprise](#)
- [BC|Enterprise Server Requirements](#)
- [Provide a URL for the User Interface \(Admin Only\)](#)

Designated Ports for BC|Connector and BC|Enterprise

Designated Ports on a BC|Connector Server

The BC|Enterprise software must communicate with each instance of BC|Connector software through designated ports on the BC|Enterprise server to designated ports on each BC|Connector server.

The following table identifies the designated ports from the BC|Enterprise server to each BC|Connector server that are used by BC|Enterprise:

Purpose	From	To	Protocol
BC Enterprise setup only	Ephemeral port on BC Enterprise server	BC Connector server TCP port 23000	IPv4 TCP, IPv6 TCP
BC Enterprise metrics request and publishing	Ephemeral port on BC Enterprise server	BC Connector server TCP port 23002 New for 11.24	IPv4 TCP, IPv6 TCP
BC Connector communication with BreadCrumbs	Ephemeral port on a BC Connector server	BreadCrumb IPv4 or IPv6 addresses port 2300	IPv4 UDP, IPv6 UDP
BC Connector Discovery New for 11.24	Ephemeral port on a BC Commander host	BC Connector server port 35057	IPv4 UDP, IPv6 UDP
BC Connector Discovery New for 11.24	Ephemeral port on BC Enterprise server	BC Connector server port 35057	IPv4 UDP, IPv6 UDP

Designated ports for BC|Enterprise data services

BC|Enterprise data services use local network connections to communicate with each other.

The following table identifies the designated port used for each BC|Enterprise data service on the BC|Enterprise server:

Important: There is a Motorola service that uses port 8888. If that Motorola service is running on the BC|Enterprise server, use a port number other than 8888 for the Rajant BC|Enterprise Service.

Service	From	To	Protocol
BC Enterprise Graph Service (Grafana)	Ephemeral port on BC Enterprise server	BC Enterprise server port 3000	IPv4 TCP, IPv6 TCP
BC Enterprise Metrics Service (Prometheus)	Ephemeral port on BC Enterprise server	BC Enterprise server port 8889	IPv4 TCP, IPv6 TCP
BC Enterprise Time-Series Database Service	Ephemeral port on BC Enterprise server	BC Enterprise server port 9090	IPv4 TCP, IPv6 TCP
Rajant BC Enterprise Service	Internet browser on BC Enterprise Client workstation	BC Enterprise server port 8888	IPv4 HTTP, IPv6 HTTP

Firewall requirements

Any port required for BC|Enterprise operation must be allowed through any configured firewall.

Changes to designated ports may require changes to the firewall configuration on the BC|Enterprise server.

Refer to the operating system documentation for the BC|Enterprise server for information about configuring firewalls.

Related Topics

For more information about ports and protocols in a Rajant network, see [Appendix A. Ports and Protocols](#).

The following topics are related to designated ports:

- [Rajant Software Requirements](#)
- [BC|Connector Server Requirements](#)
- [BC|Commander Host Requirements](#)
- [BC|Enterprise Server Requirements](#)
- [Provide a URL for the User Interface \(Admin Only\)](#)
- [Configure a BC|Connector in BC|Commander](#)
- [BC|Enterprise Client Workstation Requirements](#)
- [Configure BC|Enterprise Data Services](#)

Rajant BreadCrumb Requirements

Description

A Rajant BreadCrumb is a networking device that is a product of Rajant Corporation (<http://www.rajant.com>).

Product families and models

Each product family is designed to support particular environmental or operational requirements. BreadCrumb models within a product family differ in component parts. The hardware and firmware features in each BreadCrumb model support specific operational and administrative capabilities.

Most BreadCrumbs include radios that use the IEEE 802.11 (Wi-Fi) wireless networking standard protocols. Some BreadCrumbs support the Long-Term Evolution (LTE) standard. Some BreadCrumbs provide only wired connectivity through a Local Area Network (LAN) to the Ethernet. Many BreadCrumbs provide both wireless and wired Ethernet connections.

Refer to the BreadCrumb user guide for each BreadCrumb family for specific information. BreadCrumb user guides are available on the [Rajant Support web site](#).

Network requirements

A network connection between a BC|Connector server and the [BC|Enterprise server](#) is required to enable the [BC|Enterprise software](#) to [discover, monitor](#) and access mesh statistics for any BreadCrumbs that have a network connection to that BC|Connector server.

Installation

Each BreadCrumb must be physically installed in a mesh network.

For BreadCrumb installation requirements, refer to the BreadCrumb User Guide for each specific BreadCrumb model and firmware version. BreadCrumb user guides are available on the [Rajant Support web site](#).

Firmware

Firmware specific to each BreadCrumb model must be loaded on each BreadCrumb to enable operation.

Rajant releases updated versions of firmware for each BreadCrumb model, as needed, to provide new capabilities or improve performance.

Important: When possible, each BreadCrumb should run the latest firmware version available for that BreadCrumb model. An older version of BreadCrumb firmware may not provide all statistics to BC|Enterprise.

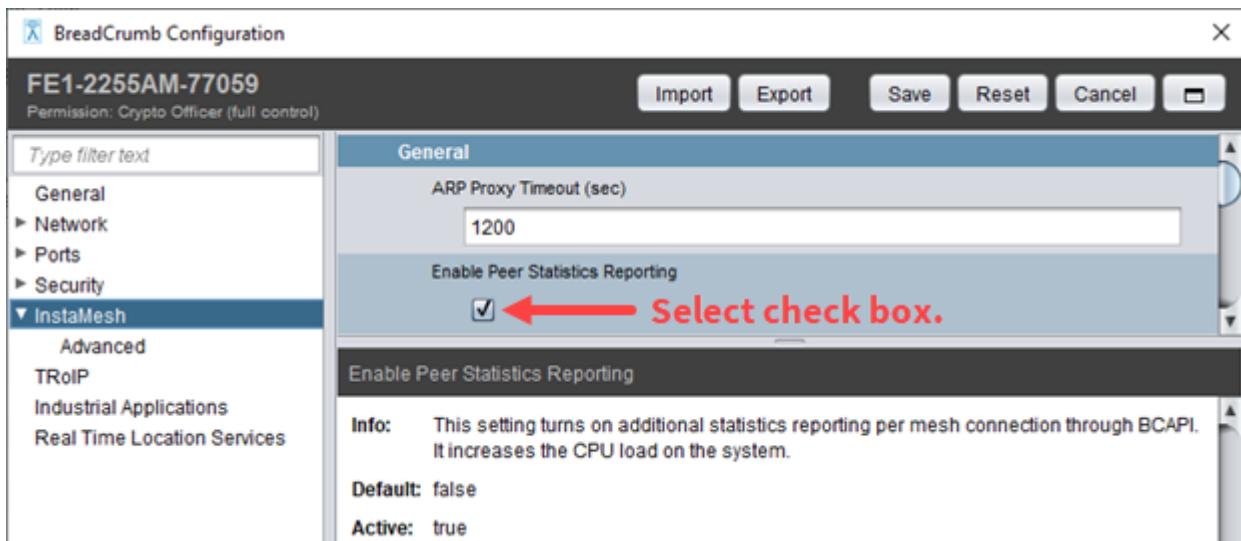
Depending on the BreadCrumb model, BreadCrumb firmware may be loaded remotely from [BC|Commander](#) or locally from a Universal Serial Bus (USB) flash drive. For procedures to load firmware, refer to the BreadCrumb user guide for the BreadCrumb model and the [BC|Commander Version 11 User Guide](#) available on the Rajant Support web site.

Configuration

Each BreadCrumb in the mesh network must be configured in BC|Commander.

BreadCrumb configuration requirements depend on the available features and capabilities to be provided by the BreadCrumb. For BreadCrumb configuration settings and procedures, refer to the [BC|Commander Version 11 User Guide](#) on the Rajant Support web site.

To enable BC|Enterprise to show statistics for peer BreadCrumbs on the **Mesh / Monitor** dashboard, in the BreadCrumb configuration for each peer BreadCrumb, select the **Enable Peer Statistics Reporting** check box, as follows:



Web Browser Requirements

Requirements

Each [user](#) must access [BC|Enterprise](#) through a web browser on a [BC|Enterprise client workstation](#).

Supported Browsers

At the time of this writing, supported web browsers are Chrome/Chromium, Firefox, Safari and Microsoft Edge.

Rajant recommends using a recent version of Chrome/Chromium, Firefox or Microsoft Edge updated in the last two years.

Note: Internet Explorer is not supported for BC|Enterprise.

BC|Enterprise uses Grafana to generate charts and graphs. The BC|Enterprise user interface will work with the current version of any web browser that Grafana supports. For the latest information, refer to [Grafana Installation Requirements](#).

Required Port

The web browser for the BC|Enterprise user interface on a client device must access the [BC|Enterprise server](#) through [port 8888](#) on the BC|Enterprise server.

Secure Login Requirements

All users require a secure login to the BC|Enterprise user interface through a web browser on a local device. A secure login for a user includes a [user name](#) and [password](#).

The following [configuration options](#) are available for configuring secure login capability:

- Set up [Transport Layer Security \(TLS\)](#)
- Set up a [Hypertext Transfer Protocol \(HTTP\) server](#)

Related Topics:

The following topics are related to web browser requirements:

- [Users](#)
- [Log In to BC|Enterprise](#)
- [Log Out of BC|Enterprise](#)
- [Open BC|Enterprise](#)
- [Close BC|Enterprise](#)
- [Provide a URL for the User Interface \(Admin Only\)](#)
- [BC|Enterprise Server Requirements](#)
- [Designated Ports for BC|Connector and BC|Enterprise](#)
- [Secure Login Configuration Options](#)
- [Requirements for TLS](#)
- [Requirements for an HTTP Server](#)

Login Requirements

Contents

[Login Configuration Options](#)

[Requirements for TLS](#)

[Example: Set up Caddy 2 to Provide TLS](#)

[Requirements for an HTTP Server](#)

Login Configuration Options

Requirements

All [users](#) require login capability to the BC|Enterprise user interface through a [web browser](#) on a [BC|Enterprise client workstation](#).

Options

The following options are available for configuring login capability:

- Set up [Transport Layer Security \(TLS\)](#)
- Set up a [Hypertext Transfer Protocol \(HTTP\) server](#)

Recommendation

Rajant strongly recommends TLS for BC|Enterprise.

Requirements for TLS

Description

Transport Layer Security (TLS) is one [option](#) for providing [login capability](#) for [users](#).

TLS provides encryption for data, such as user names and passwords, sent between a [web browser](#) on a local device and the [Rajant BC|Enterprise Service](#) on the [BC|Enterprise server](#).

Recommendations

Rajant strongly recommends configuring TLS for any web browser to be used for the BC|Enterprise user interface.

Important: A security configuration may be complex. To ensure a secure connection, TLS should be set up by a local Information Technology (IT) professional. An incorrect security configuration may appear to be working when, in fact, the configuration does not provide the required security features.

Requirements

BC|Enterprise does not provide an implementation for TLS.

Corporate policies and procedures for the site should define the implementation requirements for TLS.

BC|Enterprise should be installed behind a transparent reverse proxy to [port 8888](#) on the BC|Enterprise server.

The following are examples of transparent reverse proxy products:

- Apache HTTP Server ("httpd") (<https://httpd.apache.org>)
- nginx (<http://nginx.org>)
- Caddy 2 (<https://caddyserver.com>)
- Others

References

For troubleshooting procedures and information for a transparent reverse proxy product, refer to the product web site.

Example

[Example: Set up Caddy 2 to Provide TLS](#)

Related Topics

The following topics are related to requirements for TLS:

- [Users](#)
- [Web Browser Requirements](#)
- [Log In to BC|Enterprise](#)
- [Log Out of BC|Enterprise](#)
- [Designated Ports for BC|Connector and BC|Enterprise](#)
- [Login Configuration Options](#)
- [Requirements for TSL](#)
- [Example: Set up Caddy 2 to Provide TLS](#)

Example: Set up Caddy 2 to Provide TLS

Purpose

Set up the Caddy 2 server to provide [Transport Layer Security \(TLS\)](#) for [users](#).

The Caddy 2 server configuration includes the automatic generation and renewal of free Secure Sockets Layer (SSL) certificates via the Let's Encrypt Certificate Authority (CA).

References

Refer to the following web sites for more information:

- Let's Encrypt (<https://letsencrypt.org>)
- Caddy server (<https://caddyserver.com>)

Prerequisites

Determine whether the Caddy 2 server is to reside on the [BC|Enterprise server](#) or a different server.

Local Information Technology (IT) support personnel must do the following:

- Choose a host name for the BC|Enterprise server (example: bcenterprise.mycompany.com).
- Determine the public address for the host name for the BC|Enterprise server.
- Create a public Domain Name System (DNS) entry for the host name for the BC|Enterprise server.
- If BC|Enterprise is running behind a firewall, ensure that port 80 and port 443 of the public address associated with the host name for the BC|Enterprise server are forwarded to the server where the Caddy reside resides.
- Determine the host name for the Caddy server is to reside (example: external.host.name).

Note: In this procedure, the public address must not already host a web site or an HTTP server.

Procedure

To set up the Caddy 2 server, do the following:

1. To download the Caddy 2 server, do the following:
 - a. On the server where Caddy 2 server is to reside, go to <https://caddyserver.com>. The web page for Caddy is displayed.
 - b. In the banner, click **v2**. The web page for Caddy 2 server is displayed.
 - c. Click **Download**. The Download page for Caddy 2 packages is displayed.
 - d. In the **Platform** list, select the platform for the Caddy 2 server.
 - e. Click **Download**. The installation file for the Caddy server is downloaded to the server where Caddy server is to reside.
2. On the BC|Enterprise server, start the BC|Enterprise Service for the operating system ([Windows](#) or [Linux](#)).
3. To start Caddy 2, on the server where Caddy 2 server resides, on the command line, enter the reverse-proxy command for the operating system (Windows or Linux) for the Caddy 2 server, as follows:
 - Windows command:


```
.\caddy_windows_amd64.exe reverse-proxy --from https://
caddy2.host.name --to localhost:8888
```
 - Linux command:

```
caddy reverse-proxy --from https://caddy2.host.name --to  
localhost:8888
```

where,

caddy2.host.name is the host name for the host where the Caddy 2 server resides.

localhost is the loopback address, 127.0.0.1, if Caddy 2 server and BC|Enterprise reside on the same host. If Caddy 2 server and BC|Enterprise reside on different hosts, *localhost* must be the IP address of the BC|Enterprise host.

8888 is the [designated port](#) for the Rajant BC|Enterprise Service on the BC|Enterprise server.

Result

The first time the Caddy 2 service starts, Caddy 2 will contact [letsencrypt.org](#) and generate an SSL certificate that will be trusted by most web browsers.

Requirements for an HTTP Server

Description

A Hypertext Transfer Protocol (HTTP) server is one [option](#) for providing [login capability](#) for [users](#).

An HTTP server enables communication between web browsers and web servers.

An HTTP server can enable communication between the Rajant BC|Enterprise Service on the [BC|Enterprise server](#) and a [web browser](#) on [BC|Enterprise client workstation](#).

Options

BC|Enterprise can share an HTTP server with other web applications or use a separate HTTP server.

Requirements

Local Information Technology (IT) support personnel must map a path from the HTTP server to the location of the Rajant BC|Enterprise Service on the BC|Enterprise server. The details for this procedure will depend upon the HTTP server configuration.

Simple Mail Transfer Protocol (SMTP) Requirements

Contents

[SMTP Server Requirements](#)

[Email Account Settings for SMTP via Gmail](#)

[Email Account Settings for SparkPost Mail SMTP](#)

SMTP Server Requirements

Simple Mail Transfer Protocol (SMTP)

Simple Mail Transfer Protocol (SMTP) is an internet standard communication protocol used to send and receive electronic mail (email) messages. These messages may include Short Message Service (SMS) text messages sent by email to a cell phone.

Client

As an SMTP client application, BC|Enterprise can use SMTP to send [alerts](#) and [email reports](#) to designated recipients via email.

Server

BC|Enterprise requires an SMTP server to send email messages from BC|Enterprise to designated recipients.

The site may maintain a local SMTP server. Open source or free SMTP server packages are available on the internet. One free solution is Gmail from Google.

A site that does not maintain an SMTP server may use a paid SMTP email server on the internet.

Connection Security setting

Note: When the email account uses port 465, the correct Connection Security setting is usually **SSL/TLS**. When email uses port 25 or 587, the correct Connection Security setting is usually **STARTTLS**.

Note: It may be possible to use an SMTP server with higher security if the SMTP server provides a way for a BC|Enterprise customer to create a special App ID to enable users to log in to BC|Enterprise. However, the use of an App ID has not been tested for BC|Enterprise.

Email account

Important: Because of lowered account security, a dedicated email account (not a company account or employee account) should be used for BC|Enterprise SMTP email messages.

Ensure that the email account for BC|Enterprise SMTP email messages has the following settings:

- Enabled to allow access by Less Secure Apps or Less Secure Signins (turning off OAuth), if necessary
- Two-Step Authentication (aka Two-Step Verification) is turned off.

Refer to the web site for the email service provider for information about configuring SMTP email to use their service. For example, some SMTP services will accept only an Email From address that matches the account email or the verified trusted emails in the email account settings.

BC|Enterprise SMTP notification processing has been tested successfully with SMTP via Gmail and SparkPost Mail.

[Email Account Settings for Gmail SMTP](#)

[Email Account Settings for SparkPost Mail SMTP](#)

JavaMail properties file

If necessary, create the file `./var/conf/javamail.properties` in the BC|Enterprise [data](#) directory to provide or override JavaMail settings as needed for a specific SMTP server.

To refer to the JavaMail Application Programming Interface (API) documentation, on internet, search for "javamail properties" to go to "Package com.sun.mail.smtp" at

<https://javaee.github.io/javamail/docs/api/com/sun/mail/smtp/package-summary.html/>

BC|Enterprise configuration

To enable BC|Enterprise to use an SMTP server, [configure SMTP settings](#) in BC|Enterprise.

Email Account Settings for SMTP via Gmail

Settings for SMTP via Gmail

Email notification processing via SMTP has been tested successfully with SMTP via Gmail.

The following settings were used in testing:

Gmail:

Email Host: smtp.gmail.com

Email Port: 587

Email From: any email address; Gmail will change it to a From address in Gmail settings

Email UserName: Gmail account email address

Email Password: Gmail account password

Authentication Method: Password

Connection Security: STARTTLS

Required Gmail account settings:

Enable Allow Less Secure Apps, do not enable Two-Factor Authentication

Follow-up procedure

When logged in to a Gmail account, enable **Allow Less Secure Apps** at

<https://myaccount.google.com/lesssecureapps>

Email Account Settings for SparkPost Mail SMTP

Settings for SparkPost Mail SMTP

Email notification processing via SMTP has been tested successfully with SparkPost Mail.

The following settings were used in testing:

SparkPost Mail:

Email Host: smtp.sparkpostmail.com

Email Port: 587

Email From: Email address at a verified domain configured in the SparkPost account.

Email UserName: SMTP_Injection

Email Password: an API key you created from the SparkPost account

Authentication Method: Password

Connection Security: STARTTLS

Reference

For more help for SparkPost, go to the following we site:

<https://www.sparkpost.com/docs/faq/smtp-connection-problems/>

Syslog Server Requirements

Description

System Logging Protocol (syslog) is a standard protocol for message logging capability in a network. Syslog uses a client-server architecture. A syslog server component listens for messages from client applications in a network and logs those messages.

A syslog client application can run on a computer with a Windows or Linux operating system.

Sources

Syslog servers are available for free or for a price. For example, rsyslog is the default syslog server that is provided with the Fedora Linux operating system.

To compare available syslog servers, search for "syslog server" on the internet.

Message Formats

For information about message formats for the syslog protocol, refer to the following web pages:

- <https://tools.ietf.org/html/rfc5424> (The Syslog Protocol)
- <https://tools.ietf.org/html/rfc5425> (Transport Layer Security (TLS) Transport Mapping for Syslog)
- <https://tools.ietf.org/html/rfc3164> (The Berkeley Software Distribution (BSD) syslog Protocol)

Requirements

As a syslog client application, BC|Enterprise uses a syslog server to log **alerts**.

BC|Enterprise may use a separate syslog server or share a syslog server with other syslog client applications in a network.

A syslog server must be installed on a computer in the same Local Area Network (LAN) with the **BC|Enterprise server**.

Local Information Technology (IT) professionals must [configure syslog](#) in BC|Enterprise.

Install BC|Enterprise Software

Contents

[Installer Packages](#)

[Download an Installer Package](#)

[Installer Package for Microsoft Windows Server](#)

[Installer Package for RHEL/CentOS Linux](#)

[Installer Package for Debian](#)

Installer Packages

Description

An installer package installs a designated version of the BC|Enterprise software on the BC|Enterprise server.

For each software version, a separate installer package is available for each supported operating system platform for the BC|Enterprise server, as follows:

- Windows Server 2012 x64 or later
- Red Hat Enterprise Linux (RHEL) x64 7.x
- CentOS x64 7.x
- Debian

Note: Beginning with BC|Enterprise version 11.24.3, Rajant has discontinued support for 32-bit x86 versions of BC|Enterprise for Windows.

Each installer package installs the Open Source Java Development Kit (OpenJDK) during the installation process. This OpenJDK will not replace an existing system Java Runtime Environment (JRE), but will provide BC|Enterprise with the tools it requires to run properly.

Availability

Note: Rajant periodically releases an updated software package for each Rajant software product. Updated software packages are available on the [Rajant Support web site](#) to users with a current Software Maintenance agreement.

When a new version of the BC|Enterprise software is released, a separate installer package for each supported platform for a BC|Enterprise server will become available on the [Rajant Support web site](#).

The file name for each installer package reflects the name of the server platform (for example, Windows or Debian) and the released version of the BC|Enterprise software (for example, 11.25.1.6).

Installation Instructions

To install the BC|Enterprise software, complete the instructions for the correct installer package for the local BC|Enterprise server platform, as follows:

- [Microsoft Windows Server](#)
- [RHEL/CentOS Linux](#)
- [Debian](#)

Related Topics

The following topics are related to installer packages:

- [BC|Enterprise Server Requirements](#)
- [Rajant Software Requirements](#)
- [Download an Installer Package](#)
- [Install with Microsoft Windows Server](#)
- [Install with RHEL/CentOS Linux](#)
- [Install with Debian](#)
- [Configure the Data Directory Location](#)

Download an Installer Package

Purpose

Download an [installer package](#) for the [BC|Enterprise software](#) from the Rajant Support web site to the [BC|Enterprise server](#).

A separate installer package is available for each supported [operating system](#) platform for a BC|Enterprise server, as follows:

- Windows Server 2012 x64 or later
- Red Hat Enterprise Linux (RHEL) x64 7.x
- CentOS x64 7.x
- Debian

Prerequisites

Note: Installer packages are available on the [Rajant Support web site](#) to users with a current Software Maintenance agreement.

Determine the local user login credentials for the Rajant Support web site.

Determine the server where the BC|Enterprise software is to be installed.

Determine the file name for the installer package required for the operating system platform on the BC|Enterprise server, where the file name identifies the latest released version of BC|Enterprise and *x* is the build number:

- Windows Server: bcenterprise-windowsx64_11.25.1.6.64bit.exe - includes OpenJDK11
- RHEL/CentOS: BCEnterprise_unix_11.25.1.6.rpm
- Debian: BCEnterprise-11.25.1.6.deb

Procedure

To download an installer package from the Rajant Support site to the BC|Enterprise server, do the following:

1. On the BC|Enterprise server, open a Web browser.
2. Log in to the [Rajant Support web site](#). The Rajant Support web page opens.
3. Click **Files**.
4. In the **Search** box, type **BC|Enterprise**. The available installer packages are listed.
5. In the **Title** column, click the link for the file name for the installer package that is to be downloaded. The installer package is downloaded to the BC|Enterprise server.

Result

The installer package has been downloaded to the BC|Enterprise server.

Follow-up action

To install the BC|Enterprise software on the BC|Enterprise server, use the installation procedure for the operating system platform on the BC|Enterprise server, as follows:

- [Install with Microsoft Windows Server](#)
- [Install with RHEL/CentOS Linux](#)
- [Install with Debian](#)

Installer Package for Microsoft Windows Server

Contents

[Install with Microsoft Windows Server](#)

[Default Data Directory Location for Windows](#)

Install with Microsoft Windows Server

Purpose

Install or upgrade the BC|Enterprise software on a BC|Enterprise server that is running Microsoft Windows Server 2012 x64 or later.

Prerequisites

Read [Appendix B: Rajant End User License Agreement](#).

Satisfy the BC|Enterprise server requirements.

Download the installer package from the Rajant Support web site to the BC|Enterprise server.

Note: To upgrade from a previous release of BC|Enterprise to a later release, an uninstall procedure for the previous release is not necessary.

Procedure

To install or upgrade the BC|Enterprise software, do the following:

1. On the BC|Enterprise server, double-click the link for the downloaded installer package. The installation process starts.
2. Important: Read the Rajant End User License Agreement. Click **I accept the agreement**.
3. Complete the remaining on-screen instructions.

Results

The Rajant BC|Enterprise software is installed on the BC|Enterprise server.

The Rajant BC|Enterprise Service is registered as a system service with the Windows Service Controller.

The Rajant BC|Enterprise Service starts automatically and runs using a System account.

The Data Directory resides in the [default location](#).

Automatic restart for the Rajant BC|Enterprise Service is enabled in Windows Component Services.

Follow-up procedure

(Optional) Local Information Technology (IT) support personnel may designate an actual location other than the default location to be used for the Data Directory. If an actual location other than the default location is to be used for the Data Directory, a [user](#) with user type **Administrator** should [configure the actual location](#) immediately after BC|Enterprise is installed.

Note: Changing the location of the Data Directory in the BC|Enterprise configuration after BC|Enterprise is in use will not move existing data.

Default Data Directory Location for Windows

Description

After the BC|Enterprise software has been [installed](#) on a BC|Enterprise server with Windows Server, the Data Directory for BC|Enterprise resides in a default location.

For Windows Server, the default location for the Data Directory is the %APPDATA% folder. This location depends on the version of Windows Server. For example, for Windows Server 2016, the location of the %APPDATA% folder is the following:

C:\Windows\system32\config\systemprofile\AppData\Roaming\bcenterprise

Windows User Account

To access the %APPDATA% folder at the default location, the Windows user account must be part of the Administrative group.

Configuration option

For most BC|Enterprise installations, the default location for the Data Directory is acceptable.

(Optional) Information Technology (IT) support personnel may designate a location other than the default location to be used for the Data Directory. This location must provide the amount of [disk space required](#) for historical data for a length of time determined by IT support personnel.

If a location other than the default location is to be used for the Data Directory, a [user](#) with user type **Administrator** should [configure the Data Directory Location](#) in BC|Enterprise immediately after BC|Enterprise is installed.

Note: Changing the Data Directory location in the BC|Enterprise configuration after BC|Enterprise is in use will not move existing data. Only new data will be stored in the new Data Directory location.

Related topics

The following topics are related to the Data Directory location for Windows Server:

- [Install with Microsoft Windows Server](#)
- [Configure the Data Directory Location](#)
- [Services Tab](#)
- [Rajant /Configuration Dashboard](#)

Installer Package for RHEL/CentOS Linux

Contents

[Install with RHEL/CentOS Linux](#)

[Default Data Directory Location for RHEL/CentOS Linux](#)

Install with RHEL/CentOS Linux

Purpose

Install or upgrade the BC|Enterprise software on a BC|Enterprise server that is running RHEL/CentOS Linux.

Prerequisites

Read [Appendix B: Rajant End User License Agreement](#).

Satisfy the BC|Enterprise server requirements.

Download the installer package from the Rajant Support web site to the BC|Enterprise server.

Note: To upgrade from a previous release of BC|Enterprise to the latest release, an uninstall procedure for the previous release is not necessary.

Procedure

To install or upgrade the BC|Enterprise software, submit the following command that identifies file name for the installer package:

```
sudo dnf install ./bcenterprise_linux_11.25.1.6.rpm
```

Results

The Rajant BC|Enterprise software is installed on the BC|Enterprise server.

Program files are installed at /opt/rajant-bcenterprise.

The BC|Enterprise Service is configured as a systemd service.

The systemd service manager correctly handles the restart logic.

The Data Directory resides in a [default location](#).

Follow-up Procedure

(Optional) Local Information Technology (IT) support personnel may designate an actual location other than the default location to be used for the Data Directory. If an actual location other than the default location is to be used for the Data Directory, a [user](#) with user type **Administrator** should [configure the actual location](#) immediately after BC|Enterprise is installed.

Note: Changing the location of the Data Directory in the BC|Enterprise configuration after BC|Enterprise is in use will not move existing data.

Default Data Directory Location for RHEL/CentOS Linux

Description

After the BC|Enterprise software has been [installed](#) on a BC|Enterprise server with RHEL/CentOS Linux, the Data Directory for BC|Enterprise resides in a default location.

For RHEL/CentOS Linux, the default location for the Data Directory is the following:

/opt/bcenterprise/data

Configuration option

For most BC|Enterprise installations, the default location for the Data Directory is acceptable.

(Optional) Local Information Technology (IT) support personnel may designate a location other than the default location to be used for the Data Directory. This location must provide the amount of [disk space required](#) for historical data.

If a location other than the default location is to be used for the Data Directory, a [user](#) with user type **Administrator** should [configure the Data Directory Location](#) in BC|Enterprise immediately after BC|Enterprise is installed.

Note: Changing the Data Directory Location in the BC|Enterprise configuration after BC|Enterprise is in use will not move existing data. Only new data will be stored in the new Data Directory location.

Alternatively, an IT administrator may create a symbolic link from the default location **/opt/bcenterprise/data** to an appropriate storage location. If a symbolic link is created, the Data Directory location in the BC|Enterprise configuration does not need to be changed.

Related topics

The following topics are related to the Data Directory location for RHEL/CentOS Linux:

- [Install with RHEL/CentOS Linux](#)
- [Configure the Data Directory Location](#)
- [Services Tab](#)
- [Rajant / Configuration Dashboard](#)

Installer Package for Debian

Contents

[Install with Debian](#)

[Default Data Directory Location for Debian](#)

Install with Debian

Purpose

Install or upgrade the BC|Enterprise software on a BC|Enterprise server that is running Debian.

Prerequisites

Read [Appendix B: Rajant End User License Agreement](#).

Satisfy the BC|Enterprise server requirements.

Download the installer package from the Rajant Support web site to the BC|Enterprise server.

Note: To upgrade from a previous release of BC|Enterprise to the latest release, an uninstall procedure for the previous release is not necessary.

Procedure

To install or upgrade the BC|Enterprise software, use an apt command with an administrative account or sudo privileges.

To install or upgrade the BC|Enterprise software, submit the following command that identifies file name for the installer package:

```
sudo apt install ./bcenterprise-11.25.1.6.deb
```

Results

The Rajant BC|Enterprise software is installed on the BC|Enterprise server.

Program files are installed at /opt/bcenterprise/ with symbolic links in /usr/local/bin/.

The Data Directory resides in a [default location](#).

Follow-up procedure

(Optional) Local Information Technology (IT) support personnel may designate an actual location other than the default location to be used for the Data Directory. If an actual location other than the default location is to be used for the Data Directory, a [user](#) with user type **Administrator** should [configure the actual location](#) immediately after BC|Enterprise is installed.

Note: Changing the location of the Data Directory in the BC|Enterprise configuration after BC|Enterprise is in use will not move existing data.

Default Data Directory Location for Debian

Description

After the BC|Enterprise software has been [installed](#) on a BC|Enterprise server with Debian, the Data Directory for BC|Enterprise resides in a default location.

For Debian, the default location for the Data Directory is the following:

/opt/bcenterprise/data

Configuration options

For most BC|Enterprise installations, the default location for the Data Directory is acceptable.

(Optional) Local Information Technology (IT) support personnel may designate a location other than the default location to be used for the Data Directory. This location must provide the amount of [disk space required](#) for historical data.

If a location other than the default location is to be used for the Data Directory, a [user](#) with user type **Administrator** should [configure the Data Directory Location](#) in BC|Enterprise immediately after BC|Enterprise is installed.

Note: Changing the Data Directory Location in the BC|Enterprise configuration after BC|Enterprise is in use will not move existing data. Only new data will be stored in the new Data Directory location.

Alternatively, an IT administrator may create a symbolic link from the default location **/opt/bcenterprise/data** to an appropriate storage location. If a symbolic link is created, the Data Directory location in the BC|Enterprise configuration does not need to be changed.

Related topics

The following topics are related to the Data Directory location with Debian:

- [Install with Debian](#)
- [Configure the Data Directory Location](#)
- [Services Tab](#)
- [Rajant / Configuration Dashboard](#)

Start or Stop the BC|Enterprise Service

Contents

- [Start the BC|Enterprise Service on Windows](#)
- [Stop the BC|Enterprise Service on Windows](#)
- [Start the BC|Enterprise Service on Linux](#)
- [Stop the BC|Enterprise Service on Linux](#)
- [Overview and Monitor Dashboards at Startup](#)

Start the Rajant BCEnterprise Service on Windows

Purpose

Start the [Rajant BCEnterprise Service](#) on a [BC|Enterprise server](#) that is running with Microsoft Windows Server.

Prerequisite

The BC|Enterprise software has been [installed](#) on a Microsoft Windows server.

Automatic Start after Installation

After the BC|Enterprise software is installed, the Rajant BCEnterprise Service will start automatically.

Automatic Restart after Configuration Changes

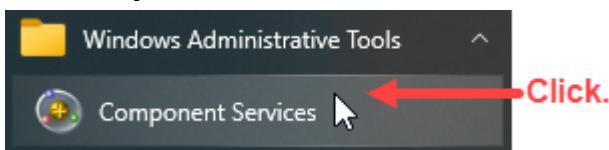
The Rajant BCEnterprise Service will automatically shutdown and then restart when the **Time-Series Polling Interval** setting is changed on the [Services tab](#) on the [Rajant / Configuration](#) dashboard.

Manual Start Procedure

When the Rajant BCEnterprise Service has stopped, the service may be started manually from the Windows **Component Services** window.

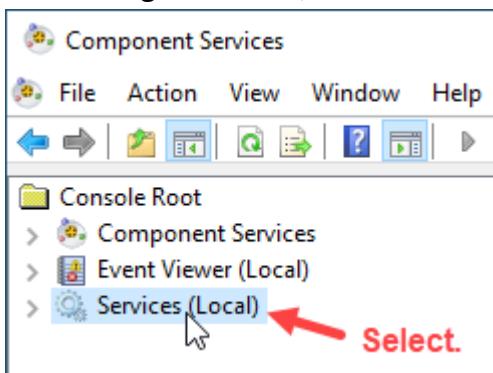
To manually start the Rajant BCEnterprise Service, do the following:

1. On the [BC|Enterprise Client workstation](#) connected to the [BC|Enterprise server](#), on the Start menu, expand the **Windows Administrative Tools** folder.
2. Click **Component Services**.



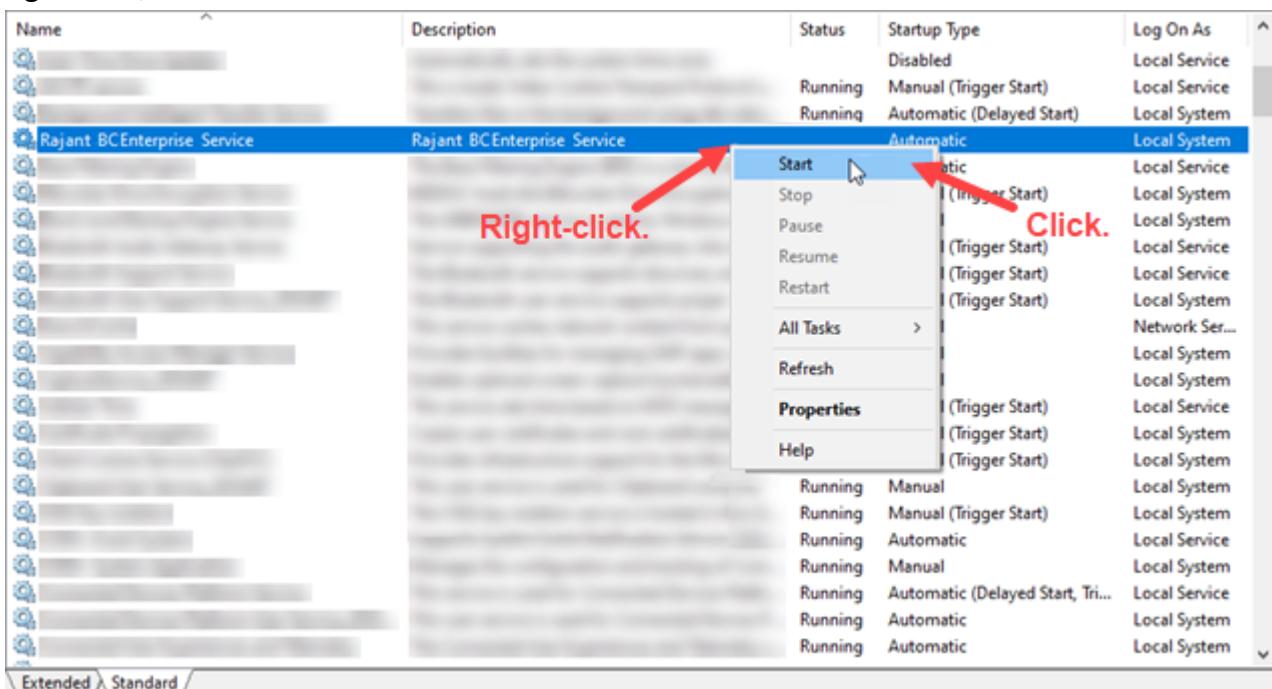
The **Component Services** window opens.

3. In the Navigation Pane, select **Services (Local)**.



4. At the bottom of the service list, click the **Extended** tab (default) or the **Standard** tab.
5. In the service list, select **Rajant BCEnterprise Service**.

6. Right-click, then click **Start**.



When the Rajant BCEnterprise Service starts, the Status changes to **Running**.

7. Close the **Component Services** window.

Results

The Rajant BCEnterprise Service is running.

The **Mesh / Overview** dashboard and **Mesh / Monitor** dashboard initially show no data.

Stop the Rajant BCEnterprise Service on Windows

Purpose

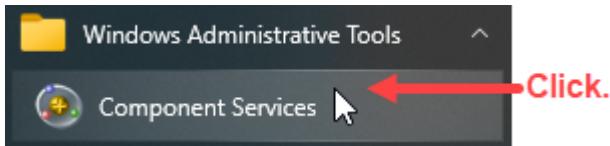
Stop the [Rajant BCEnterprise Service](#) on a BC|Enterprise server that is running with Microsoft Windows Server.

Procedure

Important: Do not attempt to use Windows Task Manager to stop the Rajant BCEnterprise Service.

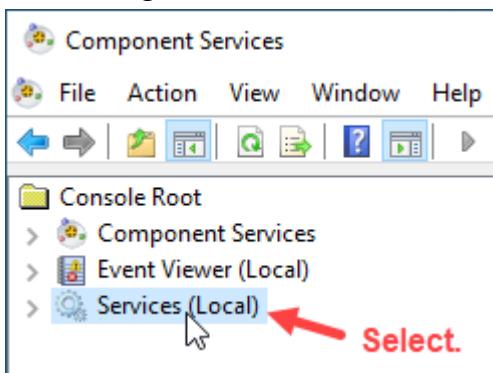
To stop the Rajant BCEnterprise Service, do the following:

1. On the [BC|Enterprise Client Workstation](#) connected to the BC|Enterprise server, on the Start menu, expand the **Windows Administrative Tools** folder.
2. Click **Component Services**.



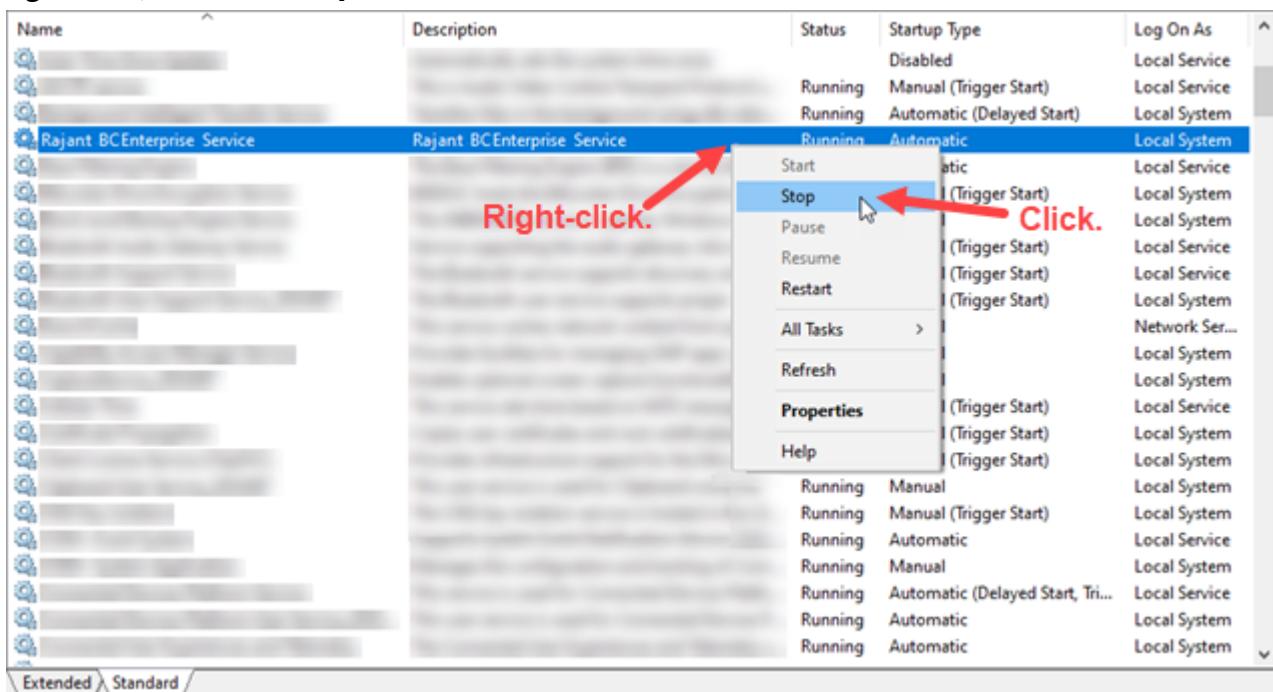
The **Component Services** window opens.

3. In the Navigation Pane, select **Services (Local)**.



4. At the bottom of the service list, click the **Extended** tab (default) or the **Standard** tab.
5. In the service list, select **Rajant BCEnterprise Service**.

6. Right-click, then click **Stop**.



7. Wait for the Rajant BCEEnterprise Service to stop. The **Status** column is blank.
 8. Close the **Component Services** window.

Result

The Rajant BCEnterprise Service is stopped.

Note: It can take up to 15 seconds for all BC|Enterprise services to stop. After stopping the Rajant BC|Enterprise Service, wait at least 15 seconds before [starting the Rajant BC|Enterprise Service](#).

Start the Rajant BC|Enterprise Service on Linux

Purpose

Start the [Rajant BCEnterprise Service](#) on a [BC|Enterprise server](#) that is running with one of the following [operating system](#) platforms:

- Red Hat Enterprise Linux (RHEL) x64 7.x
- CentOS x64 7.x
- Debian

Prerequisite

The BC|Enterprise software has been installed with [Debian](#) or [RHEL/CentOS Linux](#).

Procedure

The Rajant BCEnterprise is configured as a systemd service.

To start the Rajant BC|Enterprise Service, on the BC|Enterprise server, submit the following standard systemd command:

```
sudo systemctl start rajant-bcenterprise.service
```

Results

The Rajant BCEnterprise Service is started.

The **Mesh / Overview** dashboard and **Mesh / Monitor** dashboard [initially show no data](#).

Stop the Rajant BC|Enterprise Service on Linux

Purpose

Stop the [Rajant BC|Enterprise Service](#) on a [BC|Enterprise server](#) that is running on one of the following operating system platforms:

- Red Hat Enterprise Linux (RHEL) x64 7.x
- CentOS x64 7.x
- Debian

Procedure

The Rajant BC|Enterprise Service is configured as a systemd service.

Procedure

Important: Do not attempt to use the Linux operating system service control commands kill or taskkill to stop the Rajant BC|Enterprise Service.

To stop the Rajant BC|Enterprise Service, on the [BC|Enterprise Client workstation](#) connected to the BC|Enterprise server, submit the following standard systemd command:

```
sudo systemctl stop rajant-bcenterprise.service
```

Result

The Rajant BC|Enterprise Service is stopped.

Note: It can take up to 15 seconds for all BC|Enterprise services to stop. After stopping the Rajant BC|Enterprise Service, wait at least 15 seconds before [starting the Rajant BC|Enterprise Service](#).

Overview and Monitor Dashboards at Startup

Description

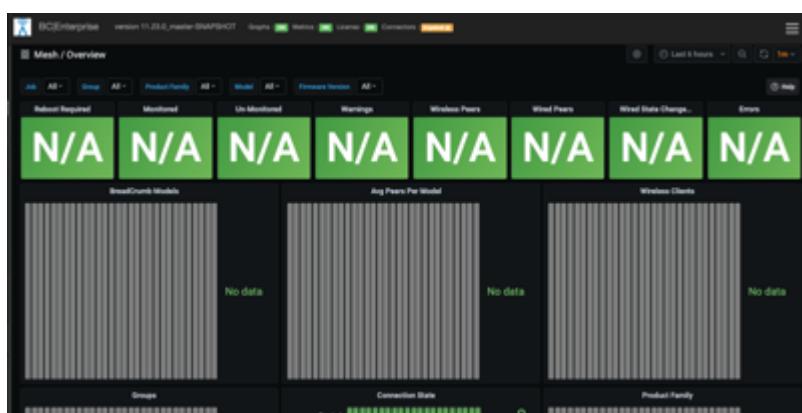
After the [Rajant BCEnterprise Service](#) starts on [Windows](#) or the [Rajant BC|Enterprise Service](#) starts on [Linux](#), the **Mesh / Overview** dashboard and **Mesh / Monitor** dashboard initially show no data.

BC|Enterprise will obtain initial values for these dashboards during the first polling interval of each [BC|Connector](#) that has been [added](#) to BC|Enterprise and is listed in the [BC|Connectors](#) table on the [Rajant / BC|Connector Management](#) dashboard has been [added](#) to BC|Enterprise.

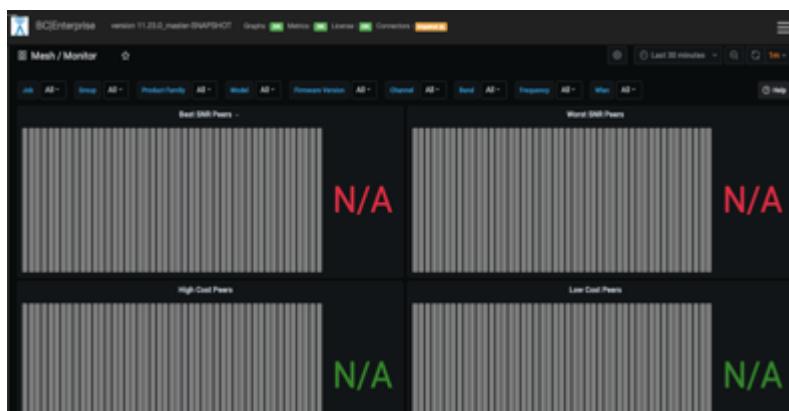
These dashboards will reflect current data after two complete polling intervals of the BC|Connectors.

Illustrations

The following illustration shows the initial **Mesh / Overview** dashboard.



The following illustration shows the initial **Mesh / Monitor** dashboard.



Related Topics

[Mesh / Overview Dashboard](#) with data

[Mesh /Monitor Dashboard](#) with data

Configure BC|Enterprise

Contents

[Rajant / Configuration Dashboard](#)

[Services Settings](#)

[License Settings](#)

[BreadCrumbs Settings](#)

[SMTP Settings](#)

[Syslog Settings](#)

[Action Settings](#)

Rajant / Configuration Dashboard

Purpose

Maintain configuration settings and perform administrative procedures for BC|Enterprise.

Navigation

To go to the **Rajant / Configuration** dashboard, on the **Main Menu**, click **Configuration**.

Procedures

Each tab on the **Rajant / Configuration** dashboard is used for a category of procedures, as follows:

Services tab:

- [Configure the Data Directory Location](#)
- [Configure BC|Enterprise Data Services](#)
- [Configure the Polling Interval for BreadCrumb Statistics](#)
- [Configure the Retention Time for Historical Data](#)

License tab:

- [Configure a License Key](#)
- [View Current License Information](#)

BreadCrumbs tab:

- [Automatically Select Monitored BreadCrumbs](#)
- [Manually Select Monitored BreadCrumbs](#)
- [Stop Monitoring a BreadCrumb](#)
- [Start Monitoring a BreadCrumb](#)
- [Select Up to Five Monitored BreadCrumbs](#)

SMTP tab: Configure SMTP Settings

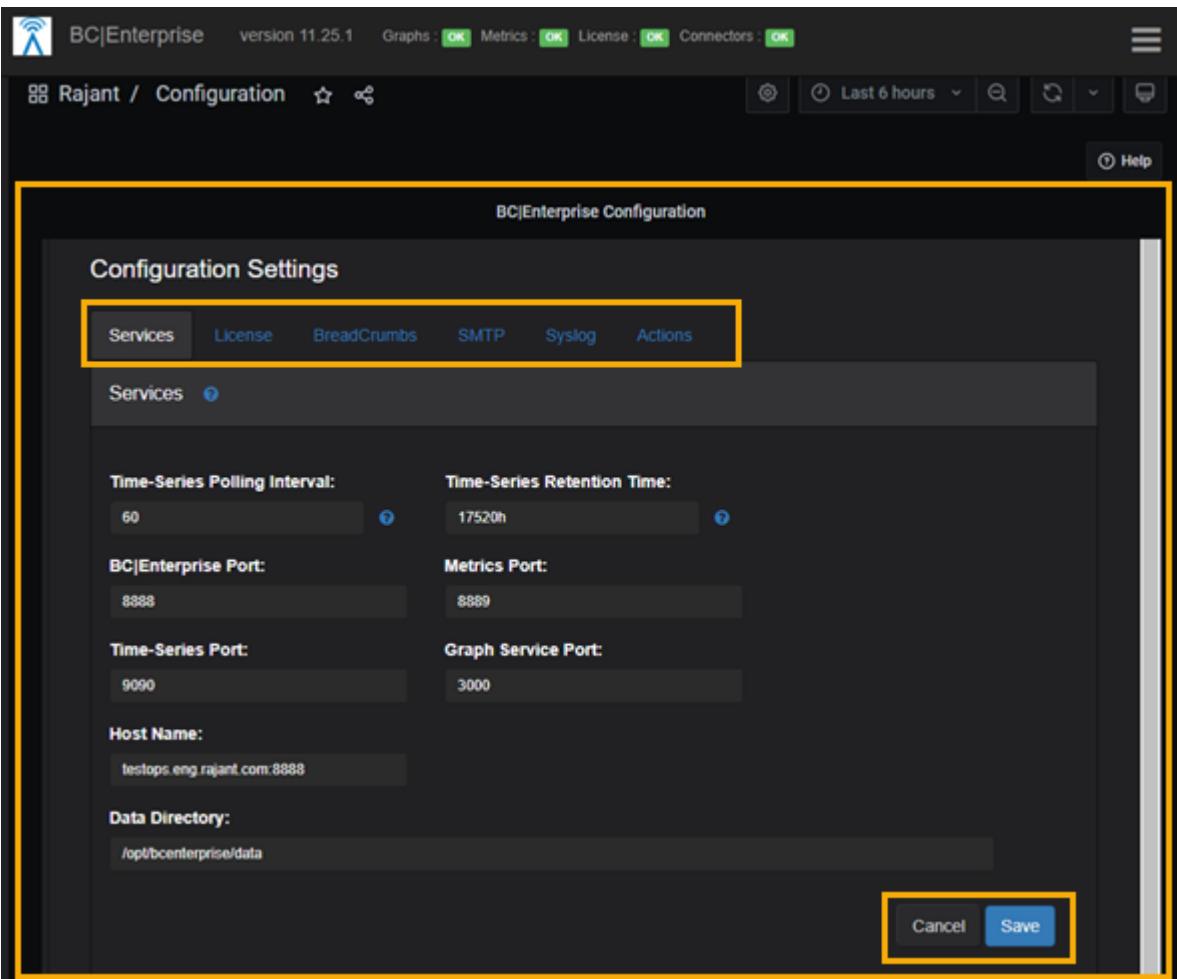
Syslog tab: Configure Syslog Settings

Actions tab:

- [Reset Dashboards](#)
- [Download Snapshot Files](#)
- [View the Current Log File](#)

Illustration

The following is an illustration indicates the major features on the **Rajant / Configuration** dashboard:



BC|Enterprise Configuration panel

In the **BC|Enterprise Configuration panel**, the **Configuration Settings** area contains a tab for each category of configuration settings.

License Count Exceeded message box

If the selected number of [monitored](#) BreadCrumb [exceeds](#) the number permitted by the current license, a **License Count Exceeded** message box opens.

Tabs

The **Configuration Settings** area contains the following tabs:

- **Services**: To configure [BC|Enterprise Data Services](#)
- **License**: To [configure](#) a license key or [view](#) the current license for Rajant BC|Enterprise
- **BreadCrumbs**: To identify each [discovered](#) BreadCrumb that is to be [monitored](#)
- **SMTP**: To configure [Simple Mail Transfer Protocol \(SMTP\)](#) to send [alerts](#) and [email reports](#)
- **Syslog**: To configure [Syslog](#) protocol for message logging
- **Actions**: To perform administrative procedures

Cancel button

To cancel all changes made to the selected tab, click **Cancel**.

Save button

To save all changes made to the selected tab, click **Save**. Save changes to each tab individually.

Services Settings

Contents

[Services Tab](#)

[BC|Enterprise Data Services](#)

[Configure the Data Directory Location](#)

[Configure BC|Enterprise Data Services](#)

[Reconfigure the Polling Interval for BreadCrumb Statistics](#)

[Reconfigure the Retention Time for Historical Data](#)

Services Tab

Purpose

Define configuration settings for the BC|Enterprise Data Services.

Navigation

To go to the **Services** tab, on the **Main Menu**, click **Configuration**. The **Rajant / Configuration** dashboard is displayed. Click the **Services** tab (default).

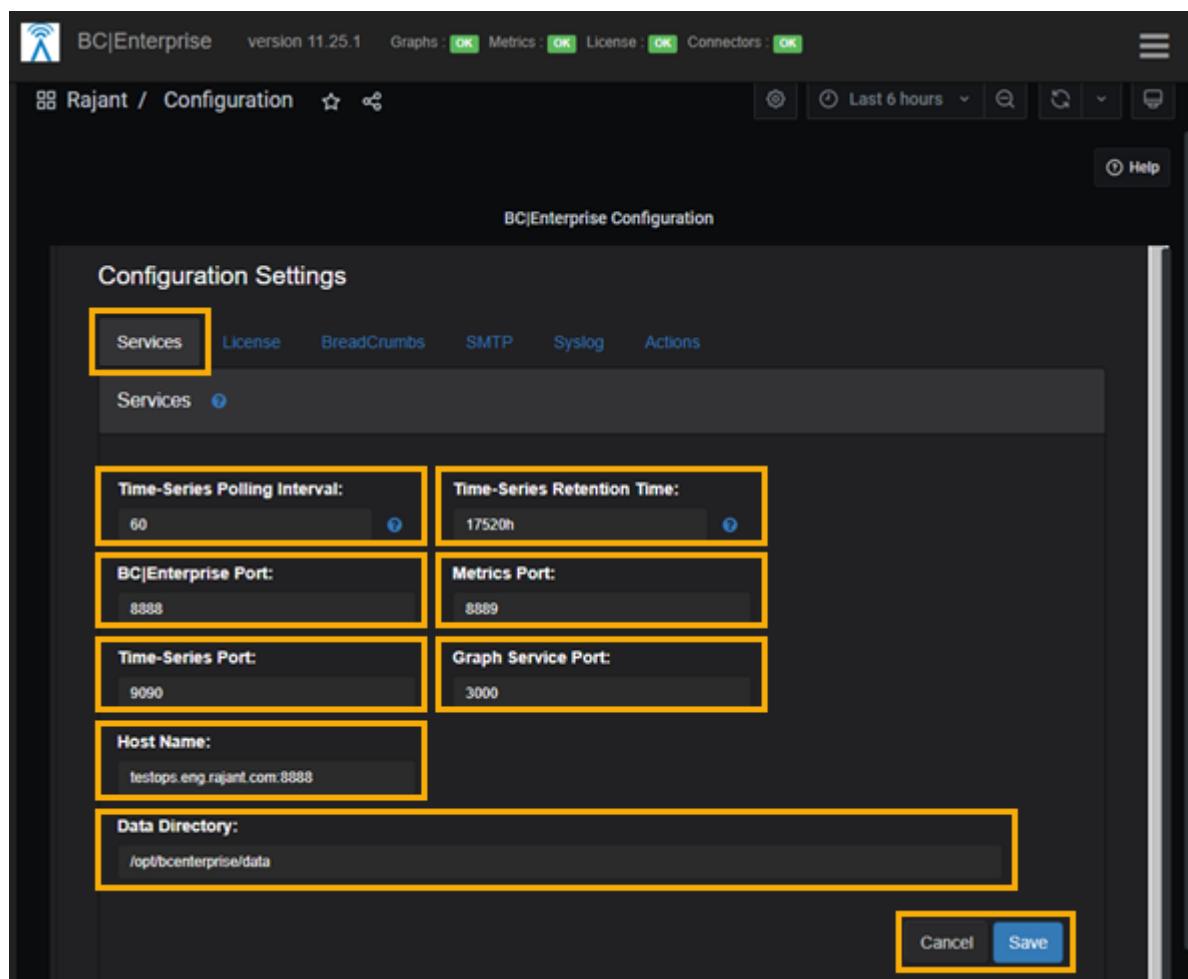
Procedures

The following procedures use the **Services** tab:

- Configure BC|Enterprise Data Services
- Configure the Data Directory Location
- Configure the Polling Interval for BreadCrumb Statistics
- Configure the Retention Time for Historical Data

Illustration

The following illustration indicates the major features of the **Services** tab on the **Rajant / Configuration** dashboard:



Services tab

The **Services** tab contains configuration settings for BC|Enterprise Data Services.

Time-Series Polling Interval

Supply the number of seconds in the polling interval for the collection and storage of BreadCrumb statistics in the time series database at the location defined for **Data Directory**.

Set this value to the lowest level of granularity needed for the display of historical data. The default value is 300 seconds (5 minutes). The minimum value is 60 seconds (1 minute).

This polling interval is a significant factor in the amount of disk space used in the Data Directory location. A shorter polling interval will require more disk space. A 130-node mesh network could generate over one Terabyte (TB) of data in one year when polling at 300-second intervals. A network with a greater number of peer BreadCrumbs will require more disk space.

Rajant recommends auditing and adjusting the **Time-Series Polling Interval** value based on the amount of data needed for analysis and the amount of disk space that is available on the partition for the Data Directory location.

Time-Series Retention Time

Supply the number of hours to retain historical historical data in the time series database. Any data older than the retention time will be discarded. The disk space used by discarded data will gradually become available again.

Supply the retention time in the format *nh*, where *n* is the number of hours as a whole number. The minimum value is 336 hours (two weeks). Three weeks is 504 hours. One year is 8760 hours.

Reducing the retention time will reduce the amount of disk space required for the Data Directory.

Rajant recommends auditing and adjusting the **Time-Series Retention Time** value based on the amount of data needed for analysis and the amount of disk space that is available on the partition where the Data Directory is located.

BC|Enterprise Port

The **BC|Enterprise Port** box contains the port number in the Universal Resource Locator (URL) that the user supplied to [open BC|Enterprise](#) in a [web browser](#) on a [BC|Enterprise Client workstation](#).

This port number is the [designated port](#) number for the Hypertext Transfer Protocol (HTTP) port on the [BC|Enterprise server](#) that the [Rajant BC|Enterprise Service](#) uses to communicate with the web browser for the BC|Enterprise [user interface](#) on BC|Enterprise Client workstations.

Metrics Port

Supply the [designated port](#) number (default **8889**) for the Metrics port on the BC|Enterprise server. BC|Enterprise uses this port to provide data to the [BC|Enterprise Metrics Service](#) (Prometheus).

Time-Series Port

Supply the [designated port](#) number (default **9090**) for the Time-Series port on the BC|Enterprise server. BC|Enterprise uses this port to communicate with the [Time-Series Service](#) for data storage in the **Data Directory** location.

Graph Service Port

Supply the [designated port](#) number (default **3000**) for the Graph Service port on the BC|Enterprise server. BC|Enterprise uses this port to communicate with the [Graph Service](#) (Grafana).

Host Name

The **Host Name** box contains the host name and port number in the URL that the user supplied to [open BC|Enterprise](#) in a [web browser](#) on a [BC|Enterprise Client workstation](#).

The host name and port number value is in one of the following formats:

hostname:bce-port

ip-address:bce-port

where,

hostname is the host name for the BC|Enterprise web site (example: bcenterprise.mycompany.com) hosted on the [BC|Enterprise server](#).

ip-address is the Internet Protocol (IP) address for the BC|Enterprise server.

bce-port is the designated port for the BC|Enterprise Service on the BC|Enterprise server (default 8888).

Examples:

bcenterprise.mycompany.com:8888

167.212.226.204:8888

Data Directory

Supply the directory path to the location of the time series database on the BC|Enterprise server where BC|Enterprise is to store historical data collected during BC|Enterprise operation.

After [BC|Enterprise](#) is installed the first time, the Data Directory location is set to a default location defined by the [installer package](#). Local Information Technology (IT) support personnel must determine the actual location for Data Directory. During the [setup procedure](#) for a new installation, a user with [user type Administrator](#) must [supply the actual location](#) for Data Directory.

After BC|Enterprise is [updated](#) to a new version, the Data Directory location is set to the same actual location used for the previous version of BC|Enterprise.

Cancel button

To cancel all unsaved changes made to the **Services** tab, click **Cancel**.

Save button

To save all changes made to the **Services** tab, click **Save**. Save changes to each tab individually.

BC|Enterprise Data Services

Description

The BC|Enterprise software provides the following data services:

- Rajant BCEEnterprise Service on Windows or Linux to provide the [user interface](#) in a web [browser](#) on a [BC|Enterprise Client workstation](#)
- BC|Enterprise Metrics Service (Prometheus) to provide a time-series data base to store metrics for the Rajant mesh network
- Graph Service (Grafana) to generate charts and graphs to present historical data and metrics in dashboards
- Time-Series Database Service for data storage

Ports

BC|Enterprise uses [designated ports](#) on the [BC|Enterprise server](#) to communicate with BC|Enterprise data services.

Changes to these ports may require manual firewall changes on the local host.

Configuration settings

On the [Rajant / Configuration dashboard](#), the [Services tab](#) provides the following configuration settings for BC|Enterprise Data Services:

- Time-Series Polling Interval for BreadCrumb statistics
- Time-Series Retention Time for historical data
- [Designated ports](#) for BC|Enterprise data services
- Host Name for the BC|Enterprise server
- Data Directory location to store historical data for BC|Enterprise

Related Topics

The following topics are related to BC|Enterprise data services:

- [Services Tab](#)
- [Configure the Data Directory Location](#)
- [Configure BC|Enterprise Data Services](#)
- [Configure the Polling Interval for BreadCrumb Statistics](#)
- [Configure the Retention Time for Historical Data](#)

Configure the Data Directory Location

Purpose

During a setup procedure for the BC|Enterprise software, configure the Data Directory location on the BC|Enterprise server where BC|Enterprise is to store all historical data.

Warning:

Configure the Data Directory location immediately after BC|Enterprise is installed. Changing the location in the BC|Enterprise configuration after BC|Enterprise is in use will not move existing data. Only new data will be stored in the new Data Directory location.

Prerequisites

Install BC|Enterprise on the BC|Enterprise server. Use the specific procedure for the [installer package](#), as follows:

- [Install with Microsoft Windows Server](#)
- [Install with RHEL/CentOS Linux](#)
- [Install with Debian](#)

After a [new installation](#) of BC|Enterprise, the Data Directory will initially reside in a default location on the BC|Enterprise server, as follows:

- [Default Data Directory Location for Windows](#)
- [Default Data Directory Location for RHEL/CentOS Linux](#)
- [Default Data Directory Location for Debian](#)

For a new installation of BC|Enterprise, local Information Technology (IT) support personnel must determine whether to use the default location or another location for the Data Directory. This location must provide the amount of [disk space required](#) for historical data.

After an [update](#) of BC|Enterprise, by default, the Data Directory will reside in the same location used by the previous version of BC|Enterprise. IT support personnel should determine whether to use the same location or a new location for the Data Directory.

Procedure

To configure a new location for the Data Directory, do the following:

1. [Log in](#) to BC|Enterprise with a user name and password for [user type Administrator](#).
2. On the [Main Menu](#), click **Configuration**. The **Rajant / Configuration** dashboard is displayed.
3. Click the [Services tab](#) (default).
4. In the **Data Directory** box, supply the new directory path to be used for the Data Directory.
5. Click **Save**. The **Save Configuration** confirmation dialog box opens.
6. Verify that the new directory path in the **Data Directory** box is correct.
7. Click **OK**. The **Save Configuration** confirmation dialog box closes. BC|Enterprise restarts.
8. Stop the Rajant BC|Enterprise Service on the BC|Enterprise server ([Windows](#) or [Linux](#)).
9. Copy the content of the Data Directory from the current location <>installdir>/data to the new location.
10. Start the [Rajant BC|Enterprise Service](#) on the BC|Enterprise server ([Windows](#) or [Linux](#)).

Result

When the Rajant BC|Enterprise Service restarts, previous and new historical data will reside in the new Data Directory location.

Configure BC|Enterprise Data Services

Purpose

During a [setup procedure](#) for BC|Enterprise, configure settings for the [BC|Enterprise data services](#).

Recommendations

When setting up BC|Enterprise for a [new installation](#), [trial license](#) or [evaluation](#), use the default configuration settings for the BC|Enterprise data services.

When BC|Enterprise is [updated](#), the configuration settings for BC|Enterprise data services from the previous release are applied in the new release. If necessary, modify the configuration settings for the new release of BC|Enterprise.

Prerequisites

Local Information Technology (IT) support personnel must determine the [designated ports](#) on the [BC|Enterprise server](#) to be used for each BC|Enterprise data service. The default ports are recommended.

Procedure

To configure BC|Enterprise data services, do the following:

1. [Log in](#) to BC|Enterprise with a user name and password for [user type Administrator](#).
2. On the [Main Menu](#), click **Configuration**. The [Rajant / Configuration](#) dashboard is displayed.
3. Click the [Services tab](#) (default).
4. In the **Time-Series Polling Interval** box, keep the current setting.
5. In the **Time-Series Retention Time** box, keep the current setting.
6. The **BC|Enterprise Port** box contains the designated port number for the Rajant BC|Enterprise Service.
7. In the **Metrics Port** box, supply the designated port number to be used for the BC|Enterprise Metrics Service (Prometheus).
8. In the **Time-Series Port** box, supply the designated port number to be used for the BC|Enterprise Time-Series Service.
9. In the **Graph Service Port** box, supply the designated port number to be used for the BC|Enterprise Graph Service (Grafana).
10. Confirm that the settings are correct.
11. Click **Save**. The **Save Configuration** confirmation dialog box opens.
12. Click **OK**. The **Save Configuration** confirmation dialog box closes.

Result

The Rajant BC|Enterprise Service restarts on [Windows](#) or the Rajant BC|Enterprise Service restarts on [Linux](#).

Any changes to configuration settings for the BC|Enterprise data services take effect after the restart.

After the Rajant BC|Enterprise Service has been running, do the following, if needed:

- [Reconfigure the polling interval for BreadCrumb statistics](#).
- [Reconfigure the retention time for historical data](#).
- Change the [designated ports](#) to be used by BC|Enterprise Data Services on the BC|Enterprise server.

Reconfigure the Polling Interval for BreadCrumb Statistics

Purpose

After the BC|Enterprise software is in use, reconfigure the number of seconds in the polling interval for the collection and storage of BreadCrumb statistics in the time series database, as needed.

Recommendations

Rajant recommends auditing and adjusting the polling interval based on the amount of data needed for analysis and the amount of disk space that is available on the partition for the [Data Directory location](#).

Set the polling interval to the lowest level of granularity needed for the display of historical data. The default value is 300 seconds (5 minutes). The minimum value is 60 seconds (1 minute).

This polling interval is a significant factor in the amount of disk space used in the Data Directory location. A shorter polling interval will require more disk space. A 130-node mesh network could generate over one Terabyte (TB) of data in one year when polling at 300-second intervals. A network with a greater number of peer BreadCrumbs will require more disk space.

Procedure

To reconfigure the polling interval for the collection and storage of BreadCrumb statistics, do the following:

1. [Log in](#) to BC|Enterprise with a user name and password for [user type Administrator](#).
2. On the [Main Menu](#), click **Configuration**. The [Rajant / Configuration](#) dashboard is displayed.
3. Click the [Services tab](#) (default).
4. In the **Time-Series Polling Interval** box, modify the number of seconds, as needed.
5. Click **Save**. The **Save Configuration** confirmation dialog box opens.
6. Click **OK**. The **Save Configuration** confirmation dialog box closes. The [Rajant BC|Enterprise Service](#) restarts.

Result

The new polling interval will take effect when the Rajant BC|Enterprise Service restarts.

Reconfigure the Retention Time for Historical Data

Purpose

After the BC|Enterprise software is in use, reconfigure the number of hours to retain historical data in the time series database, as needed. Any data older than the designated retention time will be discarded. The disk space used by discarded data will gradually become available again.

Recommendations

Rajant recommends auditing and adjusting the number of hours to retain historical historical data in the time series database based on the amount of data needed for analysis and the amount of disk space that is available on the partition for the [Data Directory location](#).

Reducing the retention time will reduce the amount of disk space required for the Data Directory.

Requirement

Supply the retention time in the format *nh*, where *n* is the number of hours as a whole number. The minimum value is 336 hours (two weeks). Three weeks is 504 hours. One year is 8760 hours.

Procedure

To reconfigure the polling interval for the collection and storage of BreadCrumb statistics, do the following:

1. [Log in](#) to BC|Enterprise with a user name and password for user type **Administrator**.
2. On the [Main Menu](#), click **Configuration**. The **Rajant / Configuration** dashboard is displayed.
3. Click the **Services tab** (default).
4. In the **Time-Series Retention Time** box, modify the number of hours, as needed.
5. Click **Save**. The **Save Configuration** dialog box opens.
6. Click **OK**. The **Save Configuration** dialog box closes. The [Rajant BC|Enterprise Service](#) restarts.

Result

The new retention time will take effect when the Rajant BC|Enterprise Service restarts.

License Settings

Contents

- [Licensing Options](#)
- [License Tab](#)
- [Configure a License Key](#)
- [View Current License Information](#)
- [License Count Exceeded](#)

Licensing Options

Licensing options

Rajant offers the following licensing options for the BC|Enterprise software:

- Purchased license
- Trial license
- Unlicensed copy for evaluation

Purchased license

A purchased license is required for normal operation in a Rajant network.

With a purchased license, BC|Enterprise can monitor any number of BreadCrumbs associated with any number of BC|Connector servers.

Rajant sells BC|Enterprise licenses in packs. Each license pack supports a specified number of BreadCrumbs. The customer must purchase enough license packs to monitor any number of existing BreadCrumbs and new BreadCrumbs that may be added in the network.

To purchase a license for the BC|Enterprise software, contact an authorized Rajant re-seller.

To preview the setup procedure for a purchased license, see the following:

- [Update the BC|Enterprise Software](#)
- [Set up a New BC|Enterprise Installation](#)

Trial license

With a trial license, BC|Enterprise can monitor a specific number of BreadCrumbs associated with any number of BC|Connector servers in a network.

A trial license has an expiration date. After a trial license expires, BC|Enterprise will continue to operate, but will monitor up to five BreadCrumbs in the network.

To obtain a trial license, contact an authorized Rajant re-seller.

To preview the setup procedure for a trial license, see [Set up BC|Enterprise for a Trial License](#).

Unlicensed copy

An unlicensed copy of BC|Enterprise is available for evaluation.

An unlicensed copy can monitor up to five selected BreadCrumbs associated with any number of BC|Connector servers in a network.

An unlicensed copy has no expiration date.

To obtain an unlicensed copy, do one of the following:

- On the Rajant Support web site (<http://www.rajant.com/>), log in to the customer account, and then download an unlicensed copy of the BC|Enterprise software.
- Contact an authorized Rajant re-seller and request an unlicensed copy of BC|Enterprise software.

To preview the setup procedure for an unlicensed copy, see [Set up BC|Enterprise for Evaluation](#).

License Tab

Purpose

Configure a license key or view the current license for the BC|Enterprise software.

Navigation

To go to the **License** tab, on the [Main Menu](#), click [Configuration](#). The [Rajant / Configuration](#) dashboard is displayed. Click the **License** tab.

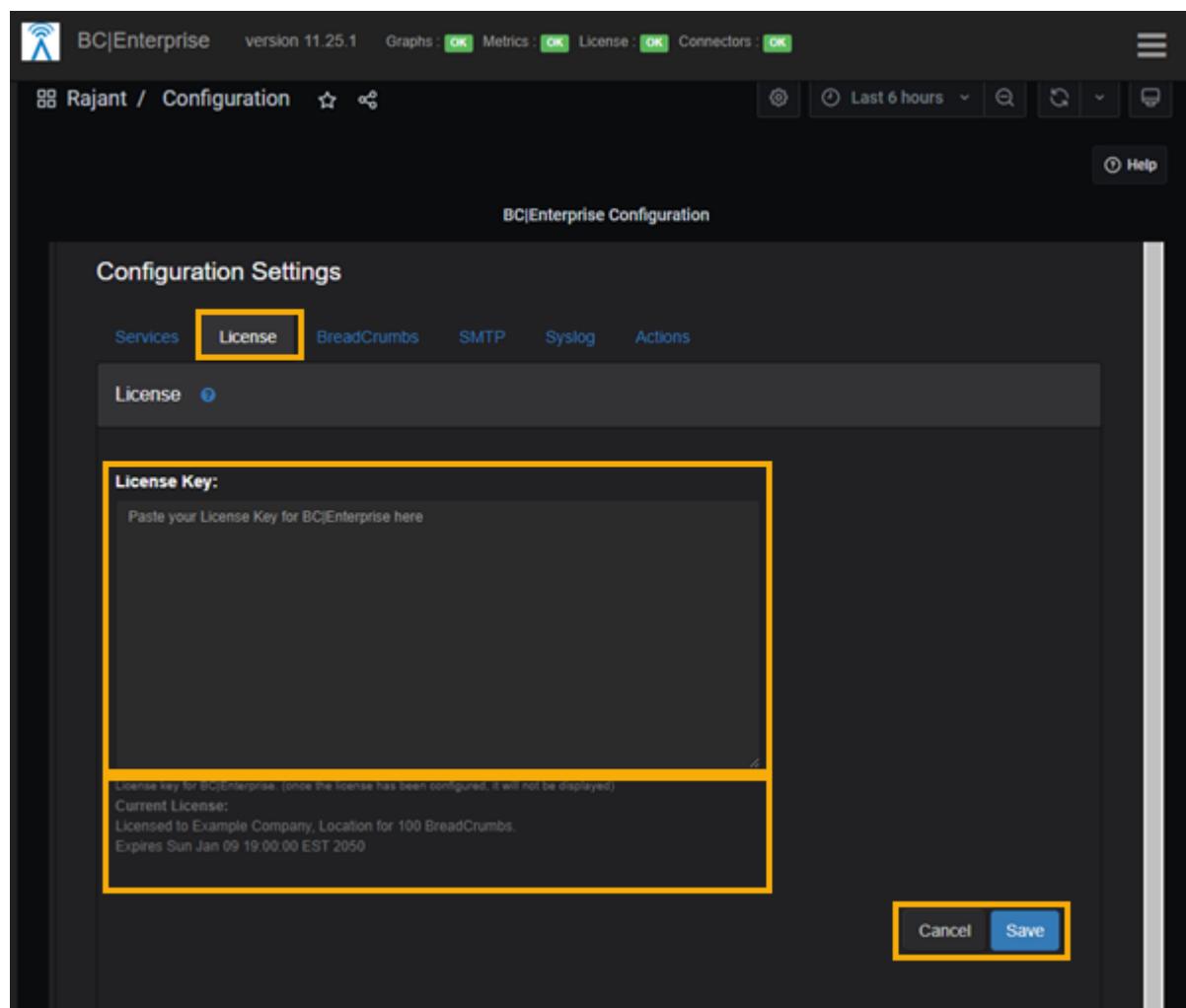
Procedures

The following procedures use the **License** tab:

- [Configure a License Key](#)
- [View Current License Information](#)

Illustration

The following illustration indicates the major features on the **License** tab on the [Rajant / Configuration](#) dashboard:



License tab

The **License** tab contains a **License Key** box to Paste a new license key and displays current license information.

License Key box

Obtain a license key for the BC|Enterprise software from an authorized Rajant reseller.

To begin to [configure a license key](#) for the BC|Enterprise software, paste the license key in the empty **License Key** box. After the license key is configured, the **License Key** box will again be empty.

Current License

After a license key is configured, the Current License information is displayed for [viewing](#). This information includes the name of the license owner, the number of [monitored BreadCrumbs](#) permitted by the license and the expiration date and time for the license.

When BC|Enterprise is configured to [automatically](#) select monitored BreadCrumbs from among all discovered BreadCrumbs, each discovered BreadCrumb will be selected as a monitored BreadCrumb in sequence as each BreadCrumb is discovered, up to the maximum number of monitored BreadCrumbs permitted by the [current license](#).

To view number of days remaining for the current license, in the [Banner](#), click the [Service Status Indicator](#) for **License**.

On the [Rajant /Configuration](#) dashboard, the **BreadCrumbs** tab indicates the current number of monitored BreadCrumbs and the maximum number of monitored BreadCrumbs permitted by the current license.

Cancel button

To cancel all unsaved changes made to the **License** tab, click **Cancel**.

Save button

To save all changes made to the **License** tab, click **Save**. Save changes to each tab individually.

Configure a License Key

Purpose

Configure a license key for the BC|Enterprise software during a [setup procedure](#) for BC|Enterprise.

Prerequisites

Determine the [licensing option](#) for the BC|Enterprise software.

Note: A license key is not used to operate with an [unlicensed copy](#) of BC|Enterprise.

Obtain a license key for a purchased license or a trial license from an authorized Rajant reseller.

Complete all steps in one of the following setup procedures up to the "Configure a License Key for BC|Enterprise" step:

- [Update the BC|Enterprise Software](#)
- [Set up a New BC|Enterprise installation](#)
- [Set up BC|Enterprise for a Trial License](#)

Procedure

To configure a license key for BC|Enterprise, do the following:

1. [Log in](#) to BC|Enterprise with a user name and password for user type **Administrator**.
2. On the [Main Menu](#), click **Configuration**. The **Rajant / Configuration** dashboard is displayed.
3. Click the **License** tab.
4. Copy and Paste the license key into the **License Key** box.
5. Click **Save**. The license is installed. The **License Key** box clears. The license information is displayed below the text **Current License**. In the [Banner](#), the service status indicator for **License** is .

Follow-up procedure

Continue the same setup procedure listed below after the "Configure a License Key for BC|Enterprise" step:

- [Update the BC|Enterprise Software](#)
- [Set up a New BC|Enterprise installation](#)
- [Set up BC|Enterprise for a Trial License](#)

View Current License Information

Purpose

View current license information for the BC|Enterprise software on the **Rajant / Configuration** dashboard.

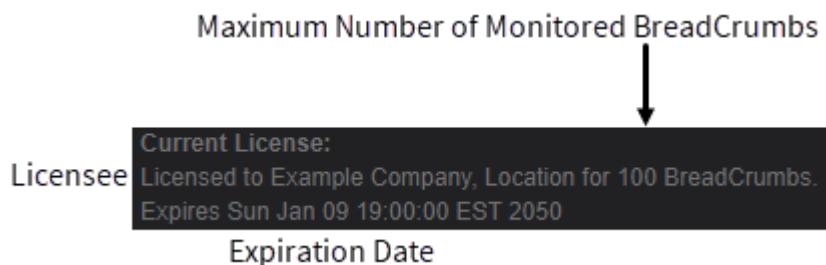
Prerequisite

Configure a license key for the BC|Enterprise software.

Procedure

To view current license information for BC|Enterprise, do the following:

1. [Log in](#) to BC|Enterprise with a user name and password for user type **Administrator**.
2. On the [Main Menu](#), click **Configuration**. The **Rajant / Configuration** dashboard is displayed.
3. Click the **License** tab. Current license information is displayed below the text **Current License** in the following format:



Follow-up procedure

If necessary, contact your Rajant re-seller to obtain a licence with a new expiration date or support for more BreadCrumbs.

License Count Exceeded

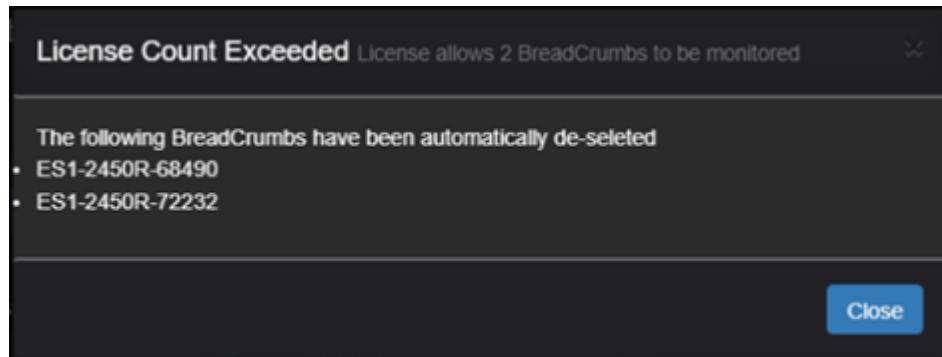
Description

If the number of selected [monitored BreadCrumb](#)s exceeds the number permitted by the current license for the BC|Enterprise software, a **License Count Exceeded** message box opens on the [Rajant / Configuration](#) dashboard.

The **License Count Exceeded** message box lists the serial number for each [discovered BreadCrumb](#) that has been automatically de-selected as a monitored BreadCrumb on the [BreadCrumb](#)s tab.

Illustration

The following illustration shows an example of a **License Count Exceeded** message box:



Action

Click **Close**. The **License Count Exceeded** message box closes.

Follow-up actions

(Optional) [View the current license information](#).

(Optional) On the [Rajant / Configuration](#) dashboard, click the [BreadCrumb](#)s tab to view the list of the monitored BreadCrumb that are currently selected among the discovered BreadCrumb.

(Optional) Review the [licensing options](#) to consider obtaining a license to monitor more BreadCrumb.

Do one of the following:

- Continue to use the current license to monitor the currently selected BreadCrumb.
- [Manually select monitored BreadCrumb](#)s up to the maximum number permitted by the current license.
- [Obtain and configure a license](#) to monitor more BreadCrumb.

BreadCrumbs Settings

Contents

- [Discovered BreadCrumbs](#)
- [Monitored BreadCrumbs](#)
- [BreadCrumbs Tab](#)
- [Automatically Select Monitored BreadCrumbs](#)
- [Manually Select Monitored BreadCrumbs](#)
- [Stop Monitoring a BreadCrumb](#)
- [Start Monitoring a BreadCrumb](#)
- [Select Up to Five Monitored BreadCrumbs](#)

Discovered BreadCrumbs

Description

A discovered BreadCrumb is a [BreadCrumb](#) that has been discovered by an instance of [BC|Connector software](#) on a [BC|Connector server](#) that has been [added](#) to the [Rajant / BC|Connector Management dashboard](#). All other BreadCrumbs in the network will be unknown to BC|Enterprise.

Discovery

Each instance of BC|Connector automatically discovers all BreadCrumbs connected to that BC|Connector server.

BreadCrumb discovery occurs when each instance of BC|Connector starts. BreadCrumb discovery continues during BC|Connector operation as BreadCrumbs are installed or removed.

In BC|Enterprise, on the [Rajant / Configuration dashboard](#), on the [BreadCrumbs tab](#), the selection table lists each BreadCrumb that has been discovered by an instance of BC|Connector.

Each instance of BC|Connector may discover BreadCrumbs in a different sequence each time that BC|Connector restarts.

Monitoring

Each discovered BreadCrumb may be [automatically](#) selected (default), [manually](#) selected or not selected as a [monitored BreadCrumb](#) in the selection table on the [Rajant / Configuration dashboard](#) on the [BreadCrumbs tab](#).

BC|Enterprise will monitor a discovered BreadCrumb only while that BreadCrumb is selected as a monitored BreadCrumb.

When BC|Enterprise is configured to [automatically](#) select monitored BreadCrumbs, each discovered BreadCrumb will be selected as a monitored BreadCrumb in sequence as each BreadCrumb is discovered, up to the maximum number of BreadCrumbs permitted by the [current license](#).

Monitored BreadCrumbs

Description

For each monitored [Breadcrumb](#), BC|Enterprise collects real-time performance data and stores historical data in the time series database.

BC|Enterprise does not collect real-time performance data from a Breadcrumb while that Breadcrumb is un-monitored.

Historical data that has already been collected for a Breadcrumb remains in the time series database.

Maximum number permitted

The [current license](#) for the BC|Enterprise software determines the maximum number of monitored BreadCrumbs permitted.

Selection

BC|Enterprise will monitor a [discovered Breadcrumb](#) only while that Breadcrumb is selected as a monitored Breadcrumb in the selection table on the [Rajant / Configuration dashboard](#) on the [Breadcrumbs tab](#).

Each discovered Breadcrumb may be [automatically](#) selected (default), [manually](#) selected or not selected as a monitored Breadcrumb.

When BC|Enterprise is configured to automatically select monitored BreadCrumb from among all discovered BreadCrumb, each discovered Breadcrumb will be selected as a monitored Breadcrumb in sequence as each Breadcrumb is discovered, up to the maximum number of monitored BreadCrumb permitted.

If a monitored Breadcrumb is being moved or replaced or is malfunctioning, monitoring of that Breadcrumb should be [stopped](#) by manually selecting that Breadcrumb as an un-monitored Breadcrumb.

To start monitoring for an un-monitored Breadcrumb, automatically or manually select that Breadcrumb as a monitored Breadcrumb.

Counts

On the [Mesh / Overview dashboard](#), the **Monitored** panel indicates the current number of monitored BreadCrumb and the **Un-Monitored** panel indicates the current number of un-monitored BreadCrumb among discovered BreadCrumb.

License Count Exceeded message box

If the number of selected monitored BreadCrumb exceeds the number permitted by the current license for the BC|Enterprise software, a **License Count Exceeded** message box opens on the [Rajant / Configuration dashboard](#).

BreadCrumbs Tab

Purpose

Discover **BreadCrumbs** and then indicate whether each discovered BreadCrumb is to be automatically selected (default), manually selected or not selected as a monitored BreadCrumb.

Navigation

To go to the **BreadCrumbs** tab, on the [Main Menu](#), click **Configuration**. The [Rajant / Configuration](#) dashboard is displayed. Click the **BreadCrumbs** tab.

Procedures

The following procedures use the **BreadCrumbs** tab:

- [Automatically Select Monitored BreadCrumb](#)
- [Manually Select Monitored BreadCrumb](#)
- [Stop Monitoring a BreadCrumb](#)
- [Start Monitoring a BreadCrumb](#)
- [Select Up to Five Monitored BreadCrumb](#)

Illustration

The following illustration indicates the major features on the **BreadCrumbs** tab on the [Rajant / Configuration](#) dashboard:

Select	Serial Number	Breadcrumb Name
<input checked="" type="checkbox"/>	LX5-24550-67041	Tower (67041)
<input checked="" type="checkbox"/>	ES1-2450R-69791	Trailer (69791)
<input type="checkbox"/>	KM3-2450R-73052	Truck Cabin (73052)
<input type="checkbox"/>	DX2-24-74133	Drone (74133)
<input type="checkbox"/>	SLIPSTREAM-2-77081	Datacenter (77081)

BreadCrumb tab

The **BreadCrumb** tab contains an [administrative table](#) that lists all discovered BreadCrumb and indicates whether each BreadCrumb was [automatically](#) selected (default), [manually](#) selected or not selected as a monitored BreadCrumb.

License usage: (n of m)

In **License usage (n of m)**, n is the current number of monitored BreadCrumb and m is the maximum number of monitored BreadCrumb permitted by the current license.

Refresh button

Click **Refresh** to update the list of discovered BreadCrumb in the selection table. After a refresh, review the selection table to notice any changes in the list of discovered BreadCrumb.

A refresh is needed after the following actions:

- A BC|Connector is [added](#) to BC|Enterprise
- A BreadCrumb is installed or removed for a BC|Connector used by BC|Enterprise
- A discovered BreadCrumb is shut down or rebooted.
- The [licensing option](#) is updated to support a different number of BreadCrumb

Manually Selected (n)

Total number of discovered BreadCrumb in the selection table that were manually selected as monitored BreadCrumb.

Automatically Selected (n)

Total number of discovered BreadCrumb in the selection table that were automatically selected as monitored BreadCrumb.

Disable Auto Selection check box

During a [setup procedure](#), the setting of the **Disable Auto Selection** check box determines how discovered BreadCrumb are to be selected as monitored BreadCrumb.

Automatic selection of monitored BreadCrumb is valid only when all of the following conditions apply:

- The current license supports the total potential number of discovered BreadCrumb in the network.
- The current license will be maintained to support all newly-discovered BreadCrumb.
- All discovered BreadCrumb in the network are to be monitored.

Manual selection of monitored BreadCrumb is required when one or both of the following conditions apply:

- The current license does not support the total number of the BreadCrumb in the network.
- Only particular BreadCrumb of interest in the network are to be monitored.

Important: After a setup procedure, change the setting of the **Disable Auto Selection** check box only when these conditions change to warrant a different setting.

(Default) To cause all discovered BreadCrumb to be automatically selected as monitored BreadCrumb, clear the **Disable Auto Selection** check box, and then click **Save**. For each of these BreadCrumb, the check box in the **Select** column is now cleared () and the selection mode column now contains a blue check mark () to indicate that this BreadCrumb was automatically selected as a monitored BreadCrumb.

To require all discovered BreadCrumbs to be manually selected as monitored BreadCrumbs, select the **Disable Auto Selection** check box, and then click **Save**. For each of these BreadCrumbs, the check box in the **Select** column is now cleared () and the selection mode column is blank (). For each BreadCrumb that is to be monitored, select the check box in the **Select** column.

Search box

In the **Search** box, type alphabetic or numeric characters. The selection table will be filtered to include only rows in which the **Serial Number** column or **BreadCrumb Name** column contains all of the typed characters.

Selection table

The selection table is an [administrative table](#) that contains one row for each [discovered BreadCrumb](#).

BreadCrumbs that were manually-selected as monitored BreadCrumbs are shown at the top of the table.

Un-monitored BreadCrumbs are shown at the bottom of the selection table.

Select column

In the selection table, to change the selection mode for a discovered BreadCrumb, click the check box in the **Select** column, as follows:

Select Check Box	Selection Mode	Click	Result Select Check Box	Result Selection Mode
(<input checked="" type="checkbox"/>)	(<input checked="" type="checkbox"/>) Manually selected	(<input checked="" type="checkbox"/>)	(<input type="checkbox"/>)	(<input checked="" type="checkbox"/>) Un-monitored
(<input type="checkbox"/>)	(<input checked="" type="checkbox"/>) Un-monitored	(<input type="checkbox"/>)	(<input checked="" type="checkbox"/>)	(<input checked="" type="checkbox"/>) Manually selected
(<input type="checkbox"/>)	(<input checked="" type="checkbox"/>) Automatically selected	(<input type="checkbox"/>)	(<input checked="" type="checkbox"/>)	(<input checked="" type="checkbox"/>) Manually selected

To apply changes to the **Select** column, click **Save**. Wait for the selection table to be refreshed.

Selection mode column

The selection mode column (to the right of the **Select** column) indicates how the discovered BreadCrumb was selected as a monitored BreadCrumb, as follows:

- Green check mark (): Manually-selected
- Blue check mark (): Automatically-selected
- Blank (): Not selected (un-monitored)

Serial Number column

BreadCrumb serial number for a BreadCrumb as shown on the **Details** tab in [BC|Commander](#).

BreadCrumb Name column

BreadCrumb name (BreadCrumb Name*) as shown on the **Details** tab in BC|Commander followed by the Encap ID portion of the BreadCrumb serial number enclosed in parentheses.

* This setting is in the BreadCrumb configuration for the BreadCrumb in BC|Commander.

Cancel button

To cancel all unsaved changes made to the **BreadCrumbs** tab, click **Cancel**.

Save button

To apply any changes to the **Disable Auto Selection** check box, the **Select** column or both, click **Save**. A confirmation message is displayed. Wait for the selection table to be refreshed to reflect the changes.

Save changes to each tab individually.

Automatically Select Monitored BreadCrumbs

Purpose

Configure BC|Enterprise to automatically select monitored BreadCrumbs from among all discovered BreadCrumbs in sequence as each BreadCrumb is discovered, up to the maximum number of monitored BreadCrumbs permitted by the current license.

Requirements

Automatic selection of monitored BreadCrumbs is valid only when all of the following conditions apply:

- The current license supports the total potential number of discovered BreadCrumbs in the network.
- The current license will be maintained to support all newly-discovered BreadCrumbs.
- All discovered BreadCrumbs in the network are to be monitored.

If these conditions do not apply, monitored BreadCrumbs should be manually selected from among discovered BreadCrumbs.

Prerequisites

Ensure that every BC|Connector instance that is to discover BreadCrumbs for BC|Enterprise is listed on the [Rajant / BC|Connector Management dashboard](#) with a Status of .

[View the current license](#) information. If the maximum number of monitored BreadCrumbs permitted by the current license is less than total potential number of discovered BreadCrumbs in the network, any BreadCrumbs discovered after that maximum will not be available for selection as monitored BreadCrumbs.

Procedure

To automatically select the BreadCrumbs to be monitored, do the following:

1. [Log in](#) to BC|Enterprise with a user name and password for user type **Administrator**.
2. On the [Main Menu](#), click **Configuration**. The [Rajant / Configuration dashboard](#) is displayed.
3. Click the **BreadCrumbs** tab.
4. Click **Refresh**. The selection table is refreshed to list all discovered BreadCrumbs.
5. Clear the **Disable Auto Selection** check box (default).
6. Click **Save**. A confirmation message is displayed. The selection table is refreshed.

Result

On the **BreadCrumbs** tab, in the selection table, each BreadCrumb with a check mark in the selection mode column is now being monitored by BC|Enterprise.

While the **Disable Auto Selection** check box is cleared, any newly-discovered BreadCrumb will be automatically selected as a monitored BreadCrumbs.

Manually Select Monitored BreadCrumbs

Purpose

Manually select BreadCrumb of interest as [monitored BreadCrumbs](#) from among the [discovered BreadCrumbs](#) in BC|Enterprise up to the maximum number of monitored BreadCrumbs permitted by the [current license](#).

Requirements

Manual selection of monitored BreadCrumbs is required when one or both of the following conditions apply:

- The current license does not support the total number of the BreadCrumbs in the network.
- Only particular BreadCrumbs of interest in the network are to be monitored.

Prerequisites

Ensure that every [BC|Connector instance](#) that is to discover BreadCrumbs for BC|Enterprise is listed on the [Rajant / BC|Connector Management dashboard](#) with a Status of .

Determine which discovered BreadCrumbs of interest are to be monitored.

Procedure

To manually select the BreadCrumbs to be monitored, do the following:

1. [Log in](#) to BC|Enterprise with a user name and password for user type **Administrator**.
2. On the [Main Menu](#), click **Configuration**. The [Rajant / Configuration dashboard](#) is displayed.
3. Click the **BreadCrumbs** tab.
4. Click **Refresh**. The selection table is refreshed to list all discovered BreadCrumbs.
5. Select the **Disable Auto Selection** check box.
6. Click **Save**. A confirmation message is displayed. The selection table is refreshed.
7. In the **Select** column, select the check box for each discovered BreadCrumb that is to be monitored.
8. In the **Select** column, clear the check box for each discovered BreadCrumb that is to be [un-monitored](#).
9. Click **Save**. A confirmation message is displayed. The selection table is refreshed.

Result

On the **BreadCrumbs** tab, in the selection table, each BreadCrumb with a check mark in the selection mode column is now being monitored by BC|Enterprise.

While the **Disable Auto Selection** check box is selected, any newly-discovered BreadCrumb will be un-monitored until that BreadCrumb is manually selected as a monitored BreadCrumb.

Follow-up procedures

While the **Disable Auto Selection** check box is selected, repeat this procedure, as needed, to manually add or change the selected BreadCrumbs that are to be monitored.

(Optional) Switch from manual selection to [automatic selection](#) of monitored BreadCrumbs.

Stop Monitoring a BreadCrumb

Purpose

Stop monitoring for a [monitored BreadCrumb](#) that is being moved, replaced or removed or is malfunctioning.

Reference

Refer to the BreadCrumb User Guide for the BreadCrumb model for power-off instructions for the BreadCrumb. BreadCrumb User Guides are available on the [Rajant Support web site](#).

Prerequisite

Ensure that the BC|Connector instance that is to [discover](#) the BreadCrumb is listed on the [Rajant / BC| Connector Management](#) dashboard with a Status of .

Procedure

To stop monitoring for a BreadCrumb, do the following:

1. Power off the affected BreadCrumb.
2. [Log in](#) to BC|Enterprise with a user name and password for user type **Administrator**.
3. On the [Main Menu](#), click **Configuration**. The [Rajant / Configuration](#) dashboard is displayed.
4. Click the **BreadCrumbs** tab.
5. Click **Refresh**. The selection table is refreshed. The powered-off BreadCrumb is no longer listed in the selection table.
6. Click **Save**. A confirmation message is displayed.

Start Monitoring a BreadCrumb

Purpose

Start [monitoring](#) a [BreadCrumb](#) that has been added, repaired or moved.

Reference

Refer to the BreadCrumb User Guide for the BreadCrumb model for power-up instructions for the BreadCrumb. BreadCrumb User Guides are available on the [Rajant Support web site](#).

Prerequisite

Ensure that the BC|Connector instance that is to [discover](#) the BreadCrumb is listed on the [Rajant / BC|Connector Management dashboard](#) with a Status of .

Procedure

To start monitoring for a BreadCrumb, do the following:

1. Power up the BreadCrumb.
2. [Log in](#) to BC|Enterprise with a user name and password for user type **Administrator**.
3. On the [Main Menu](#), click **Configuration**. The [Rajant / Configuration dashboard](#) is displayed.
4. Click the [Breadcrumbs](#) tab.
5. Click **Refresh**. The selection table is refreshed. The powered-up BreadCrumb is listed in the selection table.
6. Click **Save**. A confirmation message is displayed.

Select Up to Five Monitored BreadCrumbs

Purpose

During the [Set up BC|Enterprise for Evaluation](#) procedure for an unlicensed copy of BC|Enterprise, manually select up to five [BreadCrumbs](#) to be [monitored](#).

Prerequisites

Ensure that every [BC|Connector](#) instance that is to discover BreadCrumbs for BC|Enterprise is listed on the [Rajant / BC|Connector Management](#) dashboard with a Status of .

Determine which [discovered BreadCrumbs](#) are to be monitored.

Complete all steps in the [Set up BC|Enterprise for Evaluation](#) procedure up to the step "Select up to Five Monitored BreadCrumbs."

Procedure

To manually select the BreadCrumbs to be monitored, do the following:

1. [Log in](#) to BC|Enterprise with a user name and password for user type **Administrator**.
2. On the [Main Menu](#), click **Configuration**. The [Rajant / Configuration](#) dashboard is displayed.
3. Click the [BreadCrumbs](#) tab.
4. Click **Refresh**. The Selection Table is refreshed to list all discovered BreadCrumbs.
5. Select the **Disable Auto Selection** check box.
6. In the **Select** column, select the check box for each BreadCrumb that is to be monitored.
7. Click **Save**. A confirmation message is displayed.

Result

The selected BreadCrumbs are now being monitored by BC|Enterprise.

Follow-up procedures

Continue the [Set up BC|Enterprise for Evaluation](#) procedure after the "Select up to Five Monitored BreadCrumbs" step.

While the **Disable Auto Selection** check box is selected, do this procedure as needed to manually add or change the selected BreadCrumbs that are to be monitored.

SMTP Settings

Contents

[Syslog Tab](#)

[Configure Syslog Settings](#)

SMTP Tab

Purpose

Configure settings for the [Simple Mail Transfer Protocol \(SMTP\)](#) server to be used to send email messages from BC|Enterprise.

Local Information Technology (IT) support personnel must define these configuration settings based on the SMTP server requirements.

Navigation

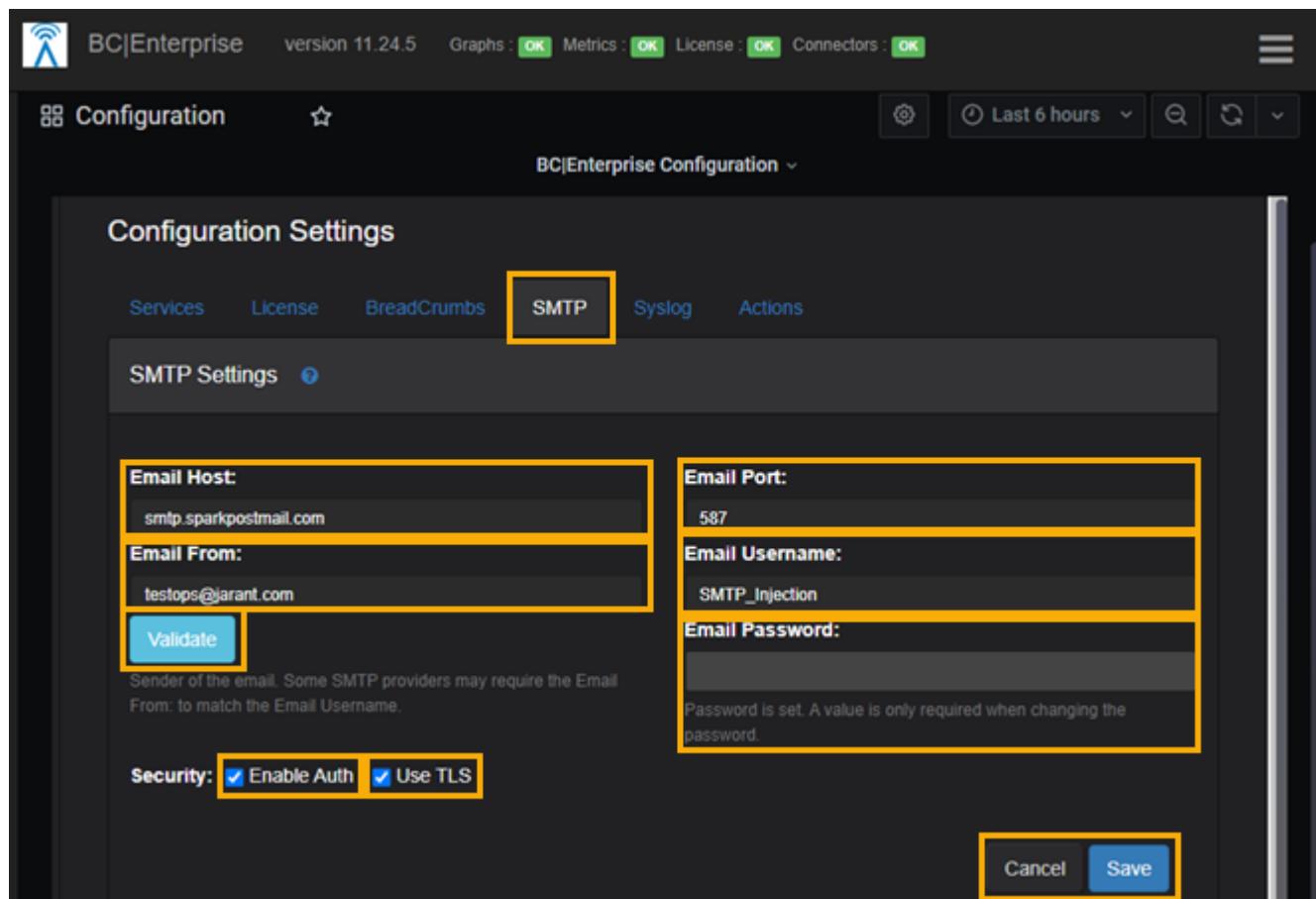
To go to the **SMTP** tab, on the [Main Menu](#), click **Configuration**. The [Rajant / Configuration](#) dashboard is displayed. Click the **SMTP** tab.

Procedure

The [Configure SMTP Settings](#) procedure uses the **SMTP** tab.

Illustration

The following illustration indicates the major features of the **SMTP** tab on the [Rajant / Configuration](#) dashboard:



SMTP tab

The **SMTP** tab contains configuration settings for the SMTP server used to send email messages from BC|Enterprise.

Email Host

In the **Email Host** box, supply the address of the SMTP host used to send email messages. This host name is determined by the email service provider.

Email Port

In the **Email Port** box, supply the port number on the SMTP host to be used to send email messages. Common port numbers are **465**, **25** and **587**.

This port number determines the **Connection Security** setting required in the email account settings.

For port **465**, the Connection Security setting is usually **SSL/TLS**.

For port **25** or **587**, the Connection Security setting is usually **STARTTLS**.

Email From

In the **Email From** box, supply the From: address to be used for email messages sent from the SMTP server.

The SMTP service provider may require the **Email From** value to match the **Email Username** value.

Email Username

In the **Email Username** box, supply the UserName for the email account to be used to log in to the SMTP server.

The SMTP service provider may require the **Email From** value to match the **Email Username** value.

Email Password

To change the password associated with the user name in the **Email Username** box, supply a new password in the **Email Password** box.

Validate button

After supplying a value in the **Email From** box and **Email Username** box, click **Validate**. A test message is sent using the **Email From** value to and the **Email Username** value.

Enable Auth check box

To enable authentication by the BC|Enterprise server, select the **Enable Auth** check box (default).

Use TLS check box

To use Transport Layer Security (TLS) for email messages, select the **Use TLS** check box (default).

Cancel button

To cancel all changes made to the **SMTP** tab, click **Cancel**.

Save button

To save all unsaved changes made to the **SMTP** tab, click **Save**.

Save changes to each tab individually.

Configure SMTP Settings

Purpose

Configure settings for the [Simple Mail Transfer Protocol \(SMTP\) server](#) to be used with BC|Enterprise.

Prerequisite

Local Information Technology (IT) support personnel must define these configuration settings based on the SMTP server requirements.

Procedure

To configure the BC|Enterprise data services, do the following:

1. [Log in](#) to BC|Enterprise with a user name and password for [user type Administrator](#).
2. On the [Main Menu](#), click **Configuration**. The [Rajant / Configuration](#) dashboard is displayed.
3. Click the [SMTP](#) tab.
4. In the **Host Name** box, supply the address of the SMTP host used to send email messages.
5. In the **Email Port** box, supply the port number on the SMTP host to be used to send email messages.
6. In the **Email From** box, supply the From: address to be used for email messages sent from the SMTP server.
7. In the **Email Username** box, supply the UserName for the email account to be used to log in to the SMTP server.
8. Click **Validate**. A message confirms that the values supplied in the **Email From** box and **Email Username** box are valid for the SMTP server.
9. Select or clear the **Enable Auth** check box.
10. Select or clear the **Use TLS** check box.
11. Confirm that the settings are correct.
12. Click **Save**. The **Save Configuration** confirmation dialog box opens.
13. Click **OK**. The **Save Configuration** confirmation dialog box closes.

Result

To apply the SMTP configuration settings, restart BC|Enterprise on the [Windows](#) platform or [Linux](#) platform.

Follow-up procedures

Test email message delivery for [reports](#) and [alerts](#) through the SMTP server.

Syslog Settings

Contents

[Syslog Tab](#)

[Configure Syslog Settings](#)

Syslog Tab

Purpose

Configure a [syslog server](#) for use with the BC|Enterprise software.

Navigation

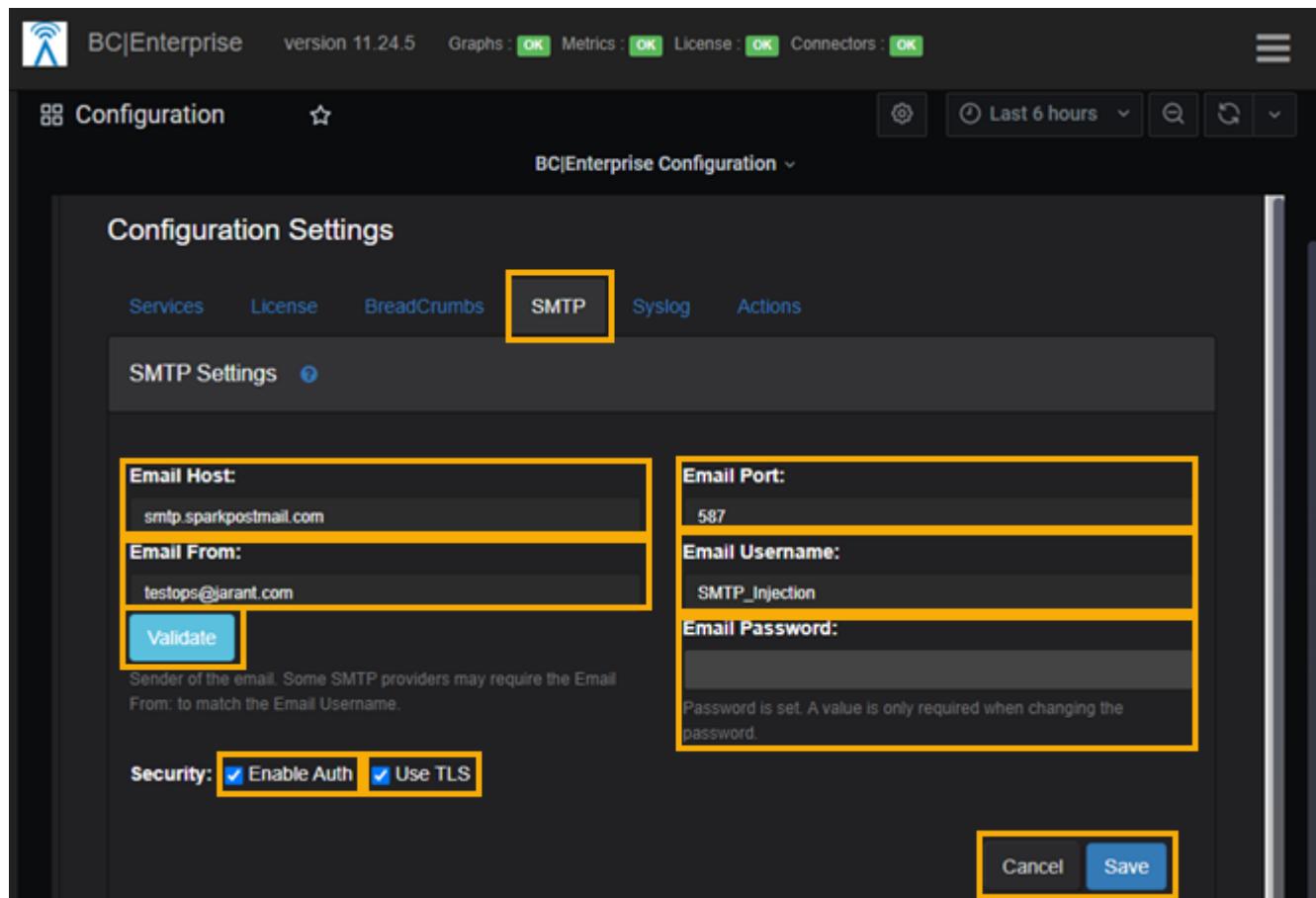
To go to the **Syslog** tab, on the Main Menu, click **Configuration**. The **Rajant / Configuration** dashboard is displayed. Click the **Syslog** tab.

Procedure

The [Configure Syslog Settings](#) procedure uses the **Syslog** tab.

Illustration

The following illustration indicates the major features of the **Syslog** tab on the **Rajant / Configuration** dashboard:



Syslog tab

The **Syslog** tab contains fields to provide configuration settings for a syslog server for use with BC|Enterprise.

Syslog Host box

In the **Syslog Host** box, supply the IP address for the computer where the syslog server resides.

Syslog Port box

In the **Syslog Port** box, supply the port number on Syslog Host to be used by the syslog server to communicate with BC|Enterprise. The port number depends upon the transport layer protocol to be used for syslog, as follows:

- User Datagram Protocol (UDP) uses port number **514** (default).
- Transmission Control Protocol (TCP) uses port number **6514**.

From Hostname box

In the **From Hostname** box, supply the host name for [BC|Enterprise server](#). The host name in the **From Hostname** box must match the host name in the **Host Name** box on the [Services tab](#).

Application Name box

In the **Application Name** box, supply the application name for the BC|Enterprise application.

Facility list

In the **Facility** list, select the keyword for the facility code for the BC|Enterprise application, which is logging messages (default **USER**).

Severity list

In the **Severity** list, select the severity level for messages from the BC|Enterprise application to the syslog server (default **INFORMATIONAL**).

Message Format list

In the **Message Format** list, select the message format used in the [syslog protocol](#) to send messages from the BC|Enterprise application to the syslog server (default **RFC_3164**).

Transport list

In the **Transport** list, select one of the following as the transport layer protocol used for syslog:

- **UDP:** User Datagram Protocol
- **TCP:** Transmission Control Protocol

Use TLS check box

If the BC|Enterprise application uses [Transport Layer Security \(TLS\)](#), select the **Use TLS** check box.

If the BC|Enterprise application does not use TLS, clear the **Use TLS** check box (default).

Cancel button

To cancel all unsaved changes made to the **Syslog** tab, click **Cancel**.

Save button

To save all changes made to the **Syslog** tab, click **Save**.

Save changes to each tab individually.

Configure Syslog Settings

Purpose

Configure a [syslog server](#) for use with the BC|Enterprise software.

Recommendations

When setting up BC|Enterprise for a [new installation](#), [trial license](#) or [evaluation](#), configure syslog server settings.

When the BC|Enterprise software is [updated](#), the configuration settings used for the BC|Enterprise data services in the previous release of BC|Enterprise are configured for the new release. Verify and keep the previous configuration settings for the new release of BC|Enterprise.

Prerequisite

Local Information Technology (IT) support personnel must determine the syslog configuration settings to be provided on the [Syslog tab](#).

Procedure

To configure the syslog server, do the following:

1. [Log in](#) to BC|Enterprise with a user name and password for [user type Administrator](#).
2. On the [Main Menu](#), click **Configuration**. The [Rajant / Configuration](#) dashboard is displayed.
3. Click the **Syslog** tab.
4. In the **Syslog Host** box, supply the IP address for the computer where the syslog server resides.
5. In the **Syslog Port** box, supply the port number on Syslog Host to be used by the syslog server to communicate with BC|Enterprise.
6. In the **From Hostname** box, supply the host name for [BC|Enterprise server](#). The host name in the **From Hostname** box must match the host name in the **Host Name** box on the [Services tab](#).
7. In the **Application Name** box, supply the application name for the BC|Enterprise application.
8. In the **Facility** list, select the keyword for the facility code for the BC|Enterprise application, which is logging messages (default **USER**).
9. In the **Message Format** list, select the message format used in the [syslog protocol](#) to send messages from the BC|Enterprise application to the syslog server (default **RFC_3164**).
10. In the **Transport** list, select the transport layer protocol (**UDP** (default) or **TCP**) used for syslog.
11. If the BC|Enterprise application uses [Transport Layer Security \(TLS\)](#), select the **Use TLS** check box.
12. Confirm that the settings are correct.
13. Click **Save**. The **Save Configuration** confirmation dialog box opens.
14. Click **OK**. The **Save Configuration** confirmation dialog box closes. The [Rajant BC|Enterprise Service](#) restarts.

Result

Changes to syslog settings will take effect when the Rajant BC|Enterprise Service restarts.

Follow-up procedures

To test message logging for [alerts](#), do the following:

1. [Create a notification rule for an alert](#).
2. [Test message delivery](#) for syslog messages for that notification rule.
3. Review log entries for syslog activity.

Actions Settings

Contents

[Actions Tab](#)

[Reset Dashboards](#)

[Download Snapshot Files](#)

[View the Current Log File](#)

Actions Tab

Purpose

Perform any of the following administrative actions for the BC|Enterprise application:

- Reset every dashboard supplied by Rajant to the default state
- Download an archive of BC|Enterprise logs
- View up to the last 10,000 lines of the current log file

Navigation

To go to the **Actions** tab, on the **Main Menu**, click **Configuration**. The **Rajant / Configuration** dashboard is displayed. Click the **Actions** tab.

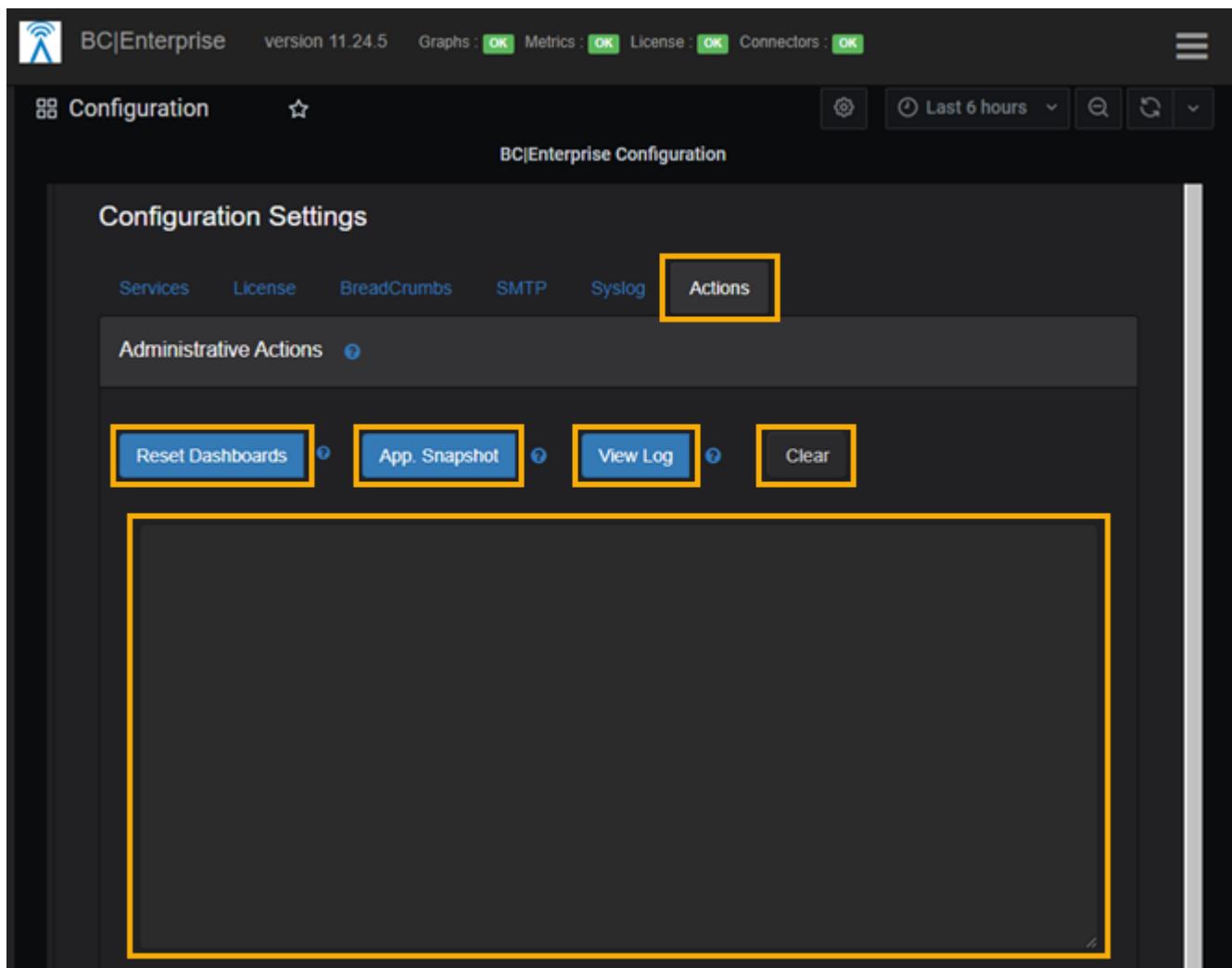
Procedures

The following procedures use the **Actions** tab:

- [Reset Dashboards](#)
- [Download Snapshot Files](#)
- [View the Current Log File](#)

Illustration

The following illustration indicates the major features of the **Actions** tab on the **Rajant / Configuration** dashboard:



Actions tab

The **Actions** tab contains a button for each administrative action and a display area.

Reset Dashboards button

Click **Reset Dashboards** to remove all automatically-generated Grafana dashboards supplied by Rajant and then recreate those dashboards with the default settings.

The Reset Dashboard operation resets the following items:

- **Dashboard for each particular BreadCrumb**
- **Group dashboard** for each BreadCrumb group
- BreadCrumb Template
- Group Template

Warning: The dashboard for any BreadCrumb that has not reported data during the last 12 weeks will not be reset.

App. Snapshot button

Click **App. Snapshot** to [download](#) an archive that contains log files and diagnostic data for the BC|Enterprise application and [BC|Enterprise data services](#). The archive is saved in the local Download folder.

This archive contains important information to help Rajant Support personnel troubleshoot and resolve BC|Enterprise issues.

To work with Rajant Support to resolve an issue, go to the [Rajant Support web site](#) to upload the archive to Rajant Support personnel. For instructions, refer to the *BC|Commander Version 11 User Guide* on the [Rajant Support web site](#).

View Log button

Click **View Log** to [view](#) up to the last 10,000 lines of the current log file for the active BC|Enterprise application. The lines to be saved are displayed in the display area.

To work with Rajant Support to resolve an issue, Copy the text from the display area and then Paste the text into a text file. Go to the [Rajant Support web site](#) to upload the text file to Rajant Support personnel. For instructions, refer to the *BC|Commander Version 11 User Guide* on the [Rajant Support web site](#).

Clear button

Click **Clear** to clear the display area.

Display area

The display area is used to [view](#) the last 10,000 lines of the current log file.

Reset Dashboards

Purpose

Remove all automatically-generated Grafana dashboards supplied by Rajant in the BC|Enterprise software and then recreate those dashboards with the default settings.

Procedure

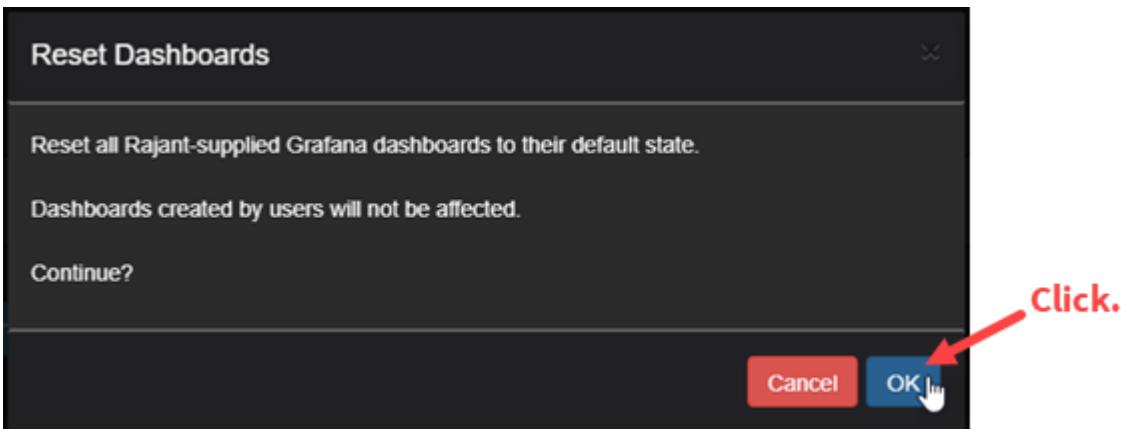
To reset dashboards, do the following:

1. Log in to BC|Enterprise with a user name and password for user type **Administrator**.
2. On the Main Menu, click **Configuration**. The **Rajant / Configuration** dashboard is displayed.
3. Click the **Actions** tab.
4. Click **Reset Dashboards**.

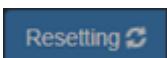


The **Reset Dashboards** dialog box opens.

5. Click **OK**.



6. Wait for the dashboards to be reset.



A message reports a successful reset.

When the **Reset Dashboards** button is enabled, the reset process is complete.



Download Snapshot Files

Purpose

Download an archive (.zip file) that contains log files and diagnostic data for the BC|Enterprise application and [BC|Enterprise data services](#). The archive is downloaded to a local Download folder.

This archive contains important information to help Rajant Support personnel troubleshoot and resolve BC|Enterprise issues.

Procedure

To download snapshot files, do the following:

1. [Log in](#) to BC|Enterprise with a user name and password for user type **Administrator**.
2. On the [Main Menu](#), click **Configuration**. The **Rajant / Configuration** dashboard is displayed.
3. Click the [Actions](#) tab.
4. Click **App. Snapshot**.



The archive is downloaded to a local Download folder.

5. Name the downloaded file to identify the content.

Follow-up procedure

To work with Rajant Support to resolve an issue, go to the [Rajant Support web site](#) to upload the archive to Rajant Support personnel. For instructions, refer to the [BC|Commander Version 11 User Guide](#) on the [Rajant Support web site](#).

View the Current Log File

Purpose

View the last 10,000 lines of the current log file for the active BC|Enterprise application.

Procedure

To view the current log file, do the following:

1. [Log in](#) to BC|Enterprise with a user name and password for **user type Administrator**.
2. On the [Main Menu](#), click **Configuration**. The **Rajant / Configuration** dashboard is displayed.
3. Click the [Actions](#) tab.
4. Click **View Log**.



The last 10,000 lines of the log file are shown in the display area.

```
2021-12-06 00:00:29.039 [scheduled:Thread-11] INFO com.rajant.bc360.App - Rajant BC|Enterprise ver11.24.2: Startup
2021-12-06 00:00:29.040 [scheduled:Thread-11] INFO com.rajant.bc360.App - appdata: /opt/bcenterprise/data
2021-12-06 00:00:29.040 [scheduled:Thread-11] INFO com.rajant.bc360.App - logging redirected to:
/opt/bcenterprise/data/var/log
2021-12-06 00:00:29.040 [scheduled:Thread-11] INFO com.rajant.bc360.App - time: millis[1638766829040]
nanos[1341237144240448]
2021-12-06 00:00:29.040 [scheduled:Thread-11] INFO com.rajant.bc360.App - processors: available[4]
2021-12-06 00:00:29.040 [scheduled:Thread-11] INFO com.rajant.bc360.App - heap: free[112442432] total[157286400]
max[2147483648]
2021-12-06 00:00:29.040 [scheduled:Thread-11] INFO com.rajant.bc360.App - ++++++ SYSTEM PROPERTIES ++++++
2021-12-06 00:00:29.040 [scheduled:Thread-11] INFO com.rajant.bc360.App - system property awt.toolkit: sun.awt.X11.xToolkit
2021-12-06 00:00:29.040 [scheduled:Thread-11] INFO com.rajant.bc360.App - system property BCENTERPRISE_BUILDDATE: 20211201-165302UTC
2021-12-06 00:00:29.040 [scheduled:Thread-11] INFO com.rajant.bc360.App - system property BCENTERPRISE_LOG_APPENDER: FILE
2021-12-06 00:00:29.040 [scheduled:Thread-11] INFO com.rajant.bc360.App - system property BCENTERPRISE_LOG_DIR:
/opt/bcenterprise/data/var/log
2021-12-06 00:00:29.040 [scheduled:Thread-11] INFO com.rajant.bc360.App - system property BCENTERPRISE_LOG_LEVEL: WARN
2021-12-06 00:00:29.040 [scheduled:Thread-11] INFO com.rajant.bc360.App - system property BCENTERPRISE_VERSION: 11.24.2
2021-12-06 00:00:29.040 [scheduled:Thread-11] INFO com.rajant.bc360.App - system property file.encoding: UTF-8
2021-12-06 00:00:29.040 [scheduled:Thread-11] INFO com.rajant.bc360.App - system property file.separator: /
```

5. Scroll to view the log file.
6. (Optional) For reference, Copy, and then Paste the text into a local text file. Name the local text file to identify the content.
7. To clear the display area, click **Clear**.



The display area is cleared.

Follow-up procedure

To work with Rajant Support to resolve an issue, go to the [Rajant Support web site](#) to upload the log file to Rajant Support personnel. For instructions, refer to the *BC|Commander Version 11 User Guide* on the [Rajant Support web site](#).

Back up Data

Contents

[Back up Data on a Linux Server](#)

[Back up Data on a Windows Server](#)

Back up Data on a Windows Server

Purpose

Note: These instructions use the [default location](#) for the BC|Enterprise Data Directory. Replace the default location with the current location of the BC|Enterprise Data Directory identified in the **Data Directory** box on the **Services** tab on the [Rajant / Configuration](#) dashboard.

Copy the contents of the following directories from the BC|Enterprise Data Directory to another location for long-term storage:

bcenterprise\var\conf
bcenterprise\var\db
bcenterprise\var\grafana
bcenterprise\var\prometheus

Prerequisite

To access the %APPDATA% folder at the default location, the Windows user account must be part of the Administrative group.

Procedure

To backup the BC|Enterprise Data Directory, do the following:

1. [Stop the Rajant BCEnterprise Service](#) on the BC|Enterprise server.
2. Copy the contents of the data directories to another location.
3. [Start](#) the Rajant BCEnterprise Service on the BC|Enterprise server.

Back up Data on a Linux Server

Purpose

Note: These instructions use the default location `/opt/bcenterprise/data` for the BC|Enterprise Data Directory. Replace `/opt/bcenterprise/data` with the current location of the BC|Enterprise Data Directory identified in the **Data Directory** box on the **Services** tab on the **Rajant / Configuration** dashboard.

Copy the contents of the following directories from the BC|Enterprise Data Directory to another location for long-term storage:

```
/opt/bcenterprise/data/var/conf  
/opt/bcenterprise/data/var/db  
/opt/bcenterprise/data/var/grafana  
/opt/bcenterprise/data/var/prometheus
```

Procedure

To backup the BC|Enterprise Data Directory, do the following:

1. [Stop the Rajant BC|Enterprise Service](#) on the BC|Enterprise server.
2. In the command line, enter the following command to change the working directory to the BC|Enterprise Data Directory:
`cd /opt/bcenterprise/data/var`
3. Enter the following command to archive the contents of the BC|Enterprise Data Directory:
`tar -cvf bce-archive.tar var /conf var /db var /grafana var /prometheus`
4. (Optional) To decompress the tar archive at the backup location, change the working directory to the folder that contains the tar archive, and then enter the following command:
`tar -xvf bce-archive.tar .`
5. [Start the Rajant BC|Enterprise Service](#) on the BC|Enterprise server.

Rajant Internal Dashboards

Contents

- [Rajant / BC|Enterprise Internal Dashboard](#)
- [Rajant / JVM Monitor Dashboard](#)
- [Rajant / Historical Metrics Support Dashboard](#)
- [Rajant / Grafana Metrics Dashboard](#)

Rajant / BC|Enterprise Internal Dashboard

Purpose

View information about the internal states of BC|Enterprise and BC|Connector software during the selected time range and filtered by the selection filters.

Important: Refer to this dashboard only while actively working with Rajant Support personnel.

Navigation

To go to the **Rajant / BC|Enterprise** dashboard, on the [Main Menu](#), click **Dashboards**, expand the [Rajant](#) dashboard folder, and then click **BC|enterprise Internal**.

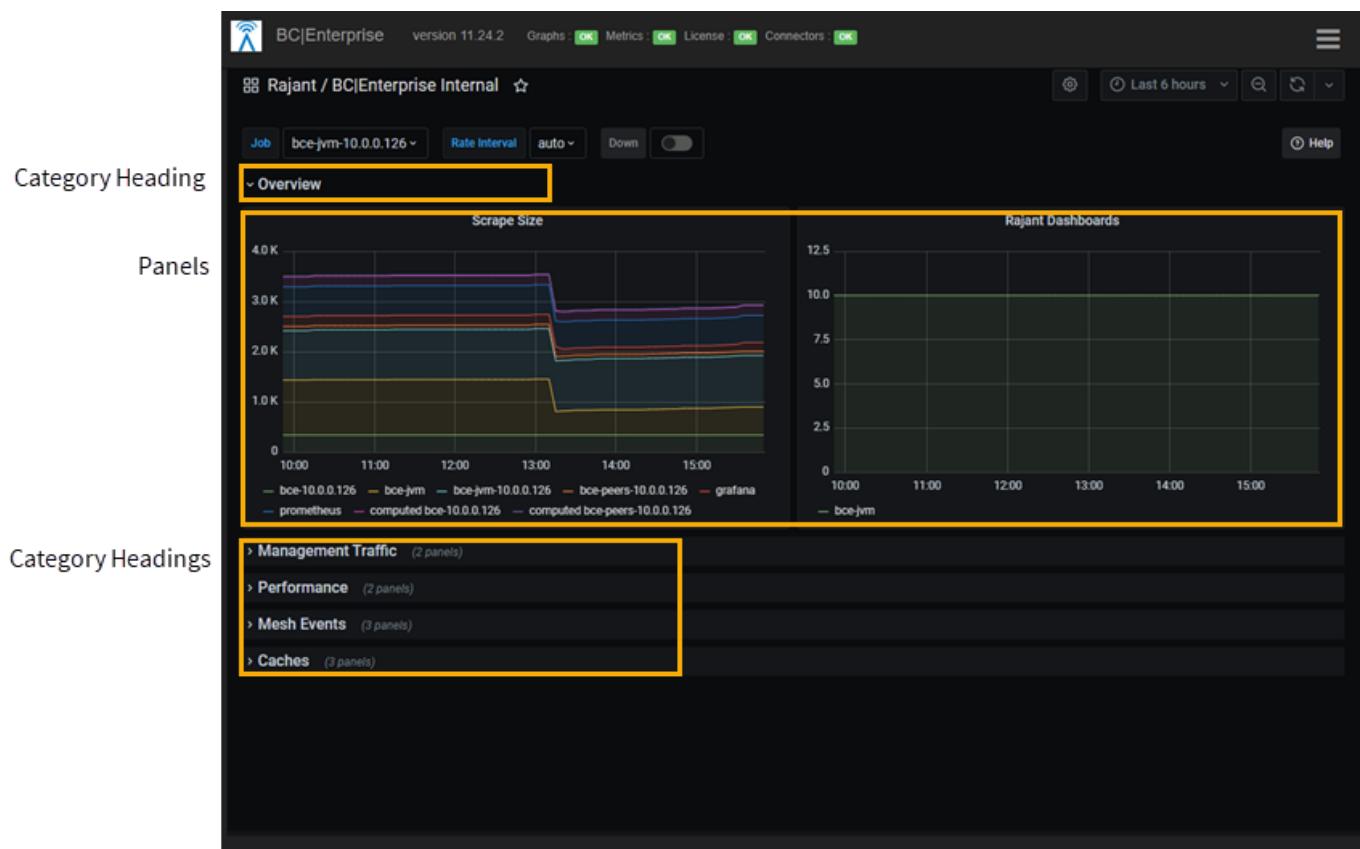
Procedures

The following procedures apply to the **BC|Enterprise Internal** dashboard:

- Set Selection Filters for a Dashboard
- Select a Time Range for a Dashboard
- Enlarge a Time Range in a Panel
- View Detail in a Graph
- Add an Annotation to a Panel
- Examine a Panel Definition

Illustration

The following illustration identifies the major features on the **BC|Enterprise Internal** dashboard:



Selection Filters

[Job Rate Interval](#)

Down toggle

Click the **Down** toggle to show or hide (default) an annotation for each time period when the [Rajant BCEnterprise Service](#) is down.

Category headings

Click the arrow to the left of each category heading to show/hide [panels](#) for that category.

Overview

- Scrape Size: Number of data item records in the time series database.
- Rajant Dashboards: Number of dashboards created by Rajant.

Management Traffic

- Management Packets / Second: Data receive rate in packets per second (pps)
- Management Traffic / Second: Data receive rate in bytes per second (bps)

Performance

- Time spent in method: Percentage of elapsed time spent in each method. Multiple threads and multiple methods on the same call stack can result in a value greater than 100 percent
- Exceptions: Number of exceptions from each method

Mesh Events

- Enqueues/Second: Number of events added to the Mesh Manager queue per second
- Dequeues/Second: Number of events removed from the Mesh Manager queue per second
- Pending Events: Number of pending Mesh Manager events. An increase in pending events indicates a performance problem

Caches

- rules Cache: Size and Hit Rate for the rules cache
- model Cache: Size and Hit Rate for the model cache
- configMeta Cache: Size and Hit Rate for the configMeta data

Rajant / JVM Monitor Dashboard

Purpose

View information about the Java Virtual Machine (JVM) that runs BC|Enterprise and BC|Connector software during the **selected time range** filtered by the **Job** selection filter.

Important: Refer to this dashboard only while actively working with Rajant Support personnel.

Navigation

To go to the **Rajant / JVM Monitor** dashboard, on the **Main Menu**, click **Dashboards**, expand the **Rajant** dashboard folder, and then click **JVM Monitor**.

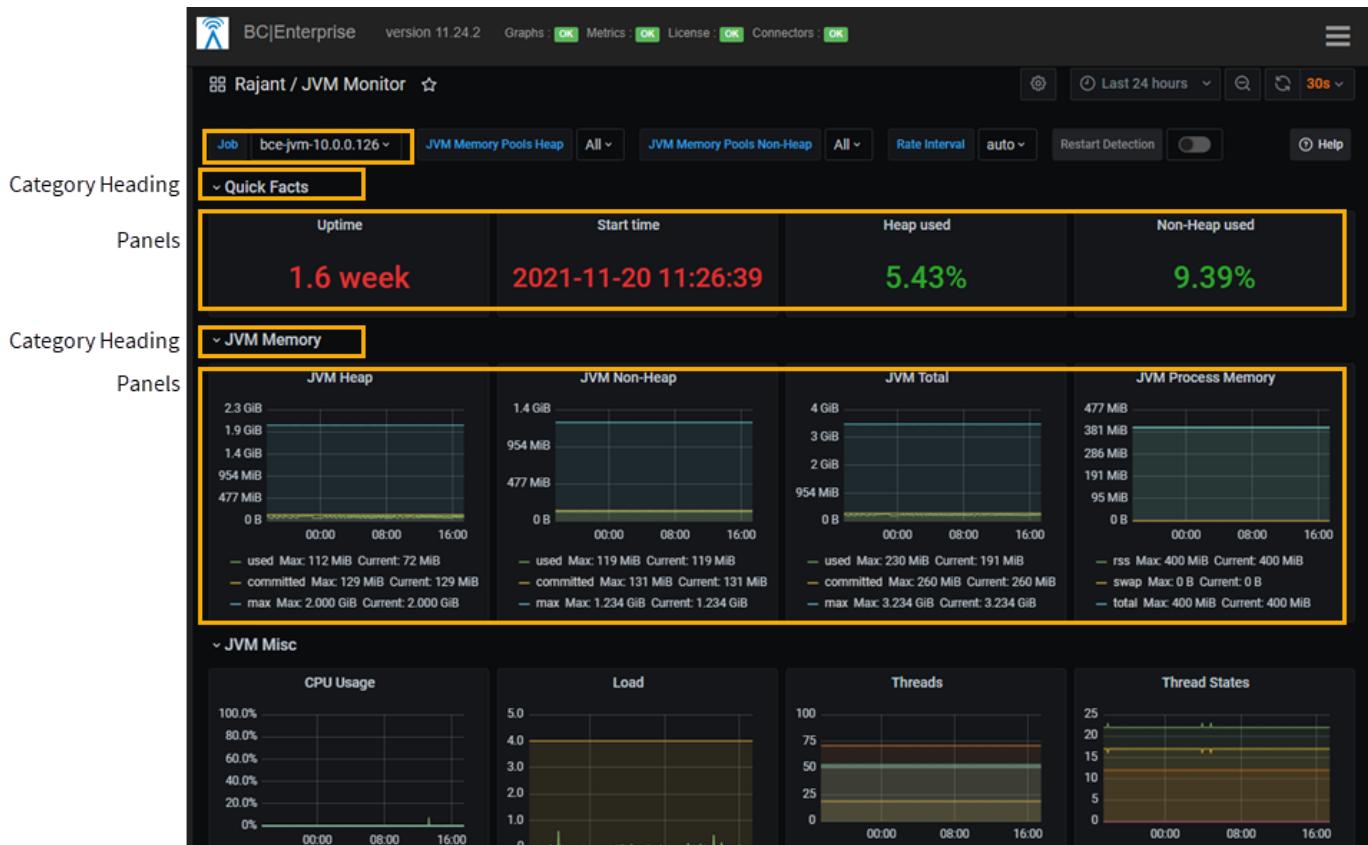
Procedures

The following procedures apply to the **Rajant / JVM Monitor** dashboard:

- Set Selection Filters for a Dashboard
- Select a Time Range for a Dashboard
- Enlarge a Time Range in a Panel
- View Detail in a Graph
- Add an Annotation to a Panel
- Examine a Panel Definition

Illustration

The following illustration indicates the major features on the **Rajant / JVM Monitor** dashboard:



Selection filters

Job JVM Memory Pools Heap JVM Memory Pools Non-Heap Rate Interval

Restart Detection toggle

Click the **Restart Detection** toggle to show or hide (default) an annotation for each restart of the JVM.

Category headings

Click the arrow to the left of each category heading to hide/show **panels** for that category.

Quick Facts

- Uptime:
- Start time: Start time for JVM Monitor in the format *yyyy-mm-dd hh:mm:ss*
- Heap used: Percentage
- Non-Heap used: Percentage

JVM Memory

- JVM Heap:
- JVM Non-Heap:
- JVM Total:
- JVM Process Memory:

JVM Misc

- CPU Usage: Percentage of CPU
- Load:
- Threads:
- Thread States:
- Log Events:
- File Descriptors:

JVM Memory Pools (Heap)

- G1 Eden Space:
- G1 Old Gen:
- G1 Survivor Space:

JVM Memory Pools (Non-Heap)

- Metaspace:
- Compressed Class Space:
- Code Cache:

Garbage Collection

- Collections:
- Pause Durations:
- Allocated/Promoted:

Classloading

- Classes loaded:
- Class delta:

Buffer Pools

- Direct Buffers:
- Direct Buffers:
- Mapped Buffers:
- Mapped Buffers:

Rajant / Historical Metrics Support Dashboard

Purpose

View information about the embedded Prometheus server and time series database for the BC|Enterprise software during the [selected time range](#) and filtered by the [selection filters](#).

Important: Refer to this dashboard only while actively working with Rajant Support personnel.

Reference

For information about Prometheus , refer to the [Prometheus documentation](#).

Navigation

To go to the **Rajant / Historical Metrics Support** dashboard, on the [Main Menu](#), click **Dashboards**, expand the [Rajant](#) [dashboard folder](#), and then click **Historical Metrics Support**.

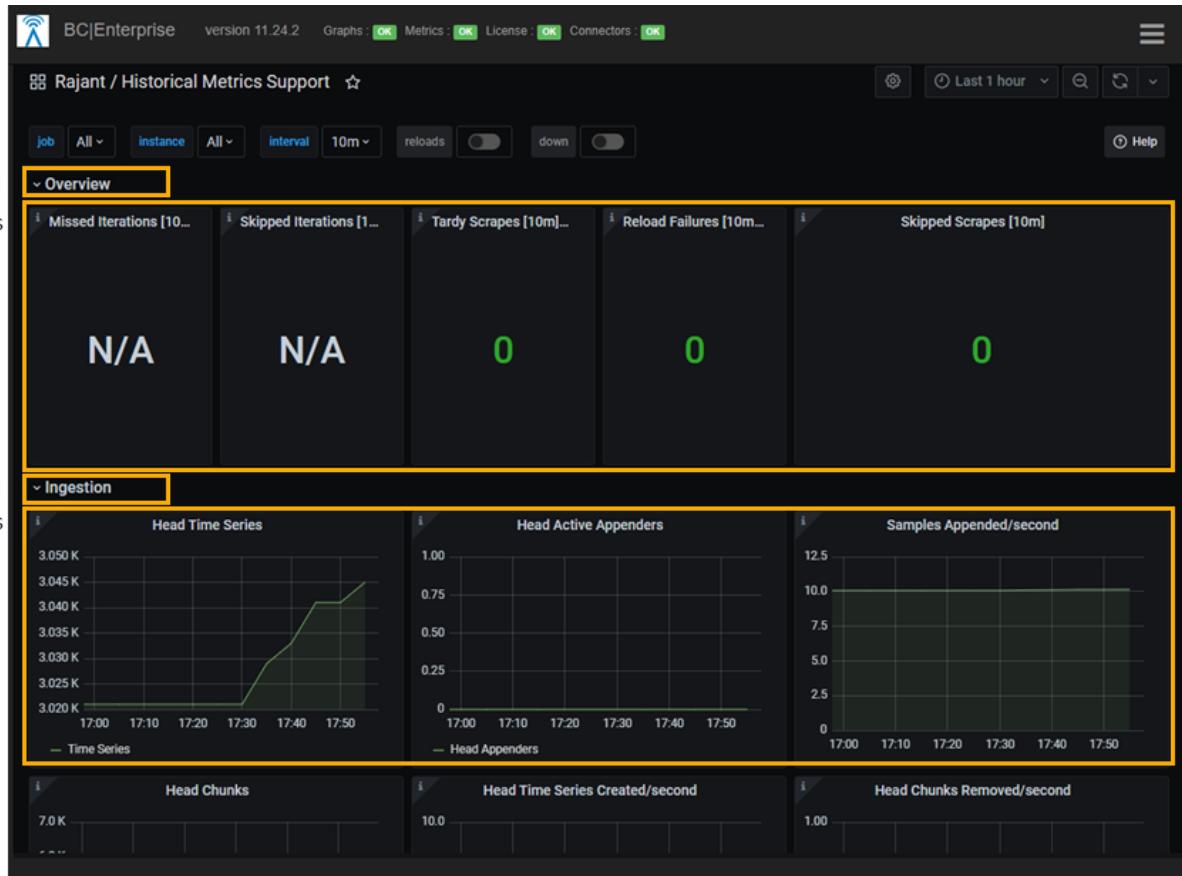
Procedures

The following procedures apply to the **Rajant / Historical Metrics Support** dashboard:

- [Set Selection Filters for a Dashboard](#)
- [Select a Time Range for a Dashboard](#)
- [Enlarge a Time Range in a Panel](#)
- [View Detail in a Graph](#)
- [Add an Annotation to a Panel](#)
- [Examine a Panel Definition](#)

Illustration

The following illustration identifies the major features on the **Rajant / Historical Metrics Support** dashboard:



Selections filters

[Job](#) [Instance](#) [Interval](#)

reloads toggle

Click the **reloads** toggle to show or hide (default) an annotation for each reload of the Prometheus configuration.

downs toggle

Click the **downs** toggle to show or hide (default) an annotation for each time period when the [BC|Enterprise Metrics Service \(Prometheus\)](#) is down.

Category headings

Click the arrow to the left of each category heading to hide/show [panels](#) for that category.

Overview

- Missed Iterations: Total number of rule group evaluations missed due to slow rule group evaluation
- Skipped Iterations: Total number of rule group evaluations missed due to throttled metric storage
- Tardy Scrapes: Total number of scrapes that hit the sample limit and were rejected
- Reload Failures: Number of times the time series data base (TSDB) failed to reload block data from disk
- Skipped Scrapes: Sum of all skipped scrapes

Ingestion

- Head Time Series: Total number of series in the head block
- Head Active Appenders: Number of currently active appended transactions
- Samples Appended / second: Number of appended samples per second
- Head Chunks: Total number of chunks in the head block
- Head Time Series Created / second: Number of series created in the head block per second
- Head Chunks Removed / second: Number of series removed from the head block per second

Compaction

- Head Time Range: Minimum time bound of the head block
- Head GC Time / second: Runtime of garbage collection in the head block
- Blocks Loaded: Number of currently loaded head blocks
- TSDB Reloads / second: Number times per second the TSDB reloaded block data from disk
- WAL Fsync&Truncate Latency: Duration of Write-ahead logging (WAL) fsync and truncation
- TSDB Problems / second: Number of times the TSDB reloaded block data from disk
- Compactions / second: Number of compactions per second that were executed for the partition
- Compaction Time / Second: Duration of compaction runs
- Retention Cutoffs / second: Number of times that blocks were deleted because the maximum time limit or number of bytes was exceeded
- First Compaction, Avg Chunk Time Range: Average time range of chunks on their first compaction
- First Compaction, Avg Bytes / Sample: Average number of bytes per chunks on their first compaction
- First Compaction, Avg Chunk Samples: Average number of chunks per sample on their first compaction

Resource Usage

- Go Memory Usage:
- File Descriptors:
- Allocations / second: Total number of bytes allocated per second, even if deleted
- CPU:
- Symbol Table Size: Size of symbol table in bytes on disk
- TSDB Disk Usage: Number of bytes currently used for local storage by all blocks in the TSDB

HTTP Server

- HTTP requests / second: Hypertext Transfer Protocol (HTTP) server requests per second
- HTTP request / latency:
- Time spent in HTTP requests / second: Time spent in HTTP server request per second

Query Engine

- Query engine timings / second:
- Rule group evaluation problems / second: Total number of rule group evaluations failed or missed per second due to slow rule group evaluations
- Evaluation time of rule groups / second: Duration of rule group evaluations

Scrapes

- Scrape Duration: Number of seconds required to complete a scrape
- Actual Interval Between Scrapes: Number of seconds between scrapes
- Scrape Rate [10m]:

- Rejected Scraps: Number of rejected scrapes

Scrape Pool

- Scrape Sync Total: Total number of syncs that were executed on a scrape pool
- Target Sync [10m]: Actual time interval to sync the scrape pool

Rule Group

- bce_alertrules.ym;bcenterprise: Duration: Interval of a rule group compared to its execution duration
- bce_alertrules.ym;bcenterprise: Number of Rules: Number of rules in a rule group

Rule Group

- bce_alertrules.ym;bce_internal: Duration: Interval of a rule group compared to its execution duration
- bce_alertrules.ym;bce_internal: Number of Rules: Number of rules in a rule group

Rajant / Grafana Metrics Dashboard

Purpose

View information about the embedded Grafana graphics server and its embedded database for the BC|Enterprise application during the [selected time range](#) and filtered by the [selection filters](#).

Important: Refer to this dashboard only while actively working with Rajant Support personnel.

Reference

For information about Grafana metrics, refer to Grafana documentation at [Grafana Docs](#).

Navigation

To go to the **Rajant / Grafana Metrics** dashboard, on the [Main Menu](#), click **Dashboards**, expand the [Rajant](#) dashboard folder, and then click **Grafana Metrics**.

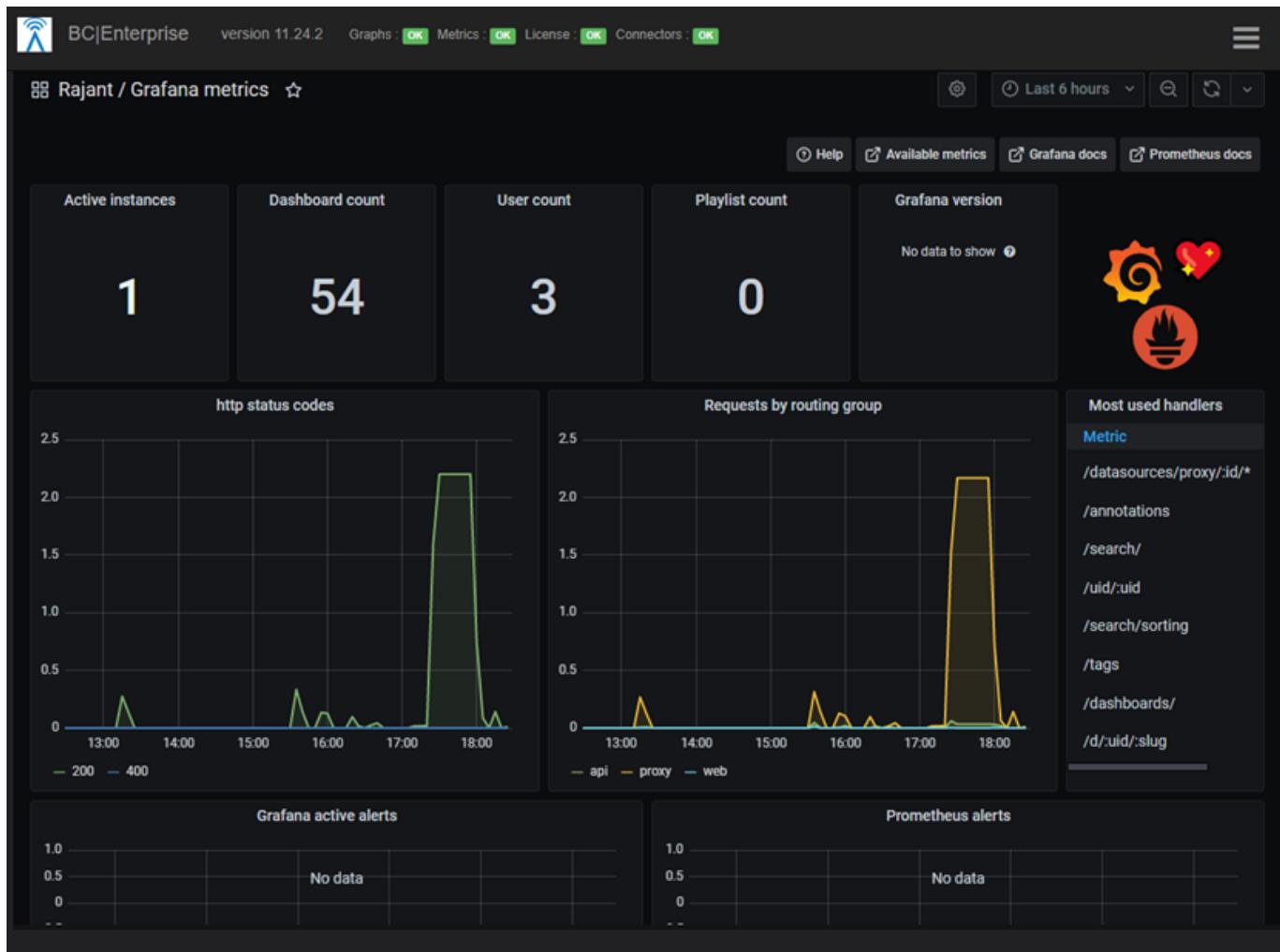
Procedures

The following procedures apply to the **Rajant / Grafana Metrics** dashboard:

- [Set Selection Filters for a Dashboard](#)
- [Select a Time Range for a Dashboard](#)
- [Enlarge a Time Range in a Panel](#)
- [View Detail in a Graph](#)
- [Add an Annotation to a Panel](#)
- [Examine a Panel Definition](#)

Illustration

The following illustration shows the panels on the **Rajant / Grafana Metrics** dashboard:



Counter Panels

A separate counter [panel](#) indicates the count for each of the following at the end of the selected time range:

- **Active instances:** Number of active Grafana instances
- **Dashboard count:** Number of dashboards in BC|Enterprise
- **User count:** Number Grafana users
- **Playlist count:** Number of playlists created for Grafana dashboards
- **Grafana version:** Grafana software version in use

http status codes

This graph indicates the number of Hypertext Transfer Protocol (HTTP) status code changes that occurred for Grafana during the selected time range.

Requests by routing group

This graph indicates the number of Grafana requests that occurred for each of the following routing groups during the selected time range:

- api: Application Programming Interface (API) for Grafana
- proxy: Grafana authentication proxy
- web: HTTP interface

Grafana active alerts

This graph indicates the number of active alerts for Grafana during the selected time range.

Prometheus alerts

This graph indicates the number of active alerts for Prometheus during the selected time range.

Grafana performance

This graph indicates the following values during the selected time range:

- Aggregated number of go routines (shown at left) over all Grafana nodes
- Memory usage in Megabytes (MB) (shown at right) over all Grafana nodes

Work with Rajant Support

Contents

[Prepare to Work with Rajant Support](#)

[Capture a Console Log for the Web Browser](#)

Work with Rajant Support

Purpose

Capture a file that documents BC|Enterprise activity and download that file to a local folder on the [BC|Enterprise server](#). Submit the file to Rajant Support personnel.

Procedure

Do one of the following procedures to capture and download the appropriate file to be sent to Rajant Support:

- [Download Snapshot Files](#)
- [View the Current Log File](#)
- [Capture a Console Log for the Web Browser](#)

Follow-up procedure

To work with Rajant Support to resolve an issue, go to the [Rajant Support web site](#) to upload the file to Rajant Support personnel. For instructions, refer to the *BC|Commander Version 11 User Guide* on the [Rajant Support web site](#).

Capture a Console Log for the Web Browser

Purpose

Capture a browser log for the [web browser](#) to debug the loading of the [Mesh / Monitor](#) dashboard.

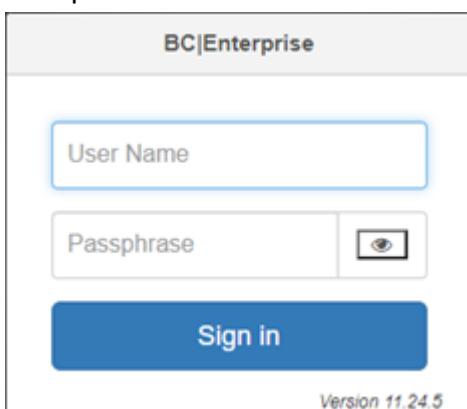
Note: The Google Chrome Browser procedure is provided here as a guide. Steps 2, 3 and 8 will be vary for each web browser. Refer to the instructions for each supported web browser.

Google Chrome browser procedure

Chrome browser console procedure

To capture a browser log file for the Google Chrome browser, do the following:

1. Log out of BC|Enterprise.
2. From the Chrome browser menu, point to **More tools**, and then click **Developer tools** (CTRL+SHIFT+I). The developer tools window opens.
3. Click the **Console** tab. A console panel opens to the left.
4. In the web Address box, supply the URL to open BC|Enterprise. The **BC|Enterprise** login dialog box opens.



5. Log in to BC|Enterprise. The **BC|Enterprise Overview** dashboard is displayed.
6. In the [Main Menu](#), click **Dashboards**. The [Dashboards](#) dashboard is displayed.
7. Open the **Rajant** folder, and then click the link for **Monitor**. The **Monitor** dashboard opens.
8. In the Developer Tools window, right-click in the console output, and then click **Save as....**
9. Save the console output to a file. Name the file to identify the content, your company and the date and time.
10. In the left panel, on the BC|Enterprise Main Menu, click **Logout**. The **BC|Enterprise** login dialog box is displayed.
11. Close the browser window.

Firefox browser procedure

Firefox browser console procedure

Follow-up procedure

To work with Rajant Support to resolve an issue, go to the [Rajant Support web site](#) to upload the log file to Rajant Support personnel. For instructions, refer to the *BC|Commander Version 11 User Guide* on the [Rajant Support web site](#).

Appendix A: Ports and Protocols

Table: Ports and Protocols

Purpose	From	To	Protocol
BreadCrumb Discovery at BC Commander startup	Ephemeral port on BC Commander host	224.0.0.224, port 35057 (UDP IPv4 multicast); FF02::1, port 35057 (UDP IPv6 multicast); BreadCrumb IPv4 or IPv6 addresses, port 35057 (UDP IPv4 or IPv6 unicast)	IPv4 UDP, IPv6 UDP
BreadCrumb Discovery at BreadCrumb startup	BreadCrumb IPv4 or IPv6 address, port 35057	Ephemeral port on BC Commander host (UDP IPv4 or IPv6 unicast); FF02::1, port 35057 (UDP IPv6 multicast)	IPv4 UDP, IPv6 UDP
BreadCrumb Application Programming Interface (BCAPI)	Ephemeral port on BC Commander host	BreadCrumb IPv4 or IPv6 addresses, port 2300 (default)	IPv4 TCP, IPv6 TCP
BC Enterprise setup only	Ephemeral port on BC Enterprise server	BC Connector TCP port 23000	IPv4 TCP, IPv6 TCP
BC Enterprise graphing service	Ephemeral port on BC Enterprise server	BC Enterprise Server port 3000	IPv4 TCP, IPv6 TCP
BC Enterprise metrics service	Ephemeral port on BC Enterprise server	BC Enterprise Server port 8889	IPv4 TCP, IPv6 TCP
BC Enterprise time-series database service	Ephemeral port on BC Enterprise server	BC Enterprise Server port 9090	IPv4 TCP, IPv6 TCP
BC Enterprise user interface	Internet browser on BC Enterprise client workstation	BC Enterprise server port 8888	IPv4 HTTP, IPv6 HTTP
BC Enterprise metrics request and publishing	Ephemeral port on BC Enterprise server	BC Connector server port 23002	IPv4 TCP, IPv6 TCP
BC Connector Discovery by BC Commander	Ephemeral port on BC Commander host	BC Connector server port 35057	IPv4 UDP, IPv6 UDP
BC Connector Discovery by BC Enterprise	Ephemeral port on BC Enterprise server	BC Connector server port 35057	IPv4 UDP, IPv6 UDP
BC Connector communicationn with BreadCrumb	Ephemeral port on BC Connector server	BreadCrumb IPv4 or IPv6 addresses, port 2300	IPv4 TCP, IPv6 TCP

BC Connector with user authentication through LDAP server	Ephemeral port on BC Connector server	LDAP server port 3268 or 389 (whichever is used)	IPv4 UDP, TCP; IPv6 UDP, TCP
Automatic Protocol Tunneling (APT)	BreadCrumb ethernet interface IPv6 link-local address, ephemeral port	BreadCrumb ethernet interface IPv6 link-local address port 2210 for service listener, ephemeral port for data flow	IPv6 UDP
Remote Protocol Tunneling (RPT) SCTP option (default)	BreadCrumb IPv4 or IPv6 address, ephemeral port	BreadCrumb IPv4 or IPv6 address, SCTP port 2210 for service listener, ephemeral port for data flow	IPv4 UDP or IPv6 SCTP
RPT UDP option	BreadCrumb IPv4 or IPv6 address, ephemeral port	BreadCrumb IPv4 or IPv6 address, UDP port 2211 for service listener, ephemeral port for data flow	IPv4 or IPv6 UDP
Tactical Radio over Internet Protocol (TRoIP) Audio RPT Traffic	BreadCrumb IPv4 or IPv6 address, ephemeral port	IPv4 multicast address 225.0.0.1-225.0.2255 port 24680	IPv4 UDP
Remote Packet Capture	Remote Packet Capture client (BC Commander)	BreadCrumb configured TCP port 5825 (default)	IPv4 TCP
Performance Test (iperf3)	BreadCrumb IPv4 or IPv6 address, ephemeral port	BreadCrumb IPv4 or IPv6 address, port 5201	IPv4 UDP, TCP; IPv6 UDP, TCP
Real Time Location System (RTLS)	BreadCrumb ephemeral port	RTLS server UDP port 12092	IPv4 UDP
RTLS	RTLS server ephemeral port	BreadCrumb UDP port 1144 (default)	IPv4 UDP

Appendix B: Rajant End User License Agreement

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THE RAJANT HARDWARE LIMITED WARRANTY ONLY APPLIES WHEN GENUINE RAJANT HARDWARE AND AUTHORIZED ACCESSORIES ARE USED BY THE INSTALLER AND END USER. USE OF ANY NON-AUTHORIZED ACCESSORIES OR PERIPHERAL EQUIPMENT VOIDS THE RAJANT LIMITED HARDWARE LIMITED WARRANTY.

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Rajant to duplicate the failure to so perform, which notice is received by Rajant within thirty (30) days after Reseller or purchaser discovers the failure, Rajant shall – after duplicating the failure – exercise its commercially reasonable efforts to deliver to Reseller or purchaser a replacement or repaired Product at Rajant's discretion. Rajant replacement parts used in such replacement may be new or equivalent to new. Rajant's obligations hereunder are conditioned upon the return of the affected Product in accordance with Rajant's then-current Return Material Authorization (RMA) procedures.

This warranty shall not apply to any Product that has been subjected to unusual physical, environmental or electrical stress. The warranty shall not apply to any problems or non-performance directly resulting from Reseller or purchaser's hardware, software, network(s) and/or host system(s) or the combination, operation or use of the Product with such hardware, software, network(s) and/or host system(s), or which results from any alteration or modification to the Product or its components by anyone other than Rajant. The warranty also does not cover any (a) Product for which the serial number has been removed or made illegible; (b) freight costs to the repair center; (c) scratches or other cosmetic damage to Product surfaces that do not affect the operation of the Product; and (d) normal and customary wear and tear.

The date of shipment of a Product by Rajant is set forth on the packaging material in which the Product is shipped. This limited warranty extends only to the original user of the Product.

Replacement, Repair or Refund Procedure for Products Covered by Warranty

Rajant will use commercially reasonable efforts to ship a repaired or replacement part within fifteen (15) working days after receipt of the RMA request. Actual delivery times may vary depending on Reseller's or purchaser's location.

To Receive a Return Materials Authorization (RMA) Number

Please contact the party from whom you purchased the Product. If you purchased the Product directly from Rajant, contact your Rajant Sales and Service Representative or email support@rajant.com.

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