

Contents

0 EDB Cloud Database Service	1
1.0 EDB Cloud Database Service	2
1.1 CDS Supported Platforms	2
1.2 Using the CDS Management Console	3
Using a Free Trial Console	4
Signing Up for a Paid Console	4
Signing Up for Manual Invoicing	5
1.3 The Management Dashboard Tab	6
1.4 The Teams/Users Tab	6
Managing Teams	6
Managing Users	7
1.5 The Account Tab	7
Using Reserved Instances	8
1.6 The Pricing Tab	9
1.7 The Help Tab	9
1.8 Using the CDS User Console	9
1.9 Using the Cluster Tab	9
The Details Panel	11
The Monitoring Panel	13
The Events Panel	13
1.10 Using the Backup Tab	14
1.11 Creating a Server Cluster	14
Manually Creating a Cluster	14
Using a Template to Create a Cluster	16
Cloning a Server Cluster	17
Using a Template to Clone a Cluster	18
1.12 Managing a Server Cluster	18
Managing Database Server Operations	18
1.13 Connecting a Client Application to a CDS Cluster	19
Load Balancing	20
1.14 Managing Backups and Recovery	21
Performing a Base Backup for Point-In-Time Recovery	21
Restoring a Cluster from Backup	22
Using a Template to Restore from Backup	23
1.15 Automatic Failover	23
1.16 Manual Scaling	24
Manually Adding Replicas and Storage	24
Manually Removing a Replica	25
Manually Changing the Server Class	25
1.17 Updating the Server Version	25
Performing a Minor Version Upgrade	26
Performing a Major Version Upgrade	26
1.18 The CDS Email Notification System	27
1.19 Conclusion	27

0 EDB Cloud Database Service

EDB Cloud Database Service

EDB Cloud Database Service (CDS) offers fast access to Postgres databases in a concierge-hosted service. In minutes, CDS configures a cluster of database machines with:

- Monitoring
- Streaming replication
- Connection pooling
- Load balancing
- Automatic failover (transaction or recovery time preferred)
- Secure data encryption

- Rotating user-scheduled backups
- Point-in-time recovery
- Elastic storage
- Elastic scale out

Simplified deployment allows you to take advantage of automatic scaling of storage resources and scale out of read replicas when a database cluster reaches user-defined thresholds. This provides unattended, around-the-clock responsiveness to unpredictable load demands on your database infrastructure without management responsibilities associated with a self-managed cloud network.

This document is written to acquaint you with the process of deploying on Cloud Database Service; it is not a comprehensive guide to using CDS or Postgres database products.

1.0 EDB Cloud Database Service

EDB Cloud Database Service

EDB Cloud Database Service (CDS) offers fast access to Postgres databases in a concierge-hosted service. In minutes, CDS configures a cluster of database machines with:

- Monitoring
- Streaming replication
- Connection pooling
- Load balancing
- Automatic failover (transaction or recovery time preferred)
- Secure data encryption
- Rotating user-scheduled backups
- Point-in-time recovery
- Elastic storage
- Elastic scale out

Simplified deployment allows you to take advantage of automatic scaling of storage resources and scale out of read replicas when a database cluster reaches user-defined thresholds. This provides unattended, around-the-clock responsiveness to unpredictable load demands on your database infrastructure without management responsibilities associated with a self-managed cloud network.

This document is written to acquaint you with the process of deploying on Cloud Database Service; it is not a comprehensive guide to using CDS or Postgres database products.

1.1 CDS Supported Platforms

The CDS management console runs on the following browser versions (or newer):

- Mozilla Firefox 18
- Mozilla Firefox 17 ESR, 24 ESR, 31 ESR
- Internet Explorer 8
- Safari 6
- Opera 16
- Google Chrome 23

CDS provisions cluster instances on the following 64-bit Linux systems:

- CentOS 7.x

CDS provisions the following cluster instance types:

- EDB Postgres Advanced Server v 11
- PostgreSQL v 11
- EDB Postgres Advanced Server v 10
- PostgreSQL v 10

Advanced Server clusters are provisioned with support for the following extensions:

- Index Advisor

- SQL*Protect
- PL/Perl
- PL/Python
- PL/Tcl
- Clone Schema
- PL Debugger
- SQL Profiler
- PostGIS
- parallel clone
- SSLUtils
- btree_gin
- btree_gist
- citext
- earthdistance
- fuzzystrmatch
- hstore
- intarray
- ltree
- pg_buffercache
- pg_trgm
- pgcrypto
- postgres_fdw
- unaccent
- uuid-oss

PostgreSQL clusters are provisioned with support for the following extensions:

- PL/PgSQL
- PL/Perl
- PL/Python
- PL/Tcl
- PL Debugger
- PostGIS
- btree_gin
- btree_gist
- citext
- earthdistance
- fuzzystrmatch
- hstore
- intarray
- ltree
- pg_buffercache
- pg_trgm
- pgcrypto
- postgres_fdw
- unaccent
- uuid-oss

1.2 Using the CDS Management Console

Cloud Database Service (CDS) is designed to help you easily create and manage high-availability database clusters. To get started with CDS, open a browser and navigate to:

<https://www.enterprisedb.com/edb-postgres-cds>

Select a link on the page to login or start a free trial. When logging in, provide your EnterpriseDB account credentials; if you do not have a user account, follow the onscreen links to register as a user.

The EnterpriseDB registration page.

Click each respective link to review details; if you agree, check the box to the left of **I agree to the Terms & Conditions**

and click **SUBMIT** to continue.

After registering, you will be sent an account activation email. Follow the link in the email to provide a password for your account and complete the registration process.

After logging in, you will be taken to the CDS **Dashboard** tab, where you can select a deployment type. Select the **AWS Free Trial** button to deploy a **free trial console**. Please note that some restrictions apply.

The CDS Dashboard tab.

Using a Free Trial Console

Using a Free Trial Console

You may elect to deploy a trial console while experimenting with CDS. You are not required to provide a credit card when registering for a free console, but some restrictions do apply:

- Free consoles are deployed in US-East-1 (N. Virginia).
- Available free instance types are **t3.micro** and **t3.small**.
- Each instance has a lifetime of 7 days.
- A template must be used to define an instance on a free console; two templates are available:
 - Developer Postgres Advanced Server
 - Developer PostgreSQL
- An organization (including all of the teams) is limited to 5 free nodes.
- Trial console usage is not included on the **Account** tab.

We offer a paid subscription option which does not have the above-listed restrictions, refer to the **Signing Up for a Paid Console** for paid console details.

billing information Signing Up for CDS

Signing Up for a Paid Console

Use options on the **Account tab** to manage your billing preferences.

The Account Details tab.

You have the option to pay for your subscription with a credit card or via manual invoicing. To apply for manual invoicing, complete the **More Options** tab located in the **Payment Methods** panel on the **Details** tab of the **Account** tab.

To use a credit card to pay for your consoles, use fields in the **Credit Card** section to provide details about the credit card that will be used for the account billing. EnterpriseDB accepts Visa, MasterCard, American Express, Discover, Diners Club, and JCB. All billing will be in US dollars.

Provide card information in the **Card** field:

- the card number in the **Card number** field.
- the expiration date in the **MM/YY** field.
- the card verification value in the **CVV** field.

Then, specify cardholder information below the card information:

- the first name of the cardholder in the **First Name** field.
- the last name of the cardholder in the **Last Name** field.
- the first line of the card's billing address in the **Address 1** field.
- the second line of the card's billing address in the **Address 2** field.
- the name of the city to which the credit card's bills are sent in the **City** field.
- the name of the state, province, or county to which the credit card's bills are sent in the **State/Province/County** field.
- the name of the country to which bills are sent in the **Country** field.
- the billing postal code in the **Postal/Zip Code** field.
- If applicable, provide a VAT number in the **VAT Number** field.

The **Organization Details** section displays the contact information entered when you registered; click the **Edit** button to update the information shown. You can modify the:

- Organization Name
- Primary Email Address
- CC Email Addresses

supported regions

Press the **Subscribe** button to complete the registration process and continue to the CDS Dashboard. Use links on the **Dashboard** tab to select the region in which your console will be deployed; CDS currently supports the following regions:

- US East (N. Virginia)
- US West (N. California)
- EU (Ireland)
- EU (Frankfurt)
- Asia Pacific (Sydney)
- Asia Pacific (Singapore)

If you would like to request support for a specific region, please reach out to:

<mailto:cds-help@enterprisedb.com>

Your current user account will be able to deploy a console on the regions offered.

Select a region for deployment.

When you select a region, the **Ark user console <cds_user_cluster_tab>** will open in a new browser tab. The CDS management console will remain available in your current tab, allowing you to perform management tasks related to the account.

Tabs on the CDS web interface allow you to manage your CDS account. Tab access is controlled by administrator-assigned membership in a **Team <cds_mgmt_teams_users>**.

manual invoicing **Signing Up for Manual Invoicing**

Signing Up for Manual Invoicing

Requests for manual invoicing will be reviewed by the CDS team. Use the **More Options** tab located in the **Payment Methods** panel to submit a request.

Provide billing details for manual invoicing.

Use fields on the **More Options** tab to provide billing information for your organization. Provide:

- the first line of the address to which invoices will be sent in the **Address 1** field.
- the second line of the billing address (if applicable) in the **Address 2** field.
- the name of the city to which bills will be sent in the **City** field.
- the name of the state to which bills will be sent in the **State** field.
- the name of the country to which bills will be sent in the **Country** field.
- the postal code for the billing address in the **Zip** field.
- a VAT number in the **VAT Number** field (if applicable).

When you've completed the dialog, click the **Contact Sales** button to submit your application.

The request for invoicing is pending.

After submitting billing details, the **More Options** tab will display the status of your request for manual invoicing. When your request is approved, the status will be updated from **Pending** to **Approved** and you will be sent a notification email. While your application is being reviewed, you will have access to free consoles via the CDS **Dashboard** tab; once approved, you will be able to select from all of the consoles shown on the **Dashboard** tab.

If the request is **Rejected**, you will be required to provide credit card information to use paid consoles.

If you have initially created an account with credit card billing, and wish to move to manual invoicing, you can submit a request for manual invoicing, and continue to use the credit card billing until the manual invoicing is approved. Once approved, credit card details will be removed from the **Credit Card** tab, and any charges will be invoiced manually.

1.3 The Management Dashboard Tab

Select an AWS region from the options displayed on the **Dashboard** tab to spin up a new console.

The Dashboard tab.

CDS will open a new browser tab in the selected region.

The Clusters tab.

To provision a database cluster, select the **New Cluster** icon in the left panel of the **Clusters** tab.

1.4 The Teams/Users Tab

A *team* is a group of users with collective permissions to access the different tabs of the administrative console based on the role(s) associated with the team. When you create (or modify) a team, you can assign membership in a role to that team. Each user in a team inherits all of the roles (privileges) of that team.

An organization can have multiple teams; similarly, a user may be a member of multiple teams.

Roles are predefined:

- The **Billing** role provides access to view your account's invoices.
- The **Provisioning** role provides access to create, update/upgrade, and delete database clusters or backups.
- The **Support** role provides access to documentation, white papers, support forums, and CDS support (you can send an e-mail to cds-help@enterprisedb.com to log tickets).
- The **User Management** role provides access to create, edit or delete teams and other team members.
- The **Organization Admin** role provides access to update payment or organization details, buy reserved CDS instances, opt for enterprise support, or view account's current usage, etc.

You can use the **Teams/Users** tab to define teams and assign membership in a team to one or more users.

The Teams/Users tab.

admin team

The **Admin** team is predefined, and has access to all of the functionality of each role.

team management

Managing Teams

Click the **Add Team** button to open the **Add Team** dialog and define additional user teams for your organization.

The Add Team dialog.

Use fields on the **Add Team** dialog to define a new team:

- Enter the name of a team in the **Name** field.
- Enter a description of the team in the **Description** field.
- Use the **Roles** field to select one or more Roles in which the team has membership.

When you're finished, click the **OK** button to save the team definition and continue.

You can use options in the **Actions** column to manage a team definition:

- Click the **Edit** icon to modify a team definition. When the **Update Team** dialog opens, modify the team definition and select **OK** to preserve your changes, or select **Cancel** to exit without saving.
- Select the **Delete** icon to delete a team. If you elect to delete a team, a popup will confirm your selection before deleting the definition.

deleting a team

Deleting a Team

To delete a team, highlight the team name and select the delete icon to the right of the name; when the popup opens, select **Delete** to delete the team, or **Cancel** to exit the popup without removing the team.

Deleting a team.

user management

Managing Users

To add a user to a team, select the **Users** tab; the tab displays a list of the currently defined users.

The Users tab.

Click the **Add User** button to open the **Add User** dialog and add users to teams within your organization.

The Add User dialog.

Use fields on the **Add User** dialog to define a new user:

- Enter the email address of the user in the **Email** field.
- Use the **Teams** field to specify one or more teams in which the user is a member. The user will have access to all of the administrative console tabs that are associated with the selected team(s).

When you're finished, click the **OK** button to save the team definition and continue.

You can use options in the **Actions** column to manage a user definition:

- Click the **Edit** icon to modify a user definition. When the **Update User** dialog opens, modify the definition and select **OK** to preserve your changes, or select **Cancel** to exit without saving.
- Select the **Delete** icon to delete a team. If you elect to delete a team, a popup will confirm your selection before deleting the definition.

deleting a user

Deleting a User

To delete a user, highlight the user name and select the delete icon to the right of the name; when the popup opens, select **Delete** to delete the user, or **Cancel** to exit the popup without removing the user.

Deleting a user.

1.5 The Account Tab

You can use options accessed through the **Account** tab to:

- manage billing and invoicing details for your account.
- save money by purchasing deeply-discounted reserved instances.
- review account usage.
- review and download invoices for your account.

Managing subscription information for your account.

Payment details

Use options on the **Details** tab to manage the information for your CDS account:

- Use the **Payment Methods** section to provide credit card or **More Options** payment information for your account.
- Use the **Organization Details** section to manage your organization name or contact emails.

Use the **Purchase** tab to enable Enterprise Support and access discounted prices for *reserved instances*.

CDS support is offered in two levels; **Basic Support and Enterprise Support**. Use the **Enterprise Support** slider to enable Enterprise Support. Enterprise support includes 24 x 7 access to Postgres Rocks, an initial response to support issues in 30 minutes, and performance tuning guidance.

If you enable **Enterprise Support**, you will be prompted to confirm that you are authorizing additional charges related to the option.

Enterprise Support.

Reserved Instances

When you reserve instances, you agree to use a pre-determined instance type for a specified length of time; EnterpriseDB offers a deep discount on the instance price for reserved instances. The discount price automatically applies to existing running instances (of the same instance type) starting from the date of purchase.

Reserving instances.

Purchasing reserved instance

Use fields on the **Reserved CDS** tab to review and select from your reserved instances offers:

- Use the **Provider** drop-down to select the service provider.
- Use the **Region** drop-down to select the region in which your instances will be deployed.
- Use the **Instance Type** drop-down to select the server type of the instances.

Then, click **Show Offers** to see the available reserved instances that match your specifications.

To purchase reserved instances, select **Add to Cart** and use shopping cart options to complete the purchase. Details about your savings are noted in the shopping cart.

The **Purchase History** tab displays a detailed list of completed purchase transactions.

usage

The **Usage** tab provides rapid access to the un-billed usage for your account. Please note that the usage displayed does not include trial consoles.

Reviewing the account usage.

invoices

The **Invoices** tab contains a list of the invoices for your account. Click a column heading to sort the displayed invoices, or the **Download** icon (in the **Actions** column) to download a specific invoice.

Reviewing the invoices for your account.

Please note that trial console information is not included on the **Invoices** tab.

reserved instances

Using Reserved Instances

You can reserve Advanced Server or PostgreSQL database instances for Cloud Database Service for a one year term. Using reserved instances provides substantial savings for:

- Steady state use cases
- Database instances for your production applications
- Mission critical applications that run on Multi-AZ database deployments for higher availability and data durability

The discount price automatically applies to existing running instances (of the same instance type) starting from the date of purchase. For more information about reserved instances, visit the [EnterpriseDB website](#).

1.6 The Pricing Tab

Use the **Pricing** tab to review cost estimates for the instances that reside on Cloud Database Service; you can select your availability zone and update the rates displayed. It also provides quick access to the support options that are available to you.

The Pricing tab.

The following support options are available:

- Email support
- Customer Portal resources
- PostgresRocks platform

support options enterprise support

Basic Support vs. Enterprise Support

Your support options will vary based on your subscription level; we recommend Basic support for development and testing while Enterprise support is more appropriate for business critical and production workloads.

Free Trial	Basic Support	Enterprise Support
Available 8am to 6pm (EST)	Available 8am to 6pm (EST)	Available 24 x 7
Postgres Rocks	Access to Postgres Rocks, Email, and Support Portal	Access to Postgres Rocks
Response as Available	Initial response on the same business day.	Initial response in 30 minutes
Support for using current features	Operation Support Only.	Guidance on performance
1 user is entitled to support services.	1 user is entitled to support services.	Unlimited user access
Cases are not visible in Customer Portal.	Cases are visible in Customer Portal.	Cases are visible in Customer Portal.

Contact your account representative or EnterpriseDB for more information about your support options.

1.7 The Help Tab

The **Help** tab provides informational resources as well as answers to frequently asked questions.

The Help tab.

1.8 Using the CDS User Console

When a CDS user selects an AWS region on the CDS management **Dashboard** tab, CDS spins up an end-user console in a new browser tab. You can use tabs on the end-user console to create, manage, and monitor your Postgres instances and backups:

- Use the **Clusters** tab to create, monitor and manage Postgres instances.
- Use links on the **Backups** tab to restore or delete backups as needed.

1.9 Using the Cluster Tab

Use the **Clusters** tab to create, monitor and manage active clusters.

The Clusters tab.

cluster health

Indicators in the columns to the right of a cluster name display the current health of the cluster. Click on a column name to sort the contents of the column; click a second time to reverse the sort-order.

- The **VM** column displays the state of the virtual machine on which the cluster resides.
- The **HA** column displays the state of the high-availability cluster.
- The **DB** column displays the state of the database server.
- The **UP** column displays the current status of the packages installed on the cluster. Periodically, the cluster manager performs a check to see if the packages are up to date.

Status indicators provide quick visual feedback about each feature:

icon1	A green checkmark indicates that an object is healthy.
icon2	A yellow alert symbol calls attention to an object that requires attention.
icon3	A red error symbol signifies that an object is not available.
icon4	A busy-indicator signals that the cluster is processing a request.
icon5	A question mark indicates that the state of the resource is unknown.

download log files log files

To download an archive of log files, right-click on a node name and select:

- **Download DB Logs** to download database server logs.
- **Download pgPool Logs** to download pgPool (load balancing) logs.

Downloading log files.

The menu options are context sensitive, displaying log types only for software that is deployed on the selected node. The archive name is in the following form:

`<address>-<log_type>-<date>.tar.gz`

Where:

address is the address of the selected node.

log_type is the type of log file (server type or pgPool).

date is the date that the archive was generated.

Archive preparation can take some time if your log files are large; the download will begin when the preparation completes.

icons

Use the icons along the left side of the **Clusters** tab to create new clusters or manage existing clusters:

icon6	Use the New Cluster icon to create a new Postgres cluster.
icon7	Select the Scale Up icon to manually add one or more replicas to the current cluster, or add additional storage
icon8	Use the Scale Down icon to remove one or more specified replicas from the cluster.
icon9	Select the Backup icon to take a backup of the highlighted cluster (a single backup of the cluster data, and a ba
icon10	
icon11	
icon12	
icon13	
icon14	
icon15	

By default, the box next to **Release elastic IP address** is checked. Deselect this option if you wish to retain the IP address for re-use with other clusters. If you release the IP address, it will be made available for use by other clusters.

When you terminate an active cluster, backups are not deleted. Backups (including user data) are retained until they are selected and deleted from the **Backups** tab.

The panels located at the bottom of the **Clusters** tab provide easy access to helpful statistical usage and activity information about the currently selected cluster. Three navigation bars control the display; click a bar to access one of the following panels:

- Open the **Details** panel to view information about the selected cluster.
- Open the **Monitoring** panel to view usage statistics for the selected cluster.
- Open the **Events** panel to review event logs describing activities on the selected cluster.

The Details Panel

The Details Panel

Click the **Details** navigation bar to open the **Details** panel.

The Details panel on the Clusters tab.

The left pane of the **Details** panel displays information about the currently selected cluster:

- The name of the cluster
- The date and time that the cluster was created
- The name of the database superuser
- The name of the cluster owner
- The email address to which notifications about the cluster will be sent
- The cluster size
- If the cluster is encrypted
- If applicable, the IOPS value for the cluster
- The region in which the cluster resides
- The virtual network or VPC ID in which the cluster resides
- The cluster's hardware type or Server Class
- The engine type and version that resides on the server
- If a template was used when provisioning the cluster, the template name
- If the cluster is configured to update when provisioned

You can use controls on the **Details** panel to specify:

- Failover preferences for the cluster
- Auto-scaling thresholds for the cluster
- Backup preferences for the cluster
- If continuous archiving should be enabled for the cluster

Please note: If a template was used to specify the configuration details for the cluster, the template may prohibit access to auto-scaling or manual scaling functionality.

cluster healing mode

Selecting a Cluster Healing Mode

Use the **Cluster healing mode** radio buttons to specify the type of failover that should be employed:

- Select the **Replace failed master with a new master** radio button to specify that the cluster manager should create a new master to replace a failed master node.

When replacing a failed master node with a new master node, the data volumes from the failed instance are attached to the new master node, preserving data integrity, while the replicas continue serving client queries.

- Select the **Replace failed master with existing replica** radio button to specify that the cluster manager should promote a replica node to be the new master node for the cluster.

When replacing a failed master node with an existing replica, a replica node is marked for promotion to master node, while the other replica nodes are re-configured to replicate data from the new master node. Since replica nodes use asynchronous replication, any data that was committed to the old master node, but not pushed to the replica prior to the node failure will be lost.

Please note that replacing a failed master node with a new master node can take a bit longer than promoting a replica node to the role of master, but it does have the advantage of guaranteeing that no committed data

will be lost. If recovery time for your cluster is more important than preserving any non-replicated transactions, then select Replace failed master with existing replica as the healing mode.

auto-scaling thresholds

Adjusting Auto-Scaling Thresholds

Use the **Auto-Scaling Thresholds** controls on the **Details** panel to adjust the threshold at which CDS automatically scales up cluster resources. When auto-scaling is enabled, CDS monitors the server storage and connection resources in use, and automatically adds additional resources when usage exceeds a user specified percent.

- When the **% of Storage Size used** is reached, CDS will automatically increase your data space by 50%.
- When the **# of Server Connections** is reached, CDS adds replica nodes.

Use the Auto Scale Options controls to adjust the threshold at which CDS automatically scales up cluster resources. The Auto Scale Options controls are located on the Details panel; to access the Details panel, navigate to the Clusters tab, and highlight the name of a cluster.

Auto Scale Options controls.

Adjust the **Auto Scale Options** sliders to increase or decrease the thresholds at which automatic scaling is invoked. When you modify the values, CDS will display a New Value Saved notice, alerting you that your changes have been saved.

backup settings

Modifying Backup Settings

Use the fields in the **Backup Settings** box to change your backup preferences for the selected cluster:

- Use the **Backup Window** drop-down listbox to select an optimal time to process cluster backups; specify a time when the number of clients accessing the database is minimal.
- Use the **Backup Retention** field to specify the number of backups that should be stored for the selected cluster.
- Select the checkbox next to **Continuous Archiving (Point-in-Time Recovery)** to enable point-in-time recovery for a cluster. When enabled, a base backup is automatically performed that can be used to restore to a specific point in time. All subsequent automatic scheduled backups will also support point-in-time recovery. Note that if you deselect this option, the cluster (and subsequent automatic backups) will be re-configured to not include support for point-in-time recovery.

When point-in-time recovery is enabled, the value specified in the Backup Retention field determines the duration of the point-in-time recovery backup window. For example, if you specify a value of 7, the backup window will be 7 calendar days long. When the backup retention threshold is reached, the oldest base backup is removed, as well as any WAL files required to perform a recovery with that backup.

connection status cluster information

Reviewing Cluster Connection and Status Information

The right side of the Details panel contains a status overview and connection information for the selected cluster. If you have created replicas, the secondary server nodes are listed below the master node in the tree control; expand the tree control to view the status of the replication nodes.

Status indicators on the **Clusters** tab provide quick visual feedback about the status of your cluster:

- A green checkmark indicates that an object is healthy.
- A yellow alert symbol calls attention to an object that requires attention.
- A red error symbol signifies that an object is not available.
- A question mark indicates that the state of the resource is unknown.

On the Details panel, use the settings icon in the upper-right corner of the **UP** column to open a tab that allows you to select the columns that will be displayed in the panel.

The column selection tab.

The columns display:

- The **AZ** column displays the Availability Zone in which the cluster resides.
- The **VPC ID** column displays the identifier of the VPC on which the cluster resides.
- The **LBPOR** column displays the port number to which a client application should connect to utilize load balancing.
- The **DBPOR** column displays the default listener port for the Advanced Server or PostgreSQL server.
- The **CXN** column displays the current number of connections to the node.
- The **VM** column displays the state of the virtual machine on which the cluster resides.
- The **HA** column displays the state of the high-availability cluster.
- The **DB** column displays the state of the database server.
- The **UP** column displays the current status of the packages installed on the cluster. Periodically, the cluster manager performs a check to see if the packages are up to date. If an update becomes available, the UP column will display a yellow alert symbol (if the update is non-critical), or a red error symbol (if the update is a critical security alert).

monitoring

The Monitoring Panel

Click the **Monitoring** navigation bar to open the **Monitoring** panel.

The **Monitoring** panel displays graphs that allow you to review statistical usage information about the amount of storage and the CPU load for the selected cluster.

The Monitoring panel displays usage information.

Use the **Time Range** drop-down listbox to modify the time period that the charted information on the **Monitoring** panel spans.

The graphs on the **Monitoring** panel display resource usage information:

- The **Data Space** chart displays the amount of allocated data space used by the selected cluster. The red line denotes the threshold specified by the Data Space Threshold slider on the Details panel (the threshold at which the cluster will be scaled-up). The blue line indicates the amount of the data space that is currently in use.
- The **Connections** chart displays a graph of the number of connections to the cluster during the selected time range. The red line denotes the threshold specified by the Connections slider on the Details panel.
- The **Load** chart displays the processing load placed on the CPU by connecting clients. The value displayed is the actual load average as read from the program, `/proc/loadavg`. The chart shows the number of jobs in the run queue or waiting for disk I/O, averaged over 15 minute periods.
- The **Replication Lag** chart displays the replication lag (in seconds) for the cluster. Each replica node is displayed as a separate colored line on the chart; the key at the bottom of the chart identifies the IP address of the node.

events

The Events Panel

Click the **Events** navigation bar to open the **Events** panel.

The **Events** panel displays an event log containing a history of selected events for the connected user.

The Events panel displays server activity.

Highlight a cluster name to display only events for that cluster; if you do not select a cluster, the **Events** panel will display the collected events for the connected user.

- Click a column heading to sort the logged activity by the selected column; click again to reverse the sort order.
- Use the mouse to select multiple rows from the event log for copy and paste operations.

1.10 Using the Backup Tab

Use the **Backups** tab to manage cluster backups; the tab displays a list of the available backups.

The Backups tab.

A backup captures and stores the status and condition of a cluster at a specific point-in-time. Click a column heading to sort the column contents; click again to reverse the sort order.

- The **ID** column contains a unique backup identifier.
- The **CLUSTER** column displays the name of the cluster that was the target of the backup.
- The **NOTES** column displays an informational note (provided by either the user or the system at the time of backup). Those messages that include (PITR) can be restored to a specific point-in-time within the backup window.
- The **ENGINE VERSION** column contains a description of the Postgres version that the saved cluster is using.
- The **CAPACITY** column contains the storage capacity of the cluster at the time that the backup was taken.
- The **STARTED** column displays the date and time that the backup was initiated.
- The **ENDED** column displays the data and time that the backup completed.

Use the icons on the left side of the **Backups** tab to restore or delete backups:

-
- | | |
|-------|--|
| icon1 | Highlight a backup in the list, and click the Recover Backup icon to open a dialog that allows you to restore a cluster. |
| icon2 | Highlight one or more backups in the list and click the Delete Backup icon to delete the selected backups. A pop-up message displays. |
-

1.11 Creating a Server Cluster

create server cluster

To create a server cluster, click the **New Cluster** button from the **Clusters** tab to open the **Create a new Server Cluster** dialog and define a new cluster.

The **Create a New Server Cluster** dialog will prompt you to select a deployment option.

Specify your server launch preferences.

If you select the **Launch From Template** option on the deployment method selection dialog, a dialog opens that allows you to use a pre-defined template for the cluster configuration.

You can also use an existing cluster or a backup as a starting point for a new cluster.

manually create cluster define cluster

Manually Creating a Cluster

Before you can connect to a database from a client application, you must create a server cluster. Use the **Manually Define A Cluster** button located on the **Create a New Server Cluster** dialog to open the **Create a New Server Cluster** dialog.

Specify information about the new cluster on the Step 1 tab.

Use fields on the **Create a New Server Cluster** dialog to specify information about the new cluster:

- Specify a name for the new server cluster in the **Cluster Name** field.
- Use the drop-down listbox in the **Engine Version** field to select the version of the Postgres engine that you wish to use.

- Use the drop-down listbox in the **Server Class** field to specify the size of each cluster node. The server class determines the size and type (compute power and RAM) of each node within the cluster. The CPU and memory resources available with the selected server class are displayed below the server class.

You can adjust the amount of storage used by the cluster, or number of replicas in the cluster as your resource demands change. For example, you can start with a m1.small instance, and later, easily upgrade to a more capable c1.medium instance as your performance requirements dictate.

The resources available to the selected server class are displayed below the **Server Class** field.

- Use the drop-down listbox in the **Number of nodes** field to specify the number of server nodes that you wish to create. The name specified in the **Cluster Name** field will apply to the master node; each additional node will act as a replication server for the master node.
- Use the **Storage GB** field to specify the initial size of the data space (in Gigabytes).
 - Check the box next to **Encrypted** to indicate that the cluster should be encrypted. CDS uses the aes-xts-plain (512-bit) cipher suite to provide an encryption environment that is both secure and transparent to connecting clients. When encryption is enabled, everything residing on the cluster is encrypted except for the root filesystem.
 - Check the box next to **EBS Optimized** to specify that your cluster should use an Amazon EBS-optimized instance and provisioned IOPS to guarantee a level of I/O performance.
- The **IOPS** field is enabled for those clusters that will reside on an EBS-optimized instance. If applicable, use the field to specify the level of I/O performance that will be maintained for the cluster by automatic scaling. The maximum value is 30 times the size of your cluster; for example, if you have a 4 Gigabyte cluster, you can specify a maximum value of 120.

Check the box next to **Perform OS and Software ? update** to specify that a software update should be performed whenever the cluster is provisioned. When you check the box next to **Perform OS and Software update ?**, CDS will warn you that enabling this functionality can significantly slow down cluster operations.

The software update warning.

Updating packages may slow down cluster maintenance operations; an update can easily take 10 minutes or more, and may initiate a reboot of the node. This setting is persistent; if you enable software updates for a cluster, you cannot directly disable software updates for that cluster at a later time.

- Enter the name of the database superuser in the **Master User** field.
- Enter the password associated with the database superuser in the **Master Password** field.
- Use the **Notification Email** field to provide the email address that will receive notices about changes to the cluster status.

Click the **Next** button to continue to the **Step 2** tab.

The Step 2 tab.

Use the fields on the **Step 2** tab to specify additional database information:

- Use the **Region** drop-down listbox to the right of each node to select the region in which the node will reside. You can create cluster with nodes in multiple regions. Creating cluster nodes spread across regions provides additional high availability to cluster users against any specific region failure.
- Use the **Auto AZ** drop-down listbox to the right of each node to select the availability zone in which the node will reside. For the selected region, available AZs will be populated automatically, you can select the AZ from the drop-down list. If you select Auto AZ, cluster will be created in one of the available AZs.
- Use the **New Subnet** drop-down listbox to the right of each node to select the subnet that the node will use. Please note that if you manually specify a subnet, you must select a subnet that resides on your private network.

Click the **Next** button to continue to the **Step 3** tab.

Specify cluster security rules on the Step 3 tab.

Use the fields on the **Step 3** tab to define security rules that allow access to the cluster through the load balancing port (**9999**) or through the database server listener port (**5444** for Advanced Server or **5432** for PostgreSQL).

Click the **Add Rule** button to open the **Add Rule** dialog and add a new security rule.

Adding a security rule.

On the **Add Rule** dialog:

- Use the **Port** drop-down listbox to select the port that the CIDR will use to access the cluster.
- Use the **CIDR** field to specify the address or address range that will be able to access the server through the port.

When you're finished, click **Apply** to create the security rule.

To delete a rule from the list, highlight the entry and click the **Delete Rule** button; you will be prompted to confirm that you wish to delete the entry before the server removes the rule.

Click **Next** to continue to the **Step 4** tab.

Specify backup information on the Step 4 tab.

Use the fields on the **Step 4** tab to specify database backup details:

- Use the **# of automatic backups to retain** field to specify the number of server backups stored. When the specified number of server backups is reached, CDS will delete the oldest backup to make room for a new backup.

When point-in-time recovery (PITR) is enabled, the value specified in the **# of automatic backups to retain** setting determines the duration of the PITR backup window. For example, if you specify a value of 7, the PITR backup window will be 7 calendar days long.

- Use the **Backup Window** field to specify a time that it is convenient to backup the server; you may wish to schedule backups to occur when the CPU load is the lightest.
- Check the box next to **Continuous Archiving (Point-in-Time Recovery)** to enable point-in-time recovery for the cluster. When enabled, a base backup is automatically performed that can be used to restore to a specific point in time. All subsequent automatic scheduled backups will also support point-in-time recovery. Note that if you deselect this option, the cluster (and subsequent automatic backups) will be re-configured to not include support for point-in-time recovery.

Use the **Previous** button or select a tab to return to a tab to review or update information; when you have completed the **Create a New Server** dialog, click **Launch** to create the database cluster.

A popup dialog confirms that CDS is creating a new cluster; click the **X** in the upper-right corner of the popup to close the popup.

A popup confirms that the new cluster is being created.

Navigate to the **Clusters** tab to monitor the creation of the cluster.

New cluster is created.

In the above figure, the cluster consists of the master node residing in one region (**us-west-1c**) and the replica node residing in a different region (**eu-west-1a**).

template Using a Template to Define a Cluster Launch from Template

Using a Template to Create a Cluster

If you select the **Launch From Template** option when deploying a cluster, a dialog that offers limited options will open when you deploy a cluster.

Creating a cluster from a template.

Use the **Template Name** drop-down listbox to select the template that you wish to use to configure your cluster. Use the **Full Template Details** link to display the attributes of a selected template.

Reviewing Template details.

After selecting the template, use the fields on the dialog to provide information about the new cluster:

- Use the **Cluster Name** field to specify a name for the new cluster.
- Use the **DB Master User** field to specify the name of the database superuser.
- Use the **DB Master Password** field to specify the password associated with the database superuser.
- Use the **Notification Email** field to provide the email address that will receive notices about changes to the cluster status.
- Use the **Availability Zone** and **Subnet Details** drop-down listboxes to select the availability zone and subnet in which each node will reside.
 - Use the Region drop-down listbox to select the region in which the node will be deployed. You can create cluster with nodes in multiple regions.
 - Use the AZ drop-down listbox to select the availability zone in which the node will reside.
 - Use the Subnet drop-down listbox to select the subnet that the node will use.

After completing the dialog, click the **Launch** button to provision a cluster that conforms to the template configuration.

Cloning a Server Cluster

With a few simple steps, you can use the **Clone** icon to create a developer sandbox that contains a duplicate of the original master node. To clone a cluster, navigate to the **Clusters** tab and highlight the name of the cluster you wish to clone; then, select the **Clone** icon from the left margin.

A dialog will open that allows you to select your deployment method.

Selecting a Cloning option.

If you select **Manually Clone A Backup**, the following dialog opens.

Creating a clone of a database.

When the **Create a clone...** dialog opens, provide values in the requested fields:

- Provide a name for the clone in the **Cluster Name** field.
- The region where the clone will be created is listed in the **Clone Region**. The clone is created only in the region where the master node resides.
- Check the box next to **Encryption** if you would like the clone to be created in an encrypted cluster.
- Check the box next to **Perform OS and Software update?** if you would like the server to perform a software update each time the clone is provisioned.
- Use the **AZ** drop-down listbox to specify the availability zone in which the new cluster will be created.
- Use the **Subnet** drop-down listbox to select a subnet that will be used by the new cluster.
- Use the **Server Class** drop-down listbox to specify the initial size of the new cluster.
- Check the box next to **EBS Optimized** to specify that your cluster should use an Amazon EBS-optimized instance and provisioned IOPS to guarantee a level of I/O performance;
- The **IOPS** field is enabled for those clusters that will reside on an EBS-optimized instance. If applicable, use the field to specify the level of I/O performance that will be maintained for the cluster by automatic scaling.
- Check the box next to **Continuous Archiving (Point-in-Time Recovery)** to enable point-in-time recovery on the clone.
- Use the **Configure Network Security Rules** section to adjust security rules for the cluster; select **Add Rule** to open the Add Rule dialog and specify the Port number that will be available to the CIDR address specified on the dialog. Highlight a rule and select **Delete Rule** to remove a rule; you will be prompted to confirm the deletion before the rule is removed.

When you've completed the dialog, click the **Clone** button to create the cluster. When you clone a database, only the master node is recreated in the new cluster; when cloning is complete, you can add replicas to your cluster.

Using a Template to Clone a Cluster

A clone deployed with a template will be an exact duplicate of the original master node, but will adhere to the cluster deployment rules described in the template by the system administrator. If you select the **Clone From Template** option on the deployment method selection dialog, the following dialog opens that allows you to use a pre-defined template for the cluster configuration.

Creating a clone of a database.

When the **Create clone...** dialog opens, provide values in the requested fields:

- Use the **Template Name** drop-down listbox to select a template that will be used for the new cluster; to review the cluster details associated with the template, click the **Full Template Details** link.
- Provide a name for the clone in the **Cluster Name** field.
- Use the **AZ** drop-down listbox to specify the availability zone in which the new cluster will be created.
- Use the **Subnet** drop-down listbox to select a subnet that will be used by the new cluster.
- Use the **Configure Network Security Rules** section to adjust security rules for the cluster; select **Add Rule** to open the **Add Rule** dialog and specify the **Port** number that will be available to the CIDR address specified on the dialog. Highlight a rule and select **Delete Rule** to remove a rule; you will be prompted to confirm the deletion before the rule is removed.

After providing the details for the cluster, click the **Clone** button to create the clone of the cluster; select **Cancel** to exit the dialog without creating a cluster.

1.12 Managing a Server Cluster

CDS offers easy to use management options for database clusters.

Change admin settings Modify rules

Fields on the **Administrative Settings** dialog display the current owner and the email address to which notification emails about the state of the cluster are sent. You can also use the dialog to modify the network security rules for the cluster.

To access the dialog, highlight the name of a cluster on the **Clusters** tab, and click the **Administrative Settings** icon.

The Administrative Settings dialog

Use the fields on the dialog to modify the Administrative settings for a cluster:

- Use the drop-down listbox in the **Owner** field to select a new cluster owner; please note that only those users with permissions to access the tenant on which the cluster resides are included in the list.
- Use the **Notification Email** field to specify the address to which you wish notices about the state of the cluster to be sent.
- Use the **Add Rule** button to open a popup that allows you to define a new security rule for the cluster.
- Highlight a security rule and click the **Delete Rule** button to delete a security rule for the cluster.

After modifying the administrative settings for the cluster, click the **Confirm** button to preserve your changes.

Restarting Server Reloading DB Server server restart

Managing Database Server Operations

Highlight a cluster name and select the **Restart/Reload DB Servers** icon (located in the left column on the **Clusters** tab) to initiate a database restart or reload operation on one or more cluster nodes.

The Restart/Reload DB Servers dialog

Use the options on the dialog to select servers and management actions:

- Check the box next to a host address to restart or reload the selected server.
- Select a radio button next to **Restart** or **ReLoad** to specify the action that will be performed.

After making your selections, click **Confirm** to start the restart or reload operation. A popup will confirm that the server(s) are restarting or reloading. You can confirm the status of the operation in the cluster's **Events** table.

The Events table displays the operation status.

Please note: you should perform these operations during maintenance windows. For more information about the reload and restart operations, please see the [Postgres core documentation](#)

1.13 Connecting a Client Application to a CDS Cluster

To connect to a CDS hosted cluster, provide your client application with the IP address and port of the server, and the credentials associated with the role defined when the server cluster was created.

The Details panel on the Clusters tab.

If you have defined a cluster with two or more servers, client applications should always connect to the load balancing port of the master server (the first Address name listed in the **Details** panel). This will ensure that read requests are distributed efficiently across the cluster replicas to maximize performance, while write requests are directed only to the cluster master.

- The **ADDRESS** column displays the address of the node; a connecting client should use this address when connecting to a specific server.
- The **LBPORT** column displays the port number to which a client application should connect to utilize load balancing. Since only the master node of a multi-server cluster operates in read/write mode, all write queries will be directed to the master node, while any read-only queries may be directed to a replica node.

Use the authentication information (**Master User** and **Master Password**) provided on the **Create a New Server Cluster** dialog to establish the initial connection to the cluster as the database superuser. Please note that connecting with this identity grants you superuser privileges on the server; you should not share this connection information with un-trusted users.

Connecting with the psql Client

To use the psql client to connect to an instance, navigate into the directory in which the psql client is installed on your local system and enter:

```
./psql -h <instance_address> -p 9999 -U <superuser_name> -d <database_name>
```

Where

instance_address is the address of the master node of the cluster.

superuser_name is the name of the database superuser.

database_name is the name of the database to which you will connect.

When prompted, provide the password associated with the CDS instance.

For example:

```
$ ./psql -h ec2-3-93-214-74.compute-1.amazonaws.com -p 9999 -U
enterprisedb
-d edb
Password for user enterprisedb:
psql.bin (11.0, server 11.1.7)
SSL connection (protocol: TLSv1.2, cipher: AES256-GCM-SHA384, bits: 256, compression: off)
Type "help" for help.
edb=#
```

Connecting with a JDBC Client

If connecting with a JDBC client, you must configure the client connection to use SSL. For example, specify the following properties when configuring the client JDBC driver:

```
String url = "jdbc:postgresql://localhost/test";
Properties props = new Properties();
props.setProperty("user", "user_name");
props.setProperty("password", "secret");
props.setProperty("ssl", "true");
//accept self-signed certificate
Connection conn = DriverManager.getConnection(url, props);
```

For more information about configuring a JDBC client, please see the [JDBC Connector Guide](#)

Load Balancing

CDS uses pgPool functionality to implement automatic load balancing. Load balancing increases system performance by distributing client queries to replica nodes, while routing database modifications to the master node. Any modifications to the master node are subsequently propagated to each replica using Postgres streaming replication.

CDS monitors the health of the load balancer to ensure that service is not interrupted. If the load balancer (pgpool) should fail while monitoring is enabled, PgPool will be automatically restarted. If the load balancer cannot be automatically restarted, CDS will display a warning sign next to the cluster name on the Details panel and send a notification email to the cluster user.

To utilize load balancing, you should direct client applications to connect to the load balancing port (port 9999). The load balancing port number is displayed in the LBPORT column on the Details pane of the Clusters tab of the console.

pgPool may direct the following statement types to *either* a primary or a standby node:

- SELECT statements (not listed below)
- COPY TO
- DECLARE
- FETCH
- CLOSE
- SHOW
- SET
- DISCARD
- DEALLOCATE ALL

When deciding which node a query should be routed to, pgPool checks the transaction log number; if the transaction log number on the standby server is lower than the log number on the master, pgPool routes the statement to the master node. This helps to ensure that the data returned by the query is the most recent available.

In some cases, specific clauses within a query statement will signal pgPool to direct a statement to the master node. In other cases, the transaction type, or order of commands within a transaction can direct a statement to the master node. By default, the following transaction types will always be executed on the master node:

- SELECT INTO, SELECT FOR UPDATE or SELECT FOR SHARE statements
- SELECT statements within SERIALIZABLE transactions
- SELECT statements that follow an INSERT statement
- SET SESSION CHARACTERISTICS AS TRANSACTION... READ WRITE statements
- SET transaction_read_only = off statements
- EXPLAIN and EXPLAIN ANALYZE SELECT statements
- START TRANSACTION... READ WRITE statements
- LOCK commands that are stricter than ROW EXCLUSIVE MODE
- Transactions that start with a BEGIN statement
- The nextval() and setval() sequence functions
- Large objects creation commands

Please Note: If your application uses JDBC, and the autocommit option is set to false, the JDBC driver will include a BEGIN and COMMIT statement with each SELECT statement. To enable load balancing when using

the JDBC driver, your application must include a call to `setAutoCommit(true)` .

pgPool directs the following non-query statement types to the master node only:

- INSERT
 - UPDATE
 - DELETE
 - COPY FROM
 - TRUNCATE
 - CREATE
 - DROP
 - ALTER
 - COMMENT
 - PREPARE TRANSACTION
 - COMMIT PREPARED
 - ROLLBACK PREPARED
 - LISTEN
 - UNLISTEN
 - NOTIFY
 - VACUUM
-

1.14 Managing Backups and Recovery

When you take a backup, CDS makes a copy of the contents of the PostgreSQL PGDATA directory. The PGDATA directory contains the data and the meta-data required to construct an exact copy of the Postgres data cluster (the data and the database objects that reside within that Postgres instance).

To capture a backup of a cluster, navigate to the **Clusters** tab, highlight a name in the cluster list, and click the **Backup** icon. The **Backup Data?** dialog opens as shown below:

The Backup Data? dialog.

You can include a reference note about the backup that can be viewed on the **Backups** tab by adding a message to the **Optional notes** field on the **Backup Data?** dialog before clicking the **Backup** button.

When you click the **Backup** button, a backup will be created in the region where the master node resides. While CDS performs the backup, the **PENDING** column of the selected cluster (on the **Clusters** tab) will display the message, **Backup in progress** .

pgbasebackup

Performing a Base Backup for Point-In-Time Recovery

When point-in-time recovery is enabled, a base backup is automatically performed that can be used to restore to a specific point in time. All subsequent automatic scheduled backups will also support point-in-time recovery. Note that if you deselect this option, the cluster (and subsequent automatic backups) will be re-configured to not include support for point-in-time recovery.

When point-in-time recovery is enabled, the value specified in the Backup Retention field of the Create cluster dialog determines the duration of the point-in-time recovery backup window. For example, if you specify a value of 7, the backup window will be 7 calendar days long. When the backup retention threshold is reached, the oldest base backup is removed, as well as any WAL files required to perform a recovery with that backup.

Please note that you cannot perform a base backup on a cluster while the database is in recovery and not accepting connections. If you attempt to perform a base backup during recovery, the backup will fail (the failure will be noted on the Events panel of the Clusters tab). You should instead wait until the database recovery is complete to enable point-in-time recovery for the cluster.

Point-in-time recovery is enabled on the Details panel of the Clusters tab. If a base backup fails, you can trigger CDS to perform a base backup by disabling point-in-time recovery, and then (after waiting a few minutes) re-enable point-in-time recovery.

Restoring from Backup

Restoring a Cluster from Backup

You can use a template or manually provide cluster properties when restoring a cluster from a backup. To restore a backup into a new cluster, navigate to the **Backups** tab and highlight the name of a backup. Then, click the **Recover Backup** icon, located in the left margin. A dialog will open that allows you to select the method by which you will specify cluster preferences.

Selecting a Restore option.

If you select the **Restore From Template** option on the recovery method dialog, a dialog opens that allows you to use a pre-defined template for the cluster configuration; for detailed information about using a template to clone a cluster, see [Using a Template to Restore from Backup](#).

If you select **Manually Restore A Backup**, the following dialog opens.

The Recover Data from a Backup dialog.

When the **Recover Data from a Backup** dialog opens:

- If applicable, use the calendar selector in the **Recovery Point** field to specify the recovery target (the date and time that the database was in the state in which you wish the new cluster to start). The Recovery Point field is only displayed for backups that were taken with point-in-time recovery implemented; you cannot perform a point-in-time recovery with a backup unless point-in-time recovery is enabled for the cluster when the backup was taken.
- Specify a name for the new cluster in the **Cluster Name** field.
- Check the box next to **Encryption** to specify that the new cluster should reside in an encrypted cluster. Please note that you can restore a non-encrypted backup into an encrypted cluster.
- Check the box next to **Perform OS and Software update** to instruct CDS to perform a yum update whenever the cluster is provisioned. Please note: this option is disabled if the database engine is statically provisioned.
- Use the **AZ** drop-down listbox to the right of each node to select the availability zone in which the node will reside.
- Use the **Subnet** drop-down listbox to the right of each node to select the subnet that the node will use.
- Use the **Server Class** drop-down listbox to specify the server class of the new cluster.
- If your cluster resides on an AWS host, check the box next to **EBS Optimized** to specify that your cluster should use an Amazon EBS-optimized instance and provisioned IOPS to guarantee a level of I/O performance;

The **IOPS** field is enabled for those clusters that will reside on an EBS-optimized instance. If applicable, use the field to specify the level of I/O performance that will be maintained for the cluster by automatic scaling. The maximum value is 30 times the size of your cluster; for example, if you have a 4 Gigabyte cluster, you can specify a maximum value of 120.

Note that you can increase the IOPS value of your cluster by recovering the cluster from a snapshot into a cluster with a higher value or cloning your database into a cluster with a higher IOPS value.

- Check the box next to **Continuous Archiving (Point-In-Time Recovery)** to indicate that the new cluster should implement point-in-time recovery. Please note that to restore into a cluster with point-in-time recovery enabled, the backup from which you are restoring must have had point-in-time recovery implemented when the backup was taken. The checkbox will not be available if point-in-time recovery was not implemented when the backup was taken.
- Use the **Configure Network Security Rules** section to provide security rules for the cluster; select **Add Rule** to open the Add Rule dialog and specify the Port number that will be available to the CIDR address specified on the dialog. Highlight a rule and select **Delete Rule** to remove a rule; you will be prompted to confirm the deletion before the rule is removed.

Click the **Recover** button to continue, or the **Cancel** button to exit without starting the recovery process. A popup confirms that the cluster is being restored; close the popup and navigate to the **Clusters** tab to monitor the restoration process.

The recovery is in progress.

Please note: when you restore a backup, the server configuration will match the original configuration, but the server addresses will change.

Please note: when restoring a cluster from backup, you may need to modify parameters in the `postgresql.conf` file on the restored cluster to reflect the available memory of the new instance if the server class has changed from the original setting (the default value in the **Server Class** field). After modifying the server configuration, restart the server for the changes to take effect.

Using a Template to Restore from Backup

Templates can make restoring from a backup quicker and easier.

Using a template to restore from a backup.

If you are using a template when restoring a cluster from backup, use the dialog shown above to provide the non-template details:

- Use the **Template Name** drop-down listbox to select a template that will be used for the new cluster; to review the cluster details associated with the template, click the **Full Template Details** link.
- Specify a name for the new cluster in the **Cluster Name** field.
- Use the **AZ** drop-down listbox to the right of each node to select the availability zone in which the node will reside.
- Use the **Subnet** drop-down listbox to the right of each node to select the subnet that the node will use.
- Use the **Configure Network Security Rules** section to provide security rules for the cluster; select **Add Rule** to open the **Add Rule** dialog and specify the **Port number** that will be available to the CIDR address specified on the dialog. Highlight a rule and select **Delete Rule** to remove a rule; you will be prompted to confirm the deletion before the rule is removed.

When you've completed the dialog, click **Recover** to restore the backup.

1.15 Automatic Failover

The CDS cluster manager constantly monitors the state of each cluster. Each cluster is composed of a single master Postgres instance that operates in read-write mode (performing all writes to the database) and one or more replica Postgres instances. Replica nodes are read-only, automatically duplicating all data found on the master node, and all changes made to that data.

If a replica fails, CDS automatically spins up a new replica instance and attaches it to the master database. The cluster continues operating during the replacement process, with the master servicing writes and reads, and the remaining replicas servicing reads. Overall read performance may degrade for a short period of time until the cluster is returned to full strength.

If a master failover occurs, the server will enforce one of two behaviors, specified by the **Cluster healing mode** radio buttons, located on the **Details** panel of the **Clusters** tab:

- Select the **Replace failed master with a new master** radio button to specify that the cluster manager should create a new master to replace a failed master node.

When replacing a failed master node with a new master node, the data volumes from the failed instance are attached to the new master node, preserving all transactions that were committed on the master.

- Select the **Replace failed master with existing replica** radio button to specify that the cluster manager should promote a replica node to be the new master node for the cluster. Choose this option when speed of recovery is important, and your application can tolerate the loss of some transactions. This is the default behavior.

When replacing a failed master node with an existing replica, a replica node is marked for promotion to master node, while the other replica nodes are re-configured to replicate data from the new master node. Since replica nodes use asynchronous replication, any data that was committed to the old master node, but not yet pushed to the replica prior to the node failure will be lost.

If you opt to promote a replica to replace the master node, a replacement replica will also be added to the cluster during the failover process, returning the cluster to full strength. This self-healing property is at the heart of providing high availability to cluster users. Please note that replacing a failed master node with a new master node can take a bit longer than promoting a replica node to the role of master, but it does have the advantage of guaranteeing that no committed data will be lost.

1.16 Manual Scaling

Console controls make it simple to add replicas and storage to an existing cluster, or to upgrade to a larger server class (i.e. vertical scaling).

- Adding additional replicas to your database cluster increases the CPU power available to handle additional client requests or applications, increasing the number of client connections that can be serviced. When the scale up is complete, each additional replica automatically assumes a share of the read-only workload from incoming queries.
- Adding additional storage to the cluster increases the amount of data that can be stored by the database servers. When you add additional storage to the cluster, each member of the cluster gets the additional storage amount.
- Vertically scaling to a larger server class increases the processing capabilities of your cluster, allowing the server to process customer requests with greater speed.

You can also downsize a cluster by selectively removing a replica. You can machine scale to a smaller machine type to reduce resource usage (cpu/memory) and/or cost.

adding replicas adding storage manually adding replica

Manually Adding Replicas and Storage

The **Scale Up** dialog makes it simple to manually add additional replicas to a cluster if you find that server resources are strained. The dialog also allows you to increase the amount of storage available to a cluster.

If you specify that CDS should add both storage and replicas, CDS will process the request for additional storage *before* adding replicas to the cluster. All of the nodes on the cluster will be of the newly specified storage size. To add a replica or storage space to a cluster, navigate to the **Clusters** tab, highlight a cluster name, and select the **Scale Up** icon. The **Scale Up** dialog opens as shown below.

The Scale Up dialog.

Use the fields on the **Step 1** tab to specify:

- The number of replicas to add to the cluster.
- - The region in which the node will reside. You can create cluster with nodes in multiple regions.
- The availability zone in which the cluster will be provisioned.
- The subnet that will be used by the cluster.
- The amount of storage memory (in Gigabytes) that will be added to each server in the cluster.

When you've completed the dialog, click **Next** to continue to the **Step 2** tab.

The Scale Up dialog.

Use the **Previous** button to return to the **Step 1** tab to modify specified values. Use the **Scale Up** button to confirm that you wish to add the specified number of replication servers or the specified amount of memory to the cluster. Use the **Cancel** button, or simply close the dialog to exit without modifying the cluster.

Scaling up is in progress.

CDS will confirm that replicas or memory are being added to the cluster.

remove replica

Manually Removing a Replica

CDS's **Scale Down** dialog makes it simple to manually remove one or more unneeded replicas from a cluster. To delete a replica, navigate to the **Clusters** tab, and click the **Scale Down** icon. The Scale Down dialog opens as shown below.

The Scale Down dialog.

Check the box to the left of the name of a replica, and click Next to proceed to the **Step 2** tab of the dialog.

The Step 2 tab of the Scale Down dialog.

Click **Scale Down** to confirm that you wish to remove the replica, or **Previous** to return to the **Step 1** tab. Use the **Cancel** button, or simply close the dialog to exit without modifying the cluster.

server class, change change server class

Manually Changing the Server Class

When your RAM processing needs, CPU power, or other circumstances warrant a larger virtual machine for your application, you can vertically scale to a larger server class. Use the **Scale Machine Type** dialog to copy the cluster into a larger server class.

When you use the **Scale Machine Type** dialog to move your cluster into a larger server class, you must provide a new name for the upgraded cluster. You can also use the dialog to specify that CDS should re-assign the IP address of the cluster, so the upgrade will be transparent to connecting clients.

You can also downsize a cluster by selectively removing a replica. You can machine scale to a smaller machine type to reduce resource usage (cpu/memory) and/or cost.

When you vertically scale your cluster with the **Scale Machine Type** dialog, CDS will copy the existing cluster into a new cluster of a different server class, and optionally re-assign the IP address of the existing cluster to the new cluster. You can scale your cluster from any region.

To open the **Scale Machine Type** dialog, navigate to the **Clusters** tab, and select the **Scale Machine Type** icon.

The Scale Machine Type dialog.

Use the **Server Class** drop-down listbox to specify the size of the new cluster.

When you click the **Scale** button to start scaling the cluster, CDS will confirm that the scaling is in progress.

The cluster is being scaled.

Before creating the new cluster and (optionally) re-assigning the IP address, CDS will perform a backup of the original cluster. During the process, status indicators in the **PENDING** column of the **Clusters** tab will keep you informed as CDS backs up the original cluster, and initializes the new cluster.

1.17 Updating the Server Version

When an update becomes available for a package installed on your cluster, the console will display an alert symbol in the **UP** column of the **Details** panel for the cluster, and in the **UP** column of the **Address** table adjacent to the node that requires an update.

The Address table.

The columns display:

- A green checkmark indicates when an object is healthy.
- A yellow alert symbol calls attention to an object that requires attention.
- A red error symbol signifies that an object is not available.

- A busy-indicator signals that the cluster is processing a request.
- A question mark indicates that the state of the resource is unknown.

The overall cluster status (displayed in the top section of the Clusters tab) is based on the values of the nodes within the cluster.

- If all of the nodes within the cluster are up-to-date, the UP column displays a green checkmark.
- If one or more nodes require a non-critical update, the UP column displays a yellow alert symbol.
- If one or more nodes require a critical update, the UP column for the cluster displays a red error symbol.
- If one or more nodes have an unknown package status, the UP column for the cluster displays a grey checkmark.

Use the **Upgrade** icon (located on the **Clusters** tab) to access a dialog that allows you to update the server version on each node within the cluster.

The cluster upgrade dialog.

When the **Upgrade Cluster** dialog opens, select the radio button next to an option to:

- Select **OS and DB Minor Version Upgrade** to invoke a yum update command and update any outdated packages and perform a minor database version upgrade on each node of the cluster. For more information, see [Performing a Minor Version Upgrade](#).
- Select **DB Major Version Upgrade** to select a version and perform a major version upgrade of the server. Please note that this functionality is restricted to users that are not required to use a template when deploying a cluster. For more information, see [Performing a Major Version Upgrade](#).

After making a selection, click **Upgrade** to continue.

Database Upgrade upgrade database minor version upgrade

Performing a Minor Version Upgrade

If you select the radio button next to **OS and DB Minor Version Upgrade** and click the **Upgrade** button, the console will invoke the yum update command on each node of the cluster. The yum update command will update all installed packages to the most recent version available of the same release (i.e., if you are running a 9.6 database server, yum will update your database server to the most recent version of 9.6).

Before performing the update, CDS will perform a backup. During the upgrade process, all clients will be disconnected from the server. The updated server will retain the IP address used by the original server. When the update has completed, clients may once again connect.

After performing a yum update, the node will be rebooted, initiating any kernel updates required. When the update completes, CDS will send an email notification that contains a list of the updated packages.

If one or more nodes in your cluster are currently displaying an unknown status, CDS will display an error message; you must correct the problem that is causing the unknown status before CDS can perform an update.

Please note that if the yum update command fails during the upgrade process, CDS will terminate the process and yum update will not be run on any remaining nodes, leaving the cluster partially upgraded.

Major Version Upgrade

Performing a Major Version Upgrade

You can use the **Upgrade Cluster** dialog to upgrade your Postgres database server; the upgrade must be to a more recent version of the same server type and must use the same server image as the current database engine. For example, you may upgrade an Advanced Server version 9.6 database server that resides on a CentOS 6.x host to Advanced Server 11, but you cannot move the server onto a CentOS 7.x host. Similarly, you may not upgrade a PostgreSQL 9.6 database server that resides on a CentOS 7.x host to use an Advanced Server 11 server on a CentOS 7.x host. The server type and host operating system version must remain the same.

Please note: if over half of the data space allocated to a cluster is used, you must add storage to the cluster before performing the upgrade.

To upgrade a running cluster, select the radio button next to **DB Major Version Upgrade** and then use the drop-down listbox to select a server version. Click **Upgrade** to continue.

The Upgrade Cluster dialog.

A popup will open, asking you to confirm that you wish to upgrade the server; click the **Upgrade** button to perform an upgrade. The server will be briefly unavailable during the upgrade process. The upgrade does not change the IP address and listening port of the server.

1.18 The CDS Email Notification System

CDS invokes an email notification system that will alert you if your cluster changes or encounters a problem. Email notifications are sent to the address used to log in to the management console.

CDS will send an email:

- When a new cluster is created.
 - If a server stops (or is terminated).
 - When a replica is added to a cluster.
 - When memory is scaled up.
 - When failover is invoked on a master or a replica.
 - If a backup fails.
 - If the password associated with your user account changes.
-

1.19 Conclusion

Cloud Database Service Guide

Copyright © 2018 - 2019 EnterpriseDB Corporation. All rights reserved.

EnterpriseDB Corporation

34 Crosby Drive, Suite 201, Bedford, MA 01730, USA

T +1 781 357 3390 F +1 978 467 1307 E

info@enterprisedb.com

www.enterprisedb.com

- EDB designs, establishes coding best practices, reviews, and verifies input validation for the logon UI for Cloud Database Service where present. EDB follows the same approach for additional input components, however the nature of the product may require that it accepts freeform SQL, WMI or other strings to be entered and submitted by trusted users for which limited validation is possible. In such cases it is not possible to prevent users from entering incorrect or otherwise dangerous inputs.
- EDB reserves the right to add features to products that accept freeform SQL, WMI or other potentially dangerous inputs from authenticated, trusted users in the future, but will ensure all such features are designed and tested to ensure they provide the minimum possible risk, and where possible, require superuser or equivalent privileges.
- EDB does not warrant that we can or will anticipate all potential threats and therefore our process cannot fully guarantee that all potential vulnerabilities have been addressed or considered.