BlueData EPIC User/Administrator Guide

VERSION 2.4

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1 - Preface

The BlueData Elastic Private Instant Clusters platform (referred to as "EPIC" throughout this manual) allows users to provide Big-Data-as-a-Service within their own secure on-premises environments.

Virtualization and container technologies have already introduced flexibility, agility, and reduced costs to most applications in the enterprise data center. BlueData EPIC extends these benefits to big data by allowing enterprises to create, modify, and remove virtual clusters on demand without sacrificing performance. With EPIC, enterprises can simultaneously run hundreds of workloads with automated policy-based scheduling and self-provisioning. Distributed applications are efficient and elastic, thanks to EPIC's proprietary application-sensitive caching, data path, and network optimization, and policy-based automation and management. IT administrators use a single interface to monitor clusters, jobs, and infrastructure status. EPIC also automates routine tasks such as provisioning, updates and monitoring.

EPIC dramatically reduces deployment complexity while improving business agility by providing an elastic self-service infrastructure that reduces the time-to-value from months to days while reducing overall costs by 50%-75% compared to traditional, non-virtualized Hadoop and Spark deployments. Users create virtual clusters on demand and execute jobs without ever having to worry about the underlying infrastructure.

Please see the *About EPIC Guide* for detailed information about EPIC, including:

- Key features and benefits
- Support for Hadoop, Spark, and other applications
- Definitions
- Architecture
- Storage
- High Availability
- Users
- System requirements

Note: Most of the information in this Guide pertains to both EPIC (full) and EPIC Lite (evaluation). The key differences between the two versions are outlined in the About EPIC Guide.

1.1 - About This Manual

This section describes the formatting conventions and information contained in this manual.

1.1.1 - Formatting Conventions

This manual uses several formatting conventions to present information of special importance.

Lists of items, points to consider, or procedures that do not need to be performed in a specific order appear in bullet format:

- Item 1
- Item 2

Procedures that must be followed in a specific order appear in numbered steps:

1. Perform this step first.
2. Perform this step second.

Specific keyboard keys are depicted in square brackets and are capitalized, for example: [ESC]. If more than one key should be pressed simultaneously, the notation will appear as [KEY1]+[KEY 2], for example [ALT]+[F4].

Interface elements such as document titles, fields, windows, tabs, buttons, commands, options, and icons appear in **bold** text.

Specific commands appear in standard `Courier` font. Sequences of commands appear in the order in which you should execute them and include horizontal or vertical spaces between commands. The following additional formatting also applies when discussing command-line commands:

Plain-text responses from the system appear in bold **`Courier`** font.

This manual also contains important safety information and instructions in specially formatted callouts with accompanying graphic symbols. These callouts and their symbols appear as follows throughout the manual:

CAUTION: CAUTIONS ALERT YOU TO THE POSSIBILITY OF A SERIOUS ERROR, DATA LOSS, OR OTHER ADVERSE CONDITION.

Note: Notes provide helpful information.

The **Note** and **Caution** icons are blue in the main chapter, and gray in the appendices.

1.1.2 - Organization

This manual contains the following chapters:

- 1 - **Preface:** Describes how this manual is formatted and organized.
- 2 - **Launching and Logging In:** Describes how to log into EPIC and access the correct tenant.
- 3 - **Using a Tenant:** Describes the EPIC Tenant Member interface and functionality in detail.
- 4 - **Tenant Administration:** Describes the EPIC Tenant Administrator interface and functionality in detail.
- 5 - **Site Administration:** Describes the EPIC Site Administrator interface and functionality in detail.

This manual also contains the following appendices:

- A - **User Management:** Describes how EPIC handles UI and SSH user authentication for local and LDAP/AD group users.
- B - **Troubleshooting:** Helps you resolve issues that may arise while using EPIC. Please see the *Installation Guide* for information on troubleshooting during installation.

1.2 - Additional Information

This section lists related documentation and provides information on contacting BlueData, Inc.

1.2.1 - Related Documentation

Please refer to the following documents for additional information:

- **About EPIC Guide:** This guide explains the EPIC architecture, features, and benefits. It also contains the End User License Agreement.
- **EPIC Lite Installation Guide:** This guide helps you install EPIC Lite, the free demonstration version of EPIC, on a single host.
- **EPIC Installation Guide:** This guide contains instructions for installing the full version of EPIC on your network.
- **Running Applications in EPIC:** This guide provides a brief overview of how to input data, run jobs, and access job output within EPIC.
- **Deployment Guide:** Certain platforms have additional requirements and/or procedures for installing/running EPIC.
- **App Store Image Authoring Guide:** Describes how Site Administrators can author new images and make them available in their local instance of the EPIC **App Store**.

1.2.2 - Contact Information

You may contact BlueData Software, Inc. at the following address:

BlueData Software, Inc.
3979 Freedom Circle, Suite 850
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Email: info@bluedata.com
Website: www.bluedata.com

1.2.3 - Support

Please see the *Installation Guide* for information on obtaining technical support from BlueData Software, Inc.

1.2.4 - End User License Agreement

Your use of EPIC is subject to the terms and conditions described in the End User License Agreement (EULA).

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2 - Launching and Logging In

To launch and log into EPIC:

1. In a Web browser, navigate to either `http://<A.B.C.D>` or `https://<A.B.C.D>`, where `<A.B.C.D>` is either:
   - The IP address of the EPIC Controller host.
   - The cluster IP address, which will automatically route you to either the EPIC Controller host (under normal circumstances) or the Shadow Controller host (if EPIC platform High Availability is enabled and the Controller host has failed). Please see *"HA Settings Tab" on page 118* and the *About EPIC Guide* for information on enabling High Availability for the EPIC platform.

   Alternatively, if you have a DNS service on the network that maps the Controller IP address to the Controller hostname, then you can navigate to `http://hostname`.

   The EPIC **Login** screen appears.

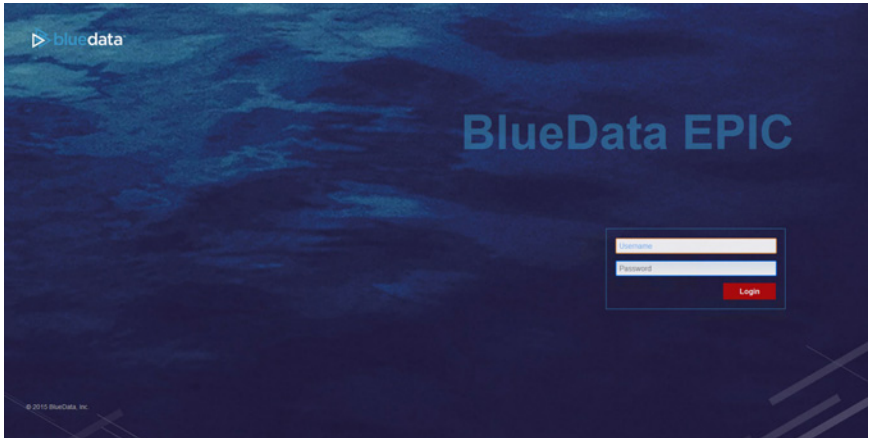


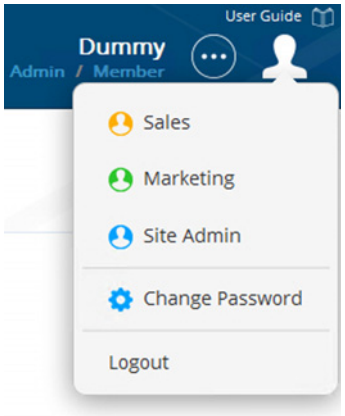
Figure 2.1: Login screen

2. Enter your username and password in the appropriate fields and then either click the **Login** button or press [ENTER].

EPIC will log you into the tenant you last accessed before logging out of your previous session and display the **Dashboard** screen appropriate to the role you have in that tenant, as follows:

- If you are a Member of the current tenant, you will see the Tenant Member **Dashboard** screen and have Member privileges. See *"Using a Tenant" on page 9*.
- If you are an Administrator of the current tenant, you will see the Tenant Administrator **Dashboard** screen and have Tenant Administrator privileges. See *"Tenant Administration" on page 41*.
- If you are a Site Administrator, you will see the Site Administrator **Dashboard** screen and have Site Administrator privileges. See *"Site Administration" on page 63*.

You may switch to any tenant that you have access to by clicking the **User** button at the right of the **Toolbar** at the top of the screen and then selecting the desired tenant in the pull-down menu.



- Tenants where you have Member privileges have a yellow icon.
- Tenants where you have Tenant Administrator privileges have a green icon.
- If you can access the **Site Admin** tenant, that will appear in the list of tenants with a blue icon and you will have Site Administrator privileges.

3 - Using a Tenant

This chapter describes the EPIC Tenant Member interface. A Member can perform the following functions:

- **Login to EPIC:** See *"Launching and Logging In" on page 7*.
- **View the Tenant Member Dashboard screen:** See *"The Tenant Member Interface" on page 11*.
- **View, add, edit, and remove jobs:** See *"Jobs" on page 16*.
- **Add, edit, and remove persistent clusters:** See *"Persistent Clusters" on page 24*.
- **View basic DataTap information:** See *"Viewing DataTaps" on page 34*.
- **View virtual nodes:** See *"Viewing DataTaps" on page 34*.

3.1 - The Tenant Member Interface

The Tenant Member interface contains the following elements:

Figure 3.1: The Tenant Member interface

The following sections describe the numbered callouts in detail.

3.1.1 - Toolbar (1-5)

The **Toolbar** contains the following information/functions from left to right:

- **Quick Status (1):** This area of the **Toolbar** displays (from left to right) the number of jobs, clusters, DataTaps, and virtual nodes. Clicking an icon opens the appropriate page, as follows:
  - **Jobs:** Clicking this icon opens the **Job Management** screen. See *"Jobs" on page 16*.
  - **Clusters:** Clicking this icon opens the **Cluster Management** screen. See *"Persistent Clusters" on page 24*.
  - **DataTaps:** Clicking this icon opens the **DataTaps** screen. See *"Viewing DataTaps" on page 34*.
  - **Nodes:** Clicking this icon opens the **Nodes** screen. See *"Viewing Nodes" on page 35*.
- **Login details (2):** This area displays the following info:
  - Tenant you are currently viewing
  - Your username
  - Your role
- **Quick Access button (3):** Clicking this button opens a pull-down menu with the following options:
  - **Create Job:** Opens the **Create New Job** screen, which allows you to create a new job (see *"Creating a New Job" on page 18*).
  - **Create Cluster:** Opens the **Create New Cluster** screen, which allows you to create a new virtual cluster (see *"Creating a New Persistent Cluster" on page 30*).
- **User Guide (4):** Clicking this link opens this *User & Administrator Guide* in Adobe Acrobat (PDF) format.
- **User button (5):** Clicking this button opens a pull-down menu with the following options:
  - **Tenant:** List of tenants that you have access to, based on your EPIC login credentials (only appears if you can access more than one tenant). Clicking a tenant opens either the Tenant Administrator **Dashboard** screen (see *"The Tenant Member Interface" on page 11*) or the Member **Dashboard** screen (see *"Viewing the Member Dashboard" on page 15*, depending on the role you have for the selected tenant.
  - **Change Password:** Opens the **Change Password** popup window, which allows you to modify your EPIC password. See *"Changing Your Password" on page 40*.
  - **Logout:** Logs you out of EPIC. Once you log out, you will need to log back as described in *"Launching and Logging In" on page 7* to access EPIC.

3.1.2 - Main Menu (6)

The Member main menu contains the following options:

- **Dashboard:** Opens the **Dashboard** screen. See *"Viewing the Member Dashboard" on page 15*.
- **Jobs:** Opens the **Job Management** screen, which allows you to view, add, edit, and delete jobs. You may also view various job logs. See *"Jobs" on page 16*.
- **Clusters:** Opens the **Cluster Management** screen, which allows you to create, edit, and delete persistent virtual clusters. See *"Persistent Clusters" on page 24*.
- **DataTaps:** Opens the **DataTaps** screen, which allows you to view basic DataTap information. See *"Viewing DataTaps" on page 34*.
- **Nodes:** Opens the **Nodes** screen, which allows you to view the nodes that have been created for this tenant. See *"Viewing Nodes" on page 35*.

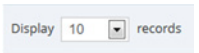
3.1.3 - Menu Expand/Collapse (7)

Clicking the **Expand/Collapse** arrow at the bottom of the main menu toggles the menu between wide (expanded) and narrow (collapsed). This feature maximizes the amount of screen space available for the work area on smaller monitors (such as mobile devices).

3.1.4 - Work Area (8)

The work area is where EPIC screens appear. Various generic functions will be available here, depending on the screen you are accessing. These generic functions may include some or all of the following:

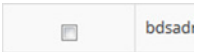
- Use the **Display... records** pull-down menu to select how many records you want to see displayed on a single screen.



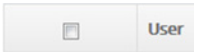
- Clicking an up arrow in a table header collapses that table.

- Clicking a down arrow in a table header expands that table.

- Clicking a checkbox in a table selects that item. You may select one or more items and then perform an action on the selected item(s).



- Clicking the checkbox in a table header selects all of the items in that table.

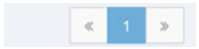


- Clicking the arrows in a table column sorts the table by the information in that column. For example, clicking the arrows in the **Tenant Description** column sorts the list of tenants by the description. Repeatedly clicking a column header toggles the display between ascending (A-Z) and descending (Z-A) order.

- Entering one or more keyword(s) in the **Search** field and then pressing [ENTER] returns all

records containing the supplied keyword(s). Searches happen in real time; the work area refreshes as you type.

- If a screen contains too many records to display on a single page, you may use the page numbers and arrows to move between pages, as follows:



  - Clicking a page number opens the selected page of the current screen.
  - Clicking the **First Page** (<<) button takes you to the first page of the current screen.
  - Clicking the **Last Page** (>>) button takes you to the last page of the current screen.
- Clicking the **Back to Top** icon at the bottom of a screen scrolls you back to the top of the current screen.

3.2 - Viewing the Member Dashboard

Clicking **Dashboard** in the main menu opens the Tenant Member **Dashboard** screen, which presents a high-level overview of current activity within this tenant. This screen refreshes every 30 seconds.

The **Dashboard** screen contains the following information:

- **Jobs Charts:** The following information appears for each current job within the tenant:
  - **Setup Time:** Blue bar showing how long the job took to set up, in seconds.
  - **Run Time:** Yellow bar showing how long the job took to run, in seconds.

  This area will display a blank box with **`Charts available after use`** before you run your first job.
- **Jobs:** The following information appears for each current job:
  - **Job Name:** Name of the job.
  - **Job Status:** Status of the job. See *"Job Statuses" on page 38*.

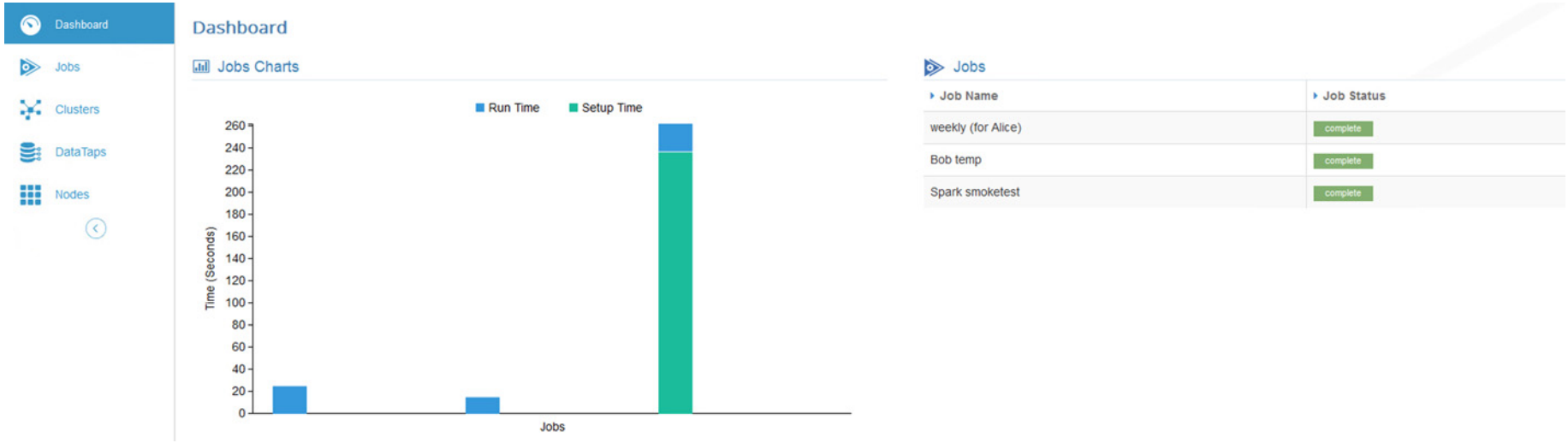


Figure 3.2: Tenant Member Dashboard screen

3.3 - Jobs

Selecting **Jobs** in the main menu opens the **Job Management** screen.

This screen contains the following buttons:

- **Create:** Clicking the green **Create** button opens the **Create New Job** screen. See *"Creating a New Job" on page 18*.
- **Delete:** Clicking the red **Delete** button deletes the selected job(s) from the tenant. Deleting a job that has completed with or without errors will only remove the job record. A popup warning appears asking you to confirm or cancel the action. Click **OK** to proceed, or **Cancel** to exit without deleting the job.

CAUTION: YOU CANNOT UNDELETE A JOB.

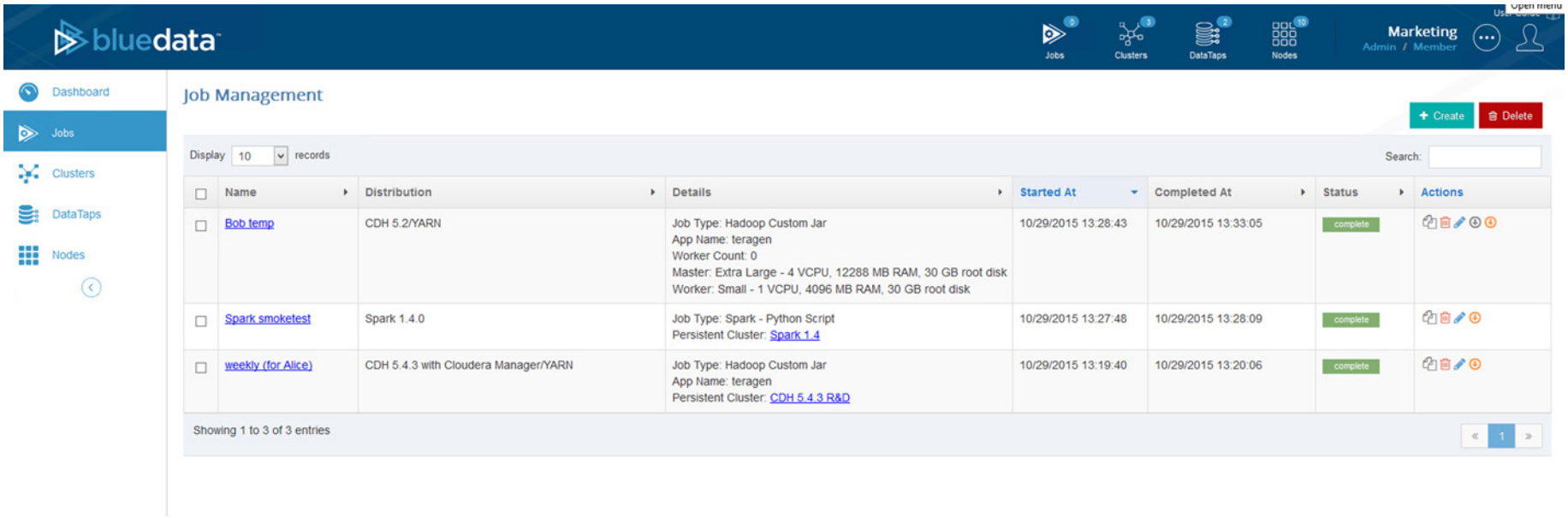


Figure 3.3: Job Management screen

The table on this screen contains the following information and functions:

- **Name:** Name of the job. Clicking a job name opens the **<Job> Output** popup, where **<Job>** is the name of the job. This popup displays the current job output and refreshes every 15 seconds. You may view the job output at any time during or after running the job. See *"Viewing Job Output" on page 23*.
- **Distribution:** Application framework being used for the job. See *"Images Tab" on page 108*.
- **Details:** Lists some or all of the following information for each job:
  - **Job type:** (such as **Hadoop Custom Jar**).
  - **App Name:** Name of the application running the job (such as **teragen**).
  - **Worker Count:** For transient jobs, number of Worker nodes assigned to the transient cluster for that job.
  - **Master Node Flavor:** For transient jobs, displays the name and definition of the flavor used for the Master node. See *"EPIC Settings" on page 113*.
  - **Worker Node Flavor:** For transient jobs, displays the name and definition of the flavor used for the Worker node(s). See *"EPIC Settings" on page 113*.
  - **Persistent Cluster:** For jobs assigned to a persistent cluster, the name of the cluster to which the job is assigned. Clicking a cluster name opens the **<Cluster>** screen for the selected cluster. See *"Viewing Cluster Details" on page 26*.
  - **ClusterFS:** While a transient job is running, clicking the **ClusterFS** link opens the **<Cluster> Cluster FS Browser** screen for the transient cluster dedicated to that job. See *"Uploading and Downloading Files" on page 36*.
  - **Cluster Details:** While a transient job is running, clicking the **Cluster Details** link opens the **<Cluster>** screen for the transient cluster dedicated to that job. See *"Viewing Cluster Details" on page 26*.
- **Started at:** Date and time the job started.
- **Completed at:** Date and time the job completed.
- **Status:** Current status of the job. See *"Job Statuses" on page 38*.
- **Actions:** The following actions are available for each job:
  - **Clone:** Clicking the gray **Clone** icon (two sheets) in the **Actions** column opens the **Create New Job** screen pre-populated with all of the existing parameters from the job you are cloning, except that the job will be named `<jobname>_n`, where *n* is the number of the current copy. See *"Creating a New Job" on page 18*.
  - **Delete:** Clicking the red **Delete** icon (trash can) in the **Actions** column deletes the job from the tenant. Deleting a running job will immediately end the job. Deleting a job that has completed with or without errors will only remove the job record. A popup warning appears asking you to confirm or cancel the action. Click **OK** to proceed, or **Cancel** to exit without deleting the job. Please see the caution on the previous page.

- **Edit:** Clicking the blue **Edit** icon (pencil) in the **Actions** column opens the **Edit Job** screen. See *"Editing a Job" on page 21*.
- **Setup Log:** Clicking the gray **Setup Log** icon (down arrow in a circle) in the **Actions** column opens the setup log for the selected job. This icon appears for jobs run on transient cluster only. See *"Viewing the Cluster Setup Log" on page 29*.
- **Job Output:** Clicking the orange **Job Output** icon (down arrow in a circle) in the **Actions** column opens the job output log for the selected job. See *"Viewing the Job Setup Log" on page 22*.

3.3.1 - Creating a New Job

Clicking the green **Create** button in the **Job Management** screen or selecting **Create Job** in the **Quick Access** button menu opens the **Create New Job** screen. If you clicked the **Clone** icon next to an existing job, then this screen will be pre-populated with the information cloned from the selected job, which you may accept or edit as needed.To create a new job:

Note: You cannot create a new job if EPIC is in Lockdown mode. See "Lockdown Mode" on page 126.

Note: You cannot use the EPIC interface to run jobs on a Kerberos-protected cluster. You must log directly into the cluster and then run `kinit` for the user who will run the job. This limitation applies to clusters only; it does not apply to Kerberos-protected DataTaps.

1. Enter a name for this job in the **Job Name** field.
2. Select the type of job you are creating using the **Job Type** pull-down menu. The default options are as follows:
   - Hadoop Custom Jar
   - Hadoop Streaming
   - Pig Script
   - Hive Script
   - Impala Script
   - HBase Script
   - Spark - Scala Jar
   - Spark - Java Jar
   - Spark - Python Script

Note: The available options will depend on the images that are installed on the EPIC platform. See "App Store" on page 108.

3. Select the .jar or script file(s), as follows:
   - If you selected **Hadoop Custom Jar**, **Spark - Scala Jar**, or **Spark - Java Jar**, then enter the .jar file and the application name to use in the **Jar File** and **App Name** fields, respectively.
   - If you selected **Hadoop Streaming,** then enter the mapper and reducer scripts to use in the **Mapper Script** and **Reducer Script** fields, respectively.

- If you selected **Pig Script**, **Hive Script**, **HBase Script**, or **Impala Script**, then enter the script path to use in the **Script Path** field.

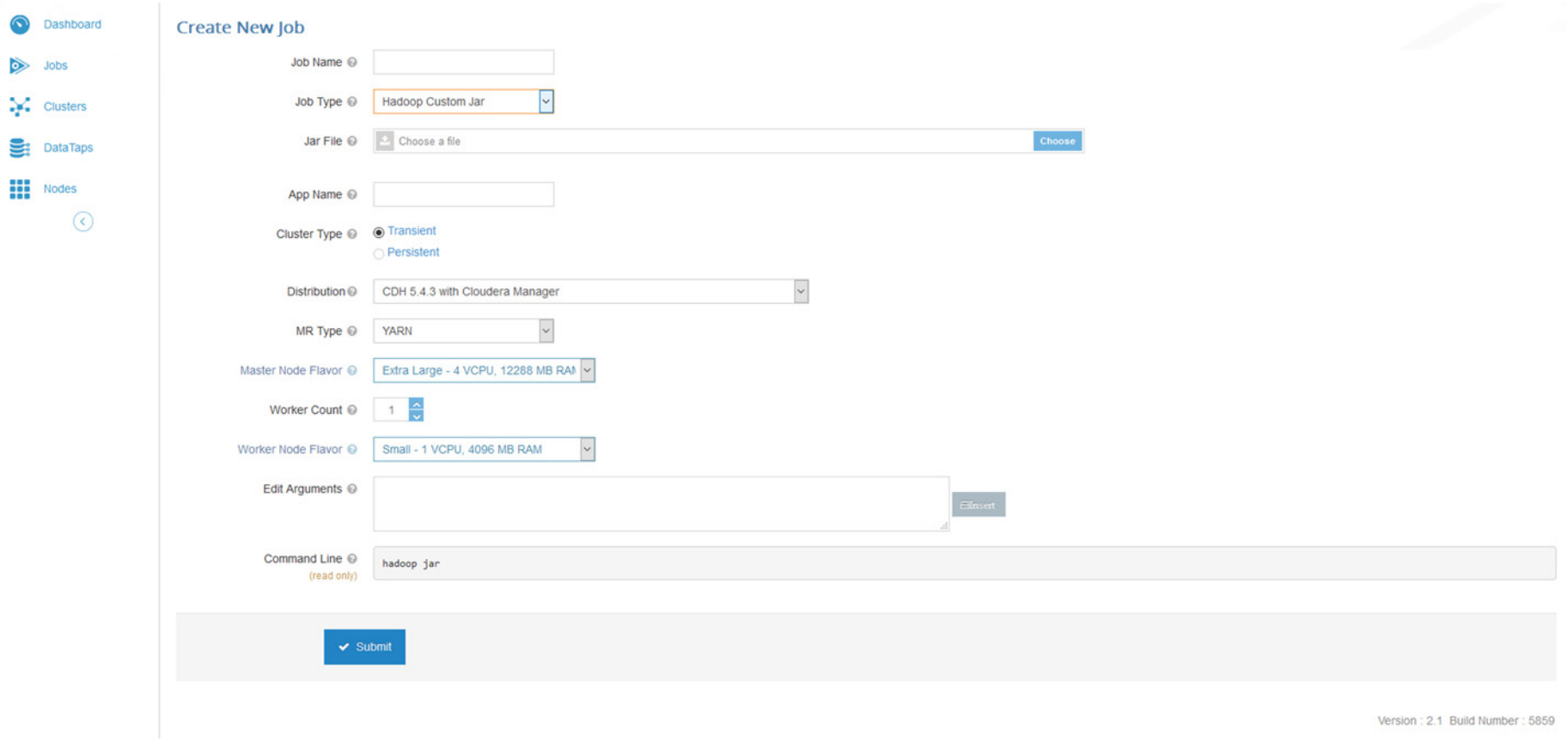


Figure 3.4: Create New Job screen

- If you selected **Spark - Python Script**, then enter the script to use in the **Script File** field.

Clicking a **Choose** button opens a **File Upload** popup, which allows you to upload a script or .jar file.

Please see the *Running Applications in EPIC Guide* for step-by-step instructions and examples for each supported job type.

4. Select the cluster type to use for this job by checking the appropriate **Cluster Type** radio button. You may select either:
   - **Transient:** A transient cluster is created based on your **Worker Count**, **Master Node Flavor**, and **Worker Node Flavor** settings (see Step 8, below) when you create the job and is removed (destroyed) when the job completes. Proceed to Step 5.
   - **Persistent:** A persistent cluster remains in existence independent of individual jobs and can be used again and again. Skip to Step 8.

Note: Jobs requiring Kerberos protection cannot be run on a transient cluster; they must be run on a persistent cluster that has Kerberos enabled.

5. Select the correct Hadoop or Spark distribution to use for this job using the **Distribution** pull-down menu. The available options will depend on the distribution(s) you currently have installed. See *"Images Tab" on page 108*.
6. Select your desired option(s) for the selected distribution in any field(s) that appear below the **Distribution** pull-down menu, such as **MR Type**.
7. If you are running this job on a transient cluster, then:
   - Select the appropriate number of Worker nodes to use for this job using the **Worker Count** menu.
   - Select the flavors to use for the nodes using the **Master Node Flavor** and **Worker Node Flavor** pull-down menus. See the *About EPIC Guide* and *"EPIC Settings" on page 113* for more information about flavors.

   Skip to Step 9.
8. If you selected **Persistent** for the **Cluster Type**, then use the **Cluster** pull-down menu to select the cluster on which you want to run the job. The available choices will be limited to the cluster(s) that are capable of running the selected job type.
9. Enter the following information as needed:
   - If you selected **Hadoop Custom Jar** or any of the **Spark** options as the job type in Step 2, then you may add or edit arguments in the **Edit Arguments** field.
   - If you selected **Hadoop Streaming** as the job type in Step 2, then you must enter an input and output path in the **Input Path** and **Output Path** fields, respectively.

   The **Insert** widget appears next to these fields as a helper. When using this widget:
   - You may modify the URIs in the argument list as needed or manually type in complete URIs from scratch.
   - This widget only assists with creating DataTap URIs. If an argument is a path within the cluster file system, then you must enter paths manually.

10. If you selected one of the **Hadoop** or **Spark** options as the job type in Step 2, you will see a read-only **Command Line** field that allows you to verify the job you are about to run.

When you have finished inputting the job parameters, click **Submit** to save your changes and run the job. If job creation fails with an error, then please see *"Common Job/Cluster Errors" on page B-5* for a list of common errors and how to resolve them.

3.3.2 - Editing a Job

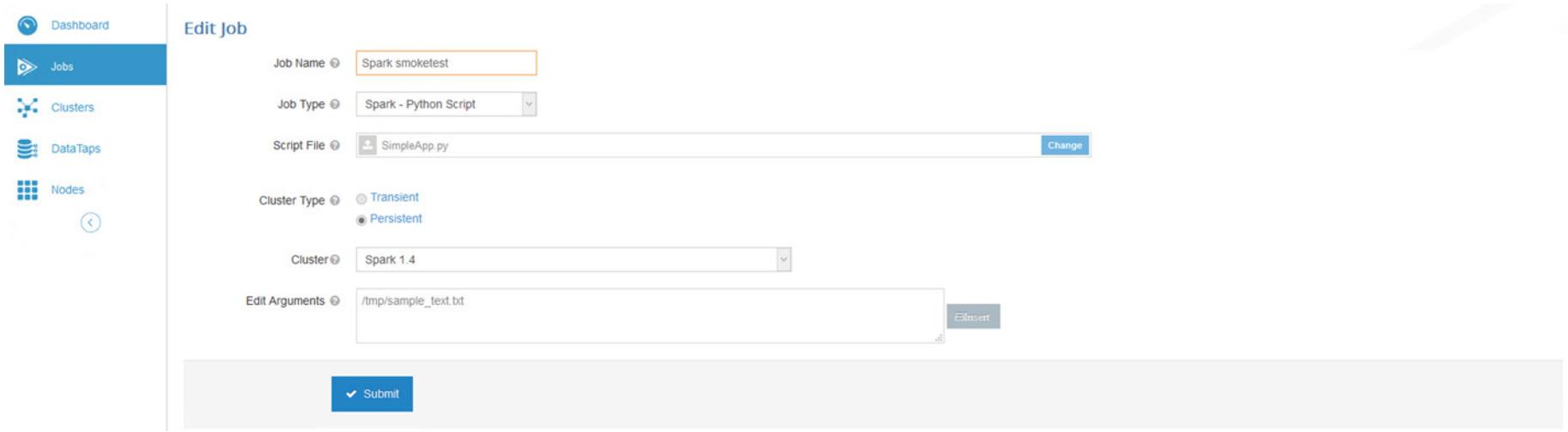
In the **Job Management** screen, clicking the blue **Edit** icon (pencil) for a job opens the **Edit Job** screen for the selected job.

Note: You cannot edit a job if EPIC is in Lockdown mode. See "Lockdown Mode" on page 126.

This screen contains the same fields that appeared on the **Create New Job** screen fields. The fields that appear will vary depending on whether the job is on a transient or persistent cluster, type of job, etc. These fields are read-only when the job is running. When the job is not running, you may edit some of the fields, depending on the job type, type of cluster, etc.

Click the **Submit** button when you have finished editing the job to save your changes.

Figure 3.5: Edit Job screen (persistent cluster; below)



3.3.3 - Viewing the Job Setup Log

In the **Job Management** screen, clicking the gray **Setup Log** icon (down arrow in a circle) in the **Actions** column opens the job setup log for the selected transient job.

Figure 3.6: Job Setup Log

3.3.4 - Viewing the Job Output Log

In the **Job Management** screen, clicking the orange **Job Output** icon (down arrow in a circle) in the **Actions** column opens the job output log for the selected job.

Figure 3.7: Job Output log

3.3.5 - Viewing Job Output

At any time, you may click the name of the job in the **Job Name** column of the **Job Management** screen to open the **<Job> Output** popup, where **<Job>** is the name of the selected job. This popup refreshes every 15 seconds while the job is running, and displays the output being generated by this job. This is the same output that you will receive when retrieving the job output as described in the *Running Applications Guide*.

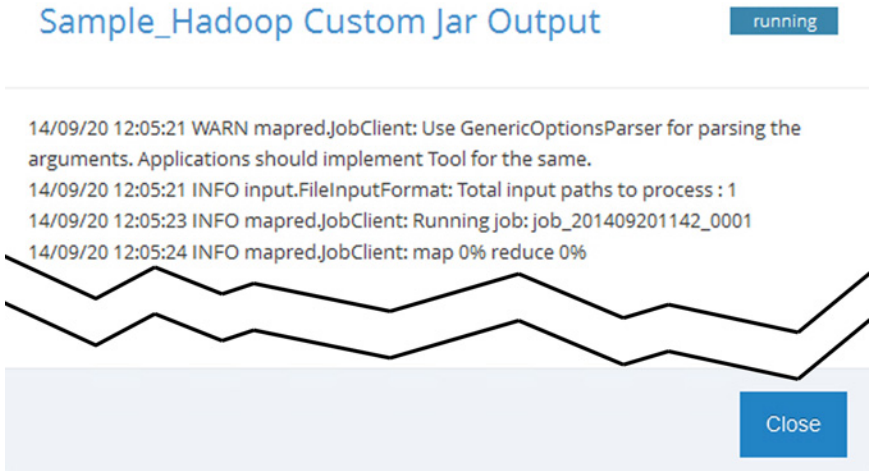


Figure 3.8: Job Output popup

3.4 - Persistent Clusters

Selecting **Clusters** in the main menu opens the **Cluster Management** screen for the tenant, which displays the persistent cluster(s). This screen contains the following buttons:

- **Create:** Clicking this button opens the **Create New Cluster** screen. See *"Creating a New Persistent Cluster" on page 30*.
- **Delete:** Clicking this button deletes the selected cluster(s) from the tenant. A popup warning appears asking you to confirm or cancel the action. Click **OK** to proceed, or **Cancel** to exit without deleting the cluster(s).

CAUTION: YOU CANNOT UNDELETE A CLUSTER. DELETING A CLUSTER IMMEDIATELY ENDS ANY JOB(S) RUNNING ON THE CLUSTER.

CAUTION: WHEN DELETING A CLUSTER WITH KERBEROS PROTECTION, THE USER PRINCIPALS ON THAT CLUSTER MUST BE REMOVED MANUALLY.

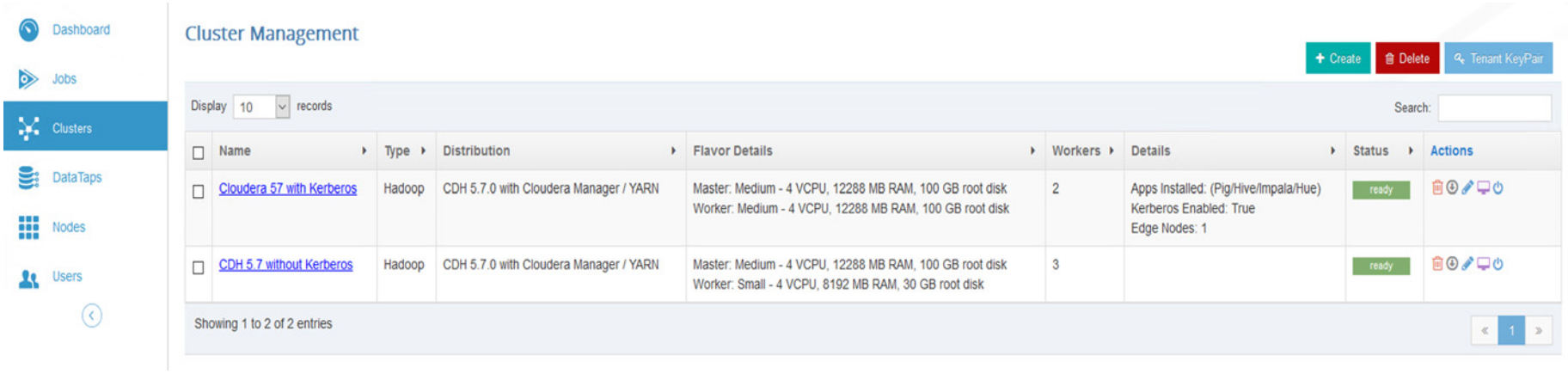


Figure 3.9: Cluster Management screen

- **Tenant KeyPair:** This button appears if you have access to the tenant keypair. Clicking this button icon opens an OS-default **Download** window that allows you to retrieve the tenant SSL certificate (in .pem format) to allow SSH connections to the virtual nodes in a tenant. You cannot connect to the default **Site Admin** tenant via SSH. When connecting to a virtual node using SSH+keypair, the username is `bluedata`.

Note: See "User Management" on page A-1 for additional information on how EPIC handles user authentication, including the ability to SSH into containers using LDAP/AD credentials instead of a keypair.

The table on this screen contains the following information and functions:

- **Name:** Name of the cluster. Clicking a cluster name opens the **<Cluster>** screen for that cluster, where **<Cluster>** is the name of the cluster. See *"Viewing Cluster Details" on page 26*.
- **Type:** Type of cluster (such as **Hadoop** or **HBase**).
- **Distribution:** Distribution and MR type used for the cluster (such as **CDH 5.4.3/YARN**).
- **Flavor Details:** Flavor of the Master and Worker nodes. See the *About EPIC Guide* and *"EPIC Settings" on page 113* for more information about node flavors.

*Note: Click the **Edit** icon (pencil) for a cluster to view the flavor of any Edge node(s) in the cluster. See "Editing a Persistent Cluster" on page 29.*

- **Workers:** Number of Worker nodes under the Master node for the cluster.
- **Details:** Lists some or all of the following information for each cluster:
  - **Apps Installed:** Hadoop application(s) installed on this cluster, such as Pig, Hive, Impala, and/or Hue.
  - **Kerberos Enabled:** Whether (**true**) Kerberos is enabled on the cluster. This does not appear if Kerberos is not installed.
  - **Spark Installed:** Whether (**true**) Spark is installed on the cluster. This does not appear if Spark is not installed.
  - **High Availability:** If YARN high availability has been enabled for the cluster, then the notation **High Availability: On** will appear.
  - **Edge Nodes:** Number of Edge nodes in the cluster. See *"Creating a New Persistent Cluster" on page 30* and *"Add-On Images Tab" on page 110*.
- **Status:** Current status of the cluster. See *"Cluster Statuses" on page 38*.
- **Actions:** The following actions are available for each cluster:
  - **Delete:** Clicking the red **Delete** icon (trash can) in the **Actions** column deletes the cluster from the tenant. A popup warning appears asking you to confirm or cancel. Please see the caution on the previous page.
  - **Setup Log:** Clicking the gray **Setup Log** icon (down arrow in a circle) in the **Actions** column opens the setup log for the cluster. See *"Viewing the Cluster Setup Log" on page 29*.

- **Edit:** Clicking the blue **Edit** icon (pencil) in the **Actions** column opens the **Edit Cluster** screen. See *"Editing a Persistent Cluster" on page 29*.
- **Hosts File Info:** Clicking the purple **Hosts file info** icon (monitor) opens the hosts file for the selected cluster in a new browser tab/window.
- **Reboot:** Clicking the blue **Reboot** icon (power button) reboots the cluster. A confirmation dialog appears. Click **OK** to proceed with the reboot.

3.4.1 - Viewing Cluster Details

Clicking a cluster name in the **Cluster Management** screen or clicking the **Cluster Details** link in the **Job Management** screen for a transient job opens the **<Cluster>** screen for that cluster, where **<Cluster>** is the name of the cluster. This screen has the following tabs:

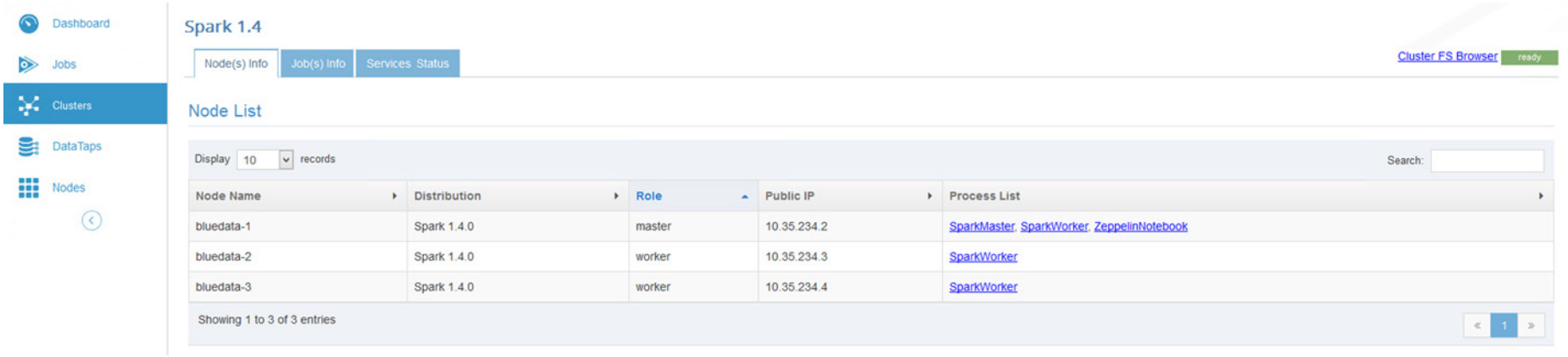
- **Node(s) Info:** See *"Node(s) Info Tab" on page 26*.
- **Job(s) Info:** See *"Job Name: Name of the job." on page 27*.
- **Service(s) Status:** This tab displays the status of various cluster services. See *"Service(s) Status Tab" on page 28*.

3.4.1.1 - Node(s) Info Tab

The **Node(s) Info** tab of the **<Cluster>** screen contains the **Node List** table. This table displays the following information for each of the nodes in the selected cluster:

- **HBase Client Configuration:** This link appears for HBase clusters only. Clicking this link opens the **Client Config Information** popup, which displays configuration information for the cluster.
- **Node Name:** Name of the node.

Figure 3.10: Node(s) Info tab (below)

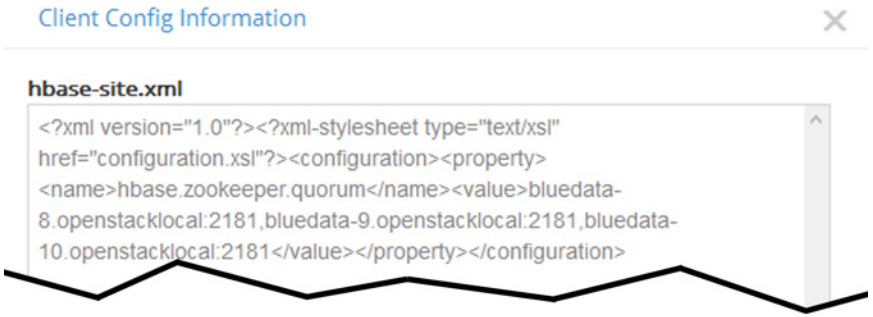


- **Distribution:** Distribution type used for the node.
- **Role:** Whether the node is a Master (**master**), Worker (**worker**), or Edge (**edge**) node. If YARN High Availability is enabled, this column may also say **arbiter** or **standby**, as appropriate.
- **Public IP:** IP address used to access the node.
- **Process list:** List of currently running services. Clicking an item in this list opens the Web interface for the selected service (including third-party tools such as Cloudera Manager or Ambari, if included in the cluster), if your network includes a route from the computer you are using to view EPIC to the Controller node. See the *About EPIC Guide* for requirements.

3.4.1.2 - Job(s) Info Tab

The **Job(s) Info** tab of the **<Cluster>** screen contains the **Running/Finished Jobs** table. This table displays the following information for available jobs:

Figure 3.11: Client Config Information popup (below)



- **Job Name:** Name of the job.
- **Job Details:** Lists the following information for each job:
  - **Job type:** (such as **Hadoop Custom Jar**).
  - **App Name:** Name of the application running the job (such as **teragen**).

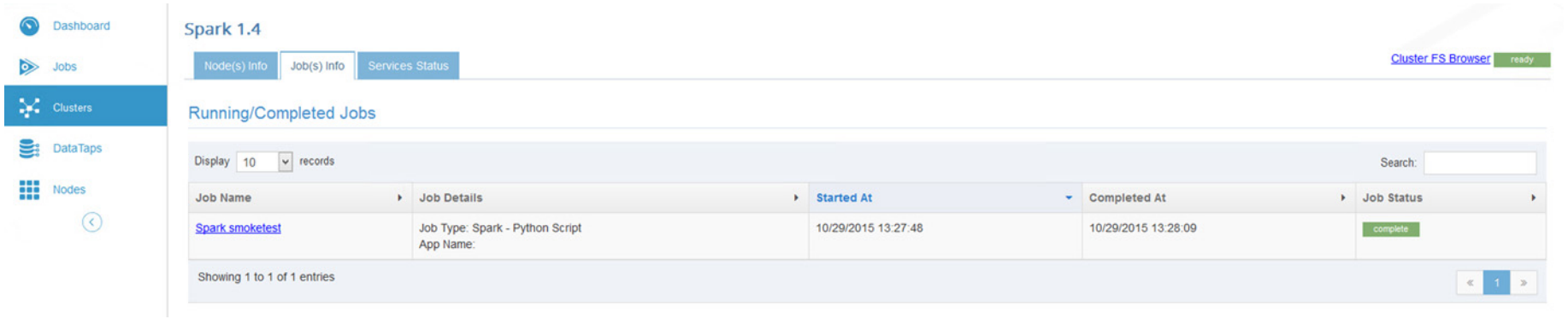


Figure 3.12: Job(s) Info tab

- **Started at:** Date and time the job started.
- **Completed at:** Date and time the job completed.
- **Job Status:** Current job status. See *"Job Statuses" on page 38*.

3.4.1.3 - Service(s) Status Tab

The **Service(s) Status** tab appears after the **Job(s) Info** tab. This tab has the following two groups of information:

- **Application Services:** Contains any services that are specific to that distribution.
- **BlueData:** Contains the common BlueData management services, such as the **BlueData Agent**.
- Additional groups may also appear, depending on the cluster configuration. These are beyond the scope of this manual.

The status of a service can be either **OK** (green dot), **CRITICAL** (red dot), or **DISABLED** (intentionally not running; gray dot). Hovering the mouse over the status button opens a popup with additional information. In general:

- The Master node for the cluster must not display any red dots. If the master node has one or more error(s), then the cluster may not function properly.
- If all of the dots for a Worker node are red, then that node will not be able to participate in jobs that run on the cluster; however, the cluster as a whole should still perform correctly with a reduced capacity. This situation usually occurs because the host is powered off or has lost network connectivity.
- A Worker node with some red and some green dots may cause some jobs to fail, unless the errors are transient conditions caused by the host powering on or regaining network connectivity.

Please contact BlueData Technical Support if a cluster that is reporting service errors meets all of the following criteria:

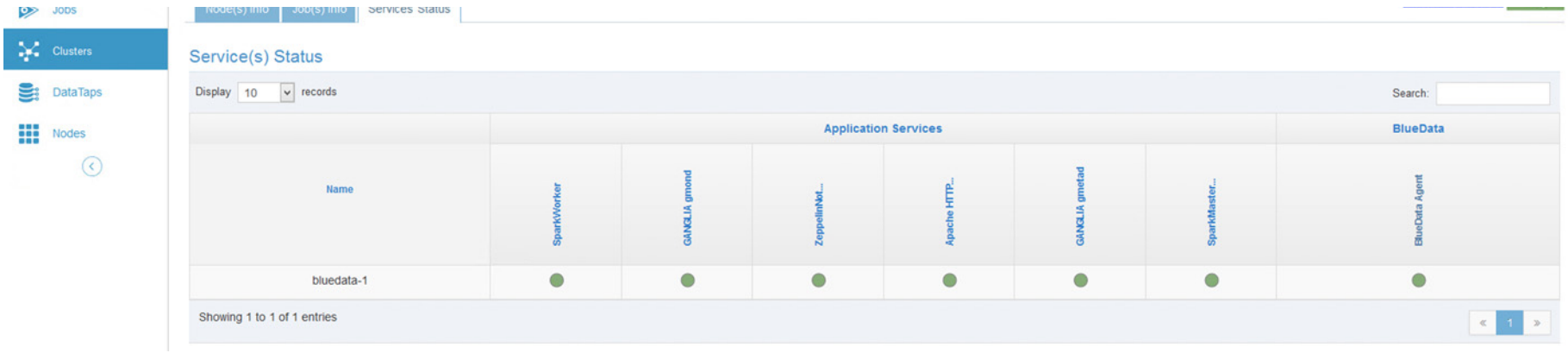


Figure 3.13: Service(s) Status tab

- The EPIC software is completely installed on the affected host(s).
- The host(s) is/are powered on.
- The host(s) has/have network connectivity.

See *"User Management" on page A-1* for more information about resolving errors.

3.4.2 - Viewing the Cluster Setup Log

In the **Cluster Management** screen, clicking the gray **Setup Log** icon (down arrow in a circle) in the **Actions** column opens the setup log for the selected persistent cluster.

3.4.3 - Editing a Persistent Cluster

Clicking the blue **Edit** icon (pencil) for a cluster in the **Cluster Management** screen opens the **Edit Cluster** screen for that persistent cluster.

Note: You cannot edit a cluster when EPIC is in Lockdown mode. See "Lockdown Mode" on page 126.

Note: You cannot add or remove Kerberos protection on an existing cluster.

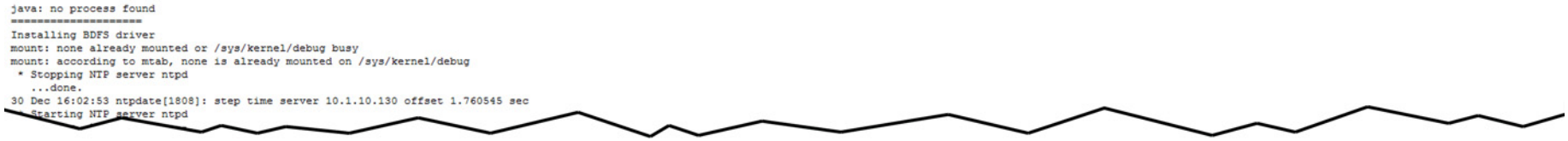
To edit a cluster, you may do one or more of the following:

- Rename the cluster by entering a new name in the **Cluster Name** field.
- Increase or decrease the number of Worker nodes in the cluster by either entering a number in the **Worker Count** field or using the up/down arrows. If an issue occurs, EPIC will place the cluster into a Warning state, allowing you to find and troubleshoot the issue(s).
- Additional properties may also be available depending on how the cluster is set up. Please see *"Creating a New Persistent Cluster" on page 30* for information on the field(s) and menu(s).

When you have finished editing the cluster setting(s), click **Submit** to save your changes to the cluster settings or **Reset** to clear your changes without editing the cluster.

*Note: The **Select Cluster Type**, **Distribution**, **Controller Node Flavor**, and **Worker Node Flavor** menus are read-only, as are Edge node settings. You cannot edit these settings.*

Figure 3.14: Cluster Setup Log (below)



3.4.4 - Creating a New Persistent Cluster

Clicking the green **Create** button in the **Cluster Management** screen or selecting **Create Cluster** in the **Quick Access** button menu opens the **Create New Cluster** screen.

Note: You cannot create a new cluster if EPIC is in Lockdown mode. See "Lockdown Mode" on page 126.

Note: If you are creating a cluster with Kerberos, then you will need to either create user accounts on the virtual nodes directly or make LDAP/AD users available on the cluster nodes. See "Container Access" on page A-5.

To create a new persistent cluster:

1. Enter a name for the new cluster in the **Cluster Name** field.

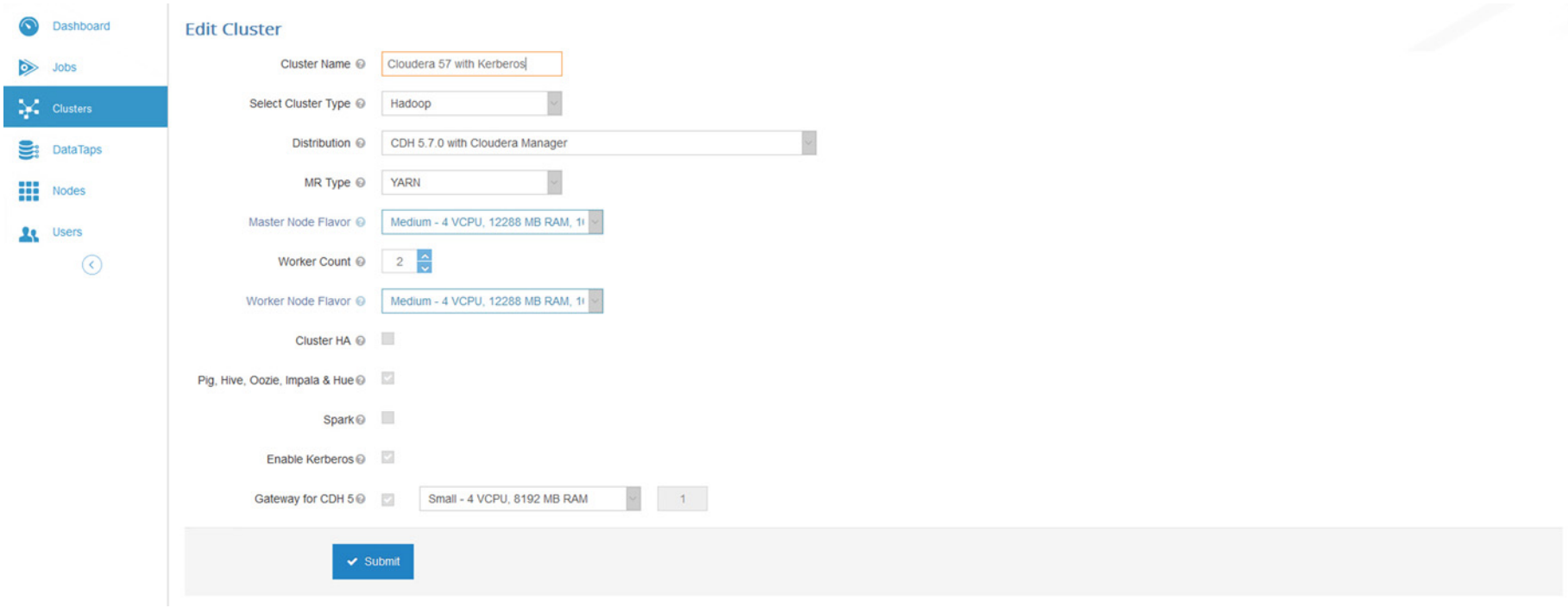


Figure 3.15: Edit Cluster screen

2. Select the cluster type using the **Cluster Type** pull-down menu. The following default options are available and may vary depending on the image(s) installed on the EPIC platform:
   - **Hadoop:** Installs Hadoop on the cluster.
   - **HBase:** Installs both Hadoop and HBase on the cluster.
   - **Spark:** Installs Spark on the cluster.
   - **Splunk:** Installs Splunk Enterprise on the cluster.
   - **Utility:** Installs a plain RHEL or CentOS image with no other applications.

*Note: Hadoop clusters that use a **Cloudera CDH 5.x** distribution can also support running Spark jobs.*

3. Select the correct Hadoop or Spark distribution to use for this cluster using the **Distribution** pull-down menu. If your selected distribution includes an additional application such as Cloudera Manager or Ambari, then that application will be installed when you create the cluster and accessible by clicking the appropriate link in the **Process List** column of the **<Cluster>** screen for that cluster. The available options will depend on the distribution(s) you currently have installed. See *"Images Tab" on page 108*.

*Note: If you select a distribution that includes Cloudera Manager, then you must set the **Master Node Flavor** to one with a minimum of 4vCPU cores and 12GB of RAM. The default **Large** flavor included with EPIC meets this requirement. Selecting a smaller flavor will cause cluster creation to fail.*

4. Select your desired option(s) for the selected distribution in the field(s) that appear below the **Distribution** pull-down menu, such as **MR Type**.
5. Select the desired flavor for the Master node using the **Master Node Flavor** pull-down menu. See the *About EPIC Guide* and *"EPIC Settings" on page 113* for more information about node flavors.
6. Select the number of Worker nodes to use for this cluster by either entering a number in the **Worker Count** field or using the up/down arrows.
7. Select the desired flavor for the Worker node(s) using the **Worker Node Flavor** pull-down menu. Each Worker node in the cluster will have the same flavor. See the *About EPIC Guide* and *"EPIC Settings" on page 113* for more about node flavors.
8. Checking the **YARN High Availability** checkbox enables YARN resource manager high availability within the virtual cluster. This allows the cluster to remain usable if the Master node fails. This option is only available for certain distributions and has the following prerequisites:
   - You must select **YARN** in the **MR Type** pull-down menu.
   - The cluster must have 3 or more Worker nodes.

Enabling YARN high availability also creates additional placement constraints for the virtual nodes, which may cause cluster creation to fail if the EPIC platform is low on available resources.

CAUTION: ENABLING HIGH AVAILABILITY FOR A CLUSTER PROTECTS AGAINST VIRTUAL NODE FAILURE. THIS IS INDEPENDENT OF EPIC PLATFORM HIGH AVAILABILITY FUNCTIONALITY, WHICH PROTECTS AGAINST CONTROLLER HOST FAILURE. PLEASE SEE THE About EPIC Guide FOR MORE INFORMATION.

9. Check the **Applications** checkbox(es) if you want the additional application(s) listed to be installed and configured in your cluster. The available options will vary depending on the distribution you selected in Step 4. For example, if you select one of the **Cloudera CDH** distributions, then this checkbox will allow you to install the Pig, Hive, Impala, Hue, and Spark application(s).
10. If you want to add Kerberos protection to the cluster, then check the **Enable Kerberos** checkbox. You will not be able to edit this setting once the cluster has been created. This option is only available if the **App Store** entry for the selected application has been specifically authored to use the tenant's KDC. The Site Administrator must also have specified a KDC for the current tenant.
11. If you selected cluster parameters that meet the requirements of one or more installed third-party data visualization and analysis application(s) (see *"Add-On Images Tab" on page 110*), then one or more checkbox(es) will appear for the compatible application(s). You can enable any combination of available applications by checking the appropriate checkbox(es) and then using the pull-down menu to select an Edge node flavor to use with that application. Some Edge-node services will also allow you to specify a number of Edge nodes. See *"EPIC Settings" on page 113*.

Note: Edge nodes are virtual nodes like the Master and any Worker node(s) in the cluster and consume the same resources as any other node with the same flavor. For example, if your cluster contains one Master node, three Worker nodes, and two Edge nodes, then the cluster will consist of six virtual nodes.

*Note: You can access any Edge node application by clicking the appropriate link in the **Process List** column of the **‹Cluster›** screen for the selected cluster.*

12. When you have finished inputting the parameters for the new cluster, click **Submit** to create the new persistent cluster. If cluster creation fails with an error, then please see *"Common Job/Cluster Errors" on page B-5* for a list of common errors and how to resolve them.

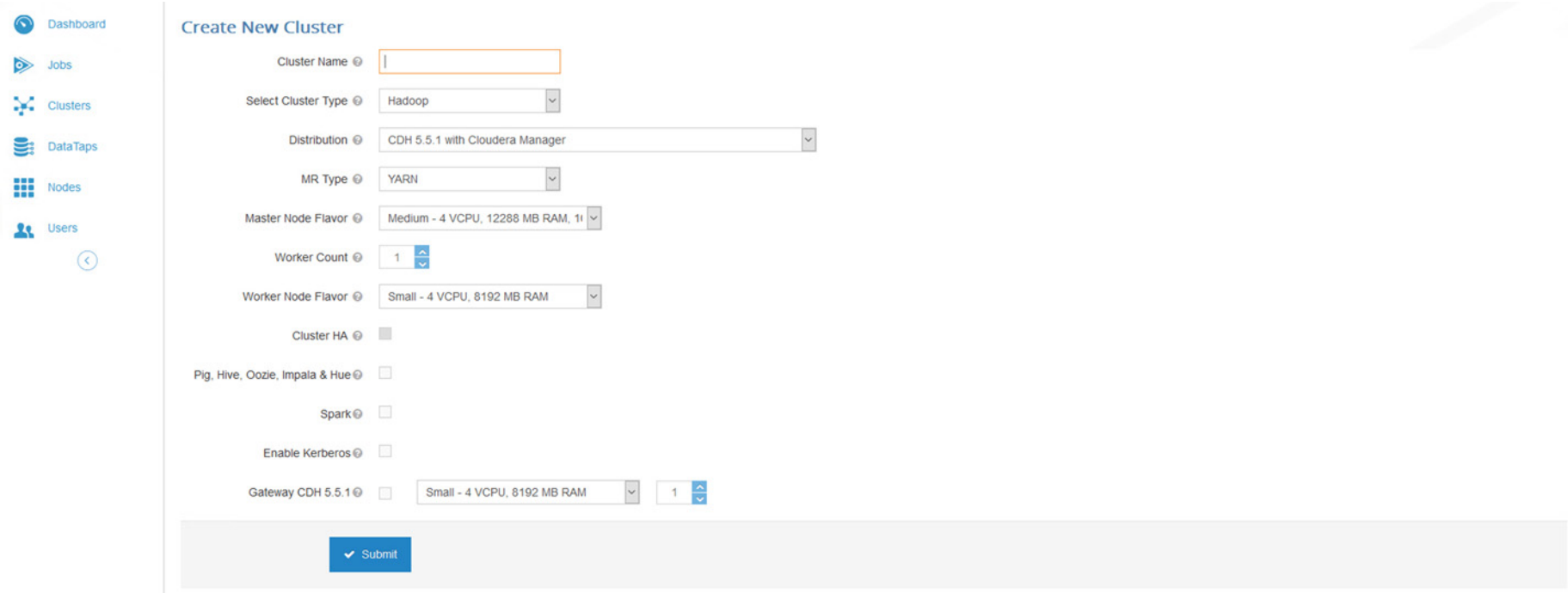


Figure 3.16: Create New Cluster screen

3.5 - Viewing DataTaps

Selecting **DataTaps** in the main menu opens the **DataTaps** screen. This screen displays the following information and is read-only; you cannot edit any of these parameters:

- **Name:** Name of the DataTap. Clicking a name in this column opens the **<DataTap> Browser** screen for the selected DataTap. See *"Uploading and Downloading Files" on page 36*.
- **Description:** Brief description of the DataTap that was entered when the Tenant Administrator created that DataTap. See *"DataTaps" on page 48*.

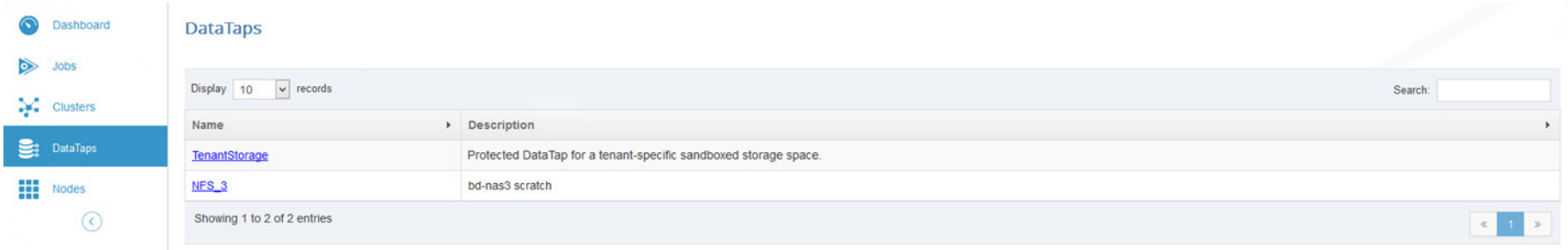


Figure 3.17: DataTaps screen

3.6 - Viewing Nodes

Selecting **Nodes** in the main menu opens the **Nodes** screen, which displays the following read-only information:

- **Name:** Name of the node.
- **Public IP:** IP address used to access that node.
- **Flavor:** Flavor of the node. See the *About EPIC Guide* for more information about flavors and *"EPIC Settings" on page 113* for information about customizing flavors.
- **Distribution:** Image used to deploy the node. See *"Images Tab" on page 108*.
- **Cluster type:** Whether the cluster was created for a specific job only (**Transient**) or exists independently of any job (**Persistent**).
- **Cluster Name:** Name of the job or cluster to which the node belongs.
- **Reboot:** Clicking the blue **Reboot** icon (power switch) reboots the selected node. A confirmation appears. Click **OK** to proceed.

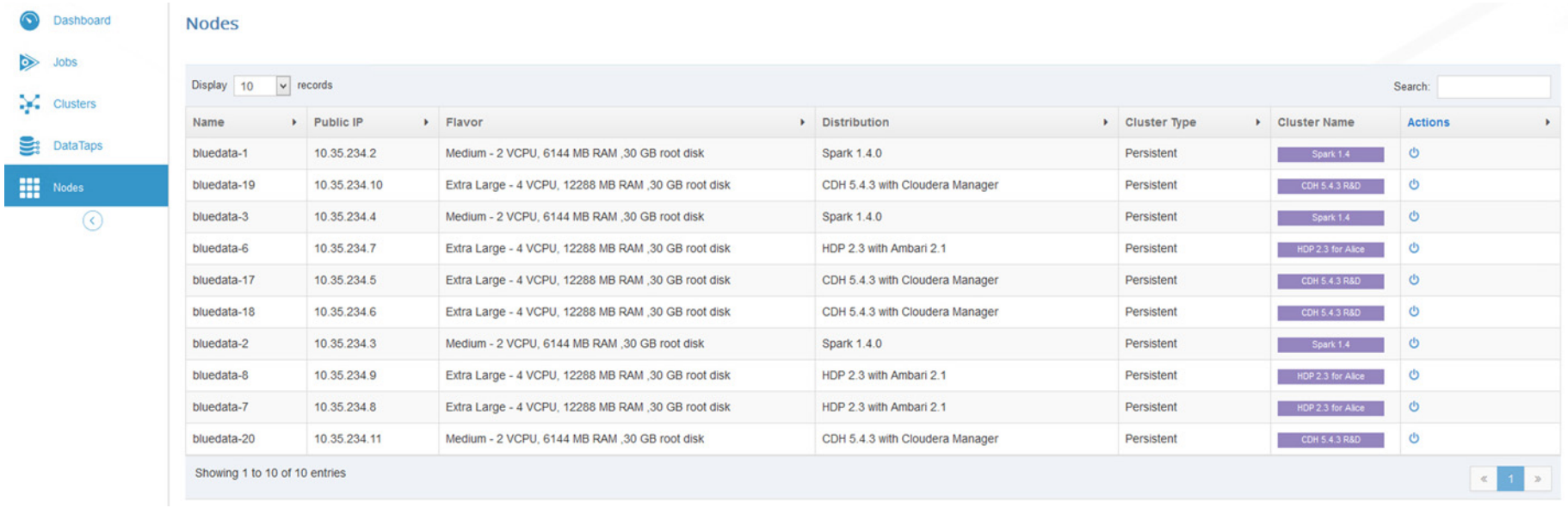


Figure 3.18: Virtual Nodes screen

3.7 - Uploading and Downloading Files

In the **DataTaps** screen, clicking the name of a DataTap opens the **<DataTap> Browser** screen, where **<DataTap>** is the name of the selected DataTap. The bottom of this screen contains an expandable tree view of the directories underneath the root directory of the selected DataTap. In this view:

- Clicking a plus sign (**+**) next to a directory expands that directory to display the file(s) and sub-directories (if any) under the selected directory.
- Clicking a minus sign (-) next to a directory collapses the view of the file(s) and sub-directories (if any) under the selected directory.

When you are browsing locations within a locally shared-storage service created at EPIC install time, the buttons across the top of this screen allow you to perform the following actions (from left to right):

- Selecting a directory and then clicking the green **Create Directory** button (plus sign) opens the **Create new directory under <dir>** window, where **<dir>** is the name of the currently selected directory. Entering a name in the field and then clicking **OK** creates a new sub-directory.
- Selecting a directory or file and then clicking the blue **Rename** button (notepad) opens the **Rename <item>** window, where **<item>** is the name of the currently selected directory or file. Entering a name in the field and then clicking **OK** renames the selected directory or file.
- Selecting a directory and then clicking the gray **Upload** button (up arrow) opens a standard **Upload** dialog, which allows you to navigate to, select, and upload a file to the selected directory. The dialog appearance will vary based on your OS and browser settings.

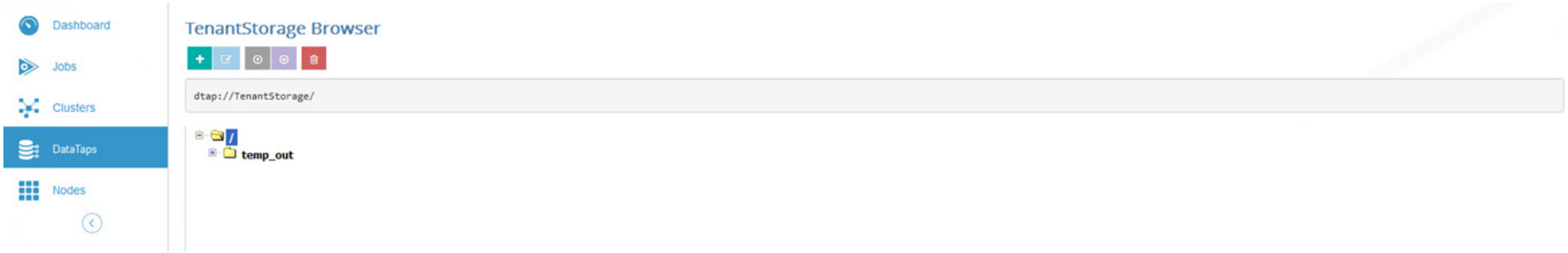


Figure 3.19: <Cluster> Cluster FS Browser screen

- Selecting a file and then clicking the purple **Download** button (down arrow) opens a standard **Save As** dialog, which allows you to save the selected file to a directory on either your local hard drive or any network storage that you have access to.

- Selecting a directory or file and then clicking the red **Delete** button (trash can) deletes the selected directory or file. Deleting a directory also deletes all of the sub-directories and files within that directory.

CAUTION: DO NOT RENAME OR DELETE A DIRECTORY OR FILE THAT IS IN USE, AS THIS COULD CAUSE JOB FAILURES AND OTHER ERRORS. THERE IS NO UNDO FUNCTION WHEN DELETING A DIRECTORY OR FILE.

As noted above, these buttons are only available when browsing locations within the local EPIC shared-storage service. For any other DataTap, this screen will allow you to view the file/directory structure and select paths for various UI purposes. In this case, you will need to upload/download files and/or create/remove directories from outside the EPIC interface using some native client appropriate for the storage service. For certain operations (like creating a directory), it may also be useful to access the DataTap from within a virtual node and then manually perform `hadoop fs` operations on it.

3.8 - Status Messages

EPIC displays status messages for clusters and jobs.

3.8.1 - Cluster Statuses

EPIC displays the following status messages for clusters, as appropriate for each cluster:

- **Created:** EPIC has accepted a command to create or configure the cluster but has not started work yet.
- **Starting:** EPIC is in the process of creating and/or configuring the cluster and virtual nodes. Hovering the mouse over the status button opens a popup with additional progress information.
- **Ready:** The cluster is ready to accept and process jobs.
- **Deleting:** Indicates that EPIC has accepted a command to delete the cluster and is processing that request. Deleting a cluster that has **Error** status will immediately remove that cluster; otherwise, the cluster will remain in the **Deleting** state for some time while EPIC shuts down its virtual nodes.
- **Updating:** The cluster is applying a change to its configuration or its number of virtual nodes.
- **Error:** Cluster creation or expansion has failed. See *"Common Job/Cluster Errors" on page B-5*.
- **Rebooting:** The cluster is rebooting and will become **Ready** once this process completes.

3.8.2 - Job Statuses

EPIC displays the following status messages for jobs, as appropriate for each job:

- **Created:** EPIC has accepted a command to start the job but has not started work yet.
- **Starting:** EPIC is in the process of creating and/or configuring the job and virtual nodes. Hovering the mouse over the status button opens a popup with additional progress information.
- **Deleting:** Indicates that EPIC has accepted a command to delete the job and is processing that request. Deleting a job that has either the **Complete** or **Error** status will immediately remove that job; otherwise, the job will remain in the **Deleting** state for some time while EPIC shuts down its virtual nodes.
- **Running:** The job is currently in progress.
- **Complete:** The job has successfully finished running.
- **Warning:** An attempt to add one or more node(s) to the cluster failed, but the cluster was successfully reverted to its original size. Hovering the mouse over the status button opens a popup with additional information about the failure.

- **Error:** The job failed to run. See *"Common Job/Cluster Errors" on page B-5*.

*Note: EPIC displays the **Complete** and **Error** job statuses based solely on whether or not EPIC was able to set up and execute the job. Errors that occur within the application itself (such as by having an improper argument and/or bad data) are not necessarily reflected as errors in the EPIC job status display. Be sure to review all job output to verify that you obtained the expected results, and rerun the job with any problem(s) fixed if this is not the case.*

3.9 - Changing Your Password

Clicking the **User** button in the **Toolbar** and then selecting **Change Password** opens the **Update User Password** popup.

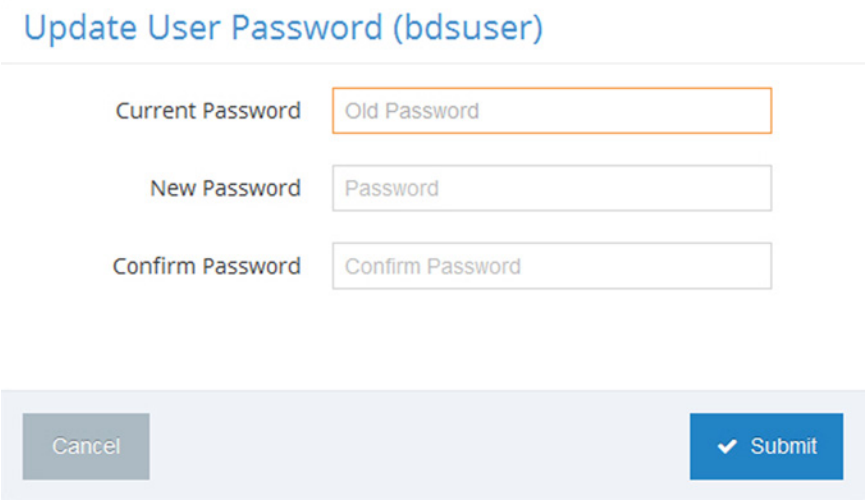


Figure 3.20: Update User Password popup

To change your password:

1. Enter your current (old) password in the **Current Password** field.
2. Enter your new password in the **New Password** field. Passwords are case-sensitive.
3. Confirm your new password in the **Confirm Password** field.

When you have finished entering your new password, click **Submit** to save your changes or **Cancel** to clear your changes without changing your password.

4 - Tenant Administration

This chapter describes the EPIC Tenant Administrator interface. A tenant administrator can perform the following functions:

- **Login to EPIC:** See *"Launching and Logging In" on page 7*.
- **View the Tenant Administrator Dashboard screen:** See *"Viewing the Tenant Admin Dashboard" on page 47*.
- **View, add, edit, and remove jobs:** See *"Jobs" on page 16*.
- **Add, edit, and remove persistent clusters:** See *"Persistent Clusters" on page 24*.
- **Add, edit, and remove DataTaps:** See *"DataTaps" on page 48*.
- **View virtual nodes:** See *"Viewing Nodes" on page 35*.
- **Assign and revoke user roles:** See *"Users" on page 56*.

4.1 - The Tenant Administrator Interface

The Tenant Administrator interface contains the following elements:

Figure 4.1: The Tenant Administrator interface

The following sections describe the numbered callouts in detail.

4.1.1 - Toolbar (1-5)

The **Toolbar** contains the following information/functions from left to right:

- **Quick Status (1):** This area of the **Toolbar** displays (from left to right) the number of jobs, clusters, DataTaps, virtual nodes, and users. Clicking an icon opens the appropriate page, as follows:
  - **Jobs:** Clicking this icon opens the **Job Management** screen. See *"Jobs" on page 16*.
  - **Clusters:** Clicking this icon opens the **Cluster Management** screen. See *"Persistent Clusters" on page 24*.
  - **DataTaps:** Clicking this icon opens the **DataTaps** screen. See *"DataTaps" on page 48*.
  - **Nodes:** Clicking this icon opens the **Nodes** screen. See *"Viewing Nodes" on page 35*.
  - **Users:** Clicking this icon opens the **<Tenant>** screen. See *"Users" on page 56*.

  The currently selected icon appears highlighted in green.
- **Login details (2):** This area displays the following information:
  - Tenant you are currently viewing
  - Your username
  - Your role
- **Quick Access button (3):** Clicking this button opens a pull-down menu with the following options:
  - **Create Job:** Opens the **Create New Job** screen, which allows you to create a new job (see *"Creating a New Job" on page 18*).
  - **Create Cluster:** Opens the **Create New Cluster** screen, which allows you to create a new cluster (see *"Creating a New Persistent Cluster" on page 30*).
  - **Create DataTap:** Opens the **Create New DataTap** screen, which allows you to create a new DataTap (see *"Creating a New DataTap" on page 51*).
  - **Assign Users:** Opens the **Assign Users** screen, which allows you to grant roles to EPIC users within the current tenant (see *"Assigning/Revoking User Roles (Local Authentication)" on page 57*).
- **User Guide (4):** Clicking this link opens this *User & Administrator Guide* in Adobe Acrobat (PDF) format.
- **User button (5):** Clicking this button opens a pull-down menu with the following options:
  - **Tenant:** List of tenants that you have access to, based on your EPIC login credentials. Clicking a tenant opens either the Tenant Administrator **Dashboard** screen (see *"Viewing the Tenant Admin Dashboard" on page 47*) or the Member **Dashboard** screen (see *"Viewing the Member Dashboard" on page 15*, depending on the role you have for the selected tenant.

- **Change Password:** Opens the **Change Password** popup window, which allows you to modify your EPIC password. See *"Changing Your Password" on page 40*.
- **Logout:** Logs you out of EPIC. Once you log out, you will need to log back as described in *"Launching and Logging In" on page 7* to access EPIC.

4.1.2 - Main Menu (6)

The Tenant Administrator main menu contains the following options:

- **Dashboard:** Opens the **Dashboard** screen. See *"Viewing the Tenant Admin Dashboard" on page 47*.
- **Jobs:** Opens the **Job Management** screen, which allows you to view, add, edit, and delete jobs. You may also view various job logs. See *"Jobs" on page 16*.
- **Clusters:** Opens the **Cluster Management** screen, which allows you to create, edit, and delete persistent clusters. See *"Persistent Clusters" on page 24*.
- **DataTaps:** Opens the **DataTaps** screen, which allows you to add, edit, and remove DataTaps. See *"DataTaps" on page 48*.
- **Nodes:** Opens the **Nodes** screen, which allows you to view the virtual nodes that the Site Administrator created for this tenant. See *"Viewing Nodes" on page 35*.
- **Users:** Opens the **<Tenant>** screen, which allows you to assign and revoke user access to the current tenant. See *"Users" on page 56*.

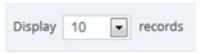
4.1.3 - Menu Expand/Collapse (7)

Clicking the **Expand/Collapse** arrow at the bottom of the main menu toggles the menu between wide (expanded) and narrow (collapsed). This feature maximizes the amount of screen space available for the work area on smaller monitors (such as mobile devices).

4.1.4 - Work Area (8)

The work area is where EPIC screens appear. Various generic functions will be available here, depending on the screen you are accessing. These generic functions may include some or all of the following:

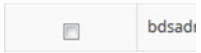
- Use the **Display... records** pull-down menu to select how many records you want to see displayed on a single screen.



- Clicking an up arrow in a table header collapses that table.

- Clicking a down arrow in a table header expands that table.

- Clicking a checkbox in a table selects that item. You may select one or more items and then perform an action on the selected item(s).



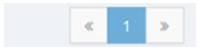
- Clicking the checkbox in a table header selects all of the items in that table.

- Clicking the arrows in a table column sorts the table by the information in that column. For

example, clicking the arrows in the **Tenant Description** column sorts the list of tenants by the description. Repeatedly clicking a column header toggles the display between ascending (A-Z) and descending (Z-A) order.

- Entering one or more keyword(s) in the **Search** field and then pressing [ENTER] returns all records containing the supplied keyword(s). Searches happen in real time; the work area refreshes as you type.

- If a screen contains too many records to display on a single page, you may use the page numbers and arrows to move between pages, as follows:



  - Clicking a page number opens the selected page of the current screen.
  - Clicking the **First Page** (≪) button takes you to the first page of the current screen.
  - Clicking the **Last Page** (≫) button takes you to the last page of the current screen.
- Clicking the **Back to Top** icon at the bottom of a screen scrolls you back to the top of the current screen.

4.2 - Viewing the Tenant Admin Dashboard

Clicking **Dashboard** in the main menu opens the Tenant Administrator **Dashboard** screen, which presents a high-level overview of current activity within this tenant. This screen refreshes every 30 seconds.

The **Dashboard** screen displays the following information:

- **Jobs Charts:** Displays the job setup and run times in seconds for each of the jobs shown in the **Statistics** section.
- **Resource Usage:** Displays graphs showing the following:
  - **Cores Used:** Percentage of virtual CPU cores used and the number of virtual CPU cores available for use in EPIC virtual clusters.
  - **Node/Tenant Storage Used (GB):** Percentage of node/ tenant storage used and the total available storage, in GB.
  - **Memory Used (GB):** Percentage of virtual RAM used (in GB) and the amount of virtual GB of RAM available for use in EPIC virtual clusters.

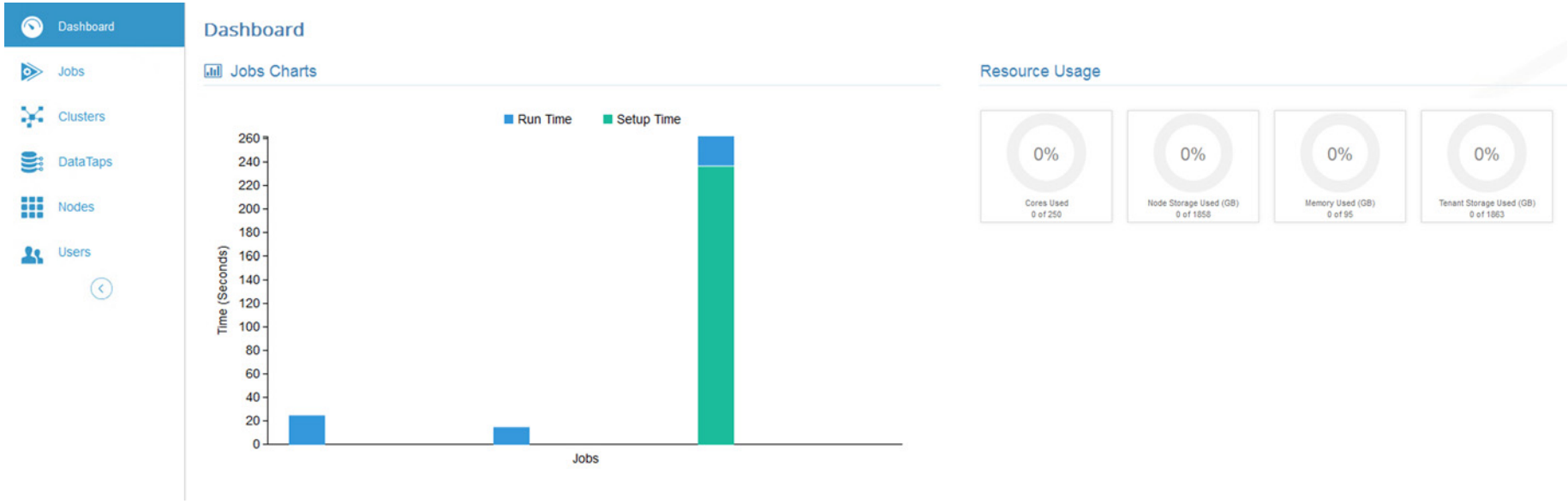


Figure 4.2: Tenant Administrator Dashboard screen

4.3 - DataTaps

Selecting **DataTaps** in the main menu opens the **Manage DataTaps** screen for the tenant.This screen contains the following buttons:

- **Create:** Clicking this button opens the **Create New DataTap** screen. See *"Creating a New DataTap" on page 51*.
- **Delete:** Clicking this button deletes the selected DataTap(s) from the tenant. Deleting a DataTap that is being used by a currently-running job will cause file access errors within that job. A popup warning appears asking you to confirm or cancel the action. Click **OK** to proceed, or **Cancel** to exit without deleting the DataTap(s).

Note: Deleting a DataTap does not affect your data. If you accidentally delete a DataTap, simply create a new one that points to the same location.

The table on this screen contains the following information and functions:

- **Name:** Name of the DataTap. Clicking a name in this column opens the **<DataTap> Browser** screen for the selected DataTap. See *"Uploading and Downloading Files" on page 36*.
- **Description:** Brief description of the DataTap.
- **Host:** DNS name or IP address of the service providing access to the shared storage resource associated with the DataTap. For example, the namenode of an HDFS cluster.
- **Type:** Type of file system used by the storage resource (**HDFS**, or **NFS**).

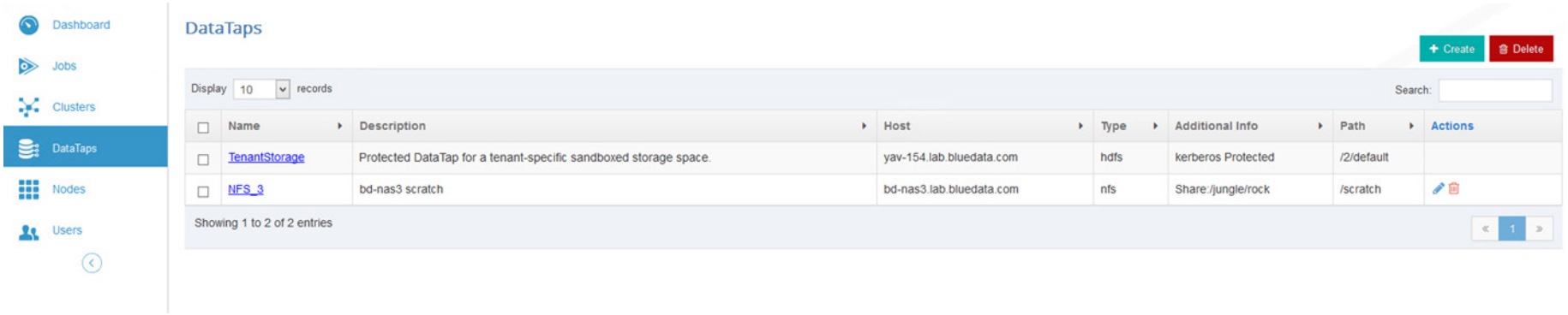


Figure 4.3: DataTaps screen

- **Additional Info:** If appropriate, the NFS share used on the storage resource. This column will also display **Kerberos Protected** for an HDFS DataTap with Kerberos protection enabled.
- **Path:** Location of the root directory of the DataTap within the specified NFS share or HDFS file system. This field is blank if the DataTap points to the root of the specified share/volume/file system.
- **Actions:** The following actions are available for each DataTap:
  - **Edit:** Clicking the blue **Edit** icon (pencil) in the **Actions** column opens the **Edit DataTap** screen. Editing a DataTap that is in use by a running job may cause file access errors within that job. See *"Editing a DataTap" on page 49*. You cannot edit the `TenantStorage` DataTap.
  - **Delete:** Clicking the red **Delete** icon (trash can) in the **Actions** column deletes the DataTap from the tenant. Deleting a DataTap that is being used by a currently-running job may cause file access errors within that job. A popup warning appears asking you to confirm or cancel the action. Click **OK** to proceed, or **Cancel** to exit without deleting the DataTap. Please see the note on this page. You cannot delete the `TenantStorage` DataTap.

4.3.1 - Editing a DataTap

Clicking the **Edit** icon (blue pencil) in the **Actions** column of the **Manage DataTaps** screen opens the **Edit DataTap** screen for the selected DataTap. You cannot edit or delete the `TenantStorage` DataTap.

You also cannot edit a DataTap in a way that will make it point to the tenant storage service outside the tenant's sandbox space. For example, if the tenant storage service is the local HDFS service and the TenantStorage DataTap for this tenant uses the path /2/default, then another DataTap within this same tenant can point to any path on a different storage service; however, if that other DataTap points to the tenant storage service (local HDFS in this example), then its path must begin with /2/default. You may point to subdirectories within this path.

Note: You cannot edit a DataTap if EPIC is in Lockdown mode. See "Lockdown Mode" on page 126.

To edit a DataTap, you may modify some or all of the following:

- **Name:** Rename the DataTap by entering a new name in the **Name** field. This name may contain letters (A-Z or a-z), digits (0-9), and hyphens (-), but may not contain spaces.
- **Description:** Update the description of the DataTap by providing a new description in the **Description** field.
- Select the storage device type (**HDFS**, or **NFS**) using the **Select Type** pull-down menu.

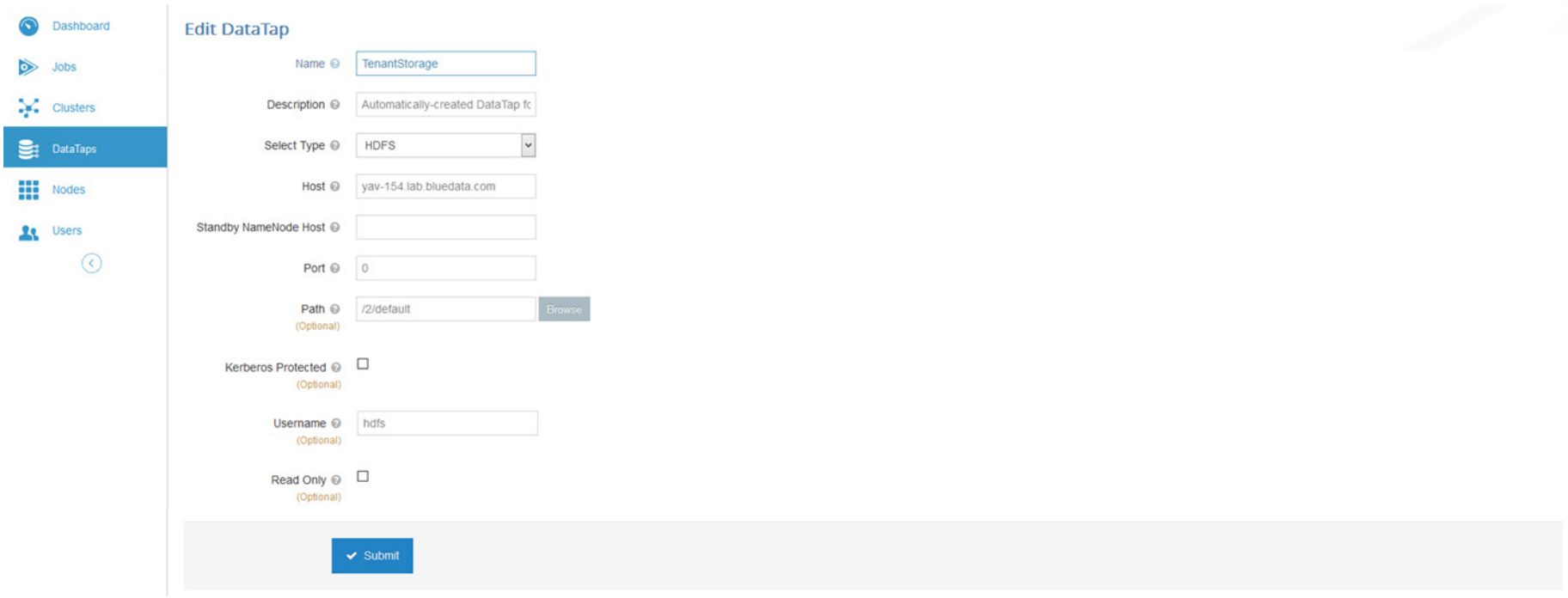


Figure 4.4: Edit DataTap screen

- If you selected **HDFS**, then you may update the following:
  - **Host:** Enter either the hostname or IP address of the HDFS namenode in the **Host** field.
  - **Standby NameNode Host:** Enter the hostname or IP address of the HDFS standby namenode, if any, in the **Standby NameNode Host** field.
  - **Port:** Enter the namenode port number in the **Port** field. Leave blank to use the default HDFS namenode port.
  - **Path:** Enter the HDFS directory under the share to use for the DataTap in the **Path** field. You may also click the **Browse** button to open an explorer window to navigate to the desired directory. You can leave this field blank if you intend the DataTap to point the root of the specified file system.
  - **Kerberos Protection:** You can enable or disable Kerberos protection for the selected DataTap by checking or clearing the **Kerberos Protected** checkbox, as appropriate. See *"Kerberos Security" on page 53*.
  - **Username:** If desired, you may enter a valid username for accessing the HDFS.
- If you selected **NFS**, then you may update the following parameters:
  - **Host:** Enter either the hostname or IP address of the file system host in the **Host** field.
  - **Share:** Enter the name of the share in the **Share** field.
  - **Path:** Enter the directory under the share to use for the DataTap in the **Path** field. You may also click the **Browse** button to open an explorer window to navigate to the desired directory. You can leave this field blank if you intend the DataTap to point the root of the specified share
- You can make a DataTap read only by checking the **Read Only** checkbox. Clearing this checkbox allows read/write access.
- When you have finished modifying the parameters for the DataTap, click **Submit** to modify that DataTap or **Reset** to clear changes without editing the DataTap.

4.3.2 - Creating a New DataTap

Clicking the green **Create** button in the **DataTaps** screen opens the **Create New DataTap** screen.

Note: You cannot create a new DataTap if EPIC is in Lockdown mode. See "Lockdown Mode" on page 126.

DataTaps are created on a per-tenant basis. This means that a DataTap created in Tenant A is not available to Tenant B. You can, however, create two DataTaps (one for each tenant) that point to the identical shared directory. This will allow both tenants to use the same data. You cannot create a DataTap that points to the tenant storage service outside of the tenant's sandbox space.

CAUTION: CREATING MULTIPLE DATAPS TO THE SAME DIRECTORY CAN LEAD TO CONFLICTS AND POTENTIAL DATA LOSS.

To create a DataTap:

1. Enter a name for the DataTap in the **Name** field. This name may contain letters (A-Z or a-z), digits (0-9), and hyphens (-), but may not contain spaces.
2. Enter a brief description for the DataTap in the **Description** field.
3. Select the file system type using the **Select Type** pull-down menu. The available options are:
   - **HDFS:** If you select this option, then proceed to Step 4.
   - **NFS:** If you select this option, then skip to Step 5.

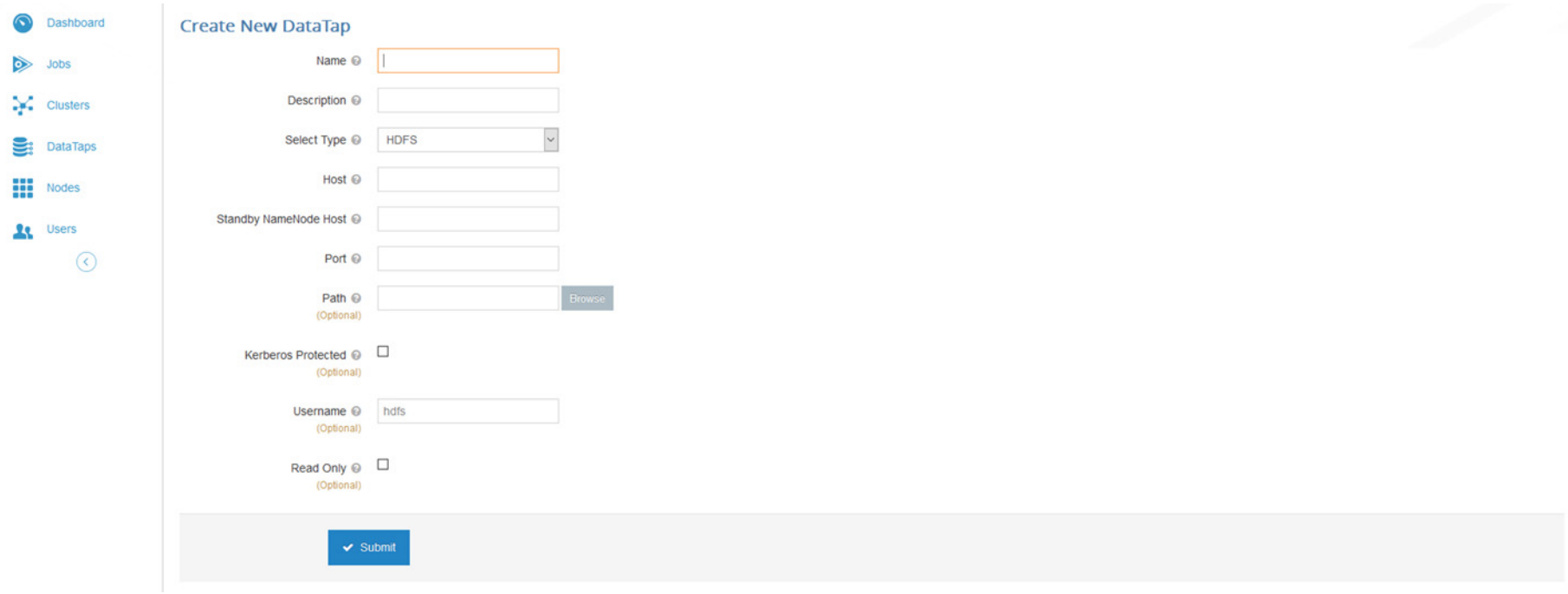


Figure 4.5: Create New DataTap screen

4. If you selected **HDFS** in Step 3, then enter the following parameters:
   - **Host:** Enter either the hostname or IP address of the HDFS namenode in the **Host** field.
   - **Standby NameNode Host:** Enter the hostname or IP address of the HDFS standby namenode, if any, in the **Standby NameNode Host** field.
   - **Port:** Enter the namenode port number in the **Port** field. Leave blank to use the default HDFS namenode port.
   - **Path:** Enter the HDFS directory under the share to use for the DataTap in the **Path** field. You may also click the **Browse** button to open an explorer window to navigate to the desired directory. You can leave this field blank if you intend the DataTap to point the root of the specified file system.
   - **Kerberos Protection:** You can enable or disable Kerberos protection for the selected DataTap by checking or clearing the **Kerberos Protected** checkbox, as appropriate. See *"Kerberos Security" on page 53*.
   - **Username:** If needed, you can enter a valid username for accessing the HDFS.

   Skip to Step 7 after entering the HDFS parameters.
5. If you selected **NFS** in Step 3, then you enter the following parameters:
   - **Host:** Enter either the hostname or IP address of the file system host in the **Host** field.
   - **Share:** Enter the name of the share in the **Share** field.
   - **Path:** Enter the directory under the share to use for the DataTap in the **Path** field. You may also click the **Browse** button to open an explorer window to navigate to the desired directory. You can leave this field blank if you intend the DataTap to point the root of the specified share.

   Also, be sure to configure the NFS device to allow access from each host and each Controller and Worker that will using this DataTap.
6. You can make a DataTap read only by checking the **Read Only** checkbox. Clearing this checkbox allows read/write access.
7. Review the entries you made in Steps 1-6 to make sure they are accurate.

When you have finished modifying the parameters for the DataTap, click **Submit** to create the new DataTap.

4.3.3 - Kerberos Security

EPIC supports DataTaps that reference Kerberos-protected HDFS services. To configure a DataTap for Kerberos-protected HDFS:

1. If you are either adding a new Kerberos-protected DataTap for the first time or editing an existing DataTap and changing the Kerberos principal name then proceed to Step2; otherwise, skip to Step 4.
2. Add the unique Kerberos principal name that will be used to register the DataTap (such as `bluedata`) as a super user by adding the following code snippet to the `core-site.xml` file of the remote HDFS:

```
<property>
      <name>hadoop.proxyuser.bluedata.groups
      </name>
     <value>*</value>
</property>
<property>
      <name>hadoop.proxyuser.bluedata.hosts
      </name>
      <value>*</value>
</property>
```

3. Restart the remote HDFS for the new configuration to take effect.
4. Set the permissions of the base HDFS directory to 777 and then open the EPIC interface for the remaining steps.
5. Check the **Kerberos Protected** checkbox.
6. Enter the following parameters:
   - **KDC Host:** Name or IP address of the Kerberos host(s). You may enter multiple hosts separated by commas. If you enter more than one host, then EPIC will use the first host in the list as the primary Kerberos host and will attempt to use the other host(s) if the primary host is unreachable.
   - **KDC Port:** Post used by the Kerberos host(s). Leave this field blank if not known. If you enter a value in this field, then all of the Kerberos hosts must use the same port.
   - **Keytab File:** Obtain this file from your Kerberos administrator. If needed (and if you have root access to the EPIC Controller node), then you can place this file on your local computer and check the **Yes** radio button under **Upload Keytab File** and then click the **Choose** button in the **Keytab File** field to browse to the file and securely upload it to EPIC. Alternatively, you can check the **No** radio button and then enter the name of a file in the **Keytab File** field. This file must previously have been uploaded to EPIC, either via the interface or manually.

Note: Your organization security policies may not allow you to upload keytab files via the EPIC interface. If you need to manually upload keytab files, then place keytab files used for local HDFS tenant storage in the /srv/bluedata/keytab/site_admin directory on the Controller node. Keytabs used in DataTap definitions are in subdirectories associated with the tenant ID, such as /srv/bluedata/keytab/3.

   - **Client Principal:** This is a unique identity to which Kerberos can assign tickets (such as `bluedata`). Enter the appropriate value in this field.
   - **HDFS Service ID:** Name of the service, as defined by your Kerberos administrator.
   - **Realm:** Name space that helps define access permissions. Obtain this from your Kerberos administrator.
7. Click **Submit** to make your changes.

*Note: To disable Kerberos protection, clear the appropriate **Kerberos Protected** checkbox(es) and then click **Submit**.*

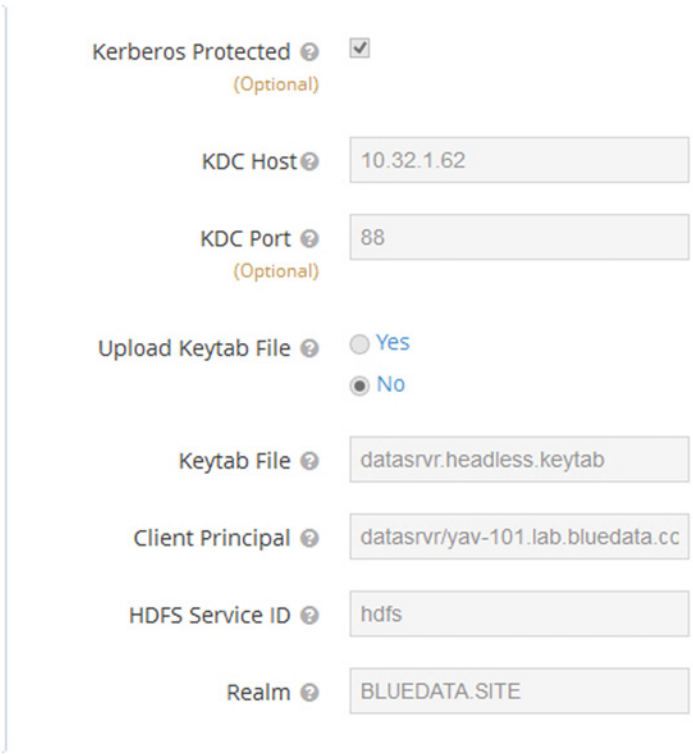


Figure 4.6: Kerberos settings for HDFS storage

4.4 - Users

Selecting **Users** in the main menu opens the **<Tenant>** screen for that tenant (where **<Tenant>** is the name of the tenant).

This screen contains the following buttons:

- **Assign:** Clicking this button opens the **Assign Users** screen. See *"Assigning/Revoking User Roles (Local Authentication)" on page 57*.
- **Revoke:** Clicking this button revokes the selected user's access to the tenant. A popup warning appears asking you to confirm or cancel the action. Click **OK** to proceed, or **Cancel** to exit without revoking the user's role for the tenant.

*Note: If you revoke a user by mistake, you can reassign them to the tenant using the **Assign Users** screen. See "Assigning/Revoking User Roles (Local Authentication)" on page 57.*

The table on this screen contains the following information and functions:

- **Login Name:** Login name of the user.
- **Full Name:** Full name of the user. This will be blank for LDAP/AD users, or if no name was entered when adding the user.
- **Role:** Role of the user within the tenant. A user may have one role per tenant.
- **Revoke:** Clicking the red **Revoke** icon (minus sign) in the **Actions** column revokes the selected user's access to the tenant. A popup warning appears asking you to confirm or cancel the action. Click **OK** to proceed, or **Cancel** to exit without revoking the user's role for the tenant. Please see the note on the left.

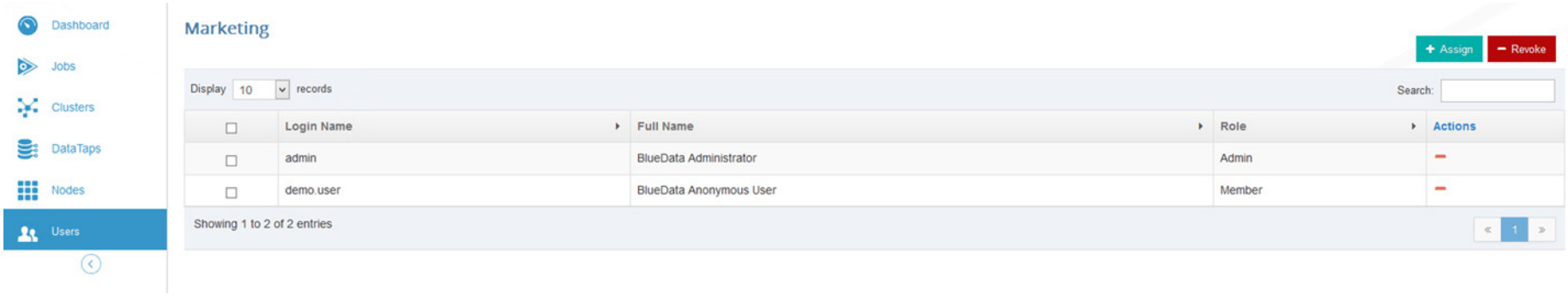


Figure 4.7: <Tenant> screen

4.4.1 - Assigning/Revoking User Roles (Local Authentication)

If the Site Administrator has set EPIC to use **Local** user authentication (see *"User Authentication Tab" on page 114*), then clicking the **Assign** button in the **<Tenant>** screen, selecting **Assign Users** in the **Quick Access** menu opens the **Assign Users** screen, which allows you to assign, change, or revoke user access to the current tenant. See*"Assigning/Revoking User Roles (External Authentication)" on page 58* for information on assigning users if EPIC is set to use LDAP or AD user authentication.

To assign a user to the current tenant or change the user's role within the current tenant (such as from Member to Tenant Administrator or vice versa):

1. On the left side of the screen, select the user you want to assign by selecting that user in the **USERS** list. You may also start typing the username into the **Filter** field, and the list of users will update in real time based on your entry.

- An **A** icon appears by each user who has the Tenant Administrator role assigned to them for the current tenant. A tenant may have multiple administrators. You may either downgrade the role of that user to Tenant Member or remove access to this tenant altogether.
- An **M** icon appears by each user who has the Tenant Member role assigned to them for the current tenant. A tenant may have multiple members. You may either upgrade the role of that user to Tenant Administrator or remove access to this tenant altogether.
- Users who do not have any role in the current tenant may be granted either the Tenant Member or Tenant Administrator role. No icon appears next to these users

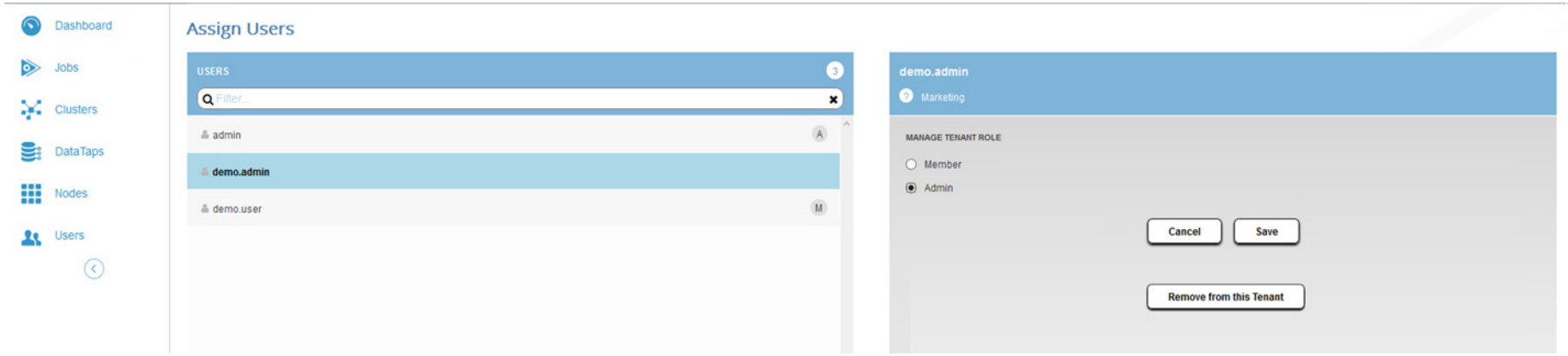


Figure 4.8: Assign Users screen (local authentication)

2. Selecting a user enables the **<user>** section on the right side of the screen, where **<user>** is the username you selected. The name of the tenant to which you are assigning the user also appears below the username.
3. Check the appropriate radio button to assign a role to the selected user. The available options are:
   - **Member:** Makes the user a non-administrative member of the selected tenant.
   - **Admin:** Makes the user a Tenant Administrator of the current tenant.

Note: A user may have one role per tenant. Please see the About EPIC Guide for an explanation of the available roles and the privileges associated with each role.

*Note: Please see "Assigning Users to a Tenant" on page 87 for instructions on assigning the **Site Administrator** role to a user.*

4. Click **Save** to save your changes. A confirmation dialog appears. Click **OK** to return to the **<Tenant>** screen.

Note: This function does not store user passwords. The built-in user database or your existing external authentication server will handle user passwords.

If the selected user already has Member or Tenant Administrator access to the current tenant, you will see a **Remove from this Tenant** button at the bottom right of the **<Tenant>** screen. Clicking this button revokes the user's role and prevents them from being able to access the current tenant. A confirmation dialog appears; click **OK** to proceed with the revocation or **Cancel** to cancel.

4.4.2 - Assigning/Revoking User Roles (External Authentication)

Note: This section describes overriding LDAP/AD group-based roles; however, to avoid confusion and possibly prevent unauthorized access, it is best to handle tenant and role assignments on the external authentication server.

If the Site Administrator has set EPIC to use **LDAP** or **Active Directory** user authentication (see *"User Authentication Tab" on page 114*), then clicking the **Assign** button in the **<Tenant>** screen or selecting **Assign Users** in the **Quick Access** button menu opens the **Assign Users** screen. On this screen, LDAP/AD users who have logged in to EPIC will appear with dark user icons. Users in assigned LDAP/AD groups who have not yet logged into EPIC will not appear on this screen unless manually added.

This screen allows you to:

- View LDAP/AD users who have signed into EPIC.
- Override group role settings for a specific user. See *"Assigning a Role (Listed User)" on page 59*.
- Manually add/assign an external user to the tenant. See *"Proceed to "Assigning a Role (Non-Listed User)" on page 60." on page 60*.
- Temporarily remove one or more user(s) from the tenant. See *"Removing Role Overrides" on page 61*.

4.4.2.1 - Assigning a Role (Listed User)

To override an LDAP/AD group-assigned role for a specific user who is listed on the **Assign Users** screen:

1. On the left side of the screen, select the user you want to assign by selecting that user in the **USERS** list. You may also start typing the username into the **Filter** field, and the list of users will update in real time based on your entry.
   - An **A** icon appears by each user who has the Tenant Administrator role assigned to them for the current tenant. A tenant may have multiple administrators. You may either downgrade the role of that user to Tenant Member or temporarily remove access to this tenant altogether.
   - An **M** icon appears by each user who has the Tenant Member role assigned to them for the current tenant. A tenant may have multiple members. You may either upgrade the role of that user to Tenant Administrator or temporarily remove access to this tenant altogether.
   - Users who do not have any role in the current tenant may be granted either the Tenant Member or Tenant Administrator role. No icon appears next to these users.

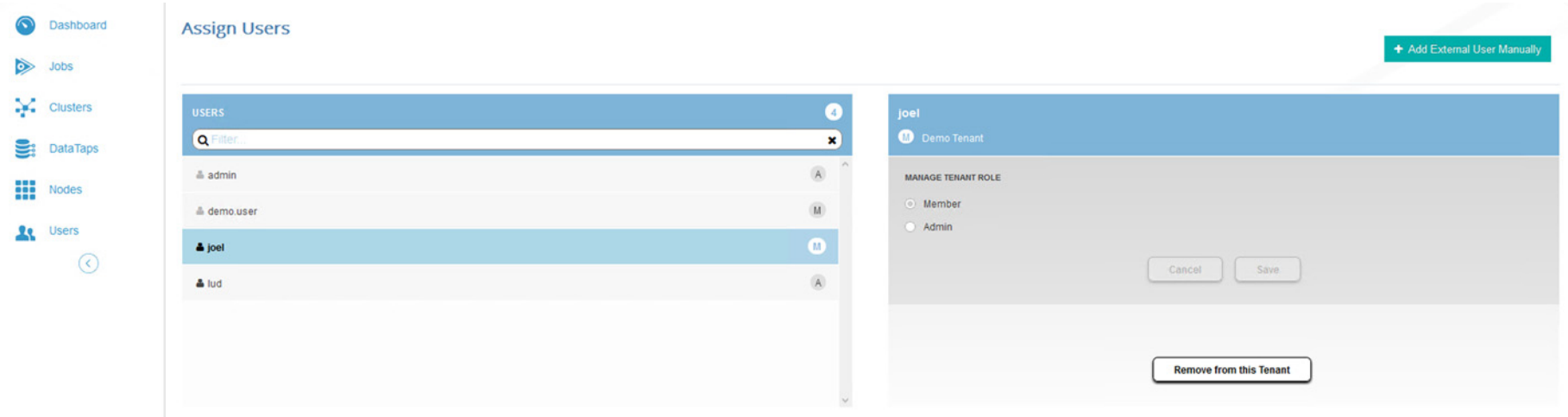


Figure 4.9: Assign Users screen (external authentication)

2. Selecting a user enables the **<user>** section on the right side of the screen, where **<user>** is the username you selected. The name of the tenant to which you are assigning the user also appears below the username. The **MANAGE TENANT ROLES** radio buttons will typically be grayed out because the user's access level is determined by their membership in an LDAP/AD group, as described in *"Creating a New Tenant" on page 81* and *"Editing an Existing Tenant" on page 76*.
3. Click the **Remove from this Tenant** button for the selected user. The selected user will be removed from the **Assign Users** screen.
4. Proceed to *"Assigning a Role (Non-Listed User)" on page 60*.

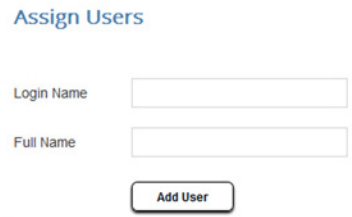
4.4.2.2 - Assigning a Role (Non-Listed User)

To override an LDAP/AD group-assigned role for a specific user who is not listed on the **Assign Users** screen, either because they have not yet logged in to EPIC or because you manually removed them as described in either *"Assigning a Role (Listed User)" on page 59* or *"Removing Role Overrides" on page 61*:

1. Click the green **Add External User Manually** button.

   The top of the **Assign Users** screen expands to display the **Login Name** and **Full Name** fields.
2. Enter the user's login name in the **Login Name** field exactly as it appears on the LDAP/AD server.

Figure 4.10: Manual user fields (below)



3. Enter the full name of the user in the **Full Name** field.
4. Click the **Add User** button.

   The user appears in the **Assign Users** screen. This user has not yet been assigned a role, so no icon appears next to their name. If you leave this as-is, then EPIC will assign the LDAP/AD group role to that user when they log in using the username you provided in Step 2, above.
5. Click the user name. This enables the **<user>** section on the right side of the screen, where **<user>** is the username you selected. The name of the tenant to which you are assigning the user also appears below the username. Click the appropriate radio button to assign one of the following roles:
   - **Member:** Makes the user a non-administrative member of the selected tenant.
   - **Admin:** Makes the user a Tenant Administrator of the current tenant.

Note: A user may have one role per tenant. Please see the About EPIC Guide for an explanation of the available roles and the privileges associated with each role.

*Note: Please see "Assigning Users to a Tenant" on page 87 for instructions on assigning the **Site Administrator** role to a user.*

6. Click **Save** to save your changes. The **Assign Users** screen refreshes to show your changes..

Note: This function does not store user passwords. The built-in user database or your existing external authentication server will handle user passwords.

4.4.2.3 - Removing Role Overrides

If the selected user already has Member or Tenant Administrator access to the current tenant, you will see a **Remove from this Tenant** button at the bottom right of the **Assign Users** screen when that user is selected. Clicking this button removes the user from the **Assign Users** screen and revokes any manually assigned role. A confirmation dialog appears; click **OK** to proceed with the removal or **Cancel** to cancel.

This action revokes any role overrides; however, that user will still be able to log in to EPIC with the tenant role(s) granted to their LDAP/AD group. For example, a user who belongs to an LDAP/AD group with Tenant Administrator privileges can be manually assigned the Tenant Member role for a tenant, and this setting will override the group settings for that user. Removing this user from the **Assign Users** screen removes the role override, and that user will have Tenant Administrator privileges the next time they log into EPIC.

To permanently remove a user from EPIC, you must remove them from the LDAP/AD group. If that user has a current EPIC session, then they will be able to continue accessing EPIC until that session expires; however, a Site Administrator can end the session at any time, as described in "Sessions Tab" on page 92.

See "User Management" on page A-1 for more information on how EPIC handles user authentication.

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5 - Site Administration

This chapter describes the EPIC Site Administrator interface. A site administrator can perform the following functions:

- **Login to EPIC:** See *"Launching and Logging In" on page 7*.
- **View the Site Administrator Dashboard screen:** See *"Viewing the Site Admin Dashboard" on page 69*.
- **Add, edit, and remove tenants:** See *"Tenants" on page 75*.
- **Add, edit, and delete users and sessions:** See *"Managing Users and Sessions" on page 90*.
- **View host status:** See *"Viewing Hosts" on page 95*.
- **View node status:** See *"Viewing Nodes" on page 35*.
- **Manage the EPIC Installation:** See *"Managing the EPIC Installation" on page 98*.
- **Access the EPIC App Store:** See *"App Store" on page 108*.
- **Modify EPIC settings:** See *"EPIC Settings" on page 113*.
- **Generate, download, and delete SOS reports:** See *"Support/Troubleshooting" on page 124*.

5.1 - The Site Administrator Interface

The Site Administrator interface contains the following elements:

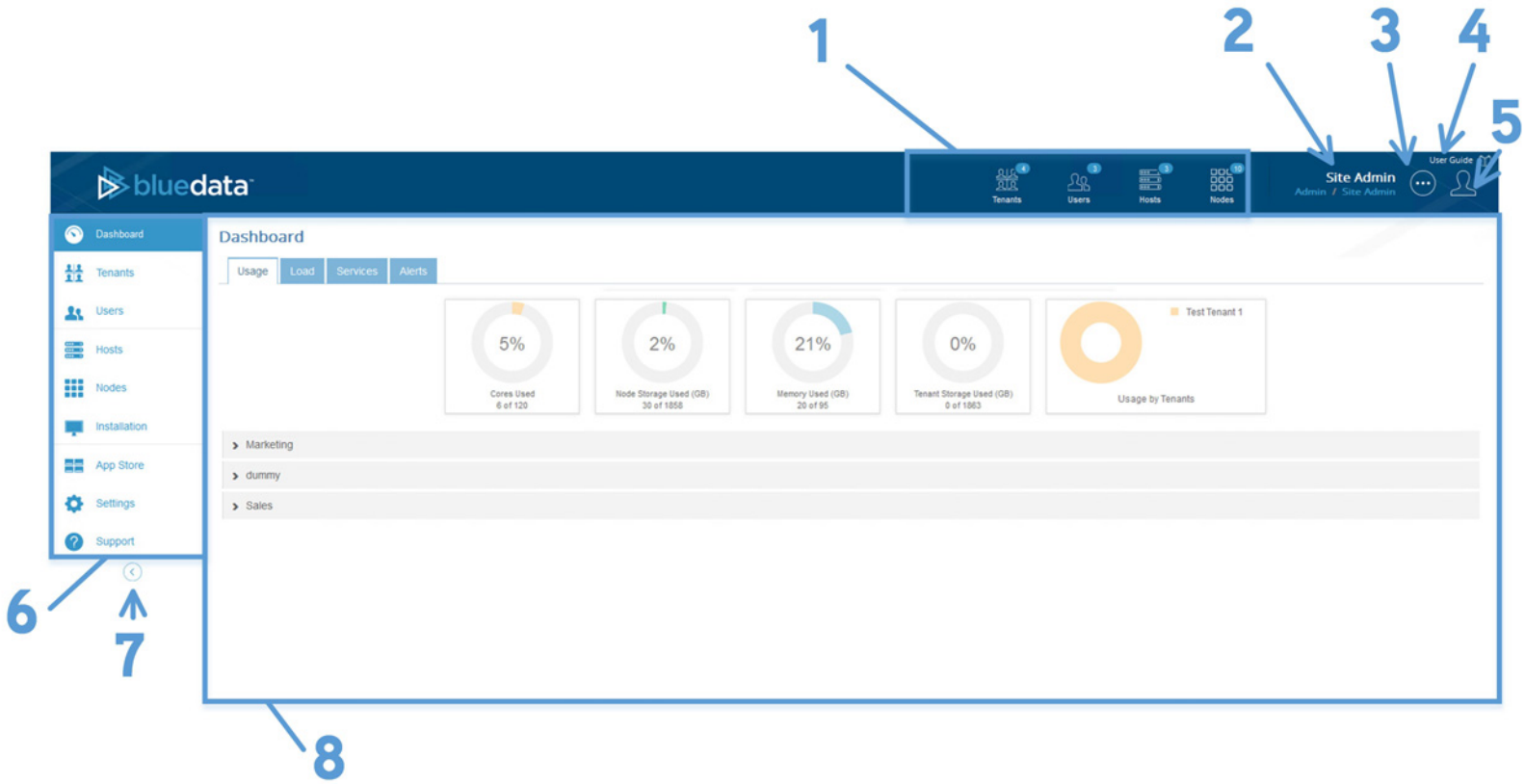


Figure 5.1: The Site Administrator interface

The following sections describe the numbered callouts in detail.

5.1.1 - Toolbar (1-5)

The **Toolbar** contains the following information/functions from left to right:

- **Quick Status (1):** This area of the **Toolbar** displays (from left to right) the number of tenants, users, hosts, and virtual nodes, as follows:
  - **Tenants:** Clicking this icon opens the **Tenant Management** screen. See *"Tenants" on page 75*.
  - **Users:** Clicking this icon opens the **User Management** screen. See *"Managing Users and Sessions" on page 90*.
  - **Hosts:** Clicking this icon opens the **Hosts** screen. See *"Viewing Hosts" on page 95*.
  - **Nodes:** Clicking this icon opens the **Nodes** screen. See *"Viewing Nodes" on page 35*.

  The currently selected icon appears highlighted in green.
- **Login details (2):** This area displays the following information:
  - Tenant you are currently viewing
  - Your username
  - Your role
- **User Guide (3):** Clicking this link opens this *User & Administrator Guide* in Adobe Acrobat (PDF) format.
- **Quick Access button (4):** Clicking this button opens a pull-down menu with the following options:
  - **Create Tenant:** Opens the **Create New Tenant** screen, which allows you to create a new EPIC tenant (see *"Creating a New Tenant" on page 81*).
  - **Create User:** Opens the **Create New User** screen, which allows you to add a new user to the local EPIC user database (see *"Creating a New User (Local Authentication)" on page 94*).
  - **Assign Users:** Opens the **Assign Users** screen, which allows you to grant roles to EPIC users (see *"Assigning Users to a Tenant" on page 87*).
  - **Enter/Exit site lockdown:** When enabled, Lockdown mode prevents users from making any changes to the EPIC platform (see *"Lockdown Mode" on page 126*).
- **User button (5):** Clicking this button opens a pull-down menu with the following options:
  - **Tenant:** List of tenants that you have access to, based on your EPIC login credentials. Clicking a tenant opens either the Tenant Administrator **Dashboard** screen (see *"The Tenant Member Interface" on page 11*) or the Member **Dashboard** screen (see *"Viewing the Member Dashboard" on page 15*, depending on the role you have for the selected tenant. The Site Administrator interface opens when you return to the default **Site Admin** tenant.
  - **Change Password:** Opens the **Change Password** popup window, which allows you to modify your EPIC password. See *"Changing Your Password" on page 40*.

- **Logout:** Logs you out of EPIC. Once you log out, you will need to log back as described in *"Launching and Logging In" on page 7* to access EPIC.

5.1.2 - Main Menu (6)

The Site Administrator main menu contains the following options:

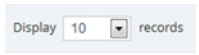
- **Dashboard:** Opens the **Dashboard** screen. See *"Viewing the Site Admin Dashboard" on page 69*.
- **Tenants:** Opens the **Tenant Management** screen, which allows you to add, modify, and delete EPIC tenants. See *"Tenants" on page 75*.
- **Users:** Opens the **User Management** screen, which allows you to view, create, assign, and delete users and sessions. See *"Managing Users and Sessions" on page 90*.
- **Hosts:** Opens the **Hosts** screen, which allows you to view statuses and statistics for the hosts in your EPIC installation. See *"Viewing Hosts" on page 95*.
- **Nodes:** Opens the **Nodes** screen, which allows you to view the nodes that have been created for all tenants and the host(s) those nodes are running on. See *"Viewing Nodes" on page 35*.
- **Installation:** Opens the **Cluster Installation** screen, which allows you to manage Worker nodes. See *"Managing the EPIC Installation" on page 98*.
- **App Store:** Opens the **App Store** screen, which allows you to install and uninstall images for Hadoop/Spark distributions and add-on applications. See *"App Store" on page 108*.
- **Settings:** Opens the **System Settings** screen, which allows you to modify various EPIC settings. See *"EPIC Settings" on page 113*.
- **Support:** Opens the **Support/Troubleshooting** screen, which allows you to generate, download, and delete SOS reports. See *"Support/Troubleshooting" on page 124*.

5.1.3 - Menu Expand/Collapse (7)

Clicking the **Expand/Collapse** arrow at the bottom of the main menu toggles the menu between wide (expanded) and narrow (collapsed). This feature maximizes the amount of screen space available for the work area on smaller monitors (such as mobile devices).

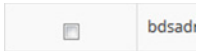
5.1.4 - Work Area (8)

The work area is where EPIC screens appear. Various generic functions will be available here, depending on the screen you are accessing. These generic functions may include some or all of the following:



- Use the **Display... records** pull-down menu to select how many records you want to see displayed on a single screen.
- Clicking an up arrow in a table header collapses that table.
- Clicking a down arrow in a table header expands that table.

- Clicking a checkbox in a table selects that item. You may select one or more items and then perform an action on the selected item(s).

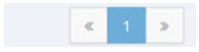


- Clicking the checkbox in a table header selects all of the items in that table.

- Clicking the arrows in a table column sorts the table by the information in that column. For example, clicking the arrows in the **Tenant Description** column sorts the list of tenants by the description. Repeatedly clicking a column header toggles the display between ascending (A-Z) and descending (Z-A) order.

- Entering one or more keyword(s) in the **Search** field and then pressing [ENTER] returns all records containing the supplied keyword(s). Searches happen in real time; the work area refreshes as you type.

- If a screen contains too many records to display on a single page, you may use the page numbers and arrows to move between pages, as follows:



  - Clicking a page number opens the selected page of the current screen.
  - Clicking the **First Page** (<<) button takes you to the first page of the current screen.
  - Clicking the **Last Page** (>>) button takes you to the last page of the current screen.
- Clicking the **Back to Top** icon at the bottom of a screen scrolls you back to the top of the current screen.

5.2 - Viewing the Site Admin Dashboard

Clicking **Dashboard** in the main menu opens the Site Administrator **Dashboard** screen, which presents a high-level overview of current EPIC activity. This screen refreshes every 30 seconds. The following tabs are available:

- **Usage:** This tab displays usage information on a per-tenant basis. See *"Usage Tab" on page 69*.
- **Load:** This tab displays load statistics for the CPU, memory, and network resources within the EPIC installation. See *"Load Tab" on page 69*.
- **Services:** This section displays the health status for each component service within the EPIC platform for each host. See *"Services Tab" on page 71*.
- **Alerts:** This tab displays any alert messages generated by the system. See *"Alerts Tab" on page 74*.

5.2.1 - Usage Tab

The top of the **Usage** tab displays dials showing the following information:

- **Cores Used:** Percentage of available virtual CPU cores being used by all of the tenants in the EPIC platform.
- **Node Storage Used (GB):** Percentage of available node storage being used by all of the nodes in the EPIC platform.
- **Memory Used (GB):** Percentage of available RAM being used by all of the tenants in the EPIC platform.
- **Tenant Storage Used (GB):** Percentage of available tenant storage being used by all of the tenants in the EPIC platform.
- **Usage by Tenants:** Relative amount of available resources used by each tenant in the EPIC platform.

The bottom of this tab contains an expandable list of all tenants in the EPIC platform. Expanding a tenant displays the **Cores Used**, **Node Storage Used (GB)**, **Memory Used (GB)**, **Tenant Storage Used (GB)**, and the number of **Running Clusters** being used by that tenant. This number is expressed as **`x of y`**, where **`x`** is the allotted number and **`y`** is either the quota or total system resources if no quota has been set. If one or more ready clusters and/or running jobs are present, then you will see the **Running Clusters** indicator.

5.2.2 - Load Tab

The **Load** tab displays a series of dials and charts that show the following information for the selected time period:

- **Load:** The dial shows the current average percentage of host CPU cores used by the EPIC platform (defined as the number of CPU cores in use vs. the total number of available CPU cores). Clicking the **Load Average** sub-tab beneath the dials opens an accompanying chart that displays the average load over the selected time period.

- **CPU%:** The dial indicates the current percentage of host CPU utilization across all cluster processes that are currently running. Clicking the **CPU** sub-tab beneath the dials opens an accompanying chart that displays the average CPU percentage over the selected time period.
- **Memory (GB):** The dial indicates the current use of host memory across all cluster processes. Clicking the **Memory** sub-tab beneath the dials opens an accompanying chart that displays the memory usage over the selected time period.
- **Network Mbps:** The dial indicates the current amount of host network bandwidth being used by the cluster. Clicking the **Network** sub-tab beneath the dials opens an accompanying chart that displays network bandwidth usage over the selected time period.

You may adjust the time period for which results appear using the green pull-down menu at the right side of the **Current Load** tab. The available options are:

- Last Hour (default)
- 2 Hours
- 4 Hours

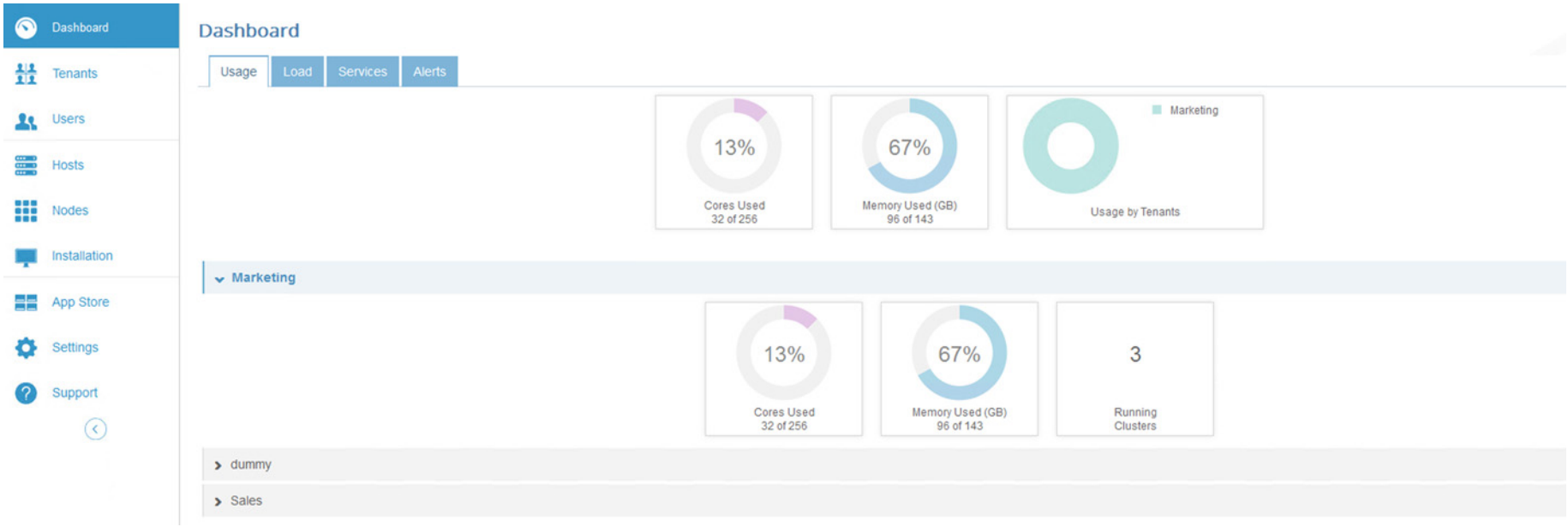


Figure 5.2: Dashboard screen - Usage tab

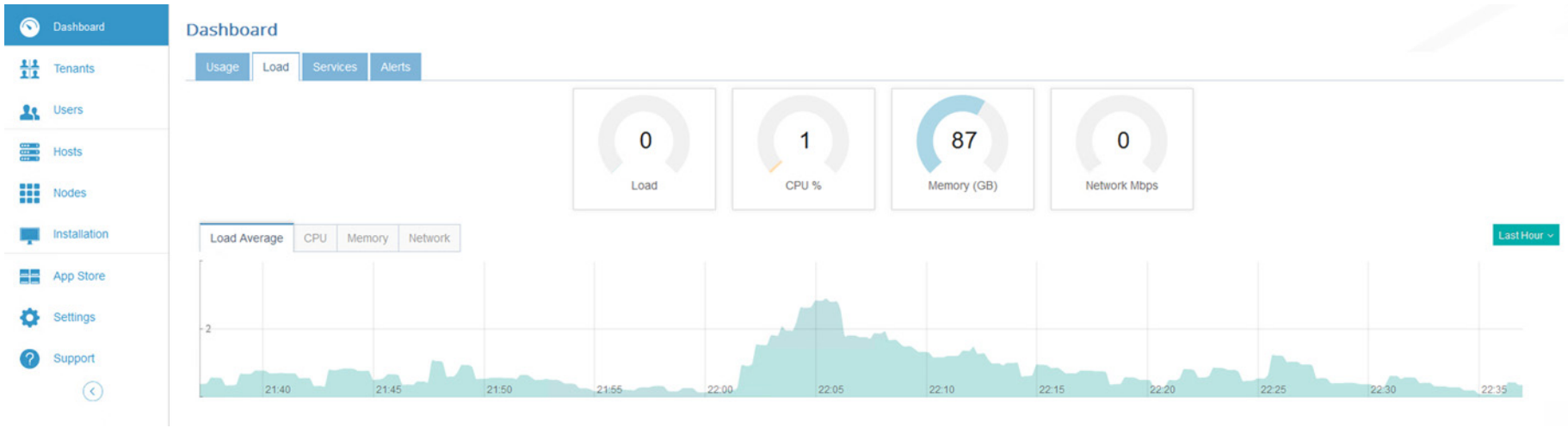
- Day
- Week
- Month
- Year

5.2.3 - Services Tab

The **Services** tab displays the following information for each host in the EPIC platform:

- **Name:** Name of the host.
- **Node Count:** Number of EPIC virtual nodes running on that host.
- **BlueData:** The **BlueData** group in this tab displays the following information:
  - **Management:** Status of the EPIC management service, which handles back-end administration tasks.
  - **Data Server:** Status of the EPIC data service agent, which acts as an intermediary between the file system and other entities. This service establishes communication between a host's virtual nodes and the Caching Node service. On the Controller host, the Data Server also receives DataTap browsing queries from the Management Service.
  - **Caching Node:** Status of the EPIC data service, which communicates with the storage services referenced by DataTaps. This service provides an accelerated I/O channel between those storage services and the applications running in virtual nodes. On the Controller host, this service also provides the back end for DataTap browsing.

Figure 5.3: Dashboard screen - Load tab (below)



- **HA:** This group only appears if High Availability is enabled for the EPIC platform as described in the *About EPIC Guide*, *"Adding Worker Hosts" on page 100*, and *"HA Settings Tab" on page 118*. When enabled, this group displays the following information:
  - **HA Engine:** Health of the High Availability Engine, which is the central High Availability state transitions executing unit. The HA Engine performs various tasks specific to High Availability in response to requests from other services and must be running on both the Controller and Shadow Controller hosts.
  - **HA Status:** Status of the High Availability service. The node for which this service appears is functioning as the Controller host. If this dot is green, then the High Availability host is functioning normally and all hosts (Controller, Shadow Controller, and Arbiter) are up. This dot appears as yellow if one of these three hosts has failed to indicate that the High Availability cluster has been degraded and that the EPIC platform is not protected against any further host failure. If the dot is red, then High Availability protection is not currently functional.

Note: Only one host (either the Controller or Shadow Controller) functions as the Controller at any given time.

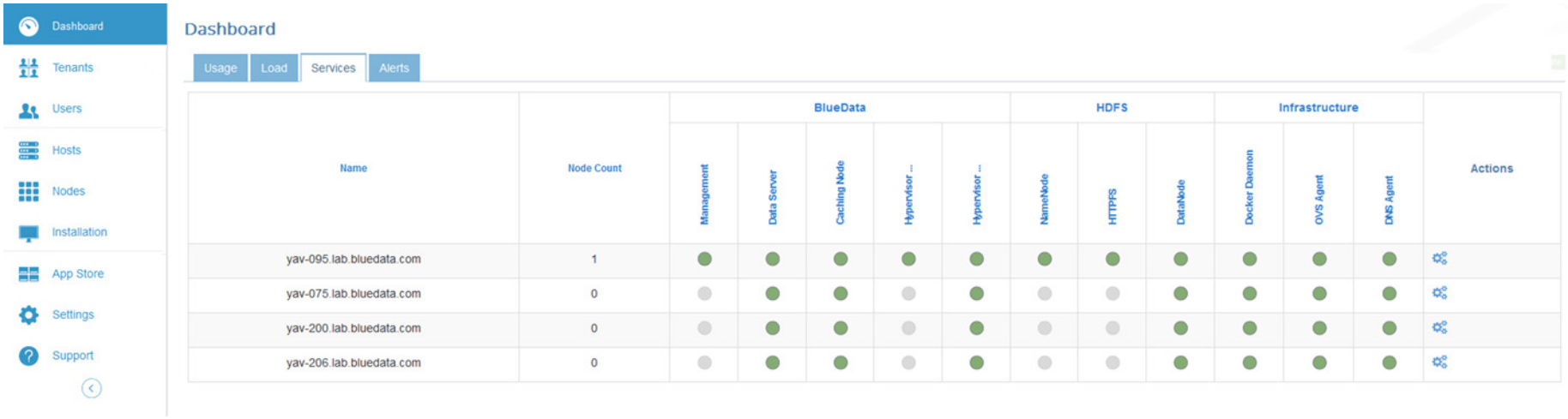


Figure 5.4: Dashboard screen - Services tab

  - **Pacemaker:** Health of the High Availability cluster polling service. This service periodically polls the High Availability cluster and, in the event of a failure, triggers failover state transition in the HA Engine. This service must be running on both the Controller and Shadow Controller hosts.
  - **Cluster Management:** Health of the cluster manager daemon that helps the Pacemaker service perform its periodic polling and trigger failover/failback. This daemon must be running on both the Controller and Shadow Controller hosts.
- **HDFS:** This group only appears if a local HDFS service was established for use as tenant storage when you installed EPIC. Describing the individual items in this group is beyond the scope of this manual.
- **Infrastructure:** Describing the individual items in this group is beyond the scope of this manual.
- **Actions:** The **Actions** column of the table includes a **Check Now** icon (gears) for each host. Clicking this icon refreshes the status of all listed services for the selected host.

The status of a service can be either **OK** (green dot), **CRITICAL** (red dot), or **DISABLED** (intentionally not running; gray dot). Hovering the mouse over the status button opens a popup with additional information. In general:

- The Controller host must not display any red dots. If the Controller host has one or more error(s), then the EPIC platform may not function properly.
- If all of the dots for a Worker host are red, then that host will not be able to provide resources to the EPIC platform. This situation typically occurs because the host has been powered off, has lost network connectivity, or because the EPIC software is not properly installed.
- A Worker host with some red and some green dots may cause some EPIC operations to fail, unless the errors are transient conditions caused by the host powering on or regaining network connectivity.

Please contact BlueData Technical Support if a host that is reporting service errors meets all of the following criteria:

- The EPIC software is completely installed.
- The host is powered on.
- The host has network connectivity.

See *"User Management" on page A-1* for more information about resolving errors.

5.2.4 - Alerts Tab

The **Alerts** tab displays any alert messages from the Caching Node, Data Server, and Management services. An alert is triggered if one or more these services goes into a critical state.

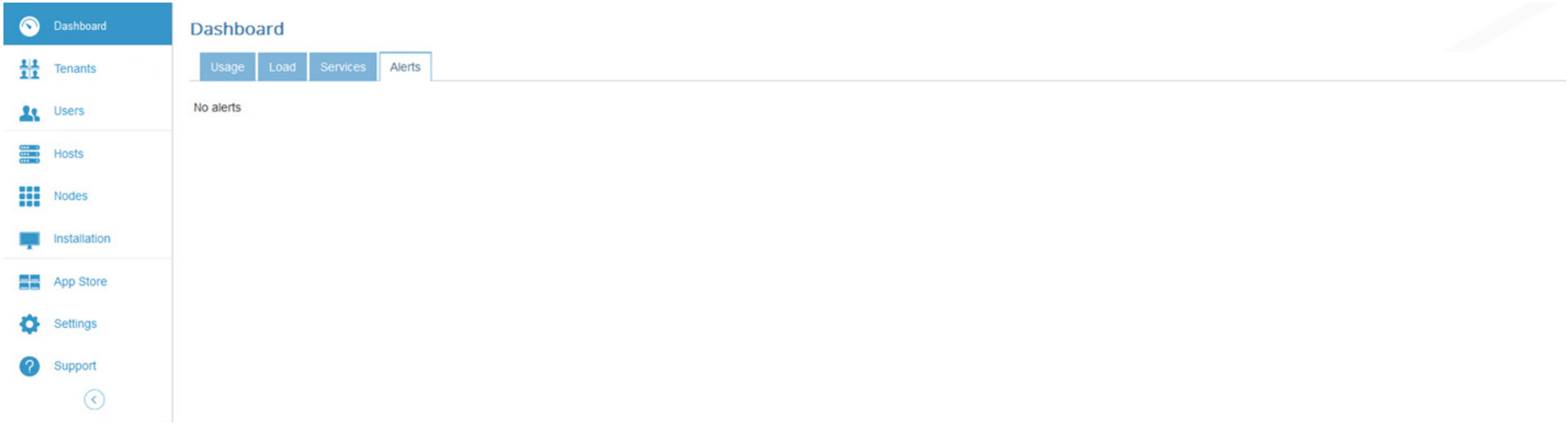


Figure 5.5: Dashboard screen - Alerts tab

5.3 - Tenants

Selecting **Tenants** in the main menu opens the **Tenant Management** screen.

This screen contains the following buttons:

- **Create:** Clicking this button opens the **Create New Tenant** screen. See *"Creating a New Tenant" on page 81*.
- **Delete:** Clicking this button deletes the selected tenant(s), except that you cannot delete the Site Administrator tenant that EPIC creates during the installation process. A popup warning appears asking you to confirm or cancel the action. Click **OK** to proceed, or **Cancel** to exit without deleting the tenant(s). See *"Deleting a Tenant" on page 89*.

CAUTION: YOU CANNOT UNDELETE A TENANT.

The table on this screen contains the following information and functions:

- **Tenant Name:** Name of the tenant. Clicking a tenant name opens the **<Tenant>** screen for that tenant, which allows you assign and revoke user roles. See *"Assigning Users to a Tenant" on page 87*.

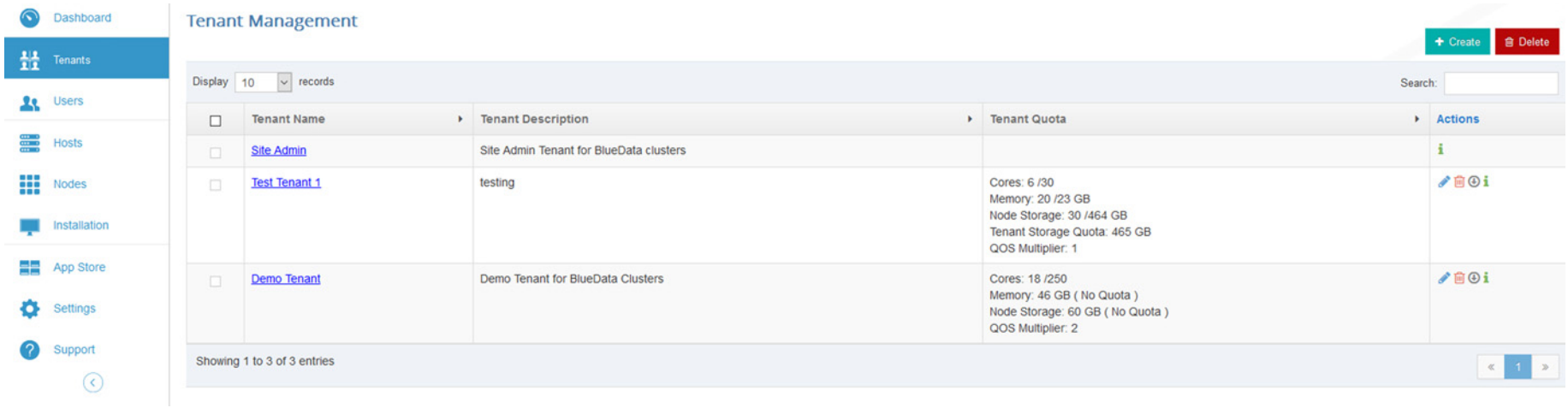


Figure 5.6: Tenant Management screen

- **Tenant Description:** Brief description of the tenant.
- **Tenant Quota:** Resource quotas assigned for the tenant, compared to the total available resources in the system (such as **`Cores=8/16`**). Resource quotas can be assigned for virtual CPU cores, RAM, node storage, and (if tenant storage is local HDFS) tenant storage. If the tenant has no quota for a resource, then the display will show the resources being used (such as **`Cores=8`**) and the message **`(No Quota`**).
- **QOS Multiplier:** EPC uses this number to assign a relative weight to each tenant when allocating system resources.
- **Actions:** The following actions are available for each tenant:
  - **Edit:** Clicking the blue **Edit** icon (pencil) in the **Actions** column opens the **Edit Tenant** screen for the tenant. See *"Editing an Existing Tenant" on page 76*. You cannot edit the **Site Admin** tenant.
  - **Delete:** Clicking the red **Delete** icon (trash can) deletes the selected tenant.
  - **Tenant KeyPair:** Clicking the gray **Download** icon (down arrow in a circle) opens an OS-default **Download** window that allows you to retrieve the tenant SSL certificate to allow SSH connections to the virtual node(s) of a tenant. Certificates are provided in .pem format. You cannot connect to the default **Site Admin** tenant via SSH. When connecting to a virtual node using SSH+keypair, the username is `bluedata` and not `root`. The Site Administrator can download the keypair from this screen regardless of **Tenant Keypair Visibility** settings (see *"Creating a New Tenant" on page 81* and *"Editing an Existing Tenant" on page 76*).
  - **Details:** Clicking the green **Details** icon (letter "i") opens the **<Tenant>** screen for that tenant and assign/revoke user roles. See *"Assigning Users to a Tenant" on page 87*.

5.3.1 - Editing an Existing Tenant

In the **Tenant Management** screen, clicking the blue **Edit** icon (pencil) for a tenant opens the **Edit Tenant** screen for that tenant.

This screen contains the following fields:

- **Tenant Name:** Enter a new name for the selected tenant in this field.
- **Tenant Description:** Enter a brief description of the tenant in this field.
- **Tenant Keypair Visibility:** By default, Tenant Member users created using the current version of EPIC will not be able to download the keypair(s) for the tenant(s) they have access to. This pull-down menu allows you to show the tenant keypair to:
  - **None:** The tenant keypair will not be available to anyone.
  - **Tenant Members:** Tenant Member and Tenant Administrator users will be able to access the keypair for the selected tenant.
  - **Tenant Admin Only:** Only Tenant Administrator users can access the keypair for the selected tenant.Please see *"Authentication Groups" on page A-3* for more information about how EPIC handles user and LDAP/AD group access.

Please see *"Container Access" on page A-5* for more information about how EPIC handles SSH logins to containers.

Note: Tenants created using a previous version of EPIC will be able to access the tenant keypair because this functionality was enabled by default. You can modify this by opening the ***Tenant Management*** *screen and modifying the menu setting.*

5.3.1.1 - Quotas Tab

Selecting the **Quotas** tab allows you to adjust CPU, storage, and QOS quotas for optimal tenant performance.

- **Maximum Cores:** Enter the maximum number of virtual CPU cores that EPIC should make available for use by this tenant. By default, this field will display a value equal to 25% of the virtual CPU cores in the EPIC platform, but you can specify any number you want, or leave this field blank if you do not want to specify a quota. Please see the *About EPIC Guide* for important information about how EPIC uses virtual CPU cores.
- **Maximum Memory (GB):** Enter the maximum amount of RAM in GB that EPIC should make available for use by this tenant. By default, this field will display a value equal to 25% of the available memory in the EPIC platform that is not reserved for EPIC services, but you can specify any number you want, or leave this field blank if you do not want to specify a quota. Please see the *About EPIC Guide* for more information about how EPIC uses virtual RAM.
- **Maximum Node Storage (GB):** Enter the maximum space the tenant may use for node storage, in GB. By default, this field will display a value equal to 25% of the available node storage in the EPIC platform, but you can specify any number you want, or leave this field blank if you do not want to specify a quota. Please see the *About EPIC Guide* for more information about node storage.
- **Maximum Tenant Storage (GB):** If the tenant uses local HDFS for tenant storage, then you can specify the maximum space to use for tenant storage, in GB. By default, this field will display a value equal to 25% of the available tenant storage in the EPIC platform, but you can specify any number you want, or leave this field blank if you do not want to specify a quota. Please see the *About EPIC Guide* for more information about tenant storage.

Note: A tenant that performs lots of I/O to the base HDFS can exceed its assigned quota. This error appears as an INFO item in the NameNode log on the Controller host. Further, the CNODE log reports a socket disconnect (which can have multiple causes). When diagnosing an I/O failure between a virtual node and the base HDFS, be sure to look for is the character string **`quota exceeded`** *in the NameNode log.*

- **QOS Multiplier:** This value multiplies the CPU timeshares given to nodes in this tenant in any situation where they are contending for resources with nodes from some other tenant. Changes to this value will be applied to nodes launched after the change. Please see the *About EPIC Guide* for more information about the QOS multiplier.
- **External User Groups:** LDAP/AD group(s) if any that can access the tenant. To assign one or more group(s) to a tenant:

- Enter the group's Distinguished Name (DN) in the **Group** field, and then use the pull-down menu to select **Member** (if members of the group should have Member access to the tenant), or **Admin** (if members of the group should have Administrator access to the tenant). Each LDAP/AD group may have one tenant role.
- Click the **Add Group** icon (plus sign) to add another LDAP/AD group.
- Click the **Remove Group** icon (minus sign) to remove an LDAP/AD group.
- To remove all LDAP/AD groups, click the **Remove Group** icon (if applicable), then highlight the final remaining group and press [DEL].

Please see *"Authentication Groups" on page A-3* for more information about how EPIC handles user/authentication (LDAP/AD) group access.

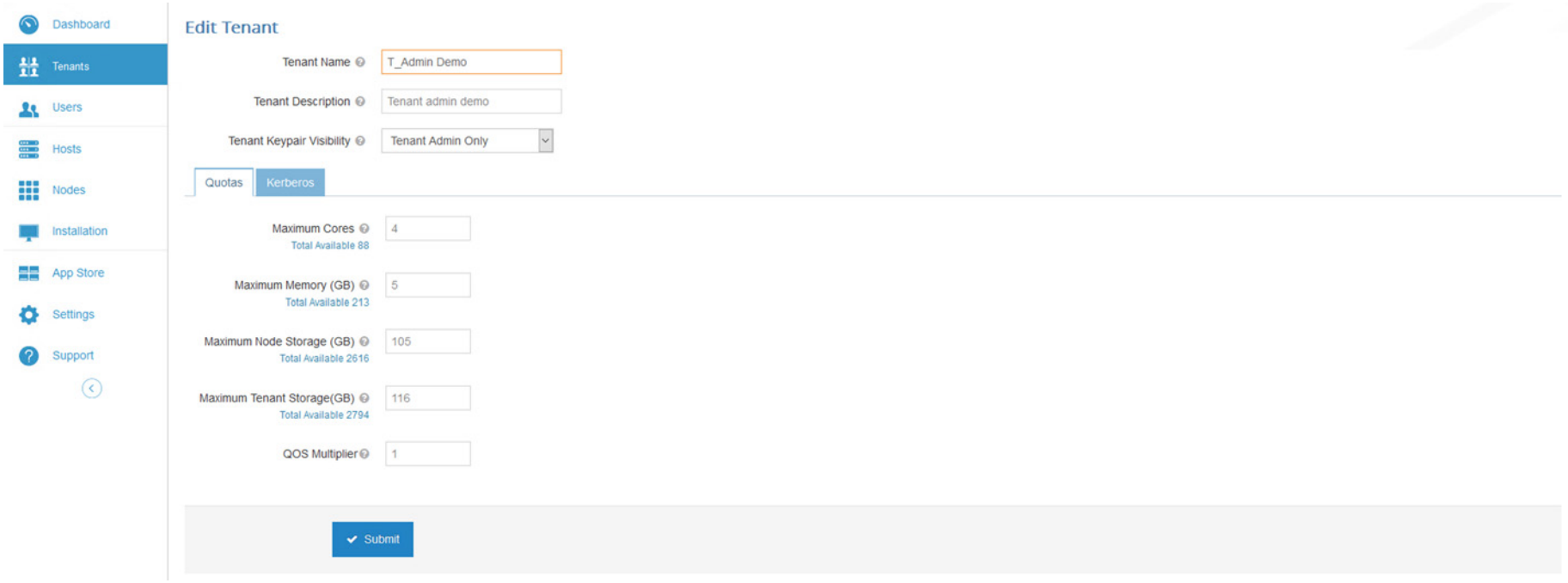


Figure 5.7: Edit Tenant screen - Quotas tab

5.3.1.2 - Kerberos Tab

If desired, you can specify a Kerberos service that can be optionally used by clusters within this tenant as follows:

1. **KDC Type:** use this pull-down menu to select one of the following options:
   - **None:** Kerberos will not be enabled for any new clusters; however, existing clusters with Kerberos will retain that protection.
   - **MIT KDC:** Proceed to Step 2.
   - **Active Directory:** Skip to Step 3.

CAUTION: INCORRECT KERBEROS SETTINGS MAY CAUSE CLUSTER CREATION TO FAIL. EPIC DOES NOT CURRENTLY VALIDATE KERBEROS SETTINGS.

2. If you selected **MIT KDC** in Step 1, then enter the following parameters:
   - **KDC Host:** Name or IP address of the Kerberos host(s). You may enter multiple hosts separated by commas. If you enter more than one host, then EPIC will use the first host in the list as the primary Kerberos host and will attempt to use the other host(s) if the primary host is unreachable.
   - **Kerberos Security Realm:** Name space that helps define access permissions. Obtain this from your Kerberos administrator.
   - **Kerberos Encryption Types:** Enter a valid Kerberos encryption type in a field. To add another encryption type, click the **+** icon to add another field. To remove an encryption type, click the **-** icon next to the field you want to remove.
   - **KDC Username:** KDC administrator username.
   - **KDC Password:** KDC administrator password.

Note: The KDC user with these credentials must have permission to create other principals.

   Skip to Step 4.

3. If you selected **Active Directory** in Step 1, then enter the following parameters:
   - **KDC Host:** Name or IP address of the Kerberos host.
   - **Kerberos Security Realm:** Name space that helps define access permissions. Obtain this from your Kerberos administrator.
   - **Kerberos Encryption Types:** Enter a valid Kerberos encryption type in a field. To add another encryption type, click the **+** icon to add another field. To remove an encryption type, click the **-** icon next to the field you want to remove.
   - **KDC Username:** KDC administrator username.
   - **KDC Password:** KDC administrator password.

Note: The KDC user with these credentials must have permission to create other principals.

   - **AD Account Prefix:** Optional prefix that will be added to all newly-created accounts. May be up to 10 characters long.

- **AD Suffix:** Active Directory suffix where all the accounts used inside virtual clusters will be created. May be up to 10 characters long.
- **AD LDAPS Port:** AD port for LDAPS.

4. Click **Submit** to save your changes.

5.3.1.3 - Completing Tenant Edits

When you have finished editing the tenant, click **Submit** to save your changes.

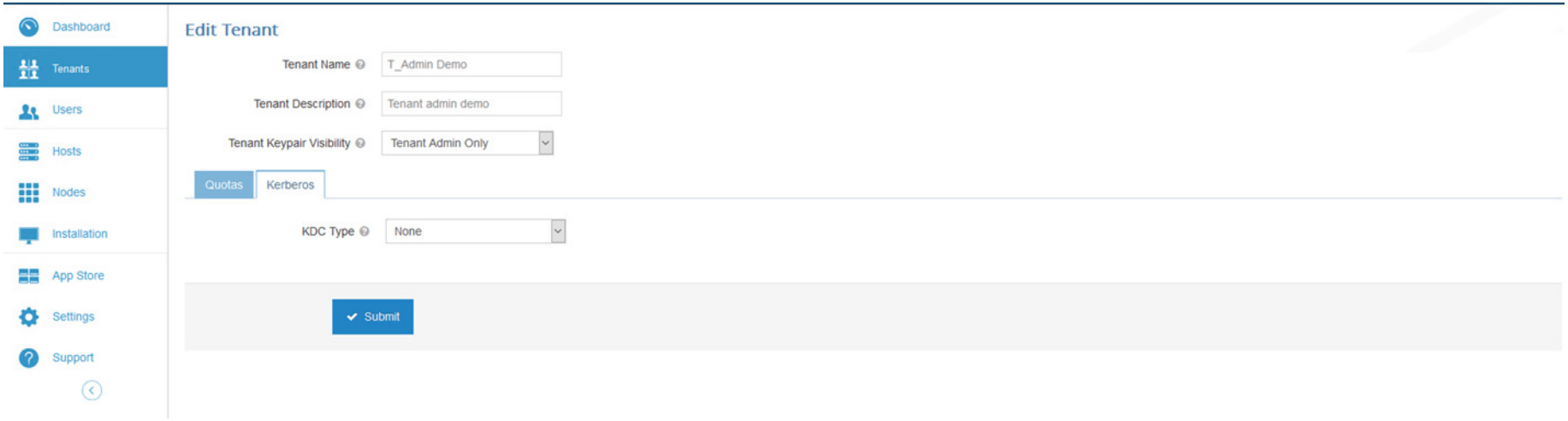


Figure 5.8: Edit Tenant screen - Kerberos tab

5.3.2 - Creating a New Tenant

Clicking the green **Create** button in the **Tenant Management** screen opens the **Create New Tenant** screen. To create a new tenant:

1. Enter a name for the new tenant in the **Tenant Name** field.
2. Enter a brief description for the new tenant in the **Tenant Description** field.
3. **Tenant Keypair Visibility:** By default, Tenant Member users created using the current version of EPIC will not be able to download the keypair(s) for the tenant(s) they have access to. This pull-down menu allows you to show the tenant keypair to:
   - **None:** The tenant keypair will not be available to anyone.
   - **Tenant Members:** Tenant Member and Tenant Administrator users will be able to access the keypair for the selected tenant.
   - **Tenant Admin Only:** Only Tenant Administrator users can access the keypair for the selected tenant.

*Note: Tenants created using a previous version of EPIC will be able to access the tenant keypair because this functionality was enabled by default. You can modify this by opening the **Tenant Management** screen and modifying the menu setting.*

5.3.2.1 - Quotas Tab

Selecting the **Quotas** tab allows you to adjust CPU, storage, and QOS quotas for optimal tenant performance.

- **Maximum Cores:** Enter the maximum number of virtual CPU cores that EPIC should make available for use by this tenant. By default, this field will display a value equal to 25% of the virtual CPU cores in the EPIC platform, but you can specify any number you want, or leave this field blank if you do not want to specify a quota. Please see the *About EPIC Guide* for important information about how EPIC uses virtual CPU cores.
- **Maximum Memory (GB):** Enter the maximum amount of RAM in GB that EPIC should make available for use by this tenant. By default, this field will display a value equal to 25% of the available memory in the EPIC platform that is not reserved for EPIC services, but you can specify any number you want, or leave this field blank if you do not want to specify a quota. Please see the *About EPIC Guide* for more information about how EPIC uses virtual RAM.
- **Maximum Node Storage (GB):** Enter the maximum space the tenant may use for node storage, in GB. By default, this field will display a value equal to 25% of the available node storage in the EPIC platform, but you can specify any number you want, or leave this field blank if you do not want to specify a quota. Please see the *About EPIC Guide* for more information about node storage.
- **Maximum Tenant Storage (GB):** If the tenant uses local HDFS for tenant storage, then you can specify the maximum space to use for tenant storage, in GB. By default, this field will display a value equal to 25% of the available tenant storage in the EPIC platform, but you can specify any number you want, or leave this

field blank if you do not want to specify a quota. Please see the *About EPIC Guide* for more information about tenant storage.

Note: A tenant that performs lots of I/O to the base HDFS can exceed its assigned quota. This error appears as an INFO item in the NameNode log on the Controller host. Further, the CNODE log reports a socket disconnect (which can have multiple causes). When diagnosing an I/O failure between a virtual node and the base HDFS, be sure to look for is the character string **`quota exceeded`** *in the NameNode log.*

- **QOS Multiplier:** This value multiplies the CPU timeshares given to nodes in this tenant in any situation where they are contending for resources with nodes from some other tenant. Changes to this value will be applied to nodes launched after the change. Please see the *About EPIC Guide* for more information about the QOS multiplier.

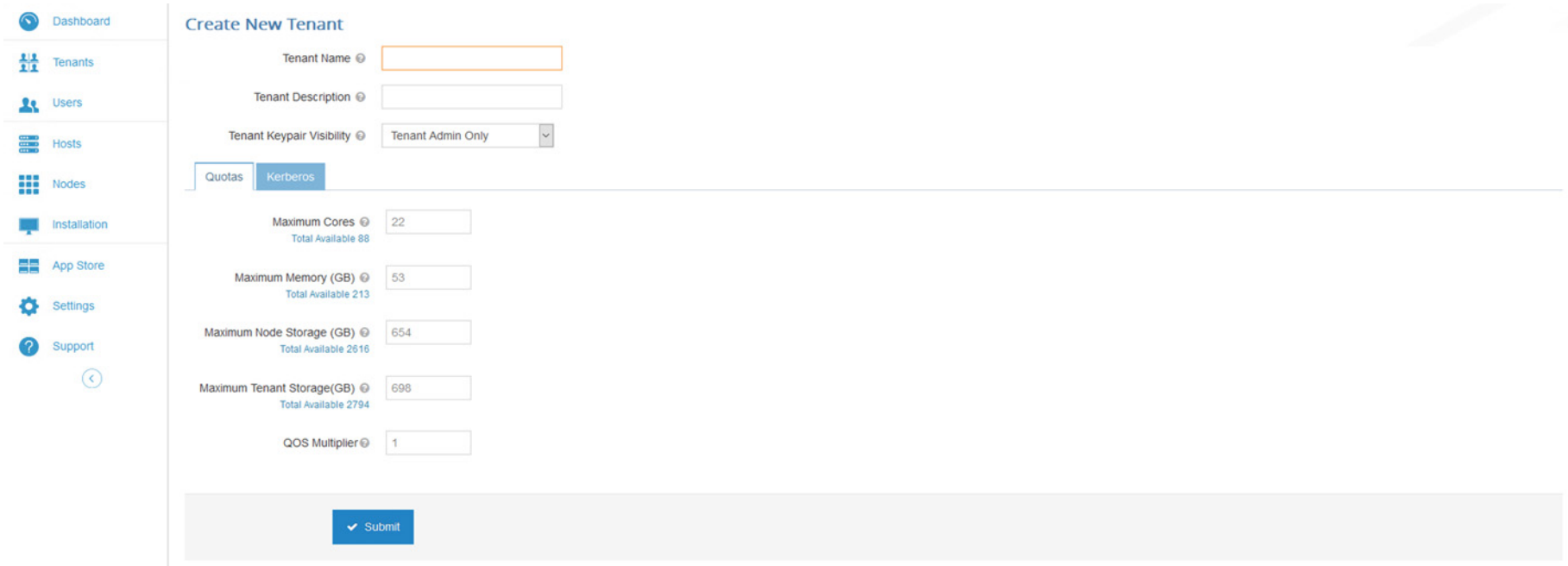


Figure 5.9: Create Tenant screen - Quotas tab

- **External User Groups:** LDAP/AD group(s) if any that can access the tenant. To assign one or more group(s) to a tenant:
  - Enter the group's Distinguished Name (DN) in the **Group** field, and then use the pull-down menu to select **Member** (if members of the group should have Member access to the tenant), or **Admin** (if members of the group should have Administrator access to the tenant). Each LDAP/AD group may have one tenant role.
  - Click the **Add Group** icon (plus sign) to add another LDAP/AD group.
  - Click the **Remove Group** icon (minus sign) to remove an LDAP/AD group.
  - To remove all LDAP/AD groups, click the **Remove Group** icon (if applicable), then highlight the final remaining group and press [DEL].

  Please see *"Authentication Groups" on page A-3* for more information about how EPIC handles user/authentication (LDAP/AD) group access.

5.3.2.2 - Kerberos Tab

If desired, you can specify a Kerberos service that can be optionally used by clusters within this tenant as follows:

1. **KDC Type:** use this pull-down menu to select one of the following options:
   - **None:** Kerberos will not be enabled for any new clusters; however, existing clusters with Kerberos will retain that protection.
   - **MIT KDC:** Proceed to Step 2.
   - **Active Directory:** Skip to Step 3.

CAUTION: INCORRECT KERBEROS SETTINGS MAY CAUSE CLUSTER CREATION TO FAIL. EPIC DOES NOT CURRENTLY VALIDATE KERBEROS SETTINGS.

2. If you selected **MIT KDC** in Step 1, then enter the following parameters:
   - **KDC Host:** Name or IP address of the Kerberos host(s). You may enter multiple hosts separated by commas. If you enter more than one host, then EPIC will use the first host in the list as the primary Kerberos host and will attempt to use the other host(s) if the primary host is unreachable.
   - **Kerberos Security Realm:** Name space that helps define access permissions. Obtain this from your Kerberos administrator.
   - **Kerberos Encryption Types:** Enter a valid Kerberos encryption type in a field. To add another encryption type, click the **+** icon to add another field. To remove an encryption type, click the **-** icon next to the field you want to remove.
   - **KDC Username:** KDC administrator username.
   - **KDC Password:** KDC administrator password.

Note: The KDC user with these credentials must have permission to create other principals.

Skip to Step 4.

3. If you selected **Active Directory** in Step 1, then enter the following parameters:
   - **KDC Host:** Name or IP address of the Kerberos host.
   - **Kerberos Security Realm:** Name space that helps define access permissions. Obtain this from your Kerberos administrator.
   - **Kerberos Encryption Types:** Enter a valid Kerberos encryption type in a field. To add another encryption type, click the **+** icon to add another field. To remove an encryption type, click the - icon next to the field you want to remove.
   - **KDC Username:** KDC administrator username.
   - **KDC Password:** KDC administrator password.

Note: The KDC user with these credentials must have permission to create other principals.

   - **AD Account Prefix:** Optional prefix that will be added to all newly-created accounts. May be up to 10 characters long.
   - **AD Suffix:** Active Directory suffix where all the accounts used inside virtual clusters will be created. May be up to 10 characters long..
   - **AD LDAPS Port:** AD port for LDAPS.
4. Click **Submit** to save your changes.

5.3.2.3 - Completing Tenant Creation

When you have finished creating the tenant, click **Submit** to save your changes.

EPIC automatically creates a default DataTap for the new tenant. See the *About EPIC Guide*. After creating a tenant, you must assign at least one user to the tenant with the Tenant Administrator role. See *"Assigning Users to a Tenant" on page 87*.

The Tenant Administrator for the newly created tenant may now add resources (virtual clusters and DataTaps) to the tenant. See *"Tenant Administration" on page 41*.

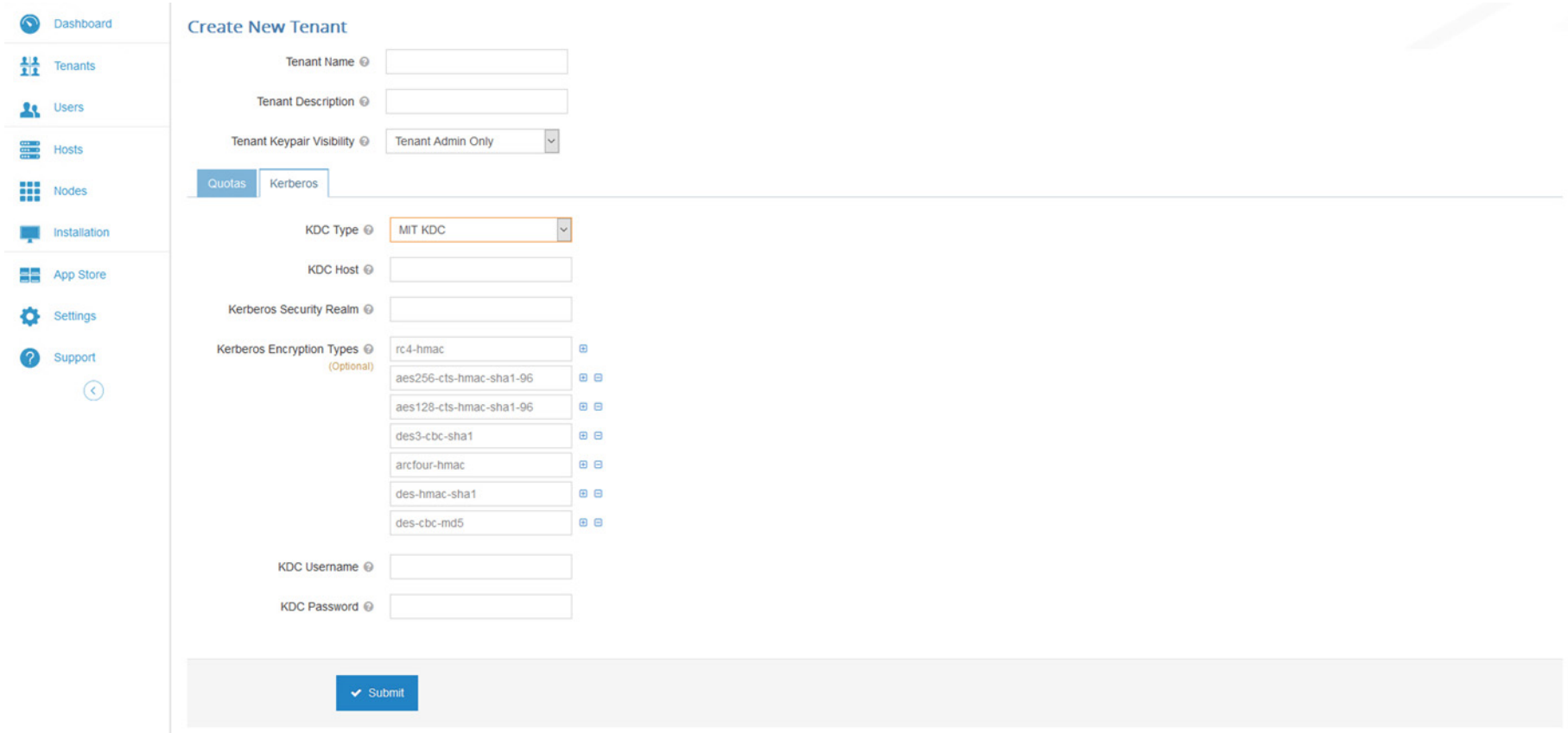


Figure 5.10: Create Tenant screen - Kerberos tab

5.3.3 - Viewing Users Assigned to a Tenant

Clicking the name of a tenant or the green **Details** icon (letter "i") in the **Tenant Management** screen opens the **<Tenant>** screen for that tenant (where **<Tenant>** is the name of the tenant).

This screen contains the following buttons:

- **Assign:** Clicking this button opens the **Assign Users** screen. See *"Assigning Users to a Tenant" on page 87*.
- **Revoke:** Clicking this button revokes the selected user's access to the tenant. A popup warning appears asking you to confirm or cancel the action. Click **OK** to proceed, or **Cancel** to exit without revoking the user's role for the tenant.

*Note: If you revoke a user by mistake, you can reassign them to the tenant using the **Assign Users** screen. See "Assigning Users to a Tenant" on page 87.*

The table on this screen contains the following information and functions:

- **Login Name:** Login name of the user.
- **Full Name:** Full name of the user.
- **Role:** Role of the user within the tenant. A user may have one role per tenant.

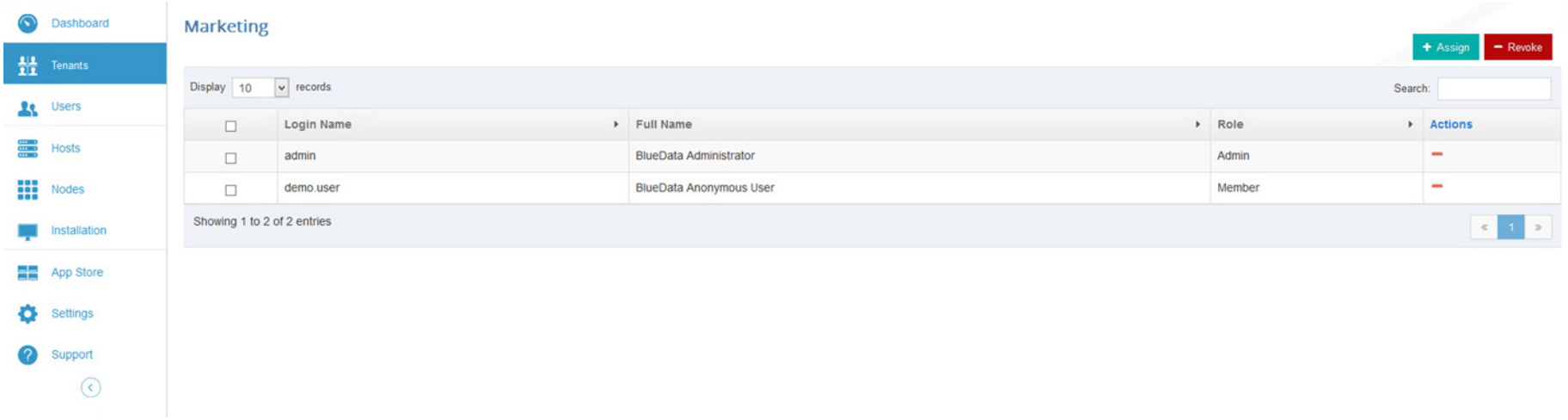


Figure 5.11: <Tenant> screen

- **Revoke:** Clicking the red **Revoke** icon (minus sign) in the **Actions** column revokes the selected user's access to the tenant. A popup warning appears asking you to confirm or cancel the action. Click **OK** to proceed, or **Cancel** to exit without revoking the user's role for the tenant.

5.3.4 - Assigning Users to a Tenant

Clicking the **Assign** button in the **<Tenant>** screen, or selecting **Assign Users** in the **Quick Access** button menu opens the **Assign Users** screen, which allows you to assign, change, or revoke user access to any existing tenant within the site.

To assign a user to a tenant, create or remove a Site Administrator, or change the user's role within the current tenant (such as from Member to Tenant Administrator or vice-versa):

1. On the left side of the screen, select the user you want to assign by selecting that user in the **USERS** list. You may also start typing the username into the **Search** field, and the list of users will update in real time based on your entry.
   - The number of tenants each user has access to appears as a numbered icon in each user listing. A user with no roles will not have an icon in their listing.
   - A star icon indicates that the user is a Site Administrator. Clicking this user expands the listing and displays a checked **Site Admin** box. You may remove the user's Site Administrator privileges by clearing the checkbox and then clicking the **Save** button.
   - You may make any user a Site Administrator by selecting that user, checking the **Site Admin** checkbox, and then clicking the **Save** button.
   - Users who do not have any role in the current tenant may be granted either the Tenant Member or Tenant Administrator role.
2. In the middle of the screen, select the tenant to which you want to add/upgrade/downgrade/remove the user using the **TENANTS** list. You may also start typing the tenant into the **Search** field, and the list of users will update in real time based on your entry.
3. Selecting both a user and a tenant enables the **<user>** section on the right side of the screen, where **<user>** is the username you selected. The name of the tenant to which you are assigning the user also appears below the username.
4. Check the appropriate radio button to assign a role to the selected user. The available options are:
   - **Member:** Makes the user a non-administrative member of the selected tenant.
   - **Admin:** Makes the user a Tenant Administrator of the current tenant..

Note: A user may have one role per tenant. See the About EPIC Guide for more information about roles and privileges.

5. Click **Save** to save your changes. A confirmation dialog appears. Click **OK** to return to the **<Tenant>** screen.

Note: This function does not store user passwords. The built-in user database or your existing external authentication server will handle user passwords.

If the selected user already has Member or Tenant Administrator access to the current tenant, you will see a **Remove from this Tenant** button at the bottom right of the **<Tenant>** screen. Clicking this button revokes the user's role and prevents them from being able to access the current tenant. A confirmation dialog appears; click **OK** to proceed or **Cancel** to cancel.

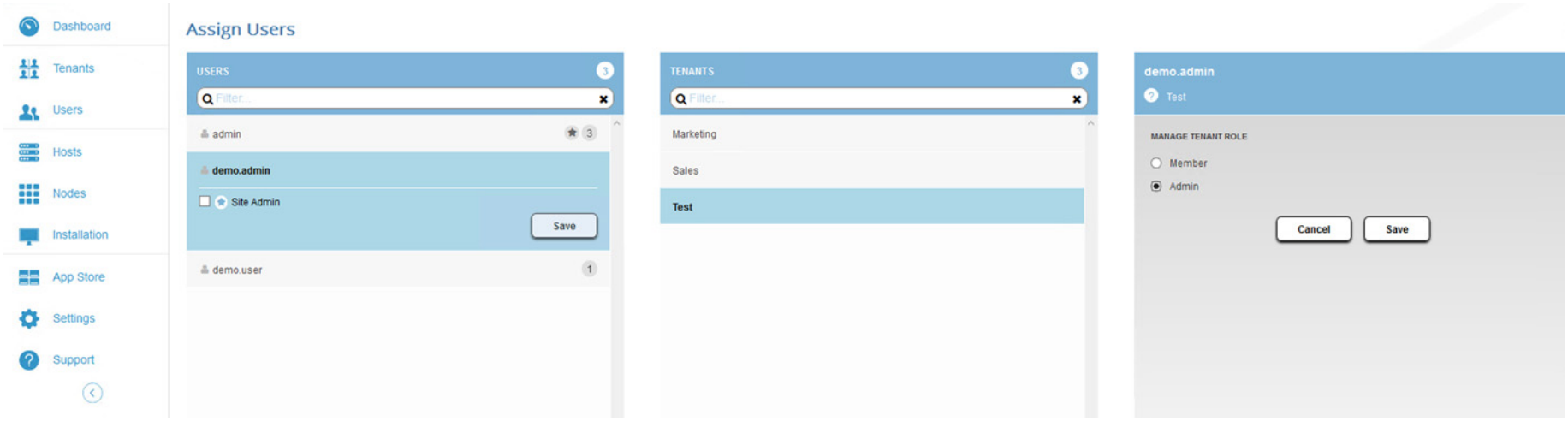


Figure 5.12: The Assign Users screen

5.3.5 - Deleting a Tenant

You can only delete a tenant if that tenant does not have any resources (jobs, clusters, or users) assigned to it. This does not affect any data placed on the storage service(s) referenced by the tenant's DataTaps. To delete a tenant:

1. Assign yourself as the Tenant Administrator for the tenant you are going to delete, using the **Assign Users** screen (see *"Assigning Users to a Tenant" on page 87*).
2. Switch to the new tenant, and then delete all of the resources assigning to that tenant. Some resources, such as jobs and clusters, will take some time to be removed completely.
3. Switch to the **Site Admin** tenant and then open the **Tenants** screen by selecting **Tenants** in the main menu.
4. Click the name of the tenant you wish to delete in the **Tenant Name** column to open the **<Tenant>** screen for that tenant and then revoke all users for that tenant.
5. Return to the **Tenants** screen to select the tenant(s) you want to delete, and then click the **Delete** button.

   A confirmation dialog appears.

Click **OK** to confirm the deletion.

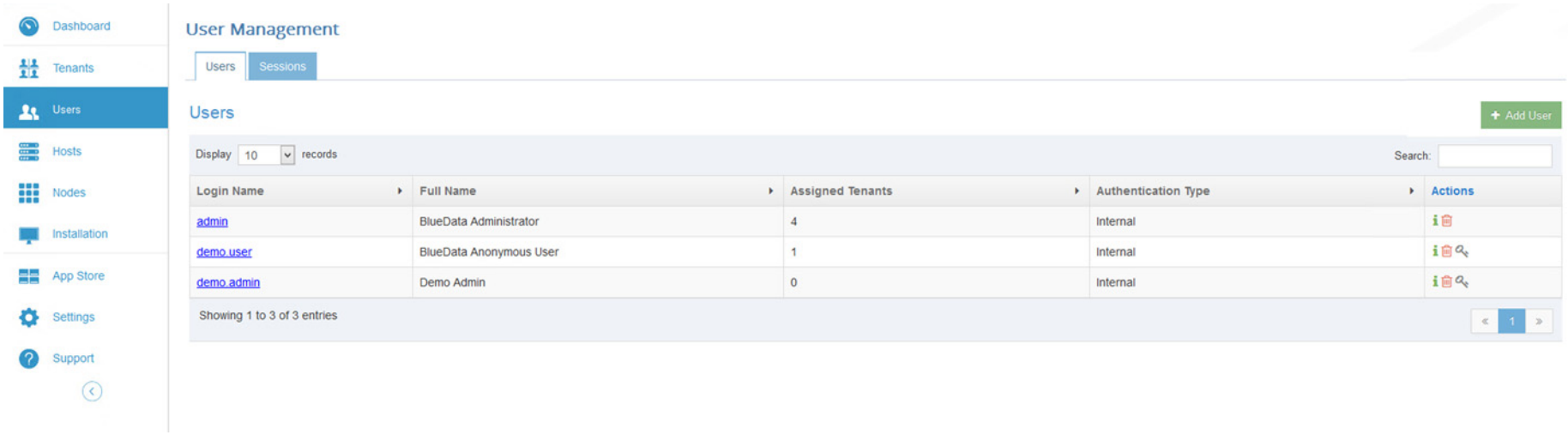
5.4 - Managing Users and Sessions

Note: See "User Management" on page A-1 for additional information on how EPIC handles user authentication.

Selecting **Users** in the main menu opens the **User Management** screen. The following tabs are available:

- **Users:** This tab displays all of the users in the EPIC platform. See *"Users Tab" on page 90*.
- **Sessions:** This tab displays the users who are currently logged into EPIC. See *"Sessions Tab" on page 92*.

Figure 5.13: User Management screen - Users tab (below)



5.4.1 - Users Tab

The **Users** tab displays the EPIC platform users and their current assignments and authentication types.on. The top of this tab contains the following button:

- Clicking the green **Add User** button opens the **Create New User** screen. See *"Creating a New User (Local Authentication)" on page 94*.

The table on this tab contains the following information/functions for each user:

- **Login Name:** Login name of the user. Clicking a user name opens the **User Details** screen for the selected user. See *"Viewing User Details" on page 92*.
- **Full Name:** Full name of the user.
- **Assigned Tenants:** Number of tenants in which the user has a role.
- **Authentication Type:** Type of authentication used when the user logs in. This will be either **Internal** (if you are using the internal EPIC user database to handle user authentication) or **External** (if the user is being authenticated using LDAP or Active Directory).
- **Actions:** The following actions are available for each user:
  - **Details:** Clicking the green **Details** icon (letter ***i***) in the **Actions** column opens the **User Details** screen for that user. See *"Viewing User Details" on page 92*.

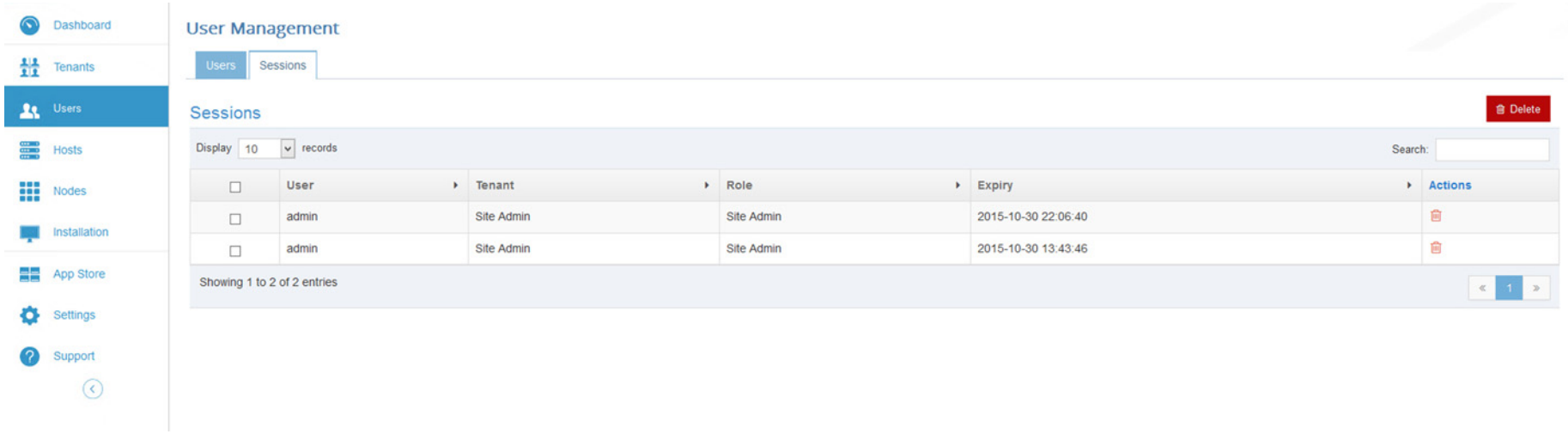


Figure 5.14: User Management screen - Sessions tab

- **Delete:** Clicking the red **Delete** icon (trash can) in the **Actions** column deletes the selected user. A popup warning appears asking you to confirm or cancel the action. Click **OK** to proceed, or **Cancel** to exit without deleting the user.

CAUTION: YOU CANNOT UNDELETE A USER. DELETING A USER REMOVES ALL EPIC ROLES.

Note: Deleting a user only removes them from the user database. If you are using an external authentication server, then you will need to remove or disable the user's account on the authentication server.

- **Reset Password:** Clicking the gray **Reset Password** icon (key) for a user opens the **Reset User Password** popup for the selected user. Enter and confirm the new password in the **New Password** and **Confirm Password** fields, and then click **Submit** to save your changes and close the popup.

5.4.2 - Sessions Tab

The **Sessions** tab of the **User Management** screen displays all of the currently active user sessions (logins). The top of this tab contains the following button:

- Clicking the red **Delete** button at the top of the **Sessions** tab deletes the selected session(s). The affected user(s) will have to log back in to EPIC with their username and password. Jobs, data, etc. are preserved.

The table on this tab contains the following information/functions for every active session:

- **User:** Name of the user running the session.
- **Tenant:** Tenant the user is using for this session. A user with access to multiple tenants may run more than one session.
- **Role:** Role of the user (**Site Admin**, **Admin**, or **Member**)
- **Expiry:** Date and time the current session will expire if the user takes no actions. EPIC allows up to 24 hours of inactivity per session, to allow running jobs to complete.
- **Delete:** Clicking the red **Delete** icon (trash can) in the **Actions** column deletes the selected session. A popup warning appears asking you to confirm or cancel the action. Click **OK** to proceed, or **Cancel** to exit without deleting the session(s).

5.4.3 - Viewing User Details

Clicking a user name in the **Users** table on the **User Management** screen or clicking the green **Details** icon for a user opens the **<User>** screen, where **<User>** is the username of the selected user.

This screen contains the following buttons:

- **Assign:** Clicking this button opens the **Assign Users** screen. See *"Assigning Users to a Tenant" on page 87*.
- **Revoke:** Clicking this button revokes the selected user(s) access to the tenant. A popup warning appears asking you to confirm or

cancel the action. Click **OK** to proceed, or **Cancel** to exit without revoking the user's role for the tenant.

*Note: If you revoke a user by mistake, you can reassign them to the tenant using the **Assign Users** screen. See "Assigning Users to a Tenant" on page 87.*

The table on this screen contains the following information and functions:

- **Tenant Name:** Name of each tenant the user is currently assigned to. Each user may have one role per tenant.
- **Tenant Description:** Brief description of each tenant.
- **Role:** Role the user has within that tenant.
- **Revoke:** Clicking the red **Revoke** icon (minus sign) in the **Actions** column revokes the selected user's access to the tenant. A popup warning appears asking you to confirm or cancel the action. Click **OK** to proceed, or **Cancel** to exit without revoking the user's role for the tenant. Please see the note on the left.

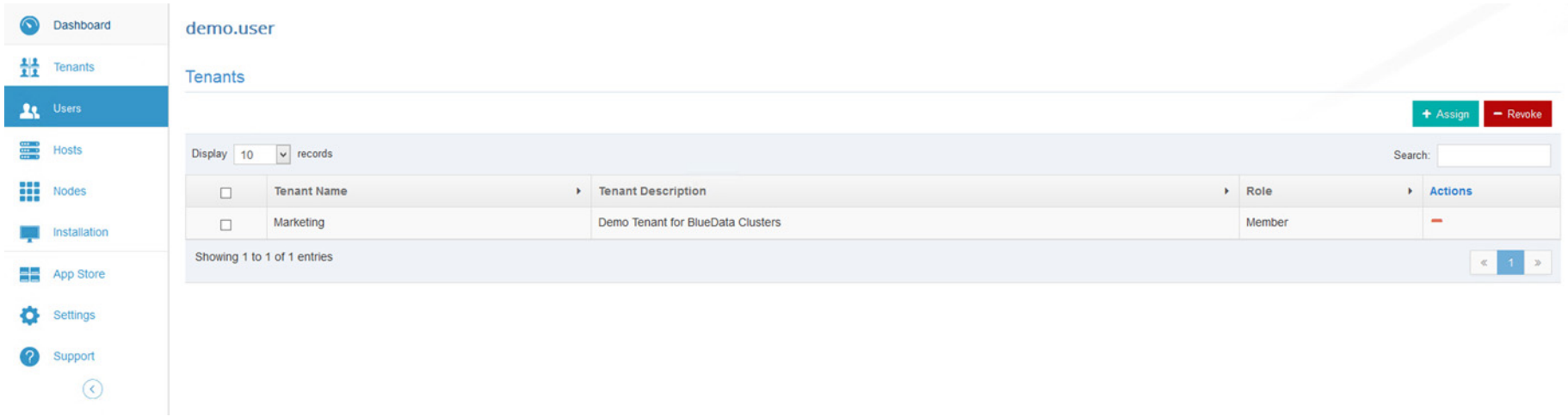


Figure 5.15: <User> screen

5.4.4 - Creating a New User (Local Authentication)

If EPIC is set to use local authentication (see *"User Authentication Tab" on page 114*), then clicking the green **Add User** button in the **User Management** screen opens the **Create New Users** screen.

Note: If EPIC is configured to use external authentication, then clicking the green Add User button opens the Assign Users screen, because user management is handled by the LDAP/AD server. See "Assigning/Revoking User Roles (External Authentication)" on page 58.

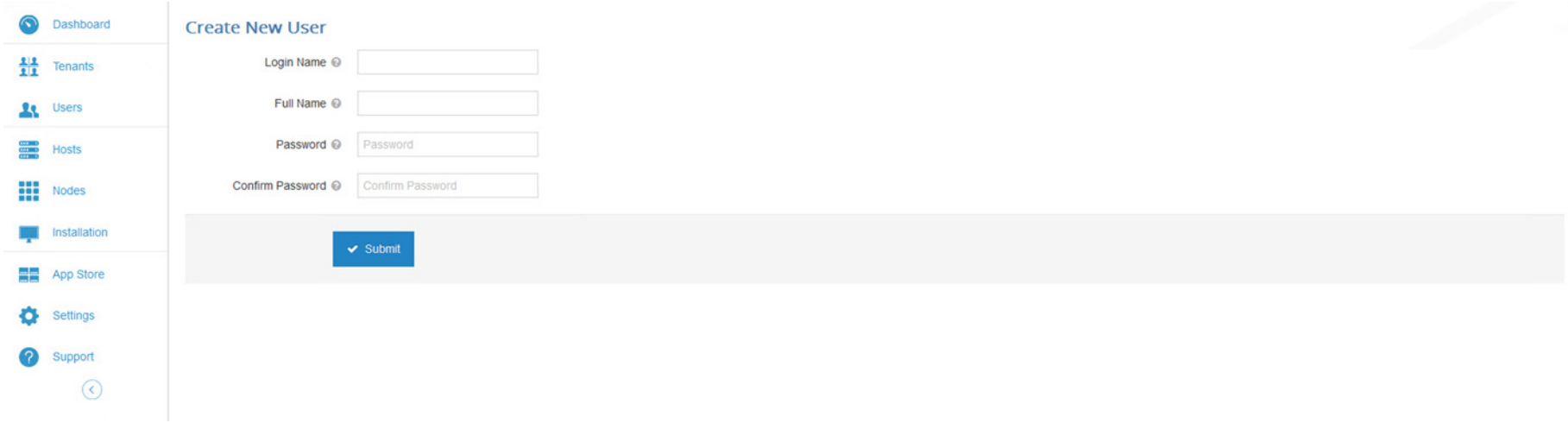
To create a new user:

1. Enter a unique user name in the **Login Name** field. This name is case sensitive.
2. Enter the full name of the user in the **Full Name** field.
3. Enter a password in the **Password** field, and then reenter the same password in the **Confirm Password** screen. Passwords are case sensitive. The user may change her or his password as described in *"Changing Your Password" on page 40*.

When you have finished entering the information for the new user, click **Submit** to save your changes.

Note: You may only create a new user via this function if your EPIC platform is configured to use the local user database. If you use an external authentication server to manage EPIC logins, then you need to create the user account on that authentication server.

Figure 5.16: Create New User screen (below)



5.5 - Viewing Hosts

Selecting **Hosts** in the main menu opens the **Hosts** screen.

The top of this screen contains the following tabs:

- **Host(s) Info:** This tab contains a table with basic information about each host in the EPIC platform. See *"Host(s) Info Tab" on page 95*.
- **Charts:** This tab contains several charts that display performance information for all hosts or a selected host. See *"Charts Tab" on page 96*.

5.5.1 - Host(s) Info Tab

The **Host(s) Info** tab displays the following information for each host in the EPIC platform:

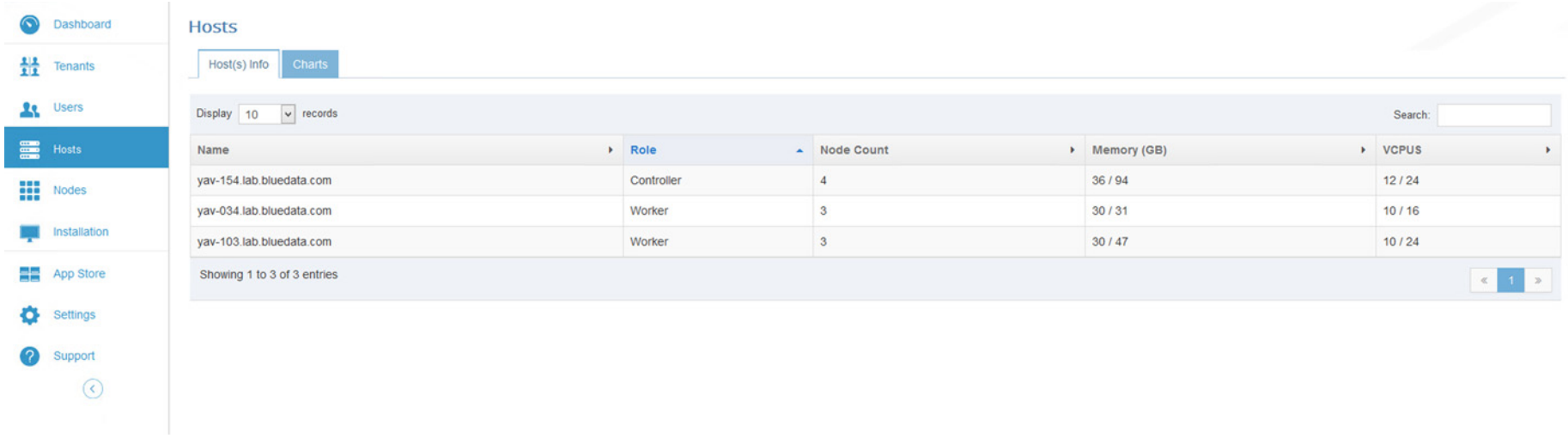


Figure 5.17: Hosts screen - Host(s) Info tab

- **Name:** Host name of the host.
- **Role:** Role of the host in the EPIC platform (**Controller** or **Worker**). This can be one of the following:
  - **Controller:** Host that manages the other nodes while also serving as a Worker host in the EPIC platform.
  - **Worker:** Host that is managed by a Controller.

*Note: If you have High Availability enabled for the EPIC platform, you may see which hosts have the Shadow Controller and Arbiter roles assigned to them using the **HA Settings** tab, which is described in* *"HA Settings Tab" on page 118* *.*

- **Node Count:** Number of virtual nodes running on the host.
- **Memory (GB):** This is a fraction consisting of the amount of host RAM being used by EPIC on the host over the total amount of host RAM available to EPIC on that host.
- **VCPUs:** This is a fraction consisting of the number of virtual CPU cores being used by EPIC on the host over the total number of virtual CPU cores available to EPIC on that host. EPIC allows over-provisioning, which means that the number of virtual cores may be larger than the number of host cores.

5.5.2 - Charts Tab

The **Charts** tab contains the following pull-down menus:

- **Hosts (blue):** The **Hosts** pull-down menu allows you to select whether you want to view charts for a single host or all hosts in the EPIC platform. Select either the desired host to view that node or **All Host(s)** to view all hosts.
- **Time period (green):** The **Time Period** pull-down menu allows you to select the time period to review. The available options are **Last Hour** (default), **2 Hours**, **4 Hours**, **Day**, **Week**, **Month**, and **Year**.

A series of dials and charts appears to show the following information for the selected host(s) and time period:

- **Load Average:** The dial shows the current average percentage of host CPU cores used by EPIC (defined as the number of CPU cores in use vs. the total number of available CPU cores), and the accompanying chart displays the historical load over the selected time period.
- **CPU%:** The dial indicates the current percentage of host CPU utilization across all EPIC processes that are currently running, and the accompanying chart displays the historical CPU percentage over the selected time period.
- **Memory Usage (GB):** The dial indicates the current use of host memory across all EPIC processes, and the accompanying chart displays the historical memory usage over the selected time period.
- **Network Usage:** The dial indicates the current amount of host network bandwidth being used by EPIC, and the accompanying chart displays historical network bandwidth usage over the selected time period.

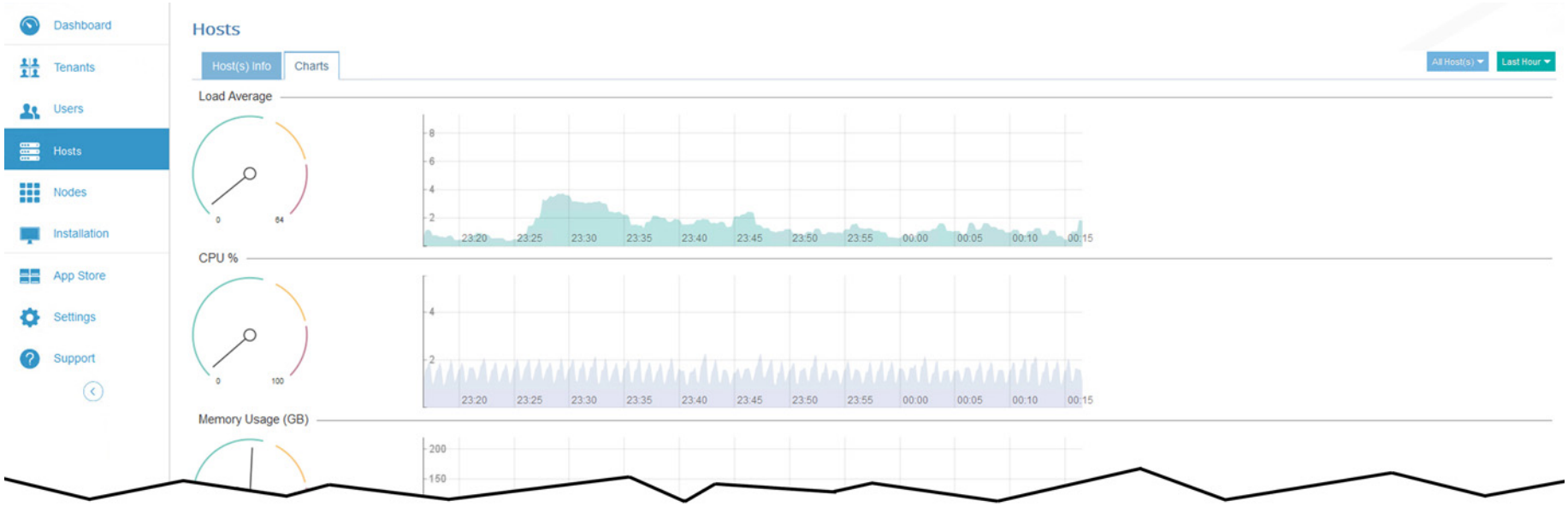


Figure 5.18: Hosts screen - Charts tab

5.6 - Managing the EPIC Installation

Selecting **Installation** in the main menu opens the **Cluster Installation** screen.

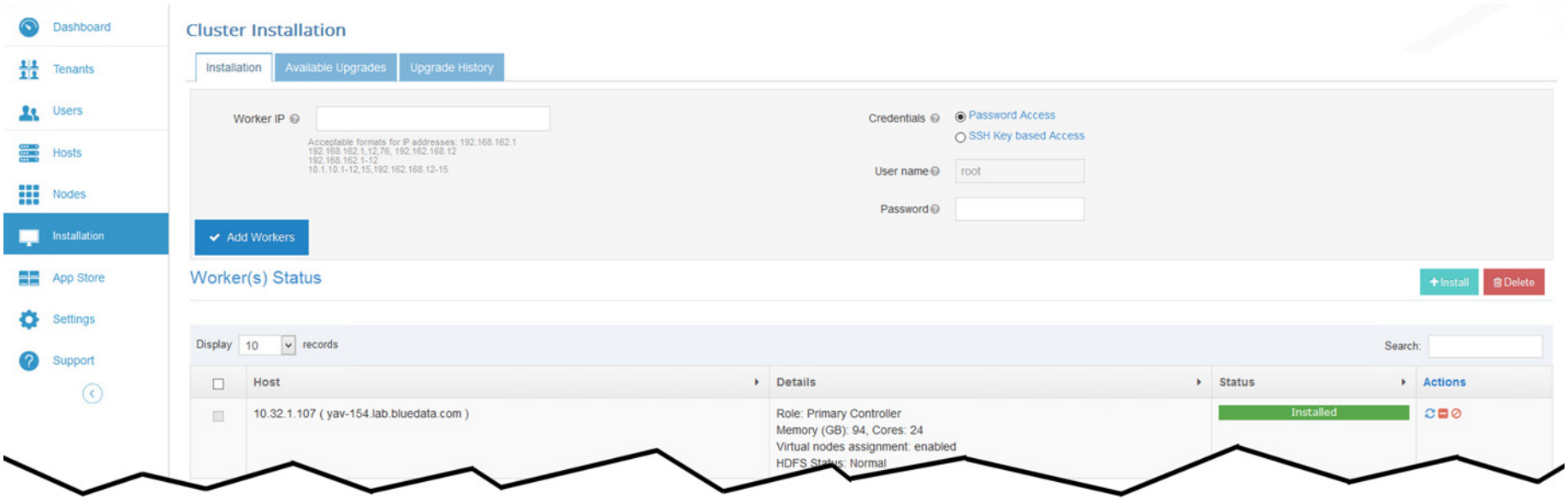
The top of this screen contains the following tabs:

- **Installation:** This tab lists all of the Worker hosts that have been added to the EPIC platform. It also allows you to install EPIC on one or more Worker host(s) and then add the Worker(s) to your EPIC cluster. See *"Installation Tab" on page 98*.
- **Available Upgrades:** This tab allows you to search for EPIC upgrades. See *"Available Upgrades Tab" on page 104*.
- **Upgrade History:** This tab displays the upgrade history for your EPIC installation. See *"Upgrade History Tab" on page 105*.

5.6.1 - Installation Tab

The **Installation** tab lists the Worker host(s) in your EPIC platform and allows you to install/edit/remove hosts. This top of this screen contains the following functions:

Figure 5.19: .Cluster Installation screen - Installation tab (below)



- **Worker IP address:** Enter the IP address(es) for one or more Worker host(s) in the **Worker IP** field.
- **Credentials:** This is where you add either a valid username and password or SSH key in order to access the Worker host(s) being added to the EPIC platform.

The middle of this screen contains the following buttons:

- **Install:** See *"Adding Worker Hosts" on page 100*.
- **Delete:** Removes host(s) that have been added to the EPIC platform but not yet installed as Worker(s).

The lower portion of this screen contains the **Worker(s) Status** table, which displays the following information and functions for each Worker host in the EPIC platform:

- **Host:** IP address and hostname of the Worker host.
- **Details:** This column displays the following information:
  - **Role:** Role the host is playing in the EPIC platform, such as **Controller**, **Worker**, **Shadow Controller**, or **Arbiter**.
  - **Memory (GB):** Amount of RAM available to the host.
  - **Cores:** Number of CPU cores available to the host.
  - **Virtual nodes assignment:** Whether (**enabled**) or not (**disabled**) the host can have EPIC virtual nodes assigned to it when creating transient or persistent clusters.
  - **Storage status:** Type and status of local shared-storage service on this host, if any.
- **Status:** Status of the host. See *"Step 2: Adding Host(s) as Potential EPIC Worker(s)" on page 102* and *"Step 5: Installing the Host(s) as EPIC Worker(s)" on page 103* for the statuses that appear during the Worker installation process. This column will say **Installed** for all fully-installed Worker nodes.
- **Actions:** The following functions are available:
  - **Update System Info:** Clicking the blue **Update System Info** icon (circular arrows) refreshes the information display for the selected host.
  - **Disable Virtual Node Assignment:** Clicking the red **Disable Virtual Node Assignment** icon (minus sign) prevents EPIC from assigning virtual nodes to that host when creating temporary or persistent clusters.
  - **Enable Virtual Node Assignment:** Clicking the green **Enable Virtual Node Assignment** icon (plus sign; not shown in Figure 5-17) allows EPIC to assign virtual nodes to that host when creating temporary or persistent clusters.
  - **Decommission:** Clicking the red **Decommission** icon (barred circle) decommissions the local HDFS DataNode on that host if local HDFS was installed.

Note: Decommissioning a Worker host is necessary before removing that Worker host from the EPIC platform. You should not need to perform this function otherwise.

  - **Delete:** Clicking the red **Delete** icon (trash can; not shown in Figure 5-17) for a host removes that host from the EPIC platform. See *"Deleting Worker Hosts" on page 104*.

5.6.2 - Adding Worker Hosts

Adding one or more Worker host(s) uses the following basic process:

1. Select the host(s) to add as the Worker node(s).
2. Install EPIC on the host(s).
3. Add the Worker host(s) to your EPIC platform.

Before adding one or more Worker host(s), be sure that the host(s) conform to the requirements described in the *About EPIC Guide* and any applicable *Deployment Guide*. For best results, it is recommended that all hosts share the same configuration (CPU, RAM, storage, OS, etc.)

CAUTION: INSTALLING EPIC ON ANY HOST THAT DOES NOT MEET ALL APPLICABLE REQUIREMENTS MAY LEAD TO UNPREDICTABLE BEHAVIOR AND/OR DATA LOSS.

CAUTION: EPIC PERFORMS NUMEROUS CONFIGURATION CHANGES TO THE HOST DURING INSTALLATION THAT ARE REQUIRED IN ORDER FOR THE PLATFORM TO FUNCTION. THESE CHANGES ARE NOT COMPLETELY REVERSIBLE AND MAY IMPACT ANY OTHER APPLICATIONS AND PROCESSES THAT ARE CURRENTLY RUNNING ON THE HOST. IT IS STRONGLY RECOMMENDED THAT YOU INSTALL EPIC ON A HOST THAT IS NOT BEING USED FOR ANY OTHER PURPOSE IN ORDER TO AVOID POSSIBLE DISRUPTIONS TO YOUR BUSINESS PROCESSES.

5.6.2.1 - Step 1: Selecting the Host(s)

The first step in adding Worker host(s) to your EPIC platform is to select the host(s) to add using the IP address(es) of the host(s). You must then supply the administrator (root) password for each host. To select the host(s):

1. Enter the IP address(es) of the host(s) in the **Worker IP** field. You may select one or more host(s) as follows:
   - **Single IP address:** Enter a properly formatted IP address, such as `10.10.1.1`. This will add a single host.
   - **Multiple IP addresses:** Enter the first three octets of the IP addresses, and then separate each digit of the fourth octet with a commas, such as `10.10.1.1,2,5,8`. In this example, EPIC will add four Worker hosts with IP addresses of 10.10.1.1, 10.10.1.2, 10.10.1.5, and 10.10.1.8.
   - **Multiple IP addresses:** Enter multiple IP addresses separated by commas, such as `10.10.1.1, 10.10.1.2, 10.10.1.5, 10.10.1.8`. In this example, EPIC will add four Worker hosts with the same IP addresses as the previous example.
   - **IP address range:** Enter an IP address range, such as `10.10.1.1-8`. In this example, EPIC will add eight Worker hosts with IP addresses from 10.10.1.1 to 10.10.1.8.

- **Combination:** Use a combination of the above methods, such as `10.10.1.1, 10.10.1.2,5,8, 10.10.1.9-12`.

Note: You may only perform one set of Worker host additions to one or more host(s) at once. To save time, consider adding all of the Worker hosts at once by entering multiple IP addresses as described above.

2. Select how to access the Worker host(s). Your available options are:

   - **Password access:** Check the **Password Access** radio button and then enter the password for the Worker host(s) you are adding in the **Password** fields. The password must be valid for the username in the **User name** field.

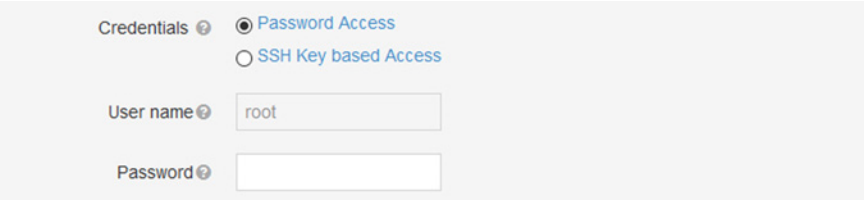


Figure 5.20: Password Access information

   - **SSH Key:** If the Worker host(s) already have a public key installed to allow password-free access (see *"Adding the Public SSH Key to EPIC" on page 101*), then you may check the **SSH Key based Access** radio button. Upload the private key by clicking the **Private Key** field to open a standard **File Upload** dialog that allows you to browse for and select the key file. If the key requires a pass phrase, enter that phrase in the **Passphrase** field. The uploaded private key will only be used for initial host access and will not be permanently stored.

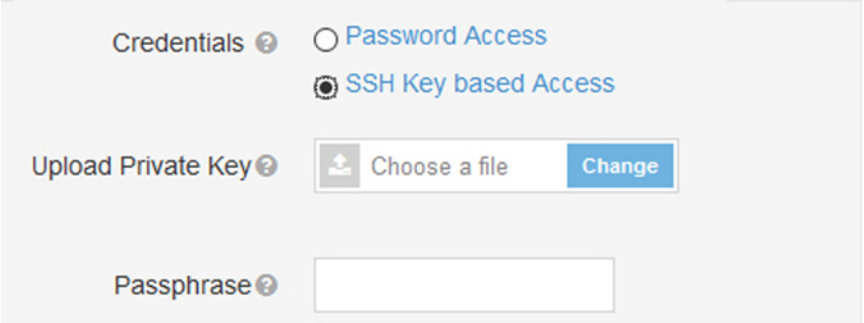


Figure 5.21: SSH Key information

3. Proceed to *"Step 2: Adding Host(s) as Potential EPIC Worker(s)" on page 102*.

5.6.2.2 - Adding the Public SSH Key to EPIC

This option is only needed if you adding a Worker host with SSH key-based access. You must upload the public key to the Worker host(s) before uploading the corresponding private key to those host(s). Assuming that you created the keys using a tool like `ssh-keygen -t rsa`, then:

1. Copy the id_rsa.pub file to the Worker host.
2. Add the public key to the list of authorized keys for the root user by executing a command similar to `root worker# cat id_rsa.pub >> /root/.ssh/authorized_keys`.
3. Test the key by executing the `ssh -i id_rsa root@worker` command (where `worker` is the hostname or

IP address of the Worker host) from the Controller host. This should log the root user into the Worker host without being prompted for a password.

5.6.2.3 - Step 2: Adding Host(s) as Potential EPIC Worker(s)

Click the **Add Workers** button to install EPIC on the selected host(s). This prepares the EPIC software for installation on the selected host(s). The host(s) will appear in the **Worker(s) Status** table, which displays the following information for each host being added:

- **IP address:** IP address and (if available), hostname of the host.
- **Status:** Current status of the Worker host, which updates as the installation progresses. This will appear as one of the following:
  - **Connecting:** EPIC is attempting to connect to the listed Worker host(s).
  - **Running bundle:** EPIC has successfully connected to the listed Worker host(s) and is preparing the host(s).
  - **Bundle completed:** EPIC has completed preparing the listed Worker host(s), which are ready to be added to the EPIC platform. If you added the host(s) by mistake, you may remove them by clicking the red **Delete** icon (trash can).

Figure 5.22: Installation progress

- **Actions:** Once EPIC finishes preparing the host(s) and before finalizing installation, you will have the opportunity to specify the use of each host's hard drives or abort the installation on a host.
  - Clicking the blue **Edit** icon (pencil) for a host opens the **Advanced Worker settings** popup for that host, which allows you to select one or more hard drive(s) to add to the local HDFS system storage. See below.
  - To remove the host(s), click the red **Delete** icon (trash can).
  - To view the log from running the EPIC bundle on the host, click the **Setup Log** icon for that host.

5.6.2.4 - Step 3: Selecting Hard Drives

Clicking the blue **Edit** icon (pencil) opens the **Advanced Worker settings** popup for that Worker.

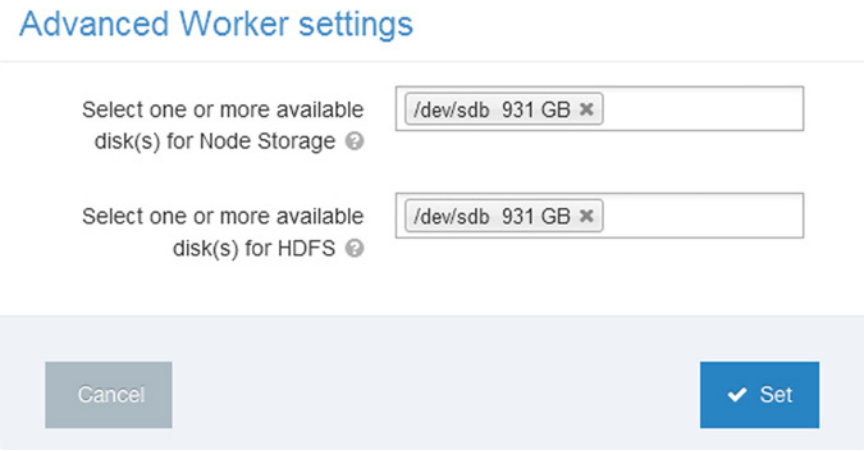


Figure 5.23: Advanced Worker settings popup

To add one or more hard drive(s) to the node and/or HDFS storage:

1. Click the drive(s) that you want to add. The **HDFS** field will not appear if the tenant storage is not using local HDFS.
2. Click the **Set** button to close the popup and add the selected drive(s) to the EPIC platform.

5.6.2.5 - Step 4: Entering Lockdown Mode

Before proceeding with adding the Worker host(s), you will need to place EPIC into Lockdown mode, as follows:

1. Open the **Quick Access** menu and then select **Enter site lockdown**.

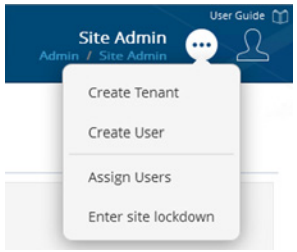


Figure 5.24: Entering Lockdown mode

   The **Lockdown the system** popup appears.
2. Enter a descriptive reason for the lockdown in the **Enter Reason** field.
3. Click the **Submit** button to place EPIC into Lockdown mode.

5.6.2.6 - Step 5: Installing the Host(s) as EPIC Worker(s)

Once EPIC has been prepared for installation on the selected Worker host(s), you may finish adding the host(s) to your EPIC platform, as follows:

1. Select one or more host(s) in the table, and then click the green **Install** button.
2. Click **OK** to proceed.

   The blue **Install Scheduled** and then the green **Installing** bar appear in the **Worker(s) Status** table for the selected Worker host(s) while EPIC finishes adding the node(s) to the EPIC platform. This status changes to **Installed** once the addition is final.

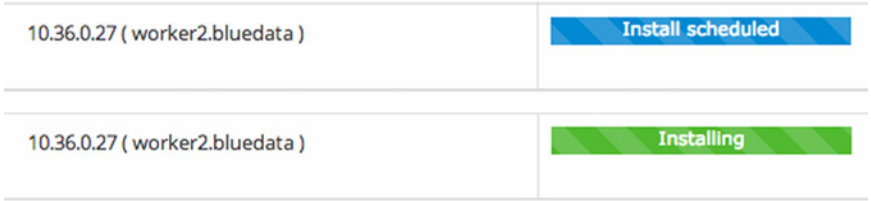


Figure 5.25: Completing the Worker installation

3. When the addition completes, exit Lockdown mode by opening the **Quick Access** menu and then selecting **Exit site lockdown**.

The newly added Worker host(s) will appear in the **Installed Workers** tab (see *"Adding Worker Hosts" on page 100*).

5.6.3 - Deleting Worker Hosts

Delete a Worker host removes that host from the EPIC platform. You cannot delete a Controller, Shadow Controller, or Arbiter host from the EPIC platform. You do not need to enter Lockdown mode in order to delete the Worker host(s). To delete one or more Worker host(s):

1. If local HDFS is installed, then decommission the HDFS DataNode by clicking the red **Decommission** icon (barred circle) for each affected host. You must have at least four (4) hosts in the EPIC platform in order to decommission the DataNode. The HDFS entry in the **Details** column will change to show the decommissioning in progress and will then say **Decommissioned** once this process is completed.
2. Prevent new virtual nodes from being assigned to the host(s) by clicking the red **Disable virtual node assignment** icon (minus sign) for each affected host. This prevents new nodes only; it does not remove any existing node(s) from the host.
3. Remove all virtual nodes from the affected host(s). To do this, you will need to delete all jobs and/or clusters that have nodes on the affected host(s). See *"Jobs" on page 16* and *"Persistent Clusters" on page 24*.
4. In the **Worker(s) Status** table, click the red **Delete** icon (trash can) for each host you want to remove.

EPIC removes the selected Worker host(s) from the EPIC platform.

5.6.4 - Available Upgrades Tab

The **Available Upgrades** tab lists any available updates to your EPIC platform software and allows you to install additional nodes. The table lists the following information for each available upgrade:

- **Upgrade Package:** The identifier of the upgrade package. This will be the same as the filename of the bundle file (without the .bin extension), unless the file has been renamed.
- **Upgrade From:** Lists the valid EPIC versions (and possibly specific version/build combinations) that can be used as the starting software version for an upgrade using this package. The current version and build of EPIC appears at the bottom right corner of every EPIC screen; this information must match one of the versions or version/build combinations listed in a package's **Upgrade From** field in order to perform an upgrade using that package.
- **Version:** EPIC software version that will be in effect once the upgrade completes.
- **Build Number:** EPIC build number that will be in effect once the upgrade completes.
- **SKU:** BlueData Software, Inc. product variant identifier for the new EPIC build and version, such as **Lite** or **Enterprise**.

- **Actions:** Clicking the green **Upgrade** button for a listed upgrade begins upgrading to that upgrade. See *"Upgrading the EPIC Installation" on page 106*.

*Note: Upgrading EPIC will also upgrade your installed **App Store** image(s) if image updates are available. Please see "App Store" on page 108 for more information.*

5.6.5 - Upgrade History Tab

The **Upgrade History** tab displays all previous upgrade attempts, successful or otherwise. The table on this tab lists the following information for each previous upgrade attempt:

- **Upgrade:** The identifier of the upgrade package used for the upgrade attempt. Clicking this link opens a popup that displays the final per-host status from that upgrade process.
- **Notes:** Any notes entered by the Site Administrator when the upgrade was initiated.
- **Start Version:** The EPIC software version that was installed on the EPIC platform when the upgrade was initiated.
- **End Version:** If the upgrade was successful, this is the EPIC software version after the upgrade completed.
- **Start Time:** Date and time the upgrade process began.
- **End Time:** Date and time the upgrade process ended.

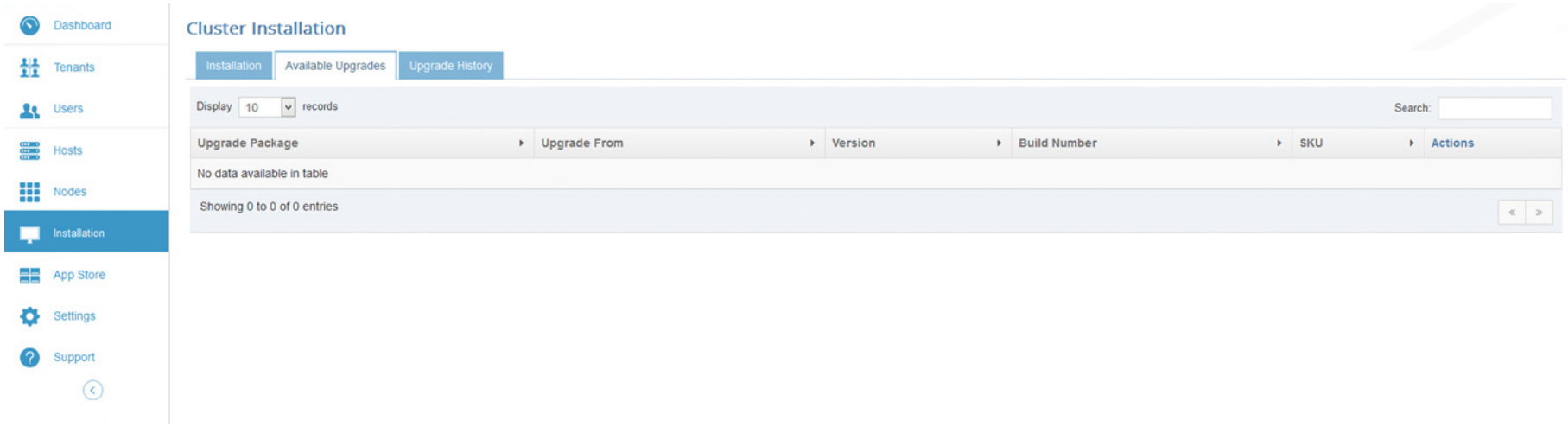


Figure 5.26: BlueData Cluster Installation screen - Available Upgrades tab

- **Status:** Overall status of the upgrade attempt:
  - **Complete:** The upgrade completed successfully.
  - **Error:** The upgrade did not complete successfully.

5.6.6 - Upgrading the EPIC Installation

The EPIC upgrade works as follows:

- The Site Administrator must have root login access to the Controller host.
- All hosts in the EPIC platform will be upgraded.
- All of the hosts must be both powered on and accessible.
- The upgrade must succeed on all hosts. If the upgrade fails on one or more host(s), then the entire upgrade will be rolled back on all host(s). If the upgrade process fails for any host, then all remaining host upgrades will be canceled, and any host that was already modified will be reverted back to the original EPIC version.
- EPIC upgrades the Controller host near the beginning of the upgrade process. At this point, the management service will be momentarily interrupted in order to change over to the new version; thus, explicitly refreshing the web UI during this interval may result in a browser error. If this occurs, try refreshing the page after a brief wait.

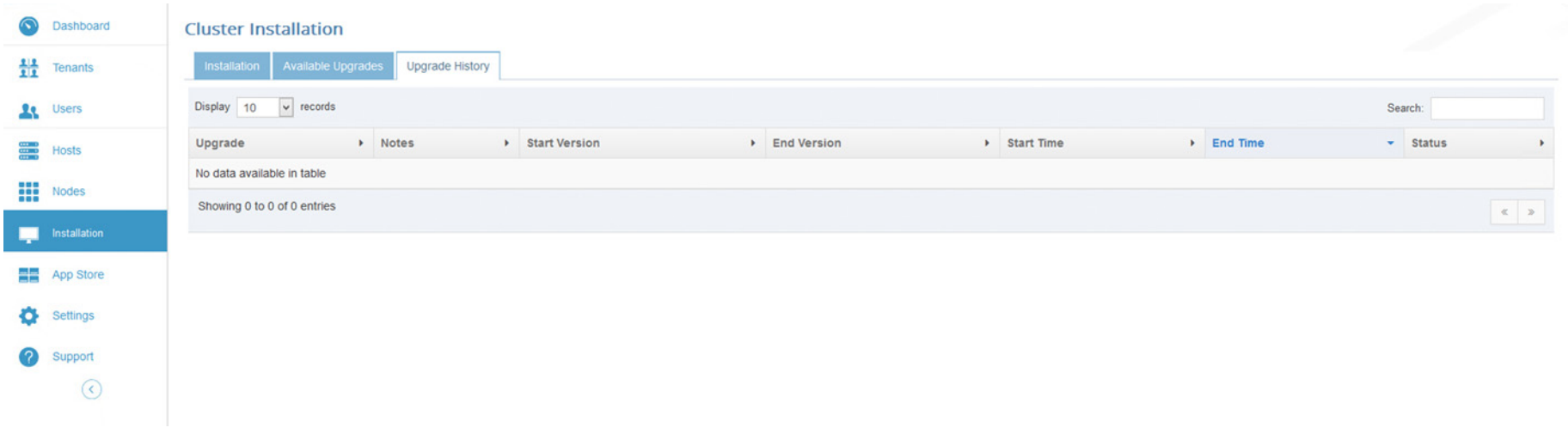


Figure 5.27: BlueData Cluster Installation screen - Upgrade History tab

To upgrade the EPIC installation:

1. Place the bundle file for the newer software in the `/srv/bluedata/bundles` directory of the Controller host. This bundle will be visible as an upgrade package in the **Available Upgrades** tab.
2. Place the EPIC platform into Lockdown status by opening the **Quick Access** menu and then selecting **Enter site lockdown**.

   The **Lockdown the system** popup appears.
3. Enter a descriptive reason for the lockdown in the **Enter Reason** field, and then click the **Submit** button to place EPIC into Lockdown mode.
4. In the **Available Upgrades** tab, click the green **Upgrade** button for the build that you want to upgrade to. EPIC will verify that Lockdown mode is in effect and confirm the upgrade compatibility with your current version, and then either proceed or display an error message.

   The **Confirm Upgrade** popup appears.
5. Enter a brief note in the **Notes** field if you like, and then click the **Proceed** button to continue with the upgrade. Any notes you enter will be saved and can be viewed later.
6. The **Upgrade Progress** section appears on the **Available Upgrades** tab to display the status of the upgrade progress. The available statuses are:
   - **Pending:** The upgrade has not yet started.
   - **Upgrading:** The upgrade is taking place. Additional details appear during this phase, as EPIC extracts the upgrade package, upgrades the Controller host and Worker hosts, and finishes the upgrade. The package version being applied also appears.
   - **Finalizing:** EPIC is performing post-upgrade cleanup.
   - **Complete:** The upgrade has completed successfully.
   - **Rolling Back:** Upgrade has encountered an error and is reverting the EPIC platform back to the original version.
   - **Error:** The upgrade did not complete successfully.
7. Clicking the **Show Upgrade Details** link at any time during the upgrade process displays the **Upgrade Status** window. Per-node status values should be interpreted in the same way as the status values of the overall upgrade process. There is also an additional **upgraded** status, which indicates that the individual node has upgraded successfully while the overall upgrade process continues on other nodes (meaning that the node will be rolled back if an error occurs).

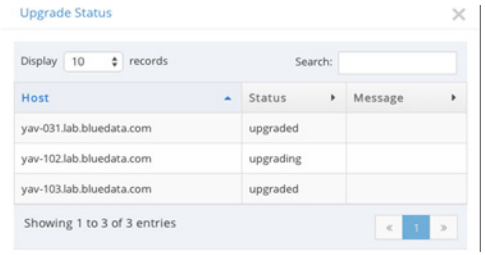


Figure 5.28: Upgrade Status window

You may view the completed upgrade in the **Upgrade History** tab. See *"Upgrade History Tab" on page 105*.

5.7 - App Store

Selecting **App Store** in the main menu opens the **App Store** screen. The **App Store** provides common Big Data frameworks, applications, and tools. Open source distributions for Hadoop, Spark, and other frameworks (as well as representative analytical applications for Big Data) are provided as pre-configured Docker images in the **App Store** and available via one-click deployment.

The top of this screen contains the following tabs:

- **Images:** This tab allows you to download and install additional Hadoop and Spark distributions. See *"Images Tab" on page 108*.
- **Add-On Images:** This tab allows you to download and install third-party data analysis and visualization tools. See *"Add-On Images Tab" on page 110*.

*Note: If the EPIC installation cannot access S3 due to lack of Internet access or no DNS on the physical servers, then the **App Store** will either be empty (after fresh EPIC installations) or will not display the latest versions as they become available. In this scenario, the Site Administrator should visit https://s3.amazonaws.com/bluedata-catalog/index.html to browse the available Catalog entries, download the required image(s) to the `/srv/bluedata/catalog` directory on the Controller, and then click **Refresh** in the **App Store** screen.*

5.7.1 - Images Tab

The **Images** tab presents all of the Hadoop and Spark distribution images offered by BlueData Software, Inc. These distributions are used by persistent and temporary clusters to load and run applications. This tab also displays the image(s) you currently have installed and allows you to install, upgrade, and uninstall additional images.

Note: You only need to download new images or revisions of existing images. Images sizes vary widely but are typically less than 3.0GB in size. These images are downloaded at image installation time, which may take some time to, depending on your network, traffic, and other variables.

*Note: Some images include additional tools, such as Cloudera Manager or Ambari. The **Details** column includes information about any such tool(s) included with each image. Installing an image that includes one or more of these tool(s) will automatically install the tool(s) as well. If you do not want to install these tool(s), then select an image that does not include the tool(s). You can access these tools by clicking the appropriate link in the **Process List** column in **Node(s) Info** tab of the **<Cluster>** screen. See "Node(s) Info Tab" on page 26.*

A variety of application frameworks (such as Hadoop and Spark) are available for use in deploying virtual clusters. Each image in the **App Store** provides a particular version and starting configuration of one of these frameworks. Add-on images are managed similarly but represent other applications that integrate with a cluster's central framework. The Site Administrator can install or uninstall available images. Installed images are available for use by tenant Members when creating jobs and clusters.

BlueData and/or application vendors may provide new images or new revisions of existing images. If a new revision becomes available for an image that is currently installed, the image will be marked in the **App Store** with an **Upgrade Available** banner, and its tile will provide a button for upgrading to the new version. Other new images or versions of currently uninstalled images will display a **New** banner.

Note: Images may only be upgraded or uninstalled when not in use by any job or cluster.

The **Images** tab contains tiles that present the following information for each image:

- **Image Name:** Short description of the image contents; for example, the name of the Hadoop or Spark distribution provided.

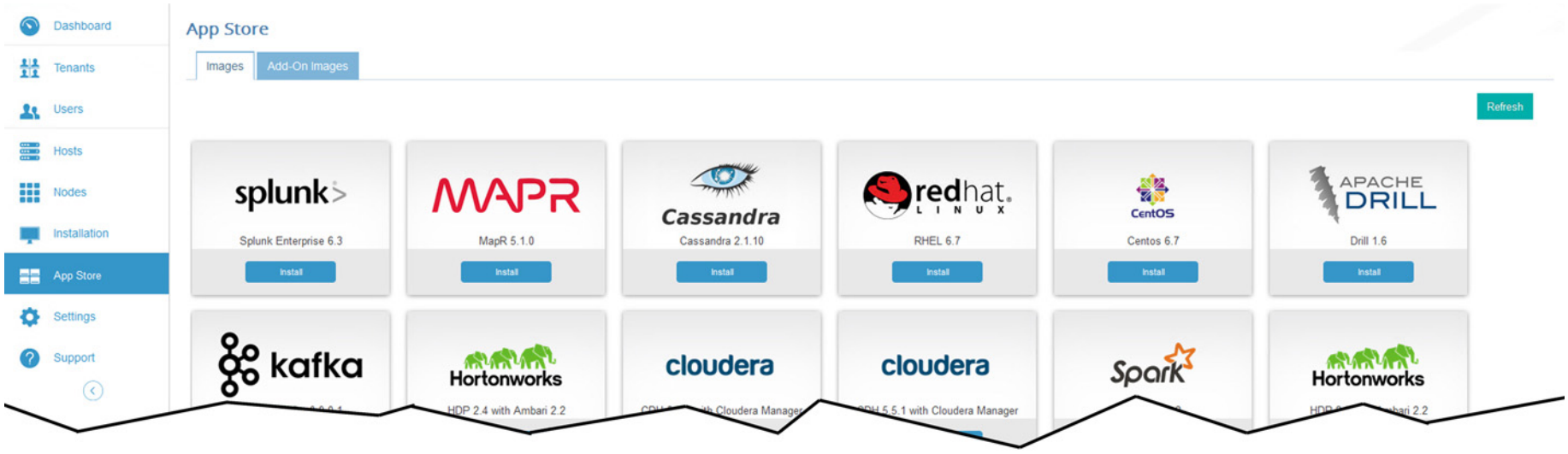


***Figure 5.29:** App Store screen - Images tab*

- **Details:** Hovering the mouse over a tile displays operating system and application support information, as well as any additional tool(s) that are included with the image. This is important when creating or editing flavors as described in *"EPIC Settings" on page 113*.
- **New/Upgrade Available:** The following additional indicators can appear:
  - **New:** This banner indicates a newly available image or new revision of an image not installed on your EPIC platform. New is defined as within 15 days from the date that the EPIC platform first detects the new or updated image.
  - **Upgrade Available:** A currently installed image has a newer revision available.
- **State:** Current status of the image, which can be one of the following:
  - **Install:** The image is available for installation on your EPIC platform.
  - **Downloading:** EPIC is downloading the selected image. A percentage indicator displays progress.
  - **Verifying:** EPIC is verifying the selected image prior to installing.
  - **Installing:** Download is complete and EPIC is installing the image.
  - **Installed:** The image is ready for use.
  - **Error:** An error has occurred during download or installation. Please try reinstalling the image. If the problem persists, please see the *Installation Guide* for instructions on contacting BlueData Technical Support for assistance.
- **Actions:** The following actions are available:
  - **Refresh:** Clicking this button at the right of the screen refreshes the image list.
  - **Install:** Clicking the blue **Install** button downloads the selected image (if necessary) and installs the selected image.
  - **Upgrade:** If the **Upgrade Available** banner appears on a tile, then clicking the **Upgrade** button installs the latest version of the selected image.
  - **Uninstall:** For installed images, hovering the mouse over the Installed button and then clicking the red **Uninstall** button removes the selected image. You can only uninstall an image that is not being used by any job(s) or cluster(s).
  - **Delete:** This option only appears for installed images that are no longer available for download from BlueData. You cannot recover a deleted image.

5.7.2 - Add-On Images Tab

The **Add-On Images** tab displays a list of third-party data analysis and visualization applications that are available for download and installation. Installed applications will appear as one or more checkbox(es) when you create a persistent cluster that meets the requirements for one or more application(s). For example, a business intelligence tool may be compatible with a cluster running Cloudera 5.2 with YARN and will appear as an option when you

create this type of cluster. Third-party applications run on Edge nodes that are separate and distinct from the Master node and any Worker node(s) in a cluster. You can select the number and flavor of Edge nodes when creating a cluster that includes one or more of these tool(s). See *"Creating a New Persistent Cluster" on page 30*.

Note: EPIC does not ship with any third-party tools; however, you may configure tools to run on EPIC Edge nodes. Please refer to the Edge Node Authoring Guide for additional information.

The **Add-On Images** tab contains tiles that present the following information for each third-party tool:

- **Image Name:** Short description of the image contents; for example, the name of the tool that it provides.
- **Details:** Hovering the mouse over a tile displays operating system and application support information, as well as any additional tool(s) that are included with the image. This is important when creating or editing flavors as described in *"EPIC Settings" on page 113*.
- **New/Upgrade Available:** The following additional indicators can appear:
  - **New:** This banner indicates a newly available image or new revision of an image not installed on your EPIC platform.
  - **Upgrade Available:** A currently installed image has a more recent revision available.

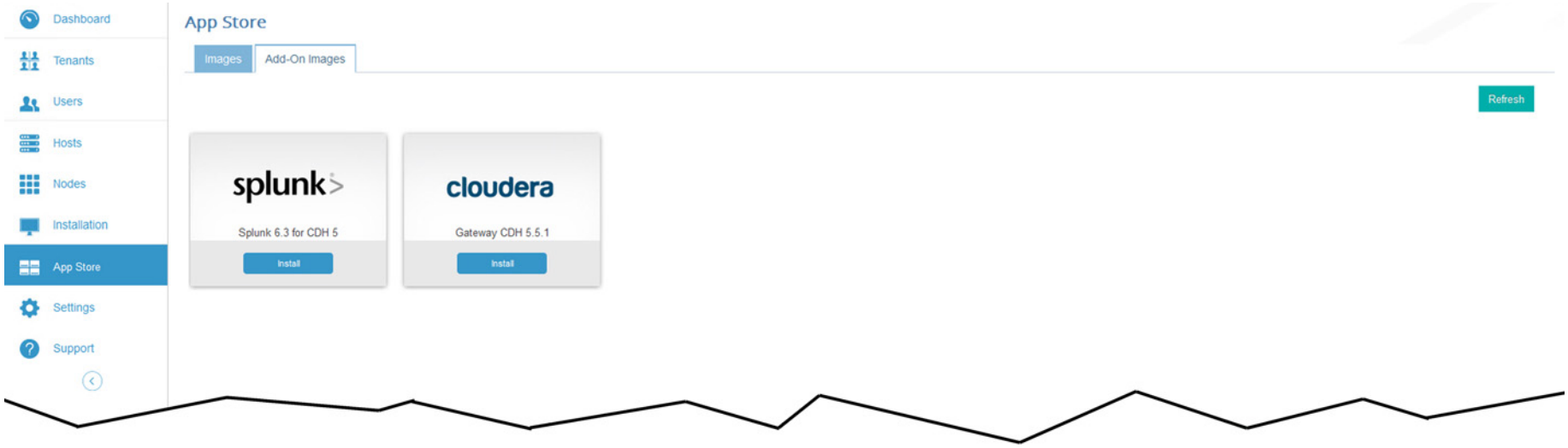


Figure 5.30: Add-On Images tab (below)

- **State:** Current status of the image, which can be one of the following:
  - **Install:** The third-party image is available for installation on your EPIC platform.
  - **Downloading:** EPIC is downloading the selected image. A percentage indicator displays progress.
  - **Verifying:** EPIC is verifying the selected image prior to installation.
  - **Installing:** Download is complete and EPIC is installing the image.
  - **Installed:** The image is ready for use.
  - **Error:** An error has occurred during download or installation. Please try reinstalling the image. If the problem persists, please see the *Installation Guide* for instructions on contacting BlueData Technical Support for assistance.
- **Actions:** The following actions are available:
  - **Refresh:** Clicking this button at the right of the screen refreshes the image list.
  - **Install:** Clicking the blue **Install** button downloads the selected image (if necessary) and installs the selected image.
  - **Upgrade:** If the **Upgrade** banner appears on a tile, then clicking the **Upgrade** button installs the latest version of the selected image.
  - **Uninstall:** For installed images, hovering the mouse over the Installed button and then clicking the red **Uninstall** button removes the selected image. You can only uninstall an image that is not being used by any job(s) or cluster(s).
  - **Delete:** This option only appears for installed images that are no longer available for download from BlueData. You cannot recover a deleted image.

5.8 - EPIC Settings

Selecting **Settings** in the main menu opens the **System Settings** screen.

The top of this screen contains the following tabs:

- **Tenant Storage:** This tab allows you to specify the root directories for automatically-created tenant DataTaps. See *"Tenant Storage Tab" on page 113*.
- **User Authentication:** This tab allows you to modify user authentication settings. See *"User Authentication Tab" on page 114*.
- **HA Settings:** This tab allows you to manage High Availability protection for the EPIC platform. See *"HA Settings Tab" on page 118*.
- **Flavors:** This tab allows you to add, edit, and remove node flavors, which specify the resources allocated to each virtual node that is created for a transient or persistent cluster. See *"Flavor Tab" on page 120*.
- **Other Settings:** This tab allows you to manage IP addresses, network interfaces, and the disk to use for High Availability protection. See *"Other Settings Tab" on page 122*.

5.8.1 - Tenant Storage Tab

The **Tenant Storage** tab allows you to designate a storage service (and, optionally, a path below the root directory) for use as tenant storage. When a tenant is created, EPIC creates a unique subdirectory for that tenant in the tenant storage and automatically creates a special DataTap pointing to that subdirectory. The properties of this DataTap cannot be edited, and the DataTap cannot be deleted until the tenant is deleted.

The nodes in a tenant may not access the Tenant Storage service outside of this subdirectory. If Tenant Storage is placed on EPIC local HDFS, a quota may also be assigned to the tenant to restrict how much data can be stored under this subdirectory.

Changing the tenant storage settings will affect tenants created after the change is made, but will not affect existing tenants. Once a tenant storage DataTap is created, it is never modified by EPIC.

To change the tenant storage settings:

1. In the **Name** field, enter a name to be used when creating the special tenant storage DataTaps.
2. In the **Description** field, enter the description to display for those DataTaps.

3. Select the file system type to use (**HDFS** or **NFS**).
   - If you selected **HDFS**, then enter the host, standby namenode host, port, and path for the root tenant DataTap directory in the appropriate fields. You may also enable or disable Kerberos security by checking or clearing the **Kerberos Protected** checkbox, as appropriate, and then following the instructions in *"Kerberos Security" on page 53*.
   - If you selected **NFS**, then enter the host, share, and path for the root tenant DataTap directory in the appropriate fields.
4. If you want EPIC to only be able to read data but not write to the tenant storage, then check the **Read Only** checkbox. This only applies to access from within the virtual nodes in the tenant. You can still upload files using the DataTap browser or other external means.
5. Click **Submit** to make your change(s).

5.8.2 - User Authentication Tab

Note: See "User Management" on page A-1 for additional information on how EPIC handles user authentication.

The **User Authentication** tab allows you to manage how EPIC integrates with your existing external authentication server (if any). To change the user authentication method:

1. Select the type of authentication to use with EPIC using the **Authentication Type** pull-down menu. The available options are:
   - **Local:** Selecting this option configures EPIC to use the built-in user database for user authentication. See *"Managing Users and Sessions" on page 90* for information on managing the local EPIC user database. Skip to Step 6.
   - **LDAP:** Selecting this option configures EPIC to use an existing external LDAP server. Proceed to Step 2.
   - **Active Directory:** Selecting this option configures EPIC to use an existing external Active Directory (AD) server. Proceed to Step 2.
2. Enter the hostname or IP address of the external LDAP/AD host in the **LDAP Host** field.
3. Enter the port of the external LDAP/AD host in the **Port** field.
4. The binding type determines how the entered username is translated into a string that is understood by the LDAP/AD server. Select how the LDAP/AD user will be determined using the **Bind Type** pull-down menu. The available options are:
   - **Direct Bind:** This option derives the user's LDAP/AD name, also known as a user's distinguished name (DN), from the entered username and then attempts to authentic the user using the entered password.
   - **Search Bind:** This option establishes a connection to the LDAP/AD server either anonymously or using a fixed account, searches for the authenticating user's DN, and then attempts to authenticate the user using the entered password.
   - Enter the LDAP/AD attribute used to retrieve user profiles (such as `cn` or `uid`) in the **User Attribute** field.

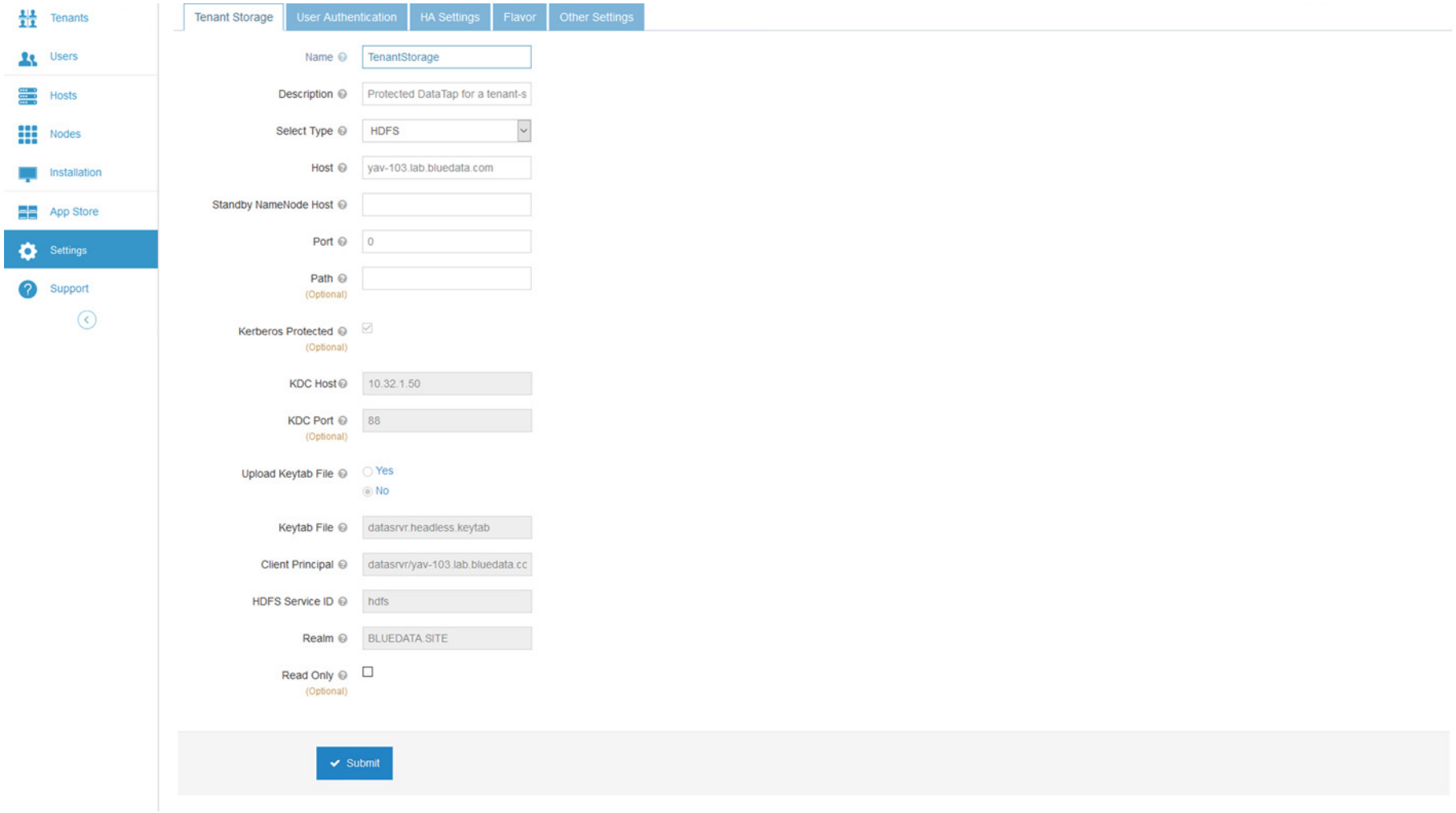


Figure 5.31: System Settings screen - Tenant Storage tab

- Enter the LDAP/AD user group(s) that will be used when searching for EPIC users in the **User Subtree DN** field.

See *"Direct Bind (LDAP)" on page 116*, or *"Search Bind (LDAP/AD)" on page 117* for configuration instructions based on your selected server/binding options. Complete the appropriate configuration before proceeding to Step 5.

5. Use the **TLS Enabled** radio buttons to specify whether Transport Layer Security (TLS) is enabled (**Yes**) or disabled (**No**) for this server. If you enable TLS, then you must specify the following:
   - **Certificate:** Clicking anywhere in the **CA Certificate File** field opens a standard **File Upload** dialog box that allows you to navigate to and select a certificate to upload.
   - **TLS Version:** Use this pull-down menu to select a specific TLS version.
   - **TLS Verify Peer:** Checking this checkbox instructs EPIC to verify that the certificate of the LDAP/AD server has been signed by a known Certificate Authority (CA).

Note: You must upload a certificate when enabling TLS for the first time. You do not need to upload it again when changing TLS settings. You can, however, upload a new certificate at any time.

6. When you have finished configuring your authorization options, click **Submit** to save your changes.

5.8.2.1 - Direct Bind (LDAP)

If you are using direct binding with an LDAP server, then you will need to specify the following parameters:

- Enter the LDAP attribute used to retrieve user profiles (such as `cn` or `uid`) in the **User Attribute** field.
- Enter the LDAP subtree that will be used when searching for EPIC users in the **User Subtree DN** field.

Note: These fields must match your existing Active Directory parameters exactly. Contact your Active Directory administrator for assistance.

Return to Step 5 in *"User Authentication Tab" on page 114*.

5.8.2.2 - Direct Bind (AD)

If you are using direct binding with an AD server, then you will need to specify whether or not to use an NT domain by checking the appropriate **NT Domain Enabled** radio button. If you select **Yes**, then enter the name of the NT domain in the **NT Domain** field. If you select No, then enter the following parameters:

- Enter the Active Directory attribute used to retrieve user profiles (such as `cn` or `uid`) in the **User Attribute** field.
- Enter the Active Directory subtree that will be used when searching for EPIC users in the **User Subtree DN** field.

Note: These fields must match your existing Active Directory parameters exactly. Contact your Active Directory administrator for assistance.

Return to Step 5 in *"User Authentication Tab" on page 114*.

5.8.2.3 - Search Bind (LDAP/AD)

If you are using search binding with either LDAP or AD, then you will need to specify the following parameters:

- **User Attribute:** Enter the LDAP/AD attribute used to retrieve user profiles (such as `cn` or `uid`) in this field.
- **Base DN:** Subtree in the LDAP/AD hierarchy within which to search for EPIC users.
- **Bind DN:** If the server does not allow anonymous binds, then enter the DN to bind to inside LDAP/AD to obtain permission to search for users.
- **Bind Password:** If the Bind DN requires a password, then enter that password (case sensitive) in this field.

Return to Step 5 in *"User Authentication Tab" on page 114*.

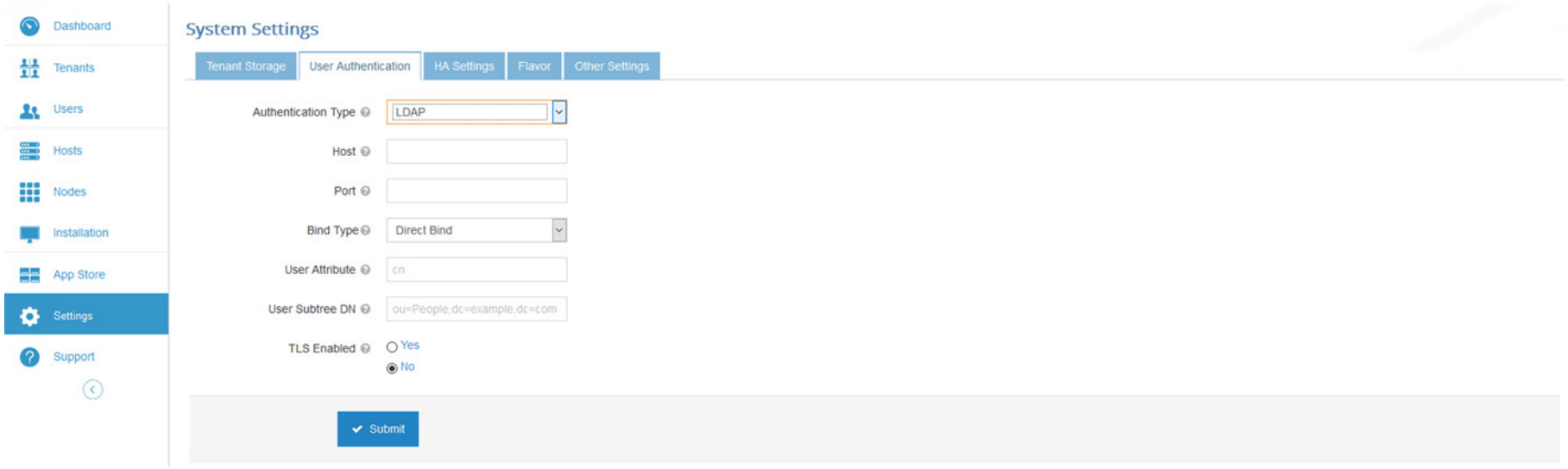


Figure 5.32: System Settings screen - User Authentication tab

5.8.3 - HA Settings Tab

The **HA Settings** tab allows you to enable High Availability protection for the EPIC platform, which protects against the failure of a single host (Controller, Shadow Controller, or Arbiter).

Note: Enabling High Availability protection for the EPIC platform protects the EPIC platform; it does not protect any virtual clusters that are running on the EPIC platform. Please see the About EPIC Guide and the EPIC Installation Guide for more information, and "Adding Worker Hosts" on page 100 for information about enabling cluster High Availability.

CAUTION: YOU CANNOT DISABLE EPIC PLATFORM HIGH AVAILABILITY AFTER IT HAS BEEN ENABLED.

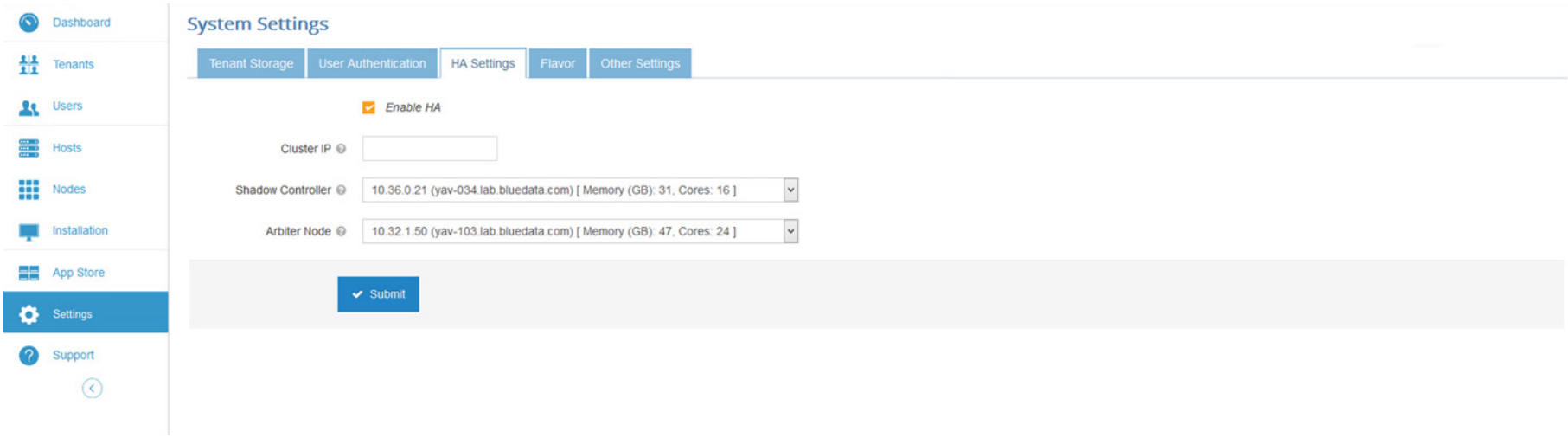
To enable High Availability for the EPIC platform:

1. Ensure that the EPIC platform meets all of the requirements listed in the *About EPIC Guide* by having at least three hosts, as described in the *EPIC Installation Guide* and *"Adding Worker Hosts" on page 100*.

   Note: All existing clusters and jobs must be removed before enabling High Availability protection. In general, you should enable this feature when you first install the EPIC platform.

2. Enter site lockdown as described in *"Lockdown Mode" on page 126*.
3. Check the **Enable HA** checkbox.

Figure 5.33: System Settings screen - HA Settings tab (below)



4. Enter an available IP address to use as the cluster IP address in the **Cluster IP** field. This IP address must be in the same subnet as the hosts in the EPIC platform. After enabling HA, you should use this IP address to log into EPIC, because this will automatically connect you to the Controller host (during normal operation) or the Shadow Controller host (when HA protection has been triggered by Controller host failure). If the Controller host fails, then you will not be able to access EPIC using the IP address of that node.

Note: The external switch connecting the hosts to the network must support gratuitous arp in order for the cluster IP address to function correctly.

5. Select the hosts to use as the Shadow Controller and Arbiter using the **Shadow Controller** and **Arbiter Host** pull-down menus. If the EPIC platform has three hosts, then the host remaining after assigning the Shadow Controller host will be the Arbiter, and vice versa. If there are more than three hosts, then you may select one of the remaining Worker hosts to be the Arbiter after selecting the Shadow Controller, and vice-versa. You cannot remove or modify the Shadow Controller or Arbiter host after enabling High Availability protection.
6. Click **Submit** to proceed with enabling High Availability protection. A message appears to inform you that the process has begun, and the **HA Settings** tab displays the message **Configuring HA**. This process may take up to 30 minutes to complete depending on a number of factors.
7. A message appears in the upper right corner of the EPIC interface once the process completes informing you have EPIC is now running in High Availability mode and reminding you to begin using the cluster IP address that you entered in Step 3 to log into EPIC going forward. Clicking the link in this message logs you out of EPIC and returns you to the **Login** screen using the cluster IP address.
8. Log into EPIC using your normal username and password.
9. Exit site lockdown as described in *"Lockdown Mode" on page 126*.

If enabling High Availability fails, then the fields in the **HA Settings** tab will reappear, and EPIC will continue running in its previous non-High Availability state. Please contact BlueData Technical Support for assistance.

5.8.3.1 - Troubleshooting Node Failures

If a High Availability host (Controller, Shadow Controller, or Arbiter) fails:

- You can access the **Service Status** tab of the Site Administrator **Dashboard** (see *"Services Tab" on page 71*) to see which host has failed. EPIC will automatically attempt to recover the host.
- If the host has not come back up within 20 minutes and EPIC has not resumed full High Availability operation, then you must manually reboot the failed host. EPIC will resume High Availability operation if the manual reboot resolves the issue.
- If manually rebooting the failed host fails to resolve the problem, then you will need to contact BlueData Technical Support for assistance.

5.8.4 - Flavor Tab

The **Flavor** tab allows the Site Administrator to create, edit, and/or delete virtual node flavors (see the *About EPIC Guide*) for use in persistent clusters and transient jobs.

This tab contains a green **Add New Flavor** button, which opens the **Add Flavor Information** popup. The table on this screen contains the following information and functions:

- **Flavor Name:** Name of the flavor.
- **Flavor Description:** Brief description of the flavor.
- **Cores:** Number of virtual CPU cores defined for that flavor.
- **Memory (GB):** Amount of memory (GB) defined for that flavor.
- **Root disk size (GB):** Size of the root disk associated with that flavor, if any.
- **Status:** Status of the flavor. This can be one of the following:
  - **Ready:** The flavor is ready for use.
  - **Error:** EPIC could not create the flavor; delete it and try again.
- **Actions:** The following actions are available for each flavor:
  - **Edit:** Clicking the blue **Edit** icon (pencil sheets) in the **Actions** column opens the **Edit Flavor Information** popup, which is populated with the selected flavor's current information. To modify the flavor, enter the updated value(s) in the appropriate field(s) and then click **Submit**.

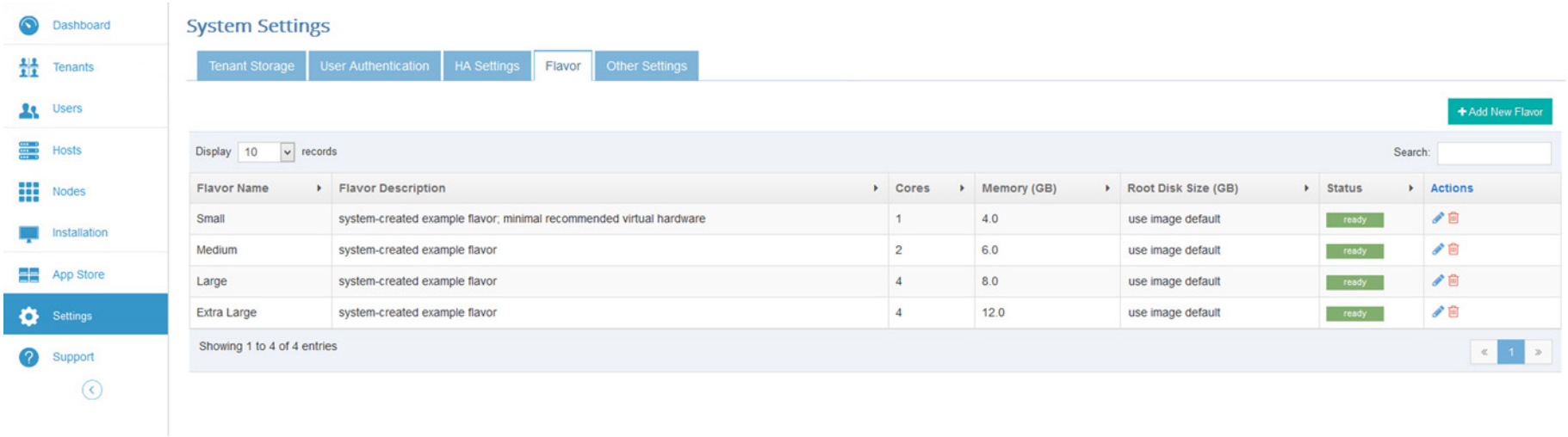


Figure 5.34: Flavor tab

Editing an existing flavor will not affect any current cluster(s) or job(s) that currently use that flavor; even adding a virtual node to an existing cluster will use the old definition of that flavor. Only clusters and jobs created after editing the flavor will use the updated values.

- **Delete:** Clicking the red **Delete** icon (trash can) in the **Actions** column deletes the selected flavor. Deleting an existing flavor will not affect any current cluster(s) or job(s) that currently use that flavor; even adding a virtual node to an existing cluster will still use the deleted flavor. A popup warning appears asking you to confirm or cancel the action. Click **OK** to proceed, or **Cancel** to exit without deleting the job.

CAUTION: EPIC WILL ALLOW YOU TO DELETE ALL OF THE FLAVORS; HOWEVER, YOU MUST HAVE AT LEAST ONE FLAVOR DEFINED IN ORDER TO CREATE A TRANSIENT JOB OR PERSISTENT CLUSTER.

5.8.5 - Creating a New Flavor

To create a new flavor:

1. In the main menu, select **Settings** to open the **Settings** screen, and then select the **Flavor** tab to open that tab.
2. Click the green **Add New Flavor** button to open the **Add Flavor Information** popup.
3. Enter the following information:
   - **Flavor Name:** Name of the flavor.
   - **Flavor Description:** Brief description of the flavor.
   - **Cores:** Number of virtual CPU cores defined for that flavor.
   - **Memory (GB):** Amount of memory in GB defined for that flavor.
   - **Data Disk (GB):** Enter the size of the data disk to use for this flavor, if any. Leaving this field blank allows the flavor to use the image data disk size (see *"Images Tab" on page 108*). This is ideal for most situations; however, you may specify a custom data disk size that will override the data disk size when creating a cluster or job that uses this flavor. When specifying a data disk size for a flavor:
     - You cannot specify a flavor data disk size that is smaller than the data disk size of the image you will be using when you create a cluster or job, as doing this will prevent you from using your desired image with this flavor.
     - You may specify a flavor data disk size that is larger than the data disk size of the image you will be using when you create a cluster or job. This may be necessary if you will be running an application that requires a local file system; however, creating a larger data disk size will consume more node storage space and count toward the tenant's node storage quota (if any).

*Note: For optimal performance, leave the **Data Disk (GB)** field blank and use DataTaps (see "DataTaps" on page 48) wherever possible.*

4. Click **Submit** to finish creating the flavor, or **Cancel** to exit without creating the flavor.

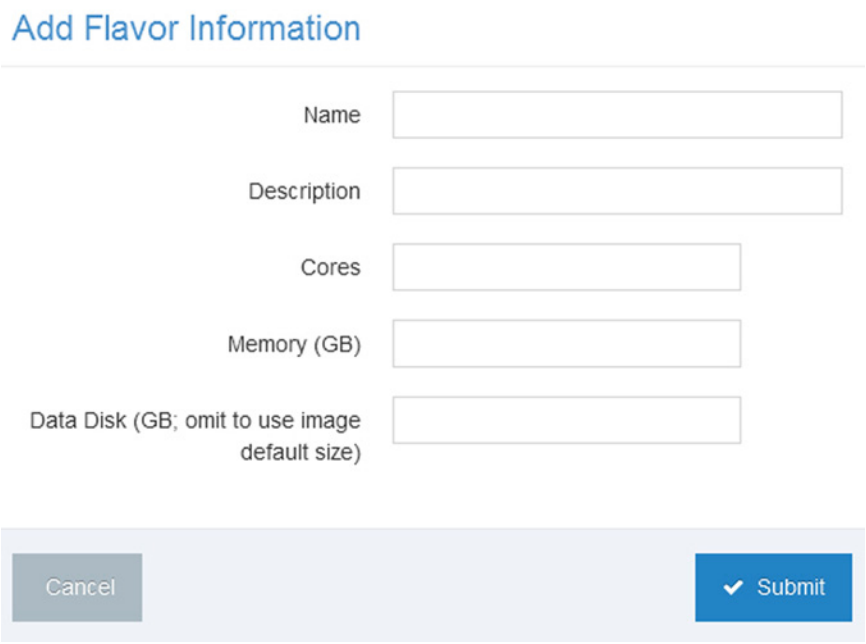


Figure 5.35: Add Flavor Information popup

5.8.6 - Other Settings Tab

The **Other Settings** tab displays the following information:

- **Floating IP Range/CIDR:** This range of addresses allows network access from outside the EPIC platform to the virtual nodes that EPIC will create as part of future clusters.
- The **Floating IP External Interface** pull-down menu displays the NIC that you selected for Internet access during the command line installation. Each host in the EPIC platform must use the same NIC to access the Internet. For example, if you selected the **eth0** NIC on the Controller host, then the **eth0** NIC on each Worker host must also be able to reach the Internet. You may select a different interface, if available and desired.
- The **Floating IP Next hop** field is the IP address of the external gateway.
- The **Internal Gateway IP** field is the IP address of the internal gateway.
- The **Domain Name for nodes** field defines the DNS domain name that will be used for virtual nodes. For example, the domain name `bdlocal` will contain virtual nodes named `bluedata-1.bdlocal`, `bluedata-2.bdlocal`, etc. You may either accept the offered default or specify some other syntactically-valid domain name.
- **CPU Allocation ratio:** This value can be set to any integer that is 1 or higher. EPIC will multiply the total number of physical CPU cores in the EPC platform by this value when reporting the total number of virtual CPUs available to the platform.
- **RAM Allocation ratio:** This value is read-only and is set to 1 because EPIC uses exactly the amount of physical unreserved RAM as the available RAM resource for nodes.

The **Other Settings** tab also contains information about whether a local HDFS service was created for tenant when you installed EPIC. This information is read-only. The presence of a local HDFS service does not necessarily mean that the EPIC platform is currently using

local HDFS for tenant storage purposes. This information is available in the **Tenant Storage** tab (see *"Tenant Storage Tab" on page 113*).

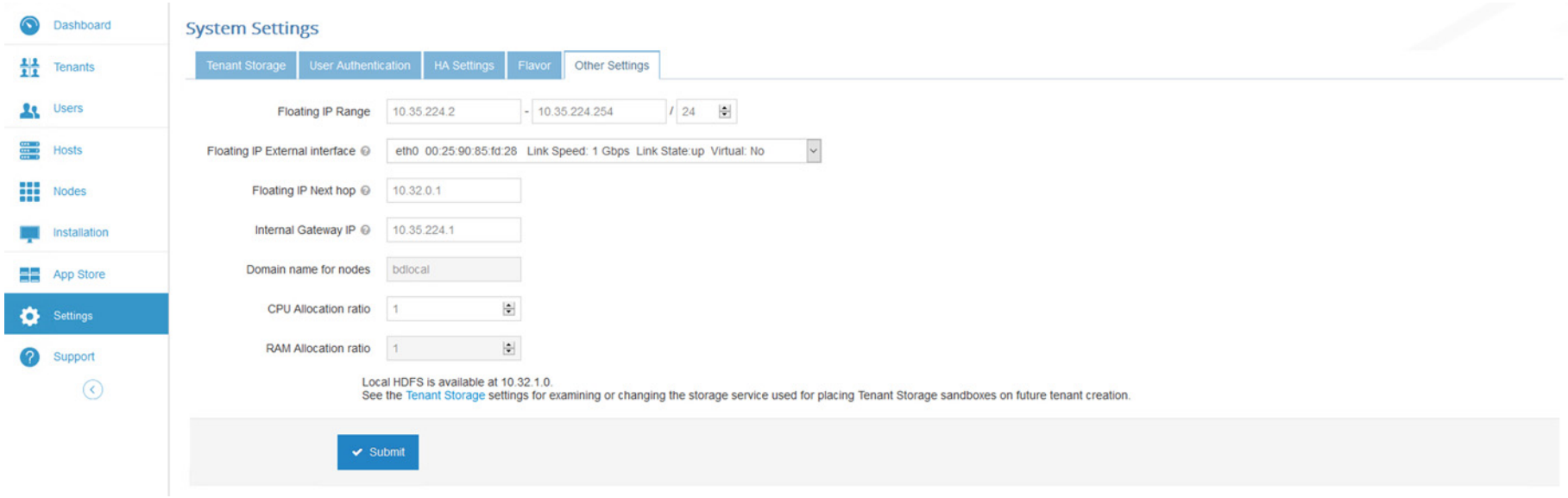


Figure 5.36: System Settings screen - Other Settings tab

5.9 - Support/Troubleshooting

Selecting **Support** in the main menu opens the **Support/ Troubleshooting** screen.

This screen allows you to create, delete, and download SOS reports to help you troubleshoot problems with your EPIC platform. If you contact BlueData Technical Support, you may be requested to forward an SOS report for support purposes. To upload an SOS report, your EPIC platform must have both of the following:

- Internet access, either directly or through a proxy.
- DNS service that can resolve references to Internet addresses.

The **SOS Report(s)** table contains the following information/ functions for all currently available SOS reports:

- **File Name:** Name of the SOS report file.
- **File Size (MB):** Size of the file in megabytes.
- **Status:** Current status of the SOS report. This may be either:
  - **Generating:** EPIC is currently generating the SOS report.
  - **Ready:** The SOS report is ready for download or upload.

Figure 5.37: Support/Troubleshooting screen

- **Uploading:** The SOS report is being uploaded to BlueData Software, Inc. The report can be downloaded, but not deleted.
- **Uploaded:** The most recent attempt to upload the SOS report to BlueData Software, Inc. succeeded. You may download, re-upload, or delete this report.
- **Upload failed:** The most recent attempt to upload the SOS report to BlueData Software, Inc. failed. You may download, re-upload, or delete this report.
- **Error:** The SOS report is in an unknown state that is probably corrupted. You may delete this report.

You can perform the following actions for each available SOS report:

- **Delete:** Clicking the red **Delete** icon (trash can) deletes the selected SOS report. A popup warning appears asking you to confirm or cancel the action. Click **OK** to proceed, or **Cancel** to exit without deleting the SOS report.
- **Download:** Clicking the gray **Download** icon (down arrow in a circle) opens an OS-default **Download** window that allows you to retrieve the selected SOS report.
- **Upload:** Clicking the **Upload** icon (up arrow in a circle) uploads (or re-uploads) the selected SOS report to BlueData Software, Inc.

5.9.1 - Generating an SOS Report

To generate an SOS report:

1. If you want to upload the SOS report to BlueData Software, Inc. then leave the **Upload to BlueData** checkbox checked; otherwise, clear this checkbox to prevent the report from being uploaded.
2. Select the desired level of detail using the **SOS Report Level** pull-down menu. You may select a number from 1-3, where **1 - sysinfo & primary logs** is the least detailed and 3 is the most detailed. Selecting **3 - large files** may generate a report that is tens or even hundreds of megabytes in size, depending on your installation and the circumstances.
3. Click the blue **Generate SOS** button.
4. You may download and/or re-upload the new SOS report once the **Status** changes from **Generating** to **Ready**.

Note: You may generate and/or upload a single SOS report at a time.

5.10 - Lockdown Mode

Lockdown mode prevents all users who do not have Site Administrator privileges from making any changes to the EPIC platform, such as creating/editing jobs, clusters, or DataTaps. This mode ensures that the EPIC platform will remain stable while the Site Administrator makes changes to the EPIC platform configuration, such as:

- Adding Worker host(s) (see *"Managing the EPIC Installation" on page 98*)
- Upgrading EPIC (see *"Adding Worker Hosts" on page 100*)

You may also use Lockdown mode to quiesce the platform during other maintenance activities outside of the EPIC interface; however, Lockdown mode does not prevent users from logging into any virtual nodes that already exist and performing activities within the virtual nodes.

Entering Lockdown mode will happen immediately if no tasks are running. If one or more task(s) are in progress when the Site Administrator enters Lockdown mode, then EPIC will complete those tasks and prevent additional changes. For example:

- Jobs will finish running.
- New clusters will finish installing.

5.10.1 - Entering Lockdown Mode

To enter Lockdown mode:

1. Open the **Quick Access** menu and then select **Enter site lockdown**.

   The **Lockdown the system** popup appears.

2. Enter a descriptive reason for the lockdown in the **Enter Reason** field and then click **Submit**.

   The red **Entering site lockdown** indicator appears in the **Toolbar** while EPIC finshes any currently-running jobs. This indicator changes to **Site lockdown** once EPIC has completed all running jobs and finished entering Lockdown mode. Any user who attempts to make any changes will receive a popup warning that this mode is in effect.

5.10.2 - Exiting Lockdown Mode

To exit Lockdown mode, open the **Quick Access** menu and then click **Exit site lockdown**. Exiting from Lockdown mode is instantaneous and allows normal usage of the EPIC platform to resume.

A - User Management

This chapter describes how EPIC handles users and access to the application, as follows:

- **Authentication Groups:** This section describes how EPIC handles users who belong to LDAP/AD groups (called *authentication groups*) compared to users who are added directly via the **User Management** screen. See *"Authentication Groups" on page A-3*.
- **Container Access:** Users who belong to authentication groups can access containers directly, subject to certain requirements. See *"Container Access" on page A-5*.

A.1 - Authentication Groups

As described in *"Creating a New Tenant" on page 81* and *"Editing an Existing Tenant" on page 76*, EPIC supports adding LDAP/AD groups (called *authentication groups*) as Tenant Members or Tenant Administrators. This avoids having to manually add individual users. Each authentication group may be associated with up to one role per tenant. A pop-up error dialog appears if you try to assign multiple roles to the same authentication group within a single tenant.

An LDAP/AD user who belongs to one of a tenant's authentication groups, as declared by the `memberOf` attribute in that user object, can log in to EPIC and act within that tenant. EPIC treats such a user as follows:

- A user who is a member of at least one tenant authentication group can log into EPIC using their LDAP/AD credentials.
- A user who is authenticated because of group membership will have their role in a tenant (i.e. member or admin) determined by the role associated with that group.
- A user who is a member of multiple authentication groups for a tenant will have the Tenant Administrator role in that tenant if any of those groups are associated with the Tenant Administrator role.
- User privileges persist for the duration of a session. A session lasts until the user logs out, 24 hours pass, or until a Site Administrator terminates the session (as described in *"Sessions Tab" on page 92*), whichever comes first.
- Changes to tenant authentication groups and role associations, or changes to group memberships on the LDAP/AD server, will apply to affected users the next time they log in and establish a new session.

Note: EPIC does not support nested group membership. For example, if Group_A is the only authentication group specified for a tenant and Group_B is a member of Group_A, then only users who are members of Group_A will be authenticated. Users who are members of Group_B but who are not direct members of Group_A will not be authenticated.

Note: When using an Active Directory server for authentication, an authentication group will not be able to grant access for AD users that have it as their Primary Group. See https://support.microsoft.com/en-us/kb/275523 for a brief discussion of the issue; however note that the Resolution of that KB article does not apply to the group queries currently used by EPIC. For EPIC's purposes, only the non-primary groups assigned to AD users can be employed as authentication groups. (This issue is not a concern if using an LDAP server.)

The EPIC user account for a group-authenticated user is automatically created when that user logs in for the first time. This behavior has the following implications:

- Users who belong to an authentication group will not appear in the **User Management** screen until they log into EPIC for the first time.
- Removing an authentication group user from the **User Management** screen does not override their group-based access permissions, because the affected user will simply be able to log back in and re-create their user account. Changing such a user's access privileges requires either removing them from the authentication group at the LDAP/AD server or changing the role associated with the entire authentication group, as described in *"Editing an Existing Tenant" on page 76*.
- Login-time account creation for a user will not occur if the Site Administrator has manually added that user to EPIC as an externally-authenticated LDAP/AD user. In that case, the user's manually assigned tenant roles will take precedence over the effects of any authentication group memberships.

A.2 - Container Access

As described in *"Tenants" on page 75*, EPIC supports user access to containers (virtual nodes) using an SSH key. EPIC now also supports direct SSH access to containers using existing credentials for users who belong to an authentication group. (This kind of access is not available for users who were manually added to EPIC via the **User Management** screen.)

For example, if your LDAP/AD username is `epicuser`, your password is `user123`, and can log in to an EPIC tenant using those credentials because of your authentication group membership, then you can use those same credentials for logging into a container within that tenant via SSH. The one exception occurs when both of the following conditions are met:

- Your LDAP/AD role specifies Member-level privileges.
- The cluster you are trying to access includes Edge nodes

If both of these conditions are met, then you will only be able to log in to those Edge nodes; however, you will be able to log into all containers if at least one of the following conditions is met:

- Your LDAP/AD role specifies Tenant Administrator privileges.
- The cluster you are trying to access does not include any Edge nodes.

The configuration process can also set up user groups and sudo access in the container. These behaviors depend on both the EPIC settings and also how the site's LDAP/AD server is set up.

*Note: A cluster with this user authentication deployed will display a **User Auth** service in the **Services** tab of the **Dashboard** screen. See "Services Tab" on page 71. A failure during this setup will give the cluster an orange warning status, indicating that configuring the authentication services has failed inside some container. This warning (or its absence) is only an indicator for the container configuration process; it does not indicate whether the objects in your LDAP/AD server are set up correctly.*

EPIC automatically configures per-user authentication after a container is first launched, such as when creating or expanding a virtual cluster, and after the application configuration package from the **App Store** has completed. The authentication package is uploaded to the container and extracted, and a script from its contents is executed. This same package is applied to all containers regardless of which **App Store** entry a container is running.

Note: EPIC includes a default package (described below), that the Site Administrator can modify as described in "Modifying the Authentication Package" on page A-10.

EPIC triggers this configuration automatically for new and existing containers. Container authentication settings are based on the EPIC

authentication and tenant external user groups settings at that time. Authentication settings for existing containers will be updated when the EPIC settings are later changed, and containers created after changing EPIC settings will reflect those changes.

Container authentication settings can be refreshed manually. This can be useful when the container is in a Warning state, or if you are a Site Administrator who wants to apply manual changes. Refreshing these settings uploads and extracts a new authentication package if the package has changed, pushes current EPIC settings to the container, and then re-executes the package. You can trigger a manual refresh by logging into the Controller host and then executing the following script:

```
/opt/bluedata/common-install/bd_mgmt/bin/
bd_mgmt cluster user_config <cluster_id>
```

In the above example, `<cluster_id>` is the number (such as 1 or 23) that corresponds to the cluster being refreshed. This ID can be viewed in multiple places, such as in the URL for the **<Cluster>** screen for that cluster in the EPIC UI (see *"Viewing Cluster Details" on page 26*).

You can also refresh cluster authentication settings by logging into one of the containers in a cluster via SSH and then executing the following script:

```
/opt/bluedata/vagent/vagent/bd_vagent/
bin/bd_vagent cluster user_config
```

This method affects only the cluster in which it is executed and therefore does not use a `<cluster_id>` argument.

A.2.1 - Authentication Settings Restrictions

The following restrictions apply to EPIC user authentication settings when enabling SSH container access for users in authentication groups:

- The authentication settings must be configured to use LDAP or Active Directory.
- TLS must be enabled.
- If **Direct Bind** is selected, then the LDAP/AD server must support anonymous search.
- If **Search Bind** is selected, then the bind DN/password can be omitted if the server supports anonymous search; otherwise the bind DN/password must be specified.

Clusters can be launched and the **Services** tab (see <xref>) will not display any orange warnings if any of these restrictions are not met; however, SSH access to containers will only be available using the tenant's SSH key as described in <xref>.

A.2.2 - LDAP/AD Server Configuration

A container must both authenticate a user and serve a POSIX user account in order to support per-user access. The LDAP/AD user object must therefore include attributes that provide additional information above and beyond what is necessary for just authenticating to the EPIC UI or API. These attributes are standard when using LDAP or AD to authenticate users into Linux systems

and must be present in order for the user to be authenticated into the container.

- For LDAP servers, user objects have the object class `posixAccount`. For AD servers, user objects have the object class `user`.
- For LDAP servers, user objects use the attributes `uid_number` and `gid_number` to specify their unique user ID and primary group ID. AD servers generate these IDs automatically.

POSIX user groups within the container can also be served from objects in the LDAP/AD server. These groups are also identified by some standard attributes. A user group in the container will only be created from an LDAP/AD group object if it has the necessary attributes.

- For LDAP servers, group objects have the object class `posixGroup`. For AD servers, group objects have the object class `group`.
- For LDAP servers, group objects use the attribute `gid_number` to specify their unique group ID. AD servers generate this ID automatically.
- For LDAP servers, group objects use the attribute `cn` to specify their name. AD servers use the attribute `sAMAccountName`.

Note: POSIX user group creation is a prerequisite for automatically configuring sudo privileges because those privileges are group-based. See "Tenant Configuration" on page A-8.

User and group objects must all be "beneath" the **Base DN** or **User Subtree DN** specified in the **User Authentication** tab (see *"User Authentication Tab" on page 114*). This constraint on group objects is not needed for tenant membership checks; however, it is necessary if you want those group objects to appear as POSIX user groups inside the containers.

Enabling tenant access filtering and user-to-group associations inside the container (beyond the user's primary group) requires the user and group objects on the LDAP/AD server to refer to each other using the following standard attributes:

- The user object identifies a group membership with an instance of the `memberOf` attribute that specifies the group DN.
- The group object also identifies its members using an attribute determined by the LDAP server schema.

OpenLDAP servers support using a `memberOf` plug-in that will automatically add `memberOf` attributes to users in response to that user being added to the group object's members. Active Directory should natively handle this cross-referencing without an additional plug-in.

The auth.props file included with the authentication package describes all of the user and group attributes listed in this section (along with other optional attributes) and allows you to modify them id needed. See *"Modifying the Authentication Package" on page A-10*.

A.2.3 - Tenant Configuration

If a tenant does not have external user groups configured, then containers within that tenant can only be accessed using the tenant's SSH key for the `bluedata` account (see *"Tenants" on page 75*).

Note: If desired, the Site Administrator can modify the authentication package to allow container access for all LDAP/AD users (in the specified search scope) in this no-external-groups case. See "Modifying the Authentication Package" on page A-10.

A tenant that does have external user groups configured will only allow members of those groups to do username/password authentication for containers in that tenant. (The tenant's SSH key for the `bluedata` account is still usable.) A user is considered to be a group member of that user's LDAP/AD object has a memberOf attribute with the value of the group DN.

The **Tenant Keypair Visibility** setting (see *"Creating a New Tenant" on page 81* and *"Editing an Existing Tenant" on page 76*) can affect sudo privileges. If an external user group is configured properly to generate a POSIX user group in the container, and if the role corresponding to that group has access to the tenant's SSH key, then users in that group will also be granted sudo access. These sudo privileges do not have any direct functional relationship to the tenant's SSH key; however, anyone with access to that key already has effective sudo access. Thus, the configuration setup will decide to extend sudo privileges to users in that POSIX group as a convenience.

Tenant external user group settings are the only settings that can affect sudo privileges within a container. Manually adding a user to a tenant with some role has no bearing on whether or not that user will have sudo privileges for the containers within that tenant.

For example, assume that a tenant has an external user group named `testadmingroup` whose DN is associated with the Tenant Administrator role. It also has an external user group named `testmembergroup` whose DN is associated with the Tenant Member role. Users who belong to either or both of these groups can authenticate to containers within this tenant. Other LDAP/AD users who do not belong to either group cannot authenticate to these containers.

In this example:

- User_A is member of the `testadmingroup`.
- User_B is a member of the `testmembergroup`.
- User_C belongs to the `testmembergroup` and some other group.
- User_D does not belong to either group.

Users A, B, and C can log into containers in this tenant using their usernames and passwords that will be authenticated by the LDAP/AD server. User D cannot log in because he is not a member of either group that has been specified for this tenant.

Further, if the tenant keypair visibility is set to **Administrator Only**, then only User_A will have sudo privileges, and this only if `testadmingroup` has the necessary attributes on the LDAP server to represent a POSIX user group. Keypair visibility can also be set to make the keypair visible to all or none of these users, as

described in *"Creating a New Tenant" on page 81* and *"Editing an Existing Tenant" on page 76*. This will result in extending group-based sudo privileges to all or none of these users.

A.2.4 - Cluster Restrictions

Per-user authentication setup will only happen in clusters that use the latest **App Store** images provided at the time of the EPIC 2.3 release (or later). Clusters created using older images will function normally, whether created before or after upgrading to EPIC 2.3; however, such clusters will not support the per-user authentication described in this Appendix, and they will not display a **User Auth** service in their **Services** tab. Continue to use the tenant's SSH key to log into those clusters (see *"Tenants" on page 75*).

A.2.5 - Troubleshooting

Per-user authentication requires the objects on the site's LDAP/AD server to provide the necessary objects and attributes. It also requires close agreement between the configuration process and the LDAP/AD server about which object classes and attributes are to be used. The configuration package assumes certain standard configurations, but it may need to be modified if those assumptions are incorrect (see *"Modifying the Authentication Package" on page A-10*).

If user authentication is failing, then you can examine log files in the container to determine the issue. Output from the configuration process is written to `/var/log/bluedata/postconfig.log`. This log is particularly useful to see if the `auth.py` script intentionally decided not to set up the per-user authentication feature because of the absence of some prerequisite (such as the fact that the app image is too old, or that the EPIC auth settings are not TLS-enabled).

Note: The initial `no domains configured` *and* `failed to clear auth credentials cache` *warnings in* `postconfig.log` *are normal.*

Any login attempts and failures will (as is normal for Linux) be tracked in `/var/log/secure`.

By default, the LDAP/AD authentication service (`sssd`) is configured to log errors only, in `/var/log/sssd/sssd_default.log`. This is useful for seeing whether the user in an attempted login is unknown to the LDAP/AD server (which may indicate an issue configuring the attributes used to search for users), or if there are problems communicating with the LDAP/AD server. You can increase the debug level by modifying `debug_level` in `auth.props` in your authentication package and forcing an authentication refresh, or by directly modifying `debug_level` in `/etc/sssd/sssd.conf` and restarting the `sssd` service. See *http://linux.die.net/man/5/sssd.conf* for a description of `debug_level`.

A.2.6 - Modifying the Authentication Package

When modifying the authentication package:

- Package-replacement must be performed from a shell on the Controller host. If platform HA is configured, Shadow Controller host access is also required.
- The package is located at `/opt/bluedata/catalog/postconfig/userconfig.tgz`. This is a normal gzipped tar package; you can extract its contents, modify them, and then re-create the package. Whatever package exists at that path will be the one uploaded to containers. If platform HA is configured, you must replace the package both on the Controller host and on the Shadow Controller host.
- If SELinux is enabled, execute the command `chcon system_u:object_r:usr_t:s0 userconfig.tgz` on any newly-created package to ensure that it has the correct security context.

About the package contents:

- The files must be contained within a directory (which is currently named `userconfig`).
- The files must include an executable script named `postconfig`. This is the script that is sudo-executed on the container after the package is uploaded and extracted there.
- `postconfig` currently runs a Python script named `auth.py`. `auth.py` handles all of the per-user SSH configuration. It reads from the `auth.props` file to determine some of the relevant settings.

The Site Administrator can arbitrarily modify the package contents. Most commonly, however, `auth.props` will need modification to adapt to the characteristics of the site's LDAP/AD server, and/or some of the constants at the top of `auth.py` will be modified to specify which containers should or should not be configured for per-user SSH.

The properties in `auth.props` correspond directly to settings that will be placed in the `[domain/default]` section of `/etc/sssd/sssd.conf`. Comments in `auth.props` document the effect of various common settings. For example, if the site's LDAP/AD server uses a nonstandard object class to identify POSIX group objects, or nonstandard attributes to identify such things as a user's full name or home directory path, then `auth.props` should be modified accordingly.

The constants at the top of `auth.py` can be used to specify the set of situations under which this configuration will be applied to a container. For example, if it is desirable that only containers in certain tenants allow per-user SSH, or only containers with certain roles, then such behaviors can be set by editing `auth.py` to change the values of the relevant constants. The value of the `RUN_IF_NO_TENANT_USER_GROUPS` constant can also be changed to allow access for LDAP/AD users when no authentication groups are specified for a tenant.

If more extensive changes are required, `auth.py` can be freely edited or replaced.

B - Troubleshooting

This chapter contains basic troubleshooting instructions, as follows:

- **Hardware Errors:** This section assists you in the event of a hardware failure in either the Controller host or Worker host(s). See *"Hardware Errors" on page B-3*.
- **Runtime Errors:** This section assists you with various errors that may occur while running EPIC. See *"Runtime" on page B-4*.

Please see the *Installation Guide* if you need to perform troubleshooting while installing EPIC.

B.1 - Hardware Errors

This section contains instructions that may help you if you run into hardware problems while running EPIC.

B.1.1 - General Problems

- EPIC does not include any redundancy. If a disk failure occurs, you will lose all data that has not been backed up. In general, you should use an external resource for default storage and ensure that it is backed up in accordance with your IT policies.
- If a Worker host fails, the Controller host will automatically drop the affected Worker host. You can replace a failed Worker host by setting up the new host with the same hostname, IP address, and MAC address as the old Worker host. Boot the replacement Worker host and register it with the desired Controller host. If this replacement involved swapping out a data drive (such as if you have local default storage), then you will need to recover the data from your existing backups according to your existing disaster recovery plan.
- If a job spans multiple hosts and one of those nodes fails, the job will fail and the Controller host will remove the failed Worker host from the EPIC platform.

B.2 - Runtime

This section contains instructions that may help you if you run into software problems while using EPIC.

B.2.1 - General

- If one of the services listed in the **Node(s) Status** tab of the **Physical Nodes** screen shows a status of **Critical**, then use the **Support/Troubleshooting** screen to generate an SOS report, as described in *"Support/Troubleshooting" on page 124*.
- If you see any other software error, then either run an SOS report (see above) or contact BlueData Technical Support as described in the *Installation Guide*.
- Remember that an application may experience an internal error that does not affect EPIC operation. In this case, the job status will appear as completed. EPIC only returns a job execution error if EPIC is unable to run the job.

B.2.2 - DataTaps

- The **Path** field of a DataTap specifies where the top of the DataTap's file system is rooted. For manually created DataTaps, this field must either be empty, or it must point to an existing subdirectory of the indicated storage system. For an automatically created tenant default DataTap, EPIC will automatically create the indicated subdirectory if necessary, whenever any writes are done to that DataTap.
- While one or more running jobs are accessing a DataTap, deleting or editing that DataTap may cause errors in those jobs.
- Tenant admins may choose to create DataTaps in different tenants that point to the same storage path; in this situation, jobs in different tenants can access the same storage simultaneously. Also, multiple jobs within a tenant may use a given DataTap simultaneously. While such sharing can be useful, be aware that the same cautions and restrictions apply to these use cases as for other types of shared storage: multiple jobs modifying files at the same location may lead to file access errors and/or unexpected job results.

B.2.3 - DataTap URIs

Given a valid DataTap, you can use its name to compose DataTap URIs that you give to applications as arguments.

Each such URI maps to some path on the storage system that the DataTap points to. The path indicated by a URI might or might not exist at the time you start a job, depending on what the application wants to do with that path. Sometimes the path must indicate a directory or file that already exists, because the application intends to use it as input. Sometimes the path must NOT be something that currently exists, because the application intends to create it.

The semantics of these paths are entirely application-dependent, and are identical to their behavior when running the application on a physical Hadoop or Spark platform.

A DataTap URI can also be used to specify the location of a cluster file system. In this usage, the path that the URI maps to does not need to already exist; it will be created if necessary.

B.2.4 - Common Job/Cluster Errors

Lack of sufficient available resources is one of the most common reasons why creating a job or cluster may fail. Some of the specific resource issues that commonly occur can include:

- There are not enough free resources remaining within the current tenant (a violation of tenant quotas) to create all of the requested virtual nodes for the job or cluster.
- The EPIC platform as a whole does not have enough free resources available, even if the tenant quota is not violated.
- An attempt to create at least one of the virtual nodes was unable to find enough free resources provided by any single host. This may occur because a virtual node must "fit" within a single host; it cannot span across or use resources drawn from multiple hosts.
- Persistent clusters with HBase or YARN High Availability enabled require the first three virtual nodes of a cluster to be placed on different hosts for optimal protection. The same requirement also holds for HBase transient jobs. If the hosts do not have enough free resources to meet this requirement, then job/cluster creation will fail. This requirement is not enforced if the EPIC platform has fewer than three hosts; however, the job/cluster will be more vulnerable to subsequent host or node failures.

Note: YARN High Availability is not currently available for transient clusters.

If a job/cluster creation attempt fails for lack of resources, you can attempt the following solutions:

- Use a smaller number of nodes, or a flavor with smaller VCPU/memory requirements, if that is still acceptable for the application requirements.
- Free up resources by either:
  - Deleting unused or lower-priority clusters in the tenant.
  - Waiting for current transient jobs in the tenant to complete.
  - Deleting unneeded or lower-priority transient jobs.
- If you selected YARN High Availability for the cluster but can make do without, try creating the cluster again without enabling YARN High Availability.
- Contact the Tenant Administrator about raising the tenant quota (if tenant quota violation caused the error).
- Contact the Site Administrator about adding more hosts to the platform.

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