



# Postgres Enterprise Manager

Version 7.12

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# 1 PEM Agent User Guide

PEM is composed of three primary components: PEM server, PEM agent, and PEM web interface. The PEM agent is responsible for performing tasks on each managed machine and collecting statistics for the database server and operating system.

This document provides information that is required to work with PEM agents. The guide will acquaint you with the basic registering, configuration, and management of agents. The guide is broken up into the following core sections:

- **Postgres Enterprise Manager - Overview** - This section provides an overview of PEM architecture and also provides information about hardware and software prerequisites for installing a PEM agent.
- **Registering a PEM Agent** - This section provides information about registration of a PEM agent.
- **Managing a PEM agent** - This section provides information about configuring and managing a PEM agent.
- **Troubleshooting for PEM agent** - This section provides information about troubleshooting for PEM agents.
- **Uninstalling a PEM agent** - This section provides information about uninstalling a PEM agent.

This document uses *Postgres* to mean either the PostgreSQL or EDB Postgres Advanced Server database.

## 1.1 Postgres Enterprise Manager - Overview

### PEM Architecture

Postgres Enterprise Manager (PEM) consists of components that provide the management and analytical features of PEM:

- **PEM Server:** The PEM server is used as the data repository for monitoring data and as a server to which both agents and clients connect. The PEM server consists of an instance of PostgreSQL, an associated database for storage of monitoring data, and a server that provides web services.
- **PEM web interface:** The PEM web interface allows you to manage and monitor Postgres servers and utilize PEM extended functionality. The web interface software is installed with the PEM server installer, and is accessed via your choice of web browser.
- **PEM Agent:** The PEM agent is responsible for executing tasks and reporting statistics from the agent host and monitored Postgres instances to the PEM server. A single PEM agent can monitor multiple installed instances of Postgres that reside on one or many hosts.
- **SQL Profiler plugin:** This plugin to the Postgres server is used to generate the monitoring data used by the SQL Profiler tool. Installation of the SQL Profiler plugin is optional, but the plugin must be installed into each instance of Postgres you wish to profile. The SQL Profiler may be used with any supported version of an EnterpriseDB distribution of a PostgreSQL server or an Advanced Server (not just those managed through the PEM server).

The PEM Agent installer creates two executables: the PEM worker (`pemworker.exe`) and the PEM agent (`pemagent.exe`). Each PEM worker has a corresponding PEM agent that you can use to start or stop the PEM worker. The PEM agent will also restart the PEM worker should it terminate unexpectedly. The PEM worker log file contains information related to PEM worker activity (probe activities, heartbeat responses, etc.), and is stored in `/var/log/pem/worker.log`.

The architectural diagram below illustrates the relationship between the various servers and workstations involved in a typical PEM installation.



## Supported Platforms

The PEM agent is supported on any Linux or Windows platform on which Advanced Server or PostgreSQL version 9.4 or higher is supported.

For information about platforms supported by Advanced Server or PostgreSQL, see:

<https://www.enterprisedb.com/services-support/edb-supported-products-and-Platforms>

## Hardware Prerequisites

For optimum speed when monitoring servers and rendering dashboards, we recommend installing PEM on a system with at least:

- 4 CPU cores
- 8 GB of RAM
- 100 GB of Storage

Additional disk space is required for data storage. Please note that resource usage will vary based on which probes are defined and enabled, and the activity level on the monitored databases. Monitoring server resources (as you use PEM) will let you know when you need to expand your initial system configuration.

## 1.2 Installing a PEM Agent

You can use a graphical installer to install the Postgres Enterprise Manager agent on a Windows host. This graphical installer can also be invoked from command line.

To install the Postgres Enterprise Manager agent on a Linux host, you must use an RPM package.

Installers are available from the EnterpriseDB website at:

<http://www.enterprisedb.com/download-postgres-enterprise-manager>

## Installing an Agent on a Windows Host

On a Windows system, you can invoke the installer by right-clicking on the downloaded installer's icon, and selecting **Run as Administrator**. The **PEM Agent Setup Wizard** opens, welcoming you.



Click **Next** to continue to the **License Agreement**.



Carefully review the license agreement before highlighting the appropriate radio button and accepting the agreement; click **Next** to continue to the **Installation Directory** dialog.



By default, the PEM agent is installed in the **/home/opt/PEM** directory. You can accept the default installation directory, or modify the contents of the Installation Directory field, specifying an alternate installation directory for the PEM agent.

By default, the PEM agent installer places a certificate in the Administrator's **%APPDATA%\pem** directory. Check the **Show advanced options** box to indicate that you would like the PEM agent installer to include a dialog that allows you to specify an alternate path for the certificate file.

Check the box next to **Register now?** to instruct the installer to register the newly installed PEM agent with the PEM server. Click **Next** to continue to the **PEM Server Installation Details** dialog.



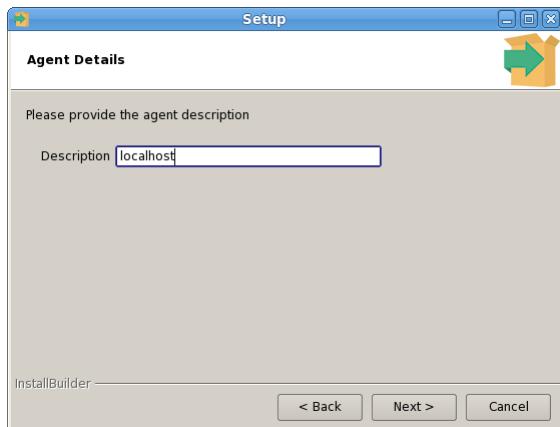
Enter the connection details for the PEM server on the PEM server installation details dialog:

- Specify the name or IP address of the system on which the PEM database server resides in the **Host** field. Please note: If the **PEM-HTTPD** web server and PEM database are hosted on different systems, you must specify the host of the PEM database.
- Specify the name of the database superuser in the **User Name** field.
- Specify the password associated with the database superuser in the **Password** field.
- Specify the port that PostgreSQL is monitoring in the **Port** field.

Click **Next** to continue. The installer will attempt to connect to the server to verify that the details are correct.

#### Note

The PEM server must allow connections from the PEM agent installer. If you encounter a connection error, confirm the connection properties specified on the PEM Server Installation Details dialog are correct, and confirm that the **pg\_hba.conf** file (on the PEM server) will allow a connection to the server described in the error message.



The tree control displayed in the Browser panel of the PEM web interface displays the value entered in the **Description** field to identify the PEM agent. Specify a descriptive name for the agent, such as the hostname of the machine the agent is installed on, or a name that reflects the host's functionality. Provide a descriptive name, or accept the default provided by the PEM agent host, and click **Next** to continue.

If you checked the **Show advanced options** checkbox, the **Advanced options** dialog opens:



By default, the PEM agent installer places the certificate in the `/root/.pem` directory. Specify an alternate path for the certificate or accept the default and click **Next**. The wizard is now ready to install the PEM agent; click **Back** to amend the installation directory, or **Next** to continue.



Click **Next** on the **Ready to Install** dialog to instruct the installer to copy files to the system and register the agent on the PEM server.



The PEM agent installer displays progress bars to mark the PEM agent's installation progress.



When the installation has completed, the PEM agent will be running and reporting operating system and host data to the PEM server. To start monitoring Postgres instances on the host of the PEM agent, they must now be added to PEM's enterprise directory and bound to the agent.

## Invoking a Graphical Installer from the Command Line

The command line options of PEM agent graphical installer offers functionality in situations where a graphical installation may not work because of limited resources or system configuration. You can:

- Include the `--mode unattended` option when invoking the installer to perform an installation without additional user input.
- Include the `--mode text` option when invoking the installer to perform an installation from the command line with an interactive installer.

For a complete reference guide to the command line options, include the `--help` option when you invoke the installer.

## Invoking a Graphical Installer in Text Mode

You can invoke the PEM agent installer at the command line to perform an interactive installation if your system does not support a full graphical installation. Please note that the system on which you are installing the agent must have access to the PEM server.

You must have Administrative privileges to install the PEM server. You can invoke the PEM server installer with the following command:

```
pem-server-7.x.x-windows-x64.exe --mode text
```

Example:

When you invoke the PEM agent installer, the installer welcomes you:

---

Welcome to the Postgres Enterprise Manager (PEM) Agent Setup Wizard.

---

Before installing the PEM server, you must review and accept the terms of the PEM license agreement:

Please read the following License Agreement. You must accept the terms of this agreement before continuing with the installation.

Press [Enter] to continue:

Do you accept this license? [y/n]:

Next, you will be prompted for an installation directory; you can use the default installation directory, or specify an alternate location. By default, the PEM agent installer places a certificate in the Administrator's %APPDATA%\pem directory. Enter a Y after [Show advanced options](#) to access menu options that allow you to specify an alternate path for the certificate file.

#### Installation Directory

Please select a directory for PEM agent installation.

Installation Directory [/opt/edb/pem]:

Show advanced options [y/N]:

When prompted, provide information about the PEM server installation:

#### PEM server installation details

Please verify the PEM server installation details

Host [localhost]:

User Name [postgres]:

Password :

Port [5432]:

You can provide a descriptive name for the agent, or press [Return](#) to accept the default:

#### Agent Details

Please provide the agent description

Description [localhost]:

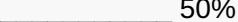
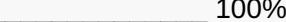
The installer will prompt you before it proceeds with the installation; press Return to start the installation:

Setup is now ready to begin installing the PEM agent on your computer.

Do you want to continue? [Y/n]:

Please wait while Setup installs the PEM agent on your computer.

#### Installing

0%  50%  100%  
#####

The installer will notify you when the installation is complete:

EnterpriseDB is the leading provider of value-added products and services for the Postgres community.

Please visit our website at [www.enterprisedb.com](http://www.enterprisedb.com).

## Invoking a Graphical Installer in Unattended Mode

You can perform an unattended PEM agent installation by providing installation preferences on the command line when invoking the installer. Please note that the system on which you are installing the PEM server must have internet access.

Before invoking the PEM agent installer in unattended mode, you must:

- install the PEM server; the `pg_hba.conf` file of the PEM server must allow connections from the host of the PEM agent.
- ensure that the monitored Postgres database has SSL enabled, and is accepting connections.

You must have Administrator privileges to install the PEM agent. Use the following command to invoke the PEM agent installer in unattended mode:

```
pem-agent-7<.x.x>-windows-x64.exe --mode unattended
--pghost <pem_server_host_address> --pgport <pem_server_port>
--pguser postgres --pgpassword <pguser_password>
--agent_description <agent_name>
```

Where: *x.x* specifies the version of PEM agent. *pem\_server\_host\_address* specifies the IP address of the host of the PEM server. *pem\_server\_port* specifies the port used by the backing PEM database; by default, the database uses port 5432 . *pguser\_password* specifies the password associated with the PEM database superuser. *agent\_name* specifies a descriptive name for the PEM agent.

## Installing an Agent on a RHEL or CentOS host

On a Linux system, you can use the `yum` package manager to install a PEM agent. Please note that before using a package manager to install the PEM agent on a host, you must:

- Install the `epel-release` package on the host:

```
yum -y install https://dl.fedoraproject.org/pub/epel/epel-release-latest-7.noarch.rpm
```

### Note

You may need to enable the `[extras]` repository definition in the `CentOS-Base.repo` file (located in `/etc/yum.repos.d`).

- You must also have credentials that allow access to the EnterpriseDB repository. For information about requesting credentials, visit:

<https://info.enterprisedb.com/rs/069-ALB-339/images/Repository%20Access%2004-09-2019.pdf>

After receiving your repository credentials you can:

1. Create the repository configuration file.
2. Modify the file, providing your user name and password.
3. Install `edb-pem-agent`.

## Creating a Repository Configuration File

To create the repository configuration file, assume superuser privileges, and invoke the following command:

```
yum -y install https://yum.enterprisedb.com/edb-repo-rpms/edb-repo-latest.noarch.rpm
```

The repository configuration file is named `edb.repo`. The file resides in `/etc/yum.repos.d`.

## Modifying the file, providing your user name and password

After creating the `edb.repo` file, use your choice of editor to ensure that the value of the `enabled` parameter is `1`, and replace the `username` and `password` placeholders in the `baseurl` specification with the name and password of a registered EnterpriseDB user.

```
[edb]
name=EnterpriseDB RPMs $releasever - $basearch
baseurl=https://<username>:<password>@yum.enterprisedb.com/edb/redhat/rhel-$releasever-$basearch
```

```
enabled=1
gpgcheck=1
gpgkey=file:///etc/pki/rpm-gpg/ENTERPRISEDB-GPG-KEY
```

## Installing PEM Agent

After saving your changes to the configuration file, you can use the yum install command to install `edb-pem-agent`. For example, the following command installs `edb-pem-agent`:

```
yum install edb-pem-agent
```

When the installation is complete, `yum` will display a list of the installed packages and dependencies.

```
root@localhost:/home/susan/Desktop
File Edit View Search Terminal Help
Is this ok [y/N]: y
Running transaction check
Running transaction test
Transaction test succeeded
Running transaction
  Installing : wxBase-2.8.12-20.el7.x86_64 1/7
  Installing : wxGTK-2.8.12-20.el7.x86_64 2/7
  Installing : wxjson-1.2.1-1.rhel7.x86_64 3/7
  Installing : libcurl-pem-7.51.0-1.rhel7.x86_64 4/7
  Installing : snmp++-3.3.7-1.rhel7.x86_64 5/7
  Installing : postgresql-libs-9.2.18-1.el7.x86_64 6/7
  Installing : pem-agent-7.0.0-beta1_6.rhel7.x86_64 7/7
  Verifying   : pem-agent-7.0.0-beta1_6.rhel7.x86_64 1/7
  Verifying   : wxGTK-2.8.12-20.el7.x86_64 2/7
  Verifying   : postgresql-libs-9.2.18-1.el7.x86_64 3/7
  Verifying   : snmp++-3.3.7-1.rhel7.x86_64 4/7
  Verifying   : libcurl-pem-7.51.0-1.rhel7.x86_64 5/7
  Verifying   : wxBase-2.8.12-20.el7.x86_64 6/7
  Verifying   : wxjson-1.2.1-1.rhel7.x86_64 7/7

Installed:
  pem-agent.x86_64 0:7.0.0-beta1_6.rhel7

Dependency Installed:
  libcurl-pem.x86_64 0:7.51.0-1.rhel7 postgresql-libs.x86_64 0:9.2.18-1.el7 snmp++.x86_64 0:3.3.7-1.rhel7 wxBase.x86_64 0:2.8.12-20.el7
  wxGTK.x86_64 0:2.8.12-20.el7          wxjson.x86_64 0:1.2.1-1.rhel7

Complete!
[root@localhost Desktop]#
```

When you install an RPM package that is signed by a source that is not recognized by your system, yum may ask for your permission to import the key to your local server. If prompted, and you are satisfied that the packages come from a trustworthy source, enter `y`, and press `Return` to continue.

During the installation, yum may encounter a dependency that it cannot resolve. If it does, it will provide a list of the required dependencies that you must manually resolve.

## Installing an Agent on a SLES Host

For detailed information about installing Advanced Server and supporting components on a SLES host, please consult the EDB Postgres Advanced Server Installation Guide, available at:

```
https://www.enterprisedb.com/resources/product-documentation
```

SLES packages are available from:

```
https://zypp.enterprisedb.com
```

Before installing a PEM agent, you must install prerequisite packages.

Use the following commands in the given sequence to install the agent:

```
SUSEConnect -p sle-module-legacy/12/x86_64
```

```
SUSEConnect -p sle-sdk/12/x86_64
```

```
zypper addrepo
https://download.opensuse.org/repositories/Apache:Modules/<SLE_version_service_pack>/Apache:Modules.repo

zypper addrepo http://download.opensuse.org/repositories/Cloud:/OpenStack:/Newton:/cisco-
apic:/2.3.1/<SLE_version_service_pack>/ pem_opensuse_boost

zypper refresh

zypper install edb-pem-agent
```

Where *SLE\_version\_service\_pack* is the version and service pack of the SLES that you are using, such as SLE\_12\_SP2 or SLE\_12\_SP3.

## Installing an Agent on a Debian or Ubuntu Host

To install PEM agent on a Debian or Ubuntu host, you must have credentials that allow access to the EnterpriseDB repository. To request credentials for the repository, contact [EnterpriseDB](#).

The following steps will walk you through using the EnterpriseDB apt repository to install a Debian package. When using the commands, replace the *username* and *password* with the credentials provided by EnterpriseDB.

1. Go to <https://apt.enterprisedb.com/> and log in as `root`:

```
sudo su -
```

2. Configure the EnterpriseDB repository:

```
sh -c 'echo "deb https://<username>:<password>@apt.enterprisedb.com/$(lsb_release - cs)-edb/
$(lsb_release -cs) main" > /etc/apt/sources.list.d/edb- $(lsb_release -cs).list'
```

3. Add support to your system for secure APT repositories:

```
apt-get install apt-transport-https
```

4. Add the EBD signing key:

```
wget -q -O -https://<username>:<password>@apt.enterprisedb.com/edb-deb.gpg.key | apt-key add -
```

- 5 . Update the repository metadata:

```
| apt-get update
```

1. Use the following command to install the Debian package for PEM agent:

```
| apt-get install edb-pem-agent
```

---

## 1.3 Registering an Agent

Each PEM agent must be *registered* with the PEM server. The registration process provides the PEM server with the information it needs to communicate with the agent. The PEM agent graphical installer for Windows supports self-registration for the agent. You must use the `pemworker` utility to register the agent if the agent is on a Linux host.

The RPM installer places the PEM agent in the `/usr/edb/pem/bin` directory. To register an agent, include the `--register-agent` keywords along with registration details when invoking the pemworker utility:

#### `pemworker --register-agent`

Append command line options to the command string when invoking the pemworker utility. Each option should be followed by a corresponding value:

Option	Description
<code>--pem-server</code>	Specifies the IP address of the PEM backend database server. This parameter is required.
<code>--pem-port</code>	Specifies the port of the PEM backend database server. The default value is 5432.
<code>--pem-user</code>	Specifies the name of the Database user (having superuser privileges) of the PEM backend database server. This parameter is required.
<code>--pem-agent-user</code>	Specifies the agent user to connect the PEM server backend database server.
<code>--cert-path</code>	Specifies the complete path to the directory in which certificates will be created. If you do not provide a path, certificates will be created in: On Linux, <code>~/.pem</code> On Windows, <code>%APPDATA%/pem</code>
<code>--config-dir</code>	Specifies the directory path where configuration file can be found. The default is the <code>&lt;pemworker path&gt;/..etc.</code>
<code>--display-name</code>	Specifies a user-friendly name for the agent that will be displayed in the PEM Browser tree control. The default is the system hostname.
<code>--force-registration</code>	Include the <code>force_registration</code> clause to instruct the PEM server to register the agent with the arguments provided; this clause is useful if you are overriding an existing agent configuration. The default value is Yes.
<code>--group</code>	The name of the group in which the agent will be displayed.
<code>--team</code>	The name of the database role, on the PEM backend database server, that should have access to the monitored database server.
<code>--owner</code>	The name of the database user, on the PEM backend database server, who will own the agent.
<code>--allow_server_restart</code>	Enable the <code>allow-server_restart</code> parameter to allow PEM to restart the monitored server. The default value is True.
<code>--allow-batch-probes</code>	Enable the <code>allow-batch-probes</code> parameter to allow PEM to run batch probes on this agent. The default value is False.
<code>--batch-script-user</code>	Specifies the operating system user that should be used for executing the batch/shell scripts. The default value is none; the scripts will not be executed if you leave this parameter blank or the specified user does not exist.
<code>--enable-heartbeat-connection</code>	Enable the <code>enable-heartbeat-connection</code> parameter to create a dedicated heartbeat connection between PEM Agent and server to update the active status. The default value is False.
<code>--enable-smtp</code>	Enable the <code>enable-smtp</code> parameter to allow the PEM agent to send the email on behalf of the PEM server. The default value is False.
<code>--enable-snmp</code>	Enable the <code>enable-snmp</code> parameter to allow the PEM agent to send the SNMP traps on behalf of the PEM server. The default value is False.
<code>-o</code>	Specify if you want to override the configuration file options.

If you want to use any PEM feature for which database server restart is required by the pemaagent such as Audit Manager, Log Manager, or Tuning Wizard, then you must set the value for `allow_server_restart` as `true` in the `agent.cfg` file.

#### Note

When configuring a shell/batch script run by a PEM agent that has PEM 7.11 or later version installed, the user for the `batch_script_user` parameter must be specified. It is strongly recommended that a non-root user is used to run the scripts. Using the root user may result in compromising the data security and operating system security.

However, if you want to restore the pemagent to its original settings using root user to run the scripts, then the `batch_script_user` parameter value must be set to `root`.

You can use the `PEM_SERVER_PASSWORD` environment variable to set the password of the PEM Admin User. If the `PEM_SERVER_PASSWORD` is not set, the server will use the `PGPASSWORD` or `pgpass` file when connecting to the PEM Database Server.

Failure to provide the password will result in a password authentication error; you will be prompted for any other required but omitted information. When the registration is complete, the server will confirm that the agent has been successfully registered.

## Setting PEM Agent Configuration Parameters

The PEM agent RPM installer creates a sample configuration file named `agent.cfg.sample` in the `/usr/edb/pem/agent/etc` directory. When you register the PEM agent, the pemworker program creates the actual agent configuration file (named `agent.cfg`). You must modify the `agent.cfg` file, adding the following configuration parameter:

```
heartbeat_connection = true
```

You must also add the location of the `ca-bundle.crt` file (the certificate authority). By default, the installer creates a `ca-bundle.crt` file in the location specified in your `agent.cfg.sample` file. You can copy the default parameter value from the sample file, or, if you use a `ca-bundle.crt` file that is stored in a different location, specify that value in the `ca_file` parameter:

```
ca_file=/usr/libexec/libcurl-pem7/share/certs/ca-bundle.crt
```

Then, use a platform-specific command to start the PEM agent service; the service is named `pemagent`. For example, on a CentOS or RHEL 6.x system, you would use the command:

```
/etc/init.d/pemagent
```

On a CentOS or RHEL 7.x host, use `systemctl` to start the service:

```
systemctl start pemagent
```

The service will confirm that it is starting the agent; when the agent is registered and started, it will be displayed on the [Global Overview](#) dashboard and in the Object browser tree control of the PEM web interface.

For information about using the pemworker utility to register a server, please see the *PEM Getting Started Guide*, available at:

```
https://www.enterprisedb.com/resources/product-documentation
```

## Using a non-root User Account to Register a PEM Agent

To register a PEM agent using a non-root user, you first need to install PEM agent as a root user. After installation, assume the identity of a non-root user (for example `edb`) and perform the following steps:

1. Create the `.pem` directory and `logs` directory as following and assign read, write, and execute permissions to the file:

```
mkdir /home/<edb>/.pem
mkdir /home/<edb>/.pem/logs
chmod 700 /home/<edb>/.pem
chmod 700 /home/<edb>/.pem/logs
```

1. Register the agent with PEM server using the `pemworker` utility as following:

```
./pemworker --register-agent --pem-server <172.19.11.230> --pem-user <postgres> --pem-port <5432> --display-name <non_root> --cert-path /home/<edb> --config-dir /home/<edb>
```

The above command creates agent certificates and an agent configuration file (`agent.cfg`) in the `/home/edb/.pem` directory. Assign read and write permissions to these files using the command:

```
| chmod -R 600 /home/edb/.pem/agent*
```

1. Change the parameters of the `agent.cfg` file as following:

```
agent_ssl_key=/home/edb/.pem/agent<id>.key
agent_ssl_crt=/home/edb/.pem/agent<id>.crt
log_location=/home/edb/.pem/worker.log
agent_log_location=/home/edb/.pem/agent.log
```

1. Update the value for path and user in the `pemagent` service file:

- If you are using CentOS 6, update the `pemagent` service file to reflect the correct path of `agent.cfg` file and also change user `su` to `su edb`.
- If you are using CentOS 7, update the parameters as following:

```
User=edb
ExecStart=/usr/edb/pem/agent/bin/pemagent -c /home/edb/.pem/agent.cfg
```

1. Kill the agent process that was started earlier, and then restart the agent service using the non-root user as follows:

```
| sudo /etc/init.d/pemagent start/stop/restart
```

2. Check the agent status on PEM dashboard.

## 1.4 Managing a PEM Agent

The sections that follow provide information about the behavior and management of a PEM agent.

### Agent Privileges

By default, the PEM agent is installed with `root` privileges for the operating system host and superuser privileges for the database server. These privileges allow the PEM agent to invoke unrestricted probes on the monitored host and database server about system usage, retrieving and returning the information to the PEM server.

Please note that PEM functionality diminishes as the privileges of the PEM agent decrease. For complete functionality, the PEM agent should run as `root`. If the PEM agent is run under the database server's service account, PEM probes will not have complete access to the statistical information used to generate reports, and functionality will be limited to the capabilities of that account. If the PEM agent is run under another lesser-privileged account, functionality will be limited even further.

If you limit the operating system privileges of the PEM agent, some of the PEM probes will not return information, and the following functionality may be affected:

Probe or Action	Operating System	PEM Functionality Affected
Data And Logfile Analysis	Linux/ Windows	The Postgres Expert will be unable to access complete information.
Session Information	Linux	The per-process statistics will be incomplete.
PG HBA	Linux/ Windows	The Postgres Expert will be unable to access complete information.
Service restart functionality	Linux/ Windows	The Audit Log Manager, Server Log Manager, Streaming Replication, Log Analysis Expert and PEM may be unable to apply requested modifications.
Package Deployment	Linux/ Windows	PEM will be unable to run downloaded installation modules.
Batch Task	Windows	PEM will be unable to run scheduled batch jobs in Windows.
Collect data from server (root access required)	Linux/ Windows	Columns such as swap usage, CPU usage, IO read, IO write will be displayed as 0 in the session activity dashboard.

#### Note

The above-mentioned list is not comprehensive, but should provide an overview of the type of functionality that will be limited.

If you restrict the database privileges of the PEM agent, the following PEM functionality may be affected:

Probe	Operating System	PEM Functionality Affected
Audit Log Collection	Linux/Windows	PEM will receive empty data from the PEM database.
Server Log Collection	Linux/Windows	PEM will be unable to collect server log information.
Database Statistics	Linux/Windows	The Database/Server Analysis dashboards will contain incomplete information.
Session Waits/System Waits	Linux/Windows	The Session/System Waits dashboards will contain incomplete information.
Locks Information	Linux/Windows	The Database/Server Analysis dashboards will contain incomplete information.
Streaming Replication	Linux/Windows	The Streaming Replication dashboard will not display information.
Slony Replication	Linux/Windows	Slony-related charts on the Database Analysis dashboard will not display information.
Tablespace Size	Linux/Windows	The Server Analysis dashboard will not display complete information.
xDB Replication	Linux/Windows	PEM will be unable to send xDB alerts and traps.

If the probe is querying the operating system with insufficient privileges, the probe may return a [permission denied](#) error.

If the probe is querying the database with insufficient privileges, the probe may return a [permission denied](#) error or display the returned data in a PEM chart or graph as an empty value.

When a probe fails, an entry will be written to the log file that contains the name of the probe, the reason the probe failed, and a hint that will help you resolve the problem.

You can view probe-related errors that occurred on the server in the Probe Log Dashboard, or review error messages in the PEM worker log files. On Linux, the default location of the log file is:

/var/log/pem/worker.log

On Windows, log information is available on the [Event Viewer](#).

## Agent Configuration

A number of user-configurable parameters and registry entries control the behavior of the PEM agent. You may be required to modify the PEM agent's parameter settings to enable some PEM functionality, such as the [Streaming Replication](#) wizard. After modifying values in the PEM agent configuration file, you must restart the PEM agent to apply any changes.

With the exception of the `PEM_MAXCONN` parameter, we strongly recommend against modifying any of the configuration parameters or registry entries listed below without first consulting EnterpriseDB support experts *unless* the modifications are required to enable PEM functionality.

On Linux systems, PEM configuration options are stored in the `agent.cfg` file, located in `/opt/edb/pem/agent/etc`. The `agent.cfg` file contains the following entries:

Parameter Name	Description	Default Value
pem_host	The IP address or hostname of the PEM server.	127.0.0.1.
pem_port	The database server port to which the agent connects to communicate with the PEM server.	Port 5432.
pem_agent	A unique identifier assigned to the PEM agent.	The first agent is '1', the second agent is '2', and so on.
agent_ssl_key	The complete path to the PEM agent's key file.	/root/.pem/agent.key
agent_ssl_crt	The complete path to the PEM agent's certificate file.	/root/.pem/agent.crt
agent_flag_dir	Used for HA support. Specifies the directory path checked for requests to take over monitoring another server. Requests are made in the form of a file in the specified flag directory.	Not set by default.
log_level	Log level specifies the type of event that will be written to the PEM log files.	warning
log_location	Specifies the location of the PEM worker log file.	127.0.0.1.
agent_log_location	Specifies the location of the PEM agent log file.	/var/log/pem/agent.log
long_wait	The maximum length of time (in seconds) that the PEM agent will wait before attempting to connect to the PEM server if an initial connection attempt fails.	30 seconds
short_wait	The minimum length of time (in seconds) that the PEM agent will wait before checking which probes are next in the queue (waiting to run).	10 seconds
alert_threads	The number of alert threads to be spawned by the agent.	Set to 1 for the agent that resides on the host of the PEM server; 0 for all other agents.
enable_smtp	When set to true, the SMTP email feature is enabled.	true for PEM server host; false for all others.

Parameter Name	Description	Default Value
enable_snmp	When set to true, the SNMP trap feature is enabled.	true for PEM server host; false for all others.
enable_nagios	When set to true, Nagios alerting is enabled.	true for PEM server host; false for all others.
connect_timeout	The max time in seconds (a decimal integer string) that the agent will wait for a connection.	Not set by default; set to 0 to indicate the agent should wait indefinitely.
allow_server_restart	If set to TRUE, the agent can restart the database server that it monitors. Some PEM features may be enabled/disabled, depending on the value of this parameter.	False
allow_package_management	If set to TRUE, the Update Monitor and Package Management features are enabled.	false
max_connections	The maximum number of probe connections used by the connection throttler.	0 (an unlimited number)
connection_lifetime	Use ConnectionLifetime (or connection_lifetime) to specify the minimum number of seconds an open but idle connection is retained. This parameter is ignored if the value specified in MaxConnections is reached and a new connection (to a different database) is required to satisfy a waiting request.	By default, set to 0 (a connection is dropped when the connection is idle after the agent's processing loop).
allow_batch_probes	If set to TRUE, the user will be able to create batch probes using the custom probes feature.	false
heartbeat_connection	When set to TRUE, a dedicated connection is used for sending the heartbeats.	false
allow_streaming_replication	If set to TRUE, the user will be able to configure and setup streaming replication.	false
batch_script_dir	Provide the path where script file (for alerting) will be stored.	/tmp
connection_custom_setup	Use to provide SQL code that will be invoked when a new connection with a monitored server is made.	Not set by default.
ca_file	Provide the path where the CA certificate resides.	/opt/PEM/agent/share/certs/ca-bundle.crt.
batch_script_user	Provide the name of the user that should be used for executing the batch/shell scripts.	None

On 64 bit Windows systems, PEM registry entries are located in:

| HKEY\_LOCAL\_MACHINE\Software\Wow6432Node\EnterpriseDB\PEM\agent

The registry contains the following entries:

Parameter Name	Description	Default Value
PEM_HOST	The IP address or hostname of the PEM server.	127.0.0.1.
PEM_PORT	The database server port to which the agent connects to communicate with the PEM server.	Port 5432.
AgentID	A unique identifier assigned to the PEM agent.	The first agent is '1', the second agent is '2', and so on.

AgentKeyPath	The complete path to the PEM agent's key file.	%APPDATA%\Roaming\pem\ agent.key.
AgentCrtPath	The complete path to the PEM agent's certificate file.	%APPDATA%\Roaming\pem\ agent.crt
AgentFlagDir	Used for HA support. Specifies the directory path checked for requests to take over monitoring another server. Requests are made in the form of a file in the specified flag directory.	Not set by default.
LogLevel	Log level specifies the type of event that will be written to the PEM log files.	warning
LongWait	The maximum length of time (in seconds) that the PEM agent will wait before attempting to connect to the PEM server if an initial connection attempt fails.	30 seconds
shortWait	The minimum length of time (in seconds) that the PEM agent will wait before checking which probes are next in the queue (waiting to run).	10 seconds
AlertThreads	The number of alert threads to be spawned by the agent.	Set to 1 for the agent that resides on the host of the PEM server; 0 for all other agents.
EnableSMTP	When set to true, the SMTP email feature is enabled.	true for PEM server host; false for all others.
EnableSNMP	When set to true, the SNMP trap feature is enabled.	true for PEM server host; false for all others.
ConnectTimeout	The max time in seconds (a decimal integer string) that the agent will wait for a connection.	Not set by default; if set to 0, the agent will wait indefinitely.
AllowServerRestart	If set to TRUE, the agent can restart the database server that it monitors. Some PEM features may be enabled/disabled, depending on the value of this parameter.	true
AllowPackageManagement	If set to TRUE, the Update Monitor and Package Management features are enabled.	false
MaxConnections	The maximum number of probe connections used by the connection throttler.	0 (an unlimited number)

ConnectionLifetime	Use ConnectionLifetime (or connection_lifetime) to specify the minimum number of seconds an open but idle connection is retained. This parameter is ignored if the value specified in MaxConnections is reached and a new connection (to a different database) is required to satisfy a waiting request.	By default, set to 0 (a connection is dropped when the connection is idle after the agent's processing loop).
AllowBatchProbes	If set to TRUE, the user will be able to create batch probes using the custom probes feature.	false
HeartbeatConnection	When set to TRUE, a dedicated connection is used for sending the heartbeats.	false
AllowStreamingReplication	If set to TRUE, the user will be able to configure and setup streaming replication.	false
BatchScriptDir	Provide the path where script file (for alerting) will be stored.	/tmp
ConnectionCustomSetup	Use to provide SQL code that will be invoked when a new connection with a monitored server is made.	Not set by default.
ca_file	Provide the path where the CA certificate resides.	/opt/PEM/agent/share/certs/ca-bundle.crt.
AllowBatchJobSteps	If set to true, the batch/shell scripts will be executed using Administrator user account.	None

## Agent Properties

The **PEM Agent Properties** dialog provides information about the PEM agent from which the dialog was opened; to open the dialog, right-click on an agent name in the PEM client tree control, and select **Properties** from the context menu.



Use fields on the PEM Agent properties dialog to review or modify information about the PEM agent:

- The **Description** field displays a modifiable description of the PEM agent. This description is displayed in the tree control of the PEM client.
  - You can use groups to organize your servers and agents in the PEM client tree control. Use the **Group** drop-down listbox to select the group in which the agent will be displayed.
  - Use the **Team** field to specify the name of the group role that should be able to access servers monitored by the agent; the servers monitored by this agent will be displayed in the PEM client tree control to connected team members. Please note that this is a convenience feature. The Team field does not provide true isolation, and should not be used for security purposes.
  - The **Heartbeat interval** fields display the length of time that will elapse between reports from the PEM agent to the PEM server. Use the selectors next to the **Minutes** or **Seconds** fields to modify the interval.
- 

## 1.5 PEM Agent Troubleshooting

### Restoring a Deleted PEM Agent

If an agent has been deleted from the `pem.agent` table then you cannot restore it. You will need to use the pemworker utility to re-register the agent.

If an agent has been deleted from PEM Web client but still has an entry in the `pem.agent` table with value of active = f, then you can restore the agent using the following steps:

1. Use the following command to check the values of the `id` and `active` fields:

```
pem=# SELECT * FROM pem.agent;
```

2. Update the status for the agent to `true` in the `pem.agent` table:

```
pem=# UPDATE pem.agent SET active=true WHERE id=<x>;
```

Where, `x` is the identifier that was displayed in the output of the query used in step 1.

3. Refresh the PEM web client.

The deleted agent will be restored again. However, the servers that were bound to that particular agent might appear to be down. To resolve this issue, you need to modify the PEM agent properties of the server to add the bound agent again; after the successful modification, the servers will be displayed as running properly.

### Reconfiguring the PEM Server

In certain situations, you may need to uninstall the PEM server, install it again, and reconfigure the PEM server. Use the following commands in the given sequence:

1. Use the following command to remove the PEM server configuration and uninstall:

```
/usr/edb/pem/bin/configure-pem-server.sh –un
```

2. Use the following command to remove the PEM packages:

```
yum erase edb-pem-server
```

3. Use the following command to drop the `pem` database:

```
DROP DATABASE pem
```

4. Move the certificates from `/root/.pem/` to another location:

```
mv /root/.pem/* <new_location>
```

5. Move the `agent.cfg` file from `/usr/edb/pem/agent/etc/agent.cfg` to another location:

```
mv /usr/edb/pem/agent/etc/agent.cfg <new_location>
```

6. Then, use the following command to configure the PEM server again:

```
/usr/edb/pem/bin/configure-pem-server.sh'
```

## Using the Command Line to Delete a PEM Agent with Down or Unknown Status

Using the PEM web interface to delete PEM agents with `Down` or `Unknown` status may be difficult if the number of such agents is large. In such situations, you might want to use the command line interface to delete Down or Unknown agents.

1. Use the following query to delete the agents that are `Down` for more than *N* number of hours:

```
UPDATE pem.agent SET active=false WHERE id IN
(SELECT a.id FROM pem.agent
a JOIN pem.agent_heartbeat b ON (b.agent_id=a.id)
WHERE a.id IN
(SELECT agent_id FROM pem.agent_heartbeat WHERE (EXTRACT (HOUR FROM now())-
EXTRACT (HOUR FROM last_heartbeat)) > <N> ));
```

1. Use the following query to delete the agents with an `Unknown` status:

```
UPDATE pem.agent SET active=false WHERE id IN
(SELECT id FROM pem.agent WHERE id NOT IN
(SELECT agent_id FROM pem.agent_heartbeat));
```

## 1.6 Uninstalling a PEM Agent

Use the uninstaller provided in the PEM installation directory to remove PEM agent from a system. By default, the PEM agent uninstaller is located:

Component	PEM agent	Uninstaller name
uninstall-pemagent	Default location	/opt/edb/PEM/agent

To remove an agent, assume superuser privileges, open a terminal window, and navigate into the directory in which the uninstaller resides; invoke the installer as follows:

```
./uninstall-<agent_name>
```

Where `agent_name` is the name of the agent that you wish to remove.

If the PEM installation resides on a Windows host, you can use the Windows [Uninstall a Program](#) applet to remove PEM components. To open the [Uninstall a Program](#) applet, navigate through the Programs submenu on the Windows [Control Panel](#), selecting [Programs and Features](#). When the [Uninstall a Program](#) window opens, highlight the name of the PEM component that you wish to remove, and click the [Uninstall/Change](#) button. A Windows popup will open, prompting you to confirm that you wish to remove the component; click [Yes](#) to remove the component.

---

## 2 PEM ARK Management

Postgres Enterprise Manager (PEM) is designed to assist database administrators, system architects, and performance analysts when administering, monitoring, and tuning PostgreSQL and Advanced Server database servers. PEM has been designed to manage and monitor a single server or multiple servers from a single console, allowing complete control over monitored databases.

EDB Ark provisions EDB Postgres Advanced Server or PostgreSQL databases in single instances, high-availability clusters, or application development sandboxes on Amazon AWS, Azure, and OpenStack hosts. EDB Ark offers an elastic and highly scalable environment that frees DBAs and application developers from the rigors of setting up and administering modern and robust database environments.

For detailed information about EnterpriseDB cloud offerings, [visit EnterpriseDB's website](#).

Throughout this guide, the term [Postgres](#) refers to either a PostgreSQL or an Advanced Server installation, where either is appropriate.

---

### 2.1 What's New

The following features have been added to create Postgres Enterprise Manager 7.12:

- Improved BART Integration- The following capabilities have been added to enhance the integration of BART with PEM:
  - PEM 7.12 provides an option to create SSH certificates to allow passwordless authentication for backup and restore operations. You can enable passwordless SSH authentication from the database server's [Properties](#) dialog or from the [Backup Restore](#) dialog.
  - You can now set or override the [archive command](#) of the database server's configuration by providing inputs in the database server's [Properties](#) dialog.
- Accessibility Improvements- Attributes have been added to provide an invisible label to the UI elements where a text label cannot be used.
- Dark Theme (Beta)- You can now choose to use the dark theme while accessing the PEM console. In the following cases, the dark theme does not work in PEM console:
  - Background of the pie charts under monitoring dashboards.
  - All the reports generated for Capacity Manager, Log Analysis Expert, Postgres Expert, Tuning Wizard etc.

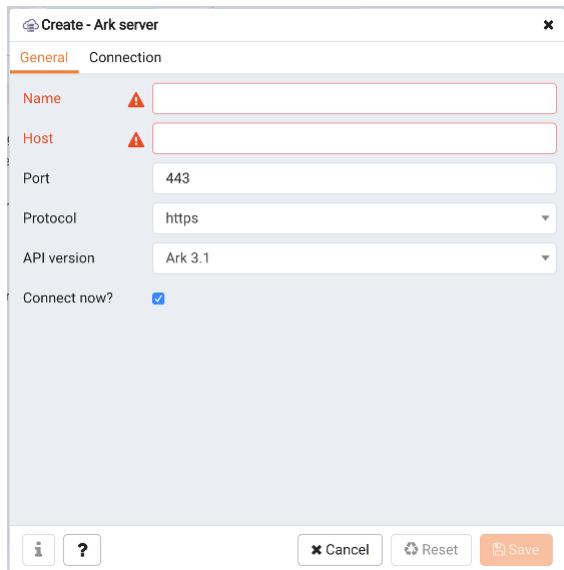
### 2.2 Using PEM to Manage EDB Postgres Ark

PEM provides a user-friendly interface that allows you to manage your Ark consoles and create and scale Ark clusters. The PEM web interface helps you manage Ark by providing a point-and-click interface accessed in your favorite browser. Object definitions on existing Ark consoles (clusters, engines, server .. /images, etc.) will be displayed in the PEM object browser when you register an Ark console with PEM.

Before you can use PEM's management features, you must register your Ark console with the PEM server.

## 2.2.1 Registering an Ark Console

You can use the **Create - Server** dialog to register an existing Ark console with the PEM server. To access the dialog, right-click on an Ark Server node to access the context menu; navigate through the **Create** option to select **Ark Server**....



Use the fields on the **General** tab to describe the general properties of the Ark console:

- Use the **Name** field to specify a user-friendly name for the server. The name specified will identify the server in the PEM Browser tree control.
- Use the **Host** field to provide the name of the Ark console host.
- Use the **Port** field to specify the port that the PEM server will use when connecting to the Ark console.
- Use the **Protocol** drop-down listbox to select the connection protocol that the PEM server will use when connecting to the Ark console.
- Use the **API version** drop-down listbox to select the version of the Ark API that the PEM server will use when managing the Ark console.



Use fields on the **Connection** tab to specify connection details for the Ark console:

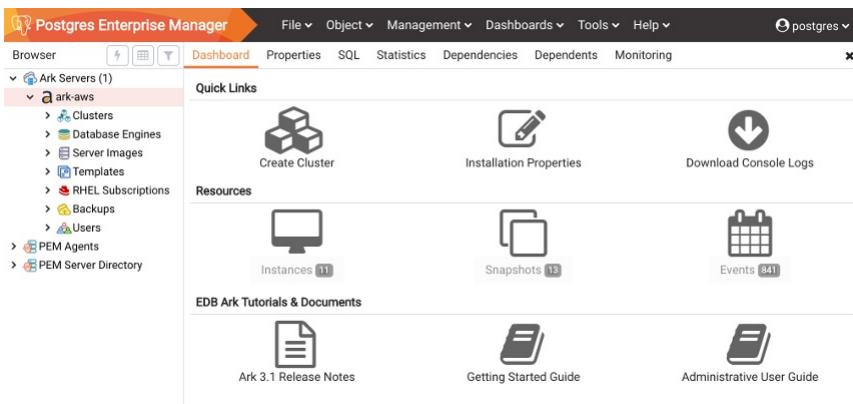
- Specify the name of the connecting user in the **Username** field. The specified user must be an existing user in the backing database of the Ark console.
- Provide the password associated with the specified user in the **Password** field.
- Specify the name of the OpenStack tenant or **Ark Port** field.
- Use the **Domain** name field to specify the name of the OpenStack domain to which the server will connect if the Ark API version specified on the General tab is version 3.1 or greater.
- Check the box next to **Save password?** to save the password associated with the console registration; if do not save the password, you will be prompted for the password when you attempt to connect to the server.

When you have provided registration information for the Ark console, click the **Save** button to save the Ark console definition.

## 2.2.2 Managing an Ark Console

The PEM web interface provides dialogs that allow you to review and modify the Ark console attributes.

The **Dashboard** tab displays icons that provide quick access to Ark information and features. If the tab is accessed from the top-level **Ark Servers** node, it includes informational links that are applicable to all consoles. If the tab is accessed from a console name node, the tab includes information specific to that console:



The **Quick Links** icons allow you to:

- Click the **Create Cluster** icon to define a new cluster on the selected console.
- Click the **Installation Properties** icon to review the deployment properties for the selected console.
- Click the **Download Console Logs** icon to download the log files for the selected console.

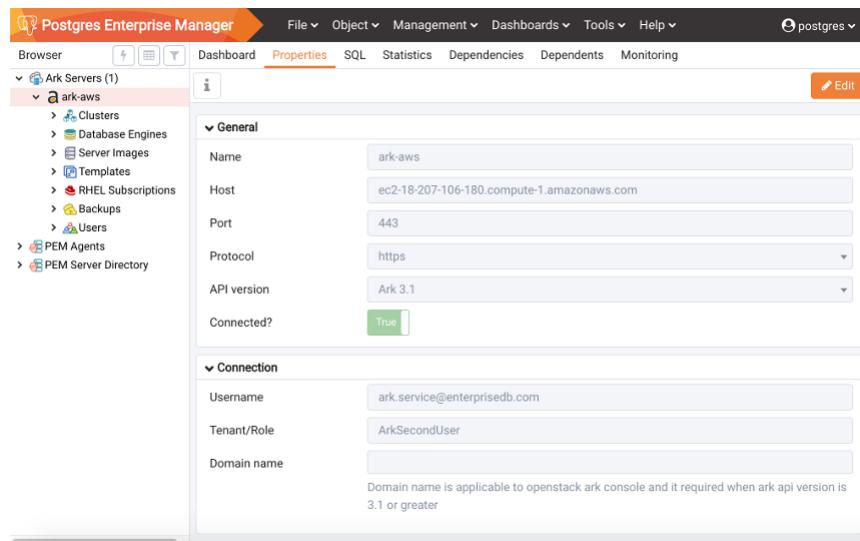
The **Resources** icons provide access to information about the objects that reside on the console:

- Click the **Instances** icon to review information about the instances that reside on the console.
- Click the **Snapshots** icon to review information about console backups.
- Click the **Events** icon to review information about events that have been logged for the selected console.

The **EDB Ark Tutorials & Documents** icons provide access to information that is specific to the Ark version that is deployed on the console:

- Click the **Ark 3.0 Release Notes** icon to review the release notes.
- Click the **Getting Started Guide** icon to review a usage guide for the Ark console.
- Click the **Administrative User Guide** icon to review the Ark Administrative User Guide.

To view console properties, select the name of a console in the PEM Browser tree control and select the **Properties** tab.



Panels on the **Properties** tab display configuration details for the console.

The **General** panel displays:

- The **Name** field displays the console name.
- The **Host** name displays the IP address of the console.
- The **Port** field displays the port at which a browser can connect to the console.
- The **Protocol** field displays the connection protocol used to connect to the console.
- The **API version** field displays the version of the API used to manage console objects.
- The **Connected?** field displays the current state of the console.

The **Connection** panel displays:

- The **Username** field displays the name of the user that deployed the console.
- The **Tenant/Role** field displays the name of the tenant or role in which the console is hosted.
- If deployed on an OpenStack host and using API version 3.1 or later, the **Domain name** field displays the OpenStack domain in which the console is hosted.

Use options on the console's context menu to manage a console registration; right-click on the console name in the PEM browser tree control and select from the following menu options:

Option	Action
Refresh	Select Refresh to update the definition of the server or server objects that reside on the console.

Option	Action
Connect Server	Select Connect Server to connect to the selected Ark console. After authenticating with the Ark console host, the tree control will display a host-specific icon to the left of the console name. Expand the tree control to review and manage objects that reside on the console.
Delete/Drop	Select Delete/Drop to delete the registration of the selected Ark console. Please note that deleting a console registration does not remove the console from the backing database. PEM will confirm that you wish to delete the registration before removing it.
Download console logs	Select Download console logs to download the log files from the selected console.
Installation options	Select Installation options to open the Installation options dialog and review or modify console deployment properties.
Disconnect Server	Select Disconnect Server to disconnect from the selected Ark console.
Properties	Select Properties to review the properties specified when registering an Ark console; if the server is disconnected, you may modify the property values. After modifying property values, select Save to preserve your changes.

## Downloading Console Logs

Use options on the console **Dashboard** panel or context menu to download a zip file that contains the server logs for the underlying application server. You can use the log file to confirm changes to server status or verify server activity. To download a console log you can either:

- Right click on the console name in the PEM Browser tree control and select **Download console logs** from the context menu.
- Highlight a console name in the tree control and navigate to the **Dashboard** tab; then, select the **Download console logs** option from the **Quick Links** panel.

A popup will ask you to confirm your selection; click **OK** to download the log file.

You can also review the console logs via an ssh session. Log files are stored in `/var/log/edb-ark`; the current log file is `/var/log/edb-ark/ark.log`. Use the Linux tail utility to display the most recent entries in any of the server logs. For example, to review the last 10 lines in the server log file, use SSH to connect to the console host's backing database and enter:

```
tail file_name
```

Where `file_name` specifies the complete path to the log file. Include the `-F` option to instruct the tail utility to display only the last 10 lines of the log file, and new log file entries as they are added to the file:

```
tail -F file_name
```

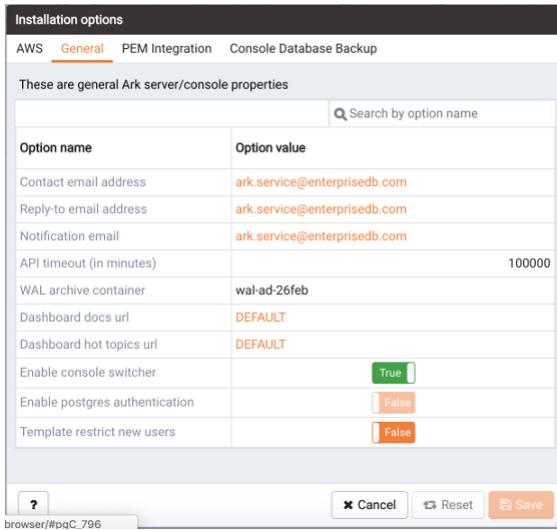
## Reviewing the Console Deployment Options

The **Installation options** dialog displays the deployment properties of the selected console. To open the dialog, right-click on a console name and select **Installation options** from the context menu.



The first tab of the **Installation options** dialog displays provider-specific details about the console deployment. The properties displayed may include:

Option	Action
AWS cross account accesskey	The Amazon access key ID associated with the AWS role that will be used for account.
AWS cross account secretkey	The Amazon secret key associated with the AWS role that will be used for account administration.
Service account externalid	The Amazon external ID that should be used by the Ark service user.
Service account rolearn	The Amazon Role ARN (resource name) that should be used by the Ark service user when performing management functions on behalf of Ark.
Enable self registration	If the Ark console should allow self-registration for Ark users.
Azure application registration ID	The application ID associated with the Azure account that hosts the Ark console.
Azure active directory ID	The directory ID associated with the Azure account that hosts the Ark console.
Azure storage account	The Azure block storage account you wish to use with this Ark server.
Azure subscription ID	The Azure account that hosts the Ark console.
OpenStack admin role	The name of the OpenStack administrative user.
OpenStack identity service endpoint	The location of the OpenStack identity service endpoint.
Service account ID	The name of the service account on the console's backing database.
Service account password	The password for the postgres user on the console's backing database.



The **General** tab displays details about behavior related aspects of the console deployment. Displayed information may include:

Option	Action
API timeout	The number of minutes that an authorization token will be valid for use with the API.
Contact email address	The email address that will be included in the body of cluster status notification emails.
Dashboard docs url	The location of the content that will be displayed on the Dashboard tab of the Ark console.
Dashboard hot topics url	The location of the content that will be displayed on the Dashboard tab of the Ark console.
Database backup tenant	The name of the tenant in which the database backup will reside.
Database name	The name of the console database.
Directory to store backups	The directory in which backups will be stored.
Enable console switcher	If the console should display console switcher functionality.
Enable PostgreSQL authentication	If Ark will enforce the authentication method configured on the backing Postgres server.
Folder to store backups	The name of the backup folder within the storage bucket.
Notification email	The email address to which email notifications about the status of the Ark console will be sent.
Reply-to email address	The return email address used on cluster status notification emails.
Template restrict new users	Indicates if the Ark console will make any new user a Template Only user by default.
WAL archive container	The name of the container in which WAL archives are stored.



The **PEM integration** tab displays details about behavior related to PEM. The properties displayed may include:

Option	Action
PEM server mode	The location of the PEM server; a LOCAL server resides on the monitored PEM instance, while a REMOTE server is on a different host.
PEM sync mode	If enabled, all roles/groups/tenants that are accessible by the role that creates the console are added to the PEM server as a member of a non-login group role.
PEM synchronisation interval	The number of minutes between PEM/Ark synchronisations.



The **Console database backup** tab displays details about backup behavior. The properties displayed may include:

Option	Action
Backup script	The complete path to the backup script on the console host.
Backup storage directory	The complete path to the backup script on the console host.
Console backup folder	The name of the console database.
Database name	The name of the console database.
Database user name	The name of the database superuser.
Backup storage directory	The directory in which backups will be stored.
Folder to store backups	The name of the backup folder within the storage bucket.
Storage bucket	The name of the container in which backups will be stored.

Option	Action
Storage tenant	The name of the tenant in which the database backup will reside.

## 2.2.3 Performing Administrative Tasks

You can use the PEM web interface to create and manage clusters that reside on the console host. Before creating a cluster, you must:

- define a server image.
- define a database engine.

After defining a server image and a database engine, you can use PEM to create, monitor, and scale Ark clusters.

### Defining a Server Image

A server image definition describes the virtual machine that will reside on the console host, and provide the environment for an instance of Advanced Server or PostgreSQL. To create a new server image, right-click on the **Server Images** node, and select **Create**, then **Server Image**....



Use fields on the Create - Server Image dialog to define the server image:

- Use the **Server ID** field to provide an identifier for the server image. The Server ID must be unique, and may not be modified after saving the server image.
- Use the **Server description** field to provide a description of the server image.
- Use the **Image ID** field to provide the Image ID of the server image.
- Use the **Initial user** field to provide the name of the default operating system user. This user must have sudo root privileges to perform the initial provisioning of software on the node.
- Use the **System type** field drop-down listbox to select the operating system type of the server; select CentOS or RHEL.
- Set the **Statically provisioned?** slider to **Yes** to indicate that the server is statically provisioned. A statically provisioned server is a pre-installed image that contains the software required to create a database cluster.

### Deleting a Server Image

To delete a server image, right-click on the image name in the PEM browser tree control, and select **Delete/Drop** from the context menu. The PEM server will prompt you to confirm that you wish to delete the server image. Please note that you cannot remove a server image that is currently in use by an engine; before deleting the

server, you must delete any dependent engines.

## Defining a Database Engine

An engine definition provides detailed information about the backing database used by a cluster; only an EDB Ark administrative user can define an engine. Once defined, all of the engines that reside within a specific tenant will be made available to all users with access to that tenant. The Ark console ships with a number of default engine definitions.

You can also create custom database engines. To create a new database engine, right-click on the **Database Engines** node, and select **Create**, then **Database Engine ....**

The screenshot shows the 'Create - Database Engine' dialog box. The 'General' tab is active. The 'Name' field is empty and has a red error icon. The 'Engine ID' field is empty. The 'Database type' dropdown is set to 'PostgreSQL Server'. The 'Version' dropdown is set to 'Select from the list'. The 'Server type' dropdown is set to 'Select from the list'. At the bottom are 'Cancel', 'Reset', and 'Save' buttons.

Use fields on the **General** tab to provide information about the engine:

- Use the **Name** field to provide a user-friendly name for the engine.
- Use the **Engine ID** field to specify the identifier of the engine. The identifier must be unique, and cannot be modified after the engine definition is saved.
- Use the **Database Type** drop-down listbox to select the database type (PostgreSQL or Advanced Server) that will be deployed on the engine. The database type cannot be modified after the engine definition is saved.
- Use the **Version** drop-down listbox to select the database server version of the engine. The version cannot be modified after the engine definition is saved.
- Use the **Server type** drop-down listbox to select the backing operating system that will be used by the engine.

The screenshot shows the 'Create - Database Engine' dialog box. The 'Software/Packages' tab is active. The 'RHEL subscription' dropdown is set to 'Select from the list'. The 'Yum repo URL(s)' text area has a placeholder: 'Enter the yum repo(s) where all required packages can be found (if more than one, enter on separate lines)'. The 'Required packages' text area has a placeholder: 'Enter the yum package names for all required Database components - database server, pgpool, etc. Never change this unless you know exactly what you are doing.'. The 'Optional packages' text area has a placeholder: 'If you would like to provision optional packages on all of your cluster nodes then enter the package names here. Node must be pre-configured with any necessary yum repo configuration for this to work.'. At the bottom are 'Cancel', 'Reset', and 'Save' buttons.

Use fields on the **Software/Packages** tab to provide information about the software that will be deployed on the engine:

- Use the **RHEL subscription** drop-down listbox to select the RHEL subscription service that will be used when provisioning the engine. You can use the **Create - RHEL Subscription** dialog to propagate the RHEL subscription list.
- Use the **Yum repo URL(s)** field to provide the names and credentials associated with one or more yum repositories from which software will be installed.
- Use the **Required packages** field to provide a list of the software packages that are required by the specified server.
- Use the **Optional packages** field to provide a list of the additional software packages that will be installed on clusters that are provisioned using the engine.

After defining the database engine click **Save** to add the engine to the Database Engines list in the PEM Browser tree control.

Before using the engine when deploying an Ark cluster, the engine must be enabled. You can use options on the node's context menu to manage the engine.

## Modifying a Database Engine

To modify a database engine, right-click on the name of the database engine, and select **Properties...** from the context menu, or highlight the engine's name and select **Properties...** from the **Object** dialog. Use fields on the engine's properties dialog to update the properties associated with the engine.

## Managing Database Engines

To view a list of the currently defined engines, select the **Database Engines** node in the PEM Browser tree control and navigate to the **Properties** tab.

Name	Engine ID	Enabled	Database type	Version	Server type	RHEL subscription
PostgreSQL 9.4 64bit on CentOS 6	PG_94_C6_ARK30	False	PostgreSQL Server	9.4		
PostgreSQL 9.4 64bit on CentOS / RHE...	PG_94_CR7_ARK30	False	PostgreSQL Server	9.4		
EDB Postgres Advanced Server 9.4 64...	PPAS_94_ARK30	False	EDB Postgres Advanced Server	9.4		
PostgreSQL 9.5 64bit on CentOS 6	PG_95_C6_ARK30	False	PostgreSQL Server	9.5		
PostgreSQL 9.5 64bit on CentOS / RHE...	PG_95_CR7_ARK30	False	PostgreSQL Server	9.5		
EDB Postgres Advanced Server 9.5 64...	PPAS_95_ARK30	False	EDB Postgres Advanced Server	9.5		
PostgreSQL 9.6 64bit on CentOS 6	PG_96_C6_ARK30	False	PostgreSQL Server	9.6		
PostgreSQL 9.6 64bit on CentOS / RHE...	PG_96_CR7_ARK30	False	PostgreSQL Server	9.6		
EDB Postgres Advanced Server 9.6 64...	PPAS_96_ARK30	False	EDB Postgres Advanced Server	9.6		
PostgreSQL 10 64bit on CentOS 6	PG_10_C6_ARK30	False	PostgreSQL Server	10		
PostgreSQL 10 64bit on CentOS / RHE...	PG_10_CR7_ARK30	False	PostgreSQL Server	10		
EDB Postgres Advanced Server 10 64b...	PPAS_10_ARK30	False	EDB Postgres Advanced Server	10		
PostgreSQL 11 64bit on CentOS 6	PG_11_C6_ARK32	False	PostgreSQL Server	11		
PostgreSQL 11 64bit on CentOS / RHE...	PG_11_CR7_ARK32	True	PostgreSQL Server	11	c7	
EDB Postgres Advanced Server 11 64b...	PPAS_11_ARK32	True	EDB Postgres Advanced Server	11	c7	
Pradip Testing API CR7 PG 10 – 150821	A_PG10CR7_150821	True	PostgreSQL Server	10	A_C7.2_150820	
INITIAL SETUP API-test-eof-false	API-test-eof-false	True	PostgreSQL Server	9.5	c7	

The **Properties** tab displays detailed information about the currently defined engines:

- The **Name** field displays the user-friendly name of the database engine.
- The **Engine ID** field displays the engine identifier.
- The **Enabled** field displays the current state of the database engine.
- The **Database type** field displays the type of database used by the engine.
- The **Version** field displays the server version used by the engine.
- The **Server type** field displays type of the backing operating system.
- If applicable, the **RHEL subscription** field displays the identifier of the RHEL subscription used by the engine.

You can use options on the engine's context menu to manage the engine. To access the context menu, right-click on the engine name in the PEM Browser tree control.



To manage the engine, select from the menu options:

Option	Action
Refresh	Select Refresh to update the definition of the database engine.
Delete/Drop	Select Delete/Drop to delete the engine. PEM will confirm that you wish to delete the engine before removing it.
Enable database engine	Select Enable database engine to make the engine available for use when deploying a cluster.
Disable database engine	Select Disable database engine to make the engine unavailable for use.
Properties...	Select Properties... to review or modify engine properties.

### Enabling or Disabling a Database Engine

Enabled engines are available for use when provisioning clusters; disabled engines are not made available. There are two ways to enable or disable a database engine - you can:

- Right-click on the engine name in the PEM browser tree control and select **Enable database engine** or **Disable database engine** from the context menu.
- Use the **Enabled** slider on the database engine **Properties** dialog to control the state of the engine.

To open the **Properties** dialog, right-click on the engine name and select **Properties...** from the context menu or highlight the engine's name and select **Properties...** from the **Object** menu.



Move the **Enabled** slider to the **Yes** position to make the engine available for cluster provisioning. To disable an engine, move the slider to the **No** position.

Please note that disabling an engine has no impact on any running clusters; it simply prevents users from creating new clusters with the engine. You can use this feature to phase out the use of older engines.

### Deleting a Database Engine

To delete an engine definition, right-click on the engine name in the PEM browser tree control, and select **Delete/Drop** from the context menu. The PEM server will prompt you to confirm that you wish to delete the engine before the engine is deleted. Please note that you cannot remove an engine that is referenced by one or more clusters and/or backups.

## Creating a RHEL Subscription

You can use the PEM web interface to attach Red Hat Subscription Manager information to engines hosted on Red Hat consoles. The Red Hat Subscription Manager tracks installed products and subscriptions to implement content management with tools like yum. For information about Red Hat Subscription Manager, visit the Red Hat [website](#).

When you create a new cluster that uses an engine that is associated with a Red Hat subscription, Ark registers the cluster nodes with Red Hat; when you terminate the node, the system's subscription is unregistered.

To create a RHEL subscription definition, right-click on the **RHEL Subscriptions** node, and select **Create**, then **RHEL Subscription ....**

Use fields on the **General** tab to provide information about the subscription:

- Use the **Subscription ID** field to provide a user-friendly name for the subscription. The name will identify the subscription in the RHEL Subscription drop-down on the engine details dialog.
- Use the **Username** field to provide the name of the user account registered with the Red Hat content server.
- Use the **Password** field to provide the password associated with the user account.
- Use the **Server Url** field to provide the host name of the subscription server used by the service; if left blank, the default value of subscription.rhn.redhat.com will be used.
- Use the **Base Url** field to provide the host name of the content delivery server used by the service; if left blank, the default value of <https://cdn.redhat.com> will be used.
- Use the **Organization** field to provide the organization that will be registered with the Red Hat subscription system.
- Use the **Environment** field to provide the name of the environment (within the organization that will be registered).
- Use the **System name** field to provide the name of the system that will be registered.

Use fields on the **Activation** tab to provide information about subscription behaviors:

- Use the **Activation** key field to provide the activation key of the Red Hat subscription.

- When the **Auto-attach** slider is set to **Yes**, any node associated with the subscription will automatically attach to the service.
- Use the **Pool** field to provide the pool identifier for the Red Hat subscription service.
- When the **Auto** slider is set to Yes, nodes provisioned with engines associated with the pool will automatically attach to the subscription service.
- Use the **Quantity** selector to specify the number of subscriptions in the subscription pool.
- Use the **Service level** drop-down listbox to provide the service level of the subscription.
- Use the **Release** field to provide the operating system minor release that will be used when identifying updates to any nodes provisioned with the subscription.
- When the **Force** slider is set to **Yes**, the node will be registered, even if it is already registered.
- Use the **Subscription type** drop-down listbox to specify the type of consumer that is being registered.



Use fields on the **Software/Packages** tab to provide information about the software that will be deployed on engines that use the repository:

- The **Required repos** list is populated by the Ark console, and displays a list of the repositories required by the subscription definition.
- Use the **Additional repos** field to provide the names of any additional repositories that should be enabled on the cluster node(s).
- Use the **Disabled repos** field to provide the names of any repositories that should be disabled on the cluster node(s).

## Managing RHEL Subscriptions

To view a list of the currently defined RHEL subscriptions, highlight the **RHEL Subscriptions** node in the PEM browser tree control and navigate to the **Properties** tab.

Subscription ID	Username	Auto-attach	Activation key	Quantity	Service level	System name	Release
RHEL_subs_ID_acctg	yogeshmahajan1903	True		0		AWS/Ark console	

To review detailed information about a specific subscription, select the subscription name and navigate to the **Properties** tab.

Panels on the **Properties** tab display details about the subscription. Select the edit button in the header to open a dialog that allows you to edit the subscription properties. Please note that to modify subscription information, you must provide the password associated with the subscription.

- The **General** panel displays subscription information such as the registered user name, your organization information, and the URLs used to connect to the subscription.
- The **Activation** panel displays information about the RHEL subscription service and its behavior.
- The **Software/Packages** panel displays the names of repositories used by the subscription and the subscription manager command.

You can use options on the subscription's context menu to manage the subscription. To access the context menu, right-click on the subscription name in the PEM Browser tree control.

Then, to manage the subscription, select from the menu options:

Option	Action
Refresh	Select Refresh to update the definition of the RHEL subscription.
Delete/Drop	Select Delete/Drop to delete the subscription. PEM will confirm that you wish to delete the subscription definition before removing it.]
Properties...	Select Properties... to modify the subscription properties.

## Modifying Subscription Properties

To modify the properties associated with a RHEL subscription, right-click on a subscription name and select **Properties ...** from the context menu.

Before modifying properties, you must provide the **Password** associated with the subscription. After entering a password and making any desired changes to the subscription definition, click **Save** to preserve your changes and exit the dialog.

## Deleting a Subscription Definition

To delete a subscription definition, right-click on the name of a subscription in the PEM Browser tree control, and select **Delete/Drop** from the context menu. The PEM server will prompt you to confirm that you wish to delete the subscription before the subscription is deleted.

## Creating a Cluster Template

You can use the PEM web interface to define one or more templates on each console. A template contains a predefined set of server options that determine the configuration of a database cluster. A template can simplify creation of clusters that use a common configuration, or limit user access to costly resources such as large server classes.

You must be an administrative user to create a template.

An administrative user can specify that a user is a *template only* user. A template only user must adhere to cluster definitions provided in a template when deploying an Ark cluster. A template only user will have access to only those templates that specify a role or tenant in which they have membership in the Select Roles (on Amazon or Azure) or Select Tenants (on OpenStack) section of the Add Template dialog.

If a user is specified as a Template Only user:

- They must use a template when deploying a cluster.
- They will be restricted to the scaling policies defined in the template.
- They cannot modify a manually-defined cluster created by another user.
- They can only create clusters in a server class that exists in an available template.
- They must use a template when cloning or restoring from backup.
- They may only delete backups of template created clusters.
- They may not delete last backup of a template created cluster if the cluster had been deleted (removing the last artifact of any cluster).



To define a new template, right click on the **Templates** node, and select **Create** then **Templates...** from the context menu.

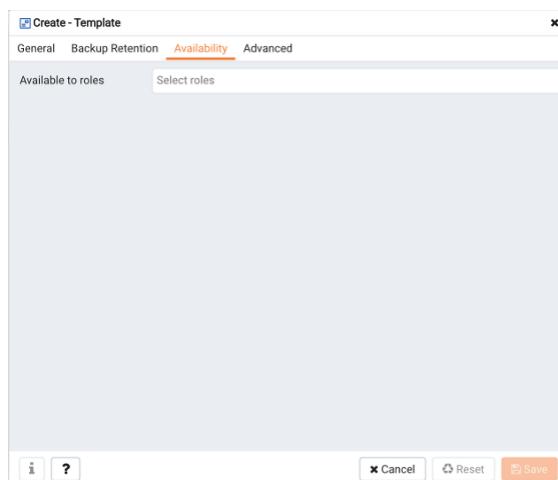
Use fields on the **General** tab to specify general behavioral preferences for the template:

- Provide a user-friendly name for the template in the **Template name** field.
- Use the **Description** field to provide a description of the template.
- Use the drop-down listbox in the **Engine version** field to select the version of the Postgres engine that you wish to use on clusters configured by the template.
- 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 any cluster configured by the template.
- If your cluster resides on an OpenStack host, use the drop-down listbox in the **Virtual network** field to specify the identity of the network in which clusters configured by the template should reside.
- If your cluster resides on an Amazon AMI, use the drop-down listbox in the **VPC** field to specify the identity of the network in which clusters configured by the template should reside.
- If your cluster resides on an OpenStack host, use the drop-down listbox in the **Floating IP pool** field to select the address pool in which clusters configured by the template should reside.
- Use the drop-down listbox in the **Number of nodes** field to specify the number of nodes that should be created in each cluster.
- Use the **Storage GB** field to specify the initial size of the data space (in Gigabytes).
- Set the **Disabled** slider to **Yes** to indicate that the template is disabled.



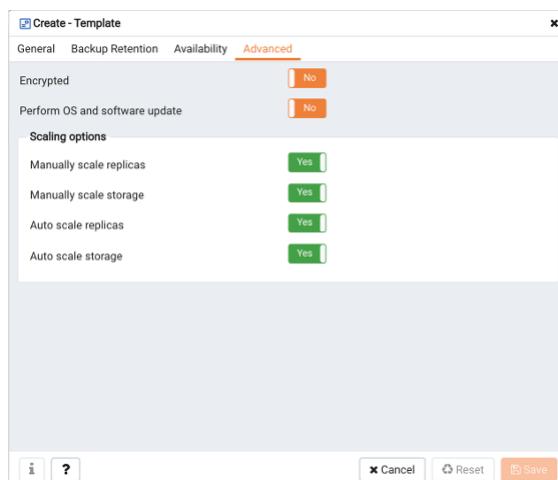
Use fields on the **Backup Retention** tab to specify the backup policies that will be applied for the template:

- Use the **Number of automatic backups to retain** field to specify the number of backups that will be retained for the cluster. When the specified number of server backups is reached, EDB Ark will delete the oldest backup to make room for a new backup.
- Use the **Backup Window** drop-down listbox to specify a time that it is convenient to perform a cluster backup.
- Set the **Continuous Archiving (Point-in-Time Recovery)** slider to **Yes** 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.



Use the **Availability** tab to specify the users that will have access to the template:

- Specify one or more tenants, roles, or groups that will be allowed to use the template in the **Available to tenant/role/group** field.



Use fields on the **Advanced tab** to specify additional template policies:

- Set the **Encrypted slider** to **Yes** to indicate that the cluster should be encrypted. EDB Ark 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.
- Set the **Perform OS and Software update** slider to **Yes** to specify that a software update should be performed whenever the cluster is provisioned. Please note: this option is disabled if the cluster uses a statically provisioned server.

Use the **Scaling Options** sliders to indicate which options will be available to template users:

- Set the **Manually scale replicas** slider to **Yes** to specify that users of this template will be allowed to manually scale replica nodes configured by this template.
- Set the **Manually scale storage** slider to **Yes** to specify that users of this template will be allowed to manually scale storage on clusters configured by this template.
- Set the **Auto scale replicas** slider to **Yes** to specify that users of this template will be able to configure automatic node scaling for clusters configured by this template.
- Set the **Auto scale storage** slider to **Yes** to specify that users of this template will be able to configure automatic storage scaling for clusters configured by this template.

## Managing Templates

To view a list of the currently defined templates, select the **Templates** node in the PEM Browser tree control and navigate to the **Properties** tab.

Template List					
	Template name	Enabled	Engine version	Server class	Available to
<input type="checkbox"/>	Ark_user_temp_1	<input checked="" type="checkbox"/> True	EDB Postgres Advanced Server 11 64bit on CentOS 6/7, RHEL 7	t2.medium	ArkSecondUser

The **Properties** tab displays detailed information about the currently defined templates:

- The **Template** name column displays the user-friendly name of the template.
- The **Enabled** column displays **True** if the template is available for use.
- The **Engine version** column displays the engine identifier.
- The **Server class** column displays the server class available to cluster deployed with the template.
- The **Available to** column displays the names of the groups/roles/tenants that have access to the template.

You can use options on the template's context menu to manage the template. To access the context menu, right-click on the template name in the PEM Browser tree control. Then, select from the menu options:

Option	Action
Refresh	Select Refresh to update the definition of the template.
Delete/Drop	Select Delete/Drop to delete the template. PEM will confirm that you wish to delete the template before removing it.
Enable template	Select Enable template to make the template available for use when deploying a cluster.
Disable template	Select Disable template to make the template unavailable for use.
Properties...	Select Properties... to review or modify template properties.

## Enabling or Disabling a Template

Enabled templates are available for use when provisioning clusters; disabled templates are not available. There

are two ways to enable or disable a template - you can:

- Right-click on the engine name in the PEM browser tree control and select **Enable template** or **Disable template** from the context menu.
- Use the **Enabled** slider on the template **Properties** dialog to control the state of the template. To open the **Properties** dialog, right-click on the template name and select **Properties ...** from the context menu:

Please note that disabling a template has no impact on any running clusters; it simply prevents users from creating new clusters with the template.

## Modifying a Template

To modify a template definition, right-click on the template name in the PEM browser tree control, and select **Properties ...** from the context menu. The template definition dialog will open, allowing you to modify the template properties. Please note that you cannot modify the **Template ID** field; the Template ID is a system-assigned identifier.

After modifying the template definition, click **Save** to preserve your changes and close the dialog.

## Deleting a Template

To delete a template, right-click on the template name in the PEM browser tree control, and select **Delete/Drop** from the context menu. The PEM server will prompt you to confirm that you wish to delete the template before the template is deleted.

## User Management

If allowed by the authentication model supported by your console, you can use the PEM web interface to define an Ark console user. For more information about authentication models supported by Ark, please consult the EDB Postgres Ark Administrative User's Guide, available via the **Dashboard** tab.

To define a new user, right-click on the **Users** node and select **Create**, then **User ...** from the context menu.

The screenshot shows the 'Create - Users' dialog box with the 'General' tab selected. The fields are as follows:

- Login ID:** Text input field.
- Email:** Text input field.
- First name:** Text input field.
- Last name:** Text input field.
- Enabled:** Slider set to **Yes**.
- Admin:** Slider set to **No**.
- Templates only:** Slider set to **No**.
- Role ARN:** Text input field.
- Role Id:** Text input field.
- Password:** Text input field.
- Confirm password:** Text input field.

A note below the password fields states: "The password will be stored/updated only if Postgres authentication is not enabled."

At the bottom of the dialog are buttons for **Cancel**, **Reset**, and **Save**.

Use fields on the **General** tab to provide information about the user:

- Use the **Login ID** field to provide the identifier that will be provided when the user logs in to the Ark server.
- Use the **Email** field to provide a notification email for the user.
- Use the **First name** field to provide the user's first name.
- Use the **Last name** field to provide the user's last name.
- Set the **Enabled** slider to **Yes** to indicate that the user account is active, and to allow the user to login.
- Set the **Admin** slider to **Yes** to specify that the user will have administrative access to the Ark console.
- Set the **Templates only** slider to **Yes** to require the user to use a template when defining a new cluster.
- Use the **Password** field to provide a password for the user.
- Use the **Confirm password** field to confirm the spelling of the user's password.



The **Info** tab provides information about console usage by the selected user:

- The **Created** field displays the date and time that the user account was created.
- The **Last login** field displays the date and time of the most recent login by the user.
- The **Logins** field displays a count of the number of logins by the user.
- The **Nodes** field displays the number of nodes created by the user.

### **Deleting a User Account**

To delete a user account, right-click on the name of a user, and select **Delete/Drop** from the context menu. PEM will prompt you to confirm that you wish to delete the user before the account is deleted.

## **2.2.4 Creating and Managing a Cluster**

There are multiple ways to create an Ark cluster; you can:

- define a new cluster manually.
- clone an existing cluster.
- restore a backup into a new cluster.

Applying a template during cluster creation simplifies the process by providing many of the cluster creation properties.

### **Using the Create Cluster Wizard**

The PEM Create cluster wizard simplifies the process of creating an Ark cluster by presenting a series of dialogs that define a cluster. The dialog content presented by the wizard will vary by platform and the steps involved in

cluster creation will be different for template users than for those users defining a console manually.

To open the wizard, connect to the hosting server and expand the PEM browser tree control. Then, right-click on the **Clusters** node and navigate through the **Create** menu option and select **Cluster**....



Use fields on the **Cluster** type selection dialog to specify how you will define the cluster:

- Select **Define a cluster** to provide detailed cluster configuration preferences.
- Select **Clone a cluster** to make a modified copy of the master node of an existing cluster.
- Select **Restore a cluster** using backup to clone a backup into the master node of a cluster. When you clone from backup, the server configuration will match the original configuration, but the server addresses will change. When the cluster creation completes, 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. After modifying the server configuration, restart the server for the changes to take effect.

A template contains a predefined set of server options that determine the configuration of a database cluster. A template can simplify creation of clusters that use a common configuration, or limit user access to costly resources such as large server classes. An administrative user can specify that a user is a **template only** user; a template only user must adhere to cluster definitions provided in a template when deploying an Ark cluster.

- Move the **Use template?** slider to **Yes** to use a template during cluster deployment.

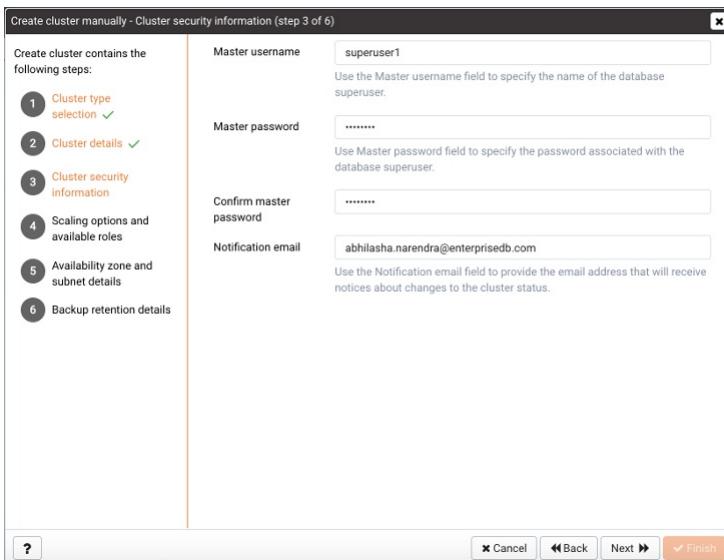
Click **Next** to continue.



Use fields on the **Cluster details** dialog to provide deployment details for the cluster:

- Specify a name for the new cluster in the **Name** field. Please Note: EDB Ark uses the name specified in the **Name** field to identify the cluster when performing management functions. The cluster name is also part of the instance name on the OpenStack console; you must not modify the name in the OpenStack management console. Changing the cluster name in the OpenStack console can break key EDB Ark features (i.e. failover).
- If applicable, use the **Clone** from cluster drop-down listbox to select an existing cluster to clone.
- If applicable, use the **Backup from cluster** drop-down listbox to select a backup to restore.
- The **Backup start** time field displays the time at which the backup was taken; this field is not modifiable. The specified time may not precede the timestamp of the specified backup..
- If applicable, use the **Template name** drop-down listbox to select a template that will provide deployment details for the cluster.
- 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. 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.
- To create a cluster on an Amazon host that resides in a private cloud, move the **Use Private IP addresses slider** to **Yes**; then use the **Virtual network** field to select the virtual private cloud into which the cluster will be deployed.
- If your cluster resides on an Azure host, use the drop-down listbox in the **Virtual network** field to specify the network in which the cluster will reside.
- If your cluster resides on an OpenStack host, use the **Virtual network** drop-down listbox to select the network in which the cluster will be deployed; then, use the **Floating IP pool** drop-down listbox to select an address pool in which the cluster will reside.
- Use the **Number of nodes** field to specify the number of server nodes that you wish to create. The name specified in the 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 amount of the data space (in Gigabytes) available for the cluster.
- Set the **Encrypted slider** to **Yes** to indicate that the cluster should be encrypted. EDB Ark 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.
- If your cluster resides on an AWS host, set the **EBS Optimized** slider to **Yes** 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. Use the IOPS 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.
- Set the **Perform OS** and software update slider to **Yes** to instruct the server to perform a software update when the cluster is provisioned. Please note: this option is disabled if the cluster uses a statically provisioned server.

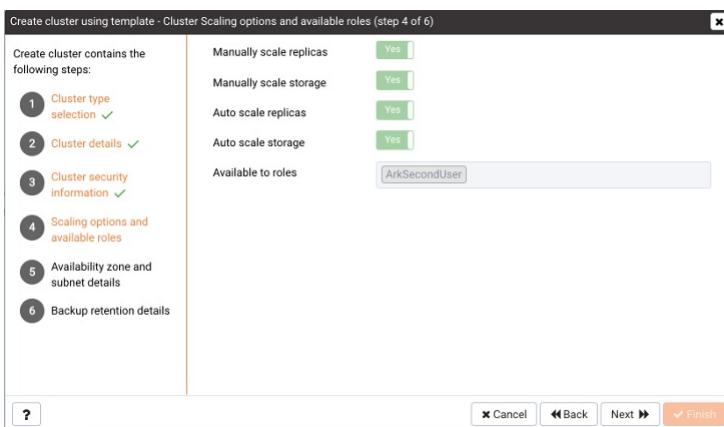
Click **Next** to continue.



Use fields on the **Cluster security information** dialog to provide connection and notification details for the cluster:

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

Click **Next** to continue.



If you are using a template to define the cluster, the **Scaling options** and **available roles** dialog displays the scaling configuration of the new cluster as designated on the template. The information displayed on the dialog is not modifiable:

- If the **Manually scale replicas** slider is set to **Yes**, manual replica scaling will be enabled for the new cluster; cluster users will be able to manually add replicas to the cluster.
- If the **Manually scale storage** slider is set to **Yes**, manual scaling of storage will be enabled for the new cluster; cluster users will be able to manually add storage to the cluster when needed.
- If the **Auto scale replicas** slider is set to **Yes**, automatic replica scaling will be enabled for the cluster; the cluster will automatically add replicas when cluster usage reaches the threshold specified in the template.
- If the **Auto scale storage** slider is set to **Yes**, automatic scaling of storage available to the cluster will be enabled; the cluster will automatically add storage when the cluster reaches the threshold specified in the template.
- The **Available to tenant/role/group** field displays the names of the platform-specific user groups that can access the new cluster.

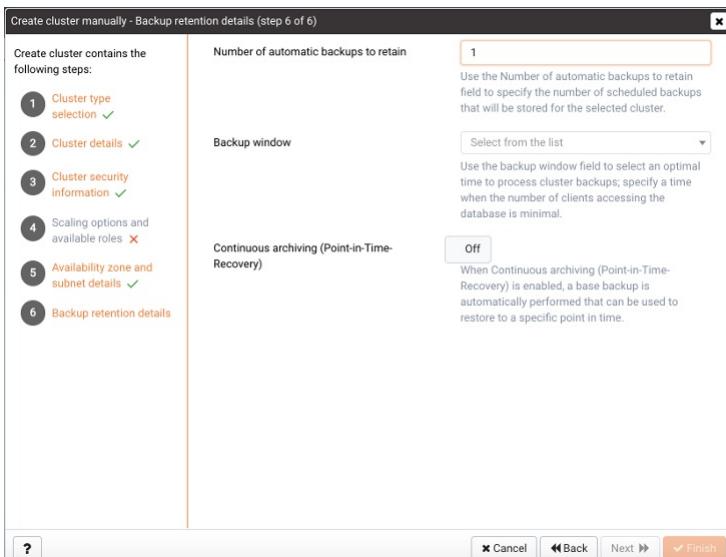
Click **Next** to continue.



Use fields on the **Availability zone** and **subnet details** dialog to specify an availability zone/subnet pair for each node of the cluster:

- Use the drop-down listbox in the **Availability** zone column to specify the data center in which the node listed in the Type column will be deployed, or accept the default to allow the host to select an availability zone.
- Use the drop-down listbox in the **Subnet** field to specify the subnet that will be used by the node listed in the Type column, or accept the default to allow the host to create a new subnet for the node.

Click **Next** to continue.



Use fields on the **Backup retention details** dialog to specify your backup preferences for the cluster:

- Use the **Number of automatic backups to retain** field to specify the number of backups that will be stored. When the specified number of backups is reached, the server will delete the oldest backup to make room for a new backup.
- Use the **Backup window** drop-down listbox to select 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).
- Use the **Continuous archiving (Point-in-Time Recovery)** slider 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 **Back** button to review or modify previous selections, or select **Finish** to create the defined cluster. Choose **Cancel** to exit without preserving your selections.

## Reviewing a List of Existing Clusters

To review a list of existing clusters that reside on a specific cluster host, highlight the **Clusters** node beneath the cluster name in the PEM client tree control, and navigate to the **Properties** tab.



Cluster Overview								
	Name	Owner	Cluster state	Number of nodes	Server class	Engine version	Region	VPC identifier
	cluster1	ark.service@enterprisedb.com	Starting	1	t2.small	PostgreSQL 11 64bit on CentOS / RHEL 7	us-east-1	vpc-9720b2f2

The **Properties** tab displays:

- The name of the cluster in the **Name** column.
- The name of the cluster owner in the **Owner** column.
- The current state of the cluster in the **Cluster state** column.
- The number of cluster nodes in the **Number of nodes** column.
- The server class that is being used by the cluster in the **Server class** column.
- The engine version that is deployed on the cluster in the **Engine version** column.
- The region in which the cluster is deployed in the **Region** column.
- The VPC identifier of the VPC that is in use by the cluster in the **VPC identifier** column.

## Managing a Cluster

To view statistical information and log entries for a cluster, select the cluster name in the PEM Browser tree control and navigate to the **Dashboard** tab.



The **Cluster nodes** table displays each node of the cluster, and the current state of the node.

- Use the refresh icon in the upper-left corner of the panel header to refresh the displayed content; the most-recent entries in the cluster log file are displayed nearest to the top of the panel.
- Use the search box in the upper-right corner of the panel header to search the table content for key words or strings; separate string values with a pipe character (|) to include entries that match more than one search term.

Icons in the left most column indicate the role of the node within the cluster; a disc icon indicates that the node is a master node within the scenario, and a copy symbol indicates that a node is currently acting as a replica.

The following columns display connection information about each node:

- The **Address** column displays the IP address of the node.
- The **AZ** column displays the Availability Zone in which the node resides.

- The **Subnet** column displays the subnet ID on which the node resides.
- The **LBPort** column displays the port number to which a client application should connect to utilize load balancing.
- The **DBPort** 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 following columns display the health of 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.

Indicators display the health of the node:

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

Graphs display usage information about the cluster:

- The memory usage of the cluster.
- The average number of connections made to the cluster.
- The average CPU Load of the cluster.

The **Events** panel displays events that are logged for the current cluster.

- Use the refresh icon in the upper-left corner of the panel header to refresh the displayed content; the most-recent entries in the cluster log file are displayed nearest to the top of the panel.
- Use the search box in the upper-right corner of the panel header to search the log file content for key words or strings; please note that the search is not context-sensitive.

You can use options on the cluster's context menu to manage the cluster. To access the context menu, right-click on the cluster name in the PEM Browser tree control. Then, to manage the cluster, select from the menu options:

Option	Action
Refresh	Select Refresh to update the definition of the server or server objects that reside on the console.
Delete/Drop	Select Delete/Drop to delete the cluster. PEM will confirm that you wish to delete the cluster before removing it.
Download SSH Key	Select Download SSH Key to download the SSH key for the cluster.
Backup...	Select Backup... to take a backup of the cluster.
Scale Up	Select Scale Up to add replicas or storage to the selected cluster.
Scale Down	Select Scale Down to remove replicas from the selected cluster.
Scale Machine Type	Select Scale Machine Type to change the size of the virtual machine on which the cluster resides.
Upgrade OS/Software	Select Upgrade OS/Software to perform a yum update on each node of the cluster.
Properties...	Select Properties... to review or modify cluster properties.

To view information about the cluster configuration, select the cluster name in the PEM Browser tree control and navigate to the **Properties** tab.

The screenshot shows the 'Properties' tab of the Postgres Enterprise Manager interface. At the top, there are tabs for Dashboard, Properties, SQL, Statistics, Dependencies, Dependents, and Monitoring. The 'Properties' tab is selected, indicated by an orange underline. Below the tabs is a navigation bar with icons for Home, Overview, Properties, SQL, Statistics, Dependencies, Dependents, and Monitoring. A large orange 'Edit' button is located at the top right. The main content area is titled 'General' and contains the following deployment details:

Name	cluster1
Created on	2019-03-06T15:13:39+05:30
Owner	ark.service@enterprisedb.com
Email	abhilasha.narendra@enterprisedb.com
Cluster state	Running
Pending modifications	
Number of nodes	2
Template used	
Server Image used	ami-6d1c2007
Database	postgres
Database user	superuser1
Availability zone	us-east-1a
Region	us-east-1
Security group	ark-ArkSecondUser-cluster1

Panels on the **Properties** tab display deployment details for the cluster.

- The **General** panel displays deployment details such as owner information, creation date, and current cluster state.
- The **Storage** panel displays information about the storage allocated for the cluster, the amount of storage used, and the amount of storage still available.
- The **Network** panel displays information about the network addresses and ports in use by the cluster.
- The **Maintenance** panel displays information about the monitoring and healing policies enforced on the cluster.
- The **Auto Scale** panel displays information about the scaling policies currently in use by the cluster; if automatic scaling is enabled, the cluster will be scaled up when the thresholds specified in the % of storage size used or # of server connections fields are reached.
- The **Backup panel** displays the backup schedule and retention policy enforced on the cluster.

## Connecting to a Cluster Instance

To download the cluster's SSH key, select **Download SSH Key** from the console's context menu. An informational popup will provide information about connecting to the cluster instance:



Before using SSH to connect to an instance, an administrative user must modify the security group used by the cluster to allow SSH connections. For more information, please see the EDB Ark Administrative User's Guide, available via the Ark server's **Dashboard** tab.

## Taking a Cluster Backup

To take a backup of the currently selected cluster, select **Backup...** from the console's context menu or the PEM web interface's **Object** menu. A popup will open, prompting you to provide a comment so you can identify the backup later should you need to use the backup to restore or clone the cluster:



Provide a comment in the **Notes for the backup** field, and click **Backup** to start the backup. An informational popup will confirm that the backup process has started.

## Managing Backups

To view a list of cluster backups, select the **Backups node** in the PEM Browser tree control and navigate to the **Properties** tab.

ID	Cluster	Notes	Engine version	Capacity (in GB)	Backup type	Start time
snap-0d5c51c540f378bde	cluster1	Scheduled backup: Thu Mar 07 02:03...	PostgreSQL 11 64bit on CentOS / RH...	2	Automatic	2019-03-07T02
snap-03325db58551526d0	cluster1		PostgreSQL 11 64bit on CentOS / RH...	2	Manual	2019-03-07T10

The **Properties** tab displays detailed information about completed backups:

- The **ID column** displays the backup identifier.
- The **Cluster** column displays the name of the cluster that was backed up.
- The **Notes column** displays the comment provided when the backup was taken.
- The **Engine version** column displays the engine version of the cluster.
- The **Capacity (in GB)** column displays the names of the groups/roles/tenants that have access to the template.
- The **Backup type** column displays Automatic if the backup is a scheduled backup, and Manual if the backup was started by a user.
- The **Start time** column displays the time at which the backup was started.
- The **End time** column displays time at which the backup completed.

You can use options on the backup's context menu to manage the backup. To access the context menu, right-click on the backup identifier in the PEM Browser tree control. Then, select from the menu options:

Option	Action
Refresh	Select Refresh to update the backup information.
Delete/Drop	Select Delete/Drop to delete the backup. PEM will confirm that you wish to delete the backup before removing it.

## Scaling a Cluster

You can use the **Scale Up** and **Scale Down** menu options to add replicas or storage to your cluster, or to delete unneeded replica nodes. Access the scaling options on either the cluster's context menu or on the PEM web interface's **Object** menu.

Type	Availability zone	Subnet
Master	us-east-1a	subnet-9e0505b3
Replica	Auto Availability Zone	Create New Subnet

To add one or more replicas to a cluster, select **Scale Up**, then **Replicas**.

When the **Scale Up** dialog opens, specify the number of replicas that you would like to add to the cluster. If applicable, select a subnet and an availability zone for each replica, and click **OK**.

The server will confirm that you wish to add the specified number of replicas; click **Yes** to continue. An informational popup will confirm when the replica(s) are being added.

To remove one or more replicas from a cluster, select **Scale Down**.



When the **Scale Down** dialog opens, click in the field and select a replica address from the list of replicas. To select more than one replica for removal, click in the field again, and select an additional address. When you've finished selecting replicas for removal, click **OK**. The server will confirm that you wish to remove the replicas; click **OK** to continue. An informational popup will confirm when the replica(s) are being removed.

To add more storage space to a cluster, select **Scale Up**, then **Storage**.



When the **Scale Up** dialog opens, specify the amount of storage (in Gigabytes) that you would like to add to the cluster, and click **OK**. The server will confirm that you wish to add the specified storage; click **Yes** to continue. An informational popup will confirm when the storage is being added.

## Scaling a Machine Type

To modify the instance type on which a cluster resides, select **Scale Machine Type** from the console's context menu or from the PEM web interface's Object menu.



Use fields on the **Scale machine type** dialog to specify your scaling preferences:

- The **Cluster name** field displays the name of the cluster; this field is not modifiable.
- Move the **Perform OS and software update** slider to **Yes** to perform a software update with the cluster is provisioned; this option can be time consuming.
- Use the **Server class** drop-down listbox to select the new server class for the cluster.

When you've specified your preferences, click **Scale** to continue. The server will ask you to confirm your changes; click **Continue** to start the scaling process. An informational popup confirms when the scaling begins.

## Upgrading a Cluster

You can use the **Upgrade OS/Software** option to invoke a `yum update` command on each node of your cluster, updating any installed packages to the most recent version available through your specified repositories. To perform an upgrade, select **Upgrade OS/Software** from the console's context menu or from the PEM web interface's Object menu.



Before starting an upgrade, PEM will prompt you to confirm that you wish to **Continue**. Please note that a software update can take some time to complete; we recommend scheduling software updates during a maintenance window. After performing a `yum update`, the cluster nodes will be rebooted (initiating any kernel updates required).

## 3 PEM BART Management Guide

This guide will acquaint you with the dialogs that are built into the Postgres Enterprise Manager (PEM) web interface that make it easier for you to monitor and manage BART.

This document uses *Postgres* to mean either the PostgreSQL or EDB Postgres Advanced Server database.

### 3.1 Managing a BART Server

Postgres Enterprise Manager (PEM) is designed to assist database administrators, system architects, and performance analysts when administering, monitoring, and tuning PostgreSQL and Advanced Server database servers.

The EDB Backup and Recovery Tool (BART) is an administrative utility providing simplified backup and recovery management for multiple local or remote EDB Postgres Advanced Server and PostgreSQL database servers. For more information about BART, please visit the EnterpriseDB website at:

<https://www.enterprisedb.com/enterprise-postgres/edb-postgres-backup-and-recovery-tool>

From PEM version 7.10 onwards, you can manage a BART server through PEM console. PEM provides a user-friendly interface that allows you to manage your BART server and perform all the BART operations from PEM console.

#### Prerequisites

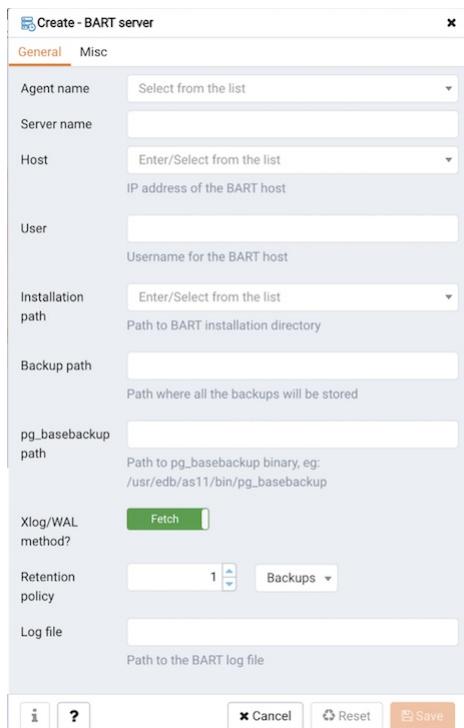
- Before adding a BART server to the PEM console, you must manually install and configure BART on the BART host. For more information about installing and configuring BART, please see the *BART Installation Guide* available at:

<https://www.enterprisedb.com/edb-docs>

- Before associating a database server with a BART server, you must install SSH on the database server and the BART server.
- Before restoring a BART backup, you must install BART, PEM agent, and SSH on the target server. SSH must also be installed on the BART server that you plan to use for restore.
- To take a backup of the standby database servers, you must ensure that the latest `pg_basebackup` utility is installed on the database server that you want to manage through BART.

## Configuring a BART Server

You can use the `Create-BART server` dialog to register an existing BART server with the PEM server. To access the dialog, right-click on the `BART Servers` node and select `Create-BART Server`.



Use the fields on the `General` tab to describe the general properties of the BART Server:

- Use the `Agent Name` field to select the agent that you want to configure as a BART server. Only those PEM agents that are supported for BART are listed in the drop-down list.
- Use the `Server Name` field to specify a user-friendly name for the server. The name specified will identify the server in the Browser tree.
- Use the `Host` field to specify the IP address of the host or agent where BART is installed.
- Use the `User` field to specify the user name that will be used for performing all the BART operations. You can either use the `enterprisedb` (for Advanced Server) or `postgres` (for PostgreSQL) database user account or you can create a new BART user account. This user must be an operating system user who owns the BART backup catalog directory.
- Use the `Installation path` field to specify the directory path where BART is installed on the host or BART server.
- Use the `Backup path` field to specify the file system parent directory where all BART backups and archived WAL files will be stored.
- Use the `pg_basebackup_path` field to specify the path to the `pg_basebackup` utility.

- Use the **Xlog/WAL** method field to specify how the transaction log should be collected during the execution of `pg_basebackup`. The default option is `fetch`; it specifies that the transaction log files will be collected after the backup has completed. Set the **Xlog** method to `stream` to stream the transaction log in parallel with the full base backup creation. If streaming is used, the `max_wal_senders` configuration parameter in the `postgresql.conf` file for affected database servers must account for an additional session for the streaming of the transaction log (the setting must be a minimum of 2).

For more information about Xlog method, see:

<https://www.postgresql.org/docs/current/app-pgbasebackup.html>

- Use the **Retention policy** field to specify the retention policy for the backup. This determines when an active backup should be marked as obsolete, and hence, be a candidate for deletion. You can specify the retention policy in terms of number of backup or in terms of duration (days, weeks, or months).
- Use the **Log file** field to specify the path to BART log file. This is an optional field.

The screenshot shows the 'Create - BART server' dialog box with the 'Misc' tab selected. The fields and their current values are:

- Scanner log file:** Path to the Xlog/WAL scanner log file (empty)
- WAL compression?**: **Disabled** (radio button selected)
- Copy Xlog/WAL during restore?**: **Disabled** (radio button selected)
- Thread count:** 1 (spin box)
- Batch size:** 49142 (spin box)
- Scan interval:** 1 (spin box)
- MBM scan timeout:** 20 (spin box)

At the bottom are buttons for **Cancel**, **Reset**, and **Save**.

Use the fields on the **Misc** tab to describe the backup-related properties of the BART Server:

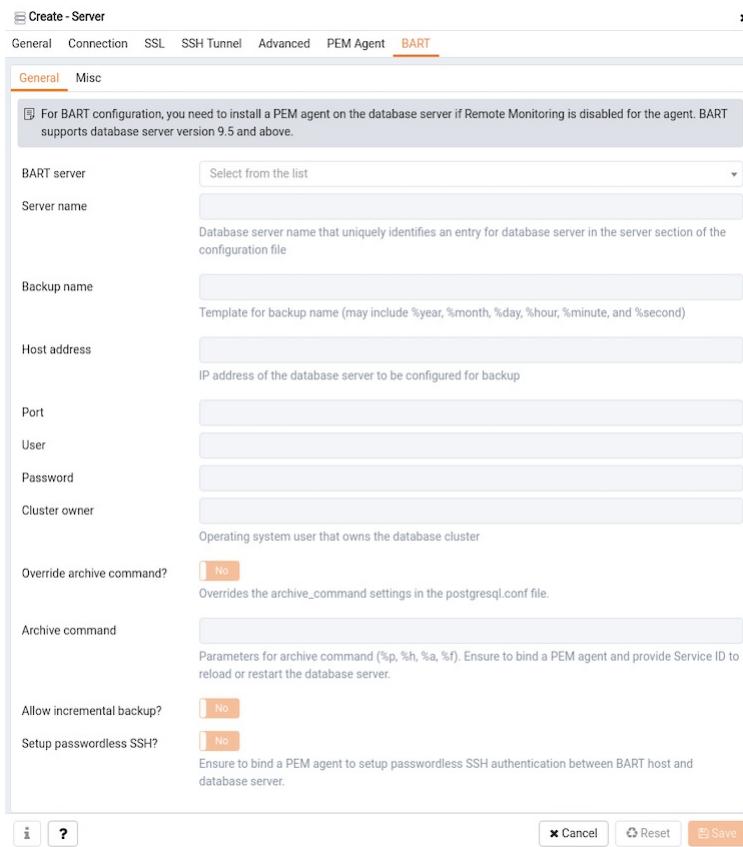
- Use the **Scanner log file** field to specify the path to the Xlog/WAL scanner log file. This is an optional field; BART does not create a WAL scanner log file if you do not specify the path.
- Use the **WAL compression?** switch to specify if you want to compress the archived Xlog/WAL files in Gzip format. To enable WAL compression, the gzip compression program must be present in the BART user account's PATH. The WAL compression setting must not be enabled for those database servers where you need to take incremental backups.
- Use the **Copy WALs during restore?** field to specify how the archived WAL files are collected when invoking the RESTORE operation. Set to `enabled` to copy the archived WAL files from the BART backup catalog to the `restore_path/archived_wals` directory prior to the database server archive recovery. Set to `disabled` to retrieve the archived WAL files directly from the BART backup catalog during the database server archive recovery. Enabling this option helps you save time during the restore operation.
- Use the **Thread count** field to specify the number of worker threads for copying blocks or data files from the database server to the BART backup catalog. Specify a **thread count** of `1` if you want to take the backup using the `pg_basebackup` utility.
- Use the **Batch size** field to specify the number of blocks of memory used for copying modified blocks. This is applicable only for incremental backups.
- Use the **scan interval** field to specify the number of seconds after which the WAL scanner should scan the new WAL files.
- Use the **MBM scan timeout** field to specify the number of seconds to wait for MBM files before timing out. This is applicable only for incremental backups.

## Associating the BART Server with a Database Server

After configuring the BART server, you need to associate it with the database server whose backup you want to manage with BART. You can do one of the following:

- Use the PEM console to modify the properties of an existing monitored database server to map it to the newly configured BART server.
- Use the PEM console to create a new monitored database server, and map it to the newly configured BART server.

To map the BART server to a new PEM database server, right-click the **PEM Server Directory** node and select **Create > Server**. Enter the details on all the generic tabs and then enter the BART-specific details on the **BART** tab.



Use the fields on the **General** tab to describe the general properties of the BART Server that will map to the PEM server:

- Use the **BART server** field to select the BART server name. All the BART servers configured in the PEM console will be listed in this drop down list.
- Use the **Server name** field to specify a name for the database server that you want to backup using the BART server. This name gets stored in the BART configuration file.
- Use the **Description** field to specify the description of the database server.
- Use the **Backup name** field to specify a template for user-defined names to be assigned to the backups of the database server. If you do not specify a backup name template, then the backup can only be referenced in BART sub-commands by the BART assigned, integer backup identifier.
- Use the **Host address** field to specify the IP address of the database server that you want to configure for backup.
- Use the **Port** field to specify the port to be used for the database that you want to backup.
- Use the **User** field to specify the user of the database that you want to backup using BART through PEM console. If you want to enable incremental backups for this database server, then the user must be a superuser.
- Use the **Password** field to specify the password for the user of the database that you want to backup.
- Use the **Cluster Owner** field to specify the Linux operating system user account that owns the database cluster. This is typically **enterprisedb** for Advanced Server database clusters installed in the Oracle databases

compatible mode, or `postgres` for PostgreSQL database clusters and for Advanced Server database clusters installed in the PostgreSQL databases compatible mode.

- Use the **Archive command** field to specify the desired format of the archive command string to be used in the `bart.cfg` file. Inputs provided for the Archive command will overwrite the database server's `Postgresql.conf` file. Once the server gets added, the database server will be restarted or database configurations will be reloaded.
- Use the **Allow incremental backup?** switch to specify if incremental backup should be enabled for this database server.
- Use the **Setup passwordless SSH?** switch to specify if you want to create SSH certificates to allow passwordless logins between the Database Server and the BART server. Ensure to bind a PEM agent before setting up the passwordless SSH authentication. Passwordless SSH will not work for a database server being remotely monitored by a PEM agent.

The screenshot shows the 'Create - Server' dialog box with the 'Misc' tab selected. The configuration fields include:

- Override default configuration?**: A switch set to 'No'. Description: 'Override the database server configurations with the selected BART server configurations'.
- Xlog method**: A switch set to 'Fetch'. Description: 'Method of collecting the transaction logs (fetch/stream)'.
- Retention policy**: A dropdown menu showing '1' and 'Backups'. Description: 'Retention policy for the backup'.
- Wal compression**: A switch set to 'Disabled'. Description: 'Compress the archived Xlog/WAL files in gzip format (The gzip must be in the BART user account's PATH)'.
- Copy WALs during restore**: A switch set to 'Disabled'. Description: 'Copy the archived Xlog/WAL files from the BART backup catalog to the restore\_path/archived\_wals directory prior to the database server archive recovery'.
- Thread count**: A dropdown menu showing '1'. Description: 'Number of threads used to copy blocks'.
- Batch size**: A text input field containing '49142'. Description: 'Number of blocks of memory used for copying the modified blocks, the default value is 49412'.
- Scan interval**: A dropdown menu showing '1'. Description: 'Number of seconds before forcing a scan of the Xlog/WAL files, default value 0 means no brute-force scanning will be started'.
- MBM Scan timeout**: A dropdown menu showing '20'. Description: 'Number of seconds to wait for MBM file before timing out, applicable only for incremental backup'.

At the bottom are 'Cancel', 'Reset', and 'Save' buttons.

Use the fields on the **Misc** tab to describe the miscellaneous properties of the BART Server:

- Use the **Override default configuration?** Switch to specify if you want to override the BART server configurations with the specific database server configurations.
- Use the **Xlog** method to specify how the transaction log should be collected during the execution of `pg_basebackup`.
- Use the **Retention policy** field to specify the retention policy for the backup. This determines when an active backup should be marked as obsolete, and hence, be a candidate for deletion. You can specify the retention policy in terms of number of backup or in terms of duration (days, weeks, or months).
- Use the **WAL compression** switch to specify if you want to compress the archived Xlog/WAL files in Gzip format. To enable WAL compression, the gzip compression program must be present in the BART user account's PATH. The `wal_compression` setting must not be enabled for those database servers where you need to take incremental backups.
- Use the **Copy WALs during restore** field to specify how the archived WAL files are collected when invoking the RESTORE operation. Set to enabled to copy the archived WAL files from the BART backup catalog to the `<restore_path>/archived_wals` directory prior to the database server archive recovery. Set to disabled to retrieve the archived WAL files directly from the BART backup catalog during the database server archive recovery.
- Use the **Thread count** field to specify the number of threads to copy the blocks. You must set `thread count` to `1` if you want to take a backup with the `pg_basebackup` utility.
- Use the **Batch size** field to specify the number of blocks of memory used for copying modified blocks, applicable only for incremental backups.
- Use the **Scan interval** field to specify the number of seconds after which the WAL scanner should scan the new WAL files.
- Use the **MBM scan timeout** field to specify the number of seconds to wait for MBM files before timing out, applicable only for incremental backups.

## Viewing the BART Server Details on a PEM Dashboard

Once the BART server is associated with the database server, you can see the entire backup and restore related details for that particular BART server on the PEM Dashboard. You can also perform operations such as restoration or deletion of a backup that is listed on the dashboard.



When you select a monitored BART server, details of all the associated database servers along with their backups and restore activities are displayed as a chart on the Dashboard in the **Backup and Restore Activities** panel. You can filter the list of backups on any criteria that you specify in the filter boxes (the database server, activity, or duration).

The **Managed Database servers** panel displays a list of all the database servers managed by that particular BART server along with their high-level details.

The **Initiated Server Backups** panel displays a list of all the backups of the database servers managed by that particular BART server. You can filter the list to display the details of a particular database server. You can also filter the list on any criteria that you specify in the filter box. Typically, this filter works with any kind of string value (excluding date, time, and size) listed under the columns. For example, you can type **tar** to filter the list and display only those backups that are in tar format.

Backup details displayed include the **Backup Name**, **Backup ID**, **Status**, **Server Name**, **Start Time**, **Type**, **Parent ID**, **Format**, **Duration**, and **Size**. The **Status** column shows the status of the backups which can be one of the following: **In Progress**, **Active**, **Keep**, or **Obsolete**.

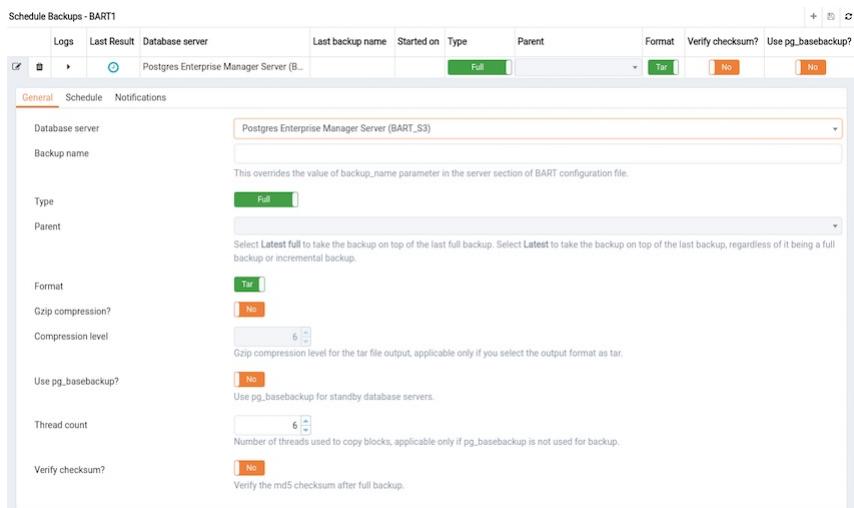
The backups are marked as **Obsolete** after the backup retention period has passed or number of retained backups that you have specified as retention policy of the BART server is met. If you want to make an exception so that a particular backup does not get marked as **Obsolete** even after the expiry of the duration of retention policy, then you need to mark that particular backup as **Keep**. Similarly, if you mark a particular backup as **NoKeep**, the backup is re-evaluated to determine if its status should be changed back to obsolete based upon the current retention policy.

A pin in the first column under **Actions** indicates that a backup can be marked as **Keep** by clicking the pin; while an inverted pin indicates that the backup can be marked as **NoKeep**. The second column under **Actions** displays the **Restore** icon; you can perform the **Restore** operation by clicking on the icon.

You can delete all the **Obsolete** backups by clicking the **Delete Obsolete** button. You can also refresh the list of backups by clicking the **Refresh** button.

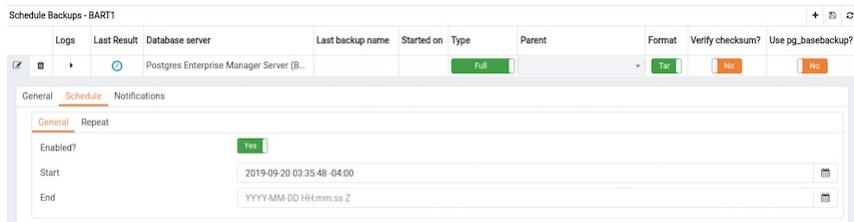
## Scheduling BART Backups

To schedule a backup using BART, select **Schedule Backup** under **Tools** menu. You can see a list of scheduled backups with details such as **Logs**, **Last result**, **Database server**, **Last backup name**, **Started on**, **Type**, **Parent**, **Format**, **Verify checksum?**, and **Use pg\_basebackup?**. Click the Add icon (+) to add a schedule for the backup. Enter the details in the schedule definition dialog:



Use the fields on the **General** tab to describe the general properties of the backup:

- Use the **Database Server** field to specify the target database server that you want to back up.
- Use the **Backup name** to specify a user-defined name for the backup.
- Use the **Backup type** switch to specify the backup type i.e. full backup or incremental backup.
- Use the **Parent backup** field to select the ID of the parent backup for incremental backup. This parent backup can either be a full or an incremental backup.
- Use the **Format switch** to specify the output format of the backup i.e plain text or tar. For incremental backup, you need to select plain text only.
- Use the **Gzip compression** switch to specify if gzip compression should be enabled for the backup. This option is applicable only for the tar format.
- Use the **Compression level** field to specify the gzip compression level on the tar file output.
- Use the **Thread count** field to specify the number of threads that will copy the blocks.
- Use the **MBM scan timeout** field to specify the number of seconds to wait for required MBM files before timing out.
- Use the **Verify checksum** field to specify if you want the application to verify the checksum of the backup.
- Use the **pg\_basebackup** field to specify if the pg\_basebackup utility should be used for the backup. Typically, pg\_basebackup utility is used only for backing up the standby servers since it cannot be used for incremental backups.



Provide information on the **Schedule** tab to describe the scheduling details:

- Use the **Enabled?** switch to indicate if the schedule should be enabled (**Yes**) or disabled (**No**).
- Use the calendar selector in the **Start** field to specify the starting date and time for the schedule.
- Use the calendar selector in the **End** field to specify the ending date and time for the schedule.



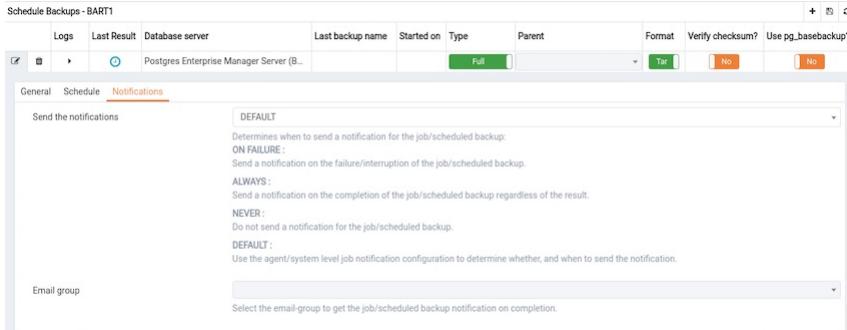
Use the fields on the **Repeat** tab to specify the details about the schedule in a cron-style format. The schedule will execute on each date or time element selected on the **Repeat** tab. Click within a field to open a list of valid values for that field; click on a specific value to add that value to the list of selected values for the field. To clear the values from a field, click the **X** located at the right-side of the field.

Use the fields within the **Days** box to specify the days on which the schedule will execute:

- Use the **Week Days** field to select the days on which the schedule will execute.
- Use the **Month Days** field to select the numeric days on which the schedule will execute. Specify the Last Day to indicate that the schedule should be performed on the last day of the month, regardless of the date.
- Use the **Months** field to select the months in which the schedule will execute.

Use the fields within the **Times** box to specify the times at which the schedule will execute:

- Use the **Hours** field to select the hour at which the schedule will execute.
- Use the **Minutes** field to select the minute at which the schedule will execute.



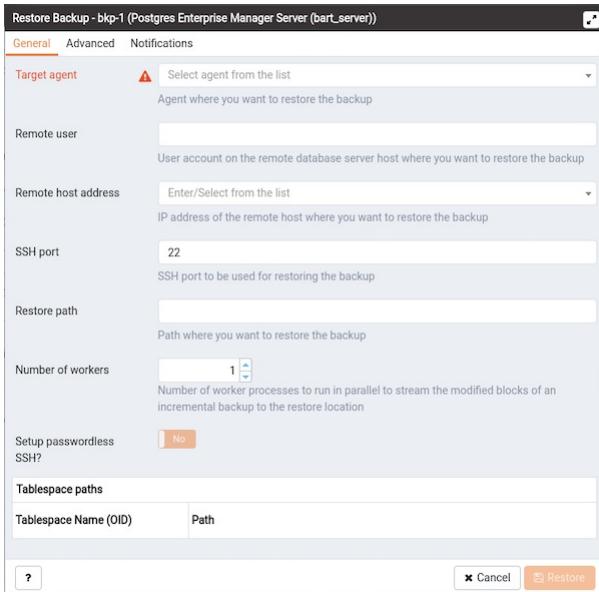
Use the fields on the **Notifications** tab to specify the email notification settings for a scheduled backup:

- Use the **Send the notifications** field to specify when you want the email notifications to be sent.
- Use the **Email group** field to specify the email group that should receive the email notification.

## Restoring BART Backups

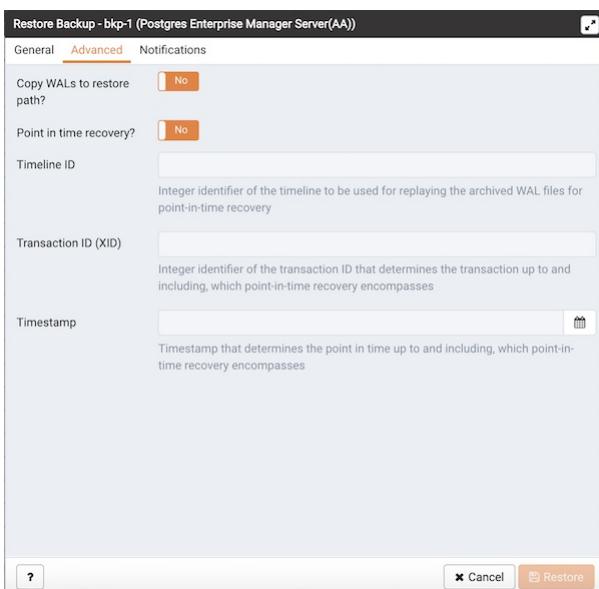
You can restore the backups that you have earlier created using BART server on a target remote host. When you select a particular BART server, all the associated backups are listed in the Dashboard under **Initiated Server Backups**.

To restore a backup, click the **Restore** icon next to the backup that you want to restore.



In the **Restore Backup** dialog, provide information in the fields on the **General** tab:

- Use the **Target agent** field name to specify the name of the agent where you want to restore the backup.
- Use the **Remote user** field to specify the use account on the remote database server host where you want to restore the backup.
- Use the **Remote host address** field to specify the IP address of the remote host where you want to restore the backup.
- Use the **SSH port** field to specify the SSH port to be used for restoring the backup.
- Use the **Restore path** field to specify the path where you want to restore the backup.
- Use the **Number of workers** field to specify processes to run in parallel to stream the modified blocks of an incremental backup to the restore location.
- Use the **Setup passwordless SSH?** switch to specify if you want to create SSH certificates to allow passwordless logins between the BART server and the target host for restore.



On the **Advanced** tab, specify your preferences for advanced options for restoring the backup:

- Use the **Copy WALs to restore path?** switch to specify if you want to copy WALs to the restore path.
- Use the **Point in time recovery?** switch to specify if you want point in time recovery.
- Use the **Timeline ID** field to specify the timeline ID to be used for replaying the archived WAL files for point-in-time recovery.
- Use the **Transaction ID (XID)** field to specify the transaction ID for point-in-time recovery.
- Use the **Timestamp** field to the timestamp to be used for restore.

## Note

You can specify either **Transaction ID** or **Timestamp** for the point-in-time recovery.



Use the fields on the **Notifications** tab to specify the email notification settings for restoring the backup.

- Use the **Send the notifications** field to specify when you want the email notifications to be sent.
- Use the **Email group** field to specify the email group that should receive the email notification.

## 4 PEM Enterprise Features Guide

This guide will acquaint you with the tools and wizards that are built into the Postgres Enterprise Manager (PEM) web interface that make it easier for you to monitor and manage your system.

This guide is not a comprehensive resource; rather, it is meant to serve as an aid to help you evaluate the tool and bring you up to speed with the basics of how to use the product. For more detailed information about using PEM's functionality, please see the online help made available by the PEM client.

Please note that the Streaming Replication wizard and Package Deployment wizard are being deprecated. These two features will not be available in future releases of PEM.

This document uses *Postgres* to mean either the PostgreSQL or EDB Postgres Advanced Server database.

### 4.1 What's New

The following features have been added to create Postgres Enterprise Manager 7.12:

- Improved BART Integration - The following capabilities have been added to enhance the integration of BART with PEM:
  - PEM 7.12 provides an option to create SSH certificates to allow passwordless authentication for backup and restore operations. You can enable passwordless SSH authentication from the database server's

**Properties** dialog or from the **Backup Restore** dialog.

- You can now set or override the **archive command** of the database server's configuration by providing inputs in the database server's **Properties** dialog.
- Accessibility Improvements - Attributes have been added to provide an invisible label to the UI elements where a text label cannot be used.
- Dark Theme (Beta) - You can now choose to use the dark theme while accessing the PEM console. In the following cases, the dark theme does not work in PEM console:
  - Background of the pie charts under monitoring dashboards.
  - All the reports generated for Capacity Manager, Log Analysis Expert, Postgres Expert, Tuning Wizard etc.

## 4.2 The PEM Query Tool

PEM contains a feature-rich Interactive Development Environment (IDE) that allows you to issue ad-hoc SQL queries against Postgres servers.

You can access the Query Tool via the *Query Tool* menu option on the *Tools* menu, or through the context menu of select nodes of the Browser tree control. The Query Tool allows you to:

- Issue ad-hoc SQL queries.
- Execute arbitrary SQL commands.
- Edit the result set of a SELECT query if it is **updatable**.
- Displays current connection and transaction status as configured by the user.
- Save the data displayed in the output panel to a CSV file.
- Review the execution plan of a SQL statement in either a text, a graphical format or a table format (similar to <https://explain.depesz.com>).
- View analytical information about a SQL statement.

You can open multiple copies of the Query tool in individual tabs simultaneously. To close a copy of the Query tool, click the X in the upper-right hand corner of the tab bar.

The Query Tool features two panels:

- The upper panel displays the *SQL Editor*. You can use the panel to enter, edit, or execute a query. It also shows the *History* tab which can be used to view the queries that have been executed in the session, and a *Scratch Pad* which can be used to hold text snippets during editing. If the Scratch Pad is closed, it can be re-opened (or additional ones opened) by right-clicking in the SQL Editor and other panels and adding a new panel.
- The lower panel displays the *Data Output* panel. The tabbed panel displays the result set returned by a query,

information about a query's execution plan, server messages related to the query's execution and any asynchronous notifications received from the server.

## The Query Tool Toolbar

The *Query Tool* toolbar uses context-sensitive icons that provide shortcuts to frequently performed tasks. If an icon is highlighted, the option is enabled; if the icon is grayed-out, the task is disabled.



Hover over an icon to display a tool-tip that describes the icon's functionality:

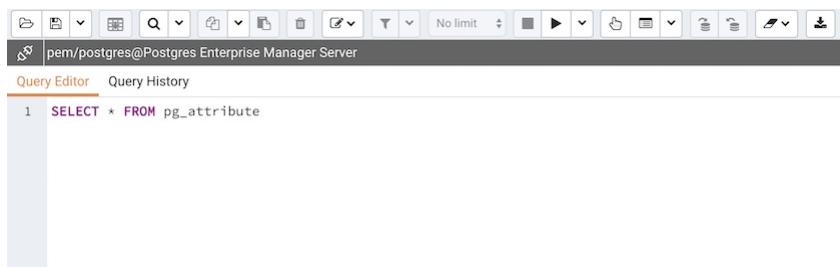
Icon	Behavior	Shortcut
<i>Open File</i>	Click the <i>Open File</i> icon to display a previously saved query in the SQL Editor.	Accesskey + O
<i>Save</i>	<p>Click the <i>Save</i> icon to perform a quick-save of a previously saved query, or to access the <i>Save</i> menu:</p> <ul style="list-style-type: none"> <li>• Select <i>Save</i> to save the selected content of the SQL Editor panel in a file.</li> <li>• Select <i>Save As</i> to open a new browser dialog and specify a new location to which to save the selected content of the SQL Editor panel.</li> </ul>	Accesskey + S
<i>Save Data Changes</i>	Click the <i>Save Data Changes</i> icon to save the data changes (insert, update, or delete) in the Data Output Panel to the server.	F6
<i>Find</i>	<p>Use the <i>Find</i> menu to search, replace, or navigate the code displayed in the SQL Editor:</p> <ul style="list-style-type: none"> <li>• Select <i>Find</i> to provide a search target, and search the SQL Editor contents.</li> <li>• Select <i>Find next</i> to locate the next occurrence of the search target.</li> <li>• Select <i>Find previous</i> to move to the last occurrence of the search target.</li> <li>• Select <i>Persistent find</i> to identify all occurrences of the search target within the editor.</li> <li>• Select <i>Replace</i> to locate and replace (with prompting) individual occurrences of the target.</li> <li>• Select <i>Replace all</i> to locate and replace all occurrences of the target within the editor.</li> <li>• Select <i>Jump</i> to navigate to the next occurrence of the search target.</li> </ul>	Cmd+F Cmd+G Cmd+Shift+G Cmd+Shift+F Alt+G
<i>Copy</i>	Click the <i>Copy</i> icon to copy the content that is currently highlighted in the Data Output panel. when in View/Edit data mode.	Accesskey + C
<i>Paste</i>	Click the <i>Paste</i> icon to paste a previously row into a new row when in View/Edit data mode.	Accesskey + P
<i>Delete</i>	Click the <i>Delete</i> icon to mark the selected rows for deletion. These marked rows get deleted when you click the <i>Save Data Changes</i> icon.	Accesskey + D

Icon	Behavior	Shortcut
<i>Edit</i>	<p>Use options on the <i>Edit</i> menu to access text editing tools; the options operate on the text displayed in the SQL Editor panel when in Query Tool mode:</p> <ul style="list-style-type: none"> <li>• Select <i>Indent Selection</i> to indent the currently selected text.</li> <li>• Select <i>Unindent Selection</i> to remove indentation from the currently selected text.</li> <li>• Select <i>Inline Comment Selection</i> to enclose any lines that contain the selection in SQL style comment notation.</li> <li>• Select <i>Inline Uncomment Selection</i> to remove SQL style comment notation from the selected line.</li> <li>• Select <i>Block Comment</i> to enclose all lines that contain the selection in C style comment notation. This option acts as a toggle.</li> </ul>	Tab Shift+Tab Cmd+/ Cmd+. Shift+Cmd+/
<i>Filter</i>	<p>Click the <i>Filter</i> icon to set filtering and sorting criteria for the data when in View/Edit data mode. Click the down arrow to access other filtering and sorting options:</p> <ul style="list-style-type: none"> <li>• Click <i>Sort/Filter</i> to open the sorting and filtering dialogue.</li> <li>• Click <i>Filter by Selection</i> to show only the rows containing the values in the selected cells.</li> <li>• Click <i>Exclude by Selection</i> to show only the rows that do not contain the values in the selected cells.</li> <li>• Click <i>Remove Sort/Filter</i> to remove any previously selected sort or filtering options.</li> </ul>	Accesskey + F
<i>Limit Selector</i>	Select a value in the <i>Limit Selector</i> to limit the size of the dataset to a number of rows.	Accesskey + R
<i>Stop</i>	Click the <i>Stop</i> icon to cancel the execution of the currently running query.	Accesskey + Q
<i>Execute/Refresh</i>	<p>Click the <i>Execute/Refresh</i> icon to either execute or refresh the query highlighted in the SQL editor panel. Click the down arrow to access other execution options:</p> <ul style="list-style-type: none"> <li>• Add a check next to <i>Auto-Rollback</i> to instruct the server to automatically roll back a transaction if an error occurs during the transaction.</li> <li>• Add a check next to <i>Auto-Commit</i> to instruct the server to automatically commit each transaction. Any changes made by the transaction will be visible to others, and durable in the event of a crash.</li> </ul>	F5
<i>Explain</i>	Click the <i>Explain</i> icon to view an explanation plan for the current query. The result of EXPLAIN is displayed graphically on the <i>Explain</i> tab of the output panel, and in text form on the <i>Data Output</i> tab.	F7

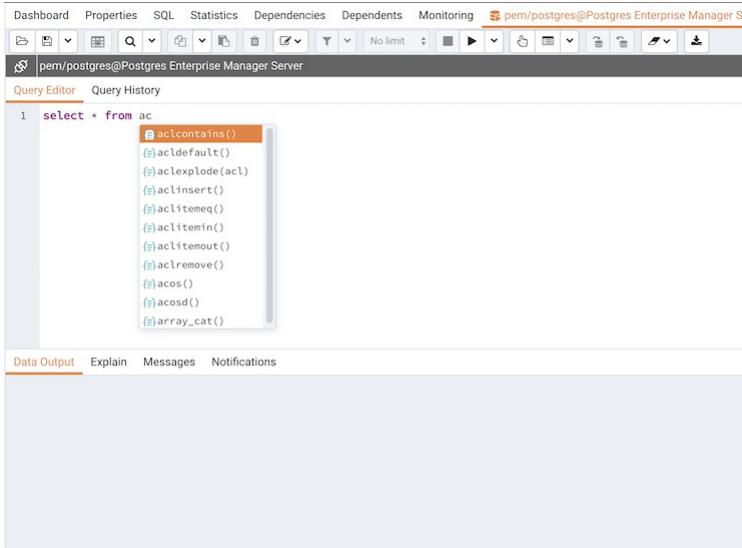
Icon	Behavior	Shortcut
<i>Explain analyze</i>	<p>Click the <i>Explain analyze</i> icon to invoke an EXPLAIN ANALYZE command on the current query.</p> <p>Navigate through the <i>Explain Options</i> menu to select options for the EXPLAIN command:</p> <ul style="list-style-type: none"> <li>• Select <i>Verbose</i> to display additional information regarding the query plan.</li> <li>• Select <i>Costs</i> to include information on the estimated startup and total cost of each plan node, as well as the estimated number of rows and the estimated width of each row.</li> <li>• Select <i>Buffers</i> to include information on buffer usage.</li> <li>• Select <i>Timing</i> to include information about the startup time and the amount of time spent in each node of the query.</li> <li>• Select <i>Summary</i> to include the summary information about the query plan.</li> </ul>	Shift+F7
<i>Commit</i>	Click the <i>Commit</i> icon to commit the transaction.	Shift+CTRL+M
<i>Rollback</i>	Click the <i>Rollback</i> icon to rollback the transaction.	Shift+CTRL+R
<i>Clear</i>	Use options on the <i>Clear</i> drop-down menu to erase display contents:	Accesskey + L
<i>Download as CSV</i>	Click the <i>Download as CSV</i> icon to download the result set of the current query to a comma-separated list. You can specify the CSV settings through <i>Preferences -&gt; SQL Editor -&gt; CSV output</i> dialogue.	F8

## The SQL Editor Panel

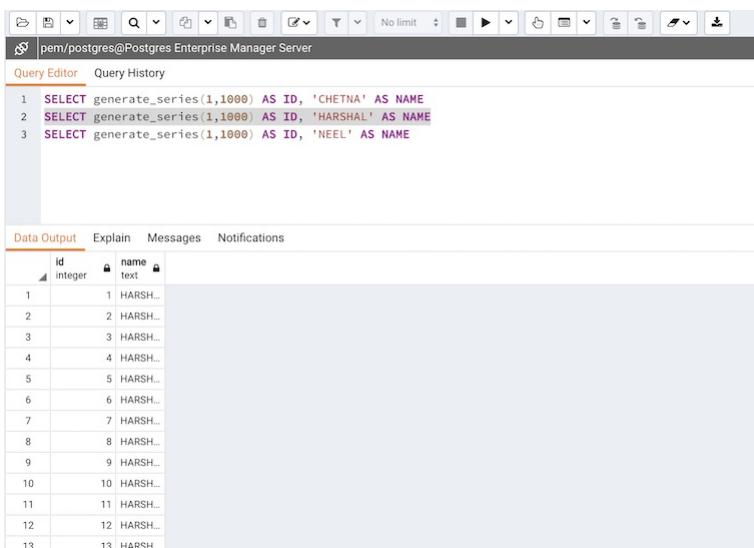
The *SQL editor* panel is a workspace where you can manually provide a query, copy a query from another source, or read a query from a file. The SQL editor features syntax coloring and auto-completion.



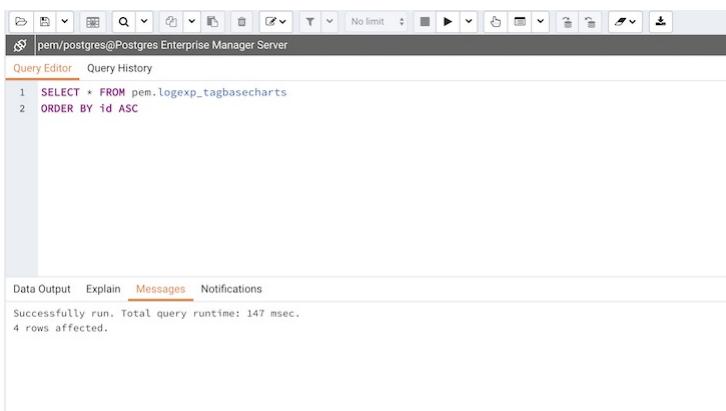
To use auto-complete, begin typing your query; when you would like the Query editor to suggest object names or commands that might be next in your query, press the Control+Space key combination. For example, type `"*SELECT * FROM*` " (without quotes, but with a trailing space), and then press the Control+Space key combination to select from a popup menu of auto-complete options.



After entering a query, select the *Execute/Refresh* icon from the toolbar. The complete contents of the SQL editor panel will be sent to the database server for execution. To execute only a section of the code that is displayed in the SQL editor, highlight the text that you want the server to execute, and click the *Execute/Refresh* icon.



The message returned by the server when a command executes is displayed on the *Messages* tab. If the command is successful, the *Messages* tab displays execution details.



Options on the *Edit* menu offer functionality that helps with code formatting and commenting:

- The auto-indent feature will automatically indent text to the same depth as the previous line when you press the **Return key**.
- Block indent text by selecting two or more lines and pressing the **Tab key**.

- Implement or remove SQL style or toggle C style comment notation within your code.

You can also **drag and drop** certain objects from the tree-view which can save time in typing long object names. Text containing the object name will be fully qualified with schema. Double quotes will be added if required. For functions and procedures, the function name along with parameter names will be pasted in the Query Tool.

## The Data Output Panel

The *Data Output* panel displays data and statistics generated by the most recently executed query.

The screenshot shows the Postgres Enterprise Manager interface. At the top, there's a toolbar with various icons. Below it is a header bar with the URL 'pem/postgres@Postgres Enterprise Manager Server' and tabs for 'Query Editor' (which is selected) and 'Query History'. The main area contains a query editor window with the following content:

```
1 SELECT * FROM PG_DATABASE
```

Below the query editor is the 'Data Output' tab, which is active. It displays a table with the following data:

	dbname	datdba	encoding	datollate	datatype	datistemplate	dataallowconn	datconnlimit	datlastsysoid
	name	oid	integer	name	name	boolean	boolean	integer	oid
1	postgres	10	6	en_US.UTF-8	en_US.UTF-8	false	true	-1	13859
2	template1	10	6	en_US.UTF-8	en_US.UTF-8	true	true	-1	13859
3	template0	10	6	en_US.UTF-8	en_US.UTF-8	true	false	-1	13859
4	pem	10	6	en_US.UTF-8	en_US.UTF-8	false	true	-1	13859
5	test	10	6	C	C	false	true	-1	13859

## Data Output Tab

The *Data Output* tab displays the result set of the query in a table format. You can:

- Select and copy from the displayed result set.
- Use the *Execute/Refresh* options to retrieve query execution information and set query execution options.
- Use the *Download as CSV* icon to download the content of the *Data Output* tab as a comma-delimited file.
- Edit the data in the result set of a *SELECT* query if it is updatable.

A result set is updatable if:

- All columns are either selected directly from a single table, or they are not actually a table column (e.g. concatenation of 2 columns). Only columns that are selected directly from the table are editable, other columns are read-only.
- All the primary key columns or OIDs of the table are selected in the result set.

Any columns that are renamed or selected more than once are also read-only.

### Note

To work with an updatable query result set, you must have [psycopg2](#) driver version 2.8 or above installed.

Editable and read-only columns are identified using pencil and lock icons (respectively) in the column headers.

The screenshot shows the Postgres Enterprise Manager interface. The top bar includes standard file and database connection icons. The main area has two tabs: 'Query Editor' (selected) and 'Scratch Pad'. The 'Query Editor' tab contains a SQL command: 'select empid, empname, deptcode as department, rank from emp;'. Below this is the 'Data Output' panel, which displays a table with four columns: empid, empname, department, and rank. The data is as follows:

empid	empname	department	rank
1	C	2	Executive
2	A	6	Associate
3	B	2	Manager

An updatable result set is similar to the Data Grid in View/Edit Data mode, and can be modified in the same way.

If Auto-commit is off, the data changes are made as part of the ongoing transaction, if no transaction is ongoing a new one is initiated. The data changes are not committed to the database unless the transaction is committed.

If any errors occur during saving (for example, trying to save NULL into a column with NOT NULL constraint) the data changes are rolled back to an automatically created SAVEPOINT to ensure any previously executed queries in the ongoing transaction are not rolled back.

All rowsets from previous queries or commands that are displayed in the *Data Output* panel will be discarded when you invoke another query; open another query tool browser tab to keep your previous results available.

## Explain Tab

To generate the *Explain* or *Explain Analyze* plan of a query, click on *Explain* or *Explain Analyze* button in the toolbar.

More options related to *Explain* and *Explain Analyze* can be selected from the drop down on the right side of *Explain Analyze* button in the toolbar.

The screenshot shows the Postgres Enterprise Manager interface with the 'Query Editor' tab selected. A dropdown menu is open next to the 'Explain' button in the toolbar, listing several options: Verbose, Costs, Buffers, Timing, and Summary. The 'Summary' option is currently selected.

Please note that pgAdmin generates the *Explain [Analyze]* plan in JSON format.

On successful generation of *Explain* plan, it will create three tabs/panels under the Explain panel.

- Graphical

Please note that *EXPLAIN VERBOSE* cannot be displayed graphically. Hover over an icon on the *Graphical* tab to review information about that item; a popup window will display information about the selected object. For information on JIT statistics, triggers and a summary, hover over the icon on top-right corner; a similar popup window will be displayed when appropriate.

Use the download button on top left corner of the *Explain* canvas to download the plan as an SVG file.

**Note:** Download as SVG is not supported on Internet Explorer.



Note that the query plan that accompanies the *Explain analyze* is available on the *Data Output* tab.

- **Analysis**

*Analysis* tab shows the plan details in table format, it generates table format similar to [explain.depesz.com](http://explain.depesz.com). Each row of the table represent the data for a *Explain Plan Node*. It may contain the node information, exclusive timing, inclusive timing, actual vs planned rows differences, actual rows, planned rows, loops. When you select a row, the child rows of that selected row are marked with an orange dot.

background color of the exclusive, inclusive, and Rows X columns may vary based on the difference between actual vs planned.

If percentage of the exclusive/inclusive timings of the total query time is:

> 90 - Red color

> 50 - Orange (between red and yellow) color

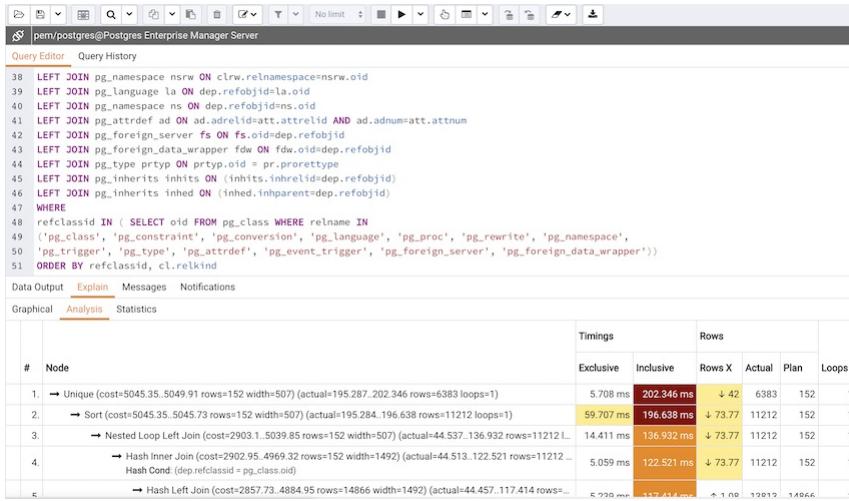
> 10 - Yellow color

If planner has misestimated the number of rows (actual vs planned) by

10 times - Yellow color

100 times - Orange (between Red and Yellow) color

1000 times - Red color



- **Statistics**

*Statistics* tab shows two tables:

1. Statistics per Plan Node Type
2. Statistics per Table

The screenshot shows the Postgres Enterprise Manager Query Editor interface. The top bar includes standard file and database selection buttons. Below the bar, the title bar says "pem/postgres@Postgres Enterprise Manager Server". The main area has tabs for "Query Editor" (selected), "Query History", "Scratch Pad", "Data Output", "Explain", "Messages", and "Notifications". Under "Graphical", there are tabs for "Statistics", "Node Type", and "Table". The "Statistics" tab is selected. It displays two tables: "Statistics per Node Type" and "Statistics per Table".

Node type	Count
Bitmap Heap Scan	1
Bitmap Index Scan	1
Hash	12
Hash Inner Join	1
Hash Left Join	10
Hash Right Join	1
Index Only Scan	1

Table name	Scan count
pg_attrdef	1
Seq Scan	1
pg_attribute	1
Seq Scan	1
pg_class	4
Seq Scan	1

## Messages Tab

Use the *Messages* tab to view information about the most recently executed query:

The screenshot shows the Postgres Enterprise Manager Query Editor interface. The "Messages" tab is selected. The query editor contains the following SQL:

```

1 SELECT * FROM pem.logexp_tagbasecharts
2 ORDER BY id ASC

```

Below the query, the "Messages" tab displays the results of the execution:

Successfully run. Total query runtime: 147 msec.  
4 rows affected.

If the server returns an error, the error message will be displayed on the *Messages* tab, and the syntax that caused the error will be underlined in the SQL editor. If a query succeeds, the *Messages* tab displays how long the query took to complete and how many rows were retrieved:

The screenshot shows the Postgres Enterprise Manager Query Editor interface. The "Messages" tab is selected. The query editor contains the same SQL as the previous screenshot:

```

1 SELECT * FROM pem.logexp_tagbasecharts
2 ORDER BY id ASC

```

Below the query, the "Messages" tab displays the results of the execution:

Successfully run. Total query runtime: 147 msec.  
4 rows affected.

## Notifications Tab

Use the *Notifications* tab to view details of the asynchronous notifications that a client process may have sent:

Recorded time	Event	Process ID	Payload
2019-11-07 12:53:53.645987	table_update	1668	Updated rows in table_1
2019-11-07 12:53:53.645987	table_update	5376	Updated rows in table_2

You can see details such as recorded time of the asynchronous notification event, name of the event or channel, process ID of the client process that has sent the notification, and the payload string that might have been sent along with the notification.

## Query History Panel

Use the *Query History* tab to review activity for the current session:

Date	Duration	Rows Affected
11/12/2019 14:18:48	168 msec	1

Messages  
Successfully run. Total query runtime: 168 ms

The Query History tab displays information about recent commands:

- The date and time that a query was invoked.
- The text of the query.
- The number of rows returned by the query.
- The amount of time it took the server to process the query and return a result set.
- Messages returned by the server (not noted on the *Messages* tab).
- The source of the query (indicated by icons corresponding to the toolbar).

You can show or hide the queries generated internally by pgAdmin (during 'View/Edit Data' or 'Save Data' operations).

To erase the content of the *Query History* tab, select *Clear history* from the *Clear* drop-down menu.

Query History is maintained across sessions for each database on a per-user basis when running in Query Tool mode. In View/Edit Data mode, history is not retained. By default, the last 20 queries are stored for each database. This can be adjusted in `config_local.py` by overriding the `MAX_QUERY_HIST_STORED` value.

## Connection Status

Use the *Connection status* feature to view the current connection and transaction status by clicking on the status icon in query tool:

If the server gets disconnected, the connection icon at the top left corner turns red and a tool tip is displayed. The icon turns green once you restore the server connection.



## 4.3 Package Deployment

The **Package Deployment** wizard walks you through the process of scheduling the installation of new packages or upgrades of existing packages. The PEM server must have internet access to deploy packages.

Please note: the Package Deployment wizard is deprecated, and will not be available in future releases of PEM.

Before invoking the **Package Deployment** wizard, you must modify the PEM agent configuration file and restart the agent; first on the server, and then on each system where packages will be deployed.

- On Linux, modify the `agent.cfg` file, setting the `allow_package_management` property to `true`. The configuration file is located in: `/opt/PEM/agent/etc`
- On Windows, use the Registry Editor to modify the registry entry for the agent, setting the value of the `AllowPackageManagement` property to `true`. The entry is located in:  
`HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\EnterpriseDB\PEM\agent`

After modifying the agent configuration properties, you must restart the PEM agent.

- On a Linux host, you can use the `service` command:

```
service pemagent restart
```

- On a Windows host, use the `Services` dialog to restart the PEM agent service:

```
Postgres Enterprise Manager - pemAgent
```

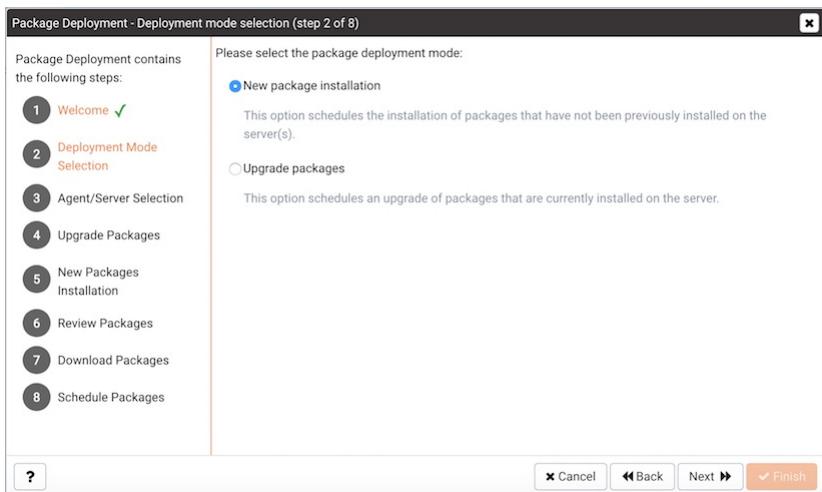
After enabling package management and restarting the agents, you should also confirm that agent-level probes are enabled on the host of the PEM server, and on any system on which a package will be deployed. To access the **Manage Probes** tab, highlight the name of the PEM agent in the PEM client tree control, and select **Manage Probes...** from the **Management** menu. The following probes must be enabled:

- the Package Catalog probe on the PEM server host.
- the Installed Packages probe on any system on which you wish to install packages.

Then, to open the **Package Deployment** wizard, select **Package Deployment...** from the **Management** menu. The **Package Deployment** wizard **Welcome...** dialog opens.



Click **Next** to continue.



Use the radio buttons on the **Deployment Mode Selection** dialog to specify the type of deployment that you are scheduling:

- Select the **New Package Installation** radio button to schedule the installation of a package that has not been previously installed on the server. This is the default.
- Select the **Upgrade Packages** radio button to schedule an upgrade of packages that are currently installed on the server.

When you've made a selection, click **Next** to continue.

## Installing a New Package

If you select **New Package Installation** on the **Deployment Mode Selection** dialog, the Package Deployment wizard opens the **Agent/Server Selection** dialog, allowing you to specify the agents and servers on which the new applications will be installed.



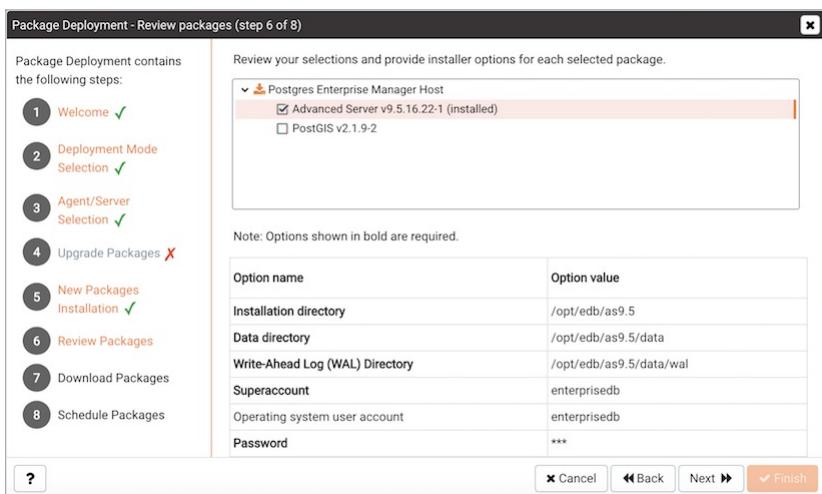
Expand the tree control, and check the box next to each server on which you wish to install a new package and click **Next**.

The **New Packages Installation** dialog opens.



Expand the tree control to review a list of applications that are available for installation. Check the box next to an application name to mark the application for installation. Note that the Package Deployment wizard will automatically check the boxes next to any supporting applications required by the applications you select.

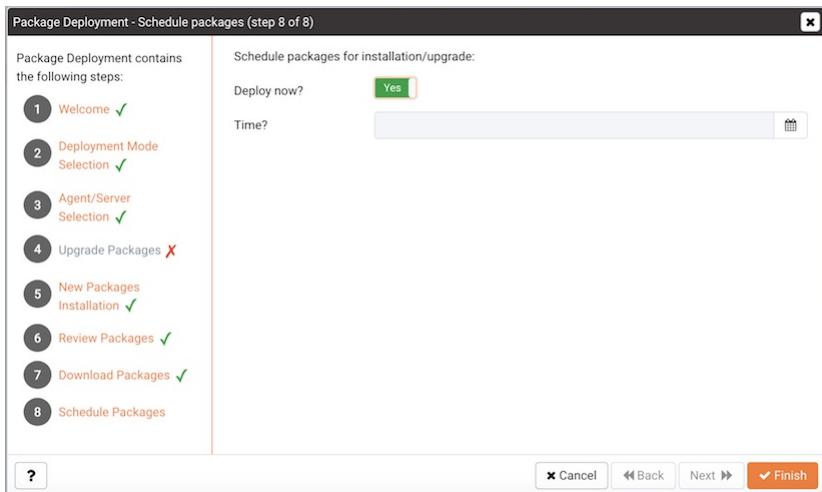
When you've selected all of the packages you wish to add, click **Next** to continue.



Review the list of packages that will be installed, and (if prompted) provide any options requested. Click **Next** to continue.



Click the **Start Download** button on the **Download Packages** dialog to instruct the Package Deployment wizard to download application installers. During the download, you can click the **Cancel Download** button to abort the batch download. When the download completes, click **Next**.



Use the options on the **scheduling** dialog to schedule an installation time for the new packages:

- Set the slider next to **Deploy Now** to **Yes** to instruct the respective PEM agents to install the downloaded packages immediately. Please note that if a package requires a server restart, current user sessions may be interrupted.
- Set the slider next to **Deploy Now** to **No** and use the **Time** selector to specify a later date and time that you would like the package installation to begin.

Click **Finish** to install the downloaded packages or schedule the installation and exit the package deployment wizard.

If you have scheduled an installation for a later date/time, the scheduled task will be displayed on the **Scheduled Tasks** tab. To open the **Scheduled Tasks** tab, select **Scheduled Tasks...** from the **Management** menu.

## Reviewing Scheduled Tasks

The **Scheduled Tasks** tab features a legend, displaying the icons that identify the status of each task. The **Manage Tasks** table displays a list of tasks that are pending execution or recently completed.

Set **Show system tasks?** to **Yes** to display system tasks; if it is set to **No**, only user-defined tasks are displayed. System tasks are displayed with a grey background, and may not be modified.

Highlight the name of a user-defined task and select the **Edit** icon to access detailed information about the selected task:

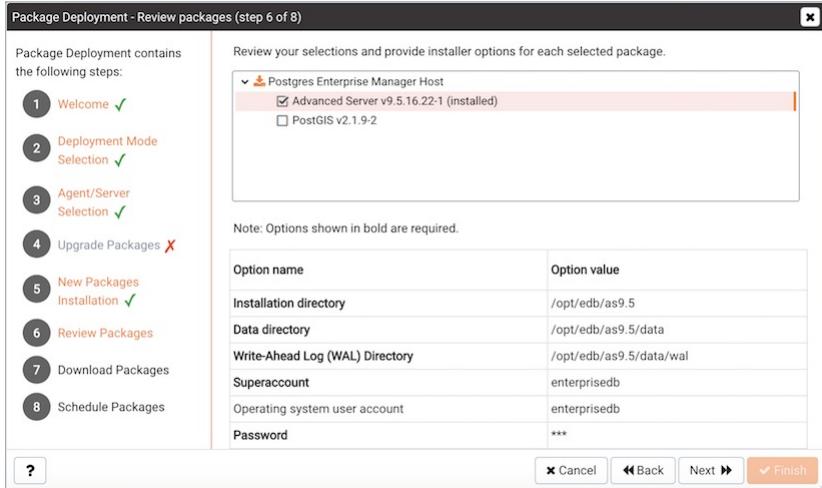
- Use the **Steps** drop-down to view a list of the steps performed during the selected task.
- The **Status** field lists the status of the current task.
- The **Enabled?** switch displays **Yes** if the task is enabled; **No** if the task is disabled.
- The **Name** field displays the name of the task.
- The **Agent** field displays the name of the agent responsible for executing the task.
- The **Last run** field displays the date and time of the last execution of the task.
- The **Next run** field displays the date and time of the next scheduled execution of the task.
- The **Created** field displays the date and time that the task was defined.

To remove a task, click the **Delete** icon located to the left of a task's name. The task will be marked for deletion, and removed when the tab refreshes.

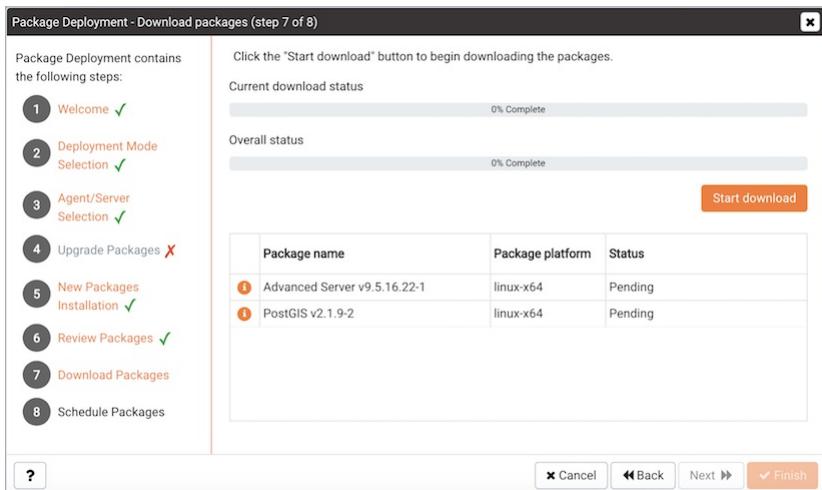
## Upgrading an Installed Package

If you select **Upgrade Packages** on the **Deployment Mode Selection** dialog, the Package Deployment wizard opens a dialog that allows you to specify which agents and packages will be updated.

Expand the tree control, and check the box next to package you wish to upgrade. Click **Next** to continue.



Review the list packages, and provide any installation options requested in the **Option Name/Option Value** fields. When you've reviewed the list, click **Next** to continue.



Click the **Start Download** button to instruct the **Package Deployment** wizard to download application installers. During the download, you can click the **Cancel Download** button to abort the batch download. When the download completes, click **Next**.



Use the options on the scheduling dialog to schedule an installation time for the new packages:

- Set the slider next to **Deploy Now** to **Yes** to instruct the respective PEM agents to install the downloaded packages immediately. Please note that if a package requires a server restart, current user sessions may be

interrupted.

- Set the slider next to **Deploy Now** to **No** and use the **Time** selector to specify a later date and time that you would like the package installation to begin.

Click **Finish** to install the downloaded packages or schedule the installation and exit the package deployment wizard. If you have scheduled the update for a later date/time, the scheduled task will be included on the Scheduled Tasks dialog (accessed through the **Scheduled Tasks...** menu selection on the agent's context menu).

## 4.4 Performance Monitoring and Management

PEM contains built-in functionality that implements enterprise-wide performance monitoring of all managed servers. While you can customize many aspects of the various performance monitoring aspects of PEM, you can also elect to accept the recommended defaults that come out-of-the-box with the product.

Agent Status										
Blackout	Name	Status	Alerts	Version	Processes	Threads	CPU Utilisation (%)	Memory Utilisation (%)	Swap Utilisation (%)	Disk Utilisation
<input checked="" type="checkbox"/>	<input type="checkbox"/> Postgres Enterprise Manager Host	UP	0	7.7.0	268	866	2.51	50.54	5.47	75.18

Server Status							Remotely Monitored?
Blackout	Name	Status	Connections	Alerts	Version		
<input checked="" type="checkbox"/>	<input type="checkbox"/> Postgres Enterprise Manager Server	UP	12	3	PostgreSQL 10.7 on x86_64-pc-linux-gnu, compiled by gcc (GCC) 4.4.7 20120313 (Red Hat 4.4.7-23), 64-bit	(Red Hat 4.4.7-23), 64-bit	No

Alerts Status										
Object Description	Alarm Type	Alert Name	Value	Database	Schema	Package	Object	Alerting Since		

The top-level dashboard is the **Global Overview**. The Global Overview presents a status summary of all the servers and agents that are being monitored by the PEM server, a list of the monitored servers, and the state of any currently triggered alerts.

### Using Dashboards to View Performance Information

PEM displays performance statistics through a number of dashboards; each dashboard contains a series of summary views that contain charts, graphs and tables that display the statistics related to the selected object.

The PEM client displays the Global Overview dashboard when it connects to the PEM server. Additional dashboards provide statistical information about monitored objects. These include the:

#### Alerts Dashboard

The Alerts dashboard displays the currently triggered alerts. If opened from the Global Overview, the dashboard displays the current alerts for all monitored nodes on the system; if opened from a node within a server, the report will reflect alerts related to that node, and all monitored objects that reside below that object.

in the tree control.

### **Audit Log Analysis dashboard**

For Advanced Server users, the Audit Log Analysis dashboard allows you to browse the audit logs that have been collected from instances that have audit logging and collection enabled.

### **Database Analysis dashboard**

The Database Analysis dashboard displays performance statistics for the selected database.

### **I/O Analysis dashboard**

The I/O Analysis dashboard displays I/O activity across various areas such as object DML activity, log operations and more.

### **Memory Analysis dashboard**

The Memory Analysis dashboard supplies statistics concerning various memory-related metrics for the Postgres server.

### **Object Activity Analysis dashboard**

The Object Activity Analysis dashboard provides performance details on tables/indexes of a selected database.

### **Operating System Analysis dashboard**

The Operating System Analysis dashboard supplies information regarding the performance of the underlying machine's operating system.

### **Probe Log Analysis Dashboard**

The Probe Log Analysis dashboard displays any error messages returned by a PEM agent.

### **Server Analysis dashboard**

The Server Analysis dashboard provides general performance information about the overall operations of a selected Postgres server.

### **Server Log Analysis dashboard**

The Server Log Analysis dashboard allows you to filter and review the contents of server logs that are stored on the PEM server.

### **Session Activity Analysis dashboard**

The Session Activity Analysis dashboard provides information about the session workload and lock activity for the selected server.

### **Session Waits Analysis dashboard**

The Session Waits Analysis dashboard provides an overview of the current DRITA wait events for an Advanced Server session.

### **Storage Analysis dashboard**

The Storage Analysis dashboard displays space-related metrics for tablespaces and objects.

### **System Waits Analysis dashboard**

The System Waits Analysis dashboard displays a graphical analysis of system wait information for an Advanced Server session.

## Streaming Replication Analysis dashboard

The Streaming Replication Analysis dashboard displays statistical information about WAL activity for a monitored server and allows you to monitor the status of Failover Manager clusters.

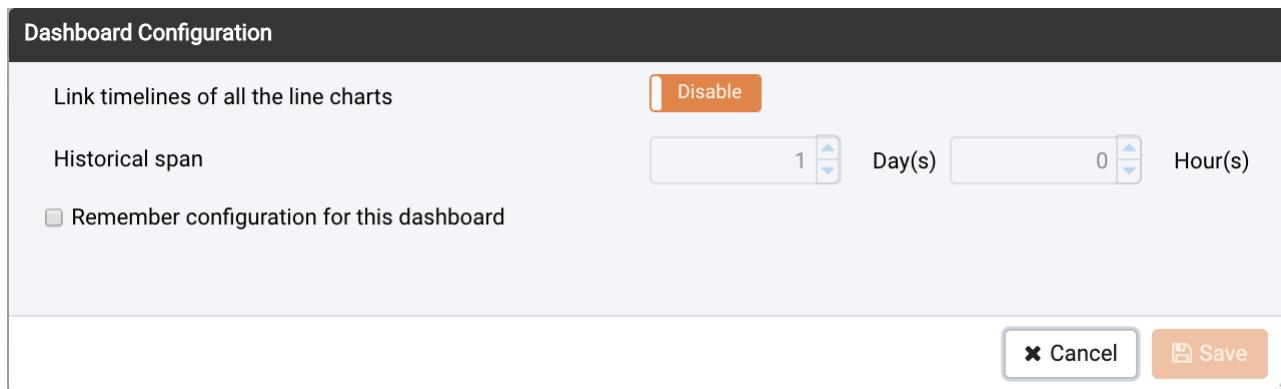
There are two ways to open a dashboard; you can:

- Select an active dashboard name from the Dashboards menu (accessed via the Management menu).
- Right click on the name of a monitored object in the tree control and select the name of the dashboard you would like to review from the Dashboards menu.

Each dashboard is displayed on the **Monitoring** tab in the main panel of the client window. After opening a dashboard, you can navigate to other dashboards within the same tab.

Each dashboard header includes navigation menus that allow you to navigate to other dashboards; use your browsers forward and back icons to scroll through previously-viewed dashboards. Use the Refresh icon to update the current dashboard.

Options on the **Dashboard Configuration** dialog allow you to link the time lines of all of the line graphs on the dashboard. To open the **Dashboard Configuration** dialog, click the Settings icon displayed in the dashboard header.



Use fields on the **Dashboard Configuration** dialog to control attributes of the charts displayed on the dashboard:

- Set the Link timelines of all the line charts slider to Enable to indicate that the specified timeline should be applied to line graphs displayed on the dashboard; if set to Disable, your preferences will be preserved for later use, but will not modify the amount of data displayed.
- Use the **Days** selector to specify the number of days of gathered data that should be displayed on line graphs.
- Use the **Hour(s)** selector to specify the number of hours of gathered data that should be displayed on line graphs.
- Check the box next to Remember configuration for this dashboard to indicate that the customized time span should be applied to the current dashboard only; if left unchecked, the time span will be applied globally to line graphs on all dashboards.

Please note that settings specified on the Dashboard Configuration dialog are applied only to the current user's session.

## Managing Custom Dashboards

PEM displays performance statistics through a number of system-defined dashboards; each dashboard contains a series of summary views that contain charts, graphs and tables that display statistics related to the selected object. You can use the **Manage Dashboards** tab to create and manage custom dashboards that display the information that is most relevant to your system.

The screenshot shows the 'Manage Dashboards' tab selected in the top navigation bar. The main content area has three sections: 'Description', 'Quick Links', and 'Custom Dashboards'. The 'Description' section contains a brief overview. The 'Quick Links' section includes links for 'Create New Dashboard' (with a pencil icon) and 'Help' (with a question mark icon). The 'Custom Dashboards' section shows a table titled 'Manage Dashboards' with one entry:

Name	Level	Description
<input checked="" type="checkbox"/> acctg_resources	Global	

A search bar labeled 'Search by Name or Level' is located at the top right of the dashboard table.

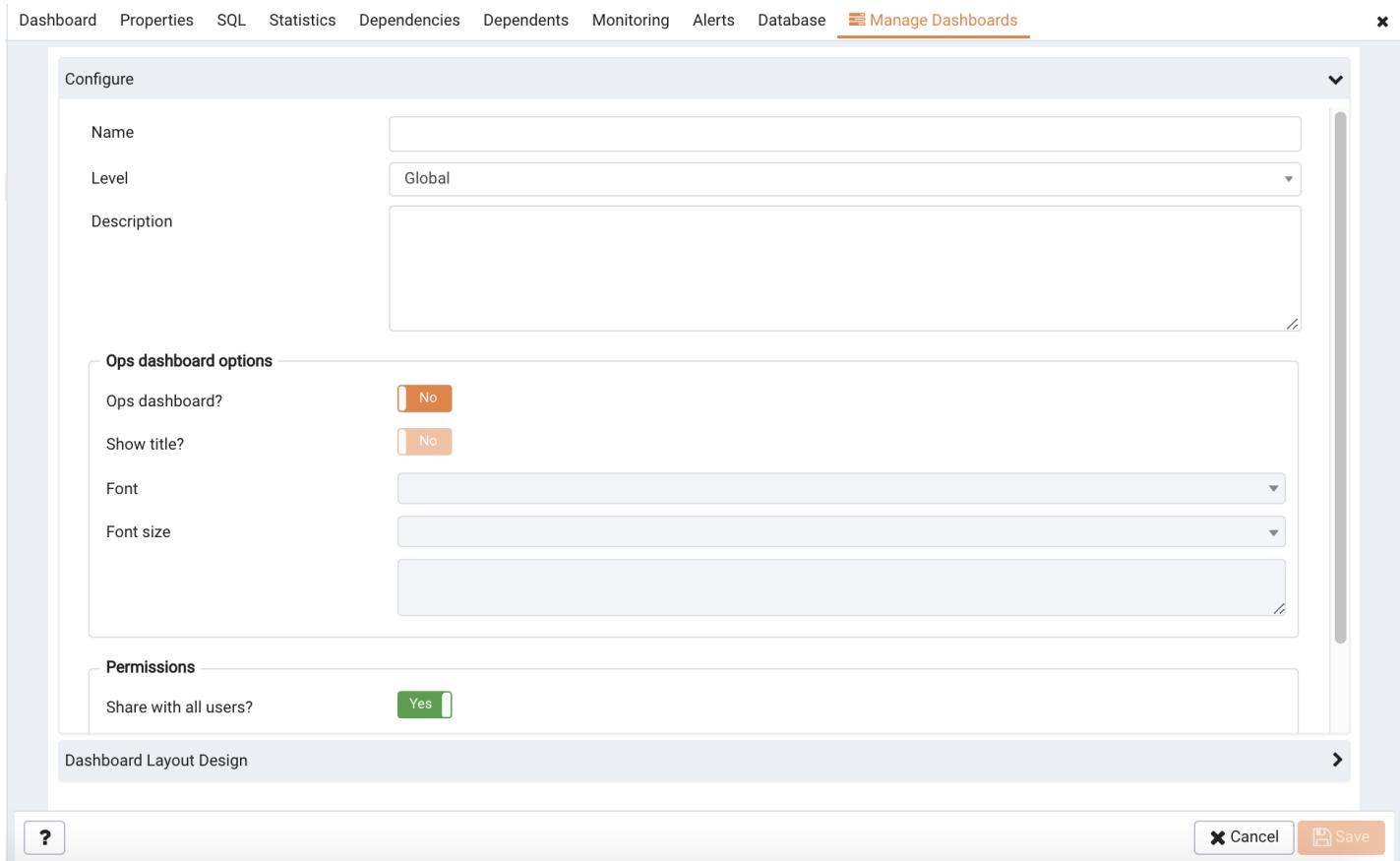
To create a custom dashboard, click the [Create New Dashboard](#) link (located in the Quick Links section of the Manage Dashboards tab).

To modify an existing dashboard, click the edit icon to the left of a dashboard name. The dashboard editor will open, displaying the definition of the dashboard. When you've finished modifying the dashboard's definition, click the Save button to preserve your changes; click Cancel to exit without saving your changes.

To delete a dashboard, click the delete icon to the left of a dashboard name. A popup will ask you to confirm that you wish to delete the dashboard; click OK to delete the selected dashboard.

## Creating a Custom Dashboard

You can use the PEM dashboard editor to create or modify a user-defined dashboard. The custom dashboard may include pre-defined charts, user-defined charts or a mix of pre-defined and user-defined charts.



Use the fields in the **Configure** section to specify general information about the dashboard:

- Specify a name for the dashboard in the **Name** field. The name specified will also be the title of the dashboard if the title is displayed.
- Use the **Level** drop-down listbox to specify the level of the PEM hierarchy within the PEM client on which the dashboard will be displayed. A dashboard may be accessed via the Dashboards menu on a Global level, an Agent level, the Server level or the Database level. Each selected level within the list will expose a different set of metrics on which the custom dashboard's charts may be based.
- Provide a description of the dashboard in the Description field.

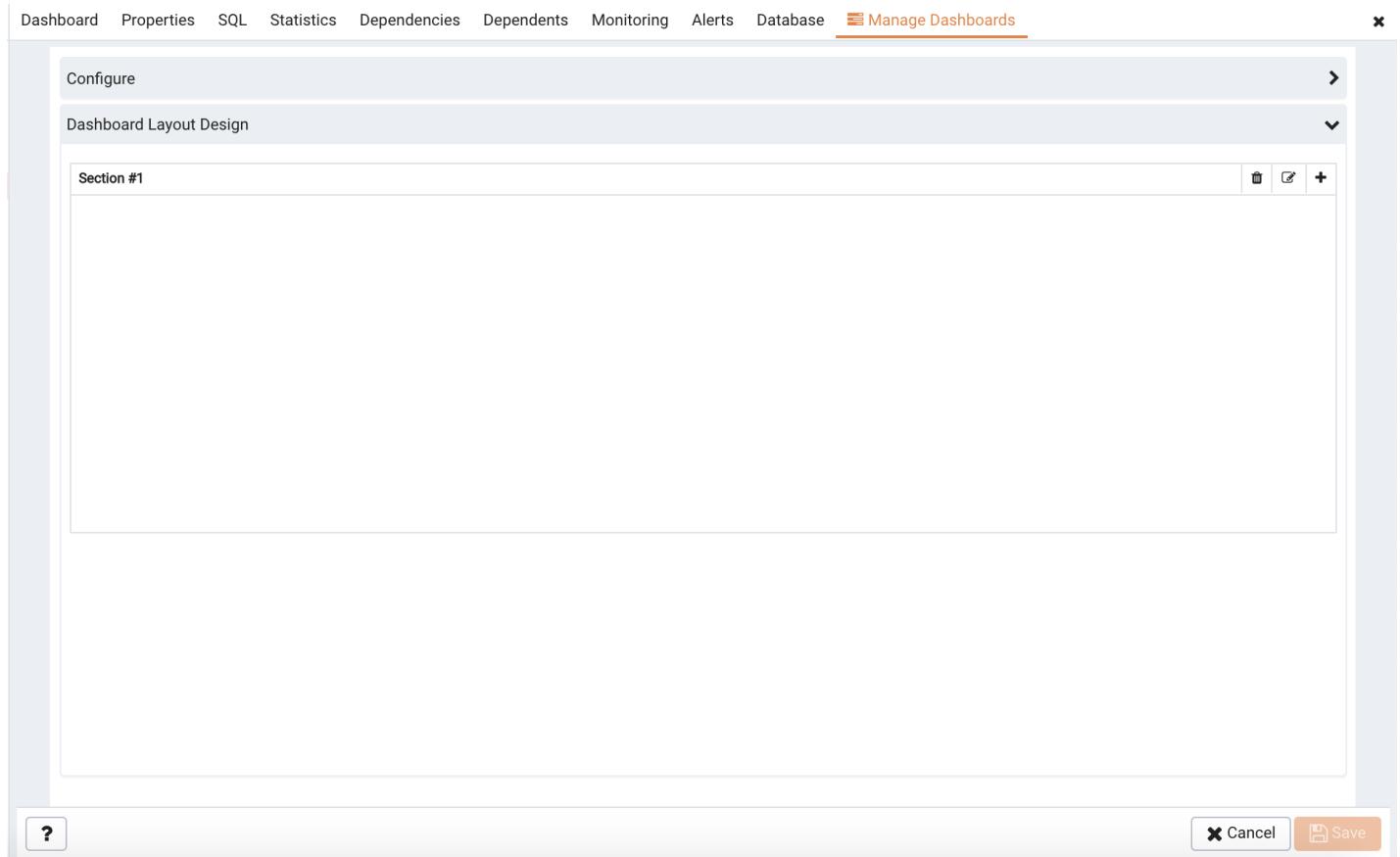
Provide information in the fields in the **Ops dashboard options** box if the dashboard will be used as an Ops dashboard:

- Set the **Ops Dashboard?** field to Yes to instruct the server to create a dashboard that is formatted for display on an Ops monitor.
- Set the **Show Title?** field to Yes to display the dashboard name at the top of the Ops dashboard.
- Use the **Font** drop-down list box to select a custom font style for the title. The selected font style will be displayed in the Preview box.
- Use the **Font size** drop-down list box to select a custom font size for the title. The selected font style will be displayed in the Preview box.

Use the **Permissions** box to specify the users that will be able to view the new dashboard:

- Set the **Share with all slider** to Yes to instruct the server to allow all Teams to access the dashboard, or set Share with all to No to enable the Access permissions field.
- Use the **Access permissions** field to specify which roles can view the new dashboard. Click in the field, and select from the list of users to add a role to the list of users with dashboard access.

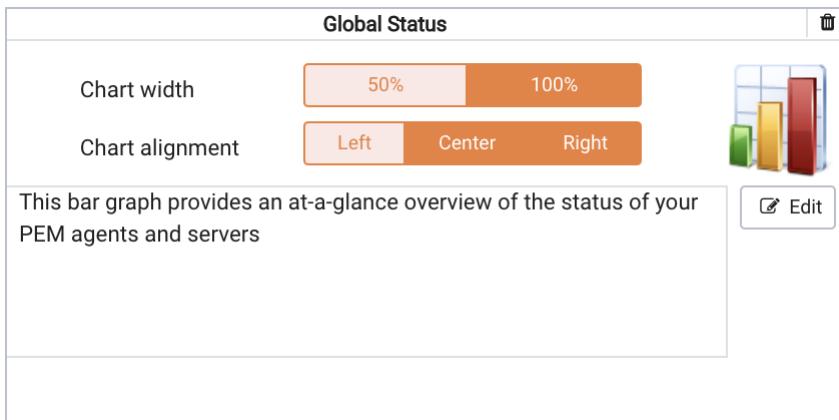
When you've completed the Configure Dashboard section, click the arrow in the upper-right corner to close the section, and access the Dashboard Layout Design section.



Click the edit icon in a section header to specify a section name; then, click the add icon (+) to add a chart to the section.



Use the arrows to the right of each chart category to display the charts available and select a chart.



Use the chart detail selectors to specify placement details for the chart:

- Use the **Chart width** selector to indicate the width of the chart; select 50% to display the chart in half of the dashboard, or 100% to use the whole dashboard width.
- Use the **Chart alignment** selector to indicate the position of the chart within the section:

Select **Left** to indicate that the chart should be left-justified.

Select **Center** to indicate that the chart should be centered.

Select **Right** to indicate that the chart should be right-justified.

Please note that tables are always displayed centered.

When creating or editing a custom dashboard, you can use drag and drop to re-arrange the charts within a section or to move a chart to a different section.

To add another chart to your dashboard, click the add icon (+) in the section header. When you've finished editing the dashboard, click the Save button to save your edits and exit.

To exit without saving your changes, click the **Cancel** button.

## Creating an Ops Dashboard

You can use the PEM dashboard editor to create a custom dashboard formatted for display on an Ops monitor. An Ops dashboard displays the specified charts and graphs, while omitting header information and minimizing extra banners, titles, and borders.

The form is titled 'Ops dashboard options'. It contains the following fields:
 

- 'Ops dashboard?' with a dropdown menu showing 'Yes'.
- 'Show title?' with a dropdown menu showing 'Yes'.
- 'Font' dropdown menu showing 'Arial'.
- 'Font size' dropdown menu showing '14'.
- A 'Preview' window showing a small sample of the dashboard layout.

To create an **Ops dashboard**, provide detailed information about the Ops display in the Ops dashboard options section of the **Create Dashboard** dialog.

- Set the **Ops Dashboard?** field to Yes to instruct the server to create a dashboard that is formatted for display on an Ops monitor.

- Set the **Show Title?** field to Yes to display the dashboard name at the top of the Ops dashboard.
- Use the **Font** drop-down list box to select a custom font style for the title. The selected font style will be displayed in the Preview box.
- Use the **Font size** drop-down list box to select a custom font size for the title. The selected font style will be displayed in the Preview box.

After adding charts and tables to the Ops dashboard, click the Save button to save your work. You can then access the dashboard by navigating through the Dashboards menu of the hierarchy level specified in the Level field on the New Dashboard dialog.

## Using the Manage Charts tab

You can use the **Manage Charts** tab to access dialogs that allow you to create or modify a custom line chart or table, or import a Capacity Manager template for use in a custom chart. After defining a chart, you can display the chart on a custom dashboard. To open the **Manage Charts** tab, select **Manage Charts...** from the PEM client **Management** menu.

The Manage Charts tab provides a Quick Links menu that allows you to access dialogs to:

- Create a New Chart for use on a custom dashboard.
- Import a Capacity Manager template to use as a template for creating a custom chart.

The **Custom Charts** table displays a list of user-defined charts; when a chart is newly added, the font displays in green. When you add an additional chart or refresh the screen, the name of the chart is displayed in black.

Custom Charts				
<input type="text"/> Search chart by Name, Type, Level or				
	Name	Type	Level	Metrics Category
<input checked="" type="checkbox"/>	acctg_resource_usage	Line Chart	Agent	Database
<input checked="" type="checkbox"/>	hr_resource_usage	Table	Agent	Audit logs
<input checked="" type="checkbox"/>	sales_resource_usage	Line Chart	Agent	Database Server

Use the search box in the upper-right hand corner of the Custom Charts table to search through your custom charts. Specify a:

- Chart name
- Type
- Level
- Metrics Category

Use icons to the left of a charts name in the **Custom Charts** table to manage a chart:

- Click the edit icon to open the **Chart Configuration** wizard and modify aspects of the chart or table.
- Click the delete icon to delete the selected chart.

## Creating a Custom Chart

Click the [Create New Chart](#) icon in the [Quick Links](#) section of the [Manage Charts](#) tab to open the [Create Chart](#) wizard. The wizard will walk you through the steps required to define a new chart.

Create Chart - Chart Configuration (step 1 of 4)

Follow the steps to create/update the chart:

- 1** Configure Chart
- 2** Select Metrics
- 3** Set Options
- 4** Set Permissions

Name	Inventory_chart_1
Category	Audit logs
Type	<input checked="" type="radio"/> Line chart <input type="radio"/> Table
Description	

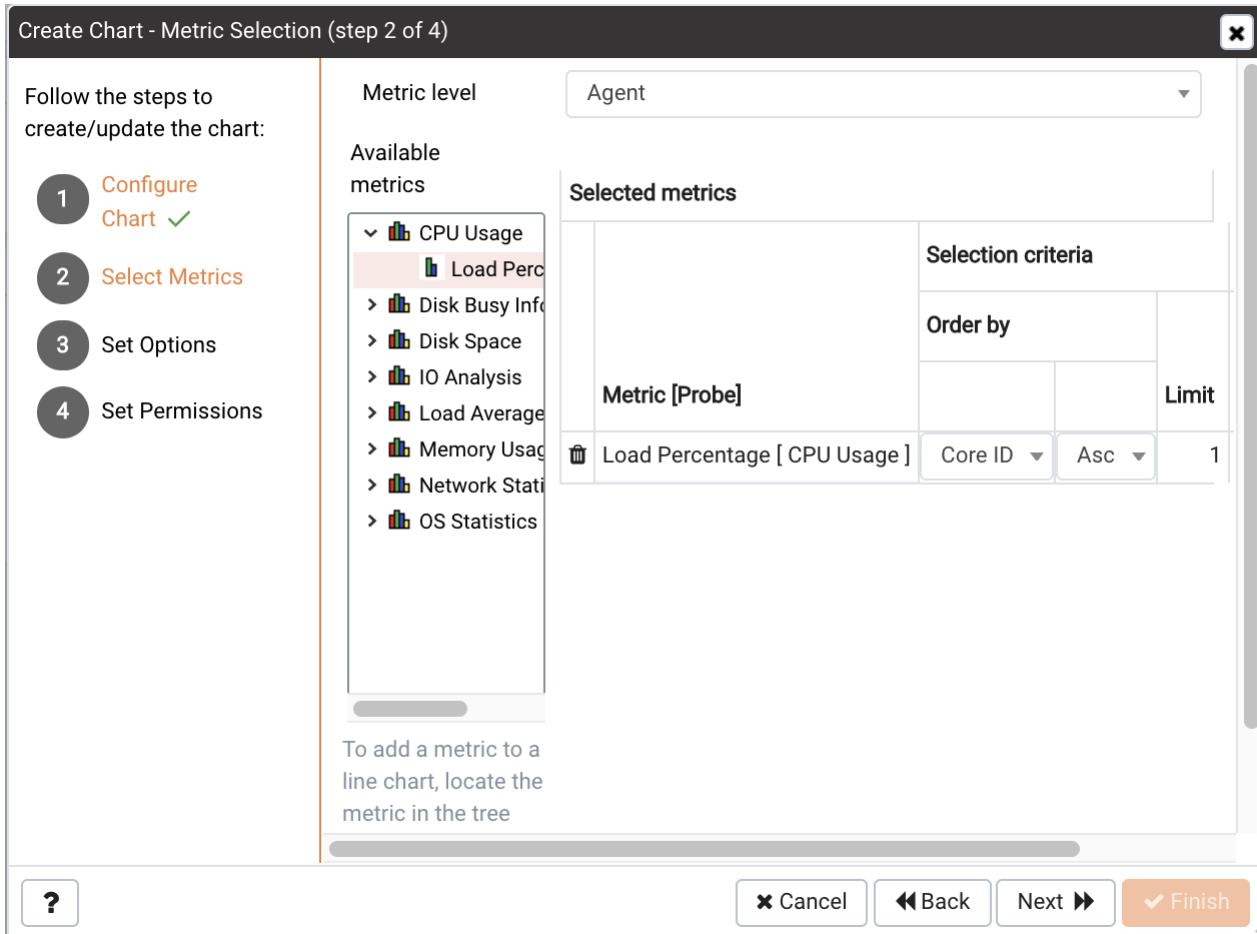
?

Cancel Back Next Finish

Use the fields on the [Configure Chart](#) dialog to specify general information about the chart:

- Specify the name of the chart in the [Name](#) field.
- Use the drop-down listbox in the [Category](#) field to specify the category in which this chart will be displayed; when adding a custom chart to a custom dashboard, the chart will be displayed for selection in the category specified.
- Use the radio buttons in the [Type](#) field to specify if the chart will be a [Line chart](#) or a [Table](#).
- Provide a description of the chart in the [Description](#) field. The description will be displayed to the user viewing the chart (on a custom dashboard) when they click the information icon.

When you've completed the fields on the [Configure Chart](#) dialog, click [Next](#) to continue.



Use the fields on the **Select Metrics** dialog to select the metrics that will be displayed on the chart.

- Use the **Metric level** drop-down listbox to specify the level of the PEM hierarchy from which you wish to select metrics. You can specify Agent, Database, or Server. Each level offers access to a unique set of probes and metrics.
- Use the tree control in the Available metrics box to select the metrics that will be displayed on the chart.

If you are creating a table, you may only select metrics from one probe; each node of the tree control lists the metrics returned by a single probe. Expand a node of the tree control, and check the boxes to the left of a metric name to include that metric data in the table.

If you are creating a line chart, expand the nodes of the tree control and double-click each metric that you would like to include in the chart.

- Use the fields in the Selected metrics panel to specify how the metric data will be displayed in your chart. The selection panel displays the name of the metric in the (non-modifiable) **Metric [Probe]** column. You can:
  - Click the garbage can icon to delete a metric from the list of selected metrics.
  - Use the drop-down listboxes in the **Selection Criteria** column to specify the order of the data displayed.
  - Use the **Limit** field to specify the number of rows in a table or lines in a chart:

The maximum number of lines allowed in a chart is 32.

The maximum number of rows allowed in a table is 100.

- If you are creating a line chart, PEM supports comparisons of cross-hierarchy metrics.
  - Click the **compare icon** to open a selection box that allows you to select one or more probe-specific attributes (i.e. CPUs, interfaces, databases, etc.) to compare in the chart.
  - Click the **copy** icon to apply your selections to all of the metrics for the same probe. When the popup opens, click Yes to confirm that other selections for the same probe will be overwritten, or No to exit the

popup without copying the attributes.

When you've completed the fields on the **Select Metrics** dialog, click Next to continue.



Figure 4.13 – Specifying chart options.

Use the fields on the **Set Options** dialog to specify display options for your chart:

- Use the **Auto Refresh** field to specify the number of minutes between chart updates - choose a value from 1 to 120. The default auto refresh rate is 2 minutes.

Use fields under the Line chart options heading to specify display preferences for a line chart:

- Use the **Points to plot** field to specify the maximum number of points that will be plotted on the chart.
- Use the fields to the right of the Historical span label to specify how much historical data should be displayed on the chart:

Use the **Day(s)** field to specify the number of days of historical data that should be included on the chart.

Use the **Hour(s)** field to specify the number of hours of historical data that should be included on the chart.

Use the **Minute(s)** field to specify the number of minutes of historical data that should be included on the chart.

Use the fields in the **Data extrapolation** box to specify if PEM should generate extrapolated data based on historical data:

- Click the **No Extrapolation** label to omit extrapolated data from the chart.
- Click the **Span** label to use the Days and Hours selectors to specify the period of time spanned by the metrics on the chart.
- Click the **Threshold** label to use threshold selectors to specify a maximum or minimum value for the chart.

When you've completed the fields on the Set Options dialog, click Next to continue.

Use the fields on the [Set Permissions](#) dialog to specify display options for your chart.

- Set the [Share with all slider](#) to Yes to indicate that the chart will be available to all authorized users, or No to restrict access to the users or groups specified in the Access permissions field.
- Use the [Access permissions](#) field to select the group or groups that will have access to the chart.

	Name	Type	Level	Metrics Category
<input checked="" type="checkbox"/>	custom_acct_chart	Line Chart	Agent	Audit logs
<input checked="" type="checkbox"/>	custom_HR_chart	Table	Database	Database
<input checked="" type="checkbox"/>	Inventory_chart_1	Line Chart	Agent	Audit logs

When you've finished defining the chart, click [Finish](#) to save your edits and add your chart to the list on the [Manage Charts](#) tab.

## Importing a Capacity Manager Template

Click the **Import Capacity Manager Template** icon in the Quick Links section of the **Manage Charts** tab to open the **Create Chart** dialog, and use a Capacity Manager template as a starting point for a chart or table.

Follow the steps to create/update the chart:

- 1** Configure Chart
- 2** Select Metrics
- 3** Set Options
- 4** Set Permissions

Import capacity template

Name

Category

Type

Description

?

Cancel

Back

Next

Finish

When the **Create Chart** dialog opens, provide information about the custom chart:

- Use the drop-down listbox in the **Import capacity template** field to select the name of the template on which the chart will be based.
- Specify the name of the chart in the **Name** field.
- Use the drop-down listbox in the **Category** field to specify the category in which this chart will be displayed. When adding a custom chart to a custom dashboard, the chart will be displayed for selection in the Category specified.
- Use the radio buttons in the **Type** field to specify if the chart will be a **Line chart** or a **Table**.
- Provide a description of the chart in the **Description** field. The description will be displayed to the user viewing the chart (on a custom dashboard) when they click the information icon.

Click **Next** to continue to the **Select Metrics** dialog.

Create Chart - Metric Selection (step 2 of 4)

Follow the steps to create/update the chart:

- 1 Configure Chart ✓
- 2 Select Metrics
- 3 Set Options
- 4 Set Permissions

Metric level		Capacity Report Chart
Selected metrics		
Metrics	Metric details	
Transactions Committed+	Display Name:	Transactions Committed+ (Postgres Enterprise Manager)
	Probe:	Database Statistics
	Metric:	Transactions Committed+
	Server:	Postgres Enterprise Manager Server
Transactions Aborted+	Display Name:	Transactions Aborted+ (Postgres Enterprise Manager)
	Probe:	Database Statistics
	Metric:	Transactions Aborted+
	Server:	Postgres Enterprise Manager Server
Database Size (MB)	Display Name:	Database Size (MB) (Postgres Enterprise Manager)
	Probe:	Database Size
	Metric:	Database Size (MB)
	Server:	Postgres Enterprise Manager Server

?

The **Select Metrics** window allows you to review the metrics specified by the selected template. The bottom panel of the chart editor displays the metrics that will be included in the chart. The metrics included in the chart are not modifiable via the chart editor; to modify the metrics, you must use the Capacity Manager utility to update the template.

When you've reviewed the metrics, click Next to continue to the Set Options dialog.

Create Chart - Chart Options (step 3 of 4)

Follow the steps to create/update the chart:

- 1 Configure Chart ✓
- 2 Select Metrics ✓
- 3 Set Options
- 4 Set Permissions

Auto refresh	<input type="text" value="2"/> Minute(s)
Please specify the number of minutes between chart updates.	
<b>Line chart options</b>	
Points to plot	<input type="text" value="50"/>
Please specify the maximum number of points to be plotted on the chart.	
Historical span	<input type="text" value="7"/> Day(s) <input type="text" value="0"/> Hour(s) <input type="text" value="0"/> Minute(s)
Please specify the number of minutes, hours or days of historical data that should be included on the chart.	
<b>Data extrapolation</b>	
<input checked="" type="radio"/> No Extrapolation <input type="radio"/> Span <input type="radio"/> Threshold	
Data will not be extrapolated into the future.	
Note: Extrapolated data is calculated using a linear trend analysis algorithm on the historical data. The accuracy of the extrapolated data depends on the	

?

Use the fields on the **Set Options** window to specify display options for your chart:

- Use the **Auto Refresh** field to specify the number of minutes between chart updates - choose a value from 1 to 120. The default auto refresh rate is 2 minutes.

Use the fields in the **Data extrapolation** box to specify the time period covered by the chart. You can either:

- click the **Historical days and extrapolated days** label and provide:
  - the number of days of historical data that should be charted in the **Historical** field.
  - the number of projected days that should be charted in the **Extrapolated** field.
- or, click the **Historical days and threshold** label and provide:
  - the number of days of historical data that should be charted in the **Historical** field
  - the **threshold** value at which the chart will end.

When you've completed the Set Options window, click **Next** to continue.

Create Chart - Security (step 4 of 4)

Follow the steps to create/update the chart:

- 1 Configure Chart ✓
- 2 Select Metrics ✓
- 3 Set Options ✓
- 4 Set Permissions

Share with all users?

Access permissions

Specify the user groups that will have access to the new chart.

?

Cancel Back Next Finish

Use the fields on the **Set Permissions** window to specify display options for your chart:

- Set the **Share with all** slider to Yes to indicate that the chart will be available to all authorized users, or No to restrict access to the users or groups specified in the Access permissions field.
- Use the **Access permissions** field to select the group or groups that will have access to the chart.

When you've finished defining the chart, click **Finish** to save your edits and add your chart to the list on the **Manage Charts** tab.

## Customizing Probes

A probe is a scheduled task that returns a set of performance metrics about a specific monitored object. A probe retrieves statistics from a monitored server, database, operating system or agent. You can use the Manage

Probes tab (shown in Figure 6.13) to override the default configuration and customize the behavior of each probe.

To open the **Manage Probes** tab, select **Manage Probes...** from the **Management** menu. The **Manage Probes** tab opens in the PEM client.

Probe name	Execution Frequency			Enabled?		Data Retention	
	Default?	Minutes	Seconds	Default?	Probe Enable?	Default?	Days
Database Frozen XID	<input checked="" type="checkbox"/>	720	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	180
Database Size	<input checked="" type="checkbox"/>	30	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	180
Database Statistics	<input checked="" type="checkbox"/>	30	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	90
Function Statistics	<input checked="" type="checkbox"/>	30	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	90
Index Size	<input checked="" type="checkbox"/>	30	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	180
Index Statistics	<input checked="" type="checkbox"/>	30	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	90
Materialized View Bloat	<input checked="" type="checkbox"/>	30	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	180
Materialized View Frozen XID	<input checked="" type="checkbox"/>	720	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	180
Materialized View Size	<input checked="" type="checkbox"/>	30	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	180

The **Manage Probes** tab provides a set of Quick Links that you can use to create and manage probes:

- Click the **Manage Custom Probes** icon to open the **Custom Probes** tab and create or modify a custom probe.
- Click the **Copy Probes** icon to open the Copy Probe dialog, and copy the probe configurations from the currently selected object to one or more monitored objects.

A probe monitors a unique set of metrics for each specific object type (server, database, database object, or agent); select the name of an object in the tree control to review the probes for that object.

To modify the properties associated with a probe, highlight the name of a probe, and customize the settings that are displayed in the Probes table:

- Move the **Default** switch in the **Execution Frequency** columns to **N** to enable the Minutes and Seconds selectors, and specify a non-default value for the length of time between executions of the probe.
- Move the **Default** switch in the **Enabled?** column to **No** to change the state of the probe, and indicate if the probe is active or not active.

#### Note

If data from a Disabled probe is used in a chart, the chart will display an information icon in the upper-left corner that allows you to enable the probe by clicking the provided link.

- Move the **Default** switch in the **Data Retention** column to **No** to enable the **Day(s)** field and specify the number of days that information gathered by the probe is stored on the PEM server.

The **Manage Probes** tab may display information about probes that cannot be modified from the current node. If a probe cannot be modified from the current dialog, the switches are disabled. Generally, a disabled probe can be modified from a node that is higher in the hierarchy of the PEM client tree control; select another object in the tree control to modify which probes are displayed or enabled in the **Manage Probes** tab.

## Creating a Custom Probe

You can use the **PEM Custom Probes** tab to create a new probe or modify an existing user-defined probe. To open the **Custom Probes** tab, select the **Manage Custom Probes...** icon from the **Manage Probes** tab.

**Description**

**System Probes:** System probes are the built-in probes provided by PEM and are part of the PEM schema. These probes are differentiated in the Probes list by a grey background. You may only modify the Enabled, Interval and Data retention fields of a system probe.

**Probes:** Custom probes are those probes created by users. You can modify the Enabled, Interval and Data retention fields in the General tab, the Unit and Graphable fields of each column on the Columns tab, the code provided in the Code tab, and the code definition on the Alternate Code tab of a user-defined probe if the Applies to all database server versions? field for that probe is set to No.

You may delete only user-defined probes. When you delete a probe, the probe is marked for deletion and will be deleted later (when custom probes are purged). During the deletion the probe definition is deleted and any corresponding tables are dropped from the pemdata and pemhistory schemas.

Probes								Show System Probes? <input checked="" type="checkbox"/> No		
	Probe name	Collection method	Target type	Execution frequency		Probe enabled?	Data retention			
				Minutes	Seconds					
<input checked="" type="checkbox"/> payables	payables	SQL	Server	5	0	<input checked="" type="checkbox"/> Yes				1
<input checked="" type="checkbox"/> emp_status	emp_status	SQL	Server	5	0	<input checked="" type="checkbox"/> Yes				1
<input checked="" type="checkbox"/> curr_accts	curr_accts	SQL	Server	5	0	<input checked="" type="checkbox"/> Yes				1

Use the **Show System Probes?** switch to display or conceal the system probes on the Custom Probes tab.

You can use the **Custom Probes** tab to create a new probe or modify an existing probe. To create a new probe, click the Add icon in the upper-right corner of the tab; provide a name for the new probe in the Probe Name column. Then, select the Edit icon (located to the left of the probe name) to review or add the probe definition.

General	Columns	Code	Alternate Code
Probe name	payables		
Collection method	SQL		
Use the Collection method field to specify the probe type. Use the drop-down to select: ▪ SQL (the probe will gather information via a SQL statement) ▪ WMI (the probe will gather information via a Windows Management Instrumentation extension) ▪ Batch/Shell Script (the probe will use a command script or shell script to gather information). Please note that batch probes are platform specific. If you specify a collection method of Batch, you must specify a platform type in the Platform field.			
Target type	Server		
Use the Target type drop-down to select the object type that the probe will monitor.			
Execution frequency	Minutes: <input type="text" value="5"/> Seconds: <input type="text" value="0"/>		
Probe enabled?	<input checked="" type="checkbox"/> Yes		
Use the Enabled? switch to specify if the probe is enabled by default. Specify Yes to enable the probe by default, or No to specify that the probe is disabled by default.			
Data retention	<input type="text" value="1"/>		
Use the Data retention field to specify the number of days that gathered information will be retained in the probe's history table.			
Discard from history?	<input type="checkbox"/> No		
Use the Discard from history field to specify if the server should create a history table for the probe. Select Yes to discard probe history, or No to retain the probe history in a table.			
Platform	*nix		

Use the fields on the **General** tab to modify the definition of an existing probe or to specify the properties of a new probe:

- Use the **Probe Name** field to provide a name for a new probe.
- Use the **Collection method** field to specify the probe type. Use the drop-down listbox to select:
  - SQL - the probe will gather information via a SQL statement.
  - WMI - the probe will gather information via a Windows Management Instrumentation extension.
  - Batch - the probe will use a command-script or shell-script to gather information.

Before creating a batch probe on a Linux system, you must modify the agent.cfg file, setting the `allow_batch_probes` parameter equal to true and restart the PEM agent. The `agent.cfg` file is located in one of the following directories:

- If you have installed PEM using graphical installer: `/opt/edb/pem/agent/etc/agent.cfg`
- If you have installed PEM using RPM: `/usr/edb/pem/agent/etc/agent.cfg`

On 64-bit Windows systems, agent settings are stored in the registry. Before creating a batch probe, modify the registry entry for the `AllowBatchProbes` registry entry and restart the PEM agent. PEM registry entries are located in `HKEY_LOCAL_MACHINE\Software\Wow6432Node\EnterpriseDB\PEM\agent`.

Please note that batch probes are platform-specific. If you specify a collection method of Batch, you must specify a platform type in the Platform field.

To invoke a script on a Linux system, you must modify the entry for `batch_script_user` parameter of `agent.cfg` file and specify the user that should be used to run the script. You can either specify a non-root user or root for this parameter. If you do not specify a user, or the specified user does not exist, then the script will not be executed. Restart the agent after modifying the file.

To invoke a script on a Windows system, set the registry entry for **AllowBatchJobSteps** to true and restart the PEM agent.

- Use the **Target Type** drop-down listbox to select the object type that the probe will monitor. Target type is disabled if Collection method is WMI.
- Use the **Minutes** and **Seconds** selectors to specify how often the probe will collect data.
- Use the **Probe Enable?** switch to specify if the probe is enabled by default. Specify Yes to enable the probe by default, or No to specify that the probe is disabled by default.

#### Note

If data from a disabled probe is used in a chart, the chart will display an information icon in the upper-left corner that allows you to enable the probe by clicking the provided link.

- Use the **Data Retention** field to specify the number of days that gathered information will be retained in the probe's history table.
- Use the switch next to **Discard from history** to specify if the server should create a history table for the probe. Select Yes to discard probe history, or No to retain the probe history in a table.
- Use the **Platform** drop-down listbox to specify the type of platform that the probe will monitor. This field is enabled only when the Collection method is Batch.

General	Columns	Code	Alternate Code																												
<table border="1"> <thead> <tr> <th>Name</th> <th>Internal name</th> <th>Column type</th> <th>Data type</th> <th>Unit</th> <th>Graphable?</th> <th>Is PIT?</th> <th>Calculate PIT?</th> </tr> </thead> <tbody> <tr> <td><input checked="" type="checkbox"/> column_1</td> <td>column_1</td> <td>Key</td> <td>numeric</td> <td></td> <td><input type="checkbox"/> No</td> <td><input type="checkbox"/> No</td> <td><input type="checkbox"/> No</td> </tr> </tbody> </table>				Name	Internal name	Column type	Data type	Unit	Graphable?	Is PIT?	Calculate PIT?	<input checked="" type="checkbox"/> column_1	column_1	Key	numeric		<input type="checkbox"/> No	<input type="checkbox"/> No	<input type="checkbox"/> No												
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Use the **Columns** tab to define the columns in which the probe data will be stored. Navigate to the **Columns** tab, and click the Add button (in the upper-right corner) to define a new column. After providing a column name in the Name field, click the Edit button (to the left of the new column name) to provide information about the column:

- Provide a descriptive name for the column in the **Name** field.
- The **Internal Name** field is not enabled for user-defined probes.
- Use the **Column Type** drop-down listbox to specify if the column is a Key column (a primary key) or a Non key

column. Non-key columns are generally metric items (values that can be graphed).

- Use the **Data Type** drop-down listbox to specify the type of data that will be stored in the column.
- Use the **Unit** field to specify the unit of measure that applies to the metric stored in the column. This unit is displayed on the Y-Axis of a custom chart or a Capacity Manager chart. This is an optional field.
- Use the **Graphable** switch to specify if the defined metric may be graphed, and that the probe should be accessible from the Capacity Manager or Manage Charts dialogs.
- Use the **Is PIT** switch to specify if the metric should be stored by point-in-time.

'Point-in-time' metrics are those metrics that change (increase or decrease) at any given point of time. For example, database size is a point-in-time metric; at any given point-in-time, the size of the database is fluctuating. Metrics that are not point-in-time (also referred to as cumulative metrics) are metrics whose size always increases over time. For example, Blocks Read and Tuples Read are cumulative metrics; the value stays the same or increases.

- Use the **Calculate PIT** switch to specify that the server should calculate a point-in-time value for the metric data. Calculate PIT is disabled if Is PIT is Yes.

PEM allows you to store point-in-time-values of cumulative metrics as well. PEM subtracts the last collected value of a cumulative metric from the current value, and stores the difference as a point-in-time value.

General Columns **Code** Alternate Code

**Code** ⚠

Use the Code tab to specify SQL SELECT statement invoked by the probe on the Code tab. The column names returned by the query must match the Internal name specified on the Columns tab. The number of columns returned by the query, as well as the column name, datatype, etc. must match the information specified on the Columns tab.

Use the **Code** tab to specify the default code that will be executed by the probe:

- If the probe is a SQL probe, you must specify the **SQL SELECT** statement invoked by the probe on the **Code** tab. The column names returned by the query must match the Internal Name specified on the **Columns** tab. The number of columns returned by the query, as well as the column name, data type, etc. must match the information specified on the **Columns** tab.
- If the probe is a batch probe, you must specify the shell or .bat script that will be invoked when the probe runs. The output of the script should be as follows:

The first line must contain the names of the columns provided on the **Columns** tab. Each column name should be separated by a tab (t) character. From the second line onwards, each line should contain the data for each column, separated by a tab character.

If a specified column is defined as key column, you should ensure that the script does not produce duplicate data for that column across lines of output. The number of columns specified in the **Columns** tab and their names, data type, etc. should match with the output of the script output.

- If the probe is a WMI probe, you must specify the WMI query as a **SELECT WMI** query. The column name referenced in the **SELECT** statement should be same as the name of the corresponding column specified on the **Column** tab. The column names returned by the query must match the **Internal Name** specified on the **Column** tab. The number of columns returned by the query, as well as the column name, data type, etc. must match the information specified on the **Columns** tab.

General Columns Code **Alternate Code**

Move the Applies to all database server versions switch to Yes to specify that the code on the Code tab will execute for every server version. If Applies to all database server versions? is set to No, you may specify code for a specific server version below. Applies to all database server versions? is disabled when the Collection method is WMI and Batch

Applies to all database server versions?	<input checked="" type="checkbox"/> Yes
Database version(s)	Probe code
No alternate code found for custom probe	

Use the **Alternate Code** tab to provide code that will be invoked if the probe fires on a specific version of the server. To provide version-specific code, move the **Applies to any server version?** switch to **No**, and click the **Add** button. Then, use the **Database Version(s)** drop-down listbox to select a version, and click the **Edit** button (to the left of the version name) to provide the code that will execute when the probe fires.

If you select a database version, and leave the **Probe Code** column blank, PEM will invoke the code specified on the **Code** tab when the probe executes on a server that matches that version.

When you've finished defining the probe, click the **Save** icon (in the corner of the **Custom Probes** tab) to save the definition, and make the probe data available for use on custom charts and graphs.

## Deleting a Probe

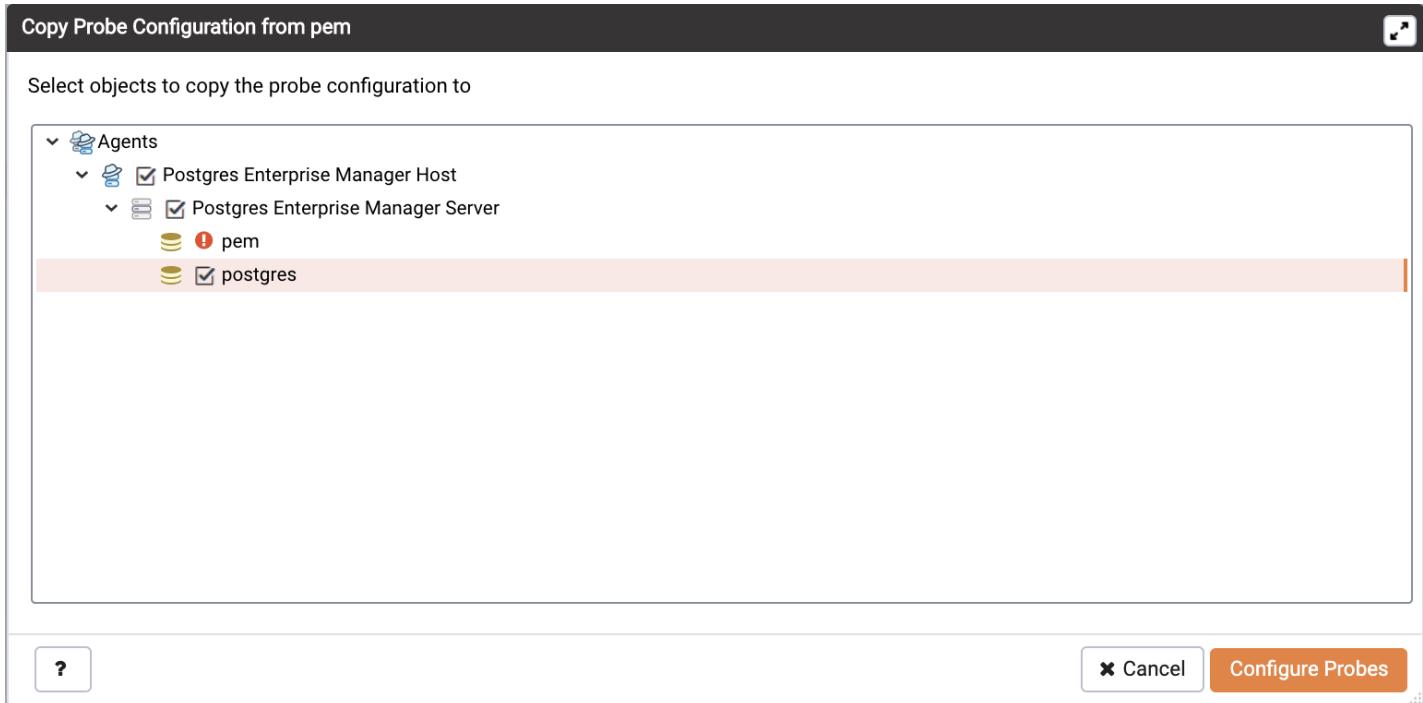
Use the Delete icon (located to the left of a Probe Name) to delete a user-defined probe. When you delete a probe, the probe is marked for deletion and will be deleted later (when custom probes are purged). During the deletion, the probe definition is deleted and any corresponding tables are dropped from the pemdata and pemhistory schemas.

System probes are the built-in probes provided by PEM, and are part of the PEM schema. If you attempt to delete a system probe, the PEM client will display a notice, informing you that the probe cannot be deleted.



## Copying a Probe

You can use the **Copy Probe Configuration...** dialog to copy probe definitions from one monitored object to one or more monitored objects of the same type. To open the **Copy Probe Configuration...** dialog, highlight the object from which you are copying probes in the PEM client tree control, and select **Manage Probes** from the **Management** menu. When the **Manage Probes** tab opens, click on **Copy Probe** to open the **Copy Probe Configuration** dialog:



The dialog will copy the probe definitions from the object through which the Copy Probe Configuration dialog was opened, to the location(s) selected on the tree control.

Note that if you specify a parent node in the Copy Probe Configuration tree control, PEM will copy the probe configurations to each object (of the same type) that resides under that node in the tree control. For example, to copy the probe definitions from one schema to all schemas that reside within a database, select only the parent database of the target schemas. Please note that a red warning symbol is displayed to the left of the name of a listed target object if that object is the source of the probe that is being copied.

When you have selected the target object or objects, click the **Configure Probes** button to copy the probe definitions to the location selected on the dialog.

## Alerting

PEM continually monitors registered servers and compares performance metrics against pre-defined and user-specified thresholds that constitute good or acceptable performance for each statistic. Any deviation from an acceptable threshold value triggers an alert. An alert is a system-defined or user-defined set of conditions that PEM compares to the system statistics. Alerts call your attention to conditions on registered servers that require your attention.

### Reviewing alerts on the Global Overview

When your system statistics deviate from the boundaries specified for that statistic, the alert triggers, displaying a high (red), low (yellow), or medium (orange) severity warning in the left-most column of the **Alert Status** table on the **Global Overview** dashboard.

Alerts Status									
	Object Description	Alarm Type	Alert Name	Value	Database	Schema	Package	Object	Alerting Since
⚠️	▶ Postgres Enterprise Manager Server	High	Last Vacuum	Never ran					2019-03-04 14:39:16
⚠️	▶ Postgres Enterprise Manager Server	High	Database size in server	106 MB					2019-03-13 09:55:45
⚠️	▶ N/A	High	Alert Errors	1					2019-03-04 14:39:16
⚠️	▶ Postgres Enterprise Manager Server	Medium	Connections in idle state	11					2019-03-25 12:13:12

Preview

The PEM server includes a number of pre-defined alerts that are actively monitoring your servers. If the alert definition makes details available about the cause of the alert, you can click the down arrow to the right of the

severity warning to access a dialog with detailed information about the condition that triggered the alert.

Alerts Status (Auto-refresh paused whilst rows are expanded. @)									
	Object Description	Alarm Type	Alert Name	Value	Database	Schema	Package	Object	Alerting Since
<span style="color: red;">!</span>	Postgres Enterprise Manager Server	High	Database size in server	106 MB					2019-03-13 09:55:45

General Parameters

Database name	Database size(MB)
pem	84

PEM also provides an interface that allows you to create customized alerts. Each alert uses metrics defined on an alert template. An alert template defines how the server will evaluate the statistics for a resource or metric. The PEM server includes a number of pre-defined alert templates, or you can create custom alert templates.

## Using the Alerts Dashboard

Use the **Dashboards** menu (on the **Monitoring** tab) to access the **Alerts** Dashboard. The **Alerts** Dashboard displays a summary of the active alerts and the status of each alert:

Dashboard Properties SQL Statistics Dependencies Dependents Monitoring **Alerts**

! Alerts

Object Type System Status N/A Generated On 25/03/2019, 16:00:49 ! No. of alerts 4 (Acknowledged: 0) !

**Alerts Overview**

Alert Status

Alert Status	Count
High	~3
Medium	~1
Low	~0
None	~21

**Alert Details**

	Ack'd	Alert Type	Name	Value	Agent	Server	Database	Schema	Package	Object	Alerting Since
<span style="color: red;">!</span>	<span style="color: grey;">□</span>	High	Last Vacuum	Never ran		Postgres Enterprise Manager Server					2019-03-04 14:39:16
<span style="color: red;">!</span>	<span style="color: grey;">□</span>	High	Database size in server	106 MB		Postgres Enterprise Manager Server					2019-03-13 09:55:45
<span style="color: red;">!</span>	<span style="color: grey;">□</span>	High	Alert Errors	1	N/A	N/A					2019-03-04 14:39:16
<span style="color: red;">!</span>	<span style="color: grey;">□</span>	Medium	Connections in idle state	11		Postgres Enterprise Manager Server					2019-03-25 12:13:12

**Alert Errors**

Alert Type	Name	Value	Agent	Server	Database	Schema	Package	Object	Error Message	Error Timestamp
<span style="color: red;">!</span> Error	Number of WAL archives pending			Postgres Enterprise Manager Server					Required probe(s) wal_archive_status are disabled.	2019-03-04 14:38:16

The **Alerts Dashboard** header displays the date and time that the dashboard was last updated, and the number of current alerts.

The **Alerts Overview** section displays a graphic representation of the active alerts, as well as a count of the current high, low and medium alerts. The vertical bar on the left of the graph provides the count of the alerts displayed in each column. Hover over a bar to display the alert count for the selected alert severity in the upper-right hand corner of the graph.

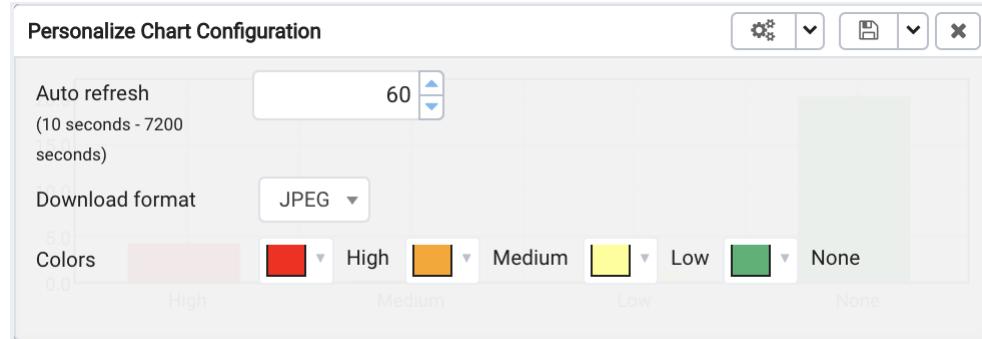
The **Alert Details** table provides a list of the alerts that are currently triggered. The entries are prioritized from high-severity to lower-severity; each entry includes information that will allow you to identify the alert and recognize the condition that triggered the alert. Click the name of an alert to review detailed information about the alert definition.

The **Alert Errors** table displays configuration-related errors (eg. accidentally disabling a required probe, or

improperly configuring an alert parameter). You can use the information provided in the Error Message column to identify and resolve the conflict that is causing the error.

## Customizing the Alerts Dashboard

You can customize tables and charts that appear on the Alerts dashboard. To customize a table or chart, click the Settings icon located in the upper-right corner.



Use fields on the Personalize chart configuration dialog (Figure 4.32) to provide your display preferences:

- Use the **Auto Refresh** field to specify the number of seconds between updates of the data displayed in the table or chart.
- If applicable, use the **Download as** field to indicate if you would like a chart to be downloaded as a JPEG image or a PNG image.
- If applicable, use the **Colours selectors** to specify the display colors that will be used on a chart.
- If applicable, set the **Show Acknowledged Alerts** switch to Yes indicate that you would like the table to display alerts that you have acknowledged with a checkbox in the Ack'ed column. Set the field to No to indicate that the table should hide any acknowledged alerts. The switch acts as a toggle; acknowledged alerts are not purged from the table content until the time specified in the alert definition passes.

To save your customizations, click the **Save** icon (a check mark) in the upper-right corner; to delete any previous changes and revert to the default values, click the **Delete** icon. The **Save** and **Delete** drop-down menus allow you to specify if your preferences should be applied to **All Dashboards**, or to a selected server or database.

## Using the Manage Alerts Tab

Use the PEM Client's **Manage Alerts** tab to define, copy, or manage alerts. To open the **Manage Alerts** tab, select **Manage Alerts** from the **Management** menu.

**Description**

**Alerting:** PEM monitors a system for conditions that require user attention. An alert definition contains a system or user defined set of conditions that PEM compares to the system statistics; if the statistics deviate from the boundaries specified for that statistic, the alert triggers, displaying a High, Low or Median severity warning and optionally sending notifications via email to Email Groups or SNMP trap/notification receivers.

**Alert Templates:** An alert template is a prototype that you can use to create a custom alert. An alert instructs the server to compare the current state of the monitored object to a threshold (specified in the alert template) to determine if a situation exists that requires administrative attention.

**Copy Alerts:** PEM allows copying of alerts from any of chosen object recursively down through the object hierarchy. Click on "Copy Alerts" to quickly copy the displayed alerts to a selected target.

**Quick Links**

- Copy Alerts
- Alert Templates
- Email Groups
- Server Configuration
- Help

**Alerts**

**Manage Alerts**

Name	Auto created?	Template	Enable?	Interval		History retention	
				Default?	Minutes	Default?	Days
Average table bloat in server	Yes	Average table bloat in server	Yes	Yes	1	Yes	30
Connections in idle-in-transaction state	Yes	Connections in idle-in-transaction state	Yes	Yes	1	Yes	30
Connections in idle-in-transaction state, as a ...	Yes	Connections in idle-in-transaction state, as a ...	Yes	Yes	1	Yes	30

Use the **Quick Links** toolbar to open dialogs and tabs that will assist you when managing alerts:

- Click **Copy Alerts** to open the **Copy Alert Configuration** dialog and copy an alert definition.
- Click **Alert Templates** to open the **Alert Template** tab, and modify or create an alert template.
- Click **Email Groups** to open the **Email Groups** tab, and modify or create an email group.
- Click **Server Configurations** to open the **Server Configuration** dialog and review or modify server configuration settings.
- Click **Help** to open the PEM online help in a new tab of the PEM web interface.

Use the table in the **Alerts** section of the **Manage Alerts** tab to create new alerts or manage existing alerts.

## Creating a Custom Alert Template

An alert template is a prototype that defines the properties of an alert. An alert instructs the server to compare the current state of the monitored object to a threshold (specified in the alert template) to determine if a situation exists that requires administrative attention.

You can use the **Alert Templates** tab to define a custom alert template or view the definitions of existing alert templates. To open the **Alert Templates** tab, select the **Manage Alerts...** menu option from the **Management** menu. When the Manage Alerts tab opens, select Alert Templates from the Quick Links toolbar.

**Description**

**Alert Template:** An alert template is a prototype that defines the properties of a custom alert. An alert instructs the server to compare the current state of the monitored object to a threshold (of the type specified in the template that is associated with the alert) to determine if a situation exists that requires administrative attention. The Alert Templates tab provides an interface that allows you to define a custom alert template or view and modify the definitions of existing alert templates.

**Alert Templates**

					Show System Template: <input type="button" value="None"/>
	Template name	Description	Target type	Applies to server	Check frequency (minutes)
<input checked="" type="checkbox"/> <input type="button" value="Delete"/>	Agent_down	Number of agents that haven't reported in re...	Server	ALL	1

Use the **Show System Template** drop-down listbox to filter the alert templates that are displayed in the Alert Templates table. Use the listbox to select a level of the PEM hierarchy to view all of the templates for the selected level.

## Defining a New Alert Template

To define a new alert template, use the **Show System Template** drop-down listbox to select None, and click the Add icon (+) located in the upper-right corner of the alert template table. The alert template editor opens.

The screenshot shows the 'General' tab of the alert template editor. It includes fields for Template name (Agent\_down), Description (Number of agents that haven't reported in recently to the PEM server), Target type (Server), Applies to server (ALL), History retention (30 days), Threshold unit (empty), Auto create (Auto create? slider set to No), Operator (operator dropdown with > selected), Check frequency (minutes) (1 minute), and a note about auto-create logic.

General		Probe Dependency	Parameters	SQL
Template name	Agent_down			
Description	Number of agents that haven't reported in recently to the PEM server			
Target type	Server Use the Target type field to select the type of object that will be the focus of the alert.			
Applies to server	ALL Use the Applies to server field to specify the server to which the alert will be applied; specify a single server type or ALL.			
History retention	30 Use the History retention field to specify the number of days that the result of the alert execution will be stored on the PEM server.			
Threshold unit				
Auto create	Auto create? <input checked="" type="checkbox"/> No Use the Auto create field to automatically create alerts using this template. Please provide default threshold values. If the value is "Yes" then all the added parameters in Parameters tab will be removed as we do not support parametrised auto alerts.			
Operator	>	Low	Med	High
Check frequency (minutes)	1 Use the Check frequency field to specify the number of minutes between alert executions. This value specifies how often the server will invoke the SQL code specified on the SQL tab and compare the result to the threshold value specified in the alert definition.			

Use fields on the **General** tab to specify general information about the template:

- Use the **Template name** field to specify a name for the new alert template.
- Use the **Description** field to provide a description of the alert template.
- Use the **Target type** drop-down listbox to select the type of object that will be the focus of the alert.
- Use the **Applies to server** drop-down listbox to specify the server type (EDB Postgres Advanced Server or PostgreSQL) to which the alert will be applied; you can specify a single server type, or ALL.
- Use the **History retention** field to specify the number of days that the result of the alert execution will be stored on the PEM server.
- Use the **Threshold unit** field to specify the unit type of the threshold value.
- Use fields in the **Auto create** box to indicate if PEM should use the template to generate an automatic alert. If enabled, PEM will automatically create an alert when a new server or agent (as specified by the Target type drop-down listbox) is added, and delete that alert when the target object is dropped.
  - Move the **Auto create?** slider to **Yes** to indicate that PEM should automatically create alerts based on the template. If you modify an existing alert template, changing the Auto create? slider from No to Yes, PEM will create alerts on the existing agents and servers. Please note that if you change the slider from Yes to No, the default threshold values in existing alerts will be erased, and cannot be recovered.
  - Use the **Operator** drop-down listbox to select the operator that PEM will use when evaluating the current system values.

Select a greater-than sign (>) to indicate that the alert should be triggered when the system values are greater than the values entered in the Threshold values fields.

Select a less-than sign (<) to indicate that the alert should be triggered when the system values are less than

the values entered in the Threshold values fields.

- Use the threshold fields to specify the values that PEM will compare to the system values to determine if an alert should be raised. Please note that you must specify values for all three thresholds (Low, Medium, and High):

Enter a value that will trigger a low-severity alert in the **Low** field.

Enter a value that will trigger a medium-severity alert in the **Medium** field.

Enter a value that will trigger a high-severity alert in the **High** field.

- Use the **Check frequency** field to specify the default number of minutes between alert executions. This value specifies how often the server will invoke the SQL code specified in the definition and compare the result to the threshold value specified in the template.

The screenshot shows the 'Probe Dependency' tab of a configuration interface. At the top, there are tabs for 'General', 'Probe Dependency' (which is selected and highlighted in orange), 'Parameters', and 'SQL'. Below the tabs, there is a section titled 'Probes' with a dropdown menu. The dropdown menu lists several probe names: 'CPU Usage', 'Background Writer Statistics', 'Blocked Session Information', 'CPU Usage' (repeated), 'curr\_accts', 'Data and Log File Analysis', and 'Database Frozen XID'. The 'CPU Usage' entry at the top is currently selected, indicated by a red highlight. A red error message box is visible, containing the text 'Please specify alert code.' with a warning icon.

Use the fields on the **Probe Dependency** tab to specify the names of probes referred to in the SQL query specified on the SQL tab:

- Use the **Probes** drop-down listbox to select from a list of the available probes; highlight a probe name, and click the Add button to add the probe to the list of probes used by the alert template. To remove a probe from the selected probes list, highlight the probe name, and click the Delete icon.

The screenshot shows the 'Parameters' tab of a configuration interface. At the top, there are tabs for 'General', 'Probe Dependency', 'Parameters' (which is selected and highlighted in orange), and 'SQL'. Below the tabs, there is a section titled 'Parameters' with a table. The table has columns for 'Name', 'Data type', and 'Unit'. There is one row in the table with a single entry in the 'Name' column. A small trash icon is located next to the 'Name' column header. A note below the table states: 'Add (+) button is disabled in case of system template or value of "Auto create" is Yes in General tab.'

- Use fields on the **Parameters** tab to define the parameters that will be used in the SQL code specified on the **SQL** tab. Click the **Add** icon (+) and:

Use the **Name** field to specify the parameter name.

Use the **Data type** drop-down listbox to specify the type of parameter.

Use the **Unit** field to specify the type of unit specified by the parameter.

- Use the **Code** field on the **SQL** tab to provide the text of the SQL query that the server will invoke when executing the alert. The SQL query will provide the result against which the threshold value is compared; if the alert result deviates from the specified threshold value, an alert will be raised.

The screenshot shows the 'SQL' tab selected in the top navigation bar. Below it, there are two main sections: 'Code' and 'Detailed information SQL'. The 'Code' section contains a text area with a warning icon and a note explaining its purpose. The 'Detailed information SQL' section also contains a text area with a note explaining its purpose.

**Code**

Use the Code field to provide the text of the SQL query that the server will invoke when executing the alert. The SQL query will provide the result against which the threshold value is compared; if the alert result deviates from the specified threshold value, an alert will be raised.

**Detailed information SQL**

Use the Detailed information SQL field to specify the SQL query that will provide the detailed information about that alert on Dashboard.

Within the query, parameters defined on the [Parameters](#) tab should be referenced sequentially by the variable `param_x`, where `x` indicates the position of the parameter definition within the parameter list. For example, `param_1` refers to the first parameter in the parameter list, `param_2` refers to the second parameter in the parameter list, and so on.

The query can also include the following pre-defined variables:

Variable Description	Variable Name
agent identifier	'\${agent_id}'
server identifier	'\${server_id}'
database name	'\${database_name}'
schema name	'\${schema_name}'
Table	'\${object_name}'
index	'\${object_name}'
sequence	'\${object_name}'
function name	'\${object_name}'

- Use the [Detailed Information SQL](#) field to provide a SQL query that will be invoked if the alert is triggered. The result set of the query may be displayed as part of the detailed alert information on the Alerts dashboard or Global Overview dashboard.

#### Note

If the specified query is dependent on one or more probes from different levels within the PEM hierarchy (server, database, schema, etc.), and a probe becomes disabled, any resulting alerts will be displayed as follows:

- If the alert definition and the probe referenced by the query are from the same level within the PEM hierarchy, the server will display any alerts that reference the alert template on the [Alert Error](#) table of the [Global Alert Dashboard](#).
- If the alert definition and the probe referenced by the query are from different levels of the PEM hierarchy, the server will display any triggered alerts that reference the alert template on the [Alert Details](#) table of the hierarchy on which the alert was defined.

Click the Save icon to save the alert template definition and add the template name to the Alert Templates list. After saving a custom alert template, you can use the Alerting dialog to define an alert based on the template.

#### Modifying or Deleting an Alert Template

To view the definition of an existing template (including PEM pre-defined alert templates), use the [Show System Template](#) drop-down listbox to select the type of object monitored. When you select the object type, the [Alert Templates](#) table will display the currently defined alert templates that correspond with that object type.

Highlight a Template Name in the list, and click the Edit icon (at the left end of the row) to review the template definition.

Use the tabs on the **Alert Templates** dialog to view detailed information about the alert template:

- General information is displayed on the **General** tab.
- The names of probes that provide data for the template are listed on the **Probe Dependency** tab.
- The names of any parameters referred to in the SQL code are listed on the **Parameters** tab.
- The SQL code that defines the behavior of the alert is displayed on the **SQL** tab.

To delete an alert template, highlight the template name in the alert templates table, and click the Delete icon. The alert history will persist for the length of time specified in the **History Retention** field in the template definition.

## Creating a New Alert

The **Manage Alerts** tab displays a table of alerts that are defined on the object currently selected in the PEM client tree control. You can use the **Alerts** table to modify an existing alert, or to create a new alert.

Name	Auto created?	Template	Enable?	Interval	History retention		
				Default?	Minutes	Default?	Days
Average table bloat in server	Yes	Average table bloat in server	Yes	Yes	1	Yes	30
Connections in idle-in-transaction state	Yes	Connections in idle-in-transaction state	Yes	Yes	1	Yes	30
Connections in idle-in-transaction state, as a ...	Yes	Connections in idle-in-transaction state, as a ...	Yes	Yes	1	Yes	30

To open the alert editor and create a new alert, click the Add icon (+) in the upper-right corner of the table. The editor opens as shown below.

The screenshot shows the 'General' tab of a configuration interface for a new alert. The fields include:

- Name:** A text input field.
- Description:** A text area for notes.
- Template:** A dropdown menu labeled "Select from the list". Below it is a note: "A template uses metrics to generate a value to which PEM compares user specified alert boundaries. If the value returned by the template function evaluates to a value that is within the boundary of a user defined alert, PEM raises an alert."
- Enable?**: A switch labeled "Yes" with a note: "Select Yes to enable the alert, and No to disable the alert."
- Interval**: A section with a "Default?" switch (set to "Yes"), a "Minutes" selector (set to 1), and a note: "Use fields in the Interval box to specify how often the alert should confirm that alert conditions are satisfied."
- History retention**: A section with a "Default?" switch (set to "Yes"), a "Days" selector (set to 30), and a note: "Use fields in the History retention box to specify the number of days that PEM will store data collected by the alert."
- Threshold values**: A section with controls for Operator (dropdown: >), Low (text input), Median (text input), High (text input), and Unit (text input). A note states: "The fields in the Threshold values box work together to define the triggering criteria for the alert."
- Auto created?**: A switch labeled "No".

Use the fields on the **General** tab to provide information about the alert:

- Enter the name of the alert in the **Name** field.
- Use the drop-down listbox in the **Template** field to select a template for the alert. An alert template is a function that uses one (or more) metrics or parameters to generate a value to which PEM compares user-specified alert boundaries. If the value returned by the template function evaluates to a value that is within the boundary of a user-defined alert (as specified by the Operator and Threshold values fields), PEM raises an alert, adds a notice to the Alerts overview display, and performs any actions specified on the template.
- Use the **Enable?** switch to specify if the alert is enabled (Yes) or disabled (No).
- Use the controls in the **Interval** box to specify how often the alert should confirm if the alert conditions are satisfied. Use the Minutes selector to specify an interval value. Use the Default switch to set or reset the Minutes value to the default (recommended) value for the selected template.
- Use controls in the **History retention** box to specify the number of days that PEM will store data collected by the alert. Use the Days selector to specify the number of days that the data will be stored. Use the Default switch to set or reset the Days value to the default value (30 days).
- Use controls in the **Threshold values** box to define the triggering criteria for the alert. When the value specified in the Threshold Values fields evaluates to greater-than or less-than the system value (as specified with the Operator), PEM will raise a Low, Medium or High level alert:
- Use the **Operator** drop-down listbox to select the operator that PEM will use when evaluating the current system values:
  - Select a greater-than sign (>) to indicate that the alert should be triggered when the system values are greater than the values entered in the Threshold values fields.
  - Select a less-than sign (<) to indicate that the alert should be triggered when the system values are less than the values entered in the Threshold values fields.
- Use the **threshold** fields to specify the values that PEM will compare to the system values to determine if an alert should be raised. Please note that you must specify values for all three thresholds (Low, Medium, and High):
  - Enter a value that will trigger a low-severity alert in the **Low** field.
  - Enter a value that will trigger a medium-severity alert in the **Medium** field.
  - Enter a value that will trigger a high-severity alert in the **High** field.

The **Parameter Options** table contains a list of parameters that are required by the selected template; the table displays both pre-defined parameters, and parameters for which you must specify a value. Please note that you must specify a value for any parameter that displays a prompt in the Value column.

PEM can send a notification or execute a script if an alert is triggered, or if an alert is cleared. Use the [Notification](#) tab to specify how PEM will behave if an alert is raised.

The screenshot shows the 'Notification' tab of the PEM configuration interface. It is divided into three main sections: 'Email notification', 'Trap notification', and 'Nagios notification'.  
**Email notification:** This section contains four rows, one for each alert level: 'All alerts?', 'Low alerts?', 'Median alerts?', and 'High alerts?'. Each row has a 'No' slider button and a dropdown menu set to '<Default>'.  
**Trap notification:** This section includes four sliders: 'Send trap?' (set to 'No'), 'SNMP version' (set to 'v2'), 'Low alert?' (set to 'No'), and 'Median alert?' (set to 'No').  
**Nagios notification:** This section has a single slider: 'Submit passive service check result to Nagios?' (set to 'No').  
A note at the bottom of the 'Email notification' section states: 'To configure notifications for an alert, use the fields in the Email notification box to specify the user or user group that will receive an email notification if the alert is triggered at the specified level. Use the drop-down listbox to select a pre-defined group that will be sent a notification if an alert of the selected level is triggered. Please note that you must configure the PEM Server to use an SMTP server to deliver email before PEM can send email notifications.'

Use the fields in the [Email notification](#) box to specify the email group that will receive an email notification if the alert is triggered at the specified level. Use the [Email Groups](#) tab to create an email group that contains the address of the user or users that will be notified when an alert is triggered. To access the [Email Groups](#) tab, click the [Email Groups](#) icon located in the Quick Links menu of the [Manage Alerts](#) tab.

- To instruct PEM to send an email when a specific alert level is reached, set the slider next to an alert level to Yes, and use the drop-down listbox to select the pre-defined user or group that will be notified.

Please note that you must configure the PEM Server to use an SMTP server to deliver email before PEM can send email notifications.

Use the [Trap notification](#) options to configure trap notifications for this alert:

- Set the [Send trap](#) slider to [Yes](#) to send SNMP trap notifications when the state of this alert changes.
- Set the [SNMP Ver](#) slider to v1 or v2 to identify the SNMP version.
- Use the [Low alert](#), [Med alert](#) and [High alert](#) sliders to select the level(s) of alert that will trigger the trap. For example, if you set the slider next to High alert to Yes, PEM will send a notification when an alert with a high severity level is triggered.

Please note that you must configure the PEM Server to send notifications to an SNMP trap/notification receiver before notifications can be sent.

Use the field in the [Nagios notification](#) box to instruct the PEM server to notify Nagios network-alerting software when the alert is triggered or cleared.

- Set the [Submit passive service check result to Nagios](#) switch to [Yes](#) to instruct the PEM server to notify Nagios when the alert is triggered or cleared.

Use the fields in the [Script execution](#) box to (optionally) define a script that will be executed if an alert is triggered, and to specify details about the script execution.

- Set the [Execute script](#) slider to [Yes](#) to instruct PEM to execute the provided script if an alert is triggered.

- Set the **Execute on alert cleared** slider to **Yes** to instruct PEM to execute the provided script when the situation that triggered the alert has been resolved.
- Use the radio buttons next to **Execute script on** to indicate that the script should execute on the PEM Server or the Monitored Server.
- Provide the script that PEM should execute in the **Code** field. You can provide a batch/shell script, or SQL code. Within the script, you can use placeholders for the following:

**%AlertName%** - this placeholder will be replaced with the name of the triggered alert.

**%ObjectName%** - this placeholder will be replaced with the name of the server or agent on which the alert was triggered.

**%ThresholdValue%** - this placeholder will be replaced with the threshold value reached by the metric when the alert triggered.

**%CurrentValue%** - this placeholder will be replaced with the current value of the metric that triggered the alert.

**%CurrentState%** - this placeholder will be replaced with the current state of the alert.

**%OldState%** - this placeholder will be replaced with the previous state of the alert.

**%AlertRaisedTime%** - this placeholder will be replaced with the time that the alert was raised, or the most recent time that the alert state was changed.

To invoke a script on a Linux system, you must modify the entry for *batch\_script\_user* parameter of agent.cfg file and specify the user that should be used to run the script. You can either specify a non-root user or root for this parameter. If you do not specify a user, or the specified user does not exist, then the script will not be executed. Restart the agent after modifying the file.

To invoke a script on a Windows system, set the registry entry for *AllowBatchJobSteps* to true and restart the PEM agent. PEM registry entries are located in  
HKEY\_LOCAL\_MACHINE\Software\Wow6432Node\EnterpriseDB\PEM\agent.

When you have defined the alert attributes, click the edit icon to close the alert definition editor, and then the save icon (in the upper-right corner of the **Alerts** table). To discard your changes, click the refresh icon; a popup will ask you to confirm that you wish to discard the changes.

## Modifying or Deleting an Alert

Use the **Alerts** table to manage an existing alert or create a new alert. Highlight an object in the PEM client tree control to view the alerts that monitor that object.

Manage Alerts								
	Name	Auto created?	Template	Enable?	Interval		History retention	
					Default?	Minutes	Default?	Days
	connection_idle	<input type="button" value="No"/>	Connections in idle state	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1	<input checked="" type="checkbox"/>	30
	DB usage	<input type="button" value="No"/>	View Count	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1	<input checked="" type="checkbox"/>	30

You can modify some properties of an alert in the **Alerts** table:

- The **Alert name** column displays the name of the alert; to change the alert name, simply replace the name in the table, and click the save icon.
- The **Alert template** column displays the name of the alert template that specifies properties used by the alert. You can use the drop-down listbox to change the alert template associated with an alert.
- Use the **Alert enable?** switch to specify if an alert is enabled (Yes) or disabled (No).

- Use the **Interval** column to specify how often PEM should check to see if the alert conditions are satisfied. Set the **Default** switch to **No** and specify an alternate value (in Minutes), or return the Default switch to **Yes** to reset the value to its default setting. By default, PEM will check the status of each alert once every minute.
- Use the **History retention** field to specify the number of days that PEM will store data collected by the alert. Set the **Default** switch to **No** and specify an alternate value (in Days), or return the Default switch to **Yes** to reset the value to its default setting. By default, PEM will recommend storing historical data for 30 days.

After modifying an alert, click the save icon (located in the upper-right corner of the table) to make your changes persistent.

Click the edit icon to the left of an alert name to open an editor that provides access to the complete alert definition to modify other alert attributes.

Alerts Status (Auto-refresh paused whilst rows are expanded. ⏱)									
	Object Description	Alarm Type	Alert Name	Value	Database	Schema	Package	Object	Alerting Since
<span style="color: red;">!</span>	Postgres Enterprise Manager Server	High	Database size in server	106 MB					2019-03-13 09:55:45

General Parameters	
Database name	Database size(MB)
pem	84

Use fields on the **Alert details** dialog to modify the definition of the selected alert. When you've finished modifying the alert definition, click **Save** to preserve your changes, or **Cancel** to exit the dialog without saving any changes.

## Deleting an Alert

To mark an alert for deletion, highlight the alert name in the Alerts table and click the delete icon to the left of the name; the alert will remain in the list, but in red strike-through font.

Manage Alerts									
	Name	Auto created?	Template	Enable?	Interval	History retention			
					Default?	Minutes	Default?	Days	
<span style="color: red;">!</span>	<del>connection_idle</del>	No	Connections in idle state	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	+	<input checked="" type="checkbox"/>	30	
<span style="color: green;">!</span>	DB usage	No	View Count	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	1	<input checked="" type="checkbox"/>	30	

The delete icon acts as a toggle; you can undo the deletion by clicking the delete icon a second time; when you click the Save icon, the alert definition will be permanently deleted.

## Copying an Alert

To speed up the deployment of alerts in the PEM system, you can copy alert definitions from one object to one or more target objects.

To copy alerts from an object, highlight the object in the PEM client tree control on the main PEM window, and select the **Copy Alerts...** option from the **Management** menu. When the **Manage Alerts** tab opens, click the Copy Alerts icon (located in the Quick Links toolbar) to open the **Copy Alert Configuration** dialog.



The [Copy Alert Configuration](#) dialog copies all alerts from the object highlighted in the PEM client tree control to the object or objects selected on the dialog. Expand the tree control to select a node or nodes to specify the target object(s). The tree control displays a red warning indicator next to the source object.

To copy alerts to multiple objects at once, select a parent node of the target(s). For example, to copy the alerts from one table to all tables in a schema, you can simply select the checkbox next to the schema. PEM will only copy alerts to targets that are of the same type as the source object.

Check the [Ignore duplicates](#) radio button to prevent PEM from updating any existing alerts on the target objects with the same name as those being copied. Use the [Replace duplicates](#) option to replace existing alerts with alerts of the same name from the source object.

Click the [Configure Alerts](#) button to proceed to copy the alerts from the source object to all objects of the same type in, or under those objects selected on the [Copy Alert Configuration](#) dialog.

## Audit Log Alerting

PEM provides alert templates that allow you to use the [Alerting](#) dialog to create an alert that will trigger when an [ERROR](#) or [WARNING](#) statement is written to a log file for a specific server or agent. To open the [Alerting](#) dialog, highlight the name of the server or agent in the PEM client Object browser tree control, and select [Alerting...](#) from the [Management](#) menu.

To create an alert that will notify you of ERROR or WARNING messages in the log file for a specific server, create an alert that uses one of the following alert templates:

Number of ERRORS in the logfile on server M in last X hours

Number of WARNINGS in the logfile on server M in last X hours

Number of ERRORS or WARNINGS in the logfile on server M in last X hours

To create an alert that will notify you of ERROR or WARNING messages for a specific agent, create an alert that uses one of the following alert templates:

Number of ERRORS in the logfile on agent M in last X hours

Number of WARNINGS in the logfile on agent M in last X hours

Number of ERRORS or WARNINGS in the logfile on agent M in last X hours

Please note that this functionality is supported only on Advanced Server.

### Creating an Email Group

Postgres Enterprise Manager monitors your system for conditions that require user attention. You can use an email group to specify the email addresses of users that the server will notify if current values deviate from threshold values specified in an alert definition. An email group has the flexibility to notify multiple users, or target specific users during user-defined time periods.

Please note that you must configure the PEM Server to use an SMTP server to deliver email before PEM can send email notifications.

Use the **Email Groups** tab to configure groups of SMTP email recipients. To access the **Email Groups** tab, select **Manage Alerts...** from the PEM client's **Management** menu; when the **Manage Alerts** tab opens, select **Email Groups** from the Quick Links toolbar.

Group Name	
<input checked="" type="checkbox"/>	<Default>
<input checked="" type="checkbox"/>	email_group1
<input checked="" type="checkbox"/>	email_group2

The **Email Groups** tab displays a list of the currently defined email groups. Highlight a group name and click the Edit icon (at the far left end of the row) to modify an existing group.

To define a new email group, click the Add icon (+) in the upper-right corner of the **Email Groups** table. The **Email Group** definition dialog opens.

Email group options specify email notifications will be delivered to a specific group member (or members) during a selected time period.

- To addresses: Enter a comma-delimited list of recipient addresses in the To addresses field.
- Reply to addresses: Enter a comma-delimited list of recipient addresses in the Reply to addresses field.
- CC addresses: Enter a comma-delimited list of addresses that will receive a copy of the email in the CC addresses field.
- BCC addresses: Enter a comma-delimited list of addresses that will receive a copy of the email (without the knowledge of other recipients) in the BCC addresses field.
- From address: Enter the email address that messages to this group should be sent from in the From address field.
- Subject prefix: Enter the email subject prefix to this group in the Subject prefix field.
- From time/To time(HH:MM::SS): Use the From time and To time hour selectors to select a time range for a group member (or members). When a notification is sent, the server will evaluate the times specified within the group list and send the message to those members whose group entries include the current time. Provide the From time and To time values in the locale of the PEM client host, and the PEM server will translate the time into other time zones as required.

Use the **Email Group** dialog to define an email group and its members:

- Provide a name for the email group in the **Group Name** field.

Each row within the email group definition will associate a unique set of email addresses with a specific time period. When an alert is triggered, the server will evaluate the times specified in each row and send the message to those group members whose definitions are associated with the time that the alert triggered.

Click the Add icon (+) in the group members table to open the **Options** tab, and add the member addresses that will receive notifications for the time period specified:

- Enter a comma-delimited list of recipient addresses in the **Reply to Addresses** field.
- Enter a comma-delimited list of addresses that will receive a copy of the email in the **CC Addresses** field.
- Enter a comma-delimited list of addresses that will receive a copy of the email (without the knowledge of other recipients) in the **Bcc Addresses** field.
- Enter the email address that messages to this group should be sent from in the **From Address** field.
- Use the **Subject prefix** field to provide a message that will be added to the start of each subject line when a notification is sent.
- Use the **From Time** and **To Time** time selectors to specify the time range for notifications to the group member(s) that are identified on this row. Provide the From Time and To Time values in the locale of the PEM client host, and the PEM server will translate the time into other time zones as required.

When you've identified the member or members that will receive an email during a specific time period, click the Add icon to add a row to the table, and specify another time period and the email addresses that will be notified during those hours. When you've finished defining the email group, click the Save icon.

To delete an email group, highlight the name of the group in the **Email Group** table and click the Delete icon (located to the left of the group name).

Email Groups		
	Group Name	
<input checked="" type="checkbox"/>	<Default>	
<input checked="" type="checkbox"/>	email_group1	
<input checked="" type="checkbox"/>	email_group2	

The group name will be displayed in the [Email Group](#) table in red; click the [Save](#) icon to make the change persistent and remove the group from the table.

After creating the email group, you can use the [Manage Alerts](#) tab to set up the [Notification](#) details for an alert that will direct notifications to the group.

## Using PEM with Nagios

The PEM server can send a passive alert result to Nagios network-alerting software when a user-defined alert is triggered. To instruct the PEM server to notify Nagios of a triggered alert, you must:

- Enable Nagios notification for each alert that will trigger a notification from the PEM server to Nagios. Please note that PEM alerting must be configured before you create the `host.cfg` file, the `services.cfg` file, or configure Nagios.
- Configure Nagios-related behaviors of the PEM server.
- Create the `host.cfg` and `services.cfg` configuration files.
- If necessary, modify the Nagios configuration file and restart the server.

After configuring the server to enable Nagios alerting, any triggered alerts will send a passive check result to the Nagios service. The syntax of a passive alert is:

```
<timestamp> PROCESS_SERVICE_CHECK_RESULT; <host_name> ; <service_name> ; <service_status>
;
```

Where:

*timestamp* is the date and time that the alert was triggered.

*host\_name* is the name of the server or agent.

*service\_name* is the name of the alert.

*service\_status* is the numeric service status value:

- 0 if the service status is OK
- 1 if the service status is WARNING
- 2 if the service status is CRITICAL
- 3 if the service status is UNKNOWN

The PEM server uses the following rules to evaluate the service status:

- If the PEM alert level is CLEARED, the warning message will read OK.
- If the PEM alert level is LOW, the warning message will read WARNING.
- If the `is_nagios_medium_alert_as_critical` flag (specified in the PEM server configuration dialog) is set to FALSE and the alert level MEDIUM, the warning message will read WARNING.
- If the `is_nagios_medium_alert_as_critical` flag (specified in the PEM server configuration dialog) is set to TRUE and the alert level is MEDIUM, the warning message will read CRITICAL.
- If the PEM alert level is HIGH, the warning message will read CRITICAL.

## Enabling Nagios Notification for an Alert

The PEM server maintains a unique set of notification properties for each enabled alert. Use the **Notification** tab of the **Manage Alerts** tab to specify that (when triggered), a given alert will send an alert notice to Nagios.

To modify the notification properties of an alert, right-click on the name of the object monitored by the alert, and select **Manage Alerts...** from the **Management** menu. When the **Manage Alerts** tab opens, locate the alert, and then click the edit button to the left of the alert name in the **Alerts** list. When the edit pane opens, select the **Notification** tab.

To configure notifications for an alert, use the fields in the Email notification box to specify the user or user group that will receive an email notification if the alert is triggered at the specified level. Use the drop-down listbox to select a pre-defined group that will be sent a notification if an alert of the selected level is triggered. Please note that you must configure the PEM Server to use an SMTP server to deliver email before PEM can send email notifications.

Use the Trap notification options to configure trap notifications for this alert. Note that you must configure the PEM Server to send notifications to an SNMP trap/notification receiver before notifications can be sent.

To enable Nagios notification, move the slider next to **Submit passive service check result to Nagios?** to **Yes**; before exiting the **Manage Alerts** tab, click the save icon to preserve your changes.

## Configuring Nagios-related behavior of the PEM Server

You can use the **Server Configuration** dialog to provide information about your Nagios configuration to the PEM server. To open **Server Configuration** dialog, select **Server Configuration...** from the PEM client's **Management** menu.

Server Configuration		
<input type="text"/> Search by parameter name		
nagios_cmd_file_name	/usr/local/nagios/var/rw/nagios.cmd	
nagios_enabled	<input checked="" type="checkbox"/> True	t/f
nagios_medium_alert_as_critical	<input type="checkbox"/> False	t/f
nagios_spool_retention_time	7	days
package_catalog_xml	https://sbp.enterprisedb.com/applications.xml	
package_download_chunk_size	1048576	Bytes
probe_log_retention_time	30	days
proxy_server	127.0.0.1	
proxy_server_authentication	<input type="checkbox"/> False	t/f
proxy_server_enabled	<input type="checkbox"/> False	t/f
proxy_server_password		
proxy_server_port	80	
proxy_server_username		
reminder_notification_interval	24	hours

Four server configuration parameters specify information about your Nagios installation and PEM server behavior related to Nagios:

- Use the `nagios_cmd_file_name` parameter to specify the location of the Nagios pipeline file that will receive passive check alerts from PEM. The default value of this parameter is `/usr/local/nagios/var/rw/nagios.cmd`. If your `nagios.cmd` file resides in an alternate location, specify the file location in the Value field.
- Move the slider in the `nagios_enabled` parameter to `Yes` to instruct the PEM server to send passive check alerts to Nagios.
- Use the `nagios_medium_alert_as_critical` slider to specify the warning severity that the PEM server will pass to Nagios if a medium alert is triggered:

If the `is_nagios_medium_alert_as_critical` flag is set to FALSE and the alert level is MEDIUM, the warning message will read WARNING.

If the `is_nagios_medium_alert_as_critical` flag is set to TRUE and the alert level is MEDIUM, the warning message will read CRITICAL.

- Use the `nagios_spool_retention_time` parameter to specify the number of days of notification history that will be stored on the PEM server. The default value is 7 days.

After modifying parameter values, click the save icon (in the upper-right corner of the `Server Configuration` dialog) to preserve your changes.

## Creating the hosts.cfg and services.cfg File

The `templates.cfg` file (by default, located in `/usr/local/nagios/etc/objects`) specifies the properties of a generic-host and generic-service. The properties specify the parameters used in the `hosts.cfg` and `services.cfg` files.

In most cases (when PEM is installed in a default configuration), you will not be required to modify the `templates.cfg` file before creating the `hosts.cfg` and `services.cfg` files. If necessary, you can modify the `templates.cfg` file to specify alternate values for parameters or to create new templates.

Before modifying the Nagios configuration file, use the following command to create a `hosts.cfg` file that contains information about the PEM hosts that reside on the local system:

```
psql -U postgres -p 5433 -d pem -A -t -c "select pem.create_nagios_host_config('generic-host')" > /usr/local/nagios/etc/objects/hosts.cfg
```

Then, use the following command to create a `services.cfg` file that contains information about the PEM services that reside on the local system:

```
psql -U postgres -p 5433 -d pem -A -t -c "select pem.create_nagios_service_config('generic-service')" > /usr/local/nagios/etc/objects/services.cfg
```

If you wish to use a `custom template.cfg` file entry, specify the entry name in place of generic-host or generic-service in the above commands.

### Modifying the Nagios Configuration File

After creating the `host.cfg` and `services.cfg` files, you must specify their location in the Nagios configuration file (by default, `/usr/local/nagios/etc/nagios.cfg`). Modify the configuration file, adding entries that specify the location of the files:

```
cfg_file=/usr/local/etc/objects/hosts.cfg
```

```
cfg_file=/usr/local/etc/objects/services.cfg
```

You can use the following command to confirm that Nagios is properly configured:

```
/usr/local/nagios/bin/nagios -v /usr/local/nagios/etc/nagios.cfg
```

After confirming that Nagios is configured correctly, restart the Nagios service:

```
/usr/local/nagios/bin/nagios -d /usr/local/nagios/etc/nagios.cfg
```

## 4.5 Capacity Manager

PEM's Capacity Manager analyzes collected statistics (metrics) to generate a graph or table that displays the historical usage statistics of an object, and can project the anticipated usage statistics for an object. You can configure Capacity Manager to collect and analyze metrics for a specific host, server, database, or database object.

You can tailor the content of the Capacity Manager report by choosing a specific metric (or metrics) to include in the report, the time range over which the metrics were gathered, and a high or low threshold for the metrics analyzed. You can also specify a start and end date for the Capacity Manager report. If the end date of the report specifies a time in the future, Capacity Manager will analyze the historical usage of the selected object to extrapolate the projected object usage in the future.

To open Capacity Manager, select the `Capacity Manager...` option from the PEM client `Management` menu; the Capacity Manager wizard opens, displaying a tree control on the `Metrics` tab.

Capacity Manager

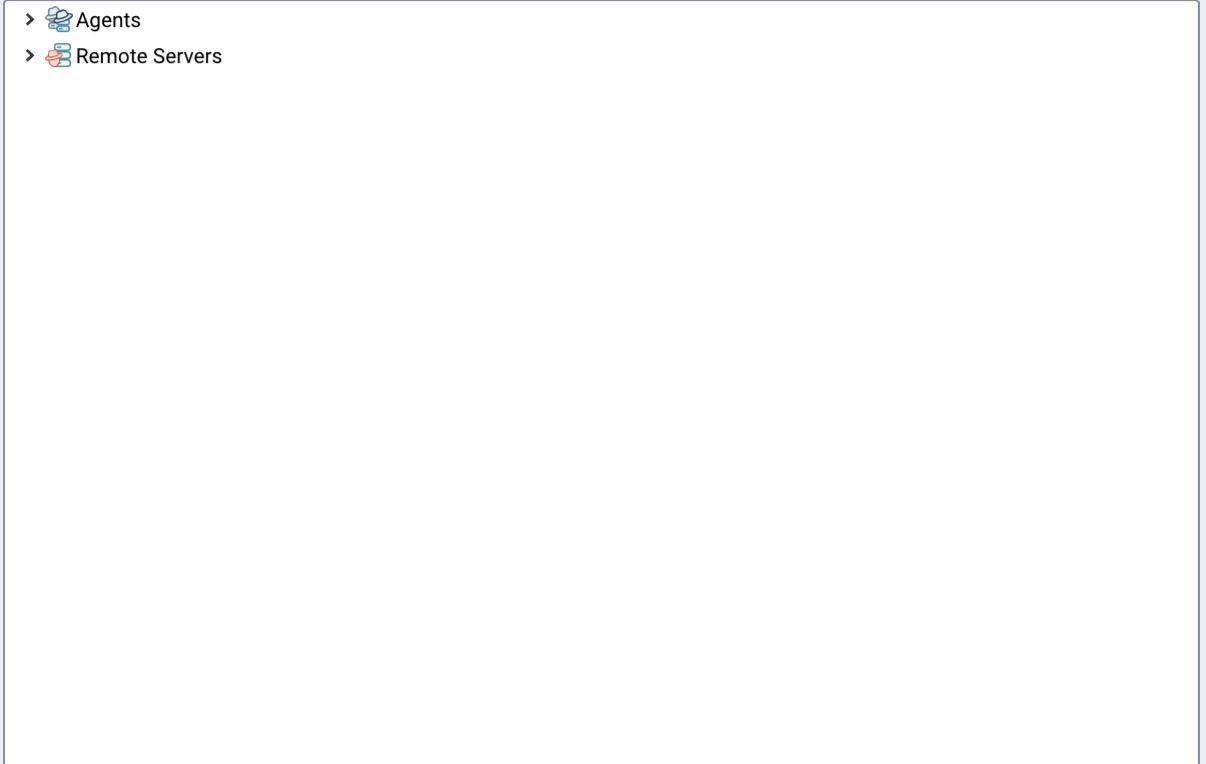
Metrics Options

- > Agents
- > Remote Servers

Aggregation Average ▾

Graph/chart metrics individually?  No

Save Template Load Template Manage Templates Reset Metrics Generate



Expand the tree control on the **Metrics** tab to review the metrics for the node that you wish to analyze. Check the box to the left of the name of the metric to include the metric in your report.

The screenshot shows the 'Capacity Manager' interface with the 'Metrics' tab selected. The left sidebar lists 'Agents' under 'Postgres Enterprise Manager Host', which further branches into 'Metrics'. A detailed list of metrics is shown, including various disk, memory, and network metrics. At the bottom of the screen, there are buttons for 'Aggregation' (set to 'Average'), 'Graph/chart metrics individually?' (set to 'No'), and several other options like 'Save Template', 'Load Template', 'Manage Templates', 'Reset Metrics', and 'Generate'.

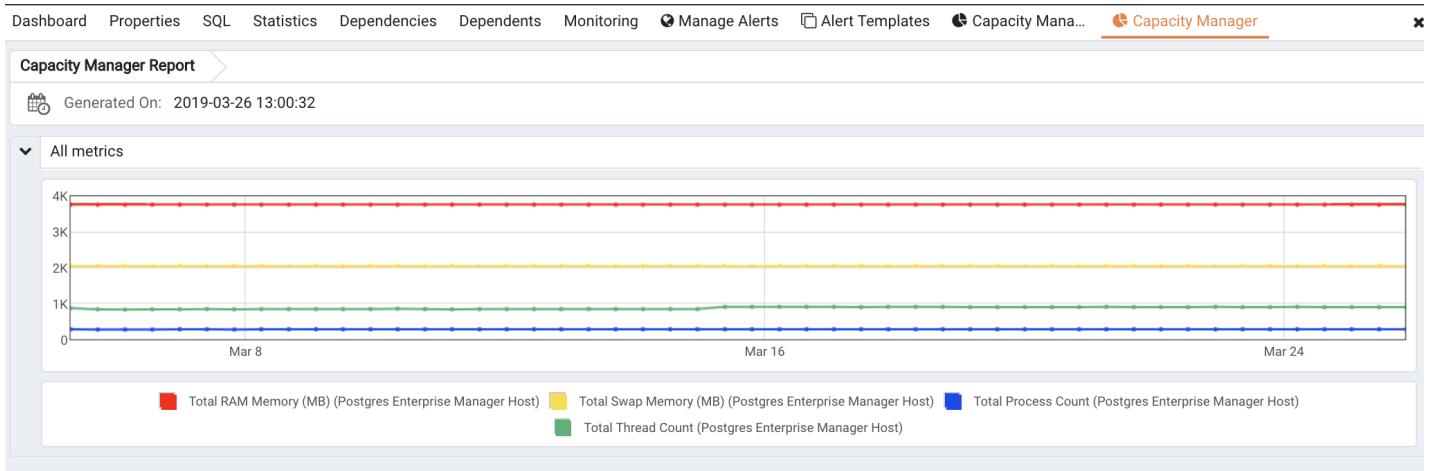
Capacity Manager will use the aggregation method specified with the Aggregation drop-down listbox (located at the bottom of the Metrics tab). The aggregation method instructs Capacity Manager how to evaluate and plot the metric values. Select from:

- **Average**: Use the average of the values recorded during the time period.
- **Maximum**: Use the maximum value recorded during the time period.
- **Minimum**: Use the minimum value recorded during the time period.
- **First**: Use the first value recorded during the time period.

To remove a metric from the Capacity Manager report, uncheck the box to the left of the name of a metric.

Move the slider next to **Graph/chart metrics individually?** to **Yes** to instruct Capacity Manager to produce a separate report for each metric selected on the Metrics tab. If the option is set to No, all selected metrics will be merged into a single graph or table.

Click the **Generate** button to display the report onscreen (accepting the default configuration options), or use the Options tab to customize sampling boundaries, report type and report destination. Please note that the times displayed on the Options tab are the time zone in which the PEM client resides.



Use the fields within the **Time Period** box to define the boundaries of the Capacity Manager report:

- Use the **Period** drop-down listbox to select the type of time period you wish to use for the report. You can select:

<b>Start time and end time</b>	Specify a start date and an end date/time for the report.
<b>Start time and threshold</b>	Specify a start date and time, and a threshold to determine the end time and date for the report.
<b>Historical days and extrapolated days</b>	Specify a start date for the report that is a number of days in the past, and an end date that is a number of days in the future. This option is useful for report templates that do not specify fixed dates.
<b>Historical days and threshold</b>	Specify a start date that is a number of days in the past, and end it when a threshold value is reached.

After specifying the type of time period for the report, select from other options in the Time Period box to define the time period for the report:

- Use the date and time selectors next to the **Start time** field to specify the starting date and time of the sampling period, or select the number of Historical day(s) of data to include in the report. The date and time specified in the Start time field must not be later than the current date/time.

By default, Capacity Manager will select a start time that is one week prior to the current date and time.

- The end boundary for the report can be a time, a number of days in the future, or the point at which a selected metric reaches a user-specified threshold value. Use the date and time selectors next to the **End time** field to specify an end boundary for the report, or select the number of Extrapolated day(s) of data to include in the report. The time specified in the End time field must be later than the time specified in the Start time field.

Note that if you select an end date and time in the future, Capacity Manager will use historical usage information to extrapolate anticipated future usage. Since the projected usage is based on the sampling of historical data, the accuracy of the future usage trend will improve with a longer sampling period.

To specify a threshold value, use the drop-down listbox in the Threshold field to select a metric, an operator (Exceeds or Falls below), and enter a target value for the metric. If you choose to define the end of the report using a threshold, the Capacity Manager report will terminate when the value for the selected metric exceeds or falls below the specified value.

The `cm_max_end_date_in_years` configuration parameter defines a default time value for the end boundary of a Capacity Manager report. If you specify a threshold value as the end boundary of a report, and the anticipated usage of the boundary is not met before the maximum time has passed, the report will terminate at the time specified by the `cm_max_date_in_years` parameter. By default, `cm_max_end_date_in_years` is 5; you can use the Server Configuration dialog to modify the value of `cm_max_end_date_in_years`.

The fields in the **Report** box specify the report type and destination. Use the **Include on report** radio buttons to specify the type of report produced by Capacity Manager:

- Select **Graph** to instruct Capacity Manager to display the report in the form of a line graph in the PEM client window.
- Select **Table of data** to instruct Capacity Manager to display a table containing the report data in the PEM client window.
- Select **Graph and table of data** to instruct Capacity Manager to display both a line graph and a data table in the PEM client window.

Use the **Report destination** radio buttons to instruct Capacity Manager where to display or save the report:

- Select **New** tab to instruct Capacity Manager to display the report on a new tab in the PEM client. You must select New tab to display the first generation of a Capacity Manager report; for subsequent reports, you may select Previous tab.
- Select **Previous** tab to instruct Capacity Manager to re-use a previously opened tab when displaying the report.
- Select **Download** the report as a file and specify a file name to instruct Capacity Manager to write the report to the specified file.

When you have specified the report boundaries and selected the type and destination of the Capacity Manager report, click the **Generate** button to create the report.

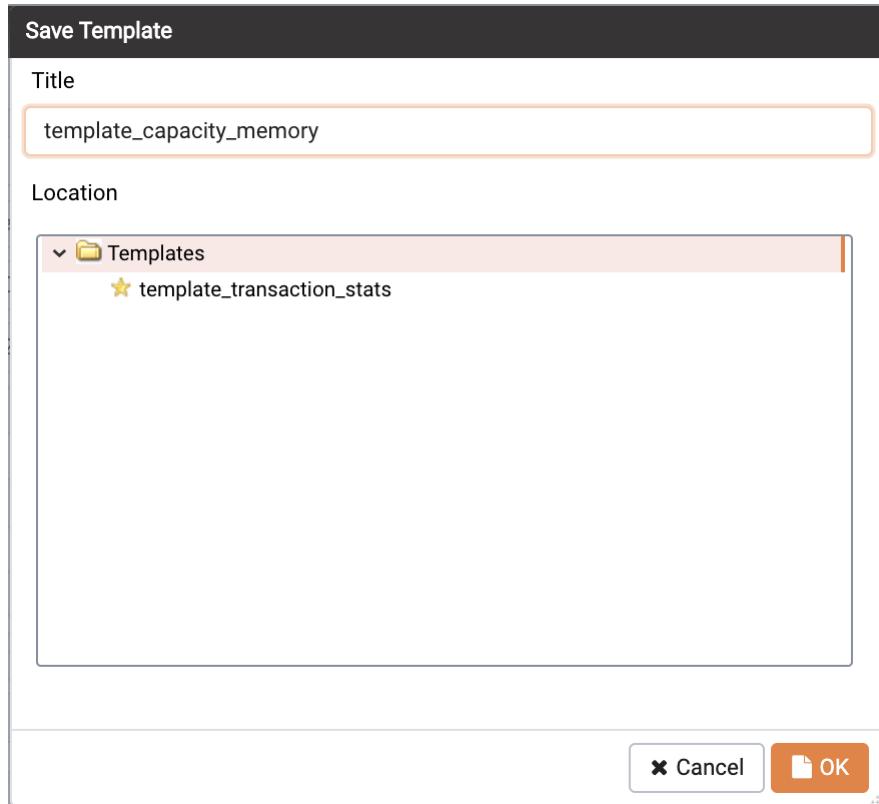


Reports saved to file are stored in HTML format. You can review a Capacity Manager report with any web browser that supports Scalable Vector Graphics (SVG). Browsers that do not support SVG will be unable to display a Capacity Manager graph and may include unwanted characters.

## Capacity Manager Templates

After defining a report, you can save the definition as a template for future reports. Capacity Manager report templates may be accessed by all PEM users. To save a report definition as a template:

1. Use the **Metrics and Options** tabs to define your report.
2. Click the **Save** button to open the **Save Template** dialog.



1. Provide a report name in the **Title** field, select a location to store the template in the tree control.
2. Click **OK**.

When creating a report, you can use the **Load Template** button to browse and open an existing template. Once opened, the report definition may be modified if required, and optionally saved again, either as a new template, or overwriting the original template.

Use the **Manage Templates** button open a dialog that allows you to rename or remove unwanted templates.

## 4.6 Audit Manager

You can use the PEM Audit Manager to simplify audit log configuration for Advanced Server instances. With the Audit Manager, you can configure logging attributes such as:

- How often log files are to be collected by PEM
- The type of database activities that are included in the log files
- How often (and when) log files are to be rotated

Audit logs may include the following activities:

- All connections made to the database instance
- Failed connection attempts
- Disconnections from the database instance
- All queries (SELECT statements)
- All DML statements (INSERT, UPDATE, DELETE)
- All DDL statements (e.g., CREATE, DROP, ALTER)

Once the audit logs are stored on the PEM server, you can use the Audit Log dashboard to review the information in an easy-to-read form. The Audit Log dashboard allows you to filter the log file by timestamp range (when an activity occurred), the database on which the activity occurred, the user performing the activity, or the type of

command being invoked.

## Setting the Advanced Server Instance Service ID

To configure logging for an Advanced Server instance, the server must be a PEM-managed server with a bound agent, and the server registration must include the name of a service script. When registering a new server, include the service name in the Service ID field on the Advanced tab of the New Server dialog.

Before adding a service name to an existing (registered and connected) server, you must disconnect the server. Right click on the server name, and select **Disconnect server** from the context menu. Then, right click on the server name and select **Properties** from the context menu. Select the **Advanced** tab, and add a service name to the **Service ID** field.

The screenshot shows the EPAS configuration dialog with the Advanced tab selected. The Service ID field is populated with 'edb-as-11'. Other fields like Host address, DB restriction, and Connection timeout are also visible. The bottom right corner features standard dialog buttons: Cancel, Reset, and Save.

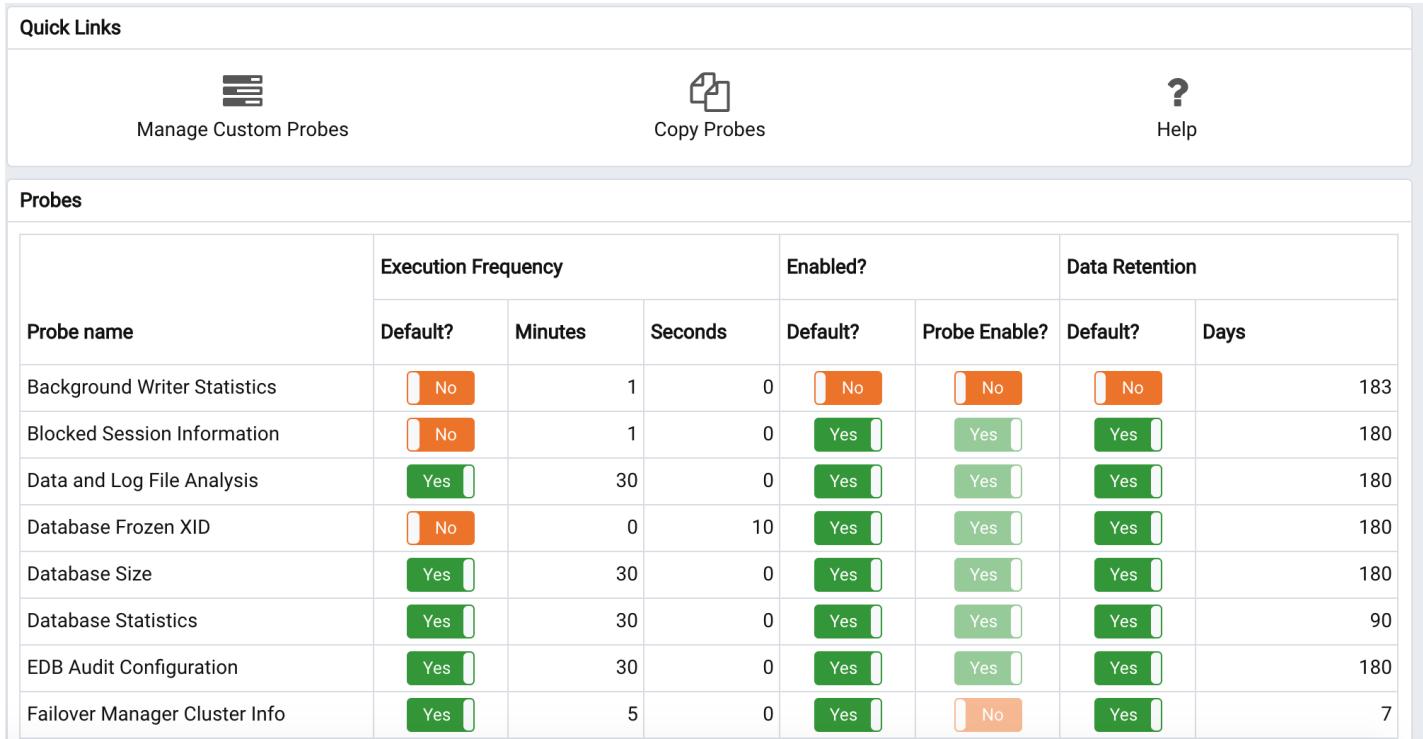
The Service ID field allows the PEM server to stop and start the service.

- The name of the Advanced Server 11 service script is `edb-as-11`.
- The name of the Advanced Server 10 service script is `edb-as-10`.
- The name of the Advanced Server 9.6 service script is `edb-as-9.6`.
- The name of the Advanced Server 9.5 (or prior) service script is `ppas-9.x`, where *x* specifies the version.
- The name of the PostgreSQL 9.6 service script is `postgresql-11`.
- The name of the PostgreSQL 9.6 service script is `postgresql-10`.
- The name of the PostgreSQL 9.6 service script is `postgresql-9.6`.

## Setting the EDB Audit Configuration Probe

Before configuring audit logging of Advanced Server servers, you must ensure that the EDB Audit Configuration probe is enabled. To open the **Manage Probes** tab and check the status of the probe, right click on the name of a registered Advanced Server server in the tree control, and select **Manage Probes...** from the **Management** menu.

Ensure that the **Enabled** column in the **Probe Configuration** dialog is set to **Yes** for the **EDB Audit Configuration probe**.



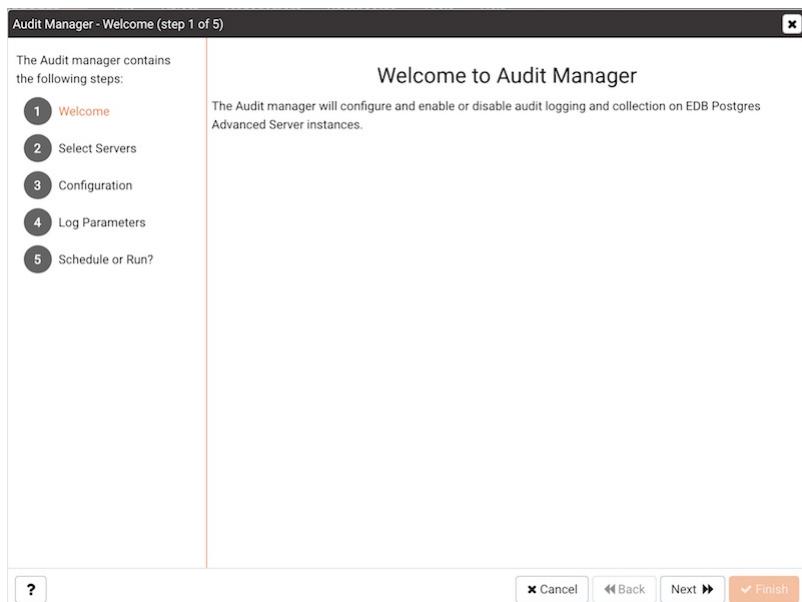
The screenshot shows the 'Probes' configuration page. At the top, there are three buttons: 'Manage Custom Probes' (with a gear icon), 'Copy Probes' (with a clipboard icon), and 'Help' (with a question mark icon). Below this is a table titled 'Probes' with the following columns: Probe name, Execution Frequency (Default?, Minutes, Seconds), Enabled? (switch), and Data Retention.

Probe name	Execution Frequency			Enabled?		Data Retention	
	Default?	Minutes	Seconds	Default?	Probe Enable?	Default?	Days
Background Writer Statistics	<input type="checkbox"/> No	1	0	<input type="checkbox"/> No	<input type="checkbox"/> No	<input type="checkbox"/> No	183
Blocked Session Information	<input type="checkbox"/> No	1	0	<input checked="" type="checkbox"/> Yes	<input checked="" type="checkbox"/> Yes	<input checked="" type="checkbox"/> Yes	180
Data and Log File Analysis	<input checked="" type="checkbox"/> Yes	30	0	<input checked="" type="checkbox"/> Yes	<input checked="" type="checkbox"/> Yes	<input checked="" type="checkbox"/> Yes	180
Database Frozen XID	<input type="checkbox"/> No	0	10	<input checked="" type="checkbox"/> Yes	<input checked="" type="checkbox"/> Yes	<input checked="" type="checkbox"/> Yes	180
Database Size	<input checked="" type="checkbox"/> Yes	30	0	<input checked="" type="checkbox"/> Yes	<input checked="" type="checkbox"/> Yes	<input checked="" type="checkbox"/> Yes	180
Database Statistics	<input checked="" type="checkbox"/> Yes	30	0	<input checked="" type="checkbox"/> Yes	<input checked="" type="checkbox"/> Yes	<input checked="" type="checkbox"/> Yes	90
EDB Audit Configuration	<input checked="" type="checkbox"/> Yes	30	0	<input checked="" type="checkbox"/> Yes	<input checked="" type="checkbox"/> Yes	<input checked="" type="checkbox"/> Yes	180
Failover Manager Cluster Info	<input checked="" type="checkbox"/> Yes	5	0	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes	7

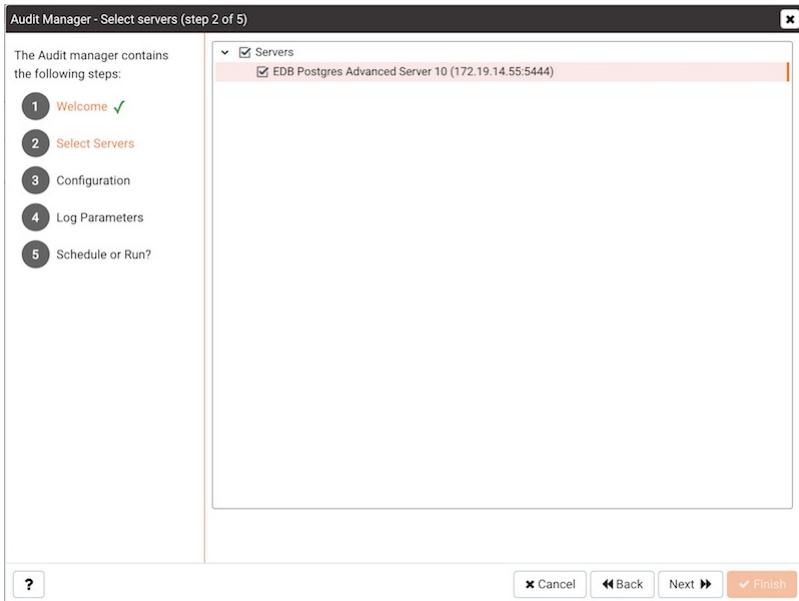
If EDB Audit Configuration is not enabled, use the **Enabled?** switch on the Manage Probes tab to enable it.

## Configuring Audit Logging with the Audit Manager

To open the **Audit manager** wizard, select **Audit Manager...** from the **Management** menu. The **Audit manager - Welcome** dialog opens.



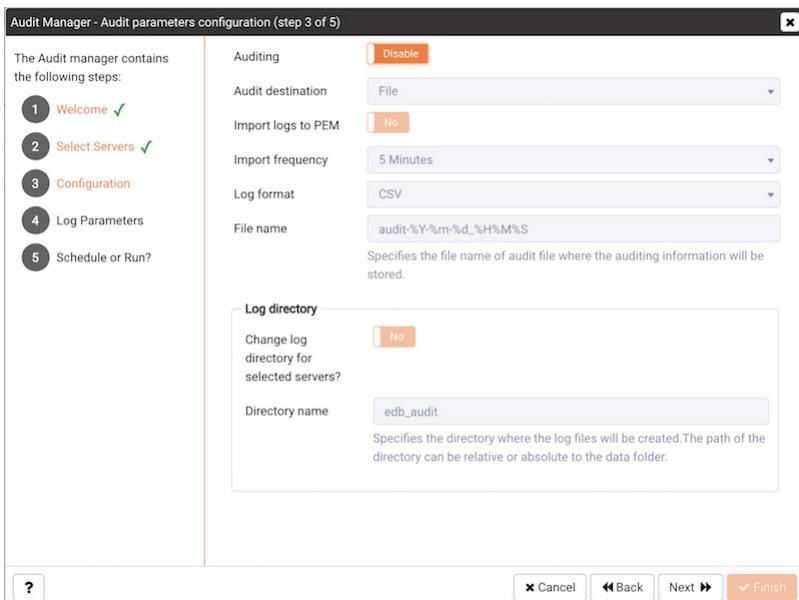
Click **Next** to continue.



Use the Select servers tree control to specify the servers to which the auditing configuration will be applied. To make a server available in the tree control, you must provide the **Service ID** on the **Advanced tab** of the **Create – Server** dialog when registering a server for monitoring by PEM. Note that only EDB Postgres Advanced Server supports auditing; PostgreSQL servers will not be included in the tree control.

Click **Next** to continue.

The **Auditing Parameters Configuration** dialog lets you enable or disable auditing and choose how often log records are collected into PEM.



Use the fields on the **Auditing parameters configuration** dialog to specify auditing preferences:

- Use the **Auditing** switch to Enable or Disable auditing on the specified servers.
- Use the **Audit destination** drop-down to select a destination for the audit logs; select File or Syslog. Please note this feature is supported on Advanced Server 10 and newer releases only.
- Use the **Import logs to PEM** switch to instruct PEM to periodically import log records from each server to the PEM Server. Set the switch to Yes to import log files; the default is No.
- Use the **Collection frequency** drop-down listbox to specify how often PEM will collect log records from monitored servers when log collection is enabled.

- Use the **Log format** drop-down listbox to select the raw log format that will be written on each server. If log collection is enabled, the PEM server will use CSV format.
- Use the **File name** field to specify the format used when generating log file names. By default, the format is set to `audit-%Y-%m-%d_%H%M%S` where:

**audit** is the file name specified in the Audit Directory Name field

**Y** is the year that the log was stored

**m** is the month that the log was stored

**d** is the day that the log was stored

**H** is the hour that the log was stored

**M** is the minute that the log was stored

**S** is the second that the log was stored

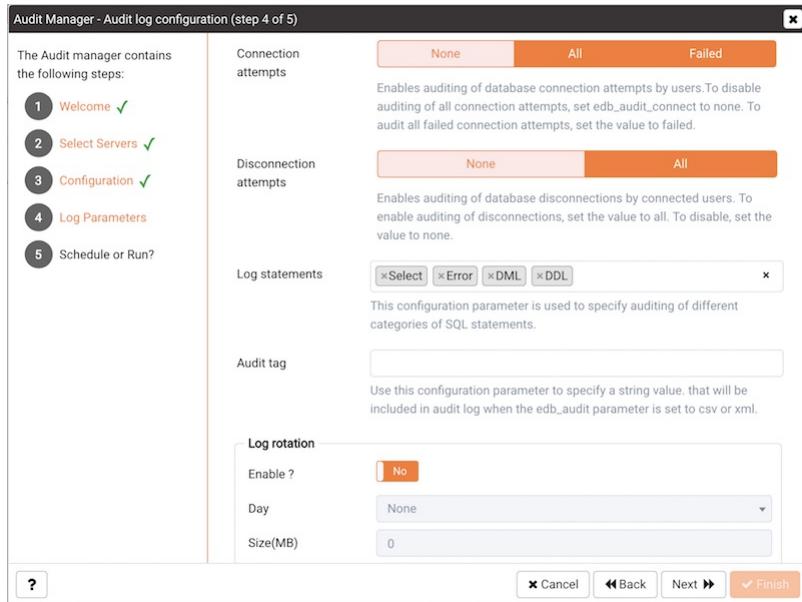
- Check the box next to **Change Log Directory for selected servers?** and use the **Audit Directory Name** field to specify a directory name to which the audit logs will be written. The directory will reside beneath the data directory on the PEM server.

Use fields in the **Log directory** box to specify information about the directory in which the log files will be saved:

- Move the **Change log directory for selected servers?** switch to Yes to enable the Directory name field.
- Use the **Directory name** field to specify the name of the directory on each server into which audit logs will be written. The directory specified will be created as a sub-directory of the data directory on the server.

Click **Next** to continue.

The **Audit log configuration** dialog is only available if you have enabled auditing on the Auditing parameters configuration dialog.



Use the controls on the **Audit log configuration** dialog to specify log configuration details that will be applied to each server:

- Use the **Connection attempts** switch to specify if connection attempts should be logged:

**None** to disable connection logging.

**All** to indicate that all connection attempts will be logged.

**Failed** to log any connection attempts that fail.

- Use the **Disconnection attempts** switch to specify if disconnections should be logged. Specify:

**None** to specify that disconnections should not be logged.

**All** to enable disconnection logging.

- Use the **Log statements** field to specify the statement types that will be logged. Click within the field, and select from:

**Select** - All statements that include the **SELECT** keyword will be logged.

**Error** - All statements that result in an error will be logged.

**DML** - All DML (Data Modification Language) statements will be logged.

**DDL** - All DDL (Data Definition Language) statements (those that add, delete or alter data) will be logged.

Check the box next to **Select All** to select all statement types.

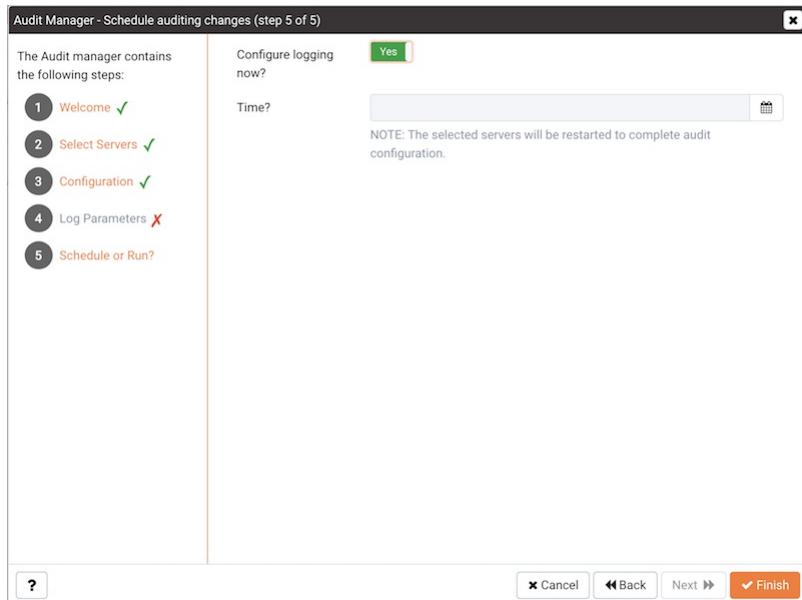
Check the box next to **Unselect All** to deselect all statement types.

- Use the **Audit tag** field to specify a tracking tag for the collected logs. Please note that audit tagging functionality is available only for Advanced Server versions 9.5 and later. If you are defining auditing functionality for multiple servers, and one or more of the servers are version 9.5 or later, this field will be enabled, but if selected, tagging functionality will only apply to those servers that are version 9.5 or later.

Use the fields in the **Log rotation** box to specify how the log files are managed on each server:

- Use the **Enable?** switch to specify that logfiles should be rotated. Please note that a new log file should be used periodically to prevent a single file becoming unmanageably large.
- Use the **Day drop-down** listbox to select a day or days on which the log file will be rotated.
- Use the **Size (MB)** field to specify a size in megabytes at which the log file will be rotated.
- Use the **Time (seconds)** field to specify the number of seconds between log file rotations.

Click **Next** to continue:



Use the **Schedule Auditing Changes** dialog to determine when auditing configuration changes are to take effect.

- Select **Configure logging now?** if you want the auditing configuration changes to take place immediately. The affected database servers will be restarted so the auditing changes can take effect.
- Use the **Time?** selector to schedule the auditing configuration changes to take place at some point in the future. Select the desired date and time from the drop-down lists. The affected database servers will be restarted at the specified date/time to put the auditing changes into effect.

Click **Finish** to complete the auditing configuration process.

The Audit Manager will schedule a job to apply the configuration to each server. The job will consist of two tasks: one to update the audit logging configuration on the server, and one to restart the server with the new configuration.

You can use the **Scheduled Tasks** tab to review a list of Scheduled jobs. To open the **Scheduled Tasks** tab, highlight the name of a server or agent and select **Scheduled Tasks...** from the **Management** menu.

## Viewing the Log with the Audit Log Dashboard

Use the Audit Log dashboard to view the audit log from Advanced Server database instances.

To open the **Audit Log** dashboard, right click on a server or agent node, and select **Audit Log Analysis** from the **Dashboards** menu. You can also open the Audit Log dashboard by navigating through the **Dashboards** menu (located on the **Management** menu).

Audit Logs											
ID	Agent	Server	Timestamp	User Name	Database Name	Process ID	Session ID	Transaction ID	Connection From	Command	Message
5656	Postgres Enterprise Manager Host	EDB Postgres Advanced Server 10	3/20/2019, 2:40:01 PM	enterprisedb	edb	48258	5c920369.bc82	0	127.0.0.1:43378	idle	disconnection: session time: 0:00:00.004 user=enterprisedb database=edb host=127.0.0.1 port=43378
5655	Postgres Enterprise Manager Host	EDB Postgres Advanced Server 10	3/20/2019, 2:40:01 PM	enterprisedb	edb	48258	5c920369.bc82	0	127.0.0.1:43378	authentication	connection authorized: user=enterprisedb database=edb
5654	Postgres Enterprise Manager	EDB Postgres Advanced	3/20/2019, 2:40:01 PM	enterprisedb	edb	48256	5c920369.bc80	0	127.0.0.1:43374	idle	disconnection: session time: n:n:n n:n:n

The Audit Log dashboard displays the audit records in reverse chronological order (newest records at the top, oldest records towards the bottom).

To view older audit records that do not appear in the window, use the vertical scroll bar controlling the list of audit records (the innermost scroll bar of the two located on the right-hand side of the window). As you move the scroll bar towards the bottom of the window, older audit records are continuously loaded and displayed.

You can use filtering to limit the number of audit records that are displayed. Click **Show Filters** to expose the filters panel.

Start	End	User	Database	Command type
2019-03-19		postgres	postgres	idle

Use the fields in the **filters panel** to provide certain selection criteria for the audit records you wish to display.

- Use the **Start** field to specify a start date for the report. Click the mouse button in the field to open a calendar and select a start date.
- Use the **End** field to specify an end date for the report. Click the mouse button in the field to open a calendar and select an end date.
- Use the **User** field to display only those entries where the activity was initiated by the given Postgres user.
- Use the **Database** field to display only those entries where the activity was issued on the given database.
- Use the **Command type** field to display only those entries where the activity was of the given type. Command types you can specify are idle, authentication, and SELECT. (For viewing SQL statements from user applications, specify the idle command type.)

Click **Filter** to apply the filtering criteria to the log entries.

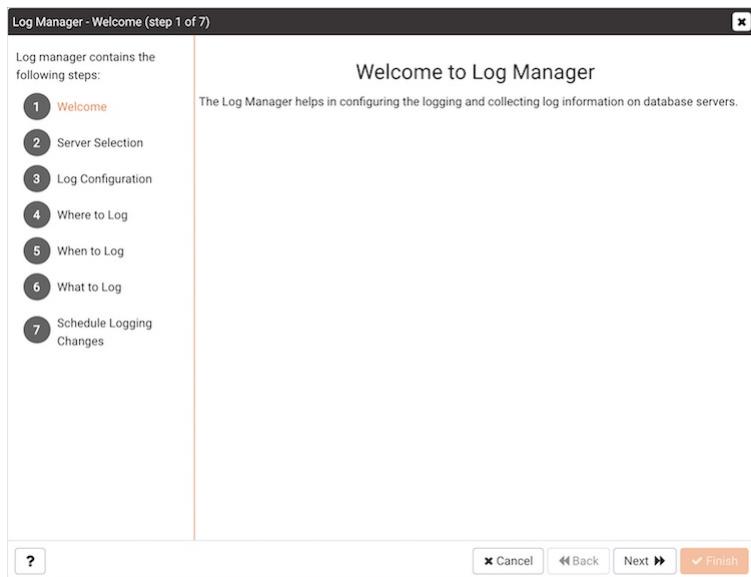
## 4.7 Log Manager

You can use the PEM Log Manager to simplify server log configuration for Postgres instances. With the Log Manager, you can modify all of your server log parameters with a click:

- Where log files are written
- How often log files are written
- The type of information written to log files
- The format of log file entries
- Log rotation properties

To configure logging for a Postgres instance, the server must be registered as a PEM-managed server, and the registration information must include the name of a service script.

To open the **Log Manager**, select the **Log Manager...** option from the **Management** menu of the PEM client. The wizard opens, welcoming you to the Log Manager.



Click **Next** to continue to the **Server selection** dialog.



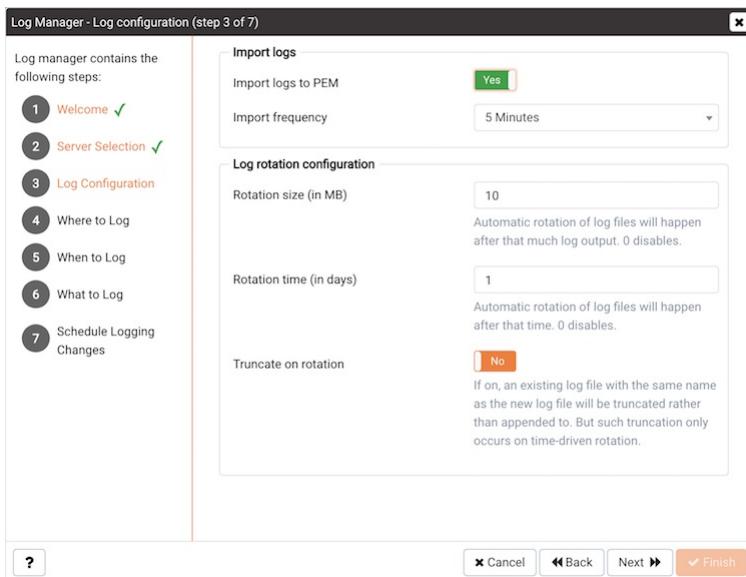
The **Server selection** dialog displays a list of the server connections monitored by PEM. Check the box next to the name of a server (or servers) to which the Log Manager wizard will apply the specified configuration. Log Manager is disabled for any server displaying a red exclamation mark to the left of its name in the Server selection tree control; there are several reasons that a server may not be enabled:

- Only a server that specifies a **Service ID** on the **Advanced** tab of the **Properties** dialog can be configured by Log Manager.

To provide a service ID, right click on the server name in the tree control, and select **Disconnect Server** from the context menu; if prompted, provide a password. Then, open the context menu for the server, and select **Properties**. Navigate to the **Advanced** tab, and provide the name of the service in the **Service ID** field; click **Save** to save your change and exit the dialog.

- If the PEM agent bound to the server does not have sufficient privileges to restart the server, the server will be disabled.
- If the PEM agent bound to the server is an older version than the associated PEM server, the server will be disabled.

Click **Next** to continue.



Use the options on the **Log configuration** dialog to specify how often log files will be imported to PEM and to specify log rotation details:

Options within the **Import Logs** box specify how often log files will be imported to PEM:

- Use the switch next to the **Import logs to PEM** label to specify if log files will be imported to PEM and displayed on the Server Log Analysis dashboard.
- Use the **Import Frequency** drop-down list box to specify how often log files are imported to PEM.

Use the fields in the **Log rotation configuration** box to specify the maximum length (lifespan or size) of a log file:

- Use the **Rotation Size** field to specify the maximum size in megabytes of an individual log file. The default value is 10 MB; when set to 0, no limit is placed on the maximum size of a log file.
- Use the **Rotation Time** field to specify the number of whole days that should be stored in each log file. The default value is 1 day.

Use the **Truncation on Rotation** switch to specify server behavior for time-based log file rotation:

- Select ON to specify that the server should overwrite any existing log file that has the same name that a new file would take.
- Select OFF to specify that the server should append any new log file entries to an existing log file with the same name that a new log file would take. This is the default behavior.

Click **Next** to continue.



Use the fields on the **Where to** log dialog to specify where log files should be written.

- Select an option from the **Log Destination** box to specify a destination for the server log output:
  - Set the **stderr** switch to Yes to specify that log files should be written to stderr.
  - Set the **csvlog** switch to Yes to specify that log files should be written to file in a comma-separated value format. This option is automatically enabled (and no longer editable) if you have selected Import logs to PEM on the Schedule dialog; if you are not importing server log files to PEM, this option is editable.
  - Set the **syslog** switch to Yes to specify that log files should be written to the system log files.
  - On Windows, set the **eventlog** switch to Yes to specify that log files should be written to the event log.
- Use the options within the **Log collection** box to specify your collection preferences:
  - Set the **Log Collector** switch to Enable to instruct the server to re-direct captured log messages (directed to STDERR) into log files.
  - Set the **Log Silent Mode** switch to Enable to instruct the server to run silently in the background, disassociated from the controlling terminal.
- Use options in the **Log Directory** box to specify log file location preferences:
  - Set the **Change log directory for selected servers?** switch to Yes to specify that each set of log files should be maintained in a separate directory.
  - Use the **Directory name** field to specify the directory to which log files will be written. The directory will reside beneath the pg\_log directory under the installation directory of the monitored server.

- Use the **Log File Name** field to specify a format for the log file name. If set to **DEFAULT**, the format is **enterprisedb-%Y-%m-%d\_%H%M%S**, where:
  - **enterprisedb** is the file name prefix
  - **Y** is the year that the log was stored
  - **m** is the month that the log was stored
  - **d** is the day that the log was stored
  - **H** is the hour that the log was stored
  - **M** is the minute that the log was stored
  - **S** is the second that the log was stored

When logging to syslog is enabled:

- Use the **Syslog Facility** drop-down list box to specify which syslog facility should be used.
- Use the **Syslog Ident** field to specify the program name that will identify Advanced Server entries in system logs.

Click **Next** to continue.



Use the fields on the **When to log** dialog to specify which events will initiate a log file entry. The severity levels (in order of severity, from most severe to least severe) are:

- **panic** - Errors that cause all database sessions to abort.
- **fatal** - Errors that cause a session to abort.
- **log** - Information messages of interest to administrators.
- **error** - Errors that cause a command to abort.
- **warning** - Error conditions in which a command will complete but may not perform as expected.
- **notice** - Items of interest to users. This is the default.
- **info** - Information implicitly requested by the user.
- **debug5** through **debug1** - Detailed debugging information useful to developers.
- Use the **Client min messages** drop-down list box to specify the lowest severity level of message sent to the client application.
- Use the **Log min messages** drop-down list box to specify the lowest severity level that will be written to the server log.
- By default, when an error message is written to the server log, the text of the SQL statement that initiated the log entry is not included. Use the **Log min error statement** drop-down list box to specify a severity level that will trigger SQL statement logging. If a message is of the specified severity or higher, the SQL statement that produced the message will be written to the server log.
- Use the **Log min duration statement** drop-down list box to specify a statement duration (in milliseconds); any statements that exceed the specified number of milliseconds will be written to the server log. A value of -1 disables all duration-based logging; a value of 0 logs all statements and their duration.
- Use the **Log temp files** field to specify a file size in kilobytes; when a temporary file reaches the specified size, it will be logged. A value of -1 (the default) disables this functionality.
- Use the **Log autoVacuum min duration** field to specify a time length in milliseconds; if auto-vacuuming

exceeds the length of time specified, the activity will be logged. A value of -1 (the default) disables this functionality.

Click **Next** to continue.



Use the fields on the **What to log** dialog to specify log entry options that are useful for debugging and auditing.

The switches in the **Debug options** box instruct the server to include information in the log files related to query execution that may be of interest to a developer:

- Set the **Parse tree** switch to Yes to instruct the server to include the parse tree in the log file.
- Set the **Rewriter output** switch to Yes to instruct the server to include query rewriter output in the log file.
- Set the **Execution plan** switch to Yes to instruct the server to include the execution plan for each executed query in the log file.

When the **Indent Debug Options Output in Log** switch is set to **Yes**, the server indents each line that contains a parse tree entry, a query rewriter entry or query execution plan entry. While indentation makes the resulting log file more readable, it does result in a longer log file.

Use the switches in the **General Options** box to instruct the server to include auditing information in the log file:

- Set the **Checkpoints** switch to Yes to include checkpoints and restartpoints in the server log.
- Set the **Connections** switch to Yes to include each attempted connection to the server (as well as successfully authenticated connections) in the server log.
- Set the **Disconnections** switch to Yes to include a server log entry for each terminated session that provides the session information and session duration.
- Set the **Duration** switch to Yes to include the amount of time required to execute each logged statement in the server log.
- Set the **Hostname** switch to Yes to include both the IP address and host name in each server log entry (by default, only the IP address is logged). Please note that this may cause a performance penalty.
- Set the **Lock Waits** switch to Yes to instruct the server to write a log entry for any session that waits longer than the time specified in the deadlock\_timeout parameter to acquire a lock. This is useful when trying to determine if lock waits are the cause of poor performance.

Use the **Error verbosity** drop-down list box to specify the detail written to each entry in the server log:

- Select **default** to include the error message, DETAIL, HINT, QUERY and CONTEXT in each server log entry.
- Select **terse** to log only the error message.
- Select **verbose** to include the error message, the DETAIL, HINT, QUERY and CONTEXT error information, SQLSTATE error code and source code file name, the function name, and the line number that generated the error.

Use the **Prefix string** field to specify a printf-style string that is written at the beginning of each log file entry. For

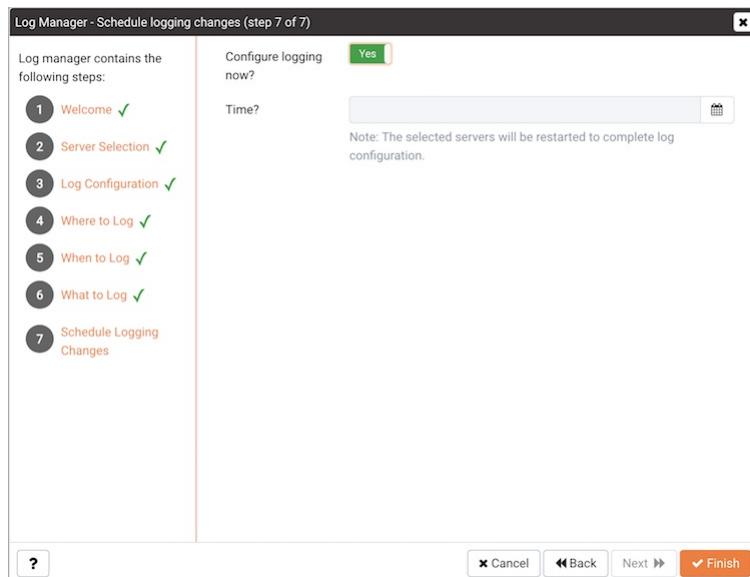
information about the options supported, please see the `log_line_prefix` documentation (in the Postgres core documentation), available at:

<http://www.postgresql.org/docs/current/static/runtime-config-logging.html>

Use the `Statements` drop-down list box to specify which SQL statements will be included in the server log. The default is none; valid options are:

- Specify none to disable logging of SQL statements.
- Specify ddl to instruct the server to log ddl (data definition language) statements, such as CREATE, ALTER, and DROP.
- Specify mod to instruct the server to log all ddl statements, as well as all dml (data modification language) statements, such as INSERT, UPDATE, DELETE, TRUNCATE and COPY FROM.
- Specify all to instruct the server to log all SQL statements.

Click `Next` to continue.



Use options on the `Schedule logging changes` dialog to specify when logging configuration changes will be applied:

- Set the `Configure logging now` switch to `Yes` to specify that your configuration preferences will be enabled, and the server will restart when you have completed the Log Manager wizard.
- Set `Configure logging now` to `No` to use the Schedule it for some other time calendar selector to specify a convenient time for logging configuration preferences to be applied, and the server to restart.

Note that when you apply the configuration changes specified by the Log Manager wizard, the server restart will temporarily interrupt use of the database server for users.

Click `Finish` to exit the wizard, and either restart the server, or schedule the server restart for the time specified on the scheduling dialog.

## Reviewing the Server Log Analysis Dashboard

After invoking the Log Manager wizard, and importing your log files to PEM, you can use the `Server Log Analysis` dashboard to review the log files for a selected server. To open the `Server Log Analysis` dashboard, right-click on the name of a monitored server in the PEM client tree control, and navigate through the `Dashboards` menu, selecting `Server Log Analysis`.



The screenshot shows the 'Server Log' section of the Postgres Enterprise Manager interface. At the top, there's a header bar with tabs for Dashboard, Properties, SQL, Statistics, Dependencies, Dependents, and Monitoring. Below the header is a sub-header for 'Server Log' with icons for Object Type (System), Status (N/A), Generated On (3/20/2019, 5:10:22 PM), and No of alerts (4 Acknowledged: 0). The main area is titled 'Server Logs' and contains a table with the following columns: Id, Agent, Server, Timestamp, User Name, Database Name, Process ID, Session ID, Transaction ID, Connection From, Command, and Message. There are three log entries listed:

ID	Agent	Server	Timestamp	User Name	Database Name	Process ID	Session ID	Transaction ID	Connection From	Command	Message
509	Postgres Enterprise Manager Advanced Host	EDB Postgres Advanced Server 10	3/20/2019, 4:55:05 PM	enterprisedb	edb	102134	5c922311.18ef6	0	localhost:36092	idle	disconnection: session time: 0:00:00 user=enterprisedb database=edb host=localhost port=36092
508	Postgres Enterprise Manager Advanced Host	EDB Postgres Advanced Server 10	3/20/2019, 4:55:05 PM	enterprisedb	edb	102134	5c922311.18ef6	0	localhost:36092	SELECT	duration: 2.456 ms statement: SELECT sw.backend_id, psa.datname AS dbname, psa.usename, sw.wait_name, sw.wait_count, avg_wait_time, max_wait_time, total_wait_time FROM session_waits sw, pg_stat_activity psa WHERE sw.backend_id = psa.pid
507	Postgres Enterprise Manager Advanced Host	EDB Postgres Advanced Server 10	3/20/2019, 4:55:05 PM	enterprisedb	edb	102134	5c922311.18ef6	0	localhost:36092	SELECT	duration: 0.286 ms statement: SELECT version();

The header information on the **Server Log Analysis** dashboard displays the date and time that the server was started, the date and time that the page was last updated, and the current number of triggered alerts.

Entries in the **Server Log** table are displayed in chronological order, with the most-recent log entries first. Use the scroll bars to navigate through the log entries, or to view columns that are off of the display.

Headings at the top of the server log table identify the information stored in each column; hover over a column heading to view a tooltip that contains a description of the content of each column.

You can use filtering to limit the number of server log records that are displayed. Click **Show Filters** to expose the filters panel and define a filter.



The screenshot shows the 'Server Log' section of the Postgres Enterprise Manager interface. At the top, there's a header bar with tabs for Dashboard, Properties, SQL, Statistics, Dependencies, Dependents, and Monitoring. Below the header is a sub-header for 'Server Log' with icons for Object Type (System), Status (N/A), Generated On (3/20/2019, 5:12:22 PM), and No of alerts (4 Acknowledged: 0). The main area is titled 'Server Logs' and contains a 'Filter Definition' panel with fields for Start, End, User, Database, and Command type, along with Apply and Reset buttons.

Use the fields within the **filter definition** box to describe the selection criteria that PEM will use to select a subset of a report for display:

- Use the **From** field to specify a starting date for the displayed server log.
- Use the **To** field to specify an ending date for the displayed server log.
- Enter a role name in the **Username** field display only transactions performed by that user.
- Enter a database name in the **Database** field to specify that the server should limit the displayed records to only those transactions that were performed against the specified database.
- Use the **Command Type** field to specify a selection criteria for the commands that will be displayed in the filtered report.

When you've described the criteria by which you wish to filter the server logs, click **Filter** to display the filtered server log in the **Server Log** table.

## Postgres Log Analysis Expert

The PEM Log Analysis Expert analyzes the log files of servers that are registered with Postgres Enterprise Manager, and produces a report that provides an analysis of your Postgres cluster's usage based on log file entries. You can use information on the Log Analysis Expert reports to make decisions about optimizing your cluster usage and configuration to improve performance.

Before using the PEM Log Analysis Expert, you must specify the Service ID on the Advanced tab of the Server Properties dialog, and use the Log Manager wizard to enable log collection by the PEM server.

To open the **Postgres Log Analysis Expert** wizard, select the **Postgres Log Analysis Expert...** option from the **Management** menu of the PEM client. The wizard's **Welcome** dialog opens; click **Next** to continue:

Postgres Log Analysis Expert - Welcome (step 1 of 5) X

Postgres Log Analysis Expert contains the following steps:

- 1 Welcome
- 2 Analyzer Selection
- 3 Server Selection
- 4 Report Options
- 5 Report Destination

**Welcome to the Postgres Log Analysis Expert**

The Postgres Log Analysis Expert analyzes Postgres log files for configuration and performance issues.

This analyser examines performance and runtime information found in the database server log files related to aspects such as checkpoints, sessions, queries and more.

? Cancel Back Next Finish

The wizard's **Analyzer selection** dialog displays a list of Analyzers from which you can select. Each Analyzer generates a corresponding table, chart, or graph that contains information gleaned from the log files.

Postgres Log Analysis Expert - Analyzer selection (step 2 of 5) X

Postgres Log Analysis Expert contains the following steps:

- 1 Welcome ✓
- 2 Analyzer Selection
- 3 Server Selection
- 4 Report Options
- 5 Report Destination

Select the analyzers or individual analyzer you wish to run:

✓ Analyzers

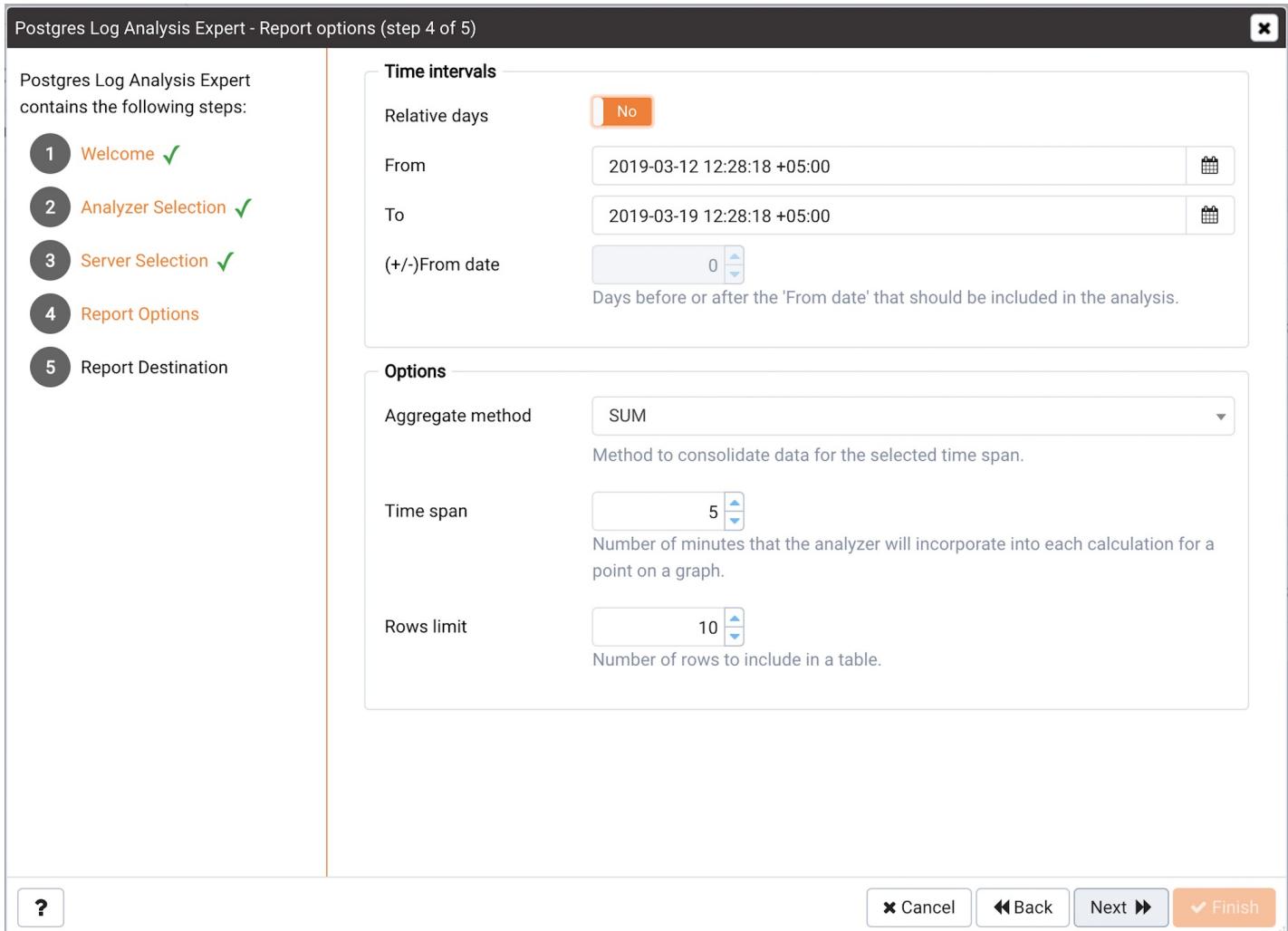
- Autoanalyze Statistics
- Autovacuum Statistics
- CHECKPOINT Statistics
- COMMIT/ROLLBACK Statistics
- Connections Overview
- DDL Statistics
- DML Statistics
- Frequently Executed Query Statistics
- Hourly DML Statistics
- Lock Statistics
- Log Event Statistics
- Log Statistics
- Most Time Consumed Query Statistics
- Slow Running Query Statistics
- Summary Statistics
- Temporary File Statistics
- Temporary Query Statistics
- Waiting Statistics

? Cancel Back Next ➞ ✓ Finish

Check the box to the left of an Analyzer to indicate that the Log Analysis Expert should prepare the corresponding table, chart or graph. After making your selections, click **Next** to continue to the Server selection tree control.



Use the tree control to specify which servers you would like the Postgres Log Analysis Expert to analyze. If you select multiple servers, the resulting report will contain the corresponding result set for each server in a separate (but continuous) list. Click **Next** to continue to the Report options dialog.



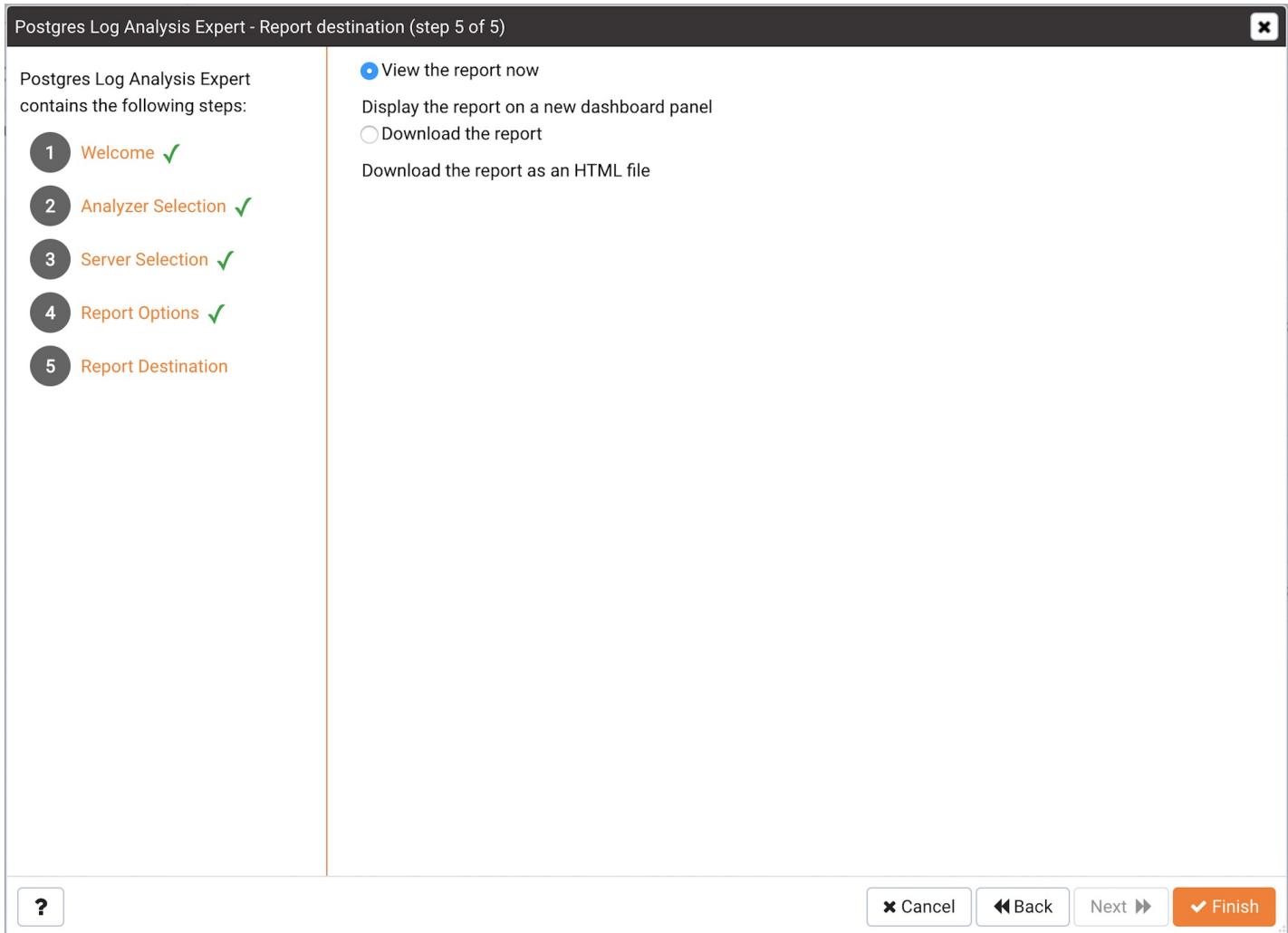
Use the fields in the **Options** section to specify the analysis method and the maximum length of any resulting tables:

- Use the **Aggregate method** drop-down to select the method used by the Log Analysis Expert to consolidate data for the selected time span. You can select from:
  - **SUM** instructs the analyzer to calculate a value that is the sum of the collected values for the specified time span.
  - **AVG** instructs the analyzer to calculate a value that is the average of the collected values for the specified time span.
  - **MAX** instructs the analyzer to use the maximum value that occurs within a specified time span.
  - **MIN** instructs the analyzer to use the minimum value that occurs within a specified time span.
- Use the **Time span** field to specify the number of minutes that the analyzer will incorporate into each calculation for a point on a graph. For example, if the Time span is 5 minutes, and the Aggregate method is AVG, each point on the given graph will contain the average value of the activity that occurred within a five minute time span.
- Use the **Rows limit** field to specify the maximum number of rows to include in a table.

Use the fields in the **Time Intervals** section to specify the time range that the Log Analysis Expert will analyze:

- Set **Relative days** to Yes to enable the (+/-)From date field and specify the number of days before or after the date and time selected in the From field.
- Use the **From** field to specify the starting date and time for the analysis.
- Use the **To** field to specify the ending date and time for the analysis.
- Use the **(+/-)** From date selector to specify the number of days before or after the From date that should be included in the analysis.

When you've specified the report options, click **Next** to continue to the Report destination dialog.



You can choose the default option and select **Finish** to view the Log Analysis Expert report in the PEM client's tabbed browser, or click the radio button next to Download the report to save a copy of the report to an HTML file for later use.

If you have specified that the report should be saved to a file, the report will be downloaded.

## Reviewing the Postgres Log Analysis Expert Report

If you've elected to review the report immediately, the Postgres Log Analysis Expert report will be displayed in the PEM Client window. The report header displays the date and time that the report was generated, the time period that the report spans, and the aggregation method specified when defining the report. The name of the server for which information is displayed is noted at the start of each section of the report.

The report displays the tables, graphs and charts that were selected in the Log Analysis Expert wizard. Use the **Jump To** button (located in the lower-right hand corner of the screen) to navigate to a specific graphic.

The screenshot shows the Postgres Log Analysis Expert interface. At the top, there are filters for Interval (2019-3-12 11:15:00 - 2019-3-19 11:15:00), Generated (2019-03-19 11:15:11), Span (5 Minutes), and Aggregate (SUM). A dropdown menu is open for "Postgres Enterprise Manager Server(127.0.0.1:5440)". Below this, there are two sections: "Summary Statistics" and "Hourly DML Statistics".

Settings	Values
Number of unique queries	9580
Total queries	44735
Total queries duration	02:40:20.815243
First query	18/03/2019 17:06:03.928 PKT
Last query	19/03/2019 11:13:58.476 PKT
Queries peak time	19/03/2019 10:27:08 PKT queries 181
Number of events	44735
Number of unique events	1
Total number of sessions	4017
Total duration of sessions	
Average sessions duration	
Total number of connections	0
Total number of databases	0

Time	Database name	Statement	Count	Min duration	Max duration	Avg duration
18/03/2019 17:00	pem	COPY	187	1.01	15.50	2.46
18/03/2019 17:00	pem	DELETE	89	1.00	16.59	2.94
18/03/2019 17:00	pem	FETCH	38	1.03	228.35	45.07

If the report contains an analysis of more than one monitored server, charts and tables will be displayed in sets; first the graphs, tables and charts that display statistics for one server, then the graphics for the next server in the report.

## 4.8 SQL Profiling and Analysis

Most RDBMS experts agree that inefficient SQL code is the leading cause of most database performance problems. The challenge for DBAs and developers is to locate the poorly-running SQL code in large and complex systems, and then optimize that code for better performance.

The SQL Profiler component allows a database superuser to locate and optimize poorly-running SQL code. Users of Microsoft SQL Server's Profiler will find PEM's SQL Profiler very similar in operation and capabilities. SQL Profiler is installed with each Advanced Server instance; if you are using PostgreSQL, you must download the SQL Profiler installer, and install the SQL Profiler product into each managed database instance you wish to profile.

For each database monitored by SQL Profiler, you must:

1. Edit the `postgresql.conf` file; you must include the SQL Profiler library in the `shared_preload_libraries` configuration parameter.

For Linux installations, the parameter value should include:

`$libdir/sql-profiler`

on Windows, the parameter value should include:

`$libdir/sql-profiler.dll`

2. Create the functions used by SQL Profiler in your database. The SQL Profiler installation program places a

SQL script (named sql-profiler.sql) in the `share/postgresql/contrib` subdirectory of the main PostgreSQL installation directory on Linux systems. On Windows systems, this script is located in the `share` subdirectory. You must invoke this script on the maintenance database specified when registering the server with PEM.

### 3. Stop and re-start the server for the changes to take effect.

Please note: if you have connected to the PEM server with the PEM client before configuring SQL Profiler, you must disconnect and reconnect with the server to enable SQL Profiler functionality. For more detailed information about installing and configuring the SQL Profiler plugin, please refer to the PEM Installation Guide, available from the EnterpriseDB website at:

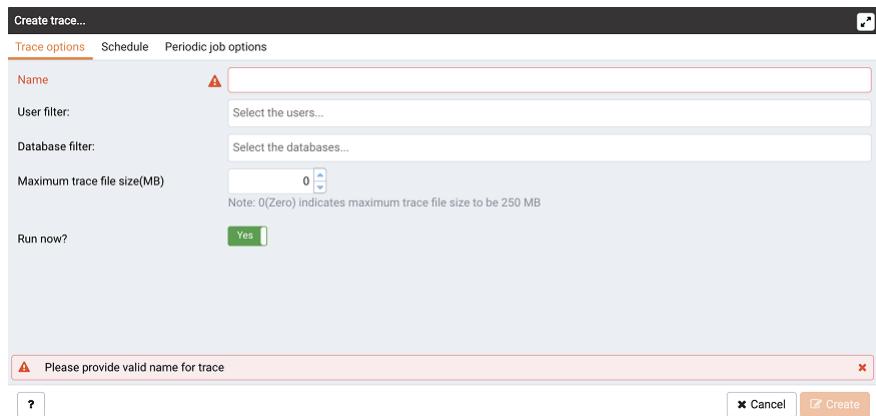
<http://enterprisedb.com/products-services-training/products/documentation>

## Creating a New SQL Trace

SQL Profiler captures and displays a specific SQL workload for analysis in a SQL trace. You can start and review captured SQL traces immediately, or save captured traces for review at a later time. You can use SQL Profiler to create and store up to 15 named traces; use menu options to create and manage traces.

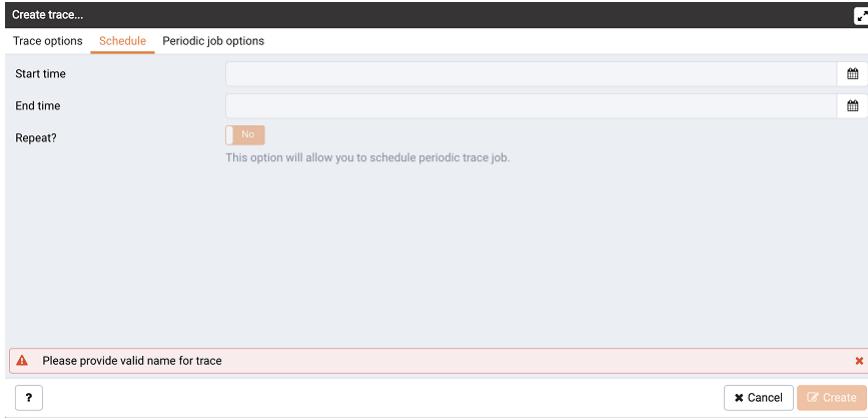
## Creating a Trace

You can use the `Create trace...` dialog to define a SQL Trace for any database on which SQL Profiler has been installed and configured. To access the dialog, highlight the name of the database in the PEM client tree control; navigate through the Management menu to the SQL Profiler pull-aside menu, and select Create trace....



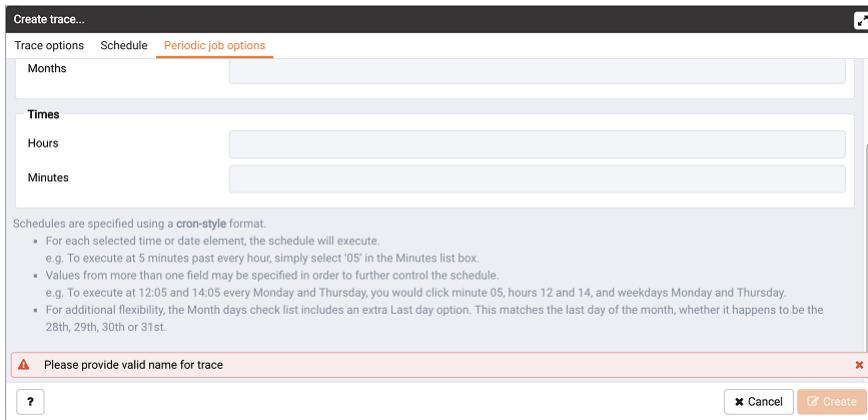
Use the fields on the `Trace options` tab to specify details about the new trace:

- Provide a name for the trace in the Name field.
- Click in the `User filter` field to specify the roles whose queries will be included in the trace; optionally, check the box next to Select All to include queries from all roles.
- Click in the `Database filter` field to specify which databases to trace; optionally, check the box next to Select All to include queries against all databases.
- Specify a `trace size in the Maximum Trace File Size` field; SQL Profiler will terminate the trace when it reaches approximately the size specified.
- Specify Yes in the `Run Now` field to start the trace when you select the Create button; select No to enable fields on the Schedule tab.



Use the fields on the **Schedule** tab to specify scheduling details for the new trace:

- Use the **Start time** field to specify the starting time for the trace.
- Use the **End time** field to specify the ending time for the trace.
- Specify Yes in the **Repeat?** field to indicate that the trace should be repeated every day at the times specified; select No to enable fields on the Periodic job options tab.



Fields on the **Periodic job options** tab specify scheduling details about a recurring trace. Use fields in the Days section to specify the days on which the job will execute:

- Click in the **Week days** field to select the days of the week on which the trace will execute.
- Click in the **Month days** field to select the days of the month on which the trace will execute.
- Click in the **Months** field to select the months in which the trace will execute.

Use fields in the **Times** section to specify a time schedule for the trace execution:

- Click in the **Hours** field to select the hours at which the trace will execute.
- Click in the **Minutes** field to select the hours at which the trace will execute.

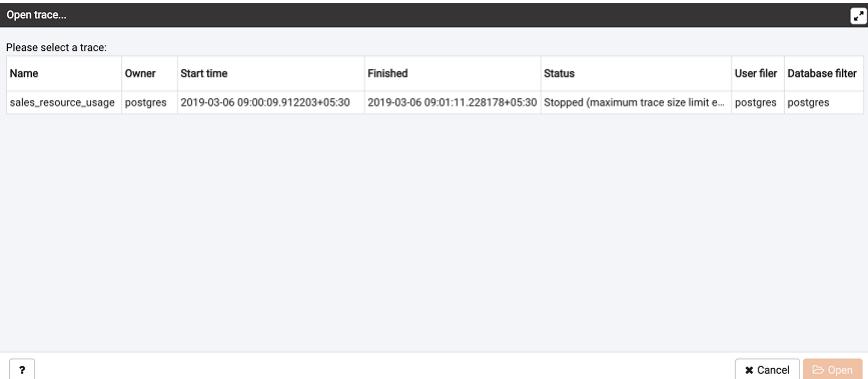
When you've completed the **Create trace...** dialog, click **Create** to start the newly defined trace or to schedule the trace for a later time.

#	Start Time	Duration (ms)	Query	Rows Affected	User	Database	PID	File System Read	File System Write
1	2019-03-06 09:00:10.083739+05:30	1.170116	SET DateStyle=ISO; S...	1	postgres	postgres	20841	456	0
2	2019-03-06 09:00:10.087154+05:30	0.016113	SELECT db.oid as did...	1	postgres	postgres	20841	0	0
3	2019-03-06 09:00:10.088981+05:30	0.01708	SELECT oid as id, roln...	1	postgres	postgres	20841	0	0
4	2019-03-06 09:00:10.440238+05:30	19.397341	/pgsqlASH*/ SELEC...	5	postgres	postgres	16266	64	0
5	2019-03-06 09:00:11.221326+05:30	10.974773	/pgsqlASH*/ SELEC...	5	postgres	postgres	16266	0	0

If you elect to execute the trace immediately, the trace results will display in the PEM client.

## Opening an Existing Trace

To view a previous trace, highlight the name of the profiled database in the PEM client tree control; navigate through the **Management** menu to the SQL Profiler pull-aside menu, and select **Open trace....** You can also use the **SQL Profiler toolbar** menu to open a trace; select the **Open trace...** option. The Open trace... dialog opens.



Highlight an entry in the trace list and click Open to open the selected trace. The selected trace opens in the SQL Profiler tab.

## Filtering a Trace

A filter is a named set of (one or more) rules, each of which can hide events from the trace view. When you apply a filter to a trace, the hidden events are not removed from the trace, but are merely excluded from the display.

Click the Filter icon to open the **Trace Filter** dialog and create a rule (or set of rules) that define a filter. Each rule will screen the events within the current trace based on the identity of the role that invoked the event, or the query type invoked during the event.

To open an existing filter, select the **Open** button; to define a new filter, click the **Add (+)** icon to add a row to the table displayed on the General tab and provide rule details:

- Use the **Type** drop-down listbox to specify the trace field that the filter rule will apply to.
- Use the **Condition** drop-down listbox to specify the type of operator that SQL Profiler will apply to the Value when it filters the trace:
  - Select **Matches to** filter events that contain the specified Value.
  - Select **Does not match** to filter events that do not contain the specified Value.

- Select **Is equal to** to filter events that contain an exact match to the string specified in the Value field.
  - Select **Is not equal** to filter events that do not contain an exact match to the string specified in the Value field.
  - Select **Starts with** to filter events that begin with the string specified in the Value field.
  - Select **Does not start with** to filter events that do not begin with the string specified in the Value field.
  - Select **Less than** to filter events that have a numeric value less than the number specified in the Value field.
  - Select **Greater than** to filter events that have a numeric value greater than the number specified in the Value field.
  - Select **Less than or equal to** to filter events that have a numeric value less than or equal to the number specified in the Value field.
  - Select **Greater than or equal to** to filter events that have a numeric value greater than or equal to the number specified in the Value field.
- Use the **Value** field to specify the string, number or regular expression that SQL Profiler will search for.

When you've finished defining a rule, click the Add (+) icon to add another rule to the filter. To delete a rule from a filter, highlight the rule and click the Delete icon.

Click the **Save** button to save the filter definition to a file without applying the filter; to apply the filter, click **OK**. Select **Cancel** to exit the dialog and discard any changes to the filter.

## Deleting a Trace

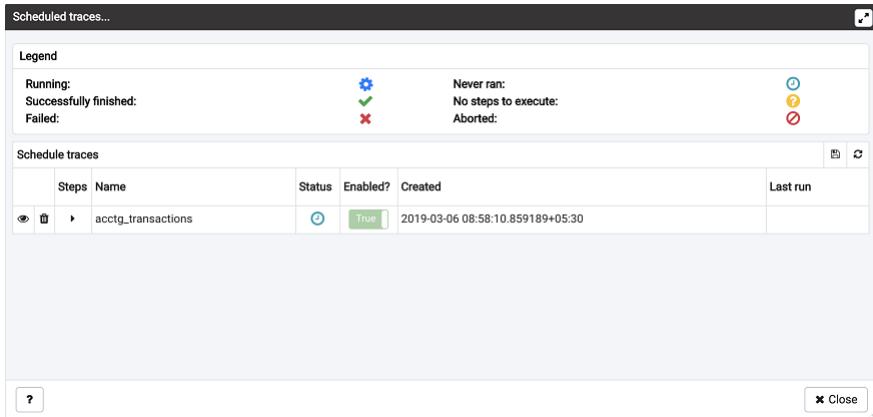
To delete a trace, highlight the name of the profiled database in the PEM client tree control; navigate through the **Management** menu to the SQL Profiler pull-aside menu, and select **Delete trace(s)...**. You can also use the SQL Profiler toolbar menu to delete a trace; select the **Delete trace(s)...** option. The **Delete traces** dialog opens.



Click the icon to the left of a trace name to mark one or more traces for deletion and click **Delete**. The PEM client will acknowledge that the selected traces have been deleted.

## Viewing Scheduled Traces

To view a list of scheduled traces, highlight the name of the profiled database in the PEM client tree control; navigate through the **Management** menu to the SQL Profiler pull-aside menu, and select **Scheduled traces...**. You can also use the SQL Profiler toolbar menu to the list; select the **Scheduled traces...** option.



The **Scheduled traces...** dialog displays a list of the traces that are awaiting execution. Click the edit button to the left of a trace name to access detailed information about the trace:

- The **Status** field lists the status of the current trace.
- The **Enabled?** switch displays Yes if the trace is enabled; No if it is disabled.
- The **Name** field displays the name of the trace.
- The **Agent** field displays the name of the agent responsible for executing the trace.
- The **Last run** field displays the date and time of the last execution of the trace.
- The **Next run** field displays the date and time of the next scheduled trace.
- The **Created** field displays the date and time that the trace was defined.

## Using the Index Advisor

Index Advisor is distributed with Advanced Server 9.0 and above. Index Advisor works with SQL Profiler by examining collected SQL statements and making indexing recommendations for any underlying tables to improve SQL response time. The Index Advisor works on all DML (INSERT, UPDATE, DELETE) and SELECT statements that are invoked by a superuser.

Diagnostic output from the Index Advisor includes:

- Forecasted performance benefits from any recommended indexes
- The predicted size of any recommended indexes
- DDL statements you can use to create the recommended indexes

Before using Index Advisor, you must:

1. Modify the **postgresql.conf** file on each Advanced Server host, adding the `index_advisor` library to the `shared_preload_libraries` parameter.
2. Install the **Index Advisor contrib** module. To install the module, use the `psql` client or PEM Query Tool to connect to the database, and invoke the following command:

```
\i <complete_path>/share/contrib/index_advisor.sql
```

3. Restart the server for your changes to take effect.

Index Advisor can make indexing recommendations based on trace data captured by SQL Profiler. Simply highlight one or more queries in the **SQL Profiler Trace Data** pane, and click the **Index Advisor** toolbar button (or select Index Advisor from the View menu). For detailed usage information about Index Advisor, please see the EDB Postgres Advanced Server Guide.

Please note: Index Advisor cannot analyze statements invoked by a non-superuser. If you attempt to analyze statements invoked by a non-superuser, the server log will include the following error:

**ERROR: access to library "index\_advisor" is not allowed**

For more information about configuring and using Index Advisor, please see the EDB Postgres Advanced Server Guide, available from EnterpriseDB at:

<https://www.enterprisedb.com/resources/product-documentation>

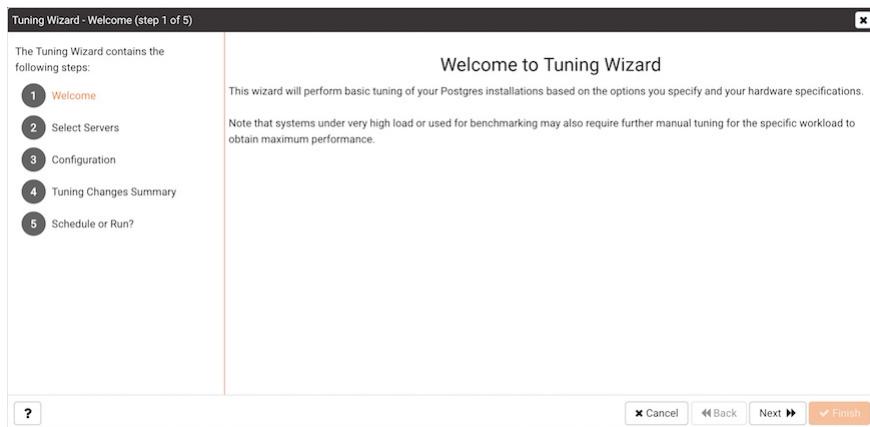
## 4.9 Tuning Wizard

The Tuning Wizard reviews your PostgreSQL or Advanced Server installation, and recommends a set of configuration options that will help tune the installation to best suit its anticipated workload. Please note that benchmarking systems or systems with a high work load may require additional manual tuning to reach optimum performance.

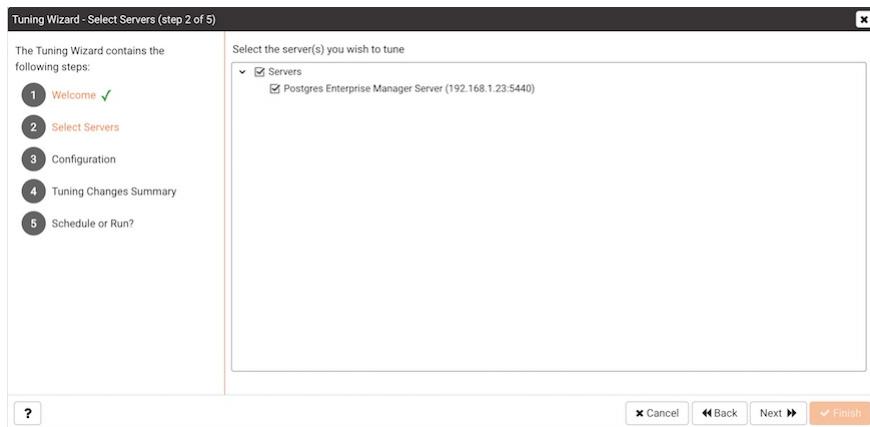
Before using the Tuning Wizard, you must specify the name of the service in the Service ID field on the Advanced tab of the server's Properties dialog. PEM will use the service name when restarting the service after tuning.

The Tuning Wizard can only make recommendations for those servers that reside on the same server as their bound PEM agent. If you have specified a value of Yes in the Remote monitoring field when defining your server, the server will not be displayed in the Tuning Wizard tree control.

To open the Tuning Wizard, select **Tuning Wizard...** from the **Management** menu of the PEM client. The Tuning Wizard opens, welcoming you.



Click **Next** to continue to the server selection dialog.

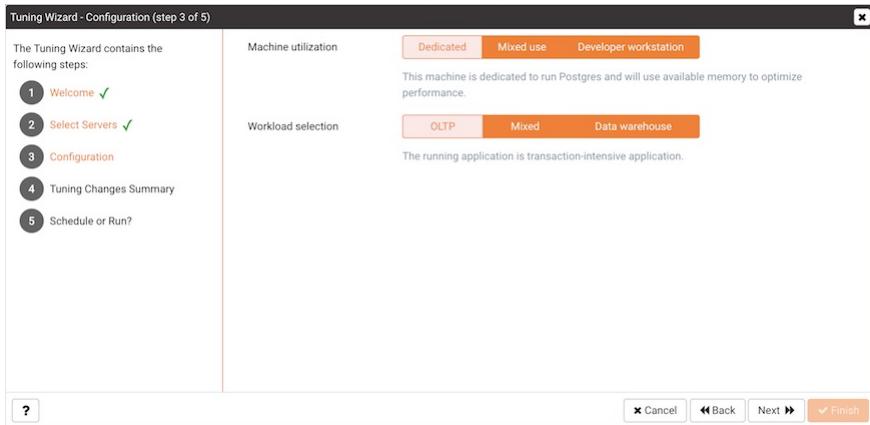


Expand the **Servers** node of the tree control to view a list of the servers that are currently monitored by PEM that are available for tuning. Check a box to the left of a server name to select the server for tuning.

## Note

the Tuning Wizard displays a red warning symbol to the left of a server name in the tree control if the service name for that server is not provided on the server's Properties dialog.

Click **Next** to continue to the Configuration dialog.



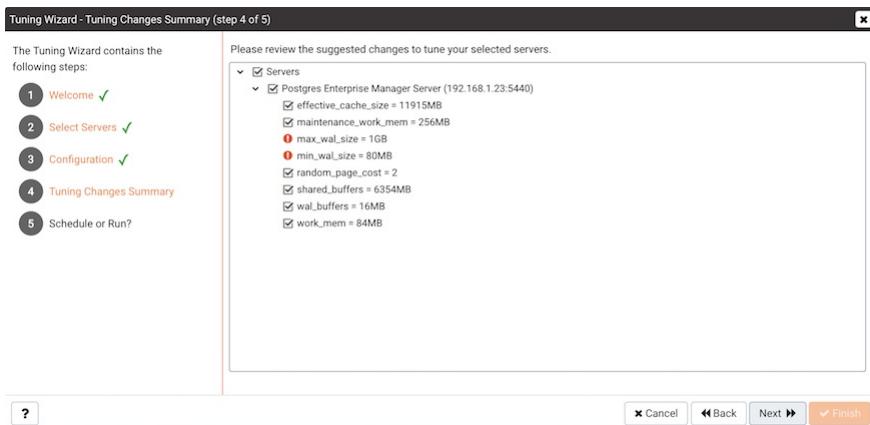
Select an option in the **Machine utilization** field to specify the type of work performed by the selected servers. The type of work performed by the server determines how the tuning wizard will allocate system resources:

- Select **Dedicated** to dedicate the majority of the system resources to the database server.
- Select **Mixed use** to dedicate a moderate amount of system resources to the database server.
- Select **Developer workstation** to dedicate a relatively small amount of system resources to the database server.

Select an option in the **Workload Selection** field to specify the type of workload typically performed on the selected server:

- Select **OLTP** if the selected server is used primarily to process online transaction workloads.
- Select **Mixed** if the selected server provides a mix of transaction processing and data reporting.
- Select **Data warehouse** if the server is used for heavy data reporting.

Click **Next** to continue to the **Tuning Changes Summary** dialog.



The tree control on the **Tuning Changes Summary** dialog displays the parameter setting modifications recommended for each server analyzed by the Tuning Wizard. Use the checkboxes next to a server or parameter name to select the recommendations that tuning wizard will either include in a preview report or apply:

- A checked box to the left of a parameter name specifies that the Tuning Wizard will include the parameter setting.
- A checked box to the left of a server name specifies that the Tuning Wizard will include all parameter setting recommendations for the specified server.

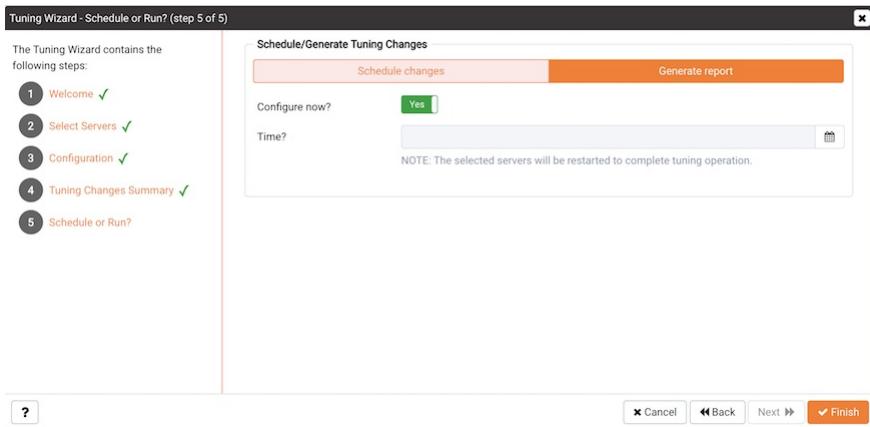
Specify which Tuning Wizard recommendations you wish to include in a report or apply, and click **Next** to

continue.

Use the **Schedule or Run?** dialog to either specify a time that PEM will apply the changes, or generate a report that details the recommended changes.

The selected actions will apply to all of the changes noted on the Tuning Changes Summary. If you opt to generate a report, PEM will create a report that contains a list of the current values and recommended modifications to the configuration parameters selected on the Tuning Changes Summary dialog. Note that to implement changes, you will need to invoke the Tuning Wizard a second time, specifying the parameters you wish to modify on the **Tuning Changes Summary** dialog.

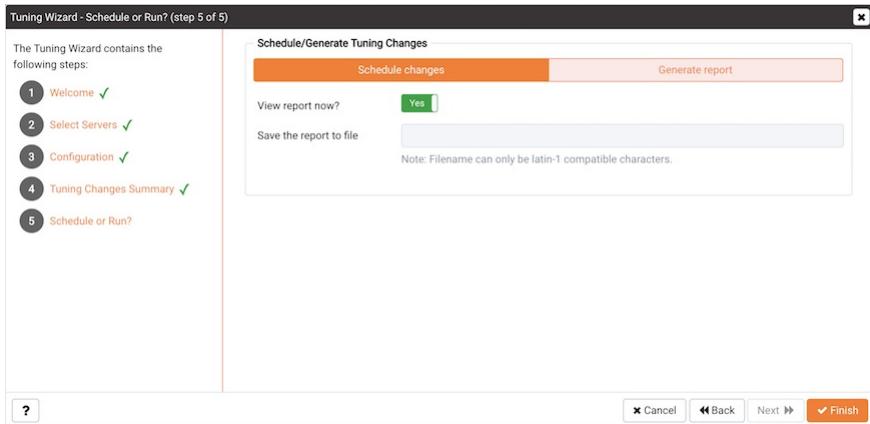
Select **Schedule changes** to view and specify your scheduling options.



You can:

- Set the **Configuration now?** slider to **Yes** to apply the tuning wizard's recommendations and restart the server now.
- Set the **Configuration now?** slider to **No** to enable the **Time?** field and use the calendar selector to specify a time for PEM to apply the tuning wizard's recommendations and restart the server. Note that if you schedule a time for the changes to be applied, you will not be provided with a preview of the change recommendations.

Select **Generate report** to view your report options.



You can:

- Set the **View report now?** slider to **Yes** to display the Tuning Wizard report onscreen.
- Set the **View report now?** slider to **No** to enable the **Save the report to file** field and use the calendar selector to specify a file name and location to which PEM will write the Tuning Wizard report.

Click the **Finish** button to either apply the Tuning Wizard's modifications or generate a report and exit the Tuning Wizard.

Dashboard Properties SQL Statistics Dependencies Dependents Monitoring [Server Tuning Report](#)

**Tuning Wizard Report**

Generated On: 2019-03-26 14:51:55 Go to: Postgres Enterprise Manager Server

**Summary**

Number of servers selected: 1 Machine utilization: Dedicated Workload profile: OLTP

Server: Postgres Enterprise Manager Server (127.0.0.1:5432)

GUC Parameter	Original Value	Recommended Value
effective_cache_size	4096MB	2828MB
maintenance_work_mem	64MB	197MB
random_page_cost	4	2
shared_buffers	128MB	1508MB
wal_buffers	4MB	16MB
work_mem	4MB	20MB

You can confirm that Tuning Wizard has implemented the recommended changes by reviewing the [postgresql.conf](#) file for the modified server. The Tuning Wizard adds a comment above each modified parameter in the [postgresql.conf](#) file when the change is applied.

```

root@localhost:/opt/PostgresPlus/9.5AS/data
File Edit View Search Terminal Help
# The value for shared_buffers was changed by the Postgres Enterprise Manager Tuning Wizard at 2017-03-06 09:15:32
#shared_buffers = 196MB
# The value for shared_buffers was changed by the Postgres Enterprise Manager Tuning Wizard at 2017-03-06 09:18:23
shared_buffers = 196MB
#huge_pages = try
# (change requires restart)
# on, off, or try
# (change requires restart)
#temp_buffers = 8MB
#min 800KB
#max_prepared_transactions = 0
# zero disables the feature
# (change requires restart)
# Note: Increasing max_prepared_transactions costs ~600 bytes of shared memory
# per transaction slot, plus lock space (see max_locks_per_transaction).
# It is not advisable to set max_prepared_transactions nonzero unless you
# actively intend to use prepared transactions.
#work_mem = 4MB
# min 64kB
# The value for work_mem was changed by the Postgres Enterprise Manager Tuning Wizard at 2017-03-06 09:15:32
#work_mem = 3MB
# The value for work_mem was changed by the Postgres Enterprise Manager Tuning Wizard at 2017-03-06 09:18:23
work_mem = 3MB
#maintenance_work_mem = 64MB
# min 1MB
# The value for maintenance_work_mem was changed by the Postgres Enterprise Manager Tuning Wizard at 2017-03-06 09:15:32
#maintenance_work_mem = 25MB
--More--(21%]

```

You can also confirm a parameter value by querying the server. For example, to confirm the value of the `shared_buffers` parameter, open a SQL command line using either the Query Tool (accessed through the Tools menu) or the `psql` client, and issue the command:

`SHOW shared_buffers;`

The value returned by the server will confirm that the parameter has been modified.

## 4.10 Postgres Expert - Best Practice Enforcement

The Postgres Expert utility provides expert advice on how to best configure your Postgres servers for optimal performance, security, and more. Postgres Expert serves as a PostgreSQL 'DBA in a box' by analyzing your servers for deviations in best practices. Postgres Expert contains three specialized Experts:

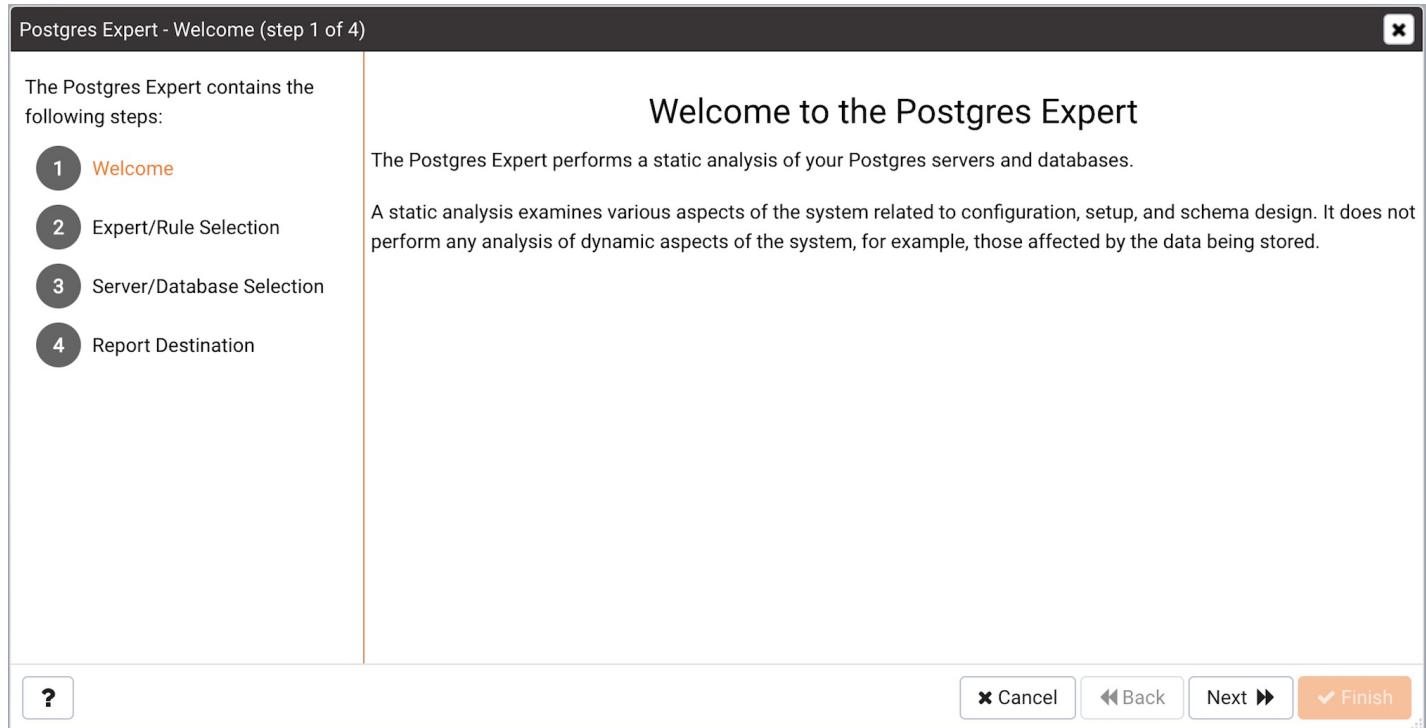
- The Configuration Expert.
- The Schema Expert.
- The Security Expert.

You can select specific rules for each Expert to analyze, or accept all rules, and then review Postgres Expert

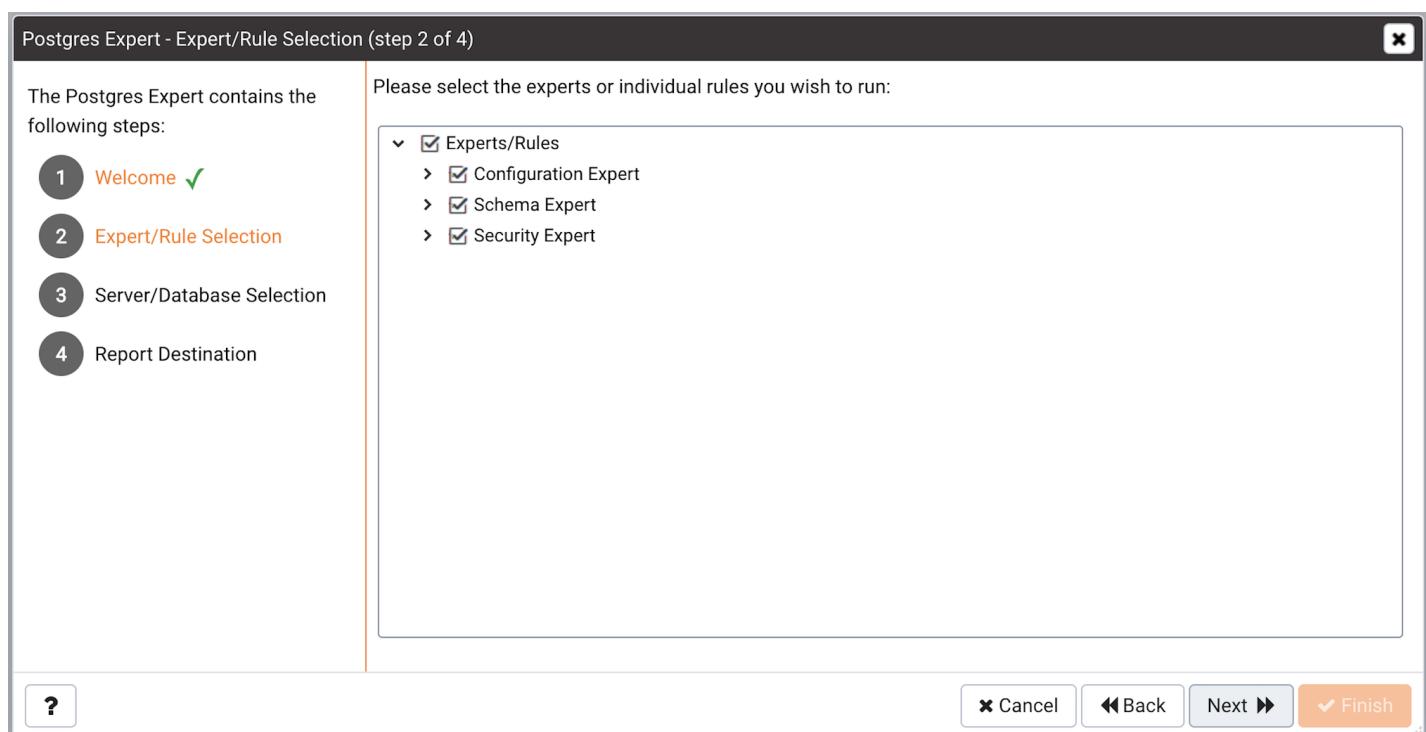
reports detailing any best practice issues that require your attention.

## Using the Postgres Expert Wizard

To use the Postgres Expert wizard select the **Postgres Expert** option from the **Management** menu in the PEM client. When the wizard's **Welcome** window opens, click **Next** to continue.



The wizard displays a tree control that allows you to choose the Experts and Rules with which Postgres Expert will evaluate the specified server or database.



The tree control categorizes the rules under three Expert headings:

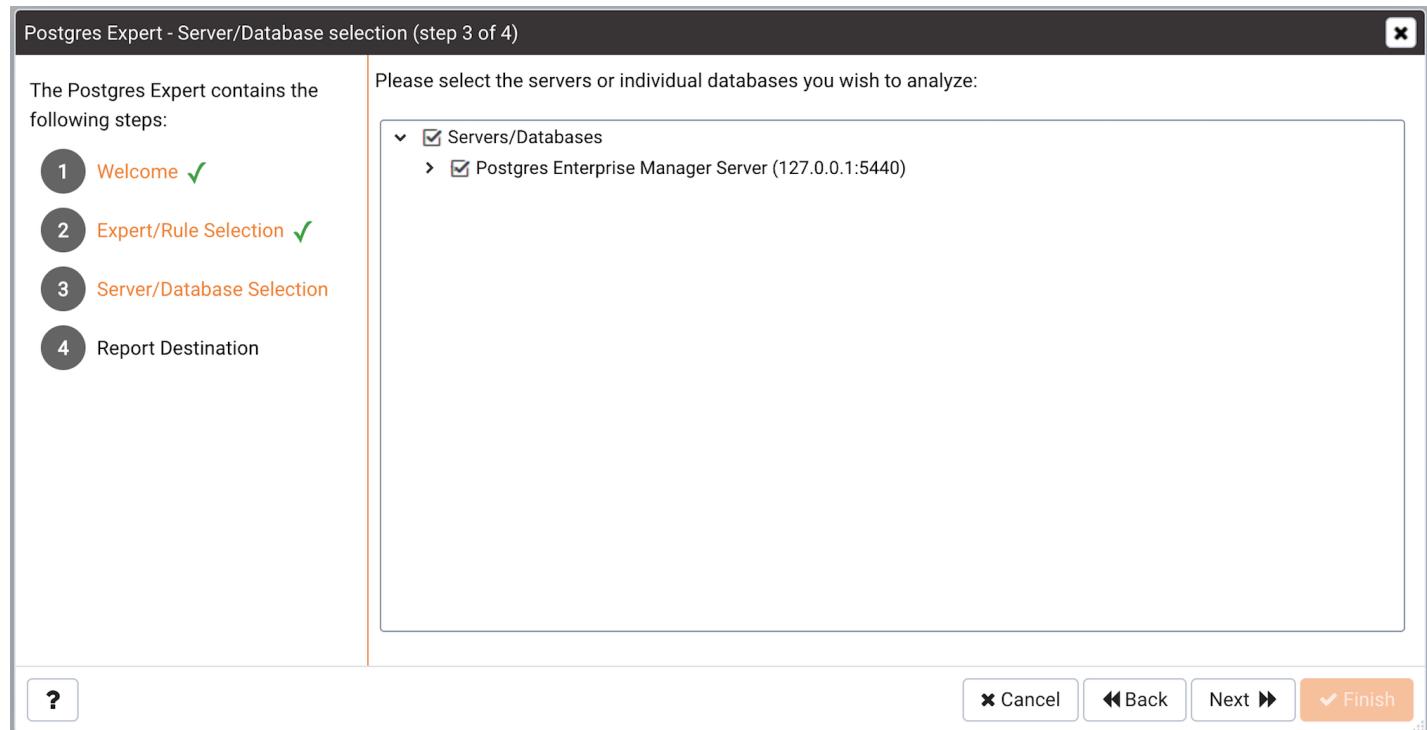
- Select from the Configuration Expert rules to analyze the parameter settings of the server or operating system to find any adjustments that might improve system performance.
- Select from the Schema Expert rules to analyze schema objects (locating missing primary keys, foreign keys without indexes, etc).
- Select from the Security Expert rules to review the system to find security vulnerabilities.

Use the checkmark indicator to the left of an expert or rule to indicate that the Postgres Expert should analyze the configuration of the selected servers for any best practice deviations related to the checked item.

You can:

- Check the box next to the name of an expert to select or deselect all of the configuration items listed under that node of the tree control.
- Check the box next to Servers/Databases to instruct Postgres Expert to review the selected server for all of the items in the tree control.
- Deselect the box next to Servers/Databases to un-check all of the rules; then, navigate through the tree control, specifying only the items that you wish Postgres Expert to evaluate.

After making your selections, click **Next** to continue to the Server/Databases tree control.



Select or de-select the servers and databases that you would like Postgres Expert to analyze. If you select multiple servers or databases, the resulting report will contain a separate analysis of each target. When you've finished, click **Next** to select a report destination.



You can select the default option and click **Finish** to view an onscreen report from Postgres Expert, or check the box next to Download the report to save a copy of the report to an HTML file for later use. If you choose to save the report to a file, the download will begin immediately. The file will be saved in your default download directory.

## Reviewing Postgres Expert Recommendations

Postgres Expert produces an easily navigated report that contains an analysis of the selected rules, categorized by high, medium, and low severities, for the selected servers.

Rule	Database	Severity
> Check checkpoint_completion_target	-	Medium
> Check effective_cache_size	-	Medium
> Check effective_io_concurrency	-	Low
> Check reducing random_page_cost	-	Low

Rule	Database	Severity
> Check data and transaction log on same drive	-	High

The report header contains a summary of the report, and includes the date and time that the report was generated, the number of rules analyzed, and the number of deviations from best practices found by Postgres Expert. Use the Jump to drop-down listbox to select a server to navigate to the section of the report that targets recommendations for that server.

The body of the report contains the detailed findings for each server selected for analysis. The findings are sorted by Expert; within each Expert heading, any rule violations are ranked by Severity.

The screenshot shows the 'Postgres Expert Report' interface. At the top, it displays 'Generated On: 2019-03-19 11:32:42' and a link to 'Postgres Enterprise Manager Server'. Below this is a 'Summary' section with counts for servers tested (1), rules checked (31), high alerts (1), medium alerts (2), and low alerts (2). A expanded section for 'Server: Postgres Enterprise Manager Server (127.0.0.1:5440)' shows an 'Advisor: Configuration Expert' report. This report lists rules under 'Rule', grouped by 'Database' (empty) and 'Severity' (Medium). One rule, 'Check checkpoint\_completion\_target', is expanded to show its 'Recommended Value' (Consider adjusting checkpoint\_completion\_target), 'Trigger' (checkpoint\_completion\_target != 0.9), 'Description' (details about PostgreSQL checkpoints), and 'Current Values' table:

Settings	Value
checkpoint_completion_target	0.5

Below this are three more collapsed rules: 'Check effective\_cache\_size', 'Check effective\_ioConcurrency', and 'Check reducing random\_page\_cost', each with a 'Medium' severity indicator.

Click on each rule in the Postgres Expert report to display details and recommendations for that rule. Within each rule, section headings display:

- The **Advisor** section lists the name of the Postgres Expert advisor that prompted the recommendation.
- The **Trigger** section displays a description of the rule that raised the alert.
- The **Recommended Value** section displays the value to which Postgres Expert recommends setting the selected parameter.
- The **Description** section displays information and advice about the parameter that caused the alert.
- The **Current Values** section displays the current value(s) of any parameter(s) that influence the Postgres Expert's evaluation.

## 4.11 Configuring Streaming Replication

The PEM Streaming Replication Wizard walks you through the process of creating or modifying a streaming replication scenario. You can use the wizard to:

- Install new servers to act as master and standby nodes in a replication scenario.
- Configure existing servers in the roles of master and standby nodes in a replication scenario.
- Add new or existing standby servers to an existing replication scenario.

If you are configuring replication using an existing server as the master node or as a standby node within the replication scenario, the servers must have been installed with the graphical installer. The Streaming Replication wizard does not support pre-existing servers installed via RPM packages at this time.

The Streaming Replication wizard is supported by PEM agent version 6.0 (or later). Please note that the Streaming Replication wizard is deprecated, and will not be available in future releases of PEM.

Each node of a replication scenario must have a resident PEM agent; remote monitoring of master or standby nodes is not supported at this time. After installing the PEM agent, you must:

- on a Linux host, modify the PEM agent configuration file (`agent.cfg`) setting the following parameters to true:  
`allow_package_management`

`allow_server_restart``allow_streaming_replication`

The `agent.cfg` file is located in one of the following directories:

- If you have installed PEM using graphical installer: `/opt/edb/pem/agent/etc/agent.cfg`
- If you have installed PEM using RPM: `/usr/edb/pem/agent/etc/agent.cfg`
- on a Windows host, modify the Windows registry located at:  
`(HKEY_LOCAL_MACHINE\Software\Wow6432Node\EnterpriseDB\PEM\agent)`.

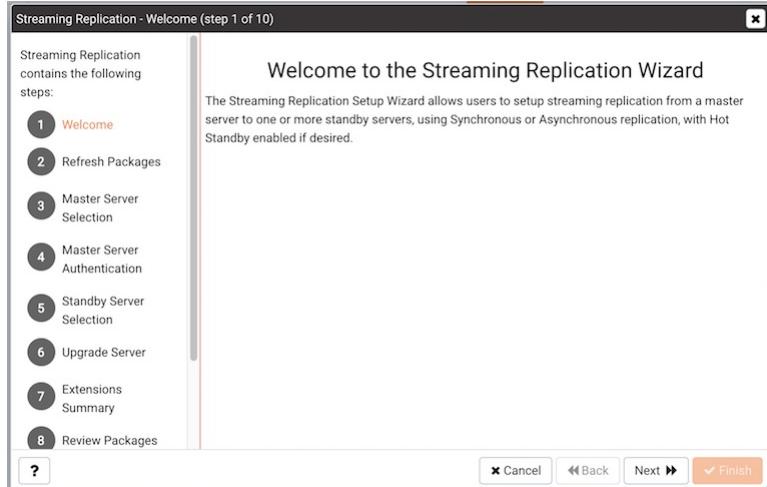
set the following entries to true:

`AllowPackageManagement``AllowServerRestart``AllowStreamingReplication`

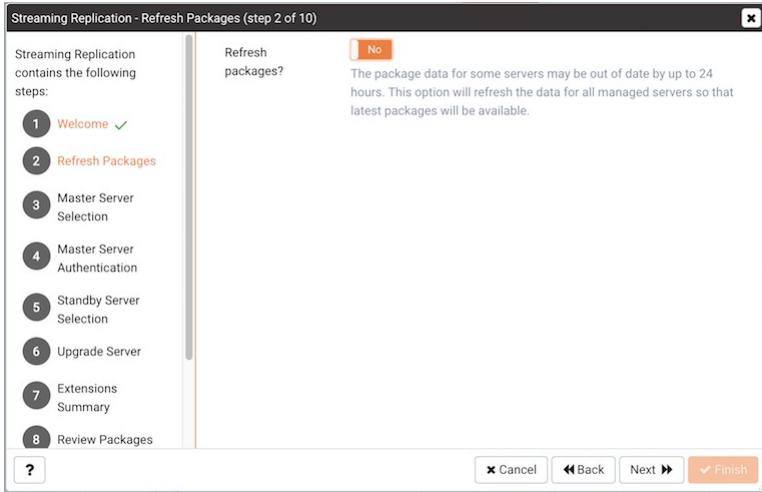
After updating the configuration file or registry, restart the PEM agent service:

- on a Linux host, open a command line, assume superuser privileges and enter the command `/etc/init.d/pemagent restart` (on RHEL or CentOS 6.x) or `systemctl restart pemagent` (on RHEL or CentOS 7.x).
- on a Windows host, use the `Services` applet to restart the `Postgres Enterprise Manager - pemAgent` service.

Then, to open the Streaming Replication wizard, select `Streaming Replication` from the `Management` menu. The Streaming Replication wizard welcomes you.



Click `Next` to continue. The `Refresh Packages` dialog opens, offering you the option to refresh the package data that is stored on the PEM server about the currently installed packages.



The PEM installed\_packages probe retrieves information about the currently installed packages that reside on hosts that are monitored by PEM agents. Select Yes to invoke the probe and update the information that is stored on the PEM server. If you have not added servers to the monitored hosts since the last probe execution (by default, the installed\_packages probe executes once every 24 hours), click No to continue without executing the probe.

Click **Next** to continue.



Fields on the **master node selection** dialog prompt you to provide information about the master node of the streaming replication scenario:

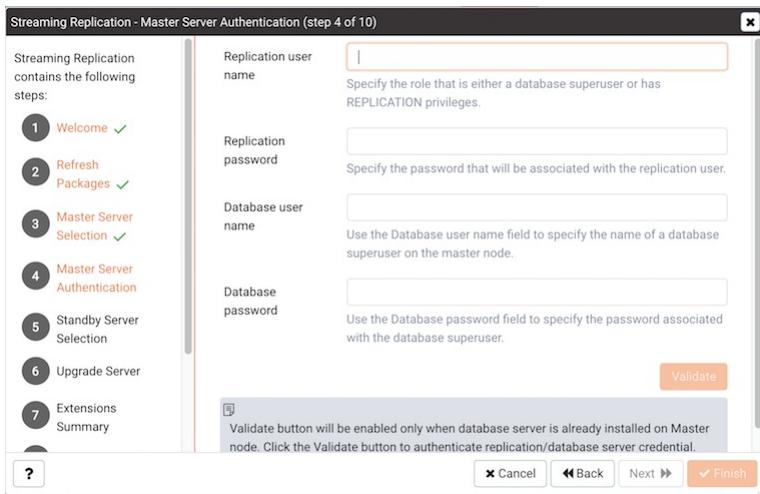
- Use the drop-down listbox in the **Host** field to select the name of the PEM agent that monitors the master node from the list of active agents. To be displayed in the listbox, the agent must be configured with `allow_streaming_replication`, `allow_package_management`, and `allow_server_restart` enabled (set to true) in the PEM Agent configuration file. Please note that each node of a replication scenario must have a resident agent; remote monitoring of replication nodes is not supported.
- Use the drop-down listbox in the **Database server** field to specify the server or server version of the master node. You can select:
  - A previously installed server to act as the master node of the replication scenario; existing servers include the word (Installed) in their description. When you select an existing server, the Validate button will be enabled.
  - The server version of the new master node that PEM will install when configuring the streaming replication scenario. To create a new server, select a server version that does not include the word (Installed) in the description.
- Use the drop-down listbox in the **Replication host address** field to select the address of the host on which the master node will reside.

- Optionally, provide a name for a replication slot in the Replication slot name field; the PEM server will create the replication slot on the master node, and add entries to the recovery.conf files on standby nodes. A replication slot name can contain lower-case letters, numbers, and the underscore character. This option is valid only for database server versions 9.4 and above.

For more information about replication slots, see the PostgreSQL Core documentation, available at:

<http://www.postgresql.org/docs/current/static/warm-standby.html#STREAMING-REPLICATION-SLOTS>

Click **Next** to continue.

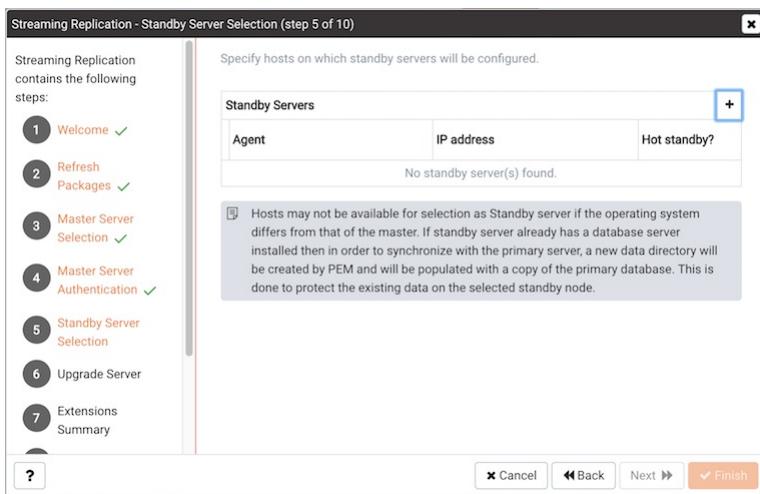


Use the **Master Server Authentication** dialog to provide authentication information for the master node.

- Use the **Replication user name** field to specify the name of an existing role that is either a database superuser or has REPLICATION privileges, or the name of a role that will be created by PEM for use during replication-related transactions. Please note that PEM will return an error if you specify the name of an existing user with insufficient privileges.
- Use the **Replication password** field to specify the password that will be associated with the replication user.
- Use the **Database user name** field to specify the name of a database superuser on the master node.
- Use the **Database password** field to specify the password associated with the database superuser.

If you are using an existing server as the master node of the replication scenario, you must use the Validate button to confirm that the connection information provided. When you press the Validate button, the server will attempt to connect with the credentials supplied.

Click **Next** to continue.



Use the table on the **Standby Server Selection** dialog to provide properties of one or more standby nodes. Click the add icon (+) to add an entry to the table.

Streaming Replication - Standby Server Selection (step 5 of 10) X

Streaming Replication contains the following steps:

- 1 Welcome ✓
- 2 Refresh Packages ✓
- 3 Master Server Selection ✓
- 4 Master Server Authentication ✓
- 5 Standby Server Selection
- 6 Upgrade Server ✘
- 7 Extensions Summary
- 8 Review Packages
- 9 Download Packages
- 10 Schedule Setup

Specify hosts on which standby servers will be configured.

Standby Servers			
Agent	IP address	Hot standby?	
<input checked="" type="checkbox"/> WIN-SNVER2CPJAB	192.168.24.220	<input checked="" type="checkbox"/>	No

**Options**

**Agent**

WIN-SNVER2CPJAB

Use the Agent drop-down to select the name of the agent that will monitor a standby node in the replication scenario.  
Please note that you will not be able to edit the properties of a standby node that is already part of a replication scenario.

**IP address**

192.168.24.220

Use the IP address drop-down listbox to select the IP address of the standby node.

**Hot standby?**

No

Use Hot standby if the standby node should be used for read-only queries while acting as a standby node in the replication scenario.

**Synchronous?**

No

Use Synchronous to enable synchronous replication; streaming replication is asynchronous by default. If a standby node is specified as Synchronous, a transaction will not be committed until it is written to the transaction log of both the master node and standby node. Data loss is less-likely in the event of a server failure of a node of a synchronous replication scenario, but will increase the processing time of each transaction.

**Priority**

1

Use the Priority to specify the order in which the standby nodes will be listed in the postgresql.conf file of the master node.  
For example, select 1 to indicate that the standby should be listed first, 2 to indicate that the node should be listed second, etc.

**Replication state**

**Application name**

**Hosts may not be available for selection as Standby server if the operating system differs from that of the master. If standby server already has a database server installed then in order to synchronize with the primary server, a new data directory will be created by PEM and will be populated with a copy of the primary database. This is done to protect the existing data on the selected standby node.**

Use the **Standby Server Options** form to provide information about the standby node:

- Use the **Agent** drop-down listbox to select the name of the agent that resides on the standby node in the replication scenario. Please note that you will not be able to edit the properties of a standby node that is already part of a replication scenario.
- Use the **IP address** drop-down listbox to select the IP address of the standby node.
- Set the **Hot standby** field to Yes if the standby node should be used for read-only queries while acting as a standby node in the replication scenario.
- Set the **Synchronous?** field to Yes to enable synchronous replication; streaming replication is asynchronous by default. If a standby node is specified as Synchronous, a transaction will not be committed until it is written to the transaction log of both the master node and standby node.

Data loss is less-likely in a synchronous replication scenario should a failover occur, but using synchronous

replication increases the processing time of each transaction.

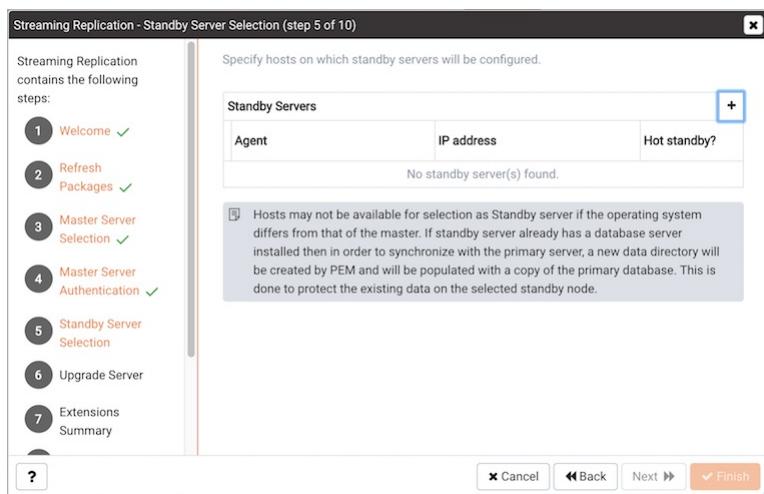
- Use the **Priority** drop-down listbox to specify the order in which the standby nodes will be listed in the postgresql.conf file of the master node. For example, select 1 to indicate that in the standby should be listed first, 2 to indicate that the node should be listed second, etc.

If you are adding the standby to an existing replication scenario, PEM will display the identity of the replication master in the Replication state field, and the name of the application (from the pg\_stat\_replication table) in the Application name field. These values are not user-modifiable.

Click the **Add/Change** button to add another standby node to the list of servers, or the **Edit** icon to modify the values associated with a server in the list. Use the **Delete** icon to remove a standby definition from the table. When you've finished defining the standby nodes, click **Next**.



The **Extension Summary** panel lists the extensions or modules that are installed on the nodes of the replication scenario. Any extension installed on the master node must also be installed on each standby node of the replication scenario.



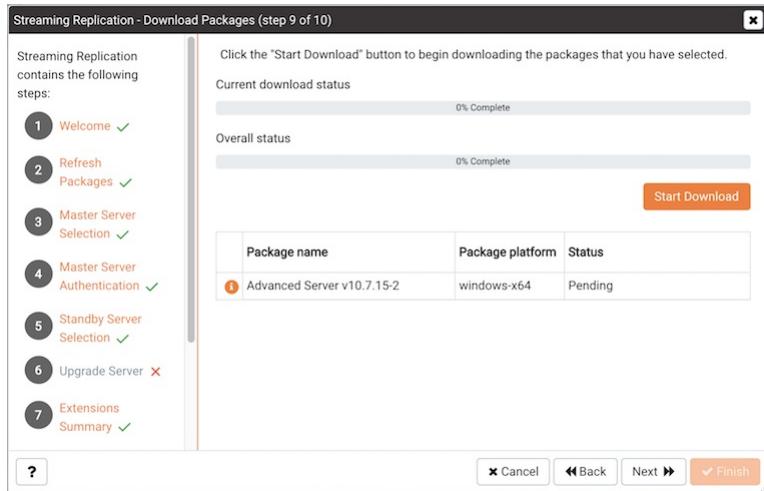
If PEM is installing new servers, the Streaming Replication wizard opens to a tree control that provides an overview of the master and standby nodes and allows you to specify installation properties for each server. To review or modify the installation properties, highlight the name of a node in the tree control; provide values for the selected server in the Option value fields. Prompts on the taskbar will notify you of each required field.

When updating the installation properties, you should confirm that the user name and password specified match

the name and password provided on the Master Server Selection dialog. You should also confirm that the specified port is not already in use on the host of the master or standby.

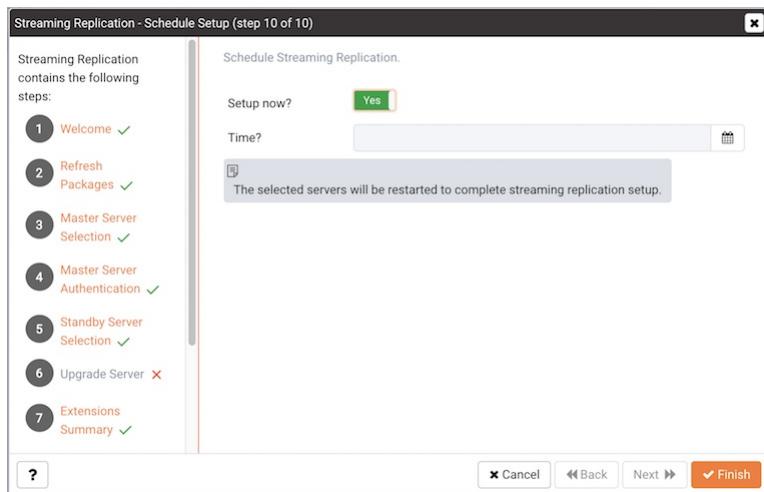
The data directory for the cluster may be created in a non-default location. If you move the data directory from the path specified during the installation, you must update the path specified in the [/etc/postgres-reg.ini](#) file.

After providing installation options, click **Next** to continue.



The **Download Packages** dialog displays a list of the packages that will be required to install the configured replication scenario. Click **Back** to return to a previous screen and modify the selections, or click **Start Download** to begin downloading the packages that will be used for the installation.

When the download completes, click **Next** to continue; the streaming replication wizard will open a dialog that allows you to schedule streaming replication setup.



Use fields on the **Schedule Setup** dialog to specify the most convenient time for the server to configure the replication scenario:

- Set **Setup now?** to **Yes** to instruct PEM that it should install and configure streaming replication immediately.
- Set **Setup now?** to **No** to enable the date and time selectors; use the selectors to specify when you would like PEM to (optionally) perform installations and configure streaming replication.

Click **Finish** to save your choice and exit the wizard; PEM will either begin the installation and configuration process or schedule the installation and configuration for the specified time. You can review the job schedule and job progress on the **Scheduled Tasks** tab; to open the Scheduled Tasks tab, highlight the name of the PEM agent for which you wish to review the job queue and select **Scheduled Tasks...** from the **Management** menu. When the Streaming Replication installation wizard completes, you can register the servers and monitor the replication scenario on the Streaming Replication dashboard.

Please note that the Streaming Replication wizard only modifies the `pg_hba.conf` file on replication nodes to allow connections by the replication user; before defining a server connection in the PEM client, you may need to modify the `pg_hba.conf` file on each node to allow the connection from the client.

## Monitoring Streaming Replication and Failover Manager

You can use the Streaming Replication Analysis dashboard to monitor Streaming Replication and Failover Manager high-availability scenarios. To view the Streaming Replication Analysis dashboard, you must enable probes that monitor replication-related activity; to change a probe configuration, highlight the server name in the PEM client tree control, and select `Manage Probes...` from the `Management` dashboard.

To view the Streaming Replication Analysis dashboard for the master node of a replication scenario, enable the following probes:

`Streaming Replication`

`WAL Archive Status`

To view the Streaming Replication Analysis dashboard for the standby node of a replication scenario, you must enable the following probe:

`Streaming Replication Lag Time`

Then, to open the `Streaming Replication Analysis` dashboard, navigate to the `Monitoring` tab, and:

1. Select the name of the agent that monitors the node from the `Agents` drop-down menu.
2. Select the name of the monitored server from the `Servers` drop-down menu.
3. Select `Streaming Replication Analysis` from the `Dashboards` drop-down menu.
4. Then, to open the `Streaming Replication` dashboard, right click on the name of the master or standby node of the replication scenario in the Object Browser tree control, and select `Streaming Replication Analysis` from the `Dashboards` context menu.

Dashboard Properties SQL Statistics Dependencies Dependents **Monitoring**

Standby Agent ▾ 9\_3\_Slave ▾ Streaming Replication ▾

Object Type Server Status UP (Since: 3/20/2019, 3:00:47 PM) Generated On 3/20/2019, 7:21:08 PM No of alerts 2 (Acknowledged: 0)

WAL Status

WAL Archive Status

Time	Value
10:00	2.0
12:00	3.0

WAL Segment Lag

'Streaming Replication' probe is disabled or no data is available.

WAL Page Lag

'Streaming Replication' probe is disabled or no data is available.

Replication Status

Replication Time Lag

Time	Value (min)
10:00	~10
12:00	~150
End	~250

Replication Status: Paused

Failover Manager Cluster Status

Failover Manager Cluster Information

Properties	Values
Cluster Name	efm
Failover Manager Agent Running Status	UP
Allowed Node List	192.168.172.143, 192.168.172.147
Standby Priority List	
Cluster Status Message	No standby databases were found.

Failover Manager Node Status

Agent Type	Address	Agent	DB	XLog Location	Status Information	XLog Information	VIP	VIP Status
Master	192.168.172.143	UP	UP	0/3FB5D5A8			192.168.172.149	True
Idle	192.168.172.147	UP	UNKNOWN	UNKNOWN		Connection to 192.168.172.147:5550 refused. Check that the hostname and port are correct and that the postmaster is accepting TCP/IP connections.	192.168.172.149	False

## Configuring High-Availability for PEM

Replication ensures that data written to the Master node of a cluster is preserved on a Standby node; if a problem

occurs on the Master node (such as hardware failure), a Standby node can easily be promoted to replace the failed node. The behavior of a replication cluster can be described as:

**active/active** – In an active/active cluster, the master node or nodes manages write transactions while the standby nodes are available for read requests. Streaming Replication *with* hot standby or EDB Postgres Multi-Master Replication manage active/active clusters. If you are using an active/active replication scenario, you probably have a PEM agent on each node of the cluster, and are actively monitoring each node with PEM.

**active/passive** – In an active/passive cluster, only the master node is used for read and write transactions. Standby nodes ensure that in the event of a failure of the master node, a complete backup is available to replace the master node. RHCS (Red Hat Cluster Suite), Veritas Replicator, or Streaming Replication *without* hot standby manage active/passive clusters. If you are using an active/passive replication scenario, you are probably only actively monitoring the master node of your replication scenario with PEM.

If PEM is configured to monitor the master and standby nodes, and a standby is promoted, the PEM agents that are currently monitoring the nodes will continue to monitor the newly promoted master unless the node on which the agent resides fails.

If PEM is configured to only monitor the master node and the master node fails, the new master node will be unmonitored unless you configure a standby PEM agent to takeover monitoring of the new master. To create an agent hierarchy that allows an agent to assume monitoring a newly promoted Master, you should install a PEM agent on the Master node, and on any Standby node that might be promoted to master; each agent should be bound to the PEM server.

To configure PEM to promote an agent on a Standby node to monitor the newly promoted Master, you must:

- Enable takeover on any Standby node that might be promoted.
- Add a line to your failover script that creates a flag directory, and instructs the agent to assume monitoring.

To enable takeover of a server, right-click on the name of a server in the PEM client tree control, and select Properties from the context menu. When the Properties dialog opens, check the box next to Allow takeover? on the PEM Agent tab of the Server Properties dialog. Each server that will potentially be promoted to the role of Master should be configured to allow takeover by another agent.

After allowing takeover of the server, add configuration steps to your failover script that instruct the PEM agent on a promoted Standby node (the new Master node) to assume monitoring the database server.

To instruct the agent to takeover the monitoring of a server, the failover process must create a file in a special *flag* directory which will instruct the agent to take responsibility for the specified server. By default, the flag directory used by the agent is:

```
$TMPDIR/pem/agent-AGENTID
```

Where \$TMPDIR is the temporary directory for the user account under which the agent runs.

The user account is usually root on a Linux system or Administrator on Windows. You can override the directory path by specifying a value for the AgentFlagDir configuration option in the registry on Windows, or in the agent\_flag\_dir parameter in the agent configuration file on Linux.

For example, you might add the following command to a failover script on a Linux server:

```
touch /tmp/pem/agent-<agent_id>/takeover-server-<server_id>
```

where

*agent\_id* is the numeric identifier of the agent that should takeover the monitoring of the server

*server\_id* is the numeric identifier of the server that will be taken over.

To find the *agent\_id* and *server\_id*, log into the PEM client, and highlight the name of the agent or server; the numeric identifier will be displayed in the ID row on the Properties pane of the PEM client.

## 4.12 Monitoring Failover Manager

If you are using EDB Failover Manager to monitor your replication scenario, you must manually install and configure Failover Manager. For detailed information about installing Failover Manager, visit the EnterpriseDB website at:

<https://www.enterprisedb.com/products/edb-postgres-platform/edb-postgres-failover-manager>

To monitor the status of a Failover Manager cluster on the Streaming Replication dashboard, you must provide the following information on the **Advanced** tab of the **server Properties** dialog for each node of the cluster:

- Use the **EFM Cluster Name** field to specify the name of the Failover Manager cluster. The cluster name is the prefix of the name of the cluster properties file. For example, if your cluster properties file is named efm.properties, your cluster name is efm.
- Use the **EFM Installation Path** field to specify the location of the Failover Manager binary file. By default, the Failover Manager binary file is installed in /usr/efm-2.1/bin.

After registering your servers, the **Streaming Replication Analysis** dashboard will display status information about your EFM cluster near the bottom of the dashboard.

The screenshot shows the 'Failover Manager Cluster Status' section of the 'Streaming Replication Analysis' dashboard. It contains two tables:

Properties		Values	
Cluster Name	efm		
Failover Manager Agent Running Status	UP		
Allowed Node List	192.168.172.143, 192.168.172.147		
Standby Priority List			
Cluster Status Message	No standby databases were found.		

Agent Type	Address	Agent	DB	XLog Location	Status Information	XLog Information	VIP	VIP Status
Master	192.168.172.143	UP	UP	0/3FBDS08			192.168.172.149	True
Idle	192.168.172.147	UP	UNKNOWN	UNKNOWN		Connection to 192.168.172.147:5550 refused. Check that the hostname and port are correct and that the postmaster is accepting TCP/IP connections.	192.168.172.149	False

The **Failover Manager Cluster Status** section of the Streaming Replication Analysis dashboard displays information about the monitored cluster:

The **Failover Manager Cluster Information** table provides information about the Failover Manager cluster:

- The **Properties** column displays the name of the cluster property.
- The **Values** column displays the current value of the property.

The **Failover Manager Node Status** table displays information about each node of the Failover Manager cluster:

- The **Agent Type** column displays the type of agent that resides on the node; the possible values are Master, Standby, Witness, Idle, and Promoting.
- The **Address** column displays the IP address of the node.
- The **Agent** column displays the status of the agent that resides on the node.
- The **DB** column displays the status of the database that resides on the node.
- The **XLog Location** column displays the transaction log location of the database.
- The **Status Information** column displays any error-related information about the node.
- The **XLog** Information column displays any error-related information about the transaction log.
- The **VIP** column displays the VIP address that is associated with the node.
- The **VIP Status** column displays True if the VIP is active for the node, False if the VIP is not.

### Replacing a Master Node

You can use the PEM client to replace the Master node of a Failover Manager cluster with a standby node. To initiate the failover process, select Replace Cluster Master from the Management menu. A dialog opens, asking you to confirm that you wish to replace the current master node.



Select **Yes** to remove the current master node from the Failover Manager cluster and promote a standby node to the role of read/write master node within a Failover Manager cluster. The node with the highest promotion priority (defined in Failover Manager) will become the new master node. PEM will display a dialog, reporting the job status.



When the job completes and the Streaming Replication Analysis dashboard refreshes, you can review the **Failover Manager Node Status** table to confirm that a standby node has been promoted to the role of master within the Failover Manager cluster.

## 4.13 Monitoring an xDB Replication Cluster

Before configuring PEM to retrieve statistics from an Advanced Server or PostgreSQL database that is part of an xDB replication scenario, you must manually install and configure xDB Replication. For more information about xDB replication solutions and documentation, please visit the EnterpriseDB website at:

<http://www.enterprisedb.com/products-services-training/products-overview/xdb-replication-server-multi-master>

The PEM xDB Replication probe monitors lag data for clusters that use xDB multi- master or single-master replication that have a publication database that is an EDB Postgres Advanced Server or PostgreSQL database. Please note that if you have configured replication between other proprietary database hosts (i.e. Oracle or SQL Server) and Advanced Server or PostgreSQL, the probe cannot return lag information.

**Description**

**Manage Custom Probes:** PEM uses probes to retrieve statistics from a monitored server, database, operating system or agent. You can view, reconfigure, delete, or create your own custom probes.

**Copy Probes:** PEM allows copying of probes from any chosen object recursively down through the object hierarchy. Click on Copy Probes to quickly copy the displayed probe configuration to a selected target.

**Quick Links**

  
Manage Custom Probes


  
Copy Probes


  
Help
**Probes**

Probe name	Execution Frequency			Enabled?		Data Retention	
	Default?	Minutes	Seconds	Default?	Probe Enable?	Default?	Days
Database Frozen XID	<input checked="" type="checkbox"/>	720	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	180
Database Size	<input checked="" type="checkbox"/>	30	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	180
Database Statistics	<input checked="" type="checkbox"/>	30	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	90
Function Statistics	<input checked="" type="checkbox"/>	30	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	90
Index Size	<input checked="" type="checkbox"/>	30	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	180
Index Statistics	<input checked="" type="checkbox"/>	30	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	90
Materialized View Bloat	<input checked="" type="checkbox"/>	30	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	180
Materialized View Frozen XID	<input checked="" type="checkbox"/>	720	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	180
Materialized View Size	<input checked="" type="checkbox"/>	30	0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	180

By default, the **xDB Replication** probe is disabled. To enable the **xDB Replication** probe, right click on the name of the server, and select **Connect** from the context menu; if prompted, provide authentication information. After connecting, expand the server node of the tree control, and highlight the name of the replicated database. Then, select **Manage Probes...** from the **Management** menu.

Use fields on the **Manage Probes** tab to configure the xDB Replication probe:

- Move the **Default** slider to **No** to modify the Minutes and Seconds between probe executions.
- Use the **Enabled?** slider to instruct PEM to execute the xDB Replication probe.
- Set the **Default** slider in the **Data Retention** field to No to modify the number of days that PEM will store the information retrieved by the probe.

After enabling the probe, you can use the metrics returned to create custom charts and dashboards in the PEM client.

## 4.14 Performance Diagnostics

You can use the Performance Diagnostic dashboard to analyze the database performance for Advanced Server instances by monitoring the wait events. To display the diagnostic charts, PEM uses the data collected by Advanced Server's EDB Wait States module.

For more information about EDB Wait States, see the *EDB Postgres Advanced Server Guide*, available at:

[https://www.enterprisedb.com/docs/en/11.0/EPAS\\_Guide\\_v11/EDB\\_Postgres\\_Advanced\\_Server\\_Guide.1.077.html](https://www.enterprisedb.com/docs/en/11.0/EPAS_Guide_v11/EDB_Postgres_Advanced_Server_Guide.1.077.html)

You can analyze the Wait States data on multiple levels by narrowing down your selection of data. Each level of the chart is populated on the basis of your selection of data at the higher level.

## Prerequisites

- You must have superuser privileges to access the Performance Diagnostic dashboard.
- You must ensure that the EDB Wait States module is installed. Modify the `postgresql.conf` file, adding the `edb_wait_states` library to the list of libraries in the `shared_preload_libraries` parameter:

```
shared_preload_libraries = '$libdir/edb_wait_states'
```

Then, restart the database server, and create the extension:

```
CREATE EXTENSION edb_wait_states;
```

The console will display an error if you do not meet the prerequisites.

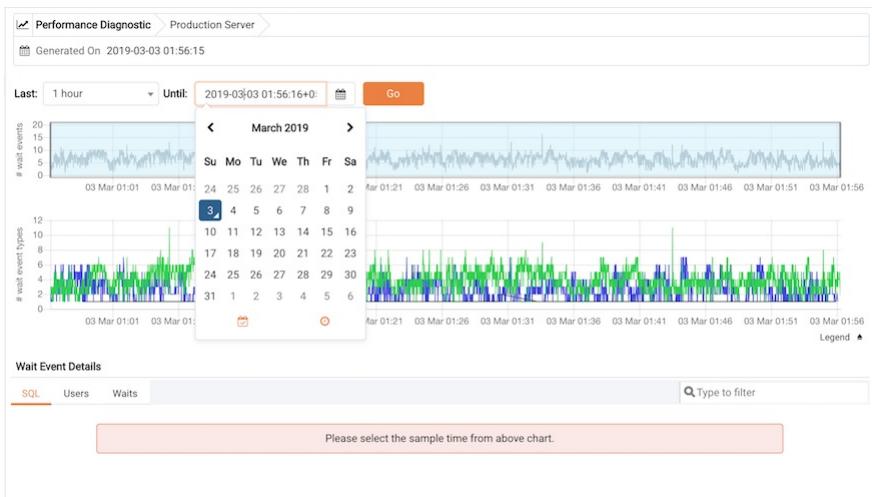


To open the Performance Diagnostic dashboard, select the `Performance Diagnostic` option from the `Management` menu of the PEM client.

By default, the top most Performance Diagnostic chart pulls the data for one hour, starting from current date and time. The default range selection in hours in the first chart can be customized in the `Performance Diagnostic` section of the `Preferences` dialog under the `File` menu. You can also use the `Preferences` dialog to display `Performance Diagnostic` in a new browser tab. Use `Open in New Browser Tab?` to display the `Performance Diagnostics` dashboard in a new browser tab.

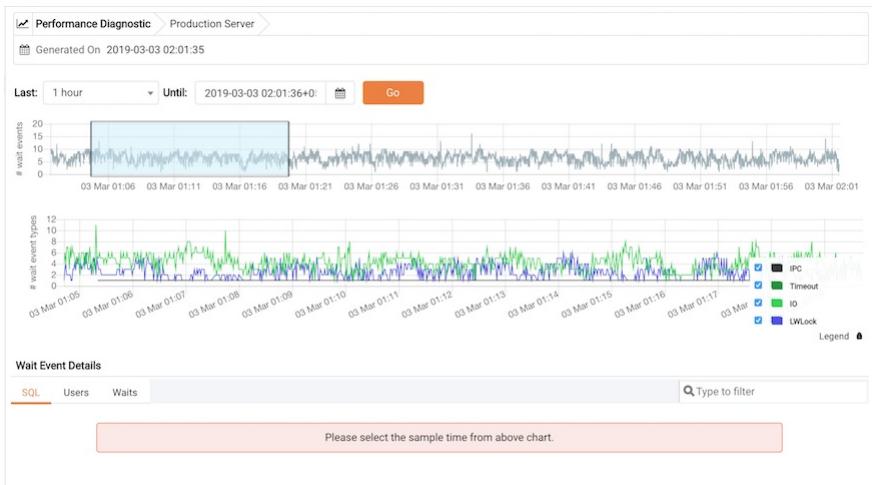


Use the `Last` drop-down list box to select the duration for which you want to see the chart. Select the 1 hour, 4 hours, 12 hours, or 24 hours. You can also select the date and time through which you want the data to be displayed.



The first chart displays the number of wait events that have occurred over the period of time that is selected for the charts. You can narrow down the timeline in the first chart to analyze the data for a specific period. The second chart displays the total number of wait events of each type, for the timeline that you select in the first chart. You can select the specific wait event types for which you want to analyze the data.

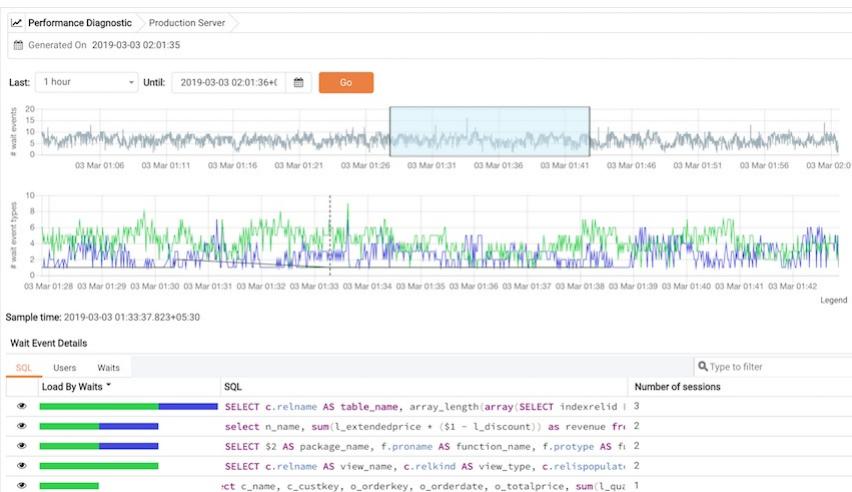
To make differentiation easier, the graph for each wait event type is displayed in a different color. Click on **Legend** to identify the color in which a particular wait event type is displayed in the graph.



Select a point in time on the second chart for which you wish to analyze the wait events; the **Wait Event Details** panel is populated on the basis of your selection in the second chart. The panel makes wait details available on three tabs:

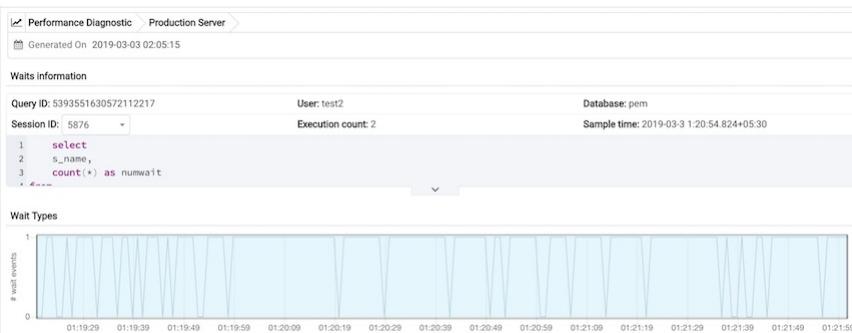
- The **SQL tab** displays the list of SQL queries having wait events for the selected sample time.
- The **Users** tab displays the details of the wait events grouped by users for selected sample time.
- The **Waits** tab displays the number of wait events belonging to each wait event type for the selected sample time.

You can filter the data displayed on the three tabs, or sort the data alphabetically by clicking on a column header.



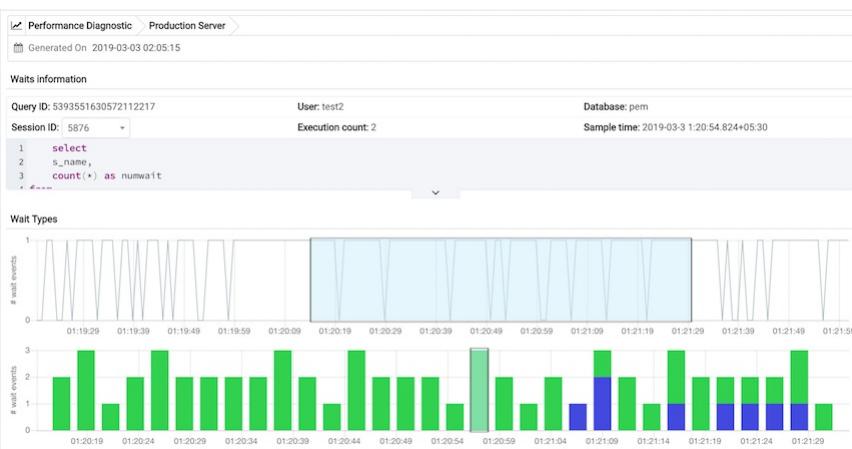
Click on the **Eye** icon in any row to display a new tab with details of the query for a particular row. This tab displays the **Query ID** and its corresponding sessions IDs in a dropdown list. Select the session ID for the query for which you want to analyze the data; the tab will display details corresponding to the selected session ID and query ID.

The **Waits information** table displays the waiting query. If the query is partially displayed, click the down arrow at the bottom of the section to view the complete SQL query.

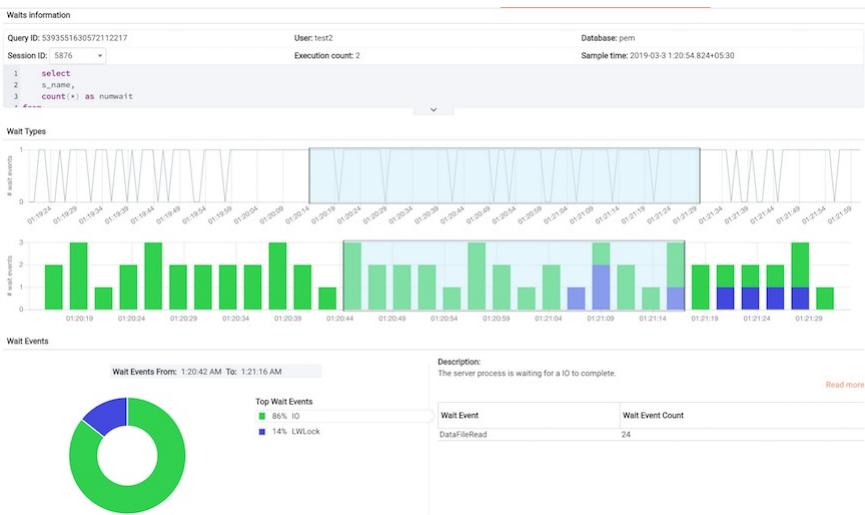


The **Wait Types** panel displays the total number of wait events for the selected session ID and query ID. Select a time range in the first chart to analyze the data for a specific period.

The **Wait Types** bar graph displays the total number of wait event types for the duration that you select. To make differentiation easier, each wait event type is represented by a different color in the bar graph.



Select the range for which you want to analyze the wait event types and their corresponding wait events; the **Wait Events** donut chart is populated on the basis of your selection. In the Wait Events donut chart, all the wait event types applicable to the selected duration are displayed in the percentage format. You can select any one wait event type to see all the wait events belonging to that particular wait event type and their count. Click Read More to read about the various wait event types and wait events.



In the **Wait Events** donut chart, all the wait event types applicable to the selected timeline are displayed a percentage format. You can select any one wait event type to see all the wait events belonging to that particular wait event type and their count. Click the [Read More](#) link to read about the various wait event types and wait events.

## 4.15 Reference

The following sections are provided for reference; please note that the items referred to in the following tables are subject to change.

### PEM Server Configuration Parameters - Reference

You can use global configuration options to modify aspects of the PEM Server's behavior. Please note that the list of configuration parameters is subject to change.

Parameter name	Value and Unit	Description
audit_log_retention_time	30 days	Specifies the number of days that an audit log will be retained on the PEM server.
auto_create_agent_alerts	true	Specifies whether to create default agent level alerts automatically when an agent is registered.
auto_create_server_alerts	true	Specifies whether to create default server level alerts automatically when a server is bound to an agent.
chart_disable_bullets	false	Enable/disable bullets on line charts on dashboards and Capacity Manager reports.
cm_data_points_per_report	50	Specifies the number of data points to plot on charts on Capacity Manager reports.
cm_max_end_date_in_years	5 years	Specifies the maximum amount of time that the Capacity Manager will extrapolate data for. Ensures that threshold-based end dates of on reports do not get extrapolated indefinitely.
dash_alerts_timeout	60 seconds	Specifies the number of seconds after which the components of the Alerts dashboard are auto-refreshed.

Parameter name	Value and Unit	Description
dash_db_comrol_span	7 days	Specifies the number of days worth of data to plot on the Commit/Rollback Analysis chart on the Database Analysis dashboard and Server Analysis dashboard.
dash_db_comrol_timeout	1800 seconds	Specifies the number of seconds after which the Commits/Rollbacks line chart is auto-refreshed on the Database Analysis dashboard and Server Analysis dashboard.
dash_db_connovervw_timeout	300 seconds	Specifies the number of seconds after which the Connection Overview pie chart is auto-refreshed in the Database Analysis dashboard.
dash_db_eventlag_span	7 days	Specifies the number of days worth of data to plot on the Number of Events Lag chart for Slony replication on the Database Analysis dashboard.
dash_db_eventlag_timeout	1800 seconds	Specifies the number of seconds after which the Number of Events Lag line chart for Slony replication is auto-refreshed on the Database Analysis dashboard.
dash_db_hottable_rows	25 rows	Specifies the number of rows to show on the HOT Table Analysis table on the Database Analysis dashboard.
dash_db_hottable_timeout	300 seconds	Specifies the number of seconds after which the Hot Tables table is auto-refreshed in the Database Analysis dashboard.
dash_db_io_span	7 days	Specifies the number of days worth of data to plot on the Database I/O Analysis chart on the Database Analysis dashboard and I/O Analysis dashboard.
dash_db_io_timeout	1800 seconds	Specifies the number of seconds after which the Database I/O line chart is auto-refreshed on the Database Analysis dashboard and I/O Analysis dashboard.
dash_db_rowact_span	7 days	Specifies the number of days worth of data to plot on the Row Activity Analysis chart on the Database Analysis dashboard, the I/O Analysis dashboard, and the Server Analysis dashboard.
dash_db_rowact_timeout	1800 seconds	Specifies the number of seconds after which the Row Activity line chart is auto-refreshed on the Database Analysis dashboard, the I/O Analysis dashboard, and the Server Analysis dashboard.
dash_db_storage_timeout	300 seconds	Specifies the number of seconds after which the Storage bar chart is auto-refreshed in the Database Analysis dashboard.
dash_db_timelag_span	7 days	Specifies the number of days worth of data to plot on the Time Lag chart for Slony replication on the Database Analysis dashboard.
dash_db_timelag_timeout	1800 seconds	Specifies the number of seconds after which the Time Lag line chart for Slony replication is auto-refreshed on the Database Analysis dashboard.
dash_db_useract_span	7 days	Specifies the number of days worth of data to plot on the User Activity Analysis chart on the Database Analysis dashboard.
dash_db_useract_timeout	1800 seconds	Specifies the number of seconds after which the User Activity line chart is auto-refreshed in the Database Analysis dashboard.
dash_efm_timeout	300 seconds	Specifies the number of seconds after which the Failover Manager Node Status and Failover Manager Cluster Info line chart is auto-refreshed on the Streaming Replication dashboard.

Parameter name	Value and Unit	Description
dash_global_overview_timeout	30 seconds	Specifies the number of seconds after which the components of the Global Overview dashboard are auto-refreshed.
dash_header_timeout	60 seconds	Specifies the number of seconds after which the information on the header of all the dashboards are auto-refreshed.
dash_io_chkpt_span	7 days	Specifies the number of days worth of data to plot on the Checkpoints chart on the I/O Analysis dashboard.
dash_io_chkpt_timeout	1800 seconds	Specifies the number of seconds after which the Checkpoints line chart is auto-refreshed on the I/O Analysis dashboard.
dash_io_hotindx_timeout	300 seconds	Specifies the number of seconds after which the Hot Indexes bar chart is auto-refreshed on the I/O Analysis dashboard.
dash_io_hottbl_timeout	300 seconds	Specifies the number of seconds after which the Hot Tables bar chart is auto-refreshed on the I/O Analysis dashboard.
dash_io_index_objectio_rows	25 rows	Specifies the number of rows displayed on the Index Activity table on the I/O Analysis dashboard and the Object Activity Analysis dashboard.
dash_io_index_objectio_timeout	60 seconds	Specifies the number of seconds after which the Index Activity table is auto-refreshed on the I/O Analysis dashboard and the Object Activity Analysis dashboard.
dash_io_objectio_rows	25 rows	Specifies the number of rows displayed in the Object I/O Details table on the I/O Analysis dashboard and Object Activity Analysis dashboard.
dash_io_objectio_timeout	300 seconds	Specifies the number of seconds after which the Object I/O Details table is auto-refreshed on the I/O Analysis dashboard and Object Activity Analysis dashboard.
dash_memory_hostmemact_span	7 days	Specifies the number of days worth of data to plot on the Host Memory Activity Analysis chart on the Memory Analysis dashboard.
dash_memory_hostmemact_timeout	1800 seconds	Specifies the number of seconds after which the Host Memory Activity line chart is auto-refreshed on the Memory Analysis dashboard.
dash_memory_hostmemconf_timeout	300 seconds	Specifies the number of seconds after which the Host Memory Configuration pie chart is auto-refreshed on the Memory Analysis dashboard and Server Analysis dashboard.
dash_memory_servmemact_span	7 days	Specifies the number of days worth of data to plot on the server Memory Activity Analysis chart on the Memory Analysis dashboard.
dash_memory_servmemact_timeout	1800 seconds	Specifies the number of seconds after which the Server Memory Activity line chart is auto-refreshed on the Memory Analysis dashboard.
dash_memory_servmemconf_timeout	300 seconds	Specifies the number of seconds after which the Server Memory Configuration pie chart is auto-refreshed on the Memory Analysis dashboard.
dash_objectact_objstorage_rows	15 rows	Specifies the number of rows to show on the Object Storage table on the Object Activity Analysis dashboard.
dash_objectact_objstorage_timeout	300 seconds	Specifies the number of seconds after which the Object Storage table is auto-refreshed in the Object Activity Analysis dashboard.

Parameter name	Value and Unit	Description
dash_objectact_objtopindexes_timeout	300 seconds	Specifies the number of seconds after which the Top 5 Largest Indexes bar chart is auto-refreshed in the Object Activity Analysis dashboard.
dash_objectact_objtoptables_timeout	300 seconds	Specifies the number of seconds after which the Top 5 Largest Tables bar chart is auto-refreshed in the Object Activity Analysis dashboard.
dash_os_cpu_span	7 days	Specifies the number of days worth of data to plot on the CPU chart on the Operating System Analysis dashboard.
dash_os_cpu_timeout	1800 seconds	Specifies the number of seconds after which the CPU line chart is auto-refreshed on the Operating System Analysis dashboard.
dash_os_data_span	7 days	Specifies the number of days worth of data to plot on the I/O line chart on the Operating System Analysis dashboard.
dash_os_disk_span	7 days	Specifies the number of days worth of data to plot on the Utilisation chart on the Operating System Analysis dashboard.
dash_os_hostfs_timeout	1800 seconds	Specifies the number of seconds after which the Host File System Details table is auto-refreshed on the Operating System Analysis dashboard.
dash_os_io_timeout	1800 seconds	Specifies the number of seconds after which the I/O line chart is auto-refreshed on the Operating System Analysis dashboard.
dash_os_memory_span	7 days	Specifies the number of days worth of data to plot on the Memory chart on the Operating System Analysis dashboard.
dash_os_memory_timeout	1800 seconds	Specifies the number of seconds after which the Memory line chart is auto-refreshed on the Operating System Analysis dashboard.
dash_os_packet_span	7 days	Specifies the number of days worth of data to plot on the Packet chart on the Operating System Analysis dashboard.
dash_os_packet_timeout	1800 seconds	Specifies the number of seconds after which the Network Packets line chart is auto-refreshed on the Operating System Analysis dashboard.
dash_os_process_span	7 days	Specifies the number of days worth of data to plot on the Process chart on the Operating System Analysis dashboard.
dash_os_process_timeout	1800 seconds	Specifies the number of seconds after which the Process line chart is auto-refreshed on the Operating System Analysis dashboard.
dash_os_storage_timeout	1800 seconds	Specifies the number of seconds after which the Storage pie chart is auto-refreshed on the Operating System Analysis dashboard.
dash_os_traffic_span	7 days	Specifies the number of days worth of data to plot on the Traffic chart on the Operating System Analysis dashboard.
dash_os_traffic_timeout	1800 seconds	Specifies the number of seconds after which the Traffic line chart is auto-refreshed on the Operating System Analysis dashboard.
dash_os_util_timeout	1800 seconds	Specifies the number of seconds after which the Utilisation line chart is auto-refreshed on the Operating System Analysis dashboard.

Parameter name	Value and Unit	Description
dash_probe_log_timeout	300 seconds	Specifies the number of seconds after which the Probe Log table is auto-refreshed on
dash_replication_archivestat_span	7 days	Specifies the number of days worth of data to plot on the WAL Archive Status chart on the Streaming Replication Analysis dashboard.
dash_replication_archivestat_timeout	1800 seconds	Specifies the number of seconds after which the WAL Archive Status line chart is auto-refreshed on the Streaming Replication dashboard.
dash_replication_pagelag_span	7 days	Specifies the number of days worth of data to plot on the WAL Lag Pages chart on the Streaming Replication dashboard.
dash_replication_pagelag_timeout	1800 seconds	Specifies the number of seconds after which the WAL Lag Pages line chart is auto-refreshed on the Streaming Replication dashboard.
dash_replication_segmentlag_span	7 days	Specifies the number of days worth of data to plot on the WAL Lag Segments chart on the Streaming Replication dashboard.
dash_replication_segmentlag_timeout	1800 seconds	Specifies the number of seconds after which the WAL Lag Segments line chart is auto-refreshed on the Streaming Replication dashboard.
dash_replication_timelag_span	7 days	Specifies the number of days worth of data to plot on the Replication Lag Time chart on the Streaming Replication dashboard.
dash_replication_timelag_timeout	1800 seconds	Specifies the number of seconds after which the Replication Lag Time line chart is auto-refreshed on the Streaming Replication dashboard.
dash_server_buffers_written	168 hours	Specifies the number of days worth of data to plot on the Background Writer Statistics chart on the Server Analysis dashboard.
dash_server_buffers_written_timeout	300 seconds	Specifies the number of seconds after which the Background Writer Statistics line chart is auto-refreshed on the Server Analysis dashboard.
dash_server_connovervw_timeout	300 seconds	Specifies the number of seconds after which the Connection Overview pie chart is auto-refreshed in the Server Analysis dashboard.
dash_server_database_timeout	300 seconds	Specifies the number of seconds after which the Databases table is auto-refreshed in the Server Analysis dashboard.
dash_server_dbsize_span	7 days	Specifies the number of days worth of data to plot on the Database Size Analysis on the Server Analysis dashboard.
dash_server_dbsize_timeout	1800 seconds	Specifies the number of seconds after which the Database Size line chart is auto-refreshed in the Server Analysis dashboard.
dash_server_disk_timeout	1800 seconds	Specifies the number of seconds after which the Disk line chart is auto-refreshed in the Server Analysis dashboard.
dash_server_global_span	7 days	Specifies the number of days worth of data to plot on the Disk line chart on the Server Analysis dashboard.
dash_server_sharedbuff_span	7 days	Specifies the number of days worth of data to plot on the Shared Buffer chart on the Server Analysis dashboard.
dash_server_sharedbuff_timeout	1800 seconds	Specifies the number of seconds after which the Shared Buffers line chart is auto-refreshed in the Server Analysis dashboard.

Parameter name	Value and Unit	Description
dash_server_tabspace_size_span	7 days	Specifies the number of days worth of data to plot on the Tablespace Size chart on the Server Analysis dashboard.
dash_server_tabspace_size_timeout	1800 seconds	Specifies the number of seconds after which the Tablespace Size line chart is auto-refreshed in the Server Analysis dashboard.
dash_server_useract_span	7 days	Specifies the number of days worth of data to plot on the User Activity chart on the Server Analysis dashboard.
dash_server_useract_timeout	1800 seconds	Specifies the number of seconds after which the User Activity line chart is auto-refreshed in the Server Analysis dashboard.
dash_sessact_lockact_timeout	300 seconds	Specifies the number of seconds after which the Session Lock Activity table is auto-refreshed in the Session Activity Analysis dashboard.
dash_sessact_workload_timeout	300 seconds	Specifies the number of seconds after which the Session Workload table is auto-refreshed in the Session Activity Analysis dashboard.
dash_sess_waits_nowaits_timeout	300 seconds	Specifies the number of seconds after which the Session Waits By Number Of Waits pie chart is auto-refreshed in the Session Waits Analysis dashboard.
dash_sess_waits_timewait_timeout	300 seconds	Specifies the number of seconds after which the Session Waits By Time Waited pie chart is auto-refreshed in the Session Waits Analysis dashboard.
dash_sess_waits_waitdtl_timeout	300 seconds	Specifies the number of seconds after which the Session Waits Details table is auto-refreshed in the Session Waits Analysis dashboard.
dash_storage_dbdtls_timeout	300 seconds	Specifies the number of seconds after which the Database Details table is auto-refreshed in the Storage Analysis dashboard.
dash_storage_dbovervw_timeout	300 seconds	Specifies the number of seconds after which the Database Overview pie chart is auto-refreshed in the Storage Analysis dashboard.
dash_storage_hostdtls_timeout	300 seconds	Specifies the number of seconds after which the Host Details table is auto-refreshed
dash_storage_hostovervw_timeout	300 seconds	Specifies the number of seconds after which the Host Overview pie chart is auto-refreshed in the Storage Analysis dashboard.
dash_storage_tblspcdtls_timeout	300 seconds	Specifies the number of seconds after which the Tablespace Details table is auto-refreshed in the Storage Analysis dashboard.
dash_storage_tblspcovervw_timeout	300 seconds	Specifies the number of seconds after which the Tablespace Overview pie chart is auto-refreshed in the Storage Analysis dashboard.
dash_sys_waits_nowaits_timeout	300 seconds	Specifies the number of seconds after which the System Waits By Number Of Waits pie chart is auto-refreshed in the System Waits Analysis dashboard.
dash_sys_waits_timewait_timeout	300 seconds	Specifies the number of seconds after which the System Waits By Time Waited pie chart is auto-refreshed in the System Waits Analysis dashboard.
dash_sys_waits_waitdtl_timeout	300 seconds	Specifies the number of seconds after which the System Waits Details table is auto-refreshed in the System Waits Analysis dashboard.
deleted_charts_retention_time	7 days	Specifies the number of days that a custom chart (displayed on a user-defined dashboard) is stored.

Parameter name	Value and Unit	Description
deleted_probes_retention_time	7 days	Specifies the number of days that a custom probe (displayed on a user-defined dashboard) is stored.
download_chart_format	jpeg	Specifies the format in which a downloaded chart will be stored. May be jpeg or png.
flapping_detection_state_change	3	Specifies the number of state changes detected within a specified interval to define a given alert as flapping.
job_retention_time	30 days	Specifies the number of days that non-recurring scheduled tasks and their associated
long_running_transaction_minutes	5 minutes	Specifies the number of minutes a query executes for before being considered long running.
nagios_cmd_file_name	<file_name>	Specifies nagios command file to which passive service check result will be sent.
nagios_enabled	t	Specifies whether alert notification will be submitted to nagios or not.
nagios_medium_alert_as_critical	f	Specifies whether medium level PEM alert will be considered as critical in nagios.
nagios_spool_retention_time	7 days	Specifies the number of days to retain nagios messages in the spool table before they are discarded.
package_catalog_xml	<address>	Specifies path of the catalog file which will be read by package catalog probe to get the list of all the supported packages.
package_download_chunk_size	1024 bytes	Specify the size( in Bytes) to be read from network while downloading packages. By default, through PEM 6, 1KB, for PEM 7 and forward, 1MB.
probe_log_retention_time	30 days	Specifies the number of days that probe log records are retained.
proxy_server	127.0.0.1	Use this parameter to specify the IP Address of a proxy server.
proxy_server_authentication	f	Set this parameter to t (true) if your proxy server requires authentication.
proxy_server_enabled proxy_server_password	f	If you use a proxy server on a client machine (when connecting with internet), enable this setting to read the manifest file and download packages. If your proxy server requires authentication, use this parameter to provide the password that will be used for authentication.
proxy_server_port proxy_server_username	80	Use this parameter to specify the port for a proxy server. If your proxy server requires authentication, use this parameter to provide the
reminder_notification_interval	24 hours	Specifies the number of hours after which a reminder email is sent in case an alert has not been cleared.
server_log_retention_time	30 days	Specifies the number of days that the server log is retained on the PEM server.
show_data_tab_on_graph	false	If 'true', a Data tab is added to each graph. Select the Data tab to review the data that is plotted on the graph.
smtp_authentication	false	Specifies whether to enable/disable authentication over SMTP.
smtp_enabled	true	Specifies whether to enable/disable sending of emails.
smtp_encryption smtp_password	false	Specifies whether to send SMTP email using an encrypted connection. Specifies the password to be used to connect to the SMTP server.
smtp_port	25	Specifies the SMTP server port to be used for sending email.

Parameter name	Value and Unit	Description
smtp_server	127.0.0.1	Specifies the SMTP server host address to be used for sending email.
smtp_spool_retention_time smtp_username	7 days	Specifies the number of days to retain sent email messages in the spool table before they are discarded. Specifies the username to be used to connect to SMTP server.
snmp_community	public	Specifies the SNMP community used when sending traps. Used only with SNMPv1 and SNMPv2.
snmp_enabled	true	Specifies whether to enable/disable sending SNMP traps.
snmp_port	162	Specifies the SNMP server port to be used for sending SNMP traps.
snmp_server	127.0.0.1	Specifies the SNMP server host address to be used for sending SNMP traps.
snmp_spool_retention_time	7 days	Specifies the number of days to retain sent traps in the spool table before they are discarded.
webclient_help_pg web_client_product_key	EnterpriseDB hosted documentation	Specifies the location of the online PostgreSQL core documentation. Specifies the product key of the PEM web client. This parameter may be changed by users with Administrative privileges.

## Capacity Manager Metrics - Reference

Please Note that the Capacity Manager metrics available will vary by platform, and are subject to change. The available metrics may include the metrics described in the table below.

Metric Name	Description
# Dead Tuples	The number of dead tuples in the selected table.
# Dead Tuples+	The cumulative number of dead tuples in the selected table.
# Heap Tuples Fetched by Index Scans	The number of heap tuples fetched by index scans.
# Heap Tuples Fetched by Index Scans	The cumulative number of heap tuples fetched by index scans.
# Idle Backends+	The cumulative number of currently idle backend clients.
# Index Scans	The number of index scans performed on the specified object.
# Index Scans+	The cumulative number of index scans performed on the specified object.
# Index Tuples Read	The number of index tuples read.
# Index Tuples Read+	The cumulative number of index tuples read.
# Live Tuples	The number of tuples visible to transactions.
# Live Tuples+	The cumulative number of tuples visible to transactions.
# Pages Estimated by ANALYZE	The number of pages estimated by ANALYZE.
# Pages Estimated by ANALYZE+	The cumulative number of pages estimated by ANALYZE.
# Sequential Scans	The number of sequential scans performed on the specific table.
# Sequential Scans+	The cumulative number of sequential scans performed on the specific table.
# Sequential Scan Tuples	The number of tuples sequentially scanned in the specific table.

Metric Name	Description
# Sequential Scan Tuples+	The cumulative number of tuples sequentially scanned in the specific table.
# Tuples Deleted	The number of tuples deleted.
# Tuples Deleted+	The cumulative number of tuples deleted.
# Tuples Estimated by ANALYZE	The number of live (visible) tuples estimated by ANALYZE.
# Tuples Estimated by ANALYZE+	The cumulative number of live tuples estimated by ANALYZE.
# Tuples HOT Updated	The number of tuples HOT updated. In a HOT update, the new tuple resides in the same block as the original tuple and the tuples share an index entry.
# Tuples HOT Updated+	The cumulative number of tuples HOT updated.
# Tuples Inserted	The number of tuples inserted into the specified table.
# Tuples Inserted+	The cumulative number of tuples inserted into the specified table.
# Tuples Updated	The number of tuples updated in the selected table.
# Tuples Updated+	The cumulative number of tuples updated in the selected table.
Blocks Hit	The number of blocks found in the cache.
Blocks Hit+	The cumulative number of blocks found in the cache.
Blocks Read	The number of blocks read.
Blocks Read+	The cumulative number of blocks read.
Blocks Read from InfiniteCache	The number of blocks read from InfiniteCache.
Blocks Read from InfiniteCache+	The cumulative number of blocks read from InfiniteCache.
Blocks Written	The number of blocks written.
Blocks Written+	The cumulative number of blocks written.
Buffers Allocated	The number of buffers allocated.
Buffers Allocated+	The cumulative number of buffers allocated.
Buffers Written - Backends	The number of buffer blocks written to disk by server processes (processes connected to a client application).
Buffers Written - Backends+	The cumulative number of buffer blocks written to disk by server processes.
Buffers Written - Checkpoint	The number of blocks written to disk by the checkpoint process.
Buffers Written - Checkpoint+	The cumulative number of blocks written to disk by the checkpoint process.
Buffers Written - Cleaning Scan	The number of blocks written to disk by the autovacuum process.
Buffers Written - Cleaning Scan+	The cumulative number of blocks written to disk by the autovacuum process.
Bytes Received (KB)	The number of bytes received from the client (in kilobytes).
Bytes Received (KB)+	The cumulative number of bytes received (in kilobytes).
Bytes Sent (KB)	The number of bytes sent to the client (in kilobytes).
Bytes Sent (KB)+	The cumulative number of bytes sent (in kilobytes).
Checkpoints - Timed	The number of checkpoint operations triggered by the checkpoint interval.
Checkpoints - Timed+	The cumulative number of checkpoint operations triggered by the checkpoint interval.
Checkpoints - Untimed	The number of checkpoint operations triggered by checkpoint size.

Metric Name	Description
Checkpoints - Untimed+	The cumulative number of checkpoint operations triggered by checkpoint size.
Database Size (MB)	The size of the specified database (in megabytes).
Free RAM Memory	The amount of free RAM memory (in megabytes).
Free Swap Memory	The amount of free swap space on disk (in megabytes).
Heap Blocks Hit	The number of heap blocks found in the cache.
Heap Blocks Hit+	The cumulative number of heap blocks found in the cache.
Heap Blocks Read	The number of heap blocks read.
Heap Blocks Read+	The cumulative number of heap blocks read.
Index Blocks Hit	The number of index blocks found in the cache.
Index Blocks Hit+	The cumulative number of index blocks found in the cache.
Index Blocks Read	The number of index blocks read.
Index Blocks Read+	The cumulative number of index blocks read.
Index Size (MB)	The size of the specified index (in megabytes).
In Packets Discards	The number of inbound packets discarded.
In Packets Discards+	The cumulative number of inbound packets discarded.
In Packets Errors	The number of inbound packets that contain errors.
In Packets Errors+	The cumulative number of inbound packets that contain errors.
Link Bandwidth (Mbit/s)	The speed of the network adapter (in megabits per second).
Load Average - 15 Minute	CPU saturation (in percent) - 15 minute sampling average.
Load Average - 1 Minute	CPU saturation (in percent) - 1 minute sampling average.
Load Average - 5 Minute	CPU saturation (in percent) - 5 minute sampling average.
Load Percentage	CPU saturation in percent.
Number of Prepared Transactions+	The cumulative number of prepared transactions.
Number of WAL Files+	The cumulative number of write-ahead log files.
Out Packets Discards	The number of outbound packets discarded.
Out Packets Discards+	The cumulative number of outbound packets discarded.
Out Packets Errors	The number of outbound packets that contain errors.
Out Packets Errors+	The cumulative number of outbound packets that contain errors.
Packets Received	The number of packets received.
Packets Received+	The cumulative number of packets received.
Packets Sent	The number of packets sent.
Packets Sent+	The cumulative number of packets sent.
Size (MB)	The total size of the disk (in megabytes).
Size of Indexes (MB)	The size of indexes on the specified table (in megabytes).
Space Available (MB)	The current disk space available (in megabytes).
Space Used (MB)	The current disk space used (in megabytes).
Table Size (MB)	The size of the specified table (in megabytes).
Tablespace Size (MB)	The size of the specified tablespace (in megabytes).

Metric Name	Description
Temp Buffers (MB)	The size of temporary buffers (in megabytes).
Toast Blocks Hit	The number of TOAST blocks found in the cache.
Toast Blocks Hit+	The cumulative number of TOAST blocks found in the cache.
Toast Blocks Read	The number of TOAST blocks read.
Toast Blocks Read+	The cumulative number of TOAST blocks read.
Total RAM Memory	The total amount of RAM memory on the system (in megabytes).
Total Swap Memory	The total amount of swap space on the system (in megabytes).
Total Table Size w/Indexes and Toast	The total size of the specified table (including indexes and associated oversized attributes).
Transactions Aborted	The number of aborted transactions.
Transactions Aborted+	The cumulative number of aborted transactions.
Transactions Committed	The number of committed transactions.
Transactions Committed+	The cumulative number of committed transactions.
Tuples Deleted	The number of tuples deleted from the specified table.
Tuples Deleted+	The cumulative number of tuples deleted from the specified table.
Tuples Estimated by ANALYZE	The number of visible tuples in the specified table.
Tuples Estimated by ANALYZE+	The cumulative number of visible tuples in the specified table.
Tuples Fetched	The number of tuples fetched from the specified table.
Tuples Fetched+	The cumulative number of tuples fetched from the specified table.
Tuples HOT Updated	The number of tuples HOT updated. In a HOT update, the new tuple resides in the same block as the original tuple and the tuples share an index entry.
Tuples HOT Updated+	The cumulative number of tuples HOT updated. In a HOT update, the new tuple resides in the same block as the original tuple and the tuples share an index entry.
Tuples Inserted	The number of tuples inserted into the specified table.
Tuples Inserted+	The cumulative number of tuples inserted into the specified table.
Tuples Returned	The number of tuples returned in result sets.
Tuples Returned+	The cumulative number of tuples returned in result sets.
Tuples Updated	The number of tuples updated in the specified table.
Tuples Updated+	The cumulative number of tuples updated in the specified table.
WAL Segment Size (MB)	The segment size of the write-ahead log (in megabytes).

## Note

The '+' following the name of a metric signifies that the data for the metric is gathered cumulatively; those metrics that are not followed by the '+' sign are collected as a 'point-in-time' value.

## PEM Probes – Reference

A probe is a scheduled task that retrieves information about the database objects that are being monitored by the PEM agent. PEM uses the collected information to build the graphs displayed on each dashboard. The Manage Probes tab (accessed via the Management menu) allows you to modify the data collection schedule and the length of time that PEM will retain information returned by a specific probe.

Probe Name	Information Monitored by Probe	Level
Background Writer Statistics	<p>This probe monitors information about the background writer. The information includes:</p> <ul style="list-style-type: none"> <li>The number of timed checkpoints</li> <li>The number of requested checkpoints</li> <li>The number of buffers written (by checkpoint)</li> <li>The number of buffers written (by background writer)</li> <li>The number of background writer cycles</li> <li>The number of background buffers written</li> <li>The number of buffers allocated</li> </ul>	Server
Blocked Session Information	This probe provides information about blocked sessions.	Server
CPU Usage	This probe monitors CPU Usage information.	Agent
Data and Log File Analysis	<p>This probe monitors information about log files. The information includes:</p> <ul style="list-style-type: none"> <li>The name of the log file</li> <li>The directory in which the log file resides</li> </ul>	Server
Database Statistics	<p>This probe monitors database statistics. The information includes:</p> <ul style="list-style-type: none"> <li>The number of backends</li> <li>The number of transactions committed</li> <li>The number of transactions rolled back</li> <li>The number of blocks read</li> <li>The number of blocks hit</li> <li>The number of rows returned</li> <li>The number of rows fetched</li> <li>The number of rows inserted</li> <li>The number of rows updated</li> <li>The number of rows deleted</li> </ul>	Server
Disk Busy Info	<p>This probe monitors information about disk activity.</p> <p>Note: This probe is not supported on Mac OS X, Solaris or HP-UX</p>	Agent

Probe Name	Information Monitored by Probe	Level
Disk Space	<p>This probe monitors information about disk space usage. The information includes:</p> <p>The amount of disk space used</p> <p>The amount of disk space available</p>	Agent
EDB Audit Configuration	This probe monitors the audit logging configuration of EDB Postgres Advanced Server.	Server
Failover Manager Cluster Info	This probe monitors a Failover Manager cluster, returning information about the cluster. This probe is disabled unless a cluster name and path of the Failover Manager binary is provided on the Server Properties dialog.	Server
Failover Manager Node Status	This probe monitors a Failover Manager cluster, returning detailed about each node within the cluster. This probe is disabled unless a cluster name and path of the Failover Manager binary is provided on the Server Properties dialog.	Server
Function Statistics	<p>This probe monitors a database, retrieving information about functions. The information includes:</p> <p>Function names</p> <p>Argument types</p> <p>Return values</p>	Database
Index Size	<p>This probe monitors a database, retrieving information about indexes. The information includes:</p> <p>The name of the index</p> <p>The time the data was gathered</p> <p>The size of the index (in MB's)</p>	Database
Index Statistics	<p>This probe monitors index statistics. The information includes:</p> <p>The number of index scans</p> <p>The number of rows read</p> <p>The number of rows fetched</p> <p>The number of blocks read</p> <p>The number of blocks hit</p>	Database
Installed Packages	<p>This probe monitors the packages that are currently installed. The information gathered includes:</p> <p>The name of the installed package</p> <p>The version of the installed package</p> <p>The date and time that the probe executed</p>	Agent

Probe Name	Information Monitored by Probe	Level
IO Analysis	<p>This probe monitors disk I/O information in. The information includes:</p> <ul style="list-style-type: none"> <li>The number of blocks read</li> </ul> <p>The number of blocks written</p> <p>The date and time that the probe executed</p> <p>Note: This probe is not supported on Mac OS X</p>	Agent
Load Average	<p>This probe monitors CPU load averages. The information includes:</p> <ul style="list-style-type: none"> <li>The 1-minute load average</li> </ul> <p>The 5-minute load average</p> <p>The 15-minute load average</p> <p>Note: This probe is not supported on Windows</p>	Agent
Lock Information	<p>This probe monitors lock information. The information includes:</p> <ul style="list-style-type: none"> <li>The database name</li> </ul> <p>The lock type</p> <p>The lock mode</p> <p>The process holding the lock</p>	Server
Memory Usage	<p>This probe monitors information about system memory usage.</p>	Agent
Network Statistics	<p>This probe monitors network statistics. The information includes:</p> <ul style="list-style-type: none"> <li>The interface IP address</li> </ul> <p>The number of packets sent</p> <p>The number of packets received</p> <p>The number of bytes sent</p> <p>The number of bytes received</p> <p>The link speed (in MB/second)</p>	Agent
Number of Prepared Transactions	<p>This probe stores the number of prepared transactions.</p>	Server
Number of WAL Files	<p>This probe monitors the number of WAL files.</p>	Server

Probe Name	Information Monitored by Probe	Level
Object Catalog: Database	<p>This probe monitors a list of databases and their properties. The information includes:</p> <ul style="list-style-type: none"> <li>The database name</li> <li>The database encoding type</li> <li>If the database allows user connections or system connections</li> </ul>	Server
Object Catalog: Foreign Key	<p>This probe monitors a list of foreign keys and their properties. The information includes:</p> <ul style="list-style-type: none"> <li>The name of the table that contains the foreign key</li> <li>The name of the table that the foreign key references</li> <li>The name of the database in which the table resides</li> <li>The name of the schema in which the table resides</li> </ul>	Schema
Object Catalog: Function	<p>This probe monitors a list of functions and their properties. The information includes:</p> <ul style="list-style-type: none"> <li>The name of the function</li> <li>The name of the schema in which the function resides</li> <li>The name of the database in which the function resides</li> </ul>	Schema
Object Catalog: Index	<p>This probe monitors a list of indexes and their properties. The information includes:</p> <ul style="list-style-type: none"> <li>The name of the index</li> <li>The name of the table that the index is associated with</li> <li>The name of the database in which the indexed table resides</li> </ul>	Schema
Object Catalog: Schema	<p>This probe monitors a list of schemas and their associated databases and servers.</p>	Database
Object Catalog: Sequence	<p>This probe monitors a list of sequences and their properties.</p>	Schema
Object Catalog: Table	<p>This probe monitors a list of table information. The information includes:</p> <ul style="list-style-type: none"> <li>The table name</li> <li>The name of the schema in which the table resides</li> <li>The name of the database in which the schema resides</li> <li>A Boolean indicator that indicates if the table has a primary key</li> </ul>	Schema

Probe Name	Information Monitored by Probe	Level
Object Catalog: Tablespace	This probe monitors a list of tablespaces.	Server
Operating System Information	This probe monitors the operating system details and boot time.	Agent
Package Catalog	<p>This probe monitors the packages that are currently available for installation. The information gathered includes:</p> <ul style="list-style-type: none"> <li>The package name</li> <li>The package version</li> </ul>	Agent
PG HBA Conf	This probe monitors authentication configuration information from the pg_hba.conf file.	Server
Server Information	This probe monitors server information.	Server
Session Information	<p>This probe monitors session information. The information includes:</p> <ul style="list-style-type: none"> <li>The name of the session user</li> <li>The date and time that the session connected to the server</li> <li>The status of the session at the time that the information was gathered (idle, waiting, etc)</li> <li>The client address and port number</li> </ul>	Server
Settings	This probe monitors the values currently assigned to GUC variables.	Server
SQL Protect	This probe monitors a server, retrieving information about SQL injection attacks.	Server
Slony Replication	This probe monitors lag data for clusters replicated using Slony.	Database
Streaming Replication	<p>This probe monitors a cluster that is using streaming replication, retrieving information about:</p> <ul style="list-style-type: none"> <li>The sent Xlog location (in bytes)</li> <li>The write Xlog location (in bytes)</li> <li>The flush Xlog location (in bytes)</li> <li>The replay Xlog location (in bytes)</li> <li>The Xlog lag (in segments)</li> <li>The Xlog lag (in pages)</li> </ul>	Server
Streaming Replication Lag Time	<p>This probe monitors a cluster that is using streaming replication, retrieving lag information about:</p> <ul style="list-style-type: none"> <li>Replication lag time (in seconds)</li> <li>Current status of replication (running/paused)</li> </ul>	Server

Probe Name	Information Monitored by Probe	Level
Streaming Replication Database Conflicts	<p>This probe monitors a database that is using streaming replication, retrieving information about any conflicts that arise. This includes information about queries that have been canceled due to:</p> <ul style="list-style-type: none"> <li>The # of drop tablespace conflicts</li> <li>The # of lock timeout conflicts</li> <li>The # of old snapshot conflicts</li> <li>The # of pinned buffer conflicts</li> <li>The # of deadlock conflicts</li> </ul>	Server
Table Bloat	<p>This probe monitors information about the current table bloat. The information includes:</p> <ul style="list-style-type: none"> <li>The name of the table</li> <li>The name of the schema in which the table resides</li> <li>The estimated number of pages</li> <li>The estimated number of wasted pages</li> <li>The estimated number of bytes per row</li> </ul>	Database
Table Frozen XID	This probe monitors the frozen XID of each table.	Schema

Probe Name	Information Monitored by Probe	Level
	<p>This probe monitors table statistics. The information includes:</p> <ul style="list-style-type: none"> <li>The number of sequential scans</li> <li>The number of sequential scan rows</li> <li>The number of index scans</li> <li>The number of index scan rows</li> <li>The number of rows inserted</li> <li>The number of rows updated</li> <li>The number of rows deleted</li> </ul>	
Table Size	<ul style="list-style-type: none"> <li>The number of live rows</li> <li>The number of dead rows</li> <li>The last VACUUM</li> <li>The last auto-vacuum</li> <li>The last ANALYZE</li> <li>The last auto-analyze</li> <li>The number of pages estimated by ANALYZE</li> <li>The number of rows estimated by ANALYZE</li> </ul>	Database
Table Statistics	This probe monitors a list of tablespaces and their sizes.	Server
Tablespace Size	This probe monitors a list of tablespaces and their sizes.	Server
User Information	<p>This probe monitors a list of the current users. The stored information includes:</p> <ul style="list-style-type: none"> <li>The user name</li> <li>The user type (superuser vs. non-superuser)</li> <li>The server to which the user is connected</li> </ul>	Server
WAL Archive Status	<p>This probe monitors the status of the WAL archive. The stored information includes:</p> <ul style="list-style-type: none"> <li>The # of WAL archives done</li> <li>The # of WAL archives pending</li> <li>The last archive time</li> <li>The # of WAL archives failed</li> <li>The time of the last failure</li> </ul>	Server

Probe Name	Information Monitored by Probe	Level
xDB Replication	This probe monitors lag data for clusters replicated using xDB replication.	Database

## PEM Pre-defined Alert Templates – Reference

An alert definition contains a system-defined or user-defined set of conditions that PEM compares to the system statistics; if the statistics deviate from the boundaries specified for that statistic, the alert triggers, and the PEM client displays a warning on the \*Alerts Overview\* page, and optionally sends a notification to a monitoring user.

The tables that follow list the system-defined alert templates that you can use to create an alert; please note that this list is subject to change, and may vary by system:

### Templates applicable on Agent

Template Name	Description
Load Average (1 minute)	1-minute system load average.
Load Average (5 minutes)	5-minute system load average.
Load Average (15 minutes)	15-minute system load average.
Load Average per CPU Core (1 minutes)	1-minute system load average per CPU core.
Load Average per CPU Core (5 minutes)	5-minute system load average per CPU core.
Load Average per CPU Core (15 minutes)	15-minute system load average per CPU core.
CPU utilization	Average CPU consumption.
Number of CPUs running higher than a	Number of CPUs running at greater than K% utilization threshold
Free memory percentage	Free memory as a percent of total system memory.
Memory used percentage	Percentage of memory used.
Swap consumption	Swap space consumed (in megabytes).
Swap consumption percentage	Percentage of swap area consumed.
Disk Consumption	Disk space consumed (in megabytes).
Disk consumption percentage	Percentage of disk consumed.
Disk Available	Disk space available (in megabytes).
Disk busy percentage	Percentage of disk busy.
Most used disk percentage	Percentage used of the most utilized disk on the system.
Total table bloat on host	The total space wasted by tables on a host, in MB.
Highest table bloat on host	The most space wasted by a table on a host, in MB.
Average table bloat on host	The average space wasted by tables on host, in MB.
Table size on host	The size of tables on host, in MB.
Database size on host	The size of databases on host, in MB.
Number of ERRORS in the logfile on agent N in last X hours.	The number of ERRORS in the logfile on agent N in last X hours
Number of WARNINGS in the logfile on agent N in last X hours	The number of WARNINGS in the logfile on agent N in last X hours.
Number of WARNINGS or ERRORS in the logfile on agent N in last X hours	The number of WARNINGS or ERRORS in the logfile on agent N in last X hours.
Package version mismatch	Check for package version mismatch as per catalog.
Total materialized view bloat on host	The total space wasted by materialized views on a host, in MB.

Template Name	Description
Highest materialized view bloat on host	The most space wasted by a materialized view on a host, in MB.
Average materialized view bloat on host	The average space wasted by materialized views on host, in MB.
Materialized view size on host	The size of materialized views on host, in MB.
Agent Down	Specified agent is currently down.

## Templates applicable on Server

Template Name	Description
Total table bloat in server	The total space wasted by tables in server, in MB.
Largest table (by multiple of unbloated size)	Largest table in server, calculated as a multiple of its own estimated unbloated size; exclude tables smaller than N MB.
Highest table bloat in server	The most space wasted by a table in server, in MB.
Average table bloat in server	The average space wasted by tables in server, in MB.
Table size in server	The size of tables in server, in MB.
Database size in server	The size of databases in server, in MB.
Number of WAL files	Total number of Write Ahead Log files.
Number of prepared transactions	Number of transactions in prepared state.
Total connections	Total number of connections in the server.
Total connections as percentage of max_connections	Total number of connections in the server as a percentage of maximum connections allowed on server, settings.
Unused, non-superuser connections	Number of unused, non-superuser connections on the server, user_info, settings.
Unused, non-superuser connections as percentage of max_connections	Number of unused, non-superuser connections on the server as a percentage of max_connections of max_connections, user_info, settings.
Ungranted locks	Number of ungranted locks in server.
Percentage of buffers written by backends	The percentage of buffers written by backends vs. the total buffers written.
Percentage of buffers written by checkpoint	The percentage of buffers written by the checkpoints vs. the total buffers written.
Buffers written per second	Number of buffers written per second, over the last two probe cycles.
Buffers allocated per second	Number of buffers allocated per second, over the last two probe cycles.
Connections in idle state	Number of connections in server that are in idle state.
Connections in idle-in-transaction state	Number of connections in server that are in idle-in-transaction state.
Connections in idle-in-transaction state, as percentage of max_connections	Number of connections in server that are in idle-in-transaction state, as a percentage of maximum connections allowed on server, settings.
Long-running idle connections	Number of connections in the server that have been idle for more than N seconds.
Long-running idle connections and idle transactions	Number of connections in the server that have been idle or transactions idle-in-transaction for more than N seconds.
Long-running idle transactions	Number of connections in the server that have been idle in transaction for more than N seconds.
Long-running transactions	Number of transactions in server that have been running for more than N seconds.

Template Name	Description
Long-running queries	Number of queries in server that have been running for more than N seconds.
Long-running vacuums	Number of vacuum operations in server that have been running for more than N seconds.
Long-running autovacuums	Number of autovacuum operations in server that have been running for more than N seconds.
Committed transactions percentage	Percentage of transactions in the server that committed vs. that rolled-back over last N minutes.
Shared buffers hit percentage	Percentage of block read requests in the server that were satisfied by shared buffers, over last N minutes.
Tuples inserted	Tuples inserted into server over last N minutes.
InfiniteCache buffers hit percentage	Percentage of block read requests in the server that were satisfied by InfiniteCache, over last N minutes.
Tuples fetched	Tuples fetched from server over last N minutes.
Tuples returned	Tuples returned from server over last N minutes.
Dead Tuples	Number of estimated dead tuples in server.
Tuples updated	Tuples updated in server over last N minutes.
Tuples deleted	Tuples deleted from server over last N minutes.
Tuples hot updated	Tuples hot updated in server, over last N minutes.
Sequential Scans	Number of full table scans in server, over last N minutes.
Index Scans	Number of index scans in server, over last N minutes.
Hot update percentage	Percentage of hot updates in the server over last N minutes.
Live Tuples	Number of estimated live tuples in server.
Dead tuples percentage	Percentage of estimated dead tuples in server.
Last Vacuum	Hours since last vacuum on the server.
Last AutoVacuum	Hours since last autovacuum on the server.
Last Analyze	Hours since last analyze on the server.
Last AutoAnalyze	Hours since last autoanalyze on the server.
Percentage of buffers written by backends over the last N minutes	The percentage of buffers written by backends vs. the total buffers backends over last N
Table Count	Total number of tables in server.
Function Count	Total number of functions in server.
Sequence Count	Total number of sequences in server.
A user expires in N days	Number of days before a user's validity expires.
Index size as a percentage of table size	Size of the indexes in server, as a percentage of their tables' size.
Largest index by table-size percentage oc_index, table_size.	Largest index in server, calculated as percentage of its table's size.
Number of ERRORS in the logfile on server M in the last X hours	The number of ERRORS in the logfile on server M in last X hours.
Number of WARNINGS in the logfile on server M in the last X hours	The number of WARNINGS in logfile on server M in the last X hours.
Number of WARNINGS or ERRORS in the logfile on server M in the last X hours	The number of WARNINGS or ERRORS in the logfile on server M in the last X hours.
Number of attacks detected in the last N minutes	The number of SQL injection attacks occurred in the last N minutes.
Number of attacks detected in the last N minutes by username	The number of SQL injection attacks occurred in the last N minutes by username.

Template Name	Description
Number of standby servers lag behind the master by write location	Streaming Replication: number of standby servers lag behind the master by write location.
Number of standby servers lag behind the master by flush location	Streaming Replication: number of standby servers lag behind the master by flush location.
Number of standby servers lag behind the master by replay location	Streaming Replication: number of standby servers lag behind the master by replay location.
Standby server lag behind the master by write location	Streaming Replication: standby server lag behind the master by write location in MB.
Standby server lag behind the master by flush location	Streaming Replication: standby server lag behind the master by flush location in MB.
Standby server lag behind the master by replay location	Streaming Replication: standby server lag behind the master by replay location in MB.
Standby server lag behind the master by size (MB)	Streaming Replication: standby server lag behind the master by size in MB.
Standby server lag behind the master by WAL segments	Streaming Replication: standby server lag behind the master by WAL segments.
Standby server lag behind the master by WAL pages	Streaming Replication: standby server lag behind the master by WAL pages.
Total materialized view bloat in server	The total space wasted by materialized views in server, in MB.
Largest materialized view (by multiple of unbloated size)	Largest materialized view in server, calculated as a multiple of its own estimated unbloated size; exclude materialized views smaller than N MB.
Highest materialized view bloat in server	The most space wasted by a materialized view in server, in MB.
Average materialized view bloat in server	The average space wasted by materialized views in server, in MB.
Materialized view size in server	The size of materialized view in server, in MB.
View Count	Total number of views in server.
Materialized View Count	Total number of materialized views in server.
Audit config mismatch	Check for audit config parameter mismatch
Server Down	Specified server is currently inaccessible.
Number of WAL archives pending	Streaming Replication: number of WAL files pending to be replayed at standby.
Number of minutes lag of standby server from master server	Streaming Replication: number of minutes standby node is lagging behind the master node.
Log config mismatch	Check for log config parameter mismatch.

## Templates applicable on Database

Template Name	Description
Total table bloat in database	The total space wasted by tables in database, in MB.
Largest table (by multiple of unbloated size)	Largest table in database, calculated as a multiple of its own estimated unbloated size; exclude tables smaller than N MB.
Highest table bloat in database	The most space wasted by a table in database, in MB.
Average table bloat in database	The average space wasted by tables in database, in MB.
Table size in database	The size of tables in database, in MB.
Database size	The size of the database, in MB.
Total connections	Total number of connections in the database.
Total connections as percentage of max_connections	Total number of connections in the database as a percentage of maximum connections allowed on server, settings.

Template Name	Description
Ungranted locks	Number of ungranted locks in database.
Connections in idle state	Number of connections in database that are in idle state.
Connections in idle-in-transaction state	Number of connections in database that are in idle-in-transaction state
Connections in idle-in-transaction state,as percentage of max_connections	Number of connections in database that are in idle-in-transaction state, as a percentage of maximum connections allowed on server, settings.
Long-running idle connections	Number of connections in the database that have been idle for more than N seconds.
Long-running idle connections and idle transactions	Number of connections in the database that have been idle or idle-in-transaction for more than N seconds.
Long-running idle transactions	Number of connections in the database that have been idle in transaction for more than N seconds.
Long-running transactions	Number of transactions in database that have been running for more than N seconds.
Long-running queries	Number of queries in database that have been running for more than N seconds.
Long-running vacuums	Number of vacuum operations in database that have been running for more than N seconds.
Long-running autovacuums	Number of autovacuum operations in database that have been running for more than N seconds.
Committed transactions percentage	Percentage of transactions in the database that committed vs. that rolled-back over last N minutes.
Shared buffers hit percentage	Percentage of block read requests in the database that were satisfied by shared buffers, over last N minutes.
InfiniteCache buffers hit percentage	Percentage of block read requests in the database that were satisfied by InfiniteCache, over last N minutes.
Tuples fetched	Tuples fetched from database over last N minutes.
Tuples returned	Tuples returned from database over last N minutes.
Tuples inserted	Tuples inserted into database over last N minutes.
Tuples updated	Tuples updated in database over last N minutes.
Tuples deleted	Tuples deleted from database over last N minutes.
Tuples hot updated	Tuples hot updated in database, over last N minutes.
Sequential Scans	Number of full table scans in database, over last N minutes.
Index Scans	Number of index scans in database, over last N minutes.
Hot update percentage	Percentage of hot updates in the database over last N minutes.
Live Tuples	Number of estimated live tuples in database.
Dead Tuples	Number of estimated dead tuples in database.
Dead tuples percentage	Percentage of estimated dead tuples in database.
Last Vacuum	Hours since last vacuum on the database.
Last AutoVacuum	Hours since last autovacuum on the database.
Last Analyze	Hours since last analyze on the database.
Last AutoAnalyze	Hours since last autoanalyze on the database.
Table Count	Total number of tables in database.
Function Count	Total number of functions in database.
Sequence Count	Total number of sequences in database.
Index size as a percentage of table size	Size of the indexes in database, as a percentage of their tables' size.
Largest index by table-size percentage	Largest index in database, calculated as percentage of its table's size, oc_index, table_size.

Template Name	Description
Database Frozen XID	The age (in transactions before the current transaction) of the database's frozen transaction ID.
Number of attacks detected in the last N minutes	The number of SQL injection attacks occurred in the last N minutes. last N minutes
Number of attacks detected in the last N minutes by username	The number of SQL injection attacks occurred in the last N minutes by last N minutes by username.
Queries that have been cancelled due to dropped tablespaces	Streaming Replication: number of queries that have been cancelled due to dropped tablespaces.
Queries that have been cancelled due to lock timeouts	Streaming Replication: number of queries that have been cancelled due to lock timeouts.
Queries that have been cancelled due to old snapshots	Streaming Replication: number of queries that have been cancelled due to old snapshots.
Queries that have been cancelled due to pinned buffers	Streaming Replication: number of queries that have been cancelled due to pinned buffers.
Queries that have been cancelled due to deadlocks	Streaming Replication: number of queries that have been cancelled due to deadlocks.
Total events lagging in all slony clusters	Slony Replication: total events lagging in all slony clusters.
Events lagging in one slony cluster	Slony Replication: events lagging in one slony cluster.
Lag time (minutes) in one slony cluster	Slony Replication: lag time (minutes) in one slony cluster.
Total rows lagging in xdb single master replication	xDB Replication: Total rows lagging in xdb single master replication
Total rows lagging in xdb multi master replication	xDB Replication: Total rows lagging in xdb multi master replication.
Total materialized view bloat in database	The total space wasted by materialized views in database, in MB.
Largest materialized view (by multiple of unbloated size)	Largest materialized view in database, calculated as a multiple of its estimated unbloated size; exclude materialized views smaller than N MB.
Highest materialized view bloat in database	The most space wasted by a materialized view in database, in MB.
Average materialized view bloat in database	The average space wasted by materialized views in database, in MB.
Materialized view size in database	The size of materialized view in database, in MB.
View Count	Total number of views in database.
Materialized View Count	Total number of materialized views in database.

## Templates applicable on Schema

Template Name	Description
Total table bloat in schema	The total space wasted by tables in schema, in MB.
Largest table (by multiple of unbloated size)	Largest table in schema, calculated as a multiple of its own estimated unbloated size; exclude tables smaller than N MB.
Highest table bloat in schema	The most space wasted by a table in schema, in MB.
Average table bloat in schema	The average space wasted by tables in schema, in MB.
Table size in schema	The size of tables in schema, in MB.
Tuples inserted	Tuples inserted in schema over last N minutes.
Tuples updated	Tuples updated in schema over last N minutes.
Tuples deleted	Tuples deleted from schema over last N minutes.

Template Name	Description
Tuples hot updated	Tuples hot updated in schema, over last N minutes.
Sequential Scans	Number of full table scans in schema, over last N minutes.
Index Scans	Number of index scans in schema, over last N minutes.
Hot update percentage	Percentage of hot updates in the schema over last N minutes.
Live Tuples	Number of estimated live tuples in schema.
Dead Tuples	Number of estimated dead tuples in schema.
Dead tuples percentage	Percentage of estimated dead tuples in schema.
Last Vacuum	Hours since last vacuum on the schema.
Last AutoVacuum	Hours since last autovacuum on the schema.
Last Analyze	Hours since last analyze on the schema.
Last AutoAnalyze	Hours since last autoanalyze on the schema.
Table Count	Total number of tables in schema.
Function Count	Total number of functions in schema.
Sequence Count	Total number of sequences in schema.
Index size as a percentage of table size	Size of the indexes in schema, as a percentage of their table's size.
Largest index by table-size percentage	Largest index in schema, calculated as percentage of its table's size, <code>oc_index_table_size</code>
Materialized View bloat	Space wasted by the materialized view, in MB.
Total materialized view bloat in schema	The total space wasted by materialized views in schema, in MB.
Materialized view size as a multiple of unbloated size	Size of the materialized view as a multiple of estimated unbloated size.
Largest materialized view (by multiple of unbloated size)	Largest materialized view in schema, calculated as a multiple of its own estimated unbloated size; exclude materialized view smaller than N MB.
Highest materialized view bloat in schema	The most space wasted by a materialized view in schema, in MB.
Average materialized view bloat in schema	The average space wasted by materialized views in schema, in MB.
Materialized view size	The size of materialized view, in MB.
Materialized view size in schema	The size of materialized views in schema, in MB.
View Count	Total number of views in schema.
Materialized View Count	Total number of materialized views in schema.
Materialized View Frozen XID	The age (in transactions before the current transaction) of the materialized view's frozen transaction ID.

## Templates applicable on Table

Template Name	Description
Table bloat	Space wasted by the table, in MB.
Table size	The size of table, in MB.
Table size as a multiple of unbloated size	Size of the table as a multiple of estimated unbloated size.
Tuples inserted	Tuples inserted in table over last N minutes.
Tuples updated	Tuples updated in table over last N minutes.
Tuples deleted	Tuples deleted from table over last N minutes.

Template Name	Description
Tuples hot updated	Tuples hot updated in table, over last N minutes.
Sequential Scans	Number of full table scans on table, over last N minutes.
Index Scans	Number of index scans on table, over last N minutes.
Hot update percentage	Percentage of hot updates in the table over last N minutes.
Live Tuples	Number of estimated live tuples in table.
Dead Tuples	Number of estimated dead tuples in table.
Dead tuples percentage	Percentage of estimated dead tuples in table.
Last Vacuum	Hours since last vacuum on the table.
Last AutoVacuum	Hours since last autovacuum on the table.
Last Analyze	Hours since last analyze on the table.
Last AutoAnalyze	Hours since last autoanalyze on the table.
Row Count	Estimated number of rows in a table.
Index size as a percentage of table size	Size of the indexes on table, as a percentage of table's size.
Table Frozen XID	The age (in transactions before the current transaction) of the table's frozen transaction ID.

## Global Templates

Template Name	Description
Agents Down	Number of agents that haven't reported in recently.
Servers Down	Number of servers that are currently inaccessible.
Alert Errors	Number of alerts in an error state.

## 5 Getting Started

This document provides an introduction to Postgres Enterprise Manager (PEM). The guide will acquaint you with the basics of the toolset, and help you be successful in your database management activities. The guide is broken up into the following core sections and categories:

- **Postgres Enterprise Manager Overview** – This section provides information about PEM functionality, components, architecture, and supported platforms. The section also provides an overview of PEM's web interface. The web interface is installed with the PEM server, and can be used from your browser of choice.
- **Registering a Server** - This section provides information about the different tools available to assist with server registration.
- **Managing Certificates** - This section provides information about managing certificates for PEM.
- **Managing a PEM server** - This section provides information about tasks related to PEM server such as restarting the PEM server and agent, controlling the PEM server or PEM agent, controlling the HTTPD service on Linux and Windows, controlling the HTTPD server, managing PEM authentication and security, modifying the pg\_hba.conf file, modifying PEM to use a proxy server etc.
- **Managing a PEM agent** - This section provides information about configuring and managing a PEM agent.

This document uses *Postgres* to mean either the PostgreSQL or EDB Postgres Advanced Server database.

## 5.1 PEM Overview

Postgres Enterprise Manager (PEM) is an enterprise management tool designed to assist database administrators, system architects, and performance analysts in administering, monitoring, and tuning PostgreSQL and EnterpriseDB Advanced Server database servers. PEM is architected to manage and monitor anywhere from a handful, to hundreds of servers from a single console, allowing complete and remote control over all aspects of your databases.

## 5.2 Registering a Server

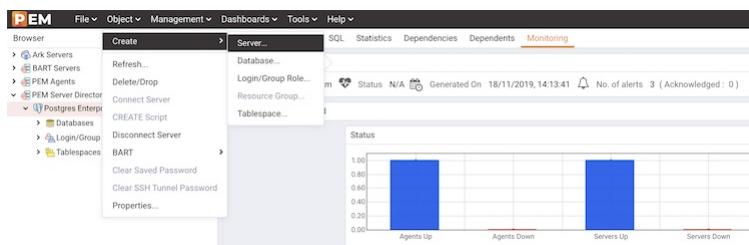
Before you can manage or monitor a server with PEM, you must register the server with PEM, and bind an agent. A server may be bound to a remote agent (an agent that resides on a different host), but if the agent does not reside on the same host, it will not have access to all of the statistical information about the instance.

### Manually Registering a Server

To manage or monitor a server with PEM, you must:

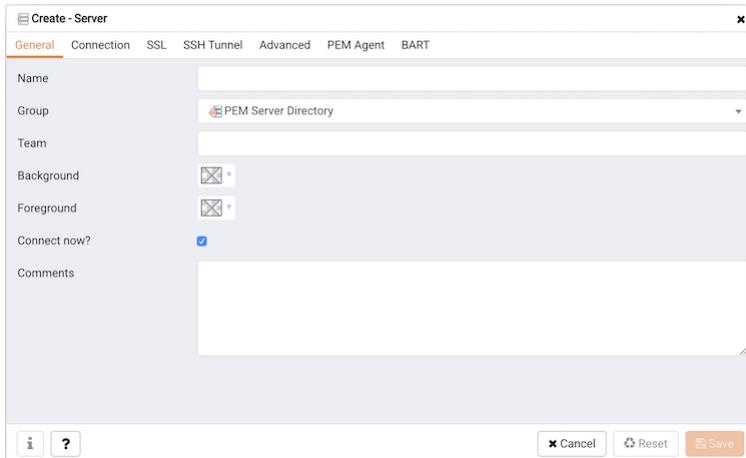
- Register your Advanced Server or PostgreSQL server with the PEM server.
- Bind the server to a PEM agent.

You can use the **Create - Server** dialog to provide registration information for a server, bind a PEM agent, and display the server in PEM client tree control. To open the **Create - Server** dialog, navigate through the **Create** option on the **Object** menu (or the context menu of a server group) and select **Server...**.



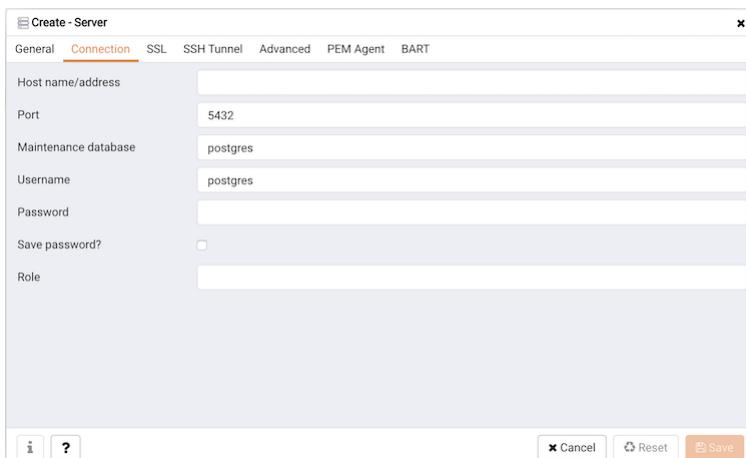
### Note

You must ensure the **pg\_hba.conf** file of the Postgres server that you are registering allows connections from the host of the PEM client before attempting to connect.



Use the fields on the **General** tab to describe the general properties of the server:

- Use the **Name** field to specify a user-friendly name for the server. The name specified will identify the server in the PEM **Browser** tree control.
- You can use groups to organize your servers and agents in the tree control. Using groups can help you manage large numbers of servers more easily. For example, you may want to have a production group, a test group, or LAN specific groups. Use the **Group** drop-down listbox to select the server group in which the new server will be displayed.
- Use the **Team** field to specify a Postgres role name. Only PEM users who are members of this role, who created the server initially, or have superuser privileges on the PEM server will see this server when they logon to PEM. If this field is left blank, all PEM users will see the server.
- Use the **Background** color selector to select the color that will be displayed in the PEM tree control behind database objects that are stored on the server.
- Use the **Foreground** color selector to select the font color of labels in the PEM tree control for objects stored on the server.
- Check the box next to **Connect now?** to instruct PEM to attempt a server connection when you click the Save button. Leave **Connect now?** unchecked if you do not want the PEM client to validate the specified connection parameters until a later connection attempt.
- Provide notes about the server in the **Comments** field.



Use fields on the **Connection tab** to specify connection details for the server:

- Specify the IP address of the server host, or the fully qualified domain name in the **Host name/address** field. On Unix based systems, the address field may be left blank to use the default PostgreSQL Unix Domain Socket on the local machine, or may be set to an alternate path containing a PostgreSQL socket. If you enter a path, the path must begin with a "/".
- Specify the port number of the host in the **Port** field.
- Use the **Maintenance database** field to specify the name of the initial database that PEM will connect to, and that will be expected to contain **pgAgent** schema and **adminpack** objects installed (both optional). On PostgreSQL 8.1 and above, the maintenance DB is normally called **postgres**; on earlier versions **template1** is often used, though it is preferable to create a **postgres** database to avoid cluttering the template database.

- Specify the name that will be used when authenticating with the server in the **Username** field.
- Provide the password associated with the specified user in the **Password** field.
- Check the box next to **Save password?** to instruct PEM to store passwords in the `~/.pgpass` file (on Linux) or `%APPDATA%\postgresql\pgpass.conf` (on Windows) for later reuse. For details, see the **pgpass** documentation. Stored passwords will be used for all libpq based tools. To remove a password, disconnect from the server, open the server's Properties dialog and uncheck the selection.
- Use the **Role** field to specify the name of the role that is assigned the privileges that the client should use after connecting to the server. This allows you to connect as one role, and then assume the permissions of another role when the connection is established (the one you specified in this field). The connecting role must be a member of the role specified.



Use the fields on the **SSL** tab to configure SSL:

- Use the drop-down list box in the **SSL mode** field to select the type of SSL connection the server should use. For more information about using SSL encryption, see the PostgreSQL documentation at:

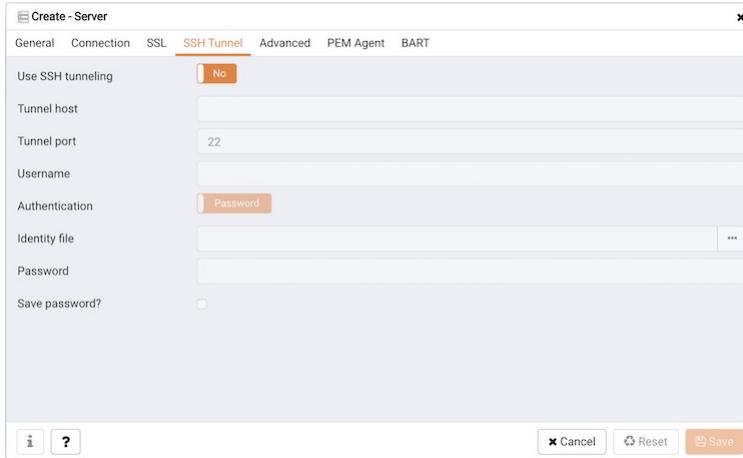
<https://www.postgresql.org/docs/current/static/libpq-ssl.html>

You can use the platform-specific **File** manager dialog to upload files that support SSL encryption to the server. To access the File manager, click the icon that is located to the right of each of the following fields:

- Use the **Client certificate** field to specify the file containing the client SSL certificate. This file will replace the default `~/.postgresql/postgresql.crt` file if PEM is installed in Desktop mode, and `<STORAGE_DIR>/<USERNAME>.postgresql/postgresql.crt` if PEM is installed in Web mode. This parameter is ignored if an SSL connection is not made.
- Use the **Client certificate key** field to specify the file containing the secret key used for the client certificate. This file will replace the default `~/.postgresql/postgresql.key` if PEM is installed in Desktop mode, and `<STORAGE_DIR>/<USERNAME>.postgresql/postgresql.key` if PEM is installed in Web mode. This parameter is ignored if an SSL connection is not made.
- Use the **Root certificate** field to specify the file containing the SSL certificate authority. This file will replace the default `~/.postgresql/root.crt` file. This parameter is ignored if an SSL connection is not made.
- Use the **Certificate revocation list** field to specify the file containing the SSL certificate revocation list. This list will replace the default list, found in `~/.postgresql/root.crl`. This parameter is ignored if an SSL connection is not made.
- When **SSL compression?** is set to True, data sent over SSL connections will be compressed. The default value is **False** (compression is disabled). This parameter is ignored if an SSL connection is not made.

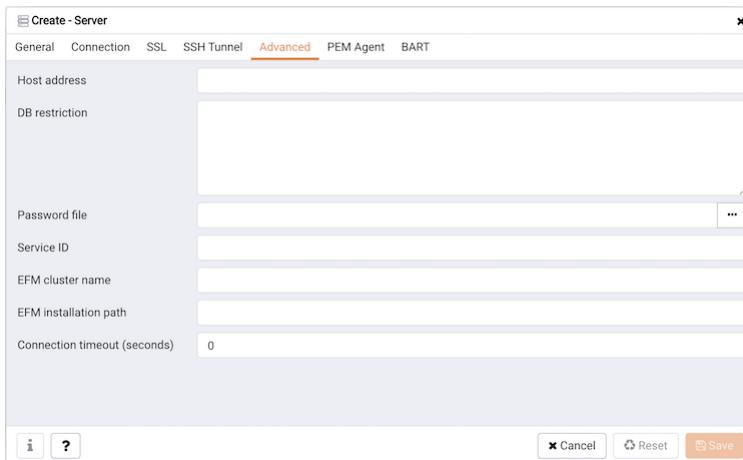
## Warning

Certificates, private keys, and the revocation list are stored in the per-user file storage area on the server, which is owned by the user account under which the PEM server process is run. This means that administrators of the server may be able to access those files; appropriate caution should be taken before choosing to use this feature.



Use the fields on the **SSH Tunnel** tab to configure SSH Tunneling. You can use a tunnel to connect a database server (through an intermediary proxy host) to a server that resides on a network to which the client may not be able to connect directly.

- Set **Use SSH tunneling** to **Yes** to specify that PEM should use an SSH tunnel when connecting to the specified server.
- Specify the name or IP address of the SSH host (through which client connections will be forwarded) in the **Tunnel host** field.
- Specify the port of the SSH host (through which client connections will be forwarded) in the **Tunnel port** field.
- Specify the name of a user with login privileges for the SSH host in the **Username** field.
- Specify the type of authentication that will be used when connecting to the SSH host in the **Authentication** field.
- Select **Password** to specify that PEM will use a password for authentication to the SSH host. This is the default.
- Select **Identity file** to specify that PEM will use a private key file when connecting.
- If the SSH host is expecting a private key file for authentication, use the **Identity file** field to specify the location of the key file.
- If the SSH host is expecting a password, use the **Password** field to specify the password, or if an identity file is being used, the passphrase.



Use fields on the **Advanced** tab to specify details that are used to manage the server:

- Specify the IP address of the server host in the **Host Address** field.
- Use the **DB restriction** field to specify a SQL restriction that will be used against the `pg_database` table to limit the databases displayed in the tree control. For example, you might enter: `'live_db', 'test_db'` to instruct the PEM browser to display only the `live_db` and `test_db` databases. Note that you can also limit the schemas shown in the database from the database properties dialog by entering a restriction against `pg_namespace`.
- Use the **Password file** field to specify the location of a password file (`.pgpass`). The `.pgpass` file allows a user to login without providing a password when they connect. For more information, see the Postgres

documentation at:

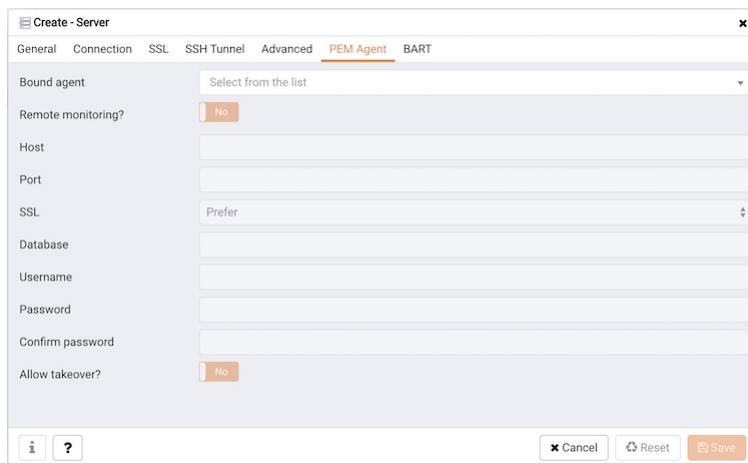
<http://www.postgresql.org/docs/current/static/libpq-pgpass.html>

- Use the **Service ID** field to specify parameters to control the database service process. For servers that are stored in the Enterprise Manager directory, enter the service ID. On Windows machines, this is the identifier for the Windows service. On Linux machines, this is the name of the init script used to start the server in `/etc/init.d`. For example, the name of the Advanced Server 10 service is `edb-as-10`. For local servers, the setting is operating system dependent:

- If the PEM client is running on a Windows machine, it can control the postmaster service if you have sufficient access rights. Enter the name of the service. In case of a remote server, it must be prepended by the machine name (e.g. `PSE1\pgsql-8.0`). PEM will automatically discover services running on your local machine.
- If the PEM client is running on a Linux machine, it can control processes running on the local machine if you have enough access rights. Provide a full path and needed options to access the `pg_ctl` program. When executing service control functions, PEM will append status/start/stop keywords to this. For example:

```
sudo /usr/local/pgsql/bin/pg_ctl -D /data/pgsql
```

- If the server is a member of a Failover Manager cluster, you can use PEM to monitor the health of the cluster and to replace the master node if necessary. To enable PEM to monitor Failover Manager, use the **EFM cluster name** field to specify the cluster name. The cluster name is the prefix of the name of the Failover Manager cluster properties file. For example, if the cluster properties file is named `efm.properties`, the cluster name is `efm`.
- If you are using PEM to monitor the status of a Failover Manager cluster, use the **EFM installation path** field to specify the location of the Failover Manager binary file. By default, the Failover Manager binary file is installed in `/usr/efm-2.x/bin`, where `x` specifies the Failover Manager version.



Use fields on the **PEM Agent** tab to specify connection details for the PEM agent:

- Select an Enterprise Manager agent using the drop-down listbox to the right of the **Bound agent** label. One agent can monitor multiple Postgres servers.
- Move the **Remote monitoring?** slider to **Yes** to indicate that the PEM agent does not reside on the same host as the monitored server. When remote monitoring is enabled, agent level statistics for the monitored server will not be available for custom charts and dashboards, and the remote server will not be accessible by some PEM utilities (such as Audit Manager, Capacity Manager, Log Manager, Postgres Expert and Tuning Wizard).
- Enter the IP address or socket path that the agent should use when connecting to the database server in the **Host** field. By default, the agent will use the host address shown on the **General** tab. On a Unix server, you may wish to specify a socket path, e.g. `/tmp`.
- Enter the **Port** number that the agent will use when connecting to the server. By default, the agent will use the port defined on the **Properties** tab.

- Use the drop-down listbox in the **SSL** field to specify an SSL operational mode; specify require, prefer, allow, disable, verify-ca or verify-full. For more information about using SSL encryption, see the PostgreSQL documentation at:

<http://enterprisedb.com/docs/en/10/pg/libpq-ssl.html>

- Use the **Database** field to specify the name of the database to which the agent will initially connect.
- Specify the name of the role that agent should use when connecting to the server in the **User name** field. Note that if the specified role is not a database superuser, then some of the features will not work as expected. For the list of features that do not work if the specified role is not a database superuser, see [Agent privileges](#).

If you are using Postgres version 10 or above, you can use the **pg\_monitor** role to grant the required privileges to a non-superuser. For information about **pg\_monitor** role, see:

<https://www.postgresql.org/docs/current/default-roles.html>

- Specify the password that the agent should use when connecting to the server in the **Password** field, and verify it by typing it again in the **Confirm password** field. If you do not specify a password, you will need to configure the authentication for the agent manually; for example, you can use a **.pgpass** file.
- Set the **Allow takeover?** slider to **Yes** to specify that the server may be taken over by another agent. This feature allows an agent to take responsibility for the monitoring of the database server if, for example, the server has been moved to another host as part of a high availability failover process.

The screenshot shows the 'Create - Server' dialog box with the 'BART' tab selected. The 'General' tab is active. The 'BART' tab contains the following fields:

- BART server:** A dropdown menu labeled "Select from the list".
- Server name:** A text input field with placeholder text: "Database server name that uniquely identifies an entry for database server in the server section of the configuration file".
- Backup name:** A text input field with placeholder text: "Template for backup name (may include %year, %month, %day, %hour, %minute, and %second)".
- Host address:** A text input field with placeholder text: "IP address of the database server to be configured for backup".
- Port:** A text input field.
- User:** A text input field.
- Password:** A text input field.
- Cluster owner:** A text input field with placeholder text: "Operating system user that owns the database cluster".
- Override archive command?**: A slider set to "No". A tooltip says: "Overrides the archive\_command settings in the postgresql.conf file".
- Archive command:** A text input field with placeholder text: "Parameters for archive command (%p, %h, %a, %f). Ensure to bind a PEM agent and provide Service ID to reload or restart the database server".
- Allow incremental backup?**: A slider set to "No". A tooltip says: "Allows incremental backups".
- Setup passwordless SSH?**: A slider set to "No". A tooltip says: "Ensures to bind a PEM agent to setup passwordless SSH authentication between BART host and database server".

At the bottom of the dialog are buttons for **Cancel**, **Reset**, and **Save**.

Use the fields on the **General** tab under **BART** tab to describe the general properties of the BART Server that will map to the PEM server:

- Use the **BART server** field to select the BART server name. All the BART servers configured in the PEM console will be listed in this drop down list.
- Use the **Server name** field to specify a name for the database server that you want to backup using the BART server. This name gets stored in the BART configuration file.
- Use the **Backup name** field to specify a template for user-defined names to be assigned to the backups of the database server. If you do not specify a backup name template, then the backup can only be referenced in BART sub-commands by the BART assigned, integer backup identifier.
- Use the **Host address** field to specify the IP address of the database server that you want to configure for

backup.

- Use the **Port** field to specify the port to be used for the database that you want to backup.
- Use the **User** field to specify the user of the database that you want to backup using BART through PEM console. If you want to enable incremental backups for this database server, then the user must be a superuser.
- Use the **Password** field to specify the password for the user of the database that you want to backup.
- Use the **Cluster Owner** field to specify the Linux operating system user account that owns the database cluster. This is typically `enterprisedb` for Advanced Server database clusters installed in the Oracle databases compatible mode, or `postgres` for PostgreSQL database clusters and for Advanced Server database clusters installed in the PostgreSQL databases compatible mode.
- Use the **Archive command** field to specify the desired format of the archive command string to be used in the `bart.cfg` file. Inputs provided for the Archive command will overwrite the database server's `Postgresql.conf` file. Once the server gets added, the database server will be restarted or database configurations will be reloaded.
- Use the **Allow incremental backup?** switch to specify if incremental backup should be enabled for this database server.
- Use the **Setup passwordless SSH?** switch to specify if you want to create SSH certificates to allow passwordless logins between the Database Server and the BART server. Ensure to bind a PEM agent before setting up the passwordless SSH authentication. Passwordless SSH will not work for a database server being remotely monitored by a PEM agent.

The screenshot shows the 'Create - Server' dialog with the 'BART' tab selected. Under the 'Misc' sub-tab, there are several configuration fields:
 

- Override default configuration?**: A switch set to 'No'. Description: 'Override the database server configurations with the selected BART server configurations'.
- Xlog method**: A dropdown menu set to 'Fetch'. Description: 'Method of collecting the transaction logs (fetch/stream)'.
- Retention policy**: A dropdown menu set to '1' (Backup). Description: 'Retention policy for the backup'.
- Wal compression**: A switch set to 'Disabled'. Description: 'Compress the archived Xlog/WAL files in gzip format (The gzip must be in the BART user account's PATH)'.
- Copy WALs during restore**: A switch set to 'Disabled'. Description: 'Copy the archived Xlog/WAL files from the BART backup catalog to the restore\_path/archived\_wals directory prior to the database server archive recovery'.
- Thread count**: An input field set to '1'. Description: 'Number of threads used to copy blocks'.
- Batch size**: An input field set to '49142'. Description: 'Number of blocks of memory used for copying the modified blocks, the default value is 49412'.
- Scan interval**: An input field set to '1'. Description: 'Number of seconds before forcing a scan of the Xlog/WAL files, default value 0 means no brute-force scanning will be started'.
- MBM Scan timeout**: An input field set to '20'. Description: 'Number of seconds to wait for MBM file before timing out, applicable only for incremental backup'.

 At the bottom are 'Cancel', 'Reset', and 'Save' buttons.

Use the fields on the **Misc** tab under **BART** tab to describe the miscellaneous properties of the BART Server:

- Use the **Override default configuration?** Switch to specify if you want to override the BART server configurations with the specific database server configurations.
- Use the **Xlog** method to specify how the transaction log should be collected during the execution of `pg_basebackup`.
- Use the **Retention policy** field to specify the retention policy for the backup. This determines when an active backup should be marked as obsolete, and hence, be a candidate for deletion. You can specify the retention policy in terms of number of backup or in terms of duration (days, weeks, or months).
- Use the **WAL compression** switch to specify if you want to compress the archived Xlog/WAL files in Gzip format. To enable WAL compression, the gzip compression program must be present in the BART user account's PATH. The `wal_compression` setting must not be enabled for those database servers where you need to take incremental backups.
- Use the **Copy WALs during restore** field to specify how the archived WAL files are collected when invoking the RESTORE operation. Set to enabled to copy the archived WAL files from the BART backup catalog to the `<restore_path>/archived_wals` directory prior to the database server archive recovery. Set to disabled to retrieve the archived WAL files directly from the BART backup catalog during the database server archive recovery.

- Use the **Thread count** field to specify the number of threads to copy the blocks. You must set **thread count** to **1** if you want to take a backup with the **pg\_basebackup** utility.
- Use the **Batch size** field to specify the number of blocks of memory used for copying modified blocks, applicable only for incremental backups.
- Use the **Scan interval** field to specify the number of seconds after which the WAL scanner should scan the new WAL files.
- Use the **MBM scan timeout** field to specify the number of seconds to wait for MBM files before timing out, applicable only for incremental backups.

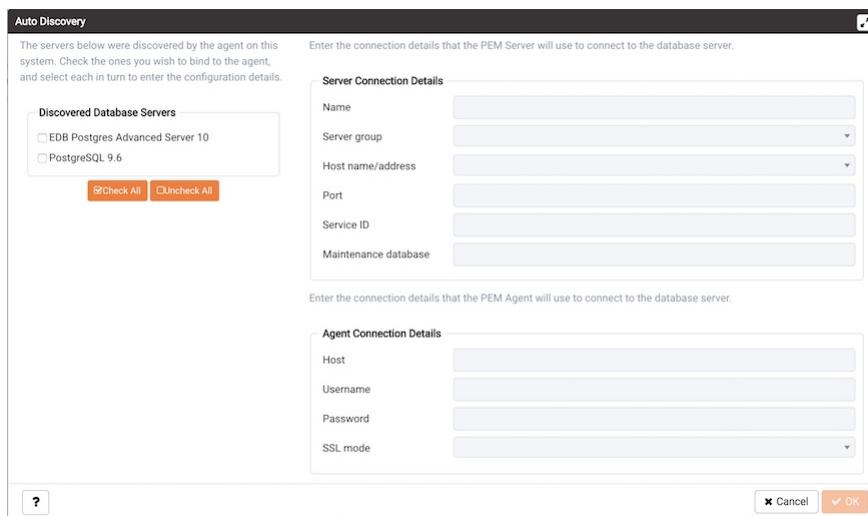
To view the properties of a server, right-click on the server name in the PEM client tree control, and select the **Properties...** option from the context menu. To modify a server's properties, disconnect from the server before opening the **Properties** dialog.

## Automatic Server Discovery

If the server you wish to monitor resides on the same host as the monitoring agent, you can use the **Auto Discovery** dialog to simplify the registration and binding process.

To enable auto discovery for a specific agent, you must enable the **Server Auto Discovery** probe. To access the Manage Probes tab, highlight the name of a PEM agent in the PEM client tree control, and select **Manage Probes...** from the **Management** menu. When the **Manage Probes** tab opens, confirm that the slider control in the **Enabled?** column is set to **Yes**.

To open the **Auto Discovery** dialog, highlight the name of a PEM agent in the PEM client tree control, and select **Auto Discovery...** from the **Management** menu.



When the **Auto Discovery** dialog opens, the **Discovered Database Servers** box will display a list of servers that are currently not being monitored by a PEM agent. Check the box next to a server name to display information about the server in the **Server Connection Details** box, and connection properties for the agent in the **Agent Connection Details** box.

Use the **Check All** button to select the box next to all of the displayed servers, or **Uncheck All** to deselect all of the boxes to the left of the server names.

The fields in the **Server Connection Details** box provide information about the server that PEM will monitor:

- Accept or modify the name of the monitored server in the **Name** field. The specified name will be displayed in the tree control of the PEM client.
- Use the **Server group** drop-down listbox to select the server group under which the server will be displayed in the PEM client tree control.
- Use the **Host name/address** field to specify the IP address of the monitored server.
- The **Port** field displays the port that is monitored by the server; this field may not be modified.
- Provide the name of the service in the **Service ID** field. Please note that the service name must be provided to

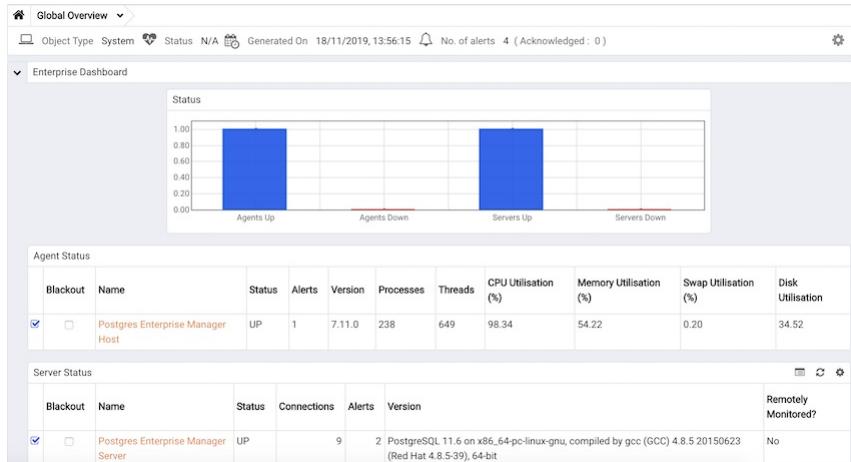
enable some PEM functionality.

- By default, the **Maintenance database** field indicates that the selected server uses a Postgres maintenance database. Customize the content of the **Maintenance database** field for your installation.

The fields in the **Agent Connection Details** box specify the properties that the PEM agent will use when connecting to the server:

- The **Host** field displays the IP address that will be used for the PEM agent binding.
- The **User name** field displays the name that will be used by the PEM agent when connecting to the selected server.
- The **Password** field displays the password associated with the specified user name.
- Use the drop-down listbox in the **SSL mode** field to specify your SSL connection preferences.

When you've finished specifying the connection properties for the servers that you are binding for monitoring, click the **OK** button to register the servers. Click **Cancel** to exit without preserving any changes.



After clicking the **OK** button, the newly registered server is displayed in the PEM tree control and is monitored by the PEM server.

## Using the pemworker Utility to Register a Server

You can use the **pemworker** utility to register a server for monitoring by the PEM server or to unregister a database server. During registration, the **pemworker** utility will bind the new server to the agent that resides on the system from which you invoked the registration command. To register a server:

on a Linux host, use the command:

```
pemworker --register-server
```

on a Windows host, use the command:

```
pemworker.exe REGISTER-SERVICE
```

Append command line options to the command string when invoking the **pemworker** utility. Each option should be followed by a corresponding value:

Option	Description
--pem-user	Specifies the name of the PEM administrative user. Required.
--server-addr	Specifies the IP address of the server host, or the fully qualified domain name. On Unix based systems, the address field may be left blank to use the default PostgreSQL Unix Domain Socket on the local machine, or may be set to an alternate path containing a PostgreSQL socket. If you enter a path, the path must begin with a /. Required.

Option	Description
--server-port	Specifies the port number of the host. Required.
--server-database	Specifies the name of the database to which the server will connect. Required.
--server-user	Specify the name of the user that will be used by the agent when monitoring the server. Required.
--server-service-name	Specifies the name of the database service that controls operations on the server that is being registered (STOP, START, RESTART, etc.). Optional.
--remote-monitoring	Include the --remote-monitoring clause and a value of false (the default) to indicate that the server is installed on the same machine as the PEM agent. When remote monitoring is enabled (true), agent level statistics for the monitored server will not be available for custom charts and dashboards, and the remote server will not be accessible by some PEM utilities (such as Audit Manager, Capacity Manager, Log Manager, Postgres Expert and Tuning Wizard). Required.
--efm-cluster-name	Specifies the name of the Failover Manager cluster that monitors the server (if applicable). Optional.
--efm-install-path	Specifies the complete path to the installation directory of Failover Manager (if applicable). Optional.
--asb-host-name	Specifies the name of the host to which the agent is connecting.
--asb-host-port	Specifies the port number that the agent will use when connecting to the database.
--asb-host-db	Specifies the name of the database to which the agent will connect.
--asb-host-user	Specifies the database user name that the agent will supply when authenticating with the database.
--asb-ssl-mode	Specifies the type of SSL authentication that will be used for connections. Supported values include: prefer, require, disable, verify-CA, verify-full.
--group	Specifies the name of the group in which the server will be displayed.
--team	Specifies the name of the group role that will be allowed to access the server.
--owner	Specifies the name of the role that will own the monitored server.

Set the environment variable `PEM_SERVER_PASSWORD` to provide the password for the PEM server to allow the pemworker to connect as a PEM admin user.

Set the environment variable `PEM_MONITORED_SERVER_PASSWORD` to provide the password of the database server being registered and monitored by pemagent.

Failure to provide the password will result in a password authentication error. The PEM server will acknowledge that the server has been registered properly.

## Using the pemworker Utility to Unregister a Server

You can use the `pemworker` utility to unregister a database server; to unregister a server, invoke the `pemworker` utility:

on a Linux host, use the command:

```
pemworker --unregister-server
```

on a Windows host, use the command:

## pemworker.exe UNREGISTER-SERVICE

Append command line options to the command string when invoking the `pemworker` utility. Each option should be followed by a corresponding value:

### Option Description

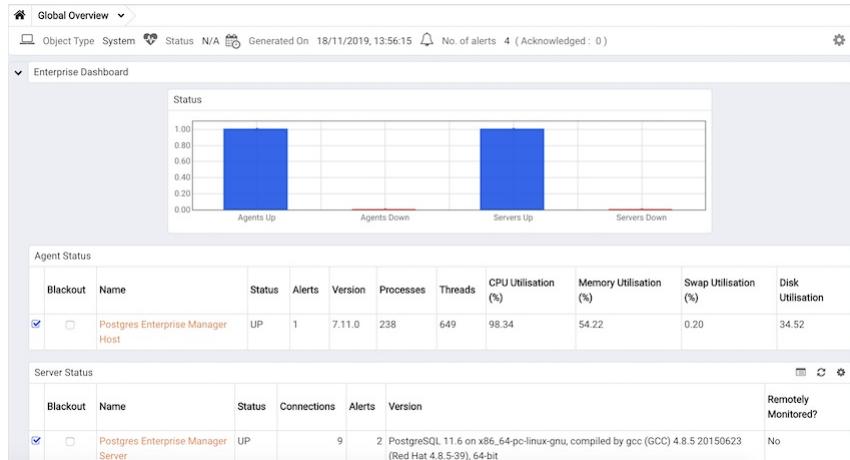
<code>--pem-user</code>	Specifies the name of the PEM administrative user. Required.
<code>--server-addr</code>	Specifies the IP address of the server host, or the fully qualified domain name. On Unix based systems, the address field may be left blank to use the default PostgreSQL Unix Domain Socket on the local machine, or may be set to an alternate path containing a PostgreSQL socket. If you enter a path, the path must begin with a /. Required.
<code>--server-port</code>	Specifies the port number of the host. Required.

Set environment variable `PEM_SERVER_PASSWORD` to provide the password for the PEM server to allow the `pemworker` to connect as a PEM admin user.

Failure to provide the password will result in a password authentication error. The PEM server will acknowledge that the server has been unregistered.

## Verifying the Connection and Binding

Once registered, the new server will be added to the PEM `Browser` tree control, and be displayed on the `Global Overview`.



When initially connecting to a newly bound server, the `Global Overview` dashboard may display the new server with a status of "unknown" in the server list; before recognizing the server, the bound agent must execute a number of probes to examine the server, which may take a few minutes to complete depending on network availability.

Within a few minutes, bar graphs on the `Global Overview` dashboard should show that the agent has now connected successfully, and the new server is included in the `Postgres Server Status` list.

If after five minutes, the `Global Overview` dashboard still does not list the new server, you should review the logfiles for the monitoring agent, checking for errors. Right-click the agent's name in the tree control, and select the `Probe Log Analysis` option from the `Dashboards` sub-menu of the context menu.

## 5.3 Managing Certificates

Files stored in the data directory of the PEM server backing database contain information that helps the PEM server utilize secure connections:

- ca\_certificate.crt
- ca\_key.key
- server.crt
- server.key
- root.crl
- root.crt

The PEM agent that is installed with the PEM server monitors the expiration date of the `ca_certificate.crt` file. When the certificate is about to expire, PEM will:

- Make a backup of the existing certificate files.
- Create new certificate files, appending the new CA certificate file to the root.crt file on the PEM server.
- Create a job that renews the certificate file of any active agents.
- Restart the PEM server.

When you uninstall an agent, the certificate associated with that agent will be added to the certificate revocation list (maintained in the `root.crl` file) to ensure that the certificate cannot be used to connect to the PEM server.

The following sections contain detailed information about manually replacing certificate files.

### Replacing SSL Certificates

The following steps detail replacing the SSL certificates on an existing PEM installation. If you plan to upgrade your server to a new version at the same time, invoke all of the PEM installers (first the server installer, then agent installers) before replacing the SSL certificates. Then:

1. Stop all running PEM agents, first on the server host, and then on any monitored node.

To stop a PEM agent on a Linux host, open a terminal window, assume superuser privileges, and enter the command:

```
/etc/init.d/pemagent stop
```

On a Windows host, you can use the `Services` applet to stop the PEM agent. The PEM agent service is named Postgres Enterprise Manager Agent; highlight the service name in the `Services` dialog, and click `Stop the service`.

2. Take a backup of the existing SSL keys and certificates. The SSL keys and certificates are stored in the `data` directory under your PEM installation. For example, the default location on a Linux system is:

```
/opt/PostgreSQL/10/data
```

Make a copy of the following files, adding an extension to each file to make the name unique:

- `ca_certificate.crt`
- `ca_key.key`
- `root.crt`
- `root.crl`
- `server.key`
- `server.crt`

For example, the command:

```
# cp ca_certificate.crt ca_certificate_old.crt
```

creates a backup of the `ca_certificate` file with the word `old` appended to the entry.

3. Use the `openssl_rsa_generate_key()` function to generate the `ca_key.key` file:

```
/opt/PostgreSQL/10/bin/psql -U postgres -d pem --no-psqlrc -t -A -c "SELECT
public.openssl_rsa_generate_key(1024)" > /opt/PostgreSQL/10/data/ca_key.key
```

After creating the `ca_key.key` file, `cat` the contents to the variable `CA_KEY` for use when generating the `ca_certificate.crt` file and modify the privileges on the `ca_key.key` file:

```
CA_KEY=$(cat /opt/PostgreSQL/10/data/ca_key.key)
```

```
chmod 600 /opt/PostgreSQL/10/data/ca_key.key
```

4. Use the key to generate the `ca_certificate.crt` file. For simplicity, place the SQL query into a temporary file with a unique name:

```
echo "SELECT openssl_csr_to_crt(openssl_rsa_key_to_csr('${CA_KEY}', 'PEM', 'US', 'MA', 'Bedford', 'Postgres
Enterprise Manager', 'support@enterprisedb.com'), NULL, '/opt/PostgreSQL/10/data/ca_key.key')"
> /tmp/_random.$$
```

Then use the variable to execute the query, placing the content into the `ca_certificate.crt` file.

```
/opt/PostgreSQL/10/bin/psql -U postgres -d pem --no-psqlrc -t -A -f /tmp/_random.$$ >
/opt/PostgreSQL/10/data/ca_certificate.crt
```

Modify the permissions of the `ca_certificate.crt` file, and remove the temporary file that contained the SQL command:

```
chmod 600 /opt/PostgreSQL/10/data/ca_certificate.crt
```

```
rm -f /tmp/_random.$$
```

5. Re-use the `ca_certificate.crt` file as the `root.crt` file:

```
cp /opt/PostgreSQL/10/data/ca_certificate.crt /opt/PostgreSQL/10/data/root.crt
```

Modify the permissions of the `root.crt` file:

```
chmod 600 /opt/PostgreSQL/10/data/root.crt
```

6. Use the `openssl_rsa_generate_crl()` function to create the certificate revocation list (`root.crl`) :

```
/opt/PostgreSQL/10/bin/psql -U postgres -d pem --no-psqlrc -t -A -c "SELECT
openssl_rsa_generate_crl('/opt/PostgreSQL/9.5/data/ca_certificate.crt', '/opt/PostgreSQL/10/data/ca_key.key')"
> /opt/PostgreSQL/10/data/root.crl
```

Modify the permissions of the `root.crl` file:

```
chmod 600 /opt/PostgreSQL/10/data/root.crl
```

7. Use the `openssl_rsa_generate_key()` function to generate the `server.key` file:

```
/opt/PostgreSQL/10/bin/psql -U postgres -d pem --no-psqlrc -t -A -c "SELECT
public.openssl_rsa_generate_key(1024)" >> /opt/PostgreSQL/10/data/server.key
```

After creating the `server.key` file, `cat` the contents to the variable `SSL_KEY` for use when generating the `server.crt` file and modify the privileges on the `server.key` file:

```
SSL_KEY=$(cat /opt/PostgreSQL/10/data/server.key)
```

```
chmod 600 /opt/PostgreSQL/10/data/server.key
```

8. Use the `SSL_KEY` to generate the server certificate. Save the certificate in the `server.crt` file. For simplicity, first place the SQL query into a temporary file with a unique name:

```
echo "SELECT openssl csr_to_crt(openssl rsa key_to_csr('${SSL_KEY}', 'PEM', 'US', 'MA', 'Bedford', 'Postgres Enterprise Manager', 'support@enterprisedb.com'), '/opt/PostgreSQL/10/data/ca_certificate.crt', '/opt/PostgreSQL/10/data/ca_key.key')" > /tmp/_random.$$
```

```
/opt/PostgreSQL/10/bin/psql -U postgres -d pem --no-psqlrc -t -A -f /tmp/_random.$$ >> /opt/PostgreSQL/10/data/server.crt
```

9. Modify the privileges on the `server.crt` file, and delete the temporary file:

```
chmod 600 /opt/PostgreSQL/10/data/server.crt
```

```
rm -f /tmp/_random.$$
```

10. Restart the Postgres server:

```
/etc/init.d/postgresql-10 restart
```

## Updating Agent SSL Certificates

For each agent that interacts with the PEM server, you must:

- generate an rsa key and a certificate.
- copy the key and certificate to the agent.
- restart the agent.

Each agent has a unique identifier that is stored in the `pem.agent` table in the `pem` database. You must replace the key and certificate files with the key or certificate that corresponds to the agent's identifier. Please note that you must move the `agent.key` and `agent.crt` files (generated in Steps 2 and 3 into place on their respective PEM agent host before generating the next key file pair; subsequent commands will overwrite the previously generated file.

To generate a PEM agent key file pair:

1. Use psql to find the number of agents and their corresponding identifiers:

```
/opt/PostgreSQL/10/bin/psql -U postgres -d pem --no-psqlrc -t -A -c "SELECT ID FROM pem.agent"
```

- On Linux, you can also find the agent identifier and location of the keys and certificates in the `PEMagent` section of the `/etc/postgres-reg.ini` file.
- On Windows, the information is stored in the registry:

- On a 64-bit Windows installation, check:

```
HKEY_LOCAL_MACHINE\SOFTWARE\Wow6432Node\EnterpriseDB\PEM\agent
```

- On a 32-bit Windows installation, check:

```
HKEY_LOCAL_MACHINE\SOFTWARE\EnterpriseDB\PEM\agent
```

1. After identifying the agents that will need key files, generate an `agent.key` for each agent. To generate the key, execute the following command, capturing the output in a file:

```
/opt/PostgreSQL/10/bin/psql -U postgres -d pem --no-psqlrc -t -A -c "SELECT openssl_rsa_generate_key(1024)" > agent.key
```

Modify the privileges of the `agent.key` file:

`chmod 600 agent.key`

1. Generate a certificate for each agent. To generate a certificate, execute the following command, capturing the output in a certificate file:

```
/opt/PostgreSQL/10/bin/psql -U postgres -d pem --no-psqlrc -t -A -c "SELECT
openssl csr to crt(openssl rsa key to csr('$(cat agent.key)', 'agent<$ID>', 'US', 'MA', 'Bedford', 'Postgres
Enterprise Manager', 'support@enterprisedb.com'), '/opt/PostgreSQL/10/data/ca_certificate.crt',
'/opt/PostgreSQL/10/data/ca_key.key')" > agent.crt
```

Where \$ID is the agent number of the agent (retrieved via the `psql` command line).

1. Modify the privileges of the `agent.crt` file:

`chmod 600 agent.crt`

2. Replace each agent's key and certificate file with the newly generated files before restarting the PEM agent service:

- On Linux, restart the service with the command:

`/etc/init.d/pemagent start`

- On a Windows host, you can use the Services applet to start the PEM agent. The PEM agent service is named `Postgres Enterprise Manager Agent`; highlight the service name in the Services dialog, and click `Start the service`.

## 5.4 Managing a PEM Server

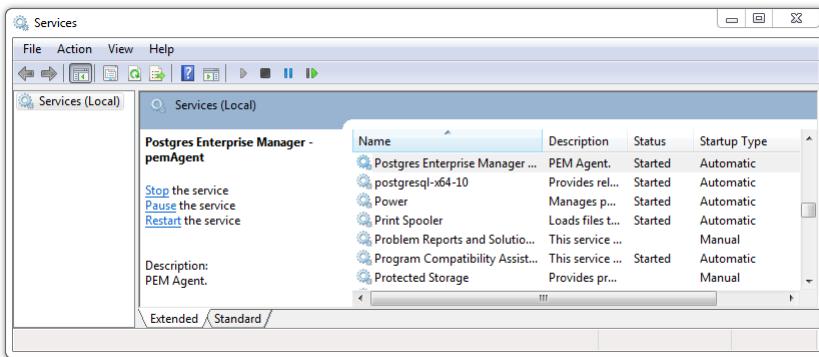
The sections that follow provide information about tasks related to PEM server such as restarting the PEM server and agent, controlling the PEM server or PEM agent, controlling the HTTPD service on Linux and Windows, controlling the HTTPD server, managing PEM authentication and security, modifying the `pg_hba.conf` file, modifying PEM to use a proxy server etc.

### Starting and Stopping the PEM Server and Agents

The PEM server starts, stops and restarts when the Postgres server instance on which it resides starts, stops or restarts; use the same commands to control the PEM server that you would use to control the Postgres server. On Linux platforms, the command that stops and starts the service script will vary by platform and OS version.

The PEM agent is controlled by a service named `pemagent`.

The Windows operating system includes a graphical service controller that displays the server status, and offers point-and-click server control. The `Services` utility can be accessed through the Windows `Control Panel`. When the utility opens, use the scroll bar to navigate through the listed services to highlight the service name.



Use the **Stop**, **Pause**, **Start**, or **Restart** buttons to control the state of the service.

Please note that any user (or client application) connected to the Postgres server will be abruptly disconnected if you stop the service. For more information about controlling a service, please consult the *EDB Postgres Advanced Server Installation Guide*, available from the EnterpriseDB website at:

<https://www.enterprisedb.com/resources/product-documentation>

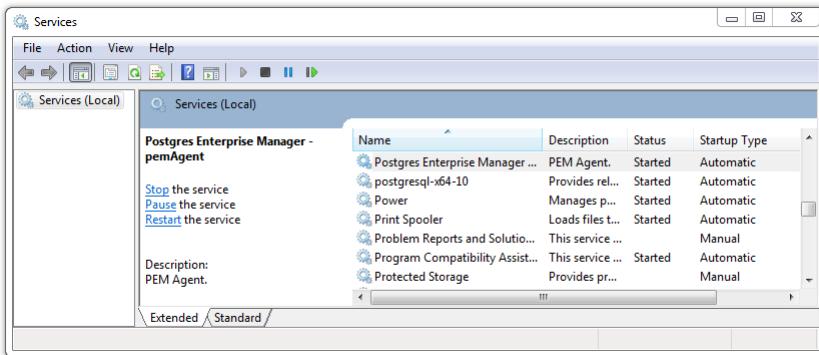
## Remotely Starting and Stopping Monitored Servers

PEM allows you to startup and shutdown managed server instances with the PEM client. To configure a server to allow PEM to manage the service, complete the Server registration dialog, registering the database server with a PEM agent and:

- specify the **Store on PEM Server** option on the **Properties** dialog.
- specify the name of a service script in the **Service ID** field on the **Advanced** tab:
  - For Advanced Server, the service name is `edb-as-<x>` or `ppas-<x>`.
  - For PostgreSQL, the service name is `postgresql-<x>`.

Where x indicates the server version number.

After connecting to the server, you can start or stop the server by highlighting the server name in the tree control, and selecting **Queue Server Startup** or **Queue Server Shutdown** from the **Management** menu.



## Controlling the PEM Server or PEM Agent on Linux

On Linux platforms, the name of the service script that controls:

- a PEM server on Advanced Server is `edb-as-<x>` or `ppas-<x>`
- a PEM server on PostgreSQL is `postgresql-<x>`

- a PEM agent is `pemagent`

Where x indicates the server version number.

You can use the service script to control the service.

- To control a service on RHEL or CentOS version 6.x, open a command line, assume superuser privileges, and enter:

```
/etc/init.d/<service_name> <action>
```

- To control a service on RHEL or CentOS version 7.x, open a command line, assume superuser privileges, and issue the command:

```
systemctl <service_name> <action>
```

Where:

`service_name` is the name of the service.

`action` specifies the action taken by the service. Specify:

- `start` to start the service.
- `stop` to stop the service.
- `restart` to stop and then start the service.
- `status` to check the status of the service.

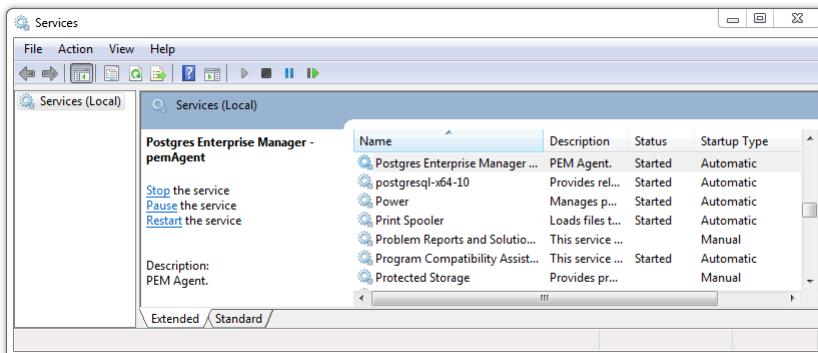
## Controlling the PEM Server or PEM Agent on Windows

The Windows operating system includes a graphical service controller that displays the server status, and offers point-and-click server control. The registered name of the service that controls:

- a PEM server host on PostgreSQL is `postgresql-<x>`
- a PEM server host on Advanced Server is `edb-as-<x>`, or `ppas-<x>`
- a PEM agent is `Postgres Enterprise Manager - pemAgent`

Where x indicates the server version number.

Navigate through the Windows `Control Panel` to open the `Services` utility. When the utility opens, use the scroll bar to browse the list of services.



Use the `Stop the service` option to stop a service. Any user (or client application) connected to the server will be abruptly disconnected if you stop the service.

Use the `Pause the service` option to instruct Postgres to reload a service's configuration parameters. The `Pause the service` option is an effective way to reset parameters without disrupting user sessions for many of the configuration parameters.

Use the **Start the service** option to start a service.

## Controlling the HTTPD Server

On Linux, you can confirm the status of the **PEM-HTTPD** service by opening a command line, and entering the following command:

```
ps -ef \| grep httpd
```

If Linux responds with an answer that is similar to the following example, **httpd** is not running:

```
user 13321 13267 0 07:37 pts/1 00:00:00 grep httpd
```

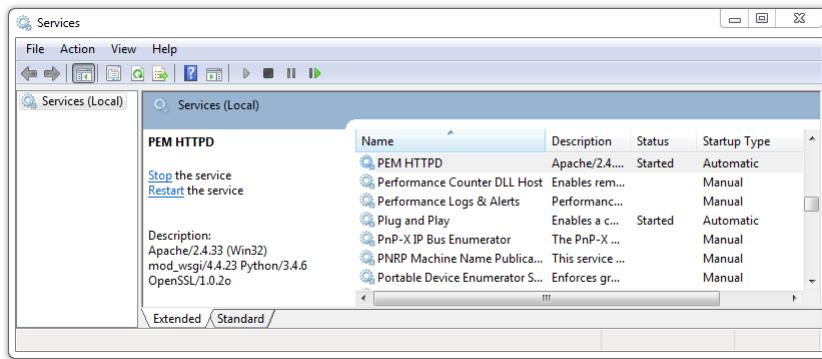
To start the service on a CentOS or RHEL 6.x system, use the command:

```
/etc/init.d/httpd start
```

To start the service on a CentOS or RHEL 7.x system, use the command:

```
systemctl start httpd
```

On Windows, you can use the **Services** applet to check the status of the **PEM HTTPD** service. After opening the Services applet, scroll through the list to locate the **PEM HTTPD** service.



The **Status** column displays the current state of the server. Click the **Start** link to start **PEM HTTPD** if the service is not running.

## Modifying the pg\_hba.conf File

Entries in the **pg\_hba.conf** file control network authentication and authorization. The **pg\_hba.conf** file on the PEM server host must allow connections between the PEM server and PEM-HTTPD, the PEM agent, and the monitored servers.

During the PEM server installation process, you are prompted for the IP address and connection information for hosts that will be monitored by PEM; this information is added to the top of the **pg\_hba.conf** file of the PEM backing database.



You may also need to manually modify the `pg_hba.conf` file to allow connections between the PEM server and other components. For example, if your PEM-HTTPD installation does not reside on the same host as the PEM server, you must modify the `pg_hba.conf` file on the PEM server host to allow PEM-HTTPD to connect to the server.

By default, the `pg_hba.conf` file resides in the data directory, under your Postgres installation; for example, on an Advanced Server 10 host, the default location of the `pg_hba.conf` is:

`/optedb/as10/data/pg_hba.conf`

You can modify the `pg_hba.conf` file with your editor of choice. After modifying the file, restart the server for changes to take effect.

The following example shows a `pg_hba.conf` entry that allows an md5 password authenticated connection from a user named `postgres`, to the `postgres` database on the host on which the `pg_hba.conf` file resides. The connection is coming from an IP address of `192.168.10.102`:

```

### TYPE  DATABASE  USER  CIDR-ADDRESS  METHOD
### IPv4 local connections:
host  postgres  postgres  192.168.10.102/32  md5

```

You may specify the address of a network host, or a network address range. For example, if you wish to allow connections from servers with the addresses `192.168.10.23`, `192.168.10.76` and `192.168.10.184`, enter a CIDR-ADDRESS of `192.168.10.0/24` to allow connections from all of the hosts in that network:

```

### TYPE  DATABASE  USER  CIDR-ADDRESS  METHOD
### IPv4 local connections:
host  postgres  all  192.168.10.0/24  md5

```

For more information about formatting a `pg_hba.conf` file entry, please see the PostgreSQL core documentation at:

<http://www.postgresql.org/docs/10/static/auth-pg-hba-conf.html>

Before you can connect to a Postgres server with PEM, you must ensure that the `pg_hba.conf` file on both servers allows the connection.

If you receive this error when connecting to the database server, modify the `pg_hba.conf` file, adding an entry that allows the connection.

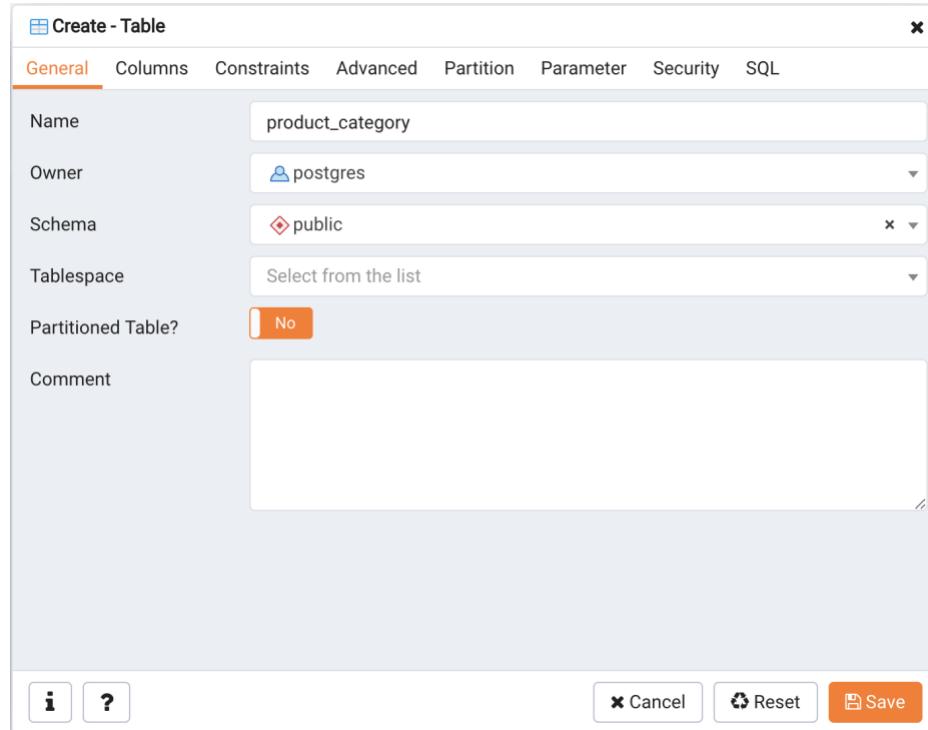
## Creating and Maintaining Databases and Objects

Each instance of a Postgres server manages one or more databases; each user must provide authentication

information to connect to the database before accessing the information contained within it. The PEM client provides dialogs that allow you to create and manage databases, and all of the various objects that comprise a database (e.g. tables, indexes, stored procedures, etc.).

Creating a database is easy in PEM: simply right click on any managed server's **Databases** node and select **Database...** from the **Create** menu. After defining a database, you can create objects within the new database.

For example, to create a new table, right click on a **Tables** node, and select **Table...** from the **Create** menu. When the **New Table** dialog opens, specify the attributes of the new table.



PEM provides similar dialogs for the creation and management of other database objects:

- tables
- indexes
- stored procedures
- functions
- triggers
- views
- constraints, etc.

Each object type is displayed in the tree control; right click on the node that corresponds to an object type to access the **Create** menu and create a new object, or select **Properties** from the context menu of a named node to perform administrative tasks for the highlighted object.

## Managing PEM Authentication

Postgres supports a number of authentication methods:

- Secure password (md5)
- GSSAPI
- SSPI
- Kerberos
- Ident
- LDAP
- RADIUS
- Certificate (SSL)

- PAM

Postgres (and PEM) authentication is controlled by the `pg_hba.conf` configuration file. Entries within the configuration file specify who may connect to a specific database, and the type of authentication required before that user is allowed to connect.

A typical entry in the `pg_hba.conf` file that allows a user named `postgres` to connect to all databases from the local host (127.0.0.1/32) using secure password (md5) authentication connections would take the form:

```
| host all postgres 127.0.0.1/32 md5
```

Depending on your system's configuration, you may also need to create a password file for the user account that the PEM agent uses to connect to the server, to allow the agent to properly respond to the server's authentication request. An entry in the password file for a user named `postgres`, with a password of `1safepwd` would take the form:

```
| localhost:5432:*:postgres:1safepwd
```

The password file is usually named `~root/.pgpass` on Linux systems, or `%APPDATA%\postgresql\pgpass.conf` (on Windows). For more information about configuring a password file, visit the EnterpriseDB website at:

<http://www.postgresql.org/docs/10/static/libpq-pgpass.html>

For more information about the authentication methods supported by Postgres, see the PostgreSQL core documentation at:

<http://www.postgresql.org/docs/10/static/client-authentication.html>

## Modifying PEM to Use a Proxy Server

If your network configuration prevents direct communication between PEM and the EnterpriseDB website, you can configure a proxy server for use by PEM when:

- updating the `package_catalog` table with information about the packages that are available for installation or update
- reading package options
- downloading packages

After configuring a proxy server on your network, modify the PEM server configuration, specifying the connection properties of the proxy, and instructing PEM to use the proxy server.

**Server Configuration**

			Search by parameter name
proxy_server	127.0.0.1		
proxy_server_authentication	<input type="button" value="False"/>	t/f	
proxy_server_enabled	<input type="button" value="False"/>	t/f	
proxy_server_password			
proxy_server_port	80		
proxy_server_username			
reminder_notification_interval	24	hours	
server_log_retention_time	30	days	
show_data_points_on_graph	<input type="button" value="False"/>	t/f	
show_data_tab_on_graph	<input type="button" value="False"/>	t/f	
smtp_authentication	<input type="button" value="False"/>	t/f	
smtp_enabled	<input checked="" type="button" value="True"/>	t/f	
smtp_encryption	<input type="button" value="False"/>	t/f	

To access the **Server Configuration** dialog and modify the server configuration, connect to the PEM web interface, and select **Server Configuration...** from the **Management** menu.

To modify a parameter value, locate the parameter, and modify the parameter value in the Value column. Use the following PEM Server configuration parameters to specify connection details that allow PEM to connect to the proxy server:

- Use the **proxy\_server** parameter to specify the IP address of the proxy server.
- Specify a value of **t** in the **proxy\_server\_authentication** parameter to indicate that the proxy server will require PEM to authenticate when connecting; specify **f** if authentication is not required.
- Specify a value of **t** in the **proxy\_server\_enabled** parameter if PEM is required to use a proxy server when retrieving the package list, or **f** if a proxy server is not configured.
- Use the **proxy\_server\_password** parameter to provide the password associated with the user specified in **proxy\_server\_username**.
- Specify the port number of the proxy server in the **proxy\_server\_port** parameter.
- Specify the user name that should be used when authenticating with the proxy server in the **proxy\_server\_username** parameter.

When you've finished updating the parameters required to configure the proxy server, click the **Save** icon in the upper-right corner of the dialog before closing the dialog.

## Editing the PEM Server Configuration

You can use the PEM client to graphically manage the configuration parameters of the PEM server to enable features or modify default settings. To open the **Server Configuration** dialog, select **Server Configuration...** from the **Management** menu.

Server Configuration

Parameter	Value	Unit
audit_log_retention_time	30	days
auto_create_agent_alerts	True	t/f
auto_create_server_alerts	True	t/f
cm_data_points_per_report	50	
cm_max_end_date_in_years	5	years
dash_alerts_timeout	60	seconds
dash_db_comrol_span	168	hours
dash_db_comrol_timeout	1800	seconds
dash_db_connovervw_timeout	300	seconds

[?](#) [Cancel](#) [Reset](#) [Save](#)

To modify a parameter value, edit the content displayed in the **Value** field to the right of a parameter name. Click the **Save** button to preserve your changes, or click the **Close** button to exit the dialog without applying the changes. Use the **Reset** button to return the parameters to their original value.

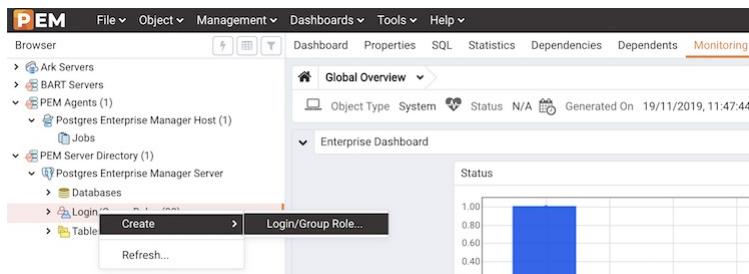
## Managing Security

PEM provides a graphical way to manage your Postgres roles and servers.

### Login Roles

When you connect to the PEM server, you must provide role credentials that allow access to the database on which the PEM server stores data. By default, the `postgres` superuser account is used to initially connect to the server, but it is strongly recommended (for both security and auditing purposes) that individual roles are created for each connecting user. You can use the PEM Query Tool, the PEM web interface [Create – Login/Group Role](#) dialog, or a command line client (such as `psql`) to create a role.

To use the [Create – Login/Group Role](#) dialog to create a role, expand the node for the server on which the role will reside in the PEM tree control, and right-click on the [Login/Group Roles](#) node to access the context menu. Then, select [Login/Group Role...](#) from the [Create](#) menu.



Use fields on the tabs of the [Create – Login/Group](#) Role dialog to define the role. To display the PEM online help in a browser tab, click the help (?) button located in the lower-left corner of the dialog.

When you've finished defining the new role, click [Save](#) to create the role.



To modify the properties of an existing login role, right click on the name of a login role in the tree control, and select **Properties** from the context menu. To delete a login role, right click on the name of the role, and select **Delete/Drop** from the context menu.

For more complete information about creating and managing a role, see the PostgreSQL online documentation:

<http://www.postgresql.org/docs/10/static/sql-createrole.html>

## Group Roles

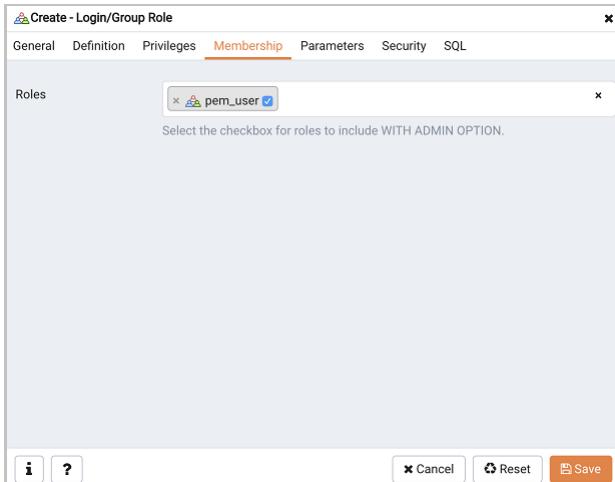
Group roles can serve as containers, used to dispense system privileges (such as creating databases) and object privileges (e.g. inserting data into a particular table). The primary purpose of a group role is to make the mass management of system and object permissions much easier for a DBA. Rather than assigning or modifying privileges individually across many different login accounts, you can assign or change privileges for a single role and then grant that role to many login roles at once.

Use the **Group Roles** node (located beneath the name of each registered server in the PEM tree control) to create and manage group roles. Options on the context menu provide access to a dialog that allows you to create a new role or modify the properties of an existing role. You can find more information about creating roles at:

<http://www.postgresql.org/docs/10/static/sql-createrole.html>

## Using PEM Pre-Defined Roles to Manage Access to PEM Functionality

You can use the **Login/Group Role** dialog to allow a role with limited privileges to access PEM features such as the Audit Manager, Capacity Manager, or SQL Profiler. PEM pre-defined roles allow access to PEM functionality; roles that are assigned membership in these roles can access the associated feature.



When defining a user, use the **Membership** tab to specify the roles in which the new user is a member. The new user will share the privileges associated with each role in which it is a member. For a user to have access to PEM extended functionality, the role must be a member of the `pem_user` role and the pre-defined role that grants access to the feature. Use the **Roles** field to select pre-defined role names from a drop down list.

The **SQL** tab displays the SQL command that the server will execute when you click **Save**.



The example shown above creates a login role named `acctg_clerk` that will have access to the **Audit Manager**; the role can make unlimited connections to the server at any given time.

You can use PEM pre-defined roles to allow access to the functionality listed in the table below:

Value	Parent Role	Description
<code>pem_super_admin</code>		Role to manage/configure everything on Postgres Enterprise Manager.
<code>pem_admin</code>	<code>pem_super_admin</code>	Role for administration/management/configuration of all visible agents/servers, and monitored objects.
<code>pem_config</code>	<code>pem_admin</code>	Role for configuration management of Postgres Enterprise Manager.
<code>pem_component</code>	<code>pem_admin</code>	Role to run/execute all wizard/dialog based components.
<code>pem_rest_api</code>	<code>pem_admin</code>	Role to access the REST API.
<code>pem_server_service_manager</code>	<code>pem_admin</code>	Role for allowing to restart/reload the monitored database server (if server-id provided).
<code>pem_manage_schedule_task</code>	<code>pem_admin</code>	Role to configure the schedule tasks.

Value	Parent Role	Description
pem_manage_alert	pem_admin	Role for managing/configuring alerts, and its templates.
pem_config_alert	pem_config, pem_manage_alert	Role for configuring the alerts on any monitored objects.
pem_manage_probe	pem_admin	Role to create, update, delete the custom probes, and change custom probe configuration.
pem_config_probe	pem_config, pem_manage_probe	Role for probe configuration (history retention, execution frequency, enable/disable the probe) on all visible monitored objects.
pem_database_server_registration	pem_admin	Role to register a database server.
pem_comp_postgres_expert	pem_component	Role to run the Postgres Expert.
pem_comp_auto_discovery	pem_component	Role to run the Auto discovery of a database server dialog.
pem_comp_log_analysis_expert	pem_component	Role to run the Log Analysis Expert.
pem_comp_sqlprofiler	pem_component	Role to run the SQL Profiler.
pem_manage_efm	pem_admin	Role to manage Failover Manager functionality.
pem_comp_capacity_manager	pem_component	Role to run the Capacity Manager.
pem_comp_log_manager	pem_component	Role to run the Log Manager.
pem_comp_audit_manager	pem_component	Role to run the Audit Manager.
pem_comp_package_deployment	pem_component	Role to run the Package Deployment Wizard.
pem_comp_streaming_replication	pem_component	Role to run the Streaming Replication Wizard.
pem_comp_tuning_wizard	pem_component	Role to run the Tuning Wizard.

## Using a Team Role

When you register a server for monitoring by PEM, you can specify a *Team* that will be associated with the server. A Team is a group role that can be used to allow or restrict access to one or more monitored servers to a limited group of role members. The PEM client will only display a server with a specified Team to those users who are:

- a member of the Team role
- the role that created the server
- a role with superuser privileges on the PEM server.

To create a team role, expand the node for the server on which the role will reside in the PEM tree control, and right-click on the **Login/Group Roles** node to access the context menu. Then, select **Login/Group Role...** from the **Create** menu; when the **Create - Login/Group Role** dialog opens, use the fields provided to specify the properties of the team role.

## Object Permissions

A role must be granted sufficient privileges before accessing, executing, or creating any database object. PEM allows you to assign (**GRANT**) and remove (**REVOKE**) object permissions to group roles or login accounts using the graphical interface of the PEM client.

Object permissions are managed via the graphical object editor for each particular object. For example, to assign privileges to access a database table, right click on the table name in the tree control, and select the Properties option from the context menu. Use the options displayed on the Privileges tab to assign privileges for the table.

The PEM client also contains a **Grant Wizard** (accessed through the **Tools** menu) that allows you to manage many object permissions at once.

## Managing Job Notifications

You can configure the settings in PEM console for sending the SMTP trap on success or failure of a system-generated job (listed under scheduled tasks) or a custom-defined agent job. For information on custom-defined agent job, see 'Creating PEM Scheduled Jobs'. These email notification settings can be configured at following three levels (in order of precedence) to send email notifications to the specified user group:

- Job level
- Agent level
- PEM server level (default level)

### Configuring job notifications at job level

You can configure email notification settings at job level only for a custom-defined agent job in one of the following ways:

- For a new agent job, you can configure the email notification settings in the *Notification* tab of *Create-Agent Job* wizard while creating the job itself.
- For an existing custom-defined job, you can edit the properties of the job and configure the notification settings.



Use the fields on the Notifications tab to configure the email notification settings on job level:

- Use the *Send the notifications* field to specify when you want the email notifications to be sent.
- Use the *Email group* field to specify the email group that should receive the email notification.

### Configuring job notifications at agent level

Select the agent in the tree view, right click and select *Properties*. In the Properties dialog, select the *Job notifications* tab.

The screenshot shows the 'Job Notifications' tab of the 'Postgres Enterprise Manager Host (1)' configuration dialog. It contains four configuration items:

- Override default configuration?**: A switch set to **No**. Description: Select to override the default configuration for job notifications. If selected, the following settings will determine whether, when, and which email group will receive the job notification for this agent.
- Email on job completion?**: A switch set to **No**. Description: Select to receive a notification email on completion of a job (regardless of the result) of this agent.
- Email on a job failure?**: A switch set to **No**. Description: Select to receive a notification email only on failure of a job of this agent.
- Email group**: A dropdown menu set to **<Default>**. Description: Select the email-group that will receive the notification on completion of a job or scheduled task.

At the bottom are buttons for **i**, **?**, **Cancel**, **Reset**, and **Save**.

Use the fields on the Job notifications tab to configure the email notification settings on agent level:

- Use the *Override default configuration?* switch to specify if you want the agent level job notification settings to override the default job notification settings. If you select Yes for this switch, you can use the rest of the settings on this dialog to define when and to whom the job notifications should be sent. Please note that the rest of the settings on this dialog work only if you enable the *Override default configuration?* switch.
- Use the *Email on job completion?* switch to specify if the job notification should be sent on the successful job completion.
- Use the *Email on a job failure?* switch to specify if the job notification should be sent on the failure of a job.
- Use the *Email group* field to specify the email group to whom the job notification should be sent.

## Configuring job notifications at server level

You can use the *Server Configuration* dialog to provide information about your email notification configuration at PEM server level. To open Server Configuration dialog, select *Server Configuration...* from the PEM client's Management menu.

The screenshot shows the 'Server Configuration' dialog with a table of parameters:

Parameter	Value	Type
job_failure_notification	<input type="button" value="False"/>	t/f
job_notification_email_group	default	
job_retention_time	30	days
job_status_change_notification	<input type="button" value="False"/>	t/f
long_running_transaction_minutes	5	minutes
max_metrics_per_group_chart	16	
nagios_cmd_file_name	/usr/local/nagios/var/rw/nagios.cmd	
nagios_enabled	<input checked="" type="button" value="True"/>	t/f

At the bottom are buttons for **?**, **Cancel**, **Reset**, and **Save**.

Four server configuration parameters specify information about your job notification preferences at PEM server level:

- Use the *job\_failure\_notification* switch to specify if you want to send email notification after each job

failure.

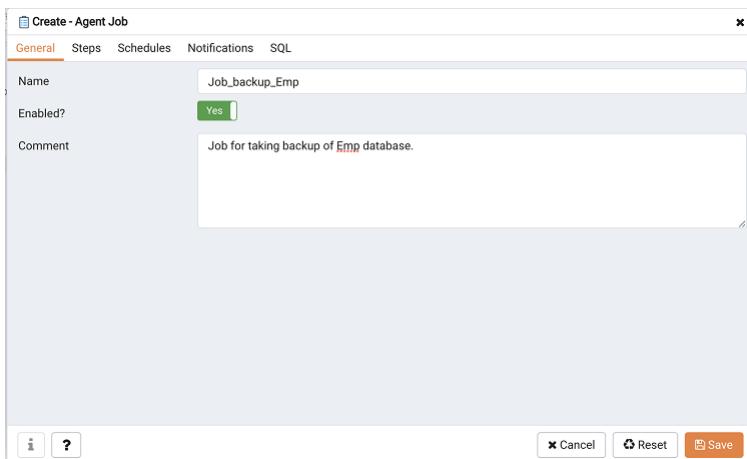
- Use the *job\_notification\_email\_group* parameter to specify the email group that should receive the email notification.
- Use the *job\_retention\_time* parameter to specify the number of days that non-recurring scheduled tasks should be retained in the system.
- Use the *job\_status\_change\_notification* switch to specify if you want to send email notification after each job status change, irrespective of its status being a failure, success, or interrupted.

## Managing PEM Scheduled Jobs

You can create a PEM scheduled job to perform a set of custom-defined steps in the specified sequence. These steps may contain SQL code or a batch/shell script that you may run on a server that is bound with the agent. You can schedule these jobs to suit your business requirements. For example, you can create a job for taking a backup of a particular database server and schedule it to run on a specific date and time of every month.

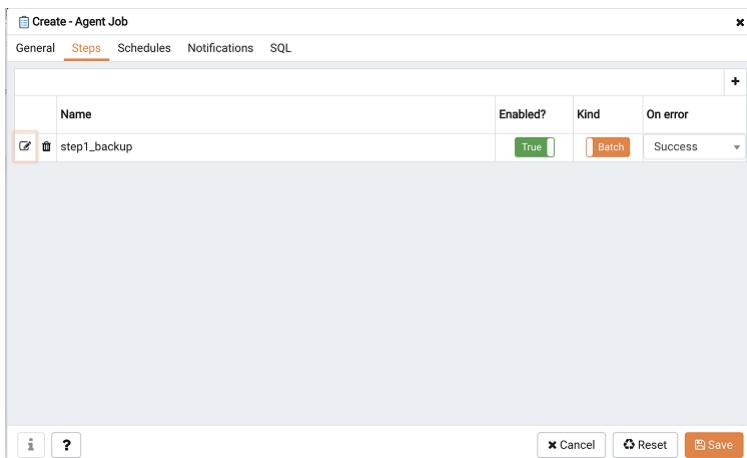
To create or manage a PEM scheduled job, use the PEM tree control to browse to the PEM agent for which you want to create the job. The tree control will display a Jobs node, under which currently defined jobs are displayed. To add a new job, right click on the **Jobs** node, and select **Create Job...** from the context menu.

When the **Create - Agent Job** dialog opens, use the tabs on the **Create - Agent Job** dialog to define the steps and schedule that make up a PEM scheduled job.



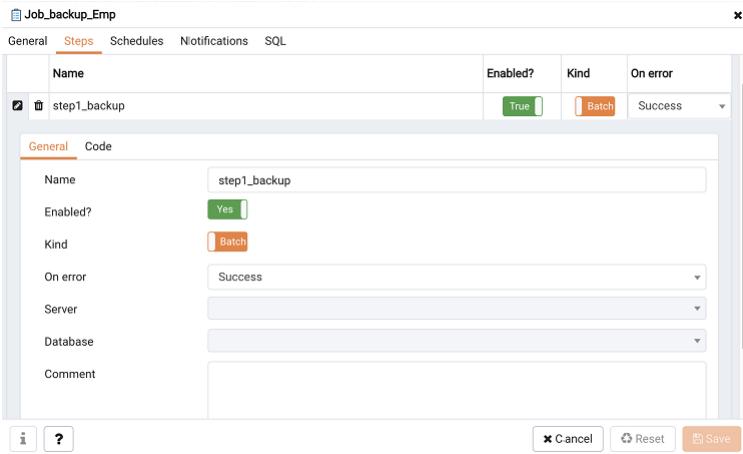
Use the fields on the **General** tab to provide general information about a job:

- Provide a name for the job in the **Name** field.
- Move the **Enabled** switch to the **Yes** position to enable a job, or **No** to disable a job.
- Use the **Comment** field to store notes about the job.



Use the **Steps** tab to define and manage the steps that the job will perform. Click the Add icon (+) to add a new

step; then click the compose icon (located at the left side of the header) to open the step definition dialog:



Use fields on the step definition dialog to define the step:

- Provide a name for the step in the **Name** field; please note that steps will be performed in alphanumeric order by name.
- Use the **Enabled** switch to include the step when executing the job (**True**) or to disable the step (**False**).
- Use the **Kind** switch to indicate if the job step invokes SQL code (**SQL**) or a batch script (**Batch**).
  - If you select **SQL**, use the **Code** tab to provide SQL code for the step.
  - If you select **Batch**, use the **Code** tab to provide the batch script that will be executed during the step.
- Use the **On error** drop-down to specify the behavior of pgAgent if it encounters an error while executing the step. Select from:
  - Fail - Stop the job if you encounter an error while processing this step.
  - Success - Mark the step as completing successfully, and continue.
  - Ignore - Ignore the error, and continue.
- If you have selected SQL as your input for **Kind** switch, provide the following additional information:
  - Use the **Server** field to specify the server that is bound with the agent for which you are creating the PEM scheduled job.
  - Use the **Database** field to specify the database that is associated with the server that you have selected.
- Use the **Comment** field to provide a comment about the step.



- Use the context-sensitive field on the step definition dialog's **Code** tab to provide the SQL code or batch script that will be executed during the step:

- If the step invokes SQL code, provide one or more SQL statements in the **SQL query** field.
- If the step invokes a batch script, provide the script in the **Code** field. If you are running on a Windows server, standard batch file syntax must be used. When running on a Linux server, any shell script may be used, provided that a suitable interpreter is specified on the first line (e.g. `#!/bin/sh`). Along with the defined inline code, you can also provide the path of any batch script, shell script, or SQL file on the filesystem.

To invoke a script on a Linux system, you must modify the entry for `batch_script_user` parameter of `agent.cfg` file and specify the user that should be used to run the script. You can either specify a non-root user or root for this parameter. If you do not specify a user, or the specified user does not exist, then the script will not be executed. Restart the agent after modifying the file.

To invoke a script on a Windows system, set the registry entry for `AllowBatchJobSteps` as true and restart the PEM agent. PEM registry entries are located in  
`HKEY_LOCAL_MACHINE\Software\Wow6432Node\EnterpriseDB\PEM\agent`.

After providing all the information required by the step, click the **Save** button to save and close the step definition dialog.

Click the add icon (+) to add each additional step, or select the **Schedules** tab to define the job schedule.

Click the Add icon (+) to add a schedule for the job; then click the compose icon (located at the left side of the header) to open the schedule definition dialog:



Use the fields on the **Schedules definition** tab to specify the days and times at which the job will execute.

- Provide a name for the schedule in the **Name** field.
- Use the **Enabled** switch to indicate that pgAgent should use the schedule (**Yes**) or to disable the schedule (**No**).
- Use the calendar selector in the **Start** field to specify the starting date and time for the schedule.
- Use the calendar selector in the **End** field to specify the ending date and time for the schedule.
- Use the **Comment** field to provide a comment about the schedule.

Select the **Repeat** tab to define the days on which the schedule will execute.



Use the fields on the **Repeat** tab to specify the details about the schedule in a cron-style format. The job will execute on each date or time element selected on the **Repeat** tab.

Click within a field to open a list of valid values for that field; click on a specific value to add that value to the list of selected values for the field. To clear the values from a field, click the X located at the right-side of the field.

- Use the fields within the **Days** box to specify the days on which the job will execute:
  - Use the **Week Days** field to select the days on which the job will execute.
  - Use the **Month Days** field to select the numeric days on which the job will execute. Specify the **Last Day** to indicate that the job should be performed on the last day of the month, regardless of the date.
  - Use the **Months** field to select the months in which the job will execute.
- Use the fields within the **Times** box to specify the times at which the job will execute:
  - Use the **Hours** field to select the hour at which the job will execute.
  - Use the **Minutes** field to select the minute at which the job will execute.

Select the **Exceptions** tab to specify any days on which the schedule will **not** execute.

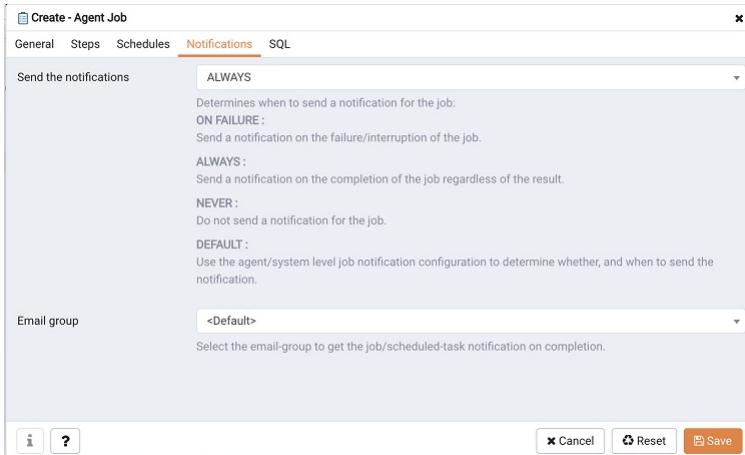


Use the fields on the **Exceptions** tab to specify days on which you wish the job to not execute; for example, you may wish for jobs to not execute on national holidays.

Click the Add icon (+) to add a row to the exception table, then:

- Click within the **Date** column to open a calendar selector, and select a date on which the job will not execute. Specify **<Any>** in the **Date** column to indicate that the job should not execute on any day at the time selected.
- Click within the **Time** column to open a time selector, and specify a time on which the job will not execute. Specify **<Any>** in the **Time** column to indicate that the job should not execute at any time on the day selected.

Select the **Notifications** tab to configure the email notification settings on job level:



Use the fields on the **Notifications** tab to configure the email notification settings for a job:

- Use the **Send the notifications** field to specify when you want the email notifications to be sent.
- Use the **Email group** field to specify the email group that should receive the email notification.

When you've finished defining the schedule, you can use the **SQL** tab to review the code that will create or modify your job.



Click the **Save** button to save the job definition, or **Cancel** to exit the job without saving. Use the **Reset** button to remove your unsaved entries from the dialog.

After saving a job, the job will be listed under the **Jobs** node of the PEM tree control of the server on which it was defined. The **Properties** tab in the PEM console will display a high-level overview of the selected job, and the Statistics tab will show the details of each run of the job. To modify an existing job or to review detailed information about a job, right-click on a job name, and select **Properties** from the context menu.

## 5.5 Managing a PEM Agent

The sections that follow provide information about the behavior and management of a PEM agent.

### Agent Privileges

By default, the PEM agent is installed with **root** privileges for the operating system host and superuser privileges

for the database server. These privileges allow the PEM agent to invoke unrestricted probes on the monitored host and database server about system usage, retrieving and returning the information to the PEM server.

Please note that PEM functionality diminishes as the privileges of the PEM agent decrease. For complete functionality, the PEM agent should run as [root](#). If the PEM agent is run under the database server's service account, PEM probes will not have complete access to the statistical information used to generate reports, and functionality will be limited to the capabilities of that account. If the PEM agent is run under another lesser-privileged account, functionality will be limited even further.

If you limit the operating system privileges of the PEM agent, some of the PEM probes will not return information, and the following functionality may be affected:

Probe or Action	Operating System	PEM Functionality Affected
Data And Logfile Analysis	Linux/ Windows	The Postgres Expert will be unable to access complete information.
Session Information	Linux	The per-process statistics will be incomplete.
PG HBA	Linux/ Windows	The Postgres Expert will be unable to access complete information.
Service restart functionality	Linux/ Windows	The Audit Log Manager, Server Log Manager, Streaming Replication, Log Analysis Expert and PEM may be unable to apply requested modifications.
Package Deployment	Linux/ Windows	PEM will be unable to run downloaded installation modules.
Batch Task	Windows	PEM will be unable to run scheduled batch jobs in Windows.
Collect data from server (root access required)	Linux/ Windows	Columns such as swap usage, CPU usage, IO read, IO write will be displayed as 0 in the session activity dashboard.

#### Note

The above-mentioned list is not comprehensive, but should provide an overview of the type of functionality that will be limited.

If you restrict the database privileges of the PEM agent, the following PEM functionality may be affected:

Probe	Operating System	PEM Functionality Affected
Audit Log Collection	Linux/Windows	PEM will receive empty data from the PEM database.
Server Log Collection	Linux/Windows	PEM will be unable to collect server log information.
Database Statistics	Linux/Windows	The Database/Server Analysis dashboards will contain incomplete information.
Session Waits/System Waits	Linux/Windows	The Session/System Waits dashboards will contain incomplete information.
Locks Information	Linux/Windows	The Database/Server Analysis dashboards will contain incomplete information.
Streaming Replication	Linux/Windows	The Streaming Replication dashboard will not display information.

Slony Replication	Linux/Windows	Slony-related charts on the Database Analysis dashboard will not display information.
Tablespace Size	Linux/Windows	The Server Analysis dashboard will not display complete information.
xDB Replication	Linux/Windows	PEM will be unable to send xDB alerts and traps.

If the probe is querying the operating system with insufficient privileges, the probe may return a [permission denied](#) error.

If the probe is querying the database with insufficient privileges, the probe may return a [permission denied](#) error or display the returned data in a PEM chart or graph as an empty value.

When a probe fails, an entry will be written to the log file that contains the name of the probe, the reason the probe failed, and a hint that will help you resolve the problem.

You can view probe-related errors that occurred on the server in the [Probe Log Dashboard](#), or review error messages in the PEM worker log files. On Linux, the default location of the log file is:

`/var/log/pem/worker.log`

On Windows, log information is available on the [Event Viewer](#).

## Agent Configuration

A number of user-configurable parameters and registry entries control the behavior of the PEM agent. You may be required to modify the PEM agent's parameter settings to enable some PEM functionality, such as the [Streaming Replication](#) wizard. After modifying values in the PEM agent configuration file, you must restart the PEM agent to apply any changes.

With the exception of the [PEM\\_MAXCONN](#) parameter, we strongly recommend against modifying any of the configuration parameters or registry entries listed below without first consulting EnterpriseDB support experts *unless* the modifications are required to enable PEM functionality.

On Linux systems, PEM configuration options are stored in the [agent.cfg](#) file, located in `/opt/edb/pem/agent/etc`. The [agent.cfg](#) file contains the following entries:

Parameter Name	Description	Default Value
pem_host	The IP address or hostname of the PEM server.	127.0.0.1.
pem_port	The database server port to which the agent connects to communicate with the PEM server.	Port 5432.
pem_agent	A unique identifier assigned to the PEM agent.	The first agent is '1', the second agent's is '2', and so on.
agent_ssl_key	The complete path to the PEM agent's key file.	/root/.pem/agent.key
agent_ssl_crt	The complete path to the PEM agent's certificate file.	/root/.pem/agent.crt
agent_flag_dir	Used for HA support. Specifies the directory path checked for requests to take over monitoring another server. Requests are made in the form of a file in the specified flag directory.	Not set by default.
log_level	Log level specifies the type of event that will be written to the PEM log files.	warning
log_location	Specifies the location of the PEM worker log file.	127.0.0.1.
agent_log_location	Specifies the location of the PEM agent log file.	/var/log/pem/agent.log

Parameter Name	Description	Default Value
long_wait	The maximum length of time (in seconds) that the PEM agent will wait before attempting to connect to the PEM server if an initial connection attempt fails.	30 seconds
short_wait	The minimum length of time (in seconds) that the PEM agent will wait before checking which probes are next in the queue (waiting to run).	10 seconds
alert_threads	The number of alert threads to be spawned by the agent.	Set to 1 for the agent that resides on the host of the PEM server; 0 for all other agents.
enable_smtp	When set to true, the SMTP email feature is enabled.	true for PEM server host; false for all others.
enable_snmp	When set to true, the SNMP trap feature is enabled.	true for PEM server host; false for all others.
enable_nagios	When set to true, Nagios alerting is enabled.	true for PEM server host; false for all others.
connect_timeout	The max time in seconds (a decimal integer string) that the agent will wait for a connection.	Not set by default; set to 0 to indicate the agent should wait indefinitely.
allow_server_restart	If set to TRUE, the agent can restart the database server that it monitors. Some PEM features may be enabled/disabled, depending on the value of this parameter.	True
allow_package_management	If set to TRUE, the Update Monitor and Package Management features are enabled.	false
max_connections	The maximum number of probe connections used by the connection throttler.	0 (an unlimited number)
connection_lifetime	Use ConnectionLifetime (or connection_lifetime) to specify the minimum number of seconds an open but idle connection is retained. This parameter is ignored if the value specified in MaxConnections is reached and a new connection (to a different database) is required to satisfy a waiting request.	By default, set to 0 (a connection is dropped when the connection is idle after the agent's processing loop).
allow_batch_probes	If set to TRUE, the user will be able to create batch probes using the custom probes feature.	false
heartbeat_connection	When set to TRUE, a dedicated connection is used for sending the heartbeats.	false
allow_streaming_replication	If set to TRUE, the user will be able to configure and setup streaming replication.	false
batch_script_dir	Provide the path where script file (for alerting) will be stored.	/tmp
connection_custom_setup	Use to provide SQL code that will be invoked when a new connection with a monitored server is made.	Not set by default.
ca_file	Provide the path where the CA certificate resides.	/opt/PEM/agent/share/certs/ca-bundle.crt.

On 64 bit Windows systems, PEM registry entries are located in:

| HKEY\_LOCAL\_MACHINE\Software\Wow6432Node\EnterpriseDB\PEM\agent.

The registry contains the following entries:

Parameter Name	Description	Default Value
PEM_HOST	The IP address or hostname of the PEM server.	127.0.0.1.
PEM_PORT	The database server port to which the agent connects to communicate with the PEM server.	Port 5432.
AgentID	A unique identifier assigned to the PEM agent.	The first agent is '1', the second agent is '2', and so on.
AgentKeyPath	The complete path to the PEM agent's key file.	%APPDATA%\Roaming\pem\agent.key.
AgentCrtPath	The complete path to the PEM agent's certificate file.	%APPDATA%\Roaming\pem\agent.crt
AgentFlagDir	Used for HA support. Specifies the directory path checked for requests to take over monitoring another server. Requests are made in the form of a file in the specified flag directory.	Not set by default.
LogLevel	Log level specifies the type of event that will be written to the PEM log files.	warning
LongWait	The maximum length of time (in seconds) that the PEM agent will wait before attempting to connect to the PEM server if an initial connection attempt fails.	30 seconds
shortWait	The minimum length of time (in seconds) that the PEM agent will wait before checking which probes are next in the queue (waiting to run).	10 seconds
AlertThreads	The number of alert threads to be spawned by the agent.	Set to 1 for the agent that resides on the host of the PEM server; 0 for all other agents.
EnableSMTP	When set to true, the SMTP email feature is enabled.	true for PEM server host; false for all others.
EnableSNMP	When set to true, the SNMP trap feature is enabled.	true for PEM server host; false for all others.
ConnectTimeout	The max time in seconds (a decimal integer string) that the agent will wait for a connection.	Not set by default; if set to 0, the agent will wait indefinitely.
AllowServerRestart	If set to TRUE, the agent can restart the database server that it monitors. Some PEM features may be enabled/disabled, depending on the value of this parameter.	true
AllowPackageManagement	If set to TRUE, the Update Monitor and Package Management features are enabled.	false

MaxConnections	The maximum number of probe connections used by the connection throttler.	0 (an unlimited number)
ConnectionLifetime	Use ConnectionLifetime (or connection_lifetime) to specify the minimum number of seconds an open but idle connection is retained. This parameter is ignored if the value specified in MaxConnections is reached and a new connection (to a different database) is required to satisfy a waiting request.	By default, set to 0 (a connection is dropped when the connection is idle after the agent's processing loop).
AllowBatchProbes	If set to TRUE, the user will be able to create batch probes using the custom probes feature.	false
HeartbeatConnection	When set to TRUE, a dedicated connection is used for sending the heartbeats.	false
AllowStreamingReplication	If set to TRUE, the user will be able to configure and setup streaming replication.	false
BatchScriptDir	Provide the path where script file (for alerting) will be stored.	/tmp
ConnectionCustomSetup	Use to provide SQL code that will be invoked when a new connection with a monitored server is made.	Not set by default.
ca_file	Provide the path where the CA certificate resides.	/opt/PEM/agent/share/certs/ca-bundle.crt.

## Agent Properties

The **PEM Agent Properties** dialog provides information about the PEM agent from which the dialog was opened; to open the dialog, right-click on an agent name in the PEM client tree control, and select **Properties** from the context menu.



Use fields on the PEM Agent properties dialog to review or modify information about the PEM agent:

- The **Description** field displays a modifiable description of the PEM agent. This description is displayed in the tree control of the PEM client.
  - You can use groups to organize your servers and agents in the PEM client tree control. Use the **Group** drop-down listbox to select the group in which the agent will be displayed.
  - Use the **Team** field to specify the name of the group role that should be able to access servers monitored by the agent; the servers monitored by this agent will be displayed in the PEM client tree control to connected team members. Please note that this is a convenience feature. The Team field does not provide true isolation, and should not be used for security purposes.
  - The **Heartbeat interval** fields display the length of time that will elapse between reports from the PEM agent to the PEM server. Use the selectors next to the **Minutes** or **Seconds** fields to modify the interval.
- 

## 6 Installation Guide

Postgres Enterprise Manager (PEM) is designed to assist database administrators, system architects, and performance analysts when administering, monitoring, and tuning PostgreSQL and Advanced Server database servers. PEM has been designed to manage and monitor a single server or multiple servers from a single console, allowing complete control over monitored databases.

This document provides step-by-step instructions to guide you through the installation of Postgres Enterprise Manager.

Throughout this guide, the term *Postgres* refers to either a PostgreSQL or an Advanced Server installation, where either is appropriate.

Language pack installers contain supported languages that may be used with EDB Postgres Advanced Server and EnterpriseDB PostgreSQL database installers. The language pack installer allows you to install Perl, TCL/TK, and Python without installing supporting software from third party vendors. For more information about installing and using Language Pack, please see the *EDB Postgres Language Pack Guide*, available from the EnterpriseDB Website.

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### 6.1 What's New

The following features have been added to create Postgres Enterprise Manager 7.12:

- Improved BART Integration- The following capabilities have been added to enhance the integration of BART with PEM:
  - PEM 7.12 provides an option to create SSH certificates to allow passwordless authentication for backup and restore operations. You can enable passwordless SSH authentication from the database server's **Properties** dialog or from the **Backup Restore** dialog.
  - You can now set or override the **archive command** of the database server's configuration by providing inputs in the database server's **Properties** dialog.
- Accessibility Improvements- Attributes have been added to provide an invisible label to the UI elements where a text label cannot be used.
- Dark Theme (Beta)- You can now choose to use the dark theme while accessing the PEM console. In the following cases, the dark theme does not work in PEM console:
  - Background of the pie charts under monitoring dashboards.
  - All the reports generated for Capacity Manager, Log Analysis Expert, Postgres Expert, Tuning Wizard etc.

## 6.2 Postgres Enterprise Manager - Overview

Postgres Enterprise Manager (PEM) consists of components that provide the management and analytical features of PEM:

- **PEM Server:** The PEM server is used as the data repository for monitoring data and as a server to which both agents and clients connect. The PEM server consists of an instance of PostgreSQL and an associated database for storage of monitoring data, and a server that provides web services.
- **PEM web interface:** The PEM web interface allows you to manage and monitor Postgres servers and utilize PEM extended functionality. The web interface software is installed with the PEM server installer, and is accessed via your choice of web browser.
- **PEM Agent:** The PEM agent is responsible for executing tasks and reporting statistics from the agent host and monitored Postgres instances to the PEM server. A single PEM agent can monitor multiple installed instances of Postgres that reside on one or many hosts.

The PEM Agent installer creates two executables: the PEM worker (`pemworker.exe`) and the PEM agent (`pemagent.exe`). Each PEM worker has a corresponding PEM agent that you can use to start or stop the PEM worker. The PEM agent will also restart the PEM worker should it terminate unexpectedly.

The PEM worker log file contains information related to PEM worker activity (probe activities, heartbeat responses, etc.), and is stored in `/var/log/pem/worker.log`.

- **SQL Profiler plugin:** This plugin to the Postgres server is used to generate the monitoring data used by the SQL Profiler tool. Installation of the SQL Profiler plugin is optional, but the plugin must be installed into each instance of Postgres you wish to profile. The SQL Profiler may be used with any supported version of an EnterpriseDB distribution of a PostgreSQL server or an Advanced Server (not just those managed through the PEM server). See [Installing the SQL Profiler Plugin](#) section for details and supported versions.

The architectural diagram below illustrates the relationship between the various servers and workstations involved in a typical PEM installation.



### Supported Platforms

#### PEM server and agent

The PEM server is supported on:

64-bit Windows:

- Windows Server 2012 R2
- Windows Server 2016
- Windows Server 2019

64-bit Linux:

- SLES 12.x SP4
- CentOS 6.x and 7.x
- OEL 6.x and 7.x
- Red Hat Enterprise Linux 6.x and 7.x
- Debian 9.x (stretch)
- Ubuntu 18.04+ (bionic)

Where x is the latest minor release of the operating system.

#### Note

It is recommended that the operating system is kept up to date with the latest updates from the vendor on an ongoing basis. Failure to do so may result in compatibility or security issues.

The PEM server is supported on these platforms, using Advanced Server or PostgreSQL backing databases (version 9.4 and higher).

The PEM agent is supported on any Linux or Windows platform on which Advanced Server or PostgreSQL version 9.4 or higher is supported.

#### Browser

The PEM web interface is supported on the following browsers:

- Google Chrome version 65 and above
- Mozilla Firefox version 59 and above
- Microsoft Edge version 42 and above
- Apple Safari version 11.1 and above

#### PostgreSQL Version Support

PEM can manage and monitor:

- PostgreSQL versions 9.4 and higher
- Advanced Server 9.4 and higher

#### SQL Profiler

SQL Profiler for Postgres Enterprise Manager is supported on EDB Postgres Advanced Server 9.4 and later, and EnterpriseDB distributions of PostgreSQL version 9.4 and above.

#### Hardware Prerequisites

For optimum speed when monitoring servers and rendering dashboards, we recommend installing PEM on a system with at least:

- 4 CPU cores
- 8 GB of RAM
- 100 GB of Storage

Additional disk space is required for data storage. Please note that resource usage will vary based on which probes are defined and enabled, and the activity level on the monitored databases. Monitoring server resources (as you use PEM) will let you know when you need to expand your initial system configuration.

## Software Prerequisites

### Modifying the pg\_hba.conf File

The `pg_hba.conf` file manages connections for the Postgres server. You must ensure that the `pg_hba.conf` file on each monitored server allows connections from the PEM server, the monitoring PEM agent, and the host of the PEM-HTTPD server.

For information about modifying the `pg_hba.conf` file, see the *PEM Getting Started Guide* available at:

<https://www.enterprisedb.com/resources/product-documentation>

Information about managing authentication is also available in the Postgres core documentation available at:

<https://www.postgresql.org/docs/current/static/auth-pg-hba-conf.html>

### Firewall Restrictions

Please note that you must adjust your firewall to allow communication between PEM components.

### PEM Agent Installation- Prerequisites for RHEL or CentOS 7.x

Before installing the PEM agent on a CentOS 7.x host, you must ensure that the host contains the `wxBase` and `epel-release` packages. To install the packages, open a command line, assume `root` privileges, and invoke the commands:

```
yum install epel-release
yum install wxBase
```

### Windows Permissions

If you are installing PEM components on Windows, you may be required to invoke the PEM installers with `Administrative` privileges. To invoke an installer using Administrator privileges, right click on the installer icon and select `Run as Administrator` from the context menu.

### Supported Locales

Currently, the PEM server and web interface support a locale of `English(US) en_US` and use of a period (.) as a language separator character. Using an alternate locale, or a separator character other than a period may result in errors.

### Windows Server IE Security

If you are using Internet Explorer on a Windows Server host to access monitored servers with the PEM web interface, you must disable Internet Explorer's Enhanced Security to take advantage of PEM functionality. If you do not wish to disable IE Enhanced Security, we recommend that you use an alternate browser (such as Chrome).

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## 6.3      Installing Postgres Enterprise Manager

You can use a graphical installer, StackBuilder Plus, or an RPM package to add the Postgres Enterprise Manager

server or agent to a host. Installers are available on the [EnterpriseDB website](#).

The PEM server graphical installer for Windows installs and configures the PEM server, a PEM agent, and the software required to connect to the PEM web interface with your choice of browser. For detailed information about using the PEM server graphical installer, see [Installing the PEM Server on Windows](#).

You can use an RPM package to install the PEM server on a Linux host; for detailed information about using the installer, see [Installing the PEM Server on Linux](#).

The PEM agent graphical installer for Windows installs and registers the PEM agent. The PEM agent that is installed with the PEM server is capable of monitoring multiple servers that reside on the same host, or on remote hosts. Please note that the PEM functionality on servers monitored by a remote agent may be limited.

For more information about using the PEM agent graphical installer, see [Installing a PEM Agent on Windows](#).

You can use an RPM package to install the PEM agent on Linux; for more information about the PEM agent RPM package, see [Installing a PEM Agent on Linux](#).

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### 6.3.1     Installing the PEM Server on Windows

At the heart of each PEM installation is the server. In a production environment, the server will typically be a dedicated machine, monitoring a large number of Postgres servers or a smaller number of busy servers.

The PEM server backend database may be an EnterpriseDB distribution of the PostgreSQL or Advanced Server database server, or an existing Postgres server installed from another source. The Postgres backing database server must be version 9.4 or later, and will contain a database named pem, which is used by the PEM server as a repository.

- If you would like to use an existing Postgres server to host the PEM server, the PEM server installer can create the `pem` database on the Postgres host. You must manually satisfy the software pre-requisites if you choose to use an existing server.

For more information about using an existing Postgres server to host the PEM server backend database, see [Installing the PEM Server on an Existing Postgres Server](#) section.

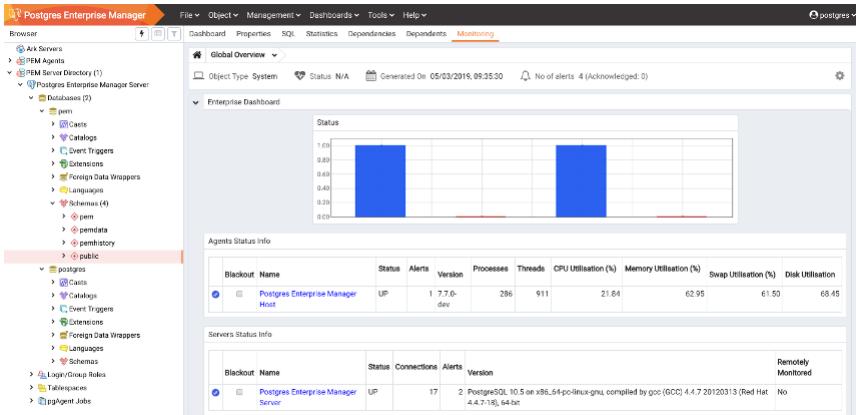
- If you do not wish to use an existing installation of Postgres as the PEM server host, the PEM server installer can install PostgreSQL, satisfy the server host's software pre-requisites, and create an instance (a PostgreSQL database cluster) that contains the `pem` database.

This is the simplest PEM server installation option.

PEM-HTTPD is made available for Postgres installations through the PEM server installer or the StackBuilder utility. If PEM-HTTPD is already installed on the host, the PEM server installer will review and update the existing installation if required. If the PEM server host does not contain an existing PEM-HTTPD installation, the PEM server installer will add it.

Before installing the PEM server, you must decide if you wish to run PostgreSQL and PEM-HTTPD on the same host or on separate hosts. If you intend to run the PostgreSQL database server and PEM-HTTPD on different hosts, then you must run the PEM server installer twice – once on each host, as detailed in [Installing the PEM Server and PEM-HTTPD on Separate Hosts](#) section.

The PEM server installer will also install the software required to access the server via the PEM web interface. You can access the web interface with a supported version of your browser of choice.



You can use the web interface to review information about objects that reside on monitored servers, manage databases and database objects that reside on monitored servers, or review statistical information gathered by the PEM server. The interface also provides access to clusters that reside on registered EDB Ark consoles.

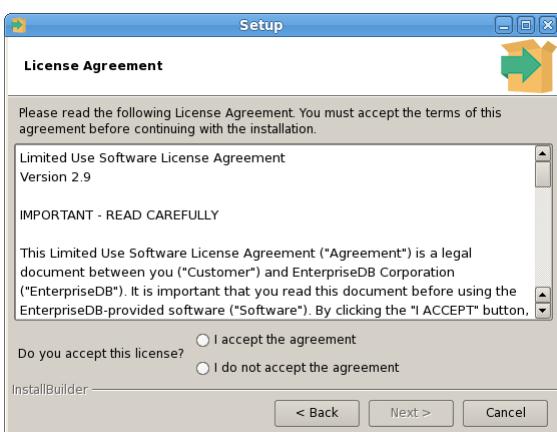
## Installing the PEM Server and PEM-HTTPD on the Same Host

The easiest PEM server installation configuration consists of a PEM backend database server (hosted on a PostgreSQL database installed with the PEM server installer) and a PEM-HTTPD service that reside on the same host. In this configuration, the PEM server installer will provide the pre-requisite software for the backend host and create a service script (on Linux) or register the service (on Windows).

To invoke the PEM server installer on a Windows system, right click the installer icon and select **Run as Administrator**. The installer displays a **Welcome** dialog.

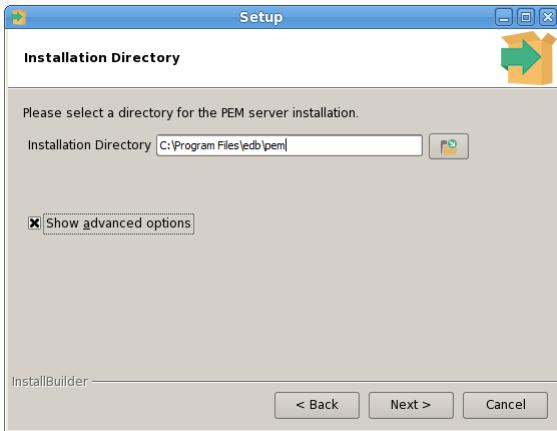


Click **Next** to continue to the **License Agreement** dialog.



Carefully review the license agreement before highlighting the appropriate radio button and accepting the

agreement. Click **Next** to continue to the **Installation Directory** dialog.



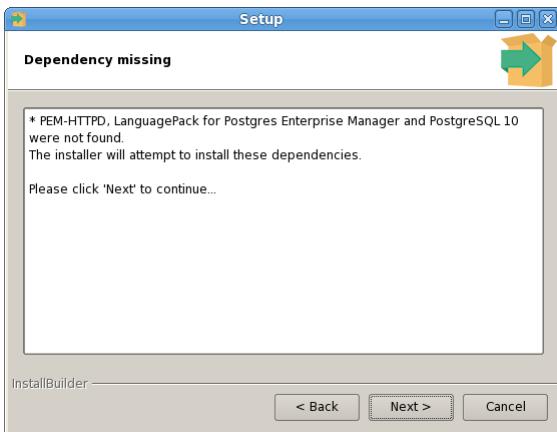
Use the **Installation Directory** dialog to specify the location of the PEM server:

- By default, the PEM server is installed in **C:\Program Files\PEM** on Windows. Accept the default location, or use the **Installation Directory** button to open a browser dialog and select the directory in which the PEM server will be installed.
- Use the **Show advanced options** check box to instruct the installer to open the **Advanced options** dialog.

Use the **Advanced options** dialog when installing the Postgres database server and the PEM-HTTPD on different hosts, or if you wish the PEM server to reside on an existing Postgres server installation.

To install the PostgreSQL server packaged with the installer and PEM-HTTPD on the same host, leave the **Show advanced options** box unchecked and click **Next**.

The PEM server installer will perform a pre-installation check for PEM-HTTPD, LanguagePack, and PostgreSQL 10. If the installer does not locate these packages, it will inform you in the **Dependency missing** dialog.



If the dependencies are missing, the PEM server installer will launch the respective installation wizards; follow the onscreen directions presented by the installation wizards for each package.

After installing any missing dependencies, the installation process continues by displaying the **Database Server Installation Details** dialog.



The information provided on the **Database Server Installation Details** dialog enables the installer to connect to the PostgreSQL server. Provide the **User name** and **Password** of a database superuser. After supplying the requested information, click **Next** to continue to the **Network Details** dialog.

After providing the name and password of the Postgres database superuser, you may be prompted for the password to the user account under which the PEM agent will run. If prompted, provide the password, and press **Next** to continue.



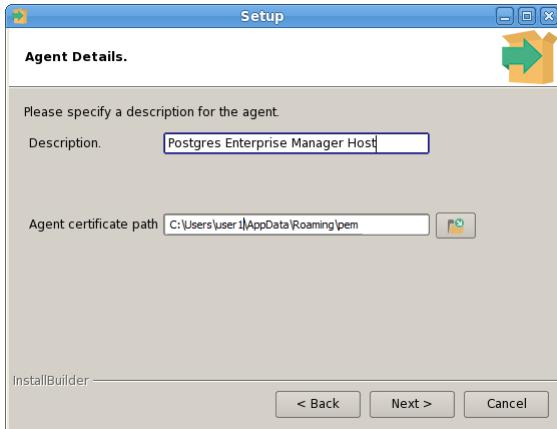
Use the **Network Details** dialog to specify the CIDR-style network address from which the PEM agents will connect to the server (the *client-side* address).

You may specify the address of a network host, or a network address range. For example, if you wish to monitor database servers with the addresses **192.168.10.23**, **192.168.10.76** and **192.168.10.184**, enter **192.168.10.0/24** to allow connections with hosts in that network.

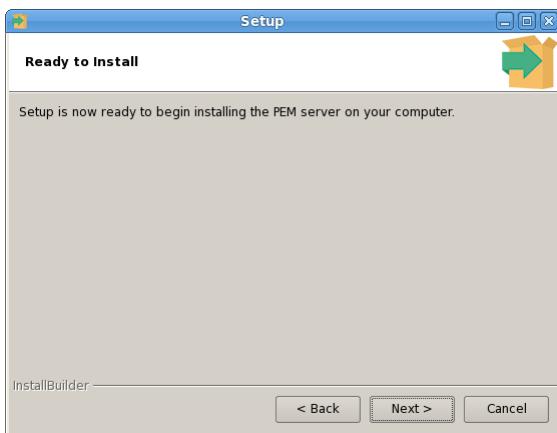
The specified address will be added to the server's **pg\_hba.conf** file. You can specify additional network addresses by manually adding entries to the **pg\_hba.conf** file on the PostgreSQL server if required, using the initial entry as a template.

When you've added the **Network address**, click **Next** to continue to the **Agent Details** dialog.

The PEM server installer will install a PEM agent on the host on which the server resides, to monitor the server and provide alert processing and garbage collection services. A certificate will also be installed in the location specified in the **Agent certificate path** field.

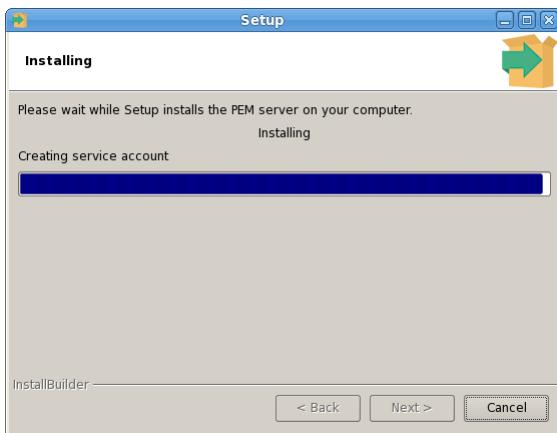


Enter an alternate description or select an alternate agent certificate path for the PEM agent, or accept the defaults. Click **Next** to continue to the **Ready to Install** dialog.



The wizard is now ready to install the PEM server.

Click **Back** to modify any of the options previously selected, or **Next** to continue with the installation.



During the installation process, the installer will copy files to the system, and set up the database and web services required to run PEM. When the installation completes, a popup dialog opens confirming that the webservice has been configured, and is listening on port **8443**, and that the pem database has been created and configured.



Click **OK** to acknowledge that the webservice has been configured, and that the **pem** database has been created,

and continue to the **Completed ... dialog**.



## Installing the PEM Server and PEM-HTTPD on Separate Hosts

To use separate hosts for the PEM server backend database and PEM-HTTPD, you must:

1. Invoke the PEM server installer on the host of the Postgres server that will contain the **pem** database. During the installation, select the **Database** option on the **Advanced options** dialog, and provide connection information for the Postgres server.
2. Modify the **pg\_hba.conf** file of the Postgres installation on which the PEM server (and **pem** database) resides, allowing connections from the host of the PEM-HTTPD server.
3. Invoke the PEM server installer on the host of the PEM-HTTPD server, selecting the **Web Services** option on the **Installation Type** dialog.

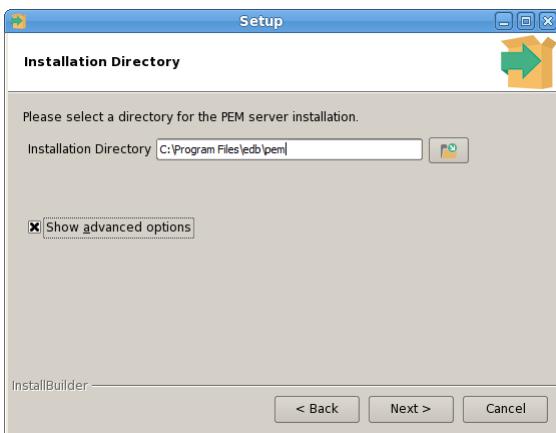
To invoke the PEM server installer on a Windows system, right click the installer icon and select **Run as Administrator**. The installer displays a **Welcome** dialog.



Click **Next** to continue to the **License Agreement** dialog.



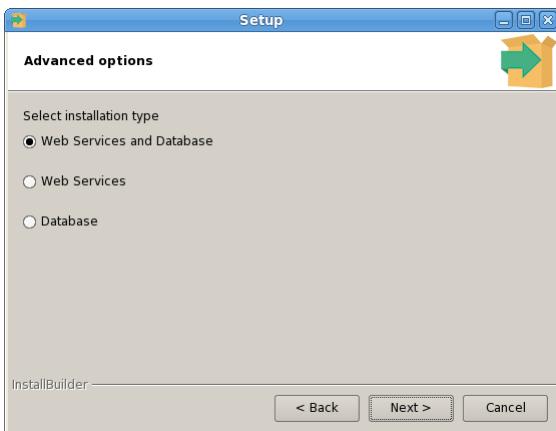
Carefully review the license agreement before highlighting the appropriate radio button and accepting the agreement; click **Next** to continue.



Use fields on the **Installation Directory** dialog to specify the directory in which the PEM server will reside, and to access the **Advanced options** dialog:

- By default, the PEM server is installed in the **C:\Program Files\PEM** on Windows. Accept the default location, or use the **Installation Directory** field to open a browser dialog and select the directory in which the PEM server will be installed.
- To install the PEM server and PEM-HTTPD on separate hosts, you must use the **Advanced options** dialog to specify the installation type (**Web Services** or **Database**). Select the **Show advanced options** check box to instruct the installer to include the **Advanced options** dialog in the installation process.

Click **Next** to continue to the **Advanced Options** dialog.



Use the radio buttons on the **Advanced options** dialog to specify the component or components that you would like to install:

- Select **Web Services and Database** to indicate that the Postgres server and PEM-HTTPD will both reside on

the current host. If you select the **Web Services and Database** option, the PEM server installer will allow you to specify which Postgres server you wish to use for the PEM server before checking for a PEM-HTTPD installation.

- Select **Web Services** to install PEM-HTTPD on the current host, while using a Postgres database server that resides on another host to host the PEM server and **pem** database.

#### Note

You must complete the PEM server installation process on the host of the PEM server (and **pem** backend database), selecting **Database** on the **Advanced options** dialog, and modifying the connection properties of the **pg\_hba.conf** file on the PEM server before using the **Web Services** option to install PEM-HTTPD.

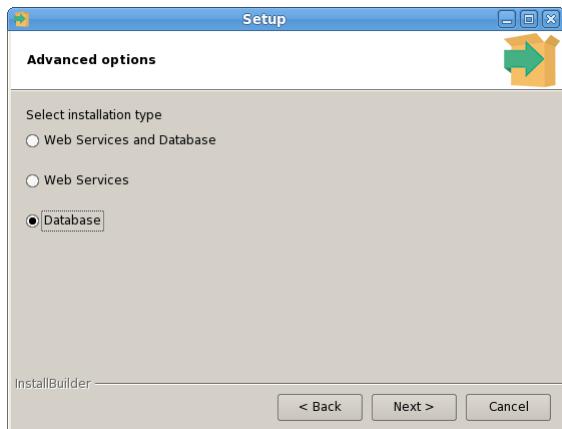
This option invokes the installation steps documented in [Installing Web Services](#) section.

- Select **Database** to use an existing Postgres server (version 9.4 or greater), or to install only the database server that is distributed with the PEM server installer. This option invokes the installation steps documented in [Specifying a Database Host](#).

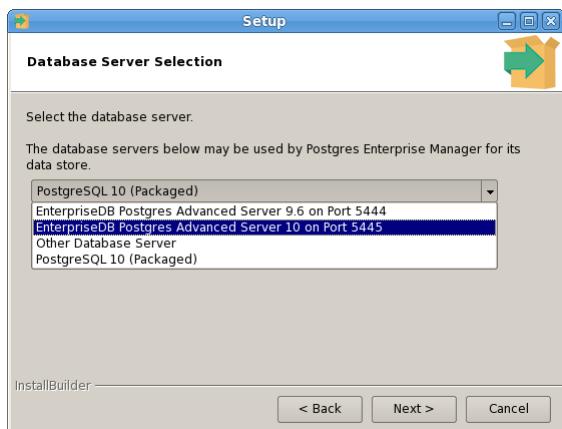
After selecting an installation option, click **Next** to continue.

## Specifying a Database Host

Selecting the **Database** option on the **Advanced options** dialog allows you to specify connection information for the host on which the PEM server backend database (named **pem**) will reside.



Click **Next** to continue to the **Database Server Selection** dialog.



Use the drop-down listbox on the **Database Server Selection** dialog to select a host for the PEM server backend database. You can:

- Select a host from existing Postgres installations that reside on the current host.

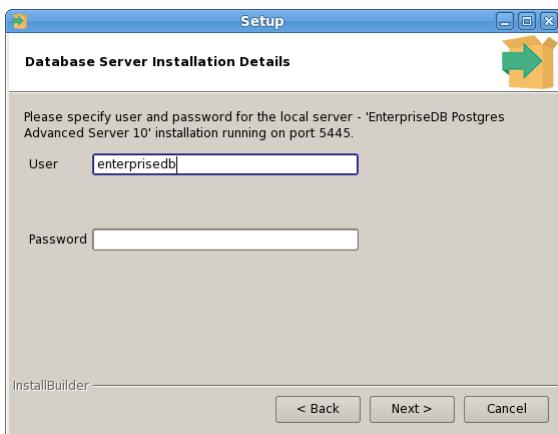
## Note

You may be required to add the `sslutils` package to your installation.

- Select the `PostgreSQL 9.6` option to install the Postgres server that is distributed with the PEM server installer. If you decide to use the version of PostgreSQL that is bundled with the PEM server installer, the EnterpriseDB one-click PostgreSQL installer will open and walk you through the installation.
- Select `Other Database Server` to specify connection information for a Postgres server that was not installed using a one-click graphical installer from EnterpriseDB. For information about the software pre-requisites for the PEM server database host, please see [Preparing the Postgres Server](#) section.

Click `Next` to continue.

If the PEM server will reside on an existing Postgres server, the `Database Server Installation Details` dialog shown in opens.

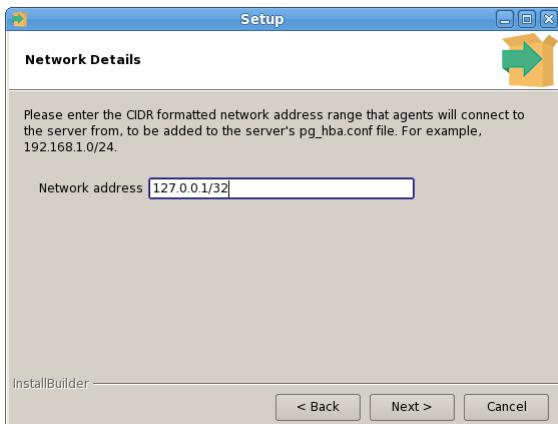


The information required on the `Database Server Installation Details` dialog may vary; the PEM server installer will ask you to provide only the information about the selected installation that it cannot locate:

- Specify the name of a Postgres database superuser in the `User` field.
- Specify the password associated with that user in the `Password` field.

Click `Next` to continue.

If prompted, provide the system password for the service account under which the PEM agent will run, and click `Next` to continue to the `Network Details` dialog.



Use the `Network Details` dialog to specify the CIDR-style network address from which PEM agents will connect to the server (the *client-side* address). The specified address will be added to the server's `pg_hba.conf` file.

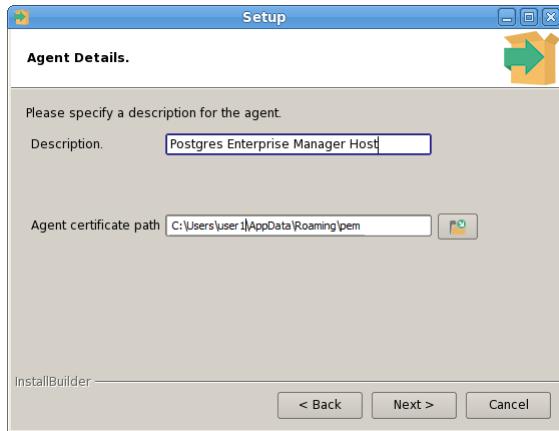
## Note

You can specify additional network addresses by manually adding entries to the `pg_hba.conf` file on the

PostgreSQL server.

Accept the default (specifying the localhost), or specify a **Network address** range, and click **Next** to continue to the **Agent Details** dialog.

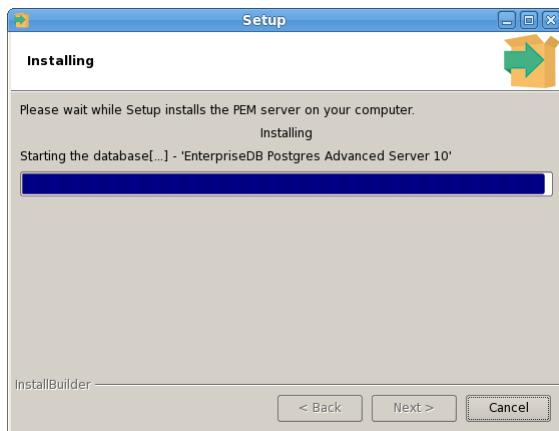
The PEM server installer will install a PEM agent on the host on which the server resides, to monitor the server and provide alert processing and garbage collection services. A certificate will also be installed in the location specified in the **Agent certificate path** field.



You can enter an alternate description or an alternate agent certificate path for the PEM agent, or accept the defaults. Click **Next** to continue.



The wizard is now ready to install the PEM server. Click **Back** to modify any of the options previously selected, or **Next** to proceed with the installation.



During the installation process, the installer will copy files to the system, and set up the PEM server's backend database. A popup dialog opens confirming that the **pem** database has been created and configured.



Click **OK** to acknowledge that the **pem** database has been created, and continue to the **Completed...** dialog.



When the database portion of the PEM server installation is complete, you can invoke the PEM server on another host to install (or upgrade) PEM-HTTPD.

## Installing Web Services

Selecting the **Web Services** radio button on the **Advanced options** dialog instructs the PEM server installer to either install PEM-HTTPD on the current host or update an existing PEM-HTTPD installation.



### Note

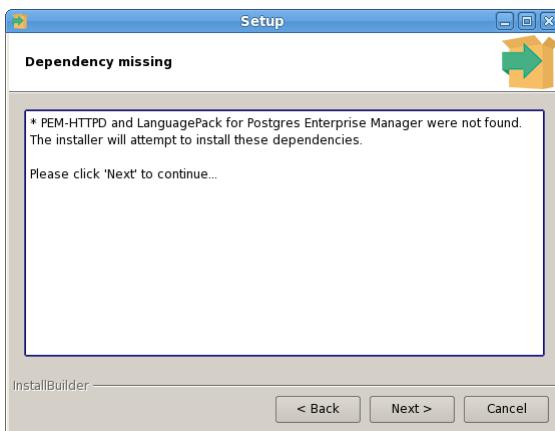
The current host may not be the host of the PEM backing database.

Before selecting this option, you must have:

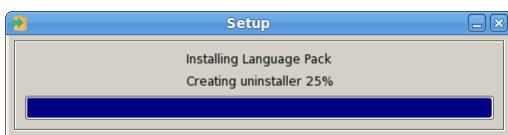
- Completed an installation of the PEM server installer on a host system, during which you specified a backing database for the PEM server.
- Modified the **pg\_hba.conf** file on the PEM server database host to allow connections from the PEM-HTTPD host, and restarted the database server.

When you select the **Web Services** option and click **Next**, the PEM server installer will check the current host for existing PEM-HTTPD and LanguagePack installations.

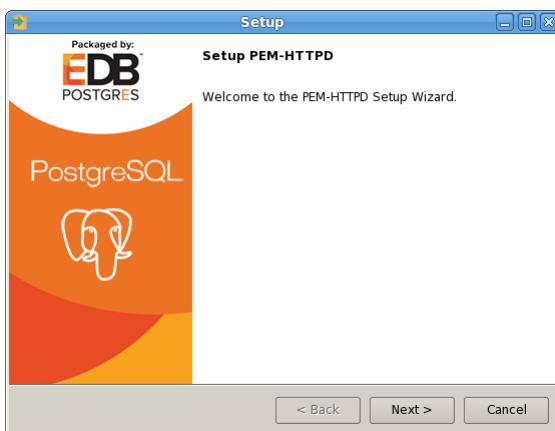
If the installer does not locate the components, the installer will inform you that one or more dependencies are missing.



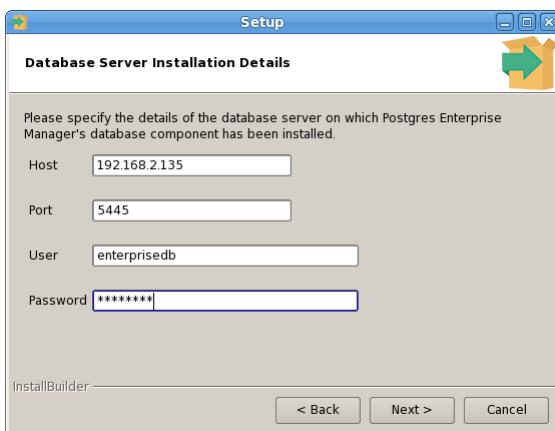
Click **Next** to instruct the server to install LanguagePack



After installing language pack, the installer will invoke the PEM-HTTPD setup wizard.



Follow the onscreen instructions of the **PEM-HTTPD Setup Wizard**. When the wizard completes the installation, click **Finish** to open the **Database Server Installation Details** dialog.



Use the fields on the **Database Server Installation Details** dialog to provide connection information for the Postgres installation that is hosting the PEM server installation:

- Enter the name or IP address of the PEM server host in the **Host** field.
- Enter the port number on which the Postgres server is listening in the **Port** field.
- Enter the name of a Postgres database superuser in the **User** field.
- Enter the password associated with the Postgres superuser in the **Password** field.

Click [Next](#) to continue. Before completing the PEM server installation, the installer will contact the database host. The `pg_hba.conf` file on the PEM database host must be configured to accept connections from the host of the httpd server and the firewall must allow a connection for the installation to continue. The PEM server installer will complete the PEM server installation, adding only those items that must reside on the host of the PEM-HTTPD server.

## Installing the PEM Server on an Existing Postgres Server

You can use an existing Postgres server (version 9.4 or later) to host the PEM server and the `pem` database. Postgres installers and pre-requisite software extensions are freely available on the [EnterpriseDB website](#) at

This section provides information about configuring an existing Postgres server for a PEM server installation.

### Note

The steps that follow should be considered guidelines only; the actual steps required to configure your Postgres installation will vary depending on the configuration of your Postgres server.

The following versions of Postgres are pre-configured to contain the `sslutils` extension and a service script; no additional preparation is required to use the following Postgres versions as a PEM backend database server:

- PostgreSQL 9.4 or later (as bundled with the PEM Server installer)
- Advanced Server 9.4 or later

## Preparing the Postgres Server

Before installing the PEM server on an existing Postgres server, you must:

- Ensure that the Postgres server contains an installation of the `sslutils` extension. For more information, see [Installing the sslutils Extension](#) section.
- Create a service script (on Linux) or register the server with the Windows service manager. For more information, see [Creating a Service Script or Registering the Service](#) section.

After preparing the server, you can use the PEM server installer to install PEM on the existing Postgres server.

### Installing the `sslutils` Extension

The Postgres server on which the PEM server will reside must contain the `sslutils` extension. The `sslutils` package is freely available for download from the [EnterpriseDB website](#)

When the web page opens, select the link for the `SRC- SSL Utils 1.2` package. When the download completes, extract the file, and copy it into the Postgres installation directory.

### On Linux

If the Postgres server resides on a Linux system, you must use the `gcc` compiler to build `sslutils`.

1. Use `yum` to install `gcc`:

```
yum install gcc
```

2. Set the value of `PATH` so it can locate the `pg_config` program:

```
export PATH=$PATH:/opt/postgres_inst_dir/9.x/bin/
```

3. Then, use `yum` to install the `sslutil` dependencies:

```
yum install openssl-devel
```

4. Move into the `sslutils` folder, and enter:

```
make USE_PGXS=1  
make USE_PGXS=1 install
```

5. Use psql to create the `sslutils` extension:

```
CREATE EXTENSION sslutils
```

## On Windows

Remember: You are *not* required to manually add the `sslutils` extension when using the following Postgres installations:

- PostgreSQL 9.4 or later (as distributed with the PEM server installer)
- Advanced Server 9.4 or later

`sslutils` must be built with the same compiler that was used to compile the backend Postgres installation. If you are using a backend Postgres database that was installed on a Windows platform using a PostgreSQL one-click installer (from EnterpriseDB) or an Advanced Server installer, you must use Visual Studio to build `sslutils`.

While specific details of the installation process will vary by platform and compiler, the basic steps are the same. You must:

1. Copy the `sslutils` package to the Postgres installation directory.
2. Open the command line of the appropriate compiler, and navigate into the `sslutils` directory.
3. Use the following commands to build `sslutils`:

```
SET USE_PGXS=1  
  
SET GETTEXTPATH=<path_to_gettext>  
  
SET OPENSSLPATH=<path_to_openssl>  
  
SET PGPATH=<path_to_pg_installation_dir>  
  
SET ARCH=x86  
  
REM Set ARCH x64 for 64 bit  
  
msbuild sslutils.proj /p:Configuration=Release
```

Where:

`path_to_gettext` specifies the location of the `GETTEXT` library and header files.

`path_to_openssl` specifies the location of the `openssl` library and header files.

`path_to_pg_installation_dir` specifies the location of the Postgres installation.

4. Copy the compiled `sslutils` files to the appropriate directory for your installation. The `sslutils` directory will contain the following files:

```
sslutils--1.1.sql  
sslutils--unpackaged--1.1.sql  
sslutils--pemagent.sql.in
```

## sslutils.dll

Copy the `.dll` libraries and `.sql` files into place:

```
COPY sslutils*.sql* "%PGPATH%\share\extension\"
```

```
COPY sslutils.dll "%PGPATH%\lib\"
```

## Creating a Service Script or Registering the Service

A service script allows the PEM server to start, stop or restart the server if necessary when performing configuration management, certificate management, or other administrative tasks.

When you install a PostgreSQL or an Advanced Server database using an installer from EnterpriseDB (such as the PostgreSQL one-click installer), the installer will create a service script, or on Windows, register the service for you. If you have built the Postgres installation from source, you are required to manually create a service script.

While the PEM server installer checks for the presence of the service script, it does not check the integrity of the script itself; for PEM to function properly, you must ensure that the service script works as expected.

## Writing a Linux Service Script

On Linux, the service script must reside in the `/etc/init.d` directory. The service script must be able to start, stop and restart the database server. Service scripts are platform-specific; you can find a sample service script for Linux in [Linux Service Script \(Sample\)](#) section. For information about customizing a Postgres service, visit:

<https://www.postgresql.org/docs/current/static/server-start.html>

## Registering a Service on Windows

If you are using Windows to host the PEM backend database, you must register the name of the Postgres server with the Windows service manager. If you are using a Postgres server that was created using an EnterpriseDB installer, the service will be registered automatically. If you are manually building the installation, you can use the `register` clause of the Postgres `pg_ctl` command to register the service. The syntax of the command is:

```
> pg_ctl register [-N <service_name>] [-U <user_name>] | [-P <password>] [-D <data_directory>]
```

Where:

*service name* specifies the name of the Postgres cluster.

*user\_name* specifies the name of an operating system user with sufficient privileges to access the Postgres installation directory and start the Postgres service.

*password* specifies the operating system password associated with the user.

*data\_directory* specifies the location of the Postgres data directory.

For more information about using the `pg_ctl` command and the available command options, see the

[Postgres core documentation](#)

## Invoking the PEM Server Installer

After preparing the existing Postgres server, invoke the PEM server installer. Assume superuser (or, on Windows, Administrative) privileges and navigate into the directory that contains the installer. Then, invoke the installer with the command:

```
./pem_server-7.<x>.<x>-<x>-<platform>
```

Where x is the major and minor versions of PEM and platform is the platform.

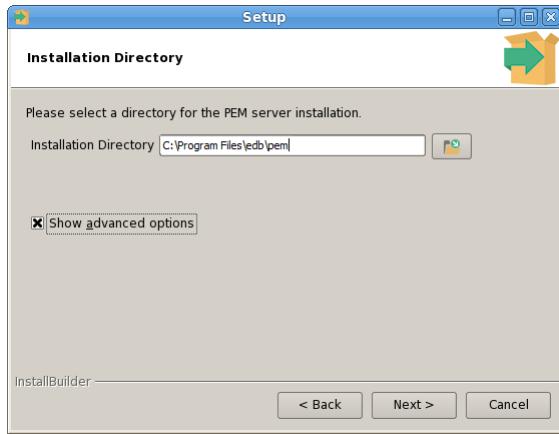
The installer displays a **Welcome** dialog.



Click **Next** to continue to the **License Agreement** dialog.



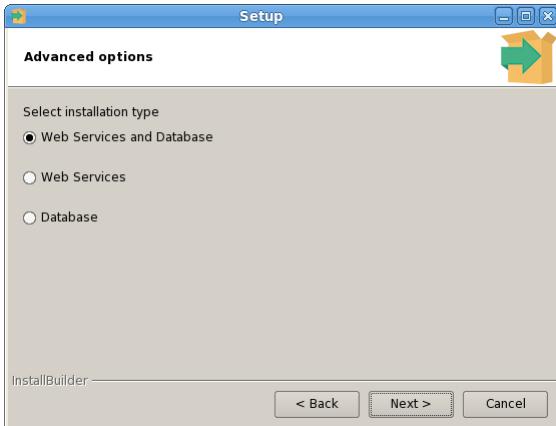
Carefully review the license agreement before highlighting the appropriate radio button and accepting the agreement; click **Next** to continue to the **Installation Directory** dialog.



Use the **Installation Directory** dialog to specify the location of the PEM server and access the **Advanced options** dialog:

- Use the **Installation Directory** field to open a browser dialog and select the directory in which the PEM server will be installed.
- If you are installing the PEM server on an existing server, check the box next to **Show advanced options** to instruct the installer to include the **Advanced options** dialog in the installation process.

Click **Next** to continue.



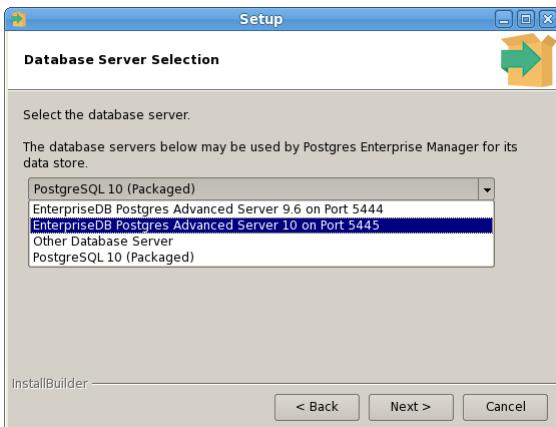
Use the radio buttons on the **Advanced options** dialog to specify an installation type. Select:

- **Web Services and Database** if both the Postgres server and the PEM-HTTPD server will reside on the current host. This option is valid if you are using an existing Postgres server to host the PEM server, or using the PEM server installer to install the Postgres server on which the PEM server will reside.

If you select **Web Services and Database**, the PEM server installer will check the current host for a PEM-HTTPD installation, and upgrade or install PEM-HTTPD if necessary.

- **Web Services** if only the PEM-HTTPD server will reside on the current host. See [Installing Web Services](#) section for more information about invoking this option.
- **Database** if you are installing only the PEM server (and creating the `pem` backend database) on the current host. This option is valid if you are using an existing Postgres server to host the PEM server, or using the PEM server installer to install the PostgreSQL server on which PEM will reside.

After selecting an installation option, click **Next** to continue.



Use the drop-down listbox on the **Database Server Selection** dialog to select a backend database for the PEM server:

- Select the name of a Postgres server on the current host that was installed using a Postgres one-click installer or Advanced Server installer.
- Select the **PostgreSQL 9.6 (Packaged)** option to instruct the installation wizard to install and use the PostgreSQL server that is packaged with the PEM server installer.
- Select **Other Database Server** to instruct the PEM server installer to use a Postgres database that was installed from a source other than an EnterpriseDB installer (i.e. from an rpm, or built from source).

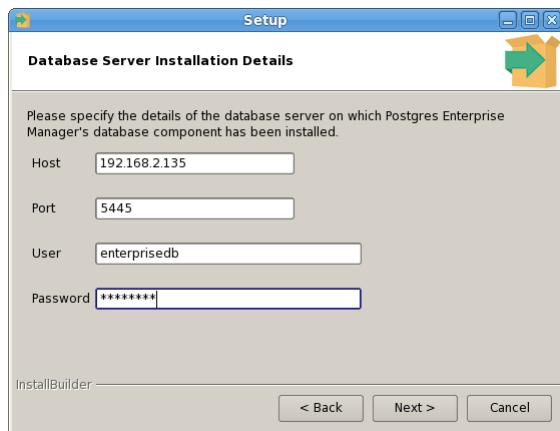
#### Note

The selected database server must include an installation of the `sslutils` contrib module, and have a startup script (on Linux) or a registered service (on Windows).

For information about Preparing the Postgres Server, please see [this section](#).

If you selected **Web Services and Database** on the **Advanced options** dialog, the installation wizard will check the current host for an existing PEM-HTTPD installation, and upgrade or install the service as needed.

If you selected **Database** on the **Advanced options** dialog, the **Database Server Installation Details** dialog opens.



Use the fields on the **Database Server Installation Details** dialog to describe the connection to the Postgres server that will host the PEM server:

- Enter the port number on which the Postgres server listens in the **Port** field.
- Enter the name of a database superuser in the **User** field.
- Enter the password associated with the superuser in the **Password** field.
- Enter the name of the service script for the Postgres server in the **Service Name** field.

#### Note

For information about preparing a service script, please see [this section](#)

Click **Next** to continue.

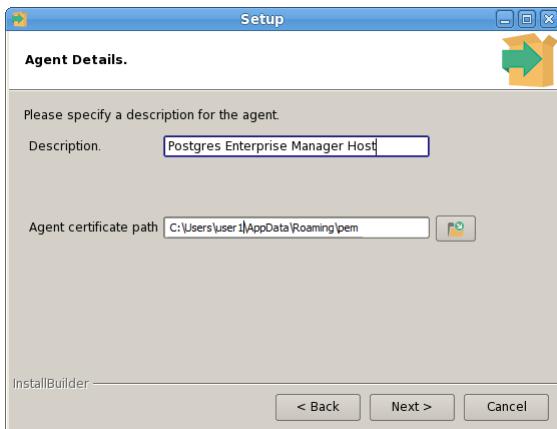


Use the **Network Details** dialog to specify the CIDR-style network address from which the PEM agents will connect to the server (the *client-side* address). The specified address will be added to the server's [pg\\_hba.conf file](#).

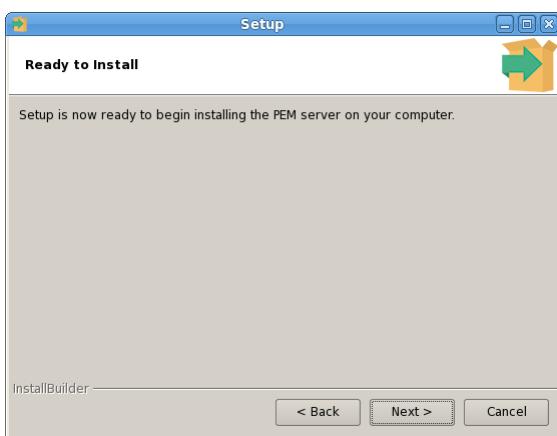
You can specify additional network addresses by manually adding entries to the **pg\_hba.conf** file on the PostgreSQL server if required, using the initial entry as a template.

When you've added the **Network address**, click **Next** to continue to the **Agent Details** dialog.

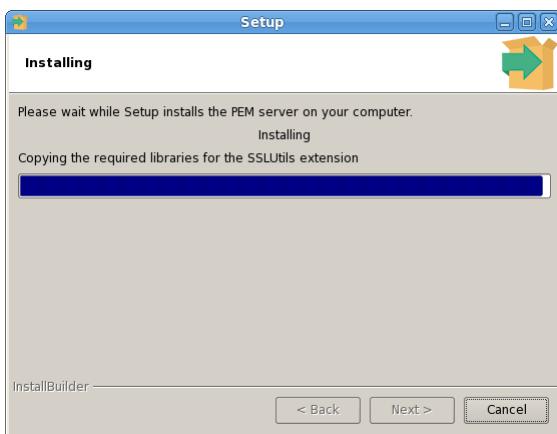
The PEM server installer will install a PEM agent to the host on which the server resides, to monitor the server and provide alert processing and garbage collection services. A certificate will also be installed in the location specified in the **Agent certificate** path field.



You can enter an alternate description or an alternate agent certificate path for the PEM agent, or accept the defaults. Click [Next](#) to continue to the [Ready to Install](#) dialog.



The wizard is now ready to install the PEM server. Click [Back](#) to modify any of the options previously selected, or [Next](#) to continue with the installation.



During the installation process, the installer will copy files to the system, and set up the PEM server's backend database. A popup dialog opens confirming that the `pem` database has been created and configured.



Click [OK](#) to acknowledge that the `pem` database has been created, and continue to the [Completed...](#) dialog.



If you are using a PEM-HTTPD service that resides on a separate host, you must:

- Modify the `pg_hba.conf` file on the Postgres server host to allow connections between the hosts.
- Invoke the PEM server installer on the host of the PEM-HTTPD server. See [Installing Web Services](#) section for more information about installing PEM-HTTPD.

## Invoking the Server Installer from Command Line

The command line options of the PEM server and PEM agent installers offer functionality in situations where a graphical installation may not work because of limited resources or system configuration. You can:

- Include the `--mode unattended` option when invoking the installer to perform an installation without additional user input.
- Include the `--mode text` option when invoking the installer to perform an installation from the command line with an interactive installer.

Not all command line options are suitable for all platforms. For a complete reference guide to the command line options, include the `--help` option when you invoke the installer.

## Invoking the PEM Server Installer in Unattended Mode

You can perform an unattended PEM server installation by providing installation preferences on the command line when invoking the installer. Please note that the system on which you are installing the PEM server must have internet access.

You must have Administrative privileges to install the PEM server. Before invoking the PEM server installer, you must install the following dependencies:

- PostgreSQL
- pem-httpd
- Language Pack

You can use the PEM server installer to satisfy the dependencies of the PEM server; use the following command to extract the dependencies. Navigate to the location of the installer, and use the following command to extract the dependencies:

```
pem-server-7.<x>.<x>-windows-x64.exe --extract-dependents C:\
```

In our example, the files are extracted to the `C:\` directory. After extracting the files, you must install each program. Navigate into the directory that contains the files (in our example, `C:\`), and enter:

```
edb-languagepack-<version>-windows-x64.exe --mode unattended  
pem-httpd-<version>-windows-x64.exe --mode unattended
```

```
postgresql-<version>-windows-x64.exe --mode unattended
```

Then, you can invoke the PEM server installer:

```
pem-server-7.<x>.<x>-windows-x64.exe --mode unattended
--existing-user <registered edb user> --existing-password
<edb user password> --pqport <port> --pquser postgres
--pqpassword postgres --cidr-address <cidr address range>
--agent_description pem-agent --systempassword <windows_password> --agent-crt-path C:\ledb
```

Where:

*registered\_edb\_user* specifies the name of a registered EnterpriseDB user. To register, visit the [EDB website](#)

*edb\_user\_password* specifies the password associated with the EDB user account.

*port* specifies the port used by the backing PostgreSQL database; by default, the PostgreSQL database uses port [5432](#).

*cidr\_address\_range* specifies the address range that will be added to the [pg\\_hba.conf](#) file of the PEM server's backing database to allow connections from the agents that will be monitored by the server. You may wish to specify a network range (for example, 192.168.2.0/24) to provide server access to agents that reside on the same network.

*windows\_password* specifies the password associated with the Windows Administrator's account.

#### Note

when invoked in unattended mode, the PostgreSQL installer creates a user named [postgres](#), with a password of [postgres](#).

## Invoking the PEM Server Installer in Text Mode

You can invoke the PEM server installer at the command line to perform an interactive installation if your system does not support a full graphical installation. Please note that the system on which you are installing PEM must have internet access.

You must have Administrative privileges to install the PEM server. Before invoking the PEM server installer, you must install the following dependencies:

- PostgreSQL
- pem-https
- Language Pack

You can use the PEM server installer to satisfy the dependencies of the PEM server; use the following command to extract the dependencies. Navigate to the location of the installer, and use the following command to extract the dependencies:

```
pem-server-7.<x>.<x>-windows-x64.exe --extract-dependents C:\
```

After extracting the files, you must install each program; navigate into the directory that contains the files, and enter:

```
edb-languageweb-<version>-windows-x64.exe --mode unattended
pem-https-<version>-windows-x64.exe --mode unattended
postgresql-<version>-windows-x64.exe --mode unattended
```

Then, you can invoke the PEM server installer with the following command:

```
pem-server-7.<x>.<x>-windows-x64.exe --mode text
```

## Example

The example that follows demonstrates performing a text-mode installation on a Linux system; the installation process on a Windows system is similar.

When you invoke the installer, the installer welcomes you:

---

Welcome to the Postgres Enterprise Manager (PEM) Server Setup Wizard.

---

Before installing the PEM server, you must review and accept the terms of the PEM license agreement:

Please read the following License Agreement. You must accept the terms of this agreement before continuing with the installation.

Review the license agreement; when prompted, accept the agreement, and press Return.

Do you accept this license? [y/n]: y

---

After accepting the license agreement, you will be prompted for the name and address of a registered EnterpriseDB user; provide the information when prompted:

EnterpriseDB User Account Information

Please enter the email address and password for your enterpriseedb.com user account.

Email address [ ]:

Password :

---

Next, you will be prompted for an installation directory; you can use the default installation directory, or specify an alternate location.

Enter a Y after **Show advanced options** to access menu options that allow you to use a pre-existing Postgres server installation or PEM-HTTPD installation with the PEM server.

Installation Directory

Please select a directory for the PEM server installation.

Installation Directory [/opt/edb/pem]:

Show advanced options [y/N]:

---

Use the fields that follow the Database Server Installation Details heading to provide the name and password of the PostgreSQL database superuser for the PEM backing database:

Database Server Installation Details

Please specify user and password for the local server - 'PostgreSQL 10' installation running on port 5432.

User [postgres]:

Password :

---

When prompted, provide the network address or range that will be added to the **pg\_hba.conf** file of the PEM server host; this will allow PEM agents on monitored hosts to contact the server:

Network Details

Please enter the CIDR formatted network address range that agents will connect to the server from, to be added to the server's pg\_hba.conf file. For example, 192.168.1.0/24.

Network address [127.0.0.1/32]:

Use the **Agent Details** fields to specify a descriptive name for the agent and the location of the agent certificate:

Agent Details.

Please specify a description for the agent.

Description. [Postgres Enterprise Manager Host]:

Agent certificate path [/root/.pem]:

The installer will prompt you before it proceeds with the installation; press **Return** to start the installation:

Setup is now ready to begin installing the PEM server on your computer.

Do you want to continue? [Y/n]:

Please wait while Setup installs the PEM server on your computer.

Installing

0% \_\_\_\_\_ 50% \_\_\_\_\_ 100%  
#####

The installer will notify you when the installation is complete:

Info: Configured the webservice for Postgres Enterprise Manager (PEM)``

Server on port '8443'.

Created and configured the 'pem' database.

EnterpriseDB is the leading provider of value-added products and services for the Postgres community.

Please visit our website at [www.enterprisedb.com](http://www.enterprisedb.com)

### 6.3.2 Installing the PEM Server on Linux

When installing a PEM server on a RHEL, CentOS, SLES, Debian, or Ubuntu host, you must ensure the following:

1. When using an RPM package to install the PEM server, you must first manually install a backing database and create the database cluster. The server's backing database must be installed via an RPM package or via BitRock. The database must be one of the following versions:
  - EDB Postgres Advanced Server version 9.4 or above
  - PostgreSQL version 9.4 or above

For detailed information about installing an Advanced Server or PostgreSQL database, please see the product documentation.

1. The **pg\_hba.conf** file on the backing database must be configured to use trust authentication for connections. For information about modifying the pg\_hba.conf file, visit:

<https://www.postgresql.org/docs/current/static/auth-pg-hba-conf.html>

2. If you are using a PostgreSQL database, you must also install the `hstore contrib` module; for more information, visit:

<https://www.postgresql.org/docs/current/static/hstore.html>

3. If you are using a firewall, you must allow access to port `8443`; use the commands:

```
firewall-cmd --permanent --zone=public --add-port=8443/tcp
```

```
firewall-cmd --reload
```

## Additional Prerequisites for RHEL or CentOS HOST

In addition to the above listed prerequisites, the following prerequisites are applicable if you are using a RHEL or CentOS host:

1. You must install the `epel-release` package on the host by running any one of the following commands:

- `yum -y install https://dl.fedoraproject.org/pub/epel/epel-release-latest-7.noarch.rpm`
- `yum install epel-release`

### Note

You may need to enable the `[extras]` repository definition in the `CentOS-Base.repo` file (located in `/etc/yum.repos.d`).

If you are a Red Hat Network user you must also enable the `rhel-<x>-server-optional-rpms` repository to use EPEL packages, where `x` specifies the version of RHEL on the host. You can make the repository accessible by enabling the `RHEL optional subchannel` for `RHN-Classic`. If you have a certificate-based subscription, please see the `Red Hat Subscription Management Guide`.

1. You must also enable the `rhel-<x>-server-extras-rpms` repository, where `x` specifies the version of the RHEL on the host.
2. If you are using a `RHEL 6.x` or `CentOS 6.x` host, you need to stop the default httpd server and also run commands to install `rh-python36` before installing the PEM server. As part of PEM server installation, an `httpd24` server will be installed if you are using a RHEL or CentOS 6.x host.

1. Stop the default httpd server using the command:

```
service httpd stop
```

2. Run the following commands to install `rh-python36`:

```
yum install centos-release-scl
```

```
yum install rh-python36
```

3. You must also have credentials that allow access to the EnterpriseDB repository. For information about requesting credentials, visit:

<https://info.enterprisedb.com/rs/069-ALB-339//images/Repository%20Access%2004-09-2019.pdf>

After receiving your repository credentials you can:

1. Create the repository configuration file.
2. Modify the file, providing your user name and password.
3. Install `edb-pem` on RHEL or CentOS host.

## Creating a Repository Configuration File

To create the repository configuration file, assume superuser privileges, and invoke the following command:

```
yum -y install https://yum.enterprisedb.com/edb-repo-rpms/edb-repo-latest.noarch.rpm
```

The repository configuration file is named `edb.repo`. The file resides in `/etc/yum.repos.d`.

### Modifying the file, providing your user name and password

After creating the `edb.repo` file, use your choice of editor to ensure that the value of the enabled parameter is `1`, and replace the `username` and `password` placeholders in the `baseurl` specification with the name and password of a registered EnterpriseDB user.

```
[edb]
name=EnterpriseDB RPMs $releasever - $basearch
baseurl=https://<username>:<password>@yum.enterprisedb.com/edb/redhat/rhel-$releasever-$basearch
enabled=1
gpgcheck=1
gpgkey=file:///etc/pki/rpm-gpg/ENTERPRISEDB-GPG-KEY
```

## Installing the PEM Server on a CentOS or RHEL Host

You can use yum to install the PEM server:

```
yum install edb-pem
```

When you install an RPM package that is signed by a source that is not recognized by your system, yum may ask for your permission to import the key to your local server. If prompted, and you are satisfied that the packages come from a trustworthy source, enter `y`, and press `Return` to continue.

During the installation, yum may encounter a dependency that it cannot resolve. If it does, it will provide a list of the required dependencies that you must manually resolve.

If you want to install PEM server on a machine that is in isolated network, you must first create PEM repository on that machine. For more information about creating PEM repository on an isolated network, see [Creating a PEM repository in an Isolated Network](#).

## Installing the PEM Server on a Debian or Ubuntu Host

To install PEM on a Debian or Ubuntu host, you must have credentials that allow access to the EnterpriseDB repository. To request credentials for the repository, contact [EnterpriseDB](#).

The following steps will walk you through using the EnterpriseDB apt repository to install a Debian package. When using the commands, replace the username and password with the credentials provided by EnterpriseDB.

1. Go to <https://apt.enterprisedb.com/> and log in as root:

```
sudo su -
```

2. Configure the EnterpriseDB repository:

```
sh -c 'echo "deb https://username:password@apt.enterprisedb.com $(lsb_release - cs)-edb/ $(lsb_release -cs) main" > /etc/apt/sources.list.d/edb-$(lsb_release -cs).list'
```

3. Add support to your system for secure APT repositories:

```
apt-get install apt-transport-https
```

4. Add the EBD signing key:

```
wget -q -O -https://username:password@apt.enterprisedb.com/edb-deb.gpg.key | apt-key add -
```

5. Update the repository metadata:

```
apt-get update
```

6. Use the following command to install the Debian package for the PEM server:

```
apt-get install edb-pem
```

## Installing PEM Server on a SLES Host

For detailed information about installing Advanced Server and supporting components on a SLES host, please consult the *EDB Postgres Advanced Server Installation Guide*, available at:

<https://www.enterprisedb.com/edb-docs/p/edb-postgres-enterprise-manager>

SLES packages are available from:  
<https://zypp.enterprisedb.com>

Before installing PEM, you must install prerequisite packages. Invoke the following commands, replacing *sp\_no* with the service pack that you are using (i.e. SP4):

```
SUSEConnect -p sle-module-legacy/12/x86_64
```

```
SUSEConnect -p sle-sdk/12/x86_64
```

```
zypper addrepo
```

```
https://download.opensuse.org/repositories/Apache:Modules/SLE_12_<sp_no>/Apache:Modules.repo
```

```
zypper addrepo http://download.opensuse.org/repositories/Cloud:/OpenStack:/Newton:/cisco-apic:/2.3.1/SLE_12_<sp_no>/ pem_opensuse_boost
```

```
zypper refresh
```

```
zypper install edb-pem
```

## Configuring the PEM Server

Before configuring the PEM server, ensure that the `sslutils` extension is installed for your backing database.

- For an Advanced Server backing database, enable the repository that corresponds to your server version, and use the command:

`yum install edb-as<x>-server-sslutils`

- If you are using a PostgreSQL backing database, ensure you have access to the PostgreSQL community repository, and use the command:

`yum install sslutils_<x> postgresql<X>-contrib`

Where, *x* is the server version.

The PEM server installer includes a script (`configure-pem-server.sh`) to help automate the configuration process

for RPM installations. The script is installed in the `/usr/edb/pem/bin` directory. To invoke the script, use the command:

```
| /usr/edb/pem/bin/configure-pem-server.sh
```

When invoking the script, you can include command line options to specify configuration properties; the script will prompt you for values that you omit on the command line. The accepted options are:

#### Option Description

<code>-acp</code>	Defines PEM Agent certificate path. The default is <code>/root/.pem</code> .
<code>-ci</code>	CIDR formatted network address range that agents will connect to the server from, to be added to the server's <code>pg_hba.conf</code> file. For example, <code>192.168.1.0/24</code> . The default is <code>0.0.0.0/0</code> .
<code>-dbi</code>	The directory for the database server installation. For example, <code>/usr/edb/as10</code> for Advanced Server or <code>/usr/pgsql-10</code> for PostgreSQL.
<code>-ds</code>	The unit file name of the PEM database server. For Advanced Server, the default file name is <code>edb-as-10</code> ; for PostgreSQL, it is <code>postgresql-10</code> .
<code>-ho</code>	The host address of the PEM database server.
<code>-p</code>	The port number of the PEM database server.
<code>-ps</code>	The service name of the pemagent; the default value is <code>pemagent</code> .
<code>-sp</code>	The superuser password of the PEM database server. This value is required.
<code>-su</code>	The superuser name of the PEM database server.
<code>-t</code>	The installation type: Specify 1 if the configuration is for web services and backing database, 2 if you are configuring web services, or 3 if you are configuring the backing database. If you specify 3, please note that the database must reside on the local host.

If you do not provide configuration properties on the command line, you will be prompted for values by the script. When you invoke the script, choose from:

1. *Web Services and Database*-Select this option if the web server and database both reside on the same host as the PEM server.
2. *Web Services*-Select this option if the web server resides on a different host than the PEM server.
3. *Database*-Select this option to configure the PEM backing database for use by the PEM server. Please note that the specified database must reside on the local host.

#### Note

If the web server and the backing database reside on separate hosts, configure the database server first (option 3), and then web services (option 2). The script will exit if the backing database is not configured before web services.

After selecting a configuration option, the script will proceed to prompt you for configuration properties. When the script completes, it will create the objects required by the PEM server, or perform the configuration steps required.

To view script-related help, use the command:

```
| /usr/edb/pem/bin/configure-pem-server.sh -help
```

If you are using a RHEL or CentOS 6.x host, restart the httpd24 server after configuring the PEM server; use the command:

```
| service httpd24-httpd restart
```

After configuring the PEM server, you can access the PEM web interface in your browser. Navigate to:

```
| https://<ip_address_of_PEM_server>:8443/pem
```

### 6.3.3 Creating a PEM Repository in an Isolated Network

You can create a local repository to act as a host for PEM RPM packages if the server on which you wish to install PEM cannot directly access the EnterpriseDB repository. Please note that this is a high-level overview of the steps required; you may need to modify the process for your individual network. To create and use a local repository, you must:

1. Download all the dependencies required for PEM on a machine with internet access using the following commands:

```
yum install yum-plugin-downloadonly  
mkdir /tmp/<pem_dir>  
yum install --downloadonly --downloaddir=/tmp/<pem_dir>/ edb-pem-server  
mkdir /tmp/<epel_dir>  
yum install --downloadonly --downloaddir=/tmp/<epel_dir>/ epel-release*
```

Where, *<pem\_dir>* and *<epel\_dir>* are the local directories that you create for downloading the RPMs.

1. Copy the directories */tmp/<pem\_dir>* and */tmp/<epel\_dir>* to the machine that is in the isolated network.
2. Create the repositories:

```
yum install createrepo  
createrepo /tmp/<pem_dir>  
createrepo /tmp/<epel_dir>
```

1. Create a repository configuration file called */etc/yum.repos.d/pem.repo* with connection information that specifies:

```
[pemrepo]  
name=PEM Repository  
baseurl=file:///tmp//<pem_dir>/  
enabled=1  
gpgcheck=0
```

1. Create a repository configuration file called */etc/yum.repos.d/epel.repo* with connection information that specifies:

```
[epelrepo]  
name=epel Repository  
baseurl=file:///tmp/<epel_dir>/  
enabled=1  
gpgcheck=0
```

After specifying the location and connection information for your local repository, you can use yum commands to install or upgrade PEM server:

- To install PEM server:

```
yum install edb-pem-server
```

- To upgrade PEM server:

```
yum upgrade edb-pem-server
```

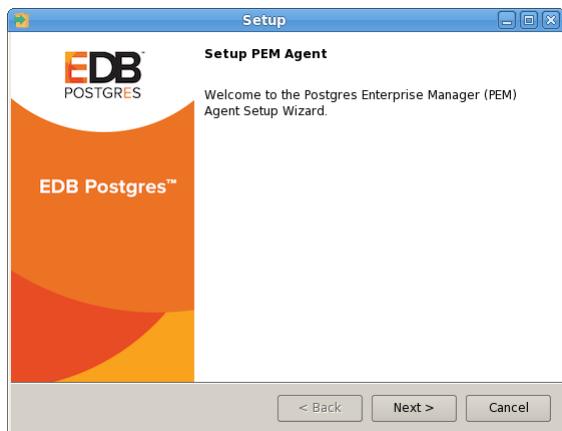
For more information about creating a local yum repository, visit:  
<https://wiki.centos.org/HowTos/CreateLocalRepos>

## 6.3.4 Installing a PEM Agent on Windows

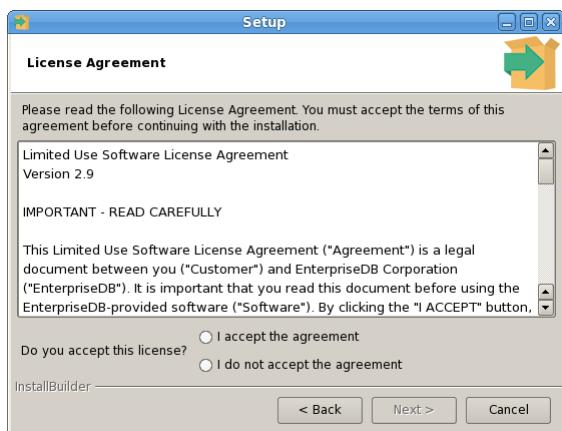
To invoke the PEM agent installer, assume **Administrative** privileges and navigate into the directory that contains the installer. Then, invoke the installer with the command:

```
pem_agent-7.<x>.<x>-<x>-platform.exe
```

The **Setup...** page opens, welcoming you to the PEM Agent installer.



Click **Next** to continue to the **License Agreement**.



Carefully review the license agreement before highlighting the appropriate radio button and accepting the agreement; click **Next** to continue to the **Installation Directory** dialog.



By default, the PEM agent is installed in the [/home/opt/PEM directory](#). You can accept the default installation directory, or modify the contents of the [Installation Directory](#) field, specifying an alternate installation directory for the PEM agent.

By default, the PEM agent installer places a certificate in the Administrator's [%APPDATA%\pem](#) directory. Check the [Show advanced options](#) box to indicate that you would like the PEM agent installer to include a dialog that allows you to specify an alternate path for the certificate file.

Check the box next to [Register now?](#) to instruct the installer to register the newly installed PEM agent with the PEM server.

Click [Next](#) to continue to the [PEM Server Installation Details](#) dialog.



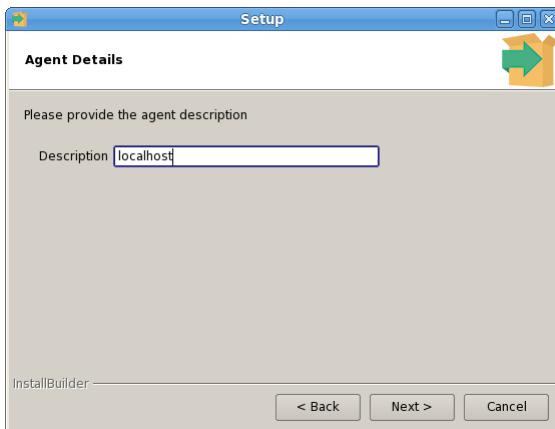
Enter the connection details for the PEM server on the [PEM server installation details](#) dialog:

- Specify the name or IP address of the system on which the PEM database server resides in the [Host](#) field.  
Please note: If the PEM-HTTPD web server and PEM database are hosted on different systems, you must specify *the host of the PEM database*.
- Specify the name of the database superuser in the [User Name](#) field.
- Specify the password associated with the database superuser in the [Password](#) field.
- Specify the port that PostgreSQL is monitoring in the [Port](#) field.

Click [Next](#) to continue. The installer will attempt to connect to the server to verify that the details are correct.

#### Note

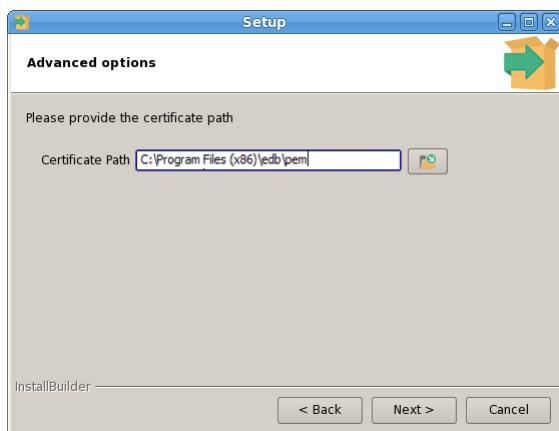
The PEM server must allow connections from the PEM agent installer. If you encounter a connection error, confirm the connection properties specified on the [PEM Server Installation Details](#) dialog are correct, and confirm that the [pg\\_hba.conf](#) file (on the PEM server) will allow a connection to the server described in the error message.



The tree control displayed in the **Browser** panel of the PEM web interface displays the value entered in the **Description** field to identify the PEM agent. Specify a descriptive name for the agent, such as the hostname of the machine the agent is installed on, or a name that reflects the host's functionality.

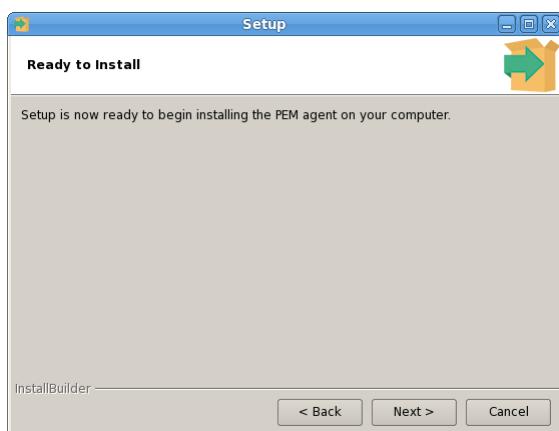
Provide a descriptive name, or accept the default provided by the PEM agent host, and click **Next** to continue.

If you checked the **Show advanced options** checkbox, the **Advanced options** dialog opens.



By default, the PEM agent installer places the certificate in the **/root/.pem** directory. Specify an alternate path for the certificate or accept the default and click **Next**.

The wizard is now ready to install the PEM agent; click **Back** to amend the installation directory, or **Next** to continue.



Click **Next** on the **Ready to Install** dialog to instruct the installer to copy files to the system and register the agent on the PEM server.



The PEM agent installer displays progress bars to mark the PEM agent's installation progress.



When the installation has completed, the PEM agent will be running and reporting operating system and host data to the PEM server. To start monitoring Postgres instances on the host of the PEM agent, they must now be added to PEM's enterprise directory and bound to the agent.

## Invoking the Agent Installer from the Command Line

The command line options of the PEM agent installers offer functionality in situations where a graphical installation may not work because of limited resources or system configuration. You can:

- Include the `--mode unattended` option when invoking the installer to perform an installation without additional user input.
- Include the `--mode text` option when invoking the installer to perform an installation from the command line with an interactive installer.

Not all command line options are suitable for all platforms. For a complete reference guide to the command line options, include the `--help` option when you invoke the installer.

## Invoking the PEM Agent Installer in Unattended Mode

You can perform an unattended PEM server installation by providing installation preferences on the command line when invoking the installer. Please note that the system on which you are installing the PEM server must have internet access.

Before invoking the PEM agent installer in unattended mode, you must:

- install the PEM server; the `pg_hba.conf` file of the PEM server must allow connections from the host of the PEM agent.

- disable SE Linux on the host of the PEM agent; for more information, see section [Software Prerequisites](#).
- ensure that the monitored Postgres database has SSL enabled, and is accepting connections.

You must have Administrator privileges to install the PEM agent. Use the following command to invoke the PEM agent installer in unattended mode:

```
pem-agent-7.<x>.<x>-windows-x64.exe --mode unattended
--pqhost <pem server host address> --pqport <pem_server_port>
--pquser postgres --pqpassword <pguser_password>
--agent_description <agent_name>
```

Where:

*pem\_server\_host\_address* specifies the IP address of the host of the PEM server.

*pem\_server\_port* specifies the port used by the backing PEM database; by default, the database uses port **5432**.

*pguser\_password* specifies the password associated with the PEM database superuser.

*agent\_name* specifies a descriptive name for the PEM agent.

## Invoking the PEM Agent Installer in Text Mode

You can invoke the PEM agent installer at the command line to perform an interactive installation if your system does not support a full graphical installation. Please note that the system on which you are installing the agent must have access to the PEM server.

You must have Administrative privileges to install the PEM server. You can invoke the PEM server installer with the following command:

```
pem-server-7.<x>.<x>-windows-x64.exe --mode text
```

### Example

When you invoke the PEM agent installer, the installer welcomes you.

---

Welcome to the Postgres Enterprise Manager (PEM) Agent Setup Wizard.

---

Before installing the PEM server, you must review and accept the terms of the PEM license agreement:

Please read the following License Agreement. You must accept the terms of this agreement before continuing with the installation.

Press [Enter] to continue:

Do you accept this license? [y/n]:

---

Next, you will be prompted for an installation directory; you can use the default installation directory, or specify an alternate location.

By default, the PEM agent installer places a certificate in the Administrator's **%APPDATA%\pem** directory. Enter a **Y** after **Show advanced options** to access menu options that allow you to specify an alternate path for the certificate file.

Installation Directory

Please select a directory for PEM agent installation.

Installation Directory [/opt/edb/pem]:

Show advanced options [y/N]:

When prompted, provide information about the PEM server installation:

PEM server installation details``

Please verify the PEM server installation details

Host [localhost]:

User Name [postgres]:

Password :

Port [5432]:

You can provide a descriptive name for the agent, or press return to accept the default:

Agent Details

Please provide the agent description

Description [localhost]:

The installer will prompt you before it proceeds with the installation; press Return to start the installation:

Setup is now ready to begin installing the PEM agent on your computer.

Do you want to continue? [Y/n]:

Please wait while Setup installs the PEM agent on your computer.

Installing

0% \_\_\_\_\_ 50% \_\_\_\_\_ 100%  
#####
#####

The installer will notify you when the installation is complete:

EnterpriseDB is the leading provider of value-added products and services for the Postgres community.

Please visit our website at [www.enterprisedb.com](http://www.enterprisedb.com).

#### Note

When configuring a shell/batch script run by a Windows agent that has PEM 7.11 or later version installed, the `AllowBatchJobSteps` parameter must be set to `True` in the `agent.cfg` file. The pemagent will not execute any batch/shell script by default.

## 6.3.5 Installing a PEM Agent on Linux

### Installing a PEM agent on a CentOS or RHEL host

On a Linux system, you can use the `yum` package manager to install a PEM agent. Please note that before using a package manager to install the PEM agent on a host, you must:

- Install the `epel-release` package on the host by running any one of the following commands:

- `yum -y install https://dl.fedoraproject.org/pub/epel/epel-release-latest-7.noarch.rpm`
- `yum install epel-release`

## Note

You may need to enable the `[extras]` repository definition in the `CentOS-Base.repo` file (located in `/etc/yum.repos.d`).

- You must also have credentials that allow access to the EnterpriseDB repository. For information about requesting credentials, visit:

<https://info.enterprisedb.com/rs/069-ALB-339/..images/Repository%20Access%2004-09-2019.pdf>

After receiving your repository credentials you can:

1. Create the repository configuration file.
2. Modify the file, providing your user name and password.
3. Install `edb-pem-agent`.

## Creating a Repository Configuration File

To create the repository configuration file, assume superuser privileges, and invoke the following command:

`yum -y install https://yum.enterprisedb.com/edb-repo-rpms/edb-repo-latest.noarch.rpm`

The repository configuration file is named `edb.repo`. The file resides in `/etc/yum.repos.d`.

## Modifying the file, providing your user name and password

After creating the `edb.repo` file, use your choice of editor to ensure that the value of the `enabled` parameter is `1`, and replace the `username` and `password` placeholders in the `baseurl` specification with the name and password of a registered EnterpriseDB user.

```
[edb]
name=EnterpriseDB RPMs $releasever - $basearch
baseurl=https://<username>:<password>@yum.enterprisedb.com/edb/redhat/rhel-$releasever-$basearch
enabled=1
gpgcheck=1
gpgkey=file:///etc/pki/rpm-gpg/ENTERPRISEDB-GPG-KEY
```

## Installing PEM Agent

After saving your changes to the configuration file, you can use the `yum install` command to install `edb-pem-agent`. For example, the following command installs `edb-pem-agent`:

`yum install edb-pem-agent`

When the installation is complete, `yum` will display a list of the installed packages and dependencies.

```

root@localhost:/home/susan/Desktop
File Edit View Search Terminal Help
Is this ok [y/N]: y
Running transaction check
Running transaction test
Transaction test succeeded
Running transaction
  Installing : wxBase-2.8.12-20.el7.x86_64 1/7
  Installing : wxGTK-2.8.12-20.el7.x86_64 2/7
  Installing : wxjson-1.2.1-1.rhel7.x86_64 3/7
  Installing : libcurl-pem-7.51.0-1.rhel7.x86_64 4/7
  Installing : snmp++-3.3.7-1.rhel7.x86_64 5/7
  Installing : postgresql-libs-9.2.18-1.el7.x86_64 6/7
  Installing : pem-agent-7.0.0-beta1_6.rhel7.x86_64 7/7
  Verifying : pem-agent-7.0.0-beta1_6.rhel7.x86_64 1/7
  Verifying : wxGTK-2.8.12-20.el7.x86_64 2/7
  Verifying : postgresql-libs-9.2.18-1.el7.x86_64 3/7
  Verifying : snmp++-3.3.7-1.rhel7.x86_64 4/7
  Verifying : libcurl-pem-7.51.0-1.rhel7.x86_64 5/7
  Verifying : wxBase-2.8.12-20.el7.x86_64 6/7
  Verifying : wxjson-1.2.1-1.rhel7.x86_64 7/7

Installed:
  pem-agent.x86_64 0:7.0.0-beta1_6.rhel7

Dependency Installed:
  libcurl-pem.x86_64 0:7.51.0-1.rhel7 postgresql-libs.x86_64 0:9.2.18-1.el7 snmp++.x86_64 0:3.3.7-1.rhel7 wxBase.x86_64 0:2.8.12-20.el7
  wxGTK.x86_64 0:2.8.12-20.el7          wxjson.x86_64 0:1.2.1-1.rhel7

Complete!
[root@localhost Desktop]#

```

When you install an RPM package that is signed by a source that is not recognized by your system, yum may ask for your permission to import the key to your local server. If prompted, and you are satisfied that the packages come from a trustworthy source, enter **y**, and press **Return** to continue.

During the installation, yum may encounter a dependency that it cannot resolve. If it does, it will provide a list of the required dependencies that you must manually resolve.

## Installing a PEM Agent on a Debian or Ubuntu Host

To install PEM on a Debian or Ubuntu host, you must have credentials that allow access to the EnterpriseDB repository. To request credentials for the repository, [contact EnterpriseDB](#).

The following steps will walk you through using the EnterpriseDB apt repository to install a Debian package. When using the commands, replace the username and password with the credentials provided by EnterpriseDB.

1. Go to <https://apt.enterprisedb.com/> and log in as root:

```
sudo su -
```

2. Configure the EnterpriseDB repository:

```
sh -c 'echo "deb https://username:password@apt.enterprisedb.com/$(lsb_release - cs)-edb/ $(lsb_release -cs) main" > /etc/apt/sources.list.d/edb-$(lsb_release -cs).list'
```

3. Add support to your system for secure APT repositories:

```
apt-get install apt-transport-https
```

4. Add the EBD signing key:

```
wget -q -O -https://username:password@apt.enterprisedb.com/edb-deb.gpg.key | apt-key add -
```

5. Update the repository metadata:

```
apt-get update
```

6. Use the following command to install the Debian package for the PEM agent:

```
apt-get install edb-pem-agent
```

## Installing a PEM Agent on a SLES Host

For detailed information about installing Advanced Server and supporting components on a SLES host, please consult the

[EDB Postgres Advanced Server Installation Guide](#)

SLES packages are available from:

<https://zypp.enterprisedb.com>

Before installing PEM, you must install prerequisite packages. Use the following commands replacing *sp\_no* with the service pack that you are using (i.e. SP2 or SP3):

```
SUSEConnect -p sle-module-legacy/12/x86_64
```

```
SUSEConnect -p sle-sdk/12/x86_64
```

```
zypper addrepo
```

```
https://download.opensuse.org/repositories/Apache:Modules/SLE_12_<sp_no>/Apache:Modules.repo
```

```
zypper addrepo http://download.opensuse.org/repositories/Cloud:/OpenStack:/Newton:/cisco-apic:/2.3.1/SLE_12_<sp_no>/ pem_opensuse_boost
```

```
zypper refresh
```

```
zypper install edb-pem-agent
```

## Registering an Agent

Each PEM agent must be *registered* with the PEM server. The registration process provides the PEM server with the information it needs to communicate with the agent. The PEM agent graphical installer supports agent self-registration, but you can use the `pemworker` utility to register the agent if you skip PEM agent registration during a graphical installation or use an RPM package to install a PEM agent.

The RPM installer places the PEM agent in the `/usr/edb/pem/agent/bin` directory. To register an agent, include the `--register-agent` keywords along with registration details when invoking the `pemworker` utility:

`pemworker --register-agent`

Append command line options to the command string when invoking the `pemworker` utility. Each option should be followed by a corresponding value:

Option	Description
<code>--pem-server</code>	Specifies the IP address of the PEM backend database server. This parameter is required.
<code>--pem-port</code>	Specifies the port of the PEM backend database server. The default value is 5432.
<code>--pem-user</code>	Specifies the name of the Database user (having superuser privileges) of the PEM backend database server. This parameter is required.
<code>--pem-agent-user</code>	Specifies the agent user to connect the PEM server backend database server.
<code>--cert-path</code>	Specifies the complete path to the directory in which certificates will be created. If you do not provide a path, certificates will be created in: On Linux, <code>~/.pem</code> On Windows, <code>%APPDATA%/.pem</code>

Option	Description
--config-dir	Specifies the directory path where configuration file can be found. The default is the <pemworker path>/..etc.
--display-name	Specifies a user-friendly name for the agent that will be displayed in the PEM Browser tree control. The default is the system hostname.
--force-registration	Include the force_registration clause to instruct the PEM server to register the agent with the arguments provided; this clause is useful if you are overriding an existing agent configuration. The default value is Yes.
--group	The name of the group in which the agent will be displayed.
--team	The name of the database role, on the PEM backend database server, that should have access to the monitored database server.
--owner	The name of the database user, on the PEM backend database server, who will own the agent.
--allow_server_restart	Enable the allow-server_restart parameter to allow PEM to restart the monitored server. The default value is True.
--allow-batch-probes	Enable the allow-batch-probes parameter to allow PEM to run batch probes on this agent. The default value is False.
--batch-script-user	Specifies the operating system user that should be used for executing the batch/shell scripts. The default value is none; the scripts will not be executed if you leave this parameter blank or the specified user does not exist.
--enable-heartbeat-connection	Enable the enable-heartbeat-connection parameter to create a dedicated heartbeat connection between PEM Agent and server to update the active status. The default value is False.
--enable-smtp	Enable the enable-smtp parameter to allow the PEM agent to send the email on behalf of the PEM server. The default value is False.
--enable-snmp	Enable the enable-snmp parameter to allow the PEM agent to send the SNMP traps on behalf of the PEM server. The default value is False.
-o	Specify if you want to override the configuration file options.

If you want to use any PEM feature for which database server restart is required by the pemagent such as Audit Manager, Log Manager, or Tuning Wizard, then you must set the value for `allow_server_restart` as `true` in the `agent.cfg` file.

#### Note

When configuring a shell/batch script run by a PEM agent that has PEM 7.11 or later version installed, the user for the `batch_script_user` parameter must be specified. It is strongly recommended that a non-root user is used to run the scripts. Using the root user may result in compromising the data security and operating system security. However, if you want to restore the pemagent to its original settings using `root` user to run the scripts, then the `batch_script_user` parameter value must be set to `root`.

Before any changes are made on the PEM database, the connecting agent is authenticated with the PEM database server. When invoking the pemworker utility, you must provide the password associated with the PEM server administrative user role (`postgres`). There are three ways to specify the administrative password; you can:

- set the `PEM_MONITORED_SERVER_PASSWORD` environment variable.
- provide the password on the command line with the `PGPASSWORD` keyword.
- create an entry in the `.pgpass` file.

Failure to provide the password will result in a password authentication error; you will be prompted for any other required but omitted information. When the registration is complete, the server will confirm that the agent has been successfully registered.

## Setting PEM Agent Configuration Parameters

The PEM agent RPM installer creates a sample configuration file named `agent.cfg.sample` in the `/usr/edb/pem/agent/etc` directory. When you register the PEM agent, the `pemworker` program creates the actual agent configuration file (named `agent.cfg`). You must modify the `agent.cfg` file, adding the following configuration

parameter:

```
| heartbeat_connection = true
```

You must also add the location of the `ca-bundle.crt` file (the certificate authority). By default, the installer creates a `ca-bundle.crt` file in the location specified in your `agent.cfg.sample` file. You can copy the default parameter value from the sample file, or, if you use a `ca-bundle.crt` file that is stored in a different location, specify that value in the `ca_file` parameter:

```
| ca_file=/usr/libexec/libcurl-pem7/share/certs/ca-bundle.crt
```

Then, use a platform-specific command to start the PEM agent service; the service is named `pemagent`. For example, on a CentOS or RHEL 6.x system, you would use the command:

```
| /etc/init.d/pemagent
```

On a CentOS or RHEL 7.x host, use `systemctl` to start the service:

```
| systemctl start pemagent
```

The service will confirm that it is starting the agent; when the agent is registered and started, it will be displayed on the `Global Overview` and in the `Object browser` of the PEM web interface.

For information about using the `pemworker` utility to register a server, please see the [PEM Getting Started Guide](#)

---

## 6.4 The PEM Web Interface

After installing a PEM server and agent, you can configure PEM to start monitoring and managing PostgreSQL or Advanced Server instances. The PEM server installer installs the PEM web interface. You can use the interface to review information about objects that reside on monitored servers, or to review statistical information gathered by the PEM server.

After installing and configuring PEM, you can use your browser to access the PEM web interface. Open your browser, and navigate to:

```
| https://<ip_address_of_PEM_host>:8443/pem
```

Where `ip_address_of_PEM_host` specifies the IP address of the host of the PEM server. The `Postgres Enterprise Manager Web Login` window opens:



Use the fields on the **Postgres Enterprise Manager Login** window to authenticate yourself with the PEM server:

- Provide the name of a **pem** database user in the **Username** field. For the first user connecting, this will be the name provided when installing the PEM server.
- Provide the password associated with the user in the **Password** field.

Click the **Login** button to connect to the PEM server.

Dashboard Properties SQL Statistics Dependencies Dependents **Monitoring**

Global Overview >

Object Type System Status N/A Generated On 3/20/2019, 3:06:19 PM No of alerts 3 (Acknowledged: 0)

Enterprise Dashboard

Status

Agents Status											
Blackout	Name	Status	Alerts	Version	Processes	Threads	CPU Utilisation (%)	Memory Utilisation (%)	Swap Utilisation (%)	Disk Utilisation	
<input checked="" type="checkbox"/>	<input type="checkbox"/> Postgres Enterprise Manager Host	UP	0	7.7.0-dev	244	783	5.28	70.82	0.00	38.08	

Servers Status							Remotely Monitored
Blackout	Name	Status	Connections	Alerts	Version		
<input checked="" type="checkbox"/>	<input type="checkbox"/> Postgres Enterprise Manager Server	UP	11	2	PostgreSQL 10.7 on x86_64-pc-linux-gnu, compiled by gcc (GCC) 4.4.7 20120313 (Red Hat 4.4.7-23), 64-bit		No

Alerts Status										
	Object Description	Alarm Type	Alert Name	Value	Database	Schema	Package	Object	Alerting Since	
	N/A	High	Alert Errors	1					2019-03-20 10:47:32	
	Postgres Enterprise Manager Server	High	Last Vacuum	Never ran					2019-03-20 10:47:33	
	Postgres Enterprise Manager Server	Low	Connections in idle state	10					2019-03-20 11:17:06	

Before you can use the PEM web interface to manage or monitor a database server, you must *register* the server with the PEM server. When you register a server, you describe the connection to the server, provide authentication information for the connection, and specify any management preferences (optionally binding an agent).

A server may be managed or unmanaged:

- A *managed* server is bound to a PEM agent. The PEM agent will monitor the server to which it is bound, and perform tasks or report statistics for display on the PEM dashboards. A managed server has access to extended PEM functionality such as Package Management or Custom Alerting; when registering a server, you can also allow a managed server to be restarted by PEM as required.
- An *unmanaged* server is not bound to a PEM agent; you can create database objects on an unmanaged server, but extended PEM functionality (such as Package Management or Custom Alerting) is not supported on an unmanaged server.

You must also ensure the `pg_hba.conf` file of the server that you are registering allows connections from the host of the PEM web interface.

To access online help information about the PEM web interface, select [Help](#) from the menu bar. Additional information is available in .pdf and .html format from the [EnterpriseDB website](#)

- The *PEM Getting Started Guide* contains information about registering and managing servers, agents, and users.
- The *PEM Enterprise Features Guide* contains information about using the tools and wizards that are part of the web interface.
- The *PEM Agent Guide* contains helpful information about managing your PEM agents.
- The *PEM Upgrade and Migration Guide* contains information about upgrading to PEM 7.8 from a previous version.
- The *PEM PgBouncer Configuration Guide* contains information about using PgBouncer with your PEM installation.
- The *PEM EDB Ark Management Guide* contains information about using PEM to manage cloud installations of Advanced Server and PostgreSQL.

## 6.5 Installing the SQL Profiler Plugin

The SQL Profiler Plugin allows you to profile a server's workload. You must install the plugin on each server on which you wish to use SQL Profiler. For example, if you have a host running PostgreSQL 9.6 and PostgreSQL 10, you must install two versions of the plugin, one for each server.

SQL Profiler for Postgres Enterprise Manager is officially supported only on the EnterpriseDB distributions of PostgreSQL version 9.4 or above and Advanced Server version 9.4 or above. The plugin is distributed via StackBuilder, or is available from the [EnterpriseDB website](#)

The plugin is also distributed and installed with the server component of the Advanced Server installer.

The SQL Profiler plugin may be installed on servers with or without a PEM agent, however traces can only be run in ad-hoc mode on unmanaged servers, and may only be scheduled on managed servers.

Follow the installation steps listed below to install the plugin for PostgreSQL before continuing to the [Configuration](#) section. If you are using Advanced Server, you can skip ahead to the [Configuration](#) section.

You can use the graphical installer to install any version of SQL Profiler on Windows platform.

On Linux, if you have installed your database server through graphical installer then you must use the graphical installer to install the SQL Profiler. If you have installed your database server using the RPM package, then you must use the RPM package to install the SQL Profiler.

### Installing SQL Profiler using Graphical Installer

To invoke the SQL Profiler graphical installer, assume superuser privileges (or [Administrator](#) privileges on Windows), navigate into the directory that contains the installer, and invoke the installer with the command:

```
postgresql<pg_version>-sqlprofiler-<sql_profiler_version>
```

Where, *pg\_version* is the version of your postgres and *sql\_profiler\_version* is the version of SQL Profiler.

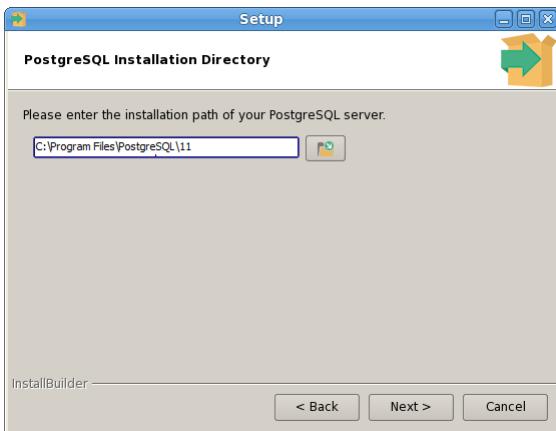
The SQL Profiler installer welcomes you to the Setup Wizard.



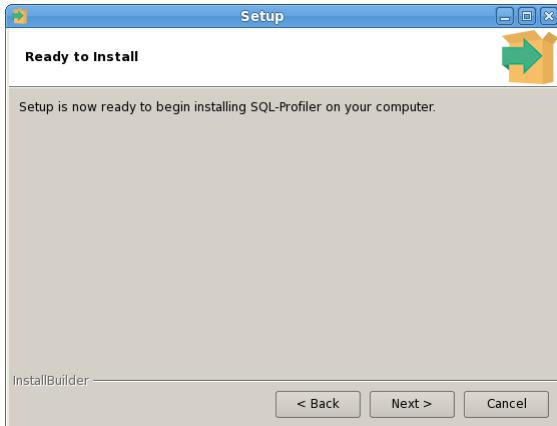
Click **Next** to continue to the **License Agreement**.



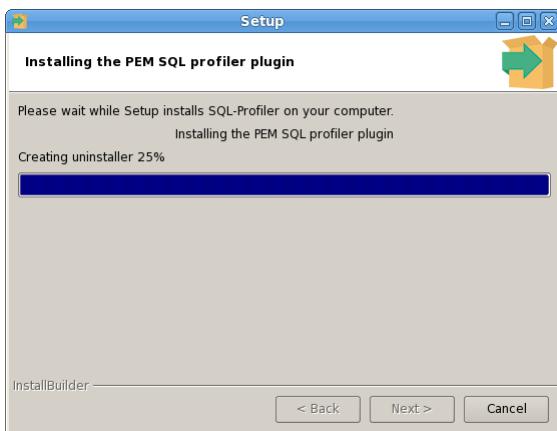
Carefully review the license agreement before highlighting the appropriate radio button and accepting the agreement; click **Next** to continue to the **Installation Directory** dialog.



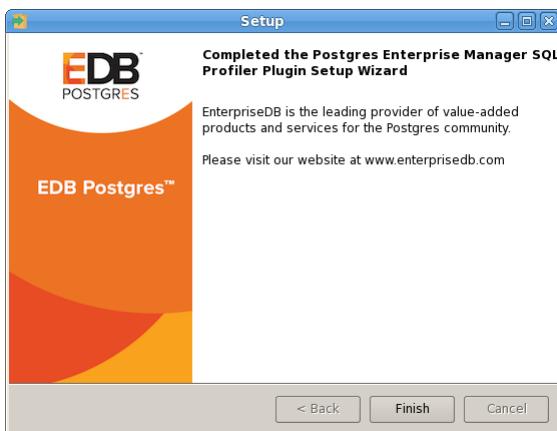
Specify an alternate location for the installation directory, or accept the default location and click **Next** to continue.



The wizard is now ready to install the SQL Profiler plugin. Click **Next** to continue.



The SQL Profiler plugin installer displays progress bars as it copies files to your system.



When the installation is complete, the SQL Profiler plugin is ready to be configured.

## Configuring SQL Profiler

The SQL Profiler plugin is not automatically enabled when the installation process completes. This allows you to restart the server at a convenient time, and prevents the plugin from being loaded unnecessarily on systems where it is not required on a continual basis.

Use the following steps to enable the plugin:

1. Edit the `postgresql.conf` file on the server you wish to profile, modifying the `shared_preload_libraries` parameter as shown below:

```
| shared_preload_libraries = '$libdir/sql-profiler'
```

2. Restart the Postgres server.
3. Using the **Query Tool** or the **psql** command line interface, run the **sql-profiler.sql** script in the database specified as the **Maintenance Database** on the server you wish to profile. If you are using:
  - PostgreSQL, the default maintenance database is **postgres**.
  - Advanced Server, the default maintenance database is **edb**.

To use the PEM Query Tool to run the script, highlight the name of the maintenance database in the **Browser** tree control, and navigate through the **Tools** menu to select **Query tool**. When the Query Tool opens, use the **Open** option on the **Files** menu to open a web browser and navigate to the **sql-profiler.sql** script. By default, the **sql-profiler.sql** script is located in the **contrib** folder, under your Postgres installation.

When the script opens in the **SQL Editor** panel of the Query Tool, highlight the content of the script in the SQL Editor and select the **Execute** option from the **Query** menu (or click the **Execute** icon) to invoke the script and configure SQL Profiler.

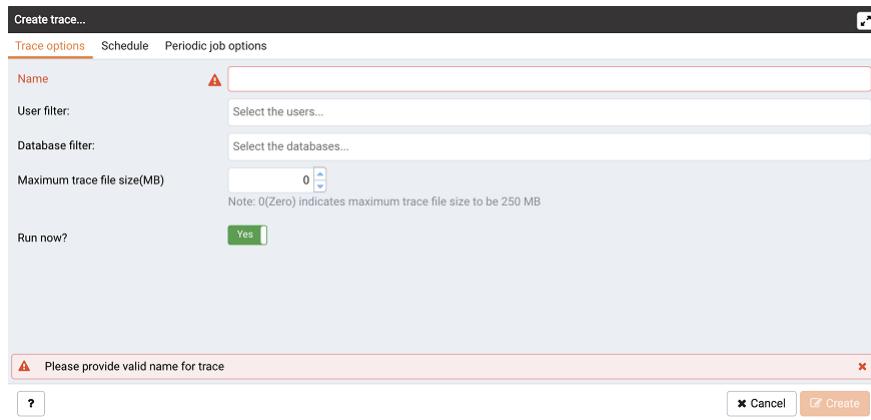
You can also use the **psql** command line to invoke the configuration script. The following command uses **psql** to invoke the **sql-profiler.sql** script on an Advanced Server database on a Linux system:

```
$ /opt/edb/as10/bin/psql -U postgres postgres <
/opt/edb/as10/share/contrib/sql-profiler.sql
```

After configuring SQL Profiler, it is ready to use with all databases that reside on the server.

To access SQL Profiler functionality, highlight the name of the database in the PEM **Browser** tree control; navigate through **Server** option under **Tools** menu to the **SQL Profiler** pull-aside menu. Menu options allow you to manage your SQL traces:

- Select **Create trace** ... to define a new trace.
- Select **Open trace** ... to open an existing trace.
- Select **Delete trace(s)** ... to delete one or more traces.
- Select **View scheduled trace(s)** ... to review a list of scheduled traces.



For more information about using SQL Profiler, consult the online help text for SQL Profiler (accessed through the **Help** menu) or the *PEM Getting Started Guide*.

## 6.6 Upgrading and Uninstalling PEM Components

For detailed information about upgrading and moving PEM components, please see the *PEM Upgrade and*

*Migration Guide.* PEM documentation and links to PEM and SQL Profiler installers are available from the [EnterpriseDB website](#)

## Upgrading Postgres Enterprise Manager on Windows

To upgrade your version of PEM on Windows, simply invoke the PEM component installers. Each installer will notify you if it detects a previous installation, and will upgrade to the more recent version of PEM.

You should invoke the PEM installers in the following order:

1. Invoke the PEM agent installer on each monitored node except the PEM server node.
2. Invoke the PEM server installer; this installer will upgrade *both* the PEM server and the PEM agent that resides on the PEM server node.

For detailed information about upgrading from a previous version, see the *PEM Upgrade and Migration Guide*.

## Upgrading SQL Profiler on a Linux Host

To upgrade a SQL Profiler installation that resides on a Linux host:

1. Delete the existing SQL Profiler query set on each node by invoking the `uninstall-sql-profiler.sql` script.

- By default, if you are using Advanced Server on a Linux host, the script resides in:

`/opt/PostgresPlus/x.x/share/contrib`

- If you are using a PostgreSQL installation on a Linux host, the script resides in:

`/opt/PostgreSQL/x.x/share/postgresql/contrib`

Where x.x specifies the installed Postgres version.

1. Then, invoke the new SQL Profiler installer on each node you wish to profile.

## Upgrading SQL Profiler on a Windows Host

If you are using SQL Profiler on a Windows host, Windows will lock any files that have been executed or loaded into memory. To release any locked files, you must stop the Postgres server before performing an upgrade.

After stopping the Postgres Server:

1. Delete the existing SQL Profiler query set on each node by invoking the `uninstall-sql-profiler.sql` script.

- If you are using Advanced Server on a Windows host, the script resides in:

`C:\Program Files\PostgresPlus\x.x\share\contrib`

- If you are using a PostgreSQL installation on a Windows host, the script resides in:

`C:\Program Files\PostgreSQL\x.x\share\contrib`

Where x specifies the installed Postgres version.

1. Invoke the new SQL Profiler installer on each node you wish to profile.

Then, restart the Postgres Server, to resume profiling the node.

## Troubleshooting

### Upgrading SQL Profiler on a Windows Host

After upgrading to a newer version of SQL Profiler, if you encounter the following error:

An error has occurred:

ERROR: function return row and query-specified return row do not

match

DETAIL: Returned row contains 11 attributes, but query expects 10.

To correct this error, you must replace the existing query set with a new query set. First, uninstall SQL Profiler by invoking the `uninstall-sql-profiler.sql` script, and then reinstall SQL Profiler by invoking the `sql-profiler.sql` script.

## Uninstalling Postgres Enterprise Manager

The process of uninstalling the PEM server or agent is platform-specific. The name of the package for PEM server is `edb-pem-server` and for PEM agent is `edb-pem-agent`.

If you uninstall the PEM server package from a host, the PEM agent package installed on the same host doesn't get uninstalled. But if you uninstall the PEM agent package, then the PEM server package installed on the same host also gets uninstalled.

### Uninstalling PEM from Windows hosts

If the PEM installation resides on a Windows host, you can use the Windows `Add/Remove Programs` application to remove PEM components. Select the `Add/Remove Programs` option from the Windows `Control Panel`. When the `control panel` opens, locate the name of the PEM component in the program list. Click the `Remove` button to remove the component.

You can also invoke the uninstaller that resides at the following location:

```
C:\Program Files\edb\pem\server
```

### Uninstalling PEM from CentOS or RHEL hosts

You can use variations of the `rpm`, `yum remove`, or `yum erase` commands to remove the installed packages. Note that removing a package does not damage the PEM data directory.

- Include the `-e` option when invoking the `rpm` command to remove an installed package; the command syntax is:

```
rpm -e <package_name>
```

- You can use the `yum remove` command to remove the pem server or agent package installed by yum. To remove a package, open a terminal window, assume superuser privileges, and enter the command:

```
yum remove <package_name>
```

- You can use the `yum erase` command to remove the pem server or agent package along with the `edb-pem` and `edb-pem-docs` dependencies. To remove a package, open a terminal window, assume superuser privileges, and enter the command:

```
yum erase <package_name>
```

Where `package_name` is the name of the package that you would like to remove.

### Uninstalling PEM from Debian or Ubuntu hosts

You can use `apt-get remove` or `apt-get purge` command to uninstall the PEM server or agent package from a Debian or Ubuntu host:

- To uninstall PEM server or agent from a Debian or Ubuntu host without impacting the configuration files and data directories, invoke the following command:

```
apt-get remove <package_name>
```

- To uninstall PEM server or agent along with the configuration files and data directory, invoke the following

command:

```
apt-get purge <package_name>
```

Where *package\_name* is the name of the package that you would like to remove.

### Uninstalling PEM from SLES hosts

To uninstall PEM server or agent from a SLES host, invoke the following command:

```
zypper remove <package_name>
```

Where *package\_name* is the name of the package that you would like to remove.

## 6.7 Reference - Linux Service Script

The Postgres server on which the PEM server resides must contain a service script. Postgres installers generated by EnterpriseDB create a service script for you; if you are using a Postgres server from another source, you must provide a service script.

You can use the following example of a linux service script as a starting point when developing a script for a Postgres installation that was installed or built from a source that does not provide one. Please ensure (if you copy and paste from this example) that the line breaks are copied correctly.

```
|#!/bin/bash
| # chkconfig: 2345 85 15
| # description: Starts and stops the PostgreSQL/Postgres Plus Advanced
| Server database server
| # PostgreSQL/Postgres Plus Advanced Server Service script template for
| Linux
| # Please modify the values accordingly
| DB_DESC="Database Server - PostgreSQL 9.5"
| DB_INSTALL_DIR=/opt/PostgreSQL/9.5
| DB_BIN_DIR=${DB_INSTALL_DIR}/bin
| DB_LIB_DIR=${DB_INSTALL_DIR}/lib
| DB_DATA_DIR=${DB_INSTALL_DIR}/data
| DB_HBA_FILE=${DB_DATA_DIR}/pg_hba.conf
| DB_CONF_FILE=${DB_DATA_DIR}/postgresql.conf
| DB_PID_FILE=${DB_DATA_DIR}/postmaster.pid
| DB_STARTUP_LOG=${DB_DATA_DIR}/pg_log/startup.log
| DB_SERVICE_USER=postgres
| _die()
| {
|   echo ""
|   echo "FATAL ERROR: $*"
|   echo ""
|   exit 1
| }
| if [ `id -u` != 0 ]; then
|   _die "You must run this script as the root."
| fi
| # Source function library.
```

```

| if [ -f /etc/rc.d/functions ];
| then
|   . /etc/init.d/functions
| fi
start()
{
| STARTDBSERVER=0
| if [ -e "${DB_PID_FILE}" ]
| then
|   PIDOFDB=`head -n 1 "${DB_PID_FILE}"```
|   PIDALIVEDB=""
|   if [ -n "${DB_PID_FILE}" ]; then
|     PIDALIVEDB=`ps -p "${PIDOFDB}" | grep
| "${PIDOFDB}"```
|   fi
|   if [ -n "${PIDALIVEDB}" ]
|   then
|     echo "The '${DB_DESC}' is already running.
|           PID(${PIDALIVEDB})."
|           exit
|   else
|     STARTDBSERVER=1
|   fi
|   else
|     STARTDBSERVER=1
|   fi
| if [ "${STARTDBSERVER}" != 0 ]
| then
| echo "Starting ${DB_DESC}..."
| su - "${DB_SERVICE_USER}" -c
"LD_LIBRARY_PATH=\"${DB_LIB_DIR}:\$LD_LIBRARY_PATH\""
"\${DB_BIN_DIR}/pg_ctl" -w start -D "\${DB_DATA_DIR}" -I
"\${DB_STARTUP_LOG}" -o "\${DB_STARTUP_OPTIONS}""
| if [ $? -eq 0 ];
| then
| echo "${DB_DESC} started successfully."
| exit 0
| else
| echo "${DB_DESC} did not start in a timely fashion, please see
| '\${DB_STARTUP_LOG}' for details."
| exit 1
| fi
| fi
}
| stop()
{
| if [ -e "${DB_PID_FILE}" ]
| then
|   PIDOFDB=`head -n 1 "${DB_PID_FILE}"```
|   PIDALIVEDB=""
|   if [ -n "${DB_PID_FILE}" ]; then
|     PIDALIVEDB=`ps -p "${PIDOFDB}" | grep "${PIDOFDB}"```
|   fi
|   if [ -n "${PIDALIVEDB}" ]
|   then

```

```

| echo "Stopping ${DB_DESC}..."
| su - "${DB_SERVICE_USER}" -c
"LD_LIBRARY_PATH=\":${DB_LIB_DIR}\:$LD_LIBRARY_PATH\
\"${DB_BIN_DIR}/pg_ctl\" stop -m fast -D \"${DB_DATA_DIR}\\""
-I \"${DB_STARTUP_LOG}\\" -o \"${DB_STARTUP_OPTIONS}\\""
| else
| echo "The '${DB_DESC}' is not running."
| fi
| else
| echo "The '${DB_DESC}' is not running."
| fi
|
| }
| reload()
| {
| echo "Reloading '${DB_DESC}...'"
| su - "${DB_SERVICE_USER}" -c
"LD_LIBRARY_PATH=\":${DB_LIB_DIR}\:$LD_LIBRARY_PATH\
\"${DB_BIN_DIR}/pg_ctl\" reload -D \"${DB_DATA_DIR}\\" -I
\"${DB_STARTUP_LOG}\\" -o \"${DB_STARTUP_OPTIONS}\\""
| }
| restart()
| {
| echo "Restarting '${DB_DESC}...'"
| su - "${DB_SERVICE_USER}" -c
"LD_LIBRARY_PATH=\":${DB_LIB_DIR}\:$LD_LIBRARY_PATH\
\"${DB_BIN_DIR}/pg_ctl\" restart -m fast -w -D
\"${DB_DATA_DIR}\\" -I \"${DB_STARTUP_LOG}\\" -o
\"${DB_STARTUP_OPTIONS}\\""
| if [ $? -eq 0 ];
| then
| echo "'${DB_DESC}' restarted successfully."
| exit 0
| else
| echo "'${DB_DESC}' did not start in a timely fashion, please see
'${DB_STARTUP_LOG}' for details."
| exit 1
| fi
| }
| _die_incomplete_requirement()
| {
| echo "One or more required configuration variables are not set."
| _die $*
| }
| _validate_script()
| {
| if [ -z "${DB_INSTALL_DIR}" ]; then
| _die_incomplete_requirement "Missing installation directory";
| fi
| if [ ! -d "${DB_INSTALL_DIR}" ]; then
| _die_incomplete_requirement "The specified - '${DB_INSTALL_DIR}'"
is not a valid installation directory. It is not present on the
system.";
| fi
| if [ -z "${DB_BIN_DIR}" ]; then
DB_BIN_DIR=${DB_INSTALL_DIR}/bin; fi

```

```

| if [ ! -d "${DB_BIN_DIR}" ]; then
| _die_incomplete_requirement "The specified - '${DB_BIN_DIR}' is
not a valid bin directory. It is not present on the system.";
| fi
| if [ ! -f "${DB_BIN_DIR}/pg_config" -o ! -f
"${DB_BIN_DIR}/pg_ctl" ]; then
| _die_incomplete_requirement "The specified - '${DB_BIN_DIR}' does
not contain the database server binaries.";
| fi
| if [ -z "${DB_LIB_DIR}" ]; then
DB_LIB_DIR=${DB_INSTALL_DIR}/lib; fi
| if [ -z "${DB_DESC}" ]; then DB_DESC=`${DB_BIN_DIR}/pg_config
--version`; fi
| if [ -z "${DB_DATA_DIR}" ]; then
| _die_incomplete_requirement "Missing data directory settings in the
script. Please set 'DB_DATA_DIR' variable in the script.";
| fi
| if [ ! -d "${DB_DATA_DIR}" ]; then
| _die_incomplete_requirement "The specified - '${DB_DATA_DIR}' is
not a valid. It is not present on the system.";
| fi
| if [ ! -f "${DB_DATA_DIR}/PG_VERSION" -o ! -d
"${DB_DATA_DIR}/base" -o ! -d "${DB_DATA_DIR}/global" ]; then
| _die_incomplete_requirement "The directory - '${DB_DATA_DIR}''
does not look like a valid PostgreSQL/Postgres Plus Advanced Server
data directory."
| fi
| if [ -z "${DB_SERVICE_USER}" ]; then
| _die_incomplete_requirement "The service-user is not specified in
the service script. Please set 'DB_SERVICE_USER' variable in the
script."
| fi
| DB_VALID_SERVICE_USER=`cat /etc/passwd | grep
"^\${DB_SERVICE_USER}:"`"
| if [ -z "${DB_VALID_SERVICE_USER}" ]; then
| _die_incomplete_requirement "The service-user
'\${DB_SERVICE_USER}' is not present on the system. Please specify
the correct information."
| fi
| DB_DATA_DIR_OWNER=`ls -l ${DB_DATA_DIR}/PG_VERSION | awk
'{print $3}'`
| if [ x"\${DB_DATA_DIR_OWNER}" != x"\${DB_SERVICE_USER}" ]; then
| _die_incomplete_requirement "The specified user -
'\${DB_SERVICE_USER}' does not own the data directory -
'\${DB_DATA_DIR}'. The data directory is owned by the user -
'\${DB_DATA_DIR_OWNER}'."
| fi
| if [ -z "${DB_HBA_FILE}" ]; then
DB_HBA_FILE=${DB_DATA_DIR}/pg_hba.conf; fi
| if [ ! -f "${DB_HBA_FILE}" ]; then
| _die_incomplete_requirement "The hba-file - '\${DB_HBA_FILE}' does
not exist."
| fi
| if [ -z "${DB_CONF_FILE}" ]; then
DB_CONF_FILE=${DB_DATA_DIR}/postgresql.conf; fi

```

```

| if [ ! -f "${DB_CONF_FILE}" ]; then
| _die_incomplete_requirement "The config-file - '${DB_CONF_FILE}'"
does not exist."
| fi
| if [ -z "${DB_PID_FILE}" ]; then
DB_PID_FILE=${DB_DATA_DIR}/postmaster.pid; fi
| if [ -z "${DB_STARTUP_LOG}" ]; then
DB_STARTUP_LOG=${DB_DATA_DIR}/pg_log/startup.log; fi
| DB_STARTUP_OPTIONS=""
| if [ x"${DB_CONF_FILE}" != x"${DB_DATA_DIR}/postgresql.conf" ];
then
| DB_STARTUP_OPTIONS="-c 'config_file=${DB_CONF_FILE}'"
| fi
| if [ x"${DB_HBA_FILE}" != x"${DB_DATA_DIR}/pg_hba.conf" ]; then
| DB_STARTUP_OPTIONS="${DB_STARTUP_OPTIONS} -c
'hba_file=${DB_HBA_FILE}'"

fi

if [ x"${DB_PID_FILE}" != x"${DB_DATA_DIR}/postmaster.pid" ]; then

| DB_STARTUP_OPTIONS="${DB_STARTUP_OPTIONS} -c
'external_pid_file=${DB_PID_FILE}'"
| fi
| if [ x"${DEBUG_VALIDATION}" = x"1" ]; then
| echo "Using these values in the scripts:"
| echo ""
| echo "DB_DESC : ${DB_DESC}"
| echo ""
| echo "DB_INSTALL_DIR : ${DB_INSTALL_DIR}"
| echo "DB_BIN_DIR : ${DB_BIN_DIR}"
| echo "DB_LIB_DIR : ${DB_LIB_DIR}"
| echo ""
| echo "DB_DATA_DIR : ${DB_DATA_DIR}"
| echo "DB_HBA_FILE : ${DB_HBA_FILE}"
| echo "DB_CONF_FILE : ${DB_CONF_FILE}"
| echo "DB_PID_FILE : ${DB_PID_FILE}"
| echo "DB_STARTUP_LOG : ${DB_STARTUP_LOG}"
| echo ""
| echo "DB_SERVICE_USER : ${DB_SERVICE_USER}"
| echo "DB_STARTUP_OPTIONS : ${DB_STARTUP_OPTIONS}"
| echo ""
| fi
| }
| DEBUG_VALIDATION=0
| # See how we were called.
| case "$1" in
| start)
| _validate_script
| start
| ;;
| stop)
| _validate_script
| stop
| ;;

```

```

| reload)
| _validate_script
| reload
| ;;
| restart)
| _validate_script
| restart
| ;;
| condrestart)
| _validate_script

if [ -e "${DB_PID_FILE}" ]
then
PIDOFDB=`head -n 1 "${DB_PID_FILE}"`"
PIDALIVEDB=""
if [ -n "${DB_PID_FILE}" ]; then
PIDALIVEDB=`ps -p "${PIDOFDB}" | grep
"${PIDOFDB}"```
fi
if [ -n "${PIDALIVEDB}" ]
then
restart
else
echo "The '${DB_DESC}' is not running."
fi
else
echo "The '${DB_DESC}' is not running."
fi
;;
status)
_validate_script
su - "${DB_SERVICE_USER}" -c
"LD_LIBRARY_PATH=\"${DB_LIB_DIR}:$LD_LIBRARY_PATH\""
"\${DB_BIN_DIR}/pg_ctl" status -D "\${DB_DATA_DIR}" -I
"\${DB_STARTUP_LOG}" -o "\${DB_STARTUP_OPTIONS}""
| ;;
| validate)
| DEBUG_VALIDATION=1
| _validate_script
| exit 0
| ;;
| *)
| echo "Usage: $0
{start|stop|restart|condrestart|reload|status|validate}"
| exit 1
| esac

```

## 7 Configuring pgBouncer for Use with PEM Agents

This document provides detailed information about using pgBouncer as a connection pooler for limiting the

number of connections from the PEM Agent towards the Postgres Enterprise Manager (PEM) server on non-Windows machine:

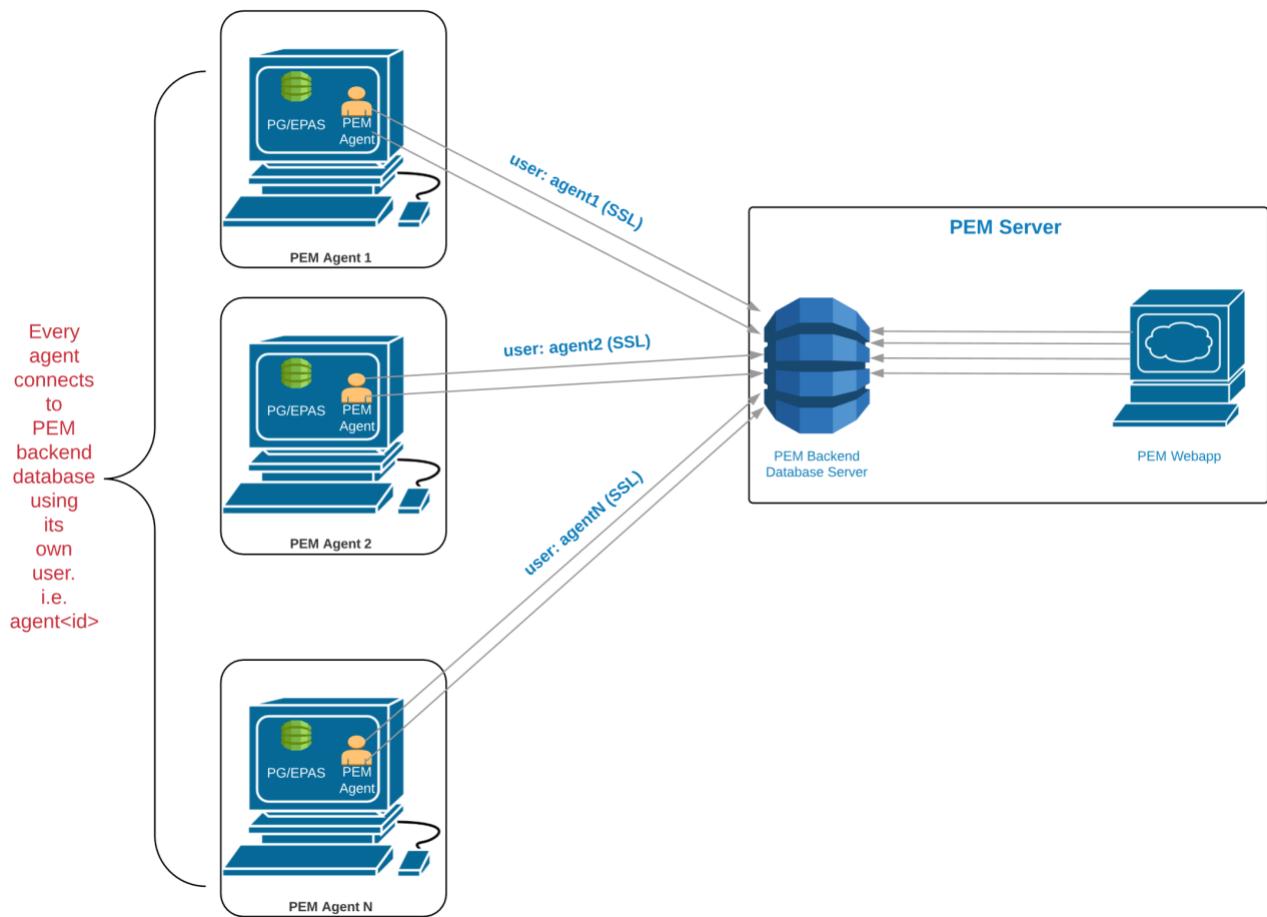
- Preparing the PEM Database Server - Chapter 3 provides information about preparing the PEM database server to be used with pgBouncer.
- Configuring pgBouncer - Chapter 4 provides detailed information about configuring pgBouncer to make it work with the PEM database server.
- Configuring the PEM Agent – Chapter 5 provides detailed information about configuring a PEM agent to connect to pgBouncer.

For detailed information about using the PEM 7 web interface, please see the PEM Getting Started Guide.

This document uses the term *Postgres* to mean either the PostgreSQL or the Advanced Server database.

## 7.1 The PEM Server - PEM Agent Connection Management Mechanism

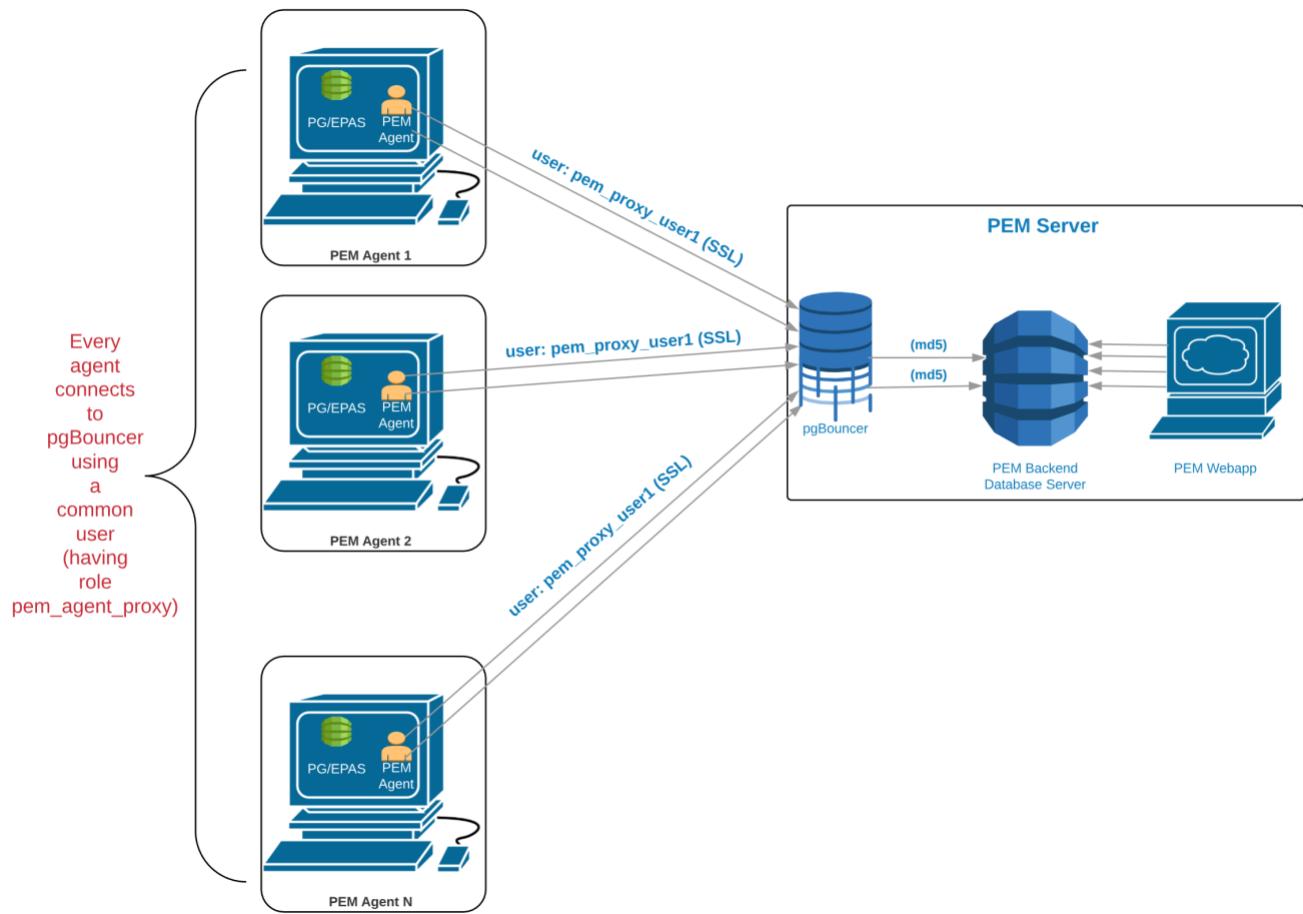
Each PEM agent connects to the PEM database server using the SSL certificates for each individual user. For example, an agent with **ID#1** connects to the PEM database server using the **agent1** user.



Prior to PEM version 7.5, the following limitations did not allow use of the connection pooler between the PEM server and PEM agent:

- The PEM agent uses an SSL Certificate to connect the PEM database server.
- It uses an individual user identifier when connecting to the PEM database server.

EnterpriseDB has modified the PEM agent to allow the agent to use a common database user (instead of the dedicated agent users) to connect the PEM database server.



We recommend using PgBouncer versions equal to or later than version 1.9.0 as the connection pooler. Since versions 1.9.0 or later support `cert` authentication; PEM Agents can connect to pgBouncer using SSL certificates.

## 7.2 Preparing the PEM Database Server

You must configure the PEM database server to make it work with PgBouncer; the following example demonstrates the steps required to configure the PEM database server.

1. Create a dedicated user named `pgbouncer` on the PEM database server. For example:

```
pem=# CREATE USER pgbouncer PASSWORD 'ANY_PASSWORD' LOGIN;
CREATE ROLE
```

1. Create a user named `pem_admin1` (a non-super user) with `pem_admin` and `pem_agent_pool` role membership on the PEM database server. For example:

```
pem=# CREATE USER pem_admin1 PASSWORD 'ANY_PASSWORD' LOGIN
CREATEROLE;
CREATE ROLE
pem=# GRANT pem_admin, pem_agent_pool TO pem_admin1;
GRANT ROLE
```

1. Grant **CONNECT** privilege to the **pgbouncer** user on the **pem** database. For example:

```
pem=# GRANT CONNECT ON DATABASE pem TO pgbouncer ;GRANT USAGE ON SCHEMA pem TO pgbouncer;
GRANT
```

1. Grant **USAGE** privilege to the **pgbouncer** user for the **pem** schema on the pem database. For example:

```
pem=# GRANT USAGE ON SCHEMA pem TO pgbouncer;
GRANT
```

1. Grant **EXECUTE** privilege to the **pgbouncer** user on the **pem.get\_agent\_pool\_auth(text)** function in the **pem** database. For example:

```
pem=# GRANT EXECUTE ON FUNCTION pem.get_agent_pool_auth(text) TO pgbouncer;
GRANT
```

1. Use the **pem.create\_proxy\_agent\_user(varchar)** function to create a user named **pem\_agent\_user1** on the PEM database server. For example:

```
pem=# SELECT pem.create_proxy_agent_user('pem_agent_user1');
create_proxy_agent_user
-----
(1 row)
```

The function will create a user with the same name with a random password, and grant **pem\_agent** and **pem\_agent\_pool** roles to the user. This allows pgBouncer to use a proxy user on behalf of the agent.

1. Add the following entries to the start of the **pg\_hba.conf** file of the PEM database server; this will allow pgBouncer user to connect to the pem database using the md5 authentication method. For example:

```
# Allow the PEM agent proxy user (used by
# pgbouncer) to connect to PEM server using
# md5

local pem pgbouncer,pem_admin1 md5
```

## 7.3 Configuring PgBouncer

You must configure PgBouncer to work with the PEM database server. In our example, we will run PgBouncer as the **enterprisedb** system user. The following steps outline the process of configuring pgBouncer (version >= 1.9).

1. Open a terminal window and navigate into the pgBouncer directory.
2. Change the owner of the etc directory for pgBouncer (where **pgbouncer.ini** resides) to **enterprisedb**, and change the directory permissions to **0700**. For example:

```
$ chown enterprisedb:enterprisedb /etc/edb/pgbouncer1.9
$ chmod 0700 /etc/edb/pgbouncer1.9
```

1. Change the contents of the **pgbouncer.ini** or **edb-pgbouncer.ini** file as follows:

```
[databases]
```

```

;; Change the pool_size according to maximum connections allowed
;; to the PEM database server as required.
;; 'auth_user' will be used for authenticate the db user (proxy
;; agent user in our case)

pem = port=5444 host=/tmp dbname=pem auth_user=pgbouncer
pool_size=80 pool_mode=transaction
* = port=5444 host=/tmp dbname=pem auth_user=pgbouncer
pool_size=10

[pgbouncer]
logfile = /var/log/edb/pgbouncer1.9/edb-pgbouncer-1.9.log
pidfile = /var/run/edb/pgbouncer1.9/edb-pgbouncer-1.9.pid
listen_addr =
;; Agent needs to use this port to connect the pem database now
listen_port = 6432
;; Require to support for the SSL Certificate authentications
;; for PEM Agents
client_tls_sslmode = require
;; These are the root.crt, server.key, server.crt files present
;; in the present under the data directory of the PEM database
;; server, used by the PEM Agents for connections.
client_tls_ca_file = /var/lib/edb/as11/data/root.crt
client_tls_key_file = /var/lib/edb/as11/data/server.key
client_tls_cert_file = /var/lib/edb/as11/data/server.crt
;; Use hba file for client connections
auth_type = hba
;; Authentication file, Reference:
;; https://pgbouncer.github.io/config.html#auth\_file
auth_file = /etc/edb/pgbouncer1.9/userlist.txt
;; HBA file
auth_hba_file = /etc/edb/pgbouncer1.9/hba_file
;; Use pem.get_agent_pool_auth(TEXT) function to authenticate
;; the db user (used as a proxy agent user).
auth_query = SELECT * FROM pem.get_agent_pool_auth($1)
;; DB User for administration of the pgbouncer
admin_users = pem_admin1
;; DB User for collecting the statistics of pgbouncer
stats_users = pem_admin1
server_reset_query = DISCARD ALL
;; Change based on the number of agents installed/required
max_client_conn = 500
;; Close server connection if its not been used in this time.
;; Allows to clean unnecessary connections from pool after peak.
server_idle_timeout = 60

```

1. Use the following command to create and update the `/etc/edb/pgbouncer1.9/userlist.txt` authentication file for PgBouncer.

```

pem=# COPY (
SELECT 'pgbouncer'::TEXT, 'pgbouncer_password'
UNION ALL
SELECT 'pem_admin1'::TEXT, 'pem_admin1_password'
TO '/etc/edb/pgbouncer1.9/userlist.txt'
WITH (FORMAT CSV, DELIMITER ',', FORCE_QUOTE *);

```

**COPY 2**

NOTE: A super user cannot invoke the PEM authentication query function `pem.get_proxy_auth(text)`. If the `pem_admin` user is a super user, you must add the password to the authentication file, which is `enterprisedb` in the above example.

1. Create an HBA file (`/etc/edb/pgbouncer1.9/hba_file`) for PgBouncer that contains the following content:

```
# Use authentication method md5 for the local connections to
# connect pem database & pgbouncer (virtual) database.
local pgbouncer all md5
# Use authentication method md5 for the remote connections to
# connect to pgbouncer (virtual database) using enterprisedb
# user.

host pgbouncer,pem pem_admin1 0.0.0.0/0 md5

# Use authentication method cert for the TCP/IP connections to
# connect the pem database using pem_agent_user1

hostssl pem pem_agent_user1 0.0.0.0/0 cert
```

1. Change the owner of the HBA file (`/etc/edb/pgbouncer1.9/hba_file`) to `enterprisedb`, and change the directory permissions to `0600`. For example:

```
$ chown enterprisedb:enterprisedb /etc/edb/pgbouncer1.9/hba_file
$ chmod 0600 /etc/edb/pgbouncer1.9/hba_file
```

1. Enable the PgBouncer service, and start the service. For example:

```
$ systemctl enable edb-pgbouncer-1.9

Created symlink from
/etc/systemd/system/multi-user.target.wants/edb-pgbouncer-1.9.service
to /usr/lib/systemd/system/edb-pgbouncer-1.9.service.

$ systemctl start edb-pgbouncer-1.9
```

## 7.4 Configuring the PEM Agent

You can use an RPM package to install a PEM Agent; for detailed installation information, please see the *PEM Installation Guide*, available from the EnterpriseDB website at:

<https://www.enterprisedb.com/resources/product-documentation>

### Configuring a New PEM Agent (installed using an RPM)

After using an RPM package to install the PEM agent, you will need to configure it to work it against a particular PEM database server. Use the following command:

```
$ PGSSLMODE=require PEM_SERVER_PASSWORD=pem_admin1_password
/usr/edb/pem/agent/bin/pemworker --register-agent --pem-server
pem_agent_user1 --display-name "Agent Name"
```

Postgres Enterprise Manager Agent registered successfully!

In above command, the command line argument `--pem-agent-user` instructs the agent to create an SSL certificate and key pair for the `pem_agent_user1` database user in `/root/.pem` directory.

For example:

```
/root/.pem/pem_agent_user1.crt
```

```
/root/.pem/pem_agent_user1.key
```

They will be used by the PEM agent to connect to the PEM database server as `pem_agent_user1`. It will also create an agent configuration file named `/usr/edb/pem/agent/etc/agent.cfg`.

You will find a line mentioning the agent-user to be used in the `agent.cfg` configuration file.

For example:

```
$ cat /usr/edb/pem/agent/etc/agent.cfg
[PEM/agent]
pem_host=172.16.254.22
pem_port=6432
agent_id=12
agent_user=pem_agent_user1
agent_ssl_key=/root/.pem/pem_agent_user1.key
agent_ssl_crt=/root/.pem/pem_agent_user1.crt
log_level=warning
log_location=/var/log/pem/worker.log
agent_log_location=/var/log/pem/agent.log
long_wait=30
short_wait=10
alert_threads=0
enable_smtp=false
enable_snmp=false
allow_server_restart=true
allow_package_management=false
allow_streaming_replication=false
max_connections=0
connect_timeout=-1
connection_lifetime=0
allow_batch_probes=false
heartbeat_connection=false
```

## Configuring an Existing PEM Agent (installed using an RPM)

If you are using an existing PEM agent, you can copy the SSL certificate and key files to the target machine, and reuse the files. You will need to modify the files, adding a new parameter and replacing some parameters in the existing `agent.cfg` file:

Add a line for `agent_user` to be used for the agent. For example:

```
agent_user=pem_agent_user1
```

Update the port to specify the pgBouncer port. For example:

```
pem_port=6432
```

Update the certificate and key path locations. For example:

```
agent_ssl_key=/root/.pem/pem_agent_user1.key
agent_ssl_crt=/root/.pem/pem_agent_user1.crt
```

Please note: as an alternative, you can run the agent self registration, but that will create a new agent id. If you do run the agent self-registration, you must replace the new agent id with existing id, and disable the entry for the new agent id in the `pem.agent` table. For example:

```
pem=# UPDATE pem.agent SET active = false WHERE id = <new_agent_id>;
```

```
UPDATE 1
```

NOTE: Keep a backup of the existing SSL certificate, key file, and agent configuration file.

## 8 Upgrade and Migration

This guide provides detailed information about upgrading the Postgres nterprise Manager (PEM) server:

- **Upgrading a PEM Installation** - This section provides information about upgrading your PEM server from one major version to another (i.e. from 6.0 to 7.5).
- **Upgrading the Backing Database** - This section provides detailed information about upgrading the backing database, while maintaining the same version of the PEM Server.
- **Moving a PEM Server** –This section provides detailed information about moving the PEM server from one host to another host.
- **Troubleshooting** –This section provides detailed information about troubleshooting the errors that you may encounter during PEM upgrade.
- **Uninstalling PEM** –This section provides detailed information about uninstalling PEM components.

This document uses the term *Postgres* to mean either the PostgreSQL or the Advanced Server database.

### 8.1 Upgrading a PEM Installation

The process of upgrading a PEM installation is platform-specific. You can update a PEM agent or server on a Windows host by using the PEM graphical installer available for Windows. Prior to PEM 7.8 release, PEM agent or server could be installed on Linux either by using the graphical installer or by using the RPMs. From PEM version 7.8 onwards, PEM graphical installers for Linux are being discontinued. To update a PEM agent or server on a Linux host from any lower version to PEM 7.9 or higher versions, you must use RPMs.

Links to PEM and SQL Profiler installers and RPMs are available at the [EnterpriseDB website](#).

## 8.2 Upgrading the Backing Postgres Database

If you are updating both PEM components and the PEM backing database, you should perform PEM component updates (the server, agents and client) before updating the backing database. For more information about updating PEM component software, see [Upgrading a PEM Installation](#).

The update process described in this section uses the `pg_upgrade` utility to migrate from one version of the backing server to a more recent version. `pg_upgrade` facilitates migration between any version of Postgres (version 9.3 or later), and any subsequent release of Postgres that is supported on the same platform.

`pg_upgrade` supports a transfer of data between servers of the same type. For example, you can use `pg_upgrade` to move data from a PostgreSQL 9.6 backing database to a PostgreSQL 10 backing database, but not to an Advanced Server 10 backing database. If you wish to migrate to a different type of backing database (i.e. from a PostgreSQL server to Advanced Server), see [Moving the Postgres Enterprise Manager Server](#).

You can find more information about using `pg_upgrade` at:

| <http://www.postgresql.org/docs/current/static/pgupgrade.html>

### Step 1 - Download and Invoke the Updated Backing Database Installer

Installers for PostgreSQL and Advanced Server are available through the EnterpriseDB website:

| <http://www.enterprisedb.com>

After downloading the installer for the server version to which you will be upgrading, invoke the installer on the host of the PEM server. Follow the onscreen instructions of the installation wizard to configure and install the Postgres server.

You can optionally use a custom-built PostgreSQL server as a host of the PEM backing database. Note that if you are upgrading from a PostgreSQL backing database listening on port `5432`, the new server must be configured to listen on a different port.

### Step 2 - Configure the SSL Utilities on the New Server

The new backing database must be running the same version of `sslutils` that the current backing database is running; you can download the SSL Utils package that is used in EnterpriseDB installers at:

| <http://www.enterprisedb.com/downloads/component-source-code>

You are *not* required to manually add the `sslutils` extension when using the Advanced Server as the new backing database. The process of configuring `sslutils` is platform-specific.

#### On Linux

If you are using Linux, you can download versions of the archived SSL Utils file from:

| <http://www.enterprisedb.com/downloads/component-source-code>

When the download completes, extract the `sslutils` folder, and move it into the Postgres installation directory for the Postgres version to which you are upgrading.

Open a command line, assume superuser privileges, and set the value of the PATH environment variable to allow make to locate the `pg_config` program:

| `export PATH=$PATH:/opt/<Postgres>/<x.x>/bin/`

Where:

Postgres specifies either of the following:

- PostareSQL if you are upgrading to a PostgreSQL server.
- PostgresPlus if you are upgrading to an Advanced Server server.
- x.x specifies the version of Postgres to which you are migrating.

Then, use `yum` to install `sslutil` dependencies:

```
yum install openssl-devel
```

Navigate into the `sslutils` folder, and build the `sslutils` package by entering:

```
make USE_PGXS=1
```

```
make USE_PGXS=1 install
```

## On Windows

`sslutils` must be compiled on the new backing database with the same compiler that was used to compile `sslutils` on the original backing database. If you are moving to a Postgres database that was installed using a PostgreSQL one-click installer (from EnterpriseDB) or an Advanced Server installer, use Visual Studio to build `sslutils`. If you are upgrading to PostgreSQL 9.3 or later, use Visual Studio 2010.

For detailed information about building a specific version of Postgres on Windows, please consult the core documentation for that version. Core documentation is available at the PostgreSQL project website at:

<http://www.postgresql.org/docs/>

or at the EnterpriseDB website at:

<http://www.enterprisedb.com/products-services-training/products/documentation/enterpriseedition>

While specific details of the process will vary by platform and compiler, the basic steps on each platform are the same. The example that follows demonstrates compiling OpenSSL support for PostgreSQL on a 32-bit Windows system.

Before compiling the OpenSSL extension, you must locate and install OpenSSL for your version of Windows. Before invoking the OpenSSL installer you may be required to download and install a pre-requisite redistributable (such as `vcredist_x86.exe`).

After installing OpenSSL, download and unpack the `sslutils` utility package available at:

<http://www.enterprisedb.com/downloads/component-source-code>

Copy the unpacked `sslutils` folder to the Postgres installation directory (i.e. `C:\ProgramFiles\PostgreSQL\9.1\<x>`)

Open the Visual Studio command line, and navigate into the `sslutils` directory. Use the following commands to build `sslutils`:

```
SET USE_PGXS=1
```

```
SET GETTEXTPATH=\ <path_to_gettext>
```

```
SET OPENSSLSPATH=\ <path_to_openssl>
```

```
SET PGPATH=\ <path_to_pg_installation_dir>
```

```
SET ARCH=x86
```

```
msbuild sslutils.proj /p:Configuration=Release
```

Where:

`path_to_gettext` specifies the location of the `GETTEXT` library and header files.

`path_to_openssl` specifies the location of the `openssl` library and header files.

`path_to_pg_installation_dir` specifies the location of the Postgres installation.

For example, the following set of commands builds OpenSSL support into the PostgreSQL 10 server:

```
SET USE_PGXS=1
SET OPENSSLPATH=C:\OpenSSL-Win32
SET GETTEXTPATH="C:\Program Files\PostgreSQL\10"
SET PGPATH="C:\Program Files\PostgreSQL\10"
SET ARCH=x86
msbuild sslutils.proj /p:Configuration=Release
```

When the build completes, the `sslutils` directory will contain the following files:

- `sslutils--1.1.sql`
- `sslutils--unpackaged--1.1.sql`
- `sslutils-pemagent.sql.in`
- `sslutils.dll`

Copy the compiled `sslutils` files to the appropriate directory for your installation; for example:

```
COPY sslutils*.sql "%PGPATH%\share\extension\"  
COPY sslutils.dll "%PGPATH%\lib\"
```

### Step 3 - Stop the Services

Stop the services of both the old backing database and the new backing database.

-On RHEL or CentOS 6.x, open a command line and assume the identity of a superuser. Enter the command:

```
/etc/init.d/<service_name> stop
```

-On RHEL or CentOS 7.x, open a command line and assume the identity of a superuser. Enter the command:

```
systemctl/<service_name> stop
```

Where `service_name` specifies the name of the Postgres service.

On Windows, you can use the `Services` dialog to control the service. To open the `Services` dialog, navigate through the `Control Panel` to the `System and Security` menu. Select `Administrative Tools`, and then double-click the `Services` icon. When the `Services` dialog opens, highlight the service name in the list, and use the option provided on the dialog to Stop the service.

### Step 4 - Use pg\_upgrade to update the Server

You can use the `pg_upgrade` utility to perform an in-place transfer of existing data between the old backing database and the new backing database. If your server is configured to enforce `md5` authentication, you may need to add an entry to the `.pgpass` file that specifies the connection properties (and password) for the database superuser, or modify the `pg_hba.conf` file to allow trust connections before invoking `pg_upgrade`. For more information about creating an entry in the `.pgpass` file, please see the PostgreSQL core documentation, available at:

<http://www.postgresql.org/docs/current/static/libpq-pgpass.html>

During the upgrade process, `pg_upgrade` will write a series of log files. The cluster owner must invoke `pg_upgrade` from a directory in which they have write privileges. If the upgrade completes successfully, `pg_upgrade` will remove the log files when the upgrade completes. To instruct `pg_upgrade` to not delete the upgrade log files, include the `--retain` keyword when invoking `pg_upgrade`.

To invoke `pg_upgrade`, assume the identity of the cluster owner, navigate into a directory in which the cluster owner has write privileges, and execute the command:

```
<path_to_pg_upgrade> pg_upgrade
-d <old_data_dir_path>
-D <new_data_dir_path>
-b <old_bin_dir_path> -B <new_bin_dir_path>
-p <old_port> -P <new_port>
-u <user_name>
```

Where:

`path_to_pg_upgrade` specifies the location of the `pg_upgrade` utility. By default, `pg_upgrade` is installed in the `bin` directory under your Postgres directory.

`old_data_dir_path` specifies the complete path to the data directory of the old backing database.

`new_data_dir_path` specifies the complete path to the data directory of the new backing database.

`old_bin_dir_path` specifies the complete path to the bin directory of the old backing database.

`new_bin_dir_path` specifies the complete path to the bin directory of the old backing database.

`old_port` specifies the port on which the old server is listening.

`new_port` specifies the port on which the new server is listening.

`user_name` specifies the name of the cluster owner.

For example, the following command:

```
C:\>"C:\Program Files\PostgreSQL\10\bin\pg_upgrade.exe"
-d "C:\Program Files\PostgreSQL\9.6\data"
-D "C:\Program Files\PostgreSQL\10\data"
-b "C:\Program Files\PostgreSQL\9.6\bin"
-B "C:\Program Files\PostgreSQL\10\bin"
-p 5432 -P 5433
-u postgres
```

Instructs `pg_upgrade` to migrate the PEM database from PostgreSQL 9.6 to PostgreSQL 10 on a Windows system (if the backing databases are installed in their default locations).

Once invoked, `pg_upgrade` will perform consistency checks before moving the data to the new backing database. When the upgrade is finished, `pg_upgrade` will notify you that the upgrade is complete.

For detailed information about using `pg_upgrade` options, or troubleshooting the upgrade process, please see:

<http://www.postgresql.org/docs/current/static/pgupgrade.html>

## Step 5 - Copy the Certificate Files from the Old Database to the New Database

Copy the following certificate files from the `data` directory of the old backing database to the `data` directory of the new backing database:

- `ca_certificate.crt`
- `ca_key.key`
- `root.crt`
- `root.crl`
- `server.key`
- `server.crt`

Once in place on the target server, the files should have the (platform-specific) permissions described below:

### Permissions and Ownership on Linux

File Name	Owner	Permissions
<code>ca_certificate.crt</code>	<code>postgres</code>	<code>-rw-----</code>
<code>ca_key.key</code>	<code>postgres</code>	<code>-rw-----</code>
<code>root.crt</code>	<code>postgres</code>	<code>-rw-----</code>
<code>root.crl</code>	<code>postgres</code>	<code>-rw-----</code>
<code>server.key</code>	<code>postgres</code>	<code>-rw-----</code>
<code>server.crt</code>	<code>postgres</code>	<code>-rw-r--r--</code>

On Linux, the certificate files must be owned by `postgres`. You can use the following command at the command line to modify the ownership of the files:

`chown postgres <file_name>`

Where `file_name` specifies the name of the certificate file.

The `server.crt` file may only be modified by the owner of the file, but may be read by any user. You can use the following command to set the file permissions for the `server.crt` file:

`chmod 644 server.crt`

The other certificate files may only be modified or read by the owner of the file. You can use the following command to set the file permissions:

`chmod 600 <file_name>`

Where `file_name` specifies the name of the file.

### Permissions and Ownership on Windows

On Windows, the certificate files moved from the source host must be owned by the service account that performed the PEM server and backing database installation on the target host. If you invoked the PEM server and Postgres installer using the `Run as Administrator` option (selected from the context menu of the installer), the owner of the certificate files will be `Administrators`.

To review and modify file permissions on Windows, right-click on the file name, and select `Properties`.



Navigate to the **Security** tab and highlight a **Group or user name** to view the assigned permissions. Select **Edit** or **Advanced** to access dialogs that allow you to modify the permissions associated with the selected user.

## Step 6 - Update the New Server Configuration File

The **postgresql.conf** file contains parameter settings that specify server behavior. You will need to modify the **postgresql.conf** file on the new server to match the configuration specified in the **postgresql.conf** file of the old server.

By default, the **postgresql.conf** file is located:

- For Postgres version lower than 10 on Linux, in **/opt/PostgreSQL/<version.x>/data**
- For Postgres version 10 or higher when installed with graphical installers on Linux, in **/opt/PostgreSQL/<version>/data**
- For Postgres version 10 or higher when installed with an RPM on Linux, in **/usr/edb/PostgreSQL/<version>/data**
- For any Postgres version on Windows, in **C:\Program Files\PostgreSQL\<version.x>\data**

Where, **version** is the major version of Postgres on your system.

Use your choice of editor to update the **postgresql.conf** file of the new server. Modify the following parameters:

- The **port** parameter to listen on the port monitored by your original backing database (typically, **5432**).
- The **ssl** parameter should be set to **on**.

You must also ensure that the following parameters are enabled. If the parameters are commented out, remove the pound sign from in front of each **postgresql.conf** file entry:

- **ssl\_cert\_file = 'server.crt' # (change requires restart)**
- **ssl\_key\_file = 'server.key' # (change requires restart)**
- **ssl\_ca\_file = 'root.crt' # (change requires restart)**
- **ssl\_crl\_file = 'root.crl'**

Your installation may have other parameter settings that require modification to ensure that the new backing database behaves in a manner comparable to the old backing database. Review the **postgresql.conf** files carefully to ensure that the configuration of the new server matches the configuration of the old server.

## Step 7 - Update the New Server Authentication File

The **pg\_hba.conf** file contains parameter settings that specify how the server will enforce host-based authentication. When you install the PEM server, the installer modifies the **pg\_hba.conf** file, adding entries to the top of the file:

```
# Adding entries for PEM agents and admins to connect to PEM server
```

```

hostssl pem +pem_user 192.168.2.0/24 md5
hostssl pem +pem_agent 192.168.2.0/24 cert
# Adding entries (localhost) for PEM agents and admins to connect to PEM server
hostssl pem +pem_user 127.0.0.1/32 md5
hostssl postgres +pem_user 127.0.0.1/32 md5
hostssl pem +pem_user 127.0.0.1/32 md5
hostssl pem +pem_agent 127.0.0.1/32 cert

```

By default, the `pg_hba.conf` file is located at the following location:

- For Postgres version lower than 10 on Linux, in `/opt/PostgreSQL/<version>.x/data`
- For Postgres version 10 or higher when installed with graphical installers on Linux, in `/Opt/PostgreSQL/<version>/data`
- For Postgres version 10 or higher when installed with RPMs on Linux, in `/var/lib/PostgreSQL/<version>/data`
- For Advanced Server version 10 or higher when installed with RPMs on Linux, in `/var/lib/edb/AS<version>/data`
- For any Postgres version on Windows, in `C:\Program Files\PostgreSQL\<version>.x\data`

Where, `version` is the major version of Postgres on your system and `x` is the minor version.

Using your editor of choice, copy the entries from the `pg_hba.conf` file of the old server to the `pg_hba.conf` file for the new server.

### Step 8 - Restart the New Postgres Server

Start the service of the new backing database.

-On RHEL or CentOS 6.x, open a command line and assume the identity of a superuser. Enter the command:

```
/etc/init.d/<service_name> start
```

-On RHEL or CentOS 7.x, open a command line and assume the identity of a superuser. Enter the command:

```
systemctl stop <service_name>
```

Where `service_name` is the name of the backing database server.

If you are using Windows, you can use the `Services` dialog to control the service. To open the `Services` dialog, navigate through the `Control Panel` to the `System and Security` menu. Select `Administrative Tools`, and then double-click the `Services` icon. When the `Services` dialog opens, highlight the service name in the list, and use the option provided on the dialog to start the service.

## 8.3 Moving the Postgres Enterprise ManagerServer

The steps in this section describe how to move a PEM server from one host machine to a new host machine. The PEM server on the new host (the target) must be installed with the same version of the PEM server installer as the original host (the source). Please note that if you do not use the same installer version, you may encounter a schema-mismatch error.

The backing database of the target server (either PostgreSQL or Advanced Server) may be of the same type and

version, or a different type and version than the backing database of the source PEM server. A PEM server that resides on a PostgreSQL host can be migrated to an Advanced Server host, or vice versa.

Before starting the server migration, you should ensure that the firewalls between the source host, the target host, and the host of any PEM agent will allow connections between the services.

## Step One - Prepare the Target Host

Invoke the installer for the PEM server on the target host. Please note that you must use the same version of the PEM server installer that you used when installing the source PEM server.

The backing database of the target server may be a different version or type than the backing database of the source. If the new PEM server does *not* reside on the same type of backing database as the original server, you must ensure that the same version of the `sslutils` extension is installed on the new server host. The version of `sslutils` that is distributed with the PEM installers is freely available for download from the EnterpriseDB website at:

<http://www.enterprisedb.com/downloads/component-source-code>

For information about installing the PEM server or the `sslutils` extension, please refer to the *PEM Installation Guide*, available at:

<https://www.enterprisedb.com/edb-docs/p/edb-postgres-enterprise-manager>

## Step Two – Drop Existing Schemas from the New PEM Server

The migration process re-creates the `pem`, `pemdata`, and `pemhistory` schemas from the source PEM server on the target PEM server. In preparation for the move, use the `psql` client to delete these schemas from the `pem` database on the target host. You can open the `psql` client at the command line, or by selecting `SQL Shell (psql)` from the `Postgres Enterprise Manager` menu.

When the `psql` client opens, connect to the `pem` backing database as the database superuser. After connecting to the `pem` database on the target host, use the following commands to drop the schemas:

- `DROP SCHEMA pem CASCADE;`
- `DROP SCHEMA pemdata CASCADE;`
- `DROP SCHEMA pemhistory CASCADE;`

When dropping the schemas, you must include the `CASCADE` keyword, instructing the server to delete all dependent objects. When executing the command, the `psql` client displays a list of the dependent objects; the client confirms each the schema is removed by displaying `DROP SCHEMA`.

```
File Edit View Search Terminal Help
drop cascades to table pemhistory.streaming_replication_lag_time
drop cascades to table pemhistory.wal_archive_status
drop cascades to table pemhistory.efm_cluster_node_status
drop cascades to table pemhistory.efm_cluster_info
DROP SCHEMA pem
pem=#
```

## Step Three - Prepare the PEM Agents on the New PEM Server

Before moving the PEM server, you must identify the number of agents that are monitored by the source PEM server, and create identities for that number of agents (less one) on the target server. To discover the total number of `PEM` agents monitored by the PEM server, connect to the `pem` database on the source host with the `psql` client, and query the `pem.agent` table.

`SELECT id FROM pem.agent WHERE active = true;`

You must manually create the number of agents that reside on the original PEM server, less one; the PEM server installer has already created one agent on the target host. For example, if the source server contains three agents, you must manually create two additional agents. Open a `psql` session with the `pem` database on the target server, and create the required agents. Use the command:

```
| CREATE USER agent <x>;
```

Where `<x>` specifies an agent number. Remember, `agent1` is created on the target host by the PEM server installer.

Then, use the `GRANT` command to assign each agent that resides on the target PEM server `pem_agent` permissions:

```
| GRANT pem_agent TO agent <x>;
```

Where `<x>` specifies an agent number.

#### **Step Four - Generate a Backup Script of the Source PEM Server**

You can use the `pg_dump` utility to generate a script that contains the commands required to recreate the `pem` database on the target host. By default, `pg_dump` is installed in the `bin` directory under your Postgres installation. To invoke `pg_dump`, open a command line, navigate to the `bin` directory, and enter:

```
| pg_dump -U <user_name> <db_name> > <file_name>
```

Where:

`<user_name>` specifies the name of the database superuser for the PEM backing database.

`<db_name>` specifies the name of the PEM backing database.

`<file_name>` specifies the name of the script generated by `pg_dump`.

When prompted, provide the password associated with the user specified.

The command shown instructs `pg_dump` to generate a script that (when executed) will re-create the `pem` database. The script will be named `backup.sql`, and will be created in the `tmp` directory. `pg_dump` is connecting to the server using the credentials of the user, `postgres`.

Note that invoking the `pg_dump` utility will not interrupt current database users.

#### **Step Five - Move the Backup to the Target Host**

Move the script generated by the `pg_dump` utility to the target host of the PEM server.

#### **Step Six - Restore the Backup on the Target Host**

Open a command line on the target host and navigate into the `bin` directory (under the Postgres backing database installation directory). Start `psql`, executing the script generated by the `pg_dump` utility:

```
| psql -U <user_name> -d pem -f <file_name>
```

Where:

`<user_name>` specifies the name of the database superuser. The user specified must have connection privileges for the backing database.

`<file_name>` specifies the complete path to the backup script generated by `pg_dump`.

When prompted, provide the password associated with the database superuser.



The example shown uses the `psql` client to invoke a script named `backup.sql` to recreate the `pem` database. The script is invoked using the privileges associated with the database superuser, `postgres`.

## Step Seven - Stop the Database Server on the Target Host

To stop the PEM server on Linux, use the command:

```
/etc/init.d/<service_name> stop
```

<service\_name> specifies the name of the backing database server. For a PostgreSQL backing database, the service name is `postgresql-x.x`, and for an Advanced Server backing database, the service name is `ppas-x.x`, where `x.x` specifies the version number.

If you are using Windows, you can use the `Services` dialog to control the service. To open the `Services` dialog, navigate through the `Control Panel` to the `System and Security` menu. Select `Administrative Tools`, and then double-click the `Services` icon. When the `Services` dialog opens, highlight the service name in the list, and use the option provided on the dialog to Stop the service.

## Step Eight - Copy the Certificate Files to the Target Host

You must replace the certificate files that are created when the target host is installed with the certificate files of the source host. Copy the following files from the source PEM server to the target PEM server:

- `ca_certificate.crt`
- `ca_key.key`
- `root.crt`
- `root.crl`
- `server.key`
- `server.crt`

Copy the files to the `data` directory under the Postgres installation that provides the backing database for the target cluster. On Linux, by default, the files reside in:

```
/opt/PostgreSQL/<x.x>/data/
```

On Windows, the files reside in:

```
C:\Program Files\PostgreSQL\<x.x>\data
```

Where:

<x.x> specifies the version of PostgreSQL on your system.

The files will already exist on the target cluster; delete the existing files before performing the copy, or overwrite the existing files with the files from the source server. Once in place on the target server, the files should have the (platform-specific) permissions described in the sections that follow.

### Permissions and Ownership on Linux

File Name	Owner	Permissions
<code>ca_certificate.crt</code>	<code>postgres</code>	<code>-rw-----</code>
<code>ca_key.key</code>	<code>postgres</code>	<code>-rw-----</code>
<code>root.crt</code>	<code>postgres</code>	<code>-rw-----</code>
<code>root.crl</code>	<code>postgres</code>	<code>-rw-----</code>
<code>server.key</code>	<code>postgres</code>	<code>-rw-----</code>
<code>server.crt</code>	<code>postgres</code>	<code>-rw-r--r--</code>

On Linux, the certificate files must be owned by `postgres`. You can use the following command at the command line to modify the ownership of the files:

```
chown postgres <file_name>
```

Where `file_name` specifies the name of the certificate file.

The server.crt file may only be modified by the owner of the file, but may be read by any user. You can use the following command to set the file permissions for the server.crt file:

```
chmod 644 server.crt
```

The other certificate files may only be modified or read by the owner of the file. You can use the following command to set the file permissions:

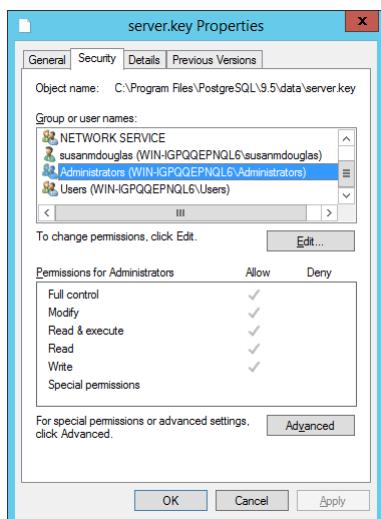
```
chmod 600 <file_name>
```

Where `file_name` specifies the name of the file.

## Permissions and Ownership on Windows

On Windows, the certificate files moved from the source host must be owned by the service account that performed the PEM server and backing database installation on the target host. If you invoked the PEM server and Postgres installer using the `Run as Administrator` option (selected from the context menu of the installer), the owner of the certificate files will be `Administrators`.

To review and modify file permissions on Windows, right-click on the file name, and select `Properties`.



Navigate to the `Security` tab and highlight a `Group or user name` to view the assigned permissions. Select `Edit` or `Advanced` to access dialogs that allow you to modify the permissions associated with the selected user.

## Step Nine - Move the PEM Agent Certificate Files to the PEM Server Host

You must move the certificate files used by the PEM agent of the source PEM server to the target host. This step is platform-specific.

### On Linux

Copy the `agent1.key` and `agent1.crt` files from the source host to the target host. By default, on Linux, the files are installed in `/root/.pem`; copy the files to the same directory on the target host.

File ownership and permissions of the files must be set to:

File Name	Owner	Permissions
agent1.key	root	-rw-----
agent1.crt	root	-rw-r--r--

If necessary, navigate to `/root/.pem`, and use the following commands to modify the permissions and ownership of

the `agent1.key` file:

```
chmod 600 agent1.key
chown root agent1.key
```

Use the following commands to modify the permissions and ownership of the `agent1.crt` file:

```
chmod 644 agent1.crt
chown root agent1.crt
```

## On Windows

Copy the `agent1.key` and `agent1.crt` files from the source host to the target host. On Windows, the files are located in:

```
C:\Users\<user_name>\AppData\Roaming\pem
```

Where `user_name` is the name of the user that invoked the PEM installer.

The ownership and permissions associated with the certificate files on the target machine should match the ownership and permissions of the certificate files on the source machine. If you invoked the PEM server and Postgres installer using the [Run as Administrator](#) option (selected from the context menu of the installer), the owner of the agent certificate files will be [Administrators](#).

To review and modify file permissions on Windows, right-click on the file name, and select [Properties](#). Navigate to the [Security](#) tab and highlight a [Group or user name](#) to view the assigned permissions. Select [Edit](#) or [Advanced](#) to access dialogs that allow you to modify the permissions associated with the selected user.

## Step Ten - Update the `pg_hba.conf` Files on the Target Host

Modify the `pg_hba.conf` file on the target host to allow connections from each PEM agent. By default, the `pg_hba.conf` file is located in the data directory under your Postgres installation.

## Step Eleven - Start the Server on the Target Host

After modifying the `pg_hba.conf` file, you must restart the server for the changes to take effect.

To restart the database server on Linux, use the command:

```
/etc/init.d/<service_name> start
```

Where `service_name` is the name of the backing database server.

If you are using Windows, you can use the [Services](#) dialog to control the service. To open the [Services](#) dialog, navigate through the [Control Panel](#) to the [System and Security](#) menu. Select [Administrative Tools](#), and then double-click the [Services](#) icon. When the [Services](#) dialog opens, highlight the service name in the list, and use the option provided on the dialog to Start the service.

## Step Twelve - Connecting Monitored Agents to the New PEM Server Host

To instruct existing PEM agents to connect to the new PEM server host, you must:

- Ensure that the PEM agent host can connect to the new PEM server host.
- Modify the registry (on each Windows host with a PEM agent) or the agent configuration files (on each Linux host with a PEM agent), specifying the IP address and port of the new PEM server.
- Restart the PEM agent's service.

These steps are platform-specific.

## If the PEM Agent Resides on Linux

Use your choice of editor to modify the `agent.cfg` file, specifying the new IP address and port number of the PEM server in the `pem_host` and `pem_port` parameters.

By default, the `agent.cfg` file is located in:

`/opt/PEM/agent/etc/agent.cfg`

```

[PEM/agent]
pem_host=192.168.2.139
pem_port=5432
agent_id=2
agent_ssl_key=/root/.pem/agent2.key
agent_ssl_crt=/root/.pem/agent2.crt
log_level=warning
log_location=/var/log/pem/worker.log
agent_log_location=/var/log/pem/agent.log
long_wait=30
short_wait=10
alert_threads=0
enable_smtp=false
enable_snmp=false
enable_nagios=false
allow_server_restart=true
allow_package_management=false
max_connections=0
connection_lifetime=0
allow_batch_probes=false
batch_script_dir=/tmp
heartbeat_connection=false
allow_streaming_replication=false
ca_file=/opt/PEM/agent/share/certs/ca-bundle.crt

```

After modifying the `agent.cfg` file, you must restart the PEM agent service; you can use the `pemagent` service script on the Linux command line to restart the service:

`/etc/init.d/pemagent restart`

### If the PEM Agent Resides on Windows

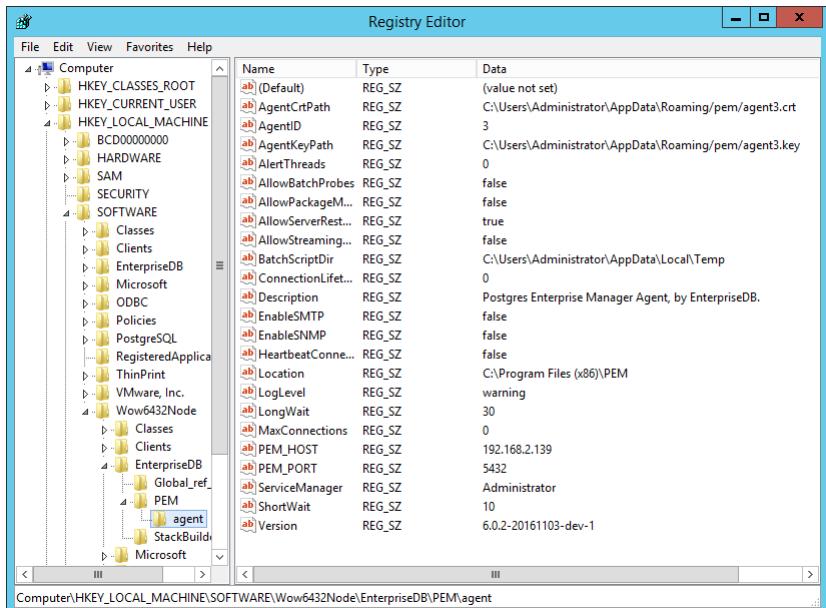
Before modifying the Windows registry on the monitored node, confirm that the firewall on the host of the PEM agent will allow connections to the PEM server. After confirming that the PEM agent host can connect to the PEM server host, you can use the Windows `Registry Editor` to review and edit the `PEM_HOST` and `PEM_PORT` entries to ensure that they correctly identify the host and port used by the PEM server. To open the `Registry Editor`, enter `regedit` in the Windows `Run` dialog or in the Windows start menu search box.

Navigate through the registry tree control to view or modify registry entries. On 64-bit Windows, the PEM agent registry entries are located:

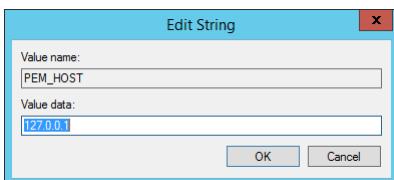
`HKEY_LOCAL_MACHINE\SOFTWARE\wow6432Mode\EnterpriseDB\PEM agent`

On 32-bit Windows, the PEM agent registry entries are located:

`HKEY_LOCAL_MACHINE\SOFTWARE\EnterpriseDB\PEM agent`

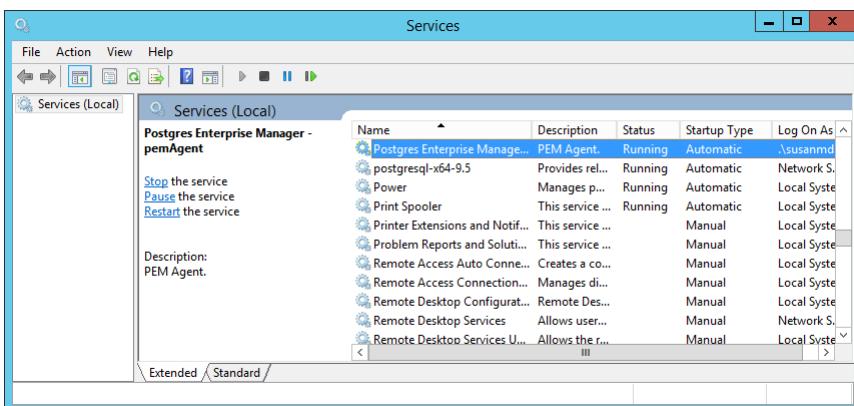


The **PEM\_HOST** and **PEM\_PORT** entries must specify the address and port number of the new PEM server on the target host. To modify a registry entry, right click on the entry **Name**, and select **Modify** from the context menu to open the **Edit String** dialog.



Use the **Edit String** dialog to make any changes to the value of the entry. When you're finished, click **OK** to save your changes, or **Cancel** to exit without saving.

After modifying the registry, you must restart the PEM agent's service; you can use the **Services** dialog (accessed through the Windows **Control Panel**) to restart the **Postgres Enterprise Manager - pemAgent** service.



After moving the server, change the connection properties in any installed PEM clients to connect to the new host of the PEM server, agents, and monitored servers.

## 8.4 Troubleshooting

## The pem.alert Table Fails to Restore

When restoring the `pem` backing database from backup, you may encounter an error during the restoration of the `pem.alert` table. This is caused by a missing table pre-requisite for the table - the `pg_restore` utility may restore the `pem.alert` pre-requisites *after* it attempts to restore `pem.alert`.

If this happens, the output from `pg_restore` will include error messages that refer to the `alert` table:

```
pg_restore: [archiver (db)] could not execute query: ERROR: insert or
update on table "alert_history" violates foreign key constraint
"alert_history_alert_id_fkey"
DETAIL: Key (alert_id)=(3) is not present in table "alert".
Command was: ALTER TABLE ONLY alert_history
ADD CONSTRAINT alert_history_alert_id_fkey FOREIGN KEY (alert_id)
REFERENCES alert(id) ON...
pg_restore: creating FK CONSTRAINT alert_status_alert_id_fkey
pg_restore: [archiver (db)] Error from TOC entry 3265; 2606 18355 FK
CONSTRAINT alert_status_alert_id_fkey postgres
pg_restore: [archiver (db)] could not execute query: ERROR: insert or
update on table "alert_status" violates foreign key constraint
>alert_status_alert_id_fkey"
DETAIL: Key (alert_id)=(1) is not present in table "alert".
Command was: ALTER TABLE ONLY alert_status
ADD CONSTRAINT alert_status_alert_id_fkey FOREIGN KEY (alert_id)
REFERENCES alert(id) ON U...
```

If you encounter this problem, restore the `pem` database before restoring the `pem.alert` table. Restoring the `pem` database will install the pre-requisites for `pem.alert`, and the restoration of the table should complete as expected.

## 8.5 Uninstalling Postgres Enterprise Manager

The process of uninstalling the PEM server or agent is platform-specific. The name of the package for PEM server is `edb-pem` and for PEM agent is `edb-pem-agent`.

If you uninstall the PEM server package from a host, the PEM agent package installed on the same host doesn't get uninstalled. But if you uninstall the PEM agent package, then the PEM server package installed on the same host also gets uninstalled.

### Uninstalling PEM from Windows hosts

If the PEM installation resides on a Windows host, you can use the Windows `Add/Remove Programs` application to remove PEM components. Select the `Add/Remove Programs` option from the Windows `Control Panel`. When the `control panel` opens, locate the name of the PEM component in the program list. Click the `Remove` button to remove the component.

You can also invoke the uninstaller that resides at the following location:

`C:\Program Files\edb\pem\server`

## Uninstalling PEM from CentOS or RHEL hosts

You can use variations of the `rpm`, `yum remove`, or `yum erase` commands to remove the installed packages. Note that removing a package does not damage the PEM data directory.

- Include the `-e` option when invoking the `rpm` command to remove an installed package; the command syntax is:

```
rpm -e <package_name>
```

- You can use the `yum remove` command to remove the pem server or agent package installed by yum. To remove a package, open a terminal window, assume superuser privileges, and enter the command:

```
yum remove <package_name>
```

- You can use the `yum erase` command to remove the pem server or agent package along with the `edb-pem` and `edb-pem-docs` dependencies. To remove a package, open a terminal window, assume superuser privileges, and enter the command:

```
yum erase <package_name>
```

Where `package_name` is the name of the package that you would like to remove.

## Uninstalling PEM from Debian or Ubuntu hosts

You can use `apt-get remove` or `apt-get purge` command to uninstall the PEM server or agent package from a Debian or Ubuntu host:

- To uninstall PEM server or agent from a Debian or Ubuntu host without impacting the configuration files and data directories, invoke the following command:

```
apt-get remove <package_name>
```

- To uninstall PEM server or agent along with the configuration files and data directory, invoke the following command:

```
apt-get purge <package_name>
```

Where `package_name` is the name of the package that you would like to remove.

## Uninstalling PEM from SLES hosts

To uninstall PEM server or agent from a SLES host, invoke the following command:

```
zypper remove <package_name>
```

Where `package_name` is the name of the package that you would like to remove.