Postgres Enterprise Manager

Version pem

Built at 2020-12-10T17:34:37

1 PEM Agent User Guide 3
1.1 Postgres Enterprise Manager - Overview 3
1.2 Installing a PEM Agent 4
1.3 Registering an Agent 13
1.4 Managing a PEM Agent 16
1.5 PEM Agent Troubleshooting 22
1.6 Uninstalling a PEM Agent 24
2 Getting Started Guide 24
2.1 PEM Overview 25
2.2 Registering a Server 25
2.3 Managing Certificates 35
2.4 Managing a PEM Server 39
2.5 Managing a PEM Agent 57

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 architecure and also provides information about hardware and software prerequsites 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 trobleshooting 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

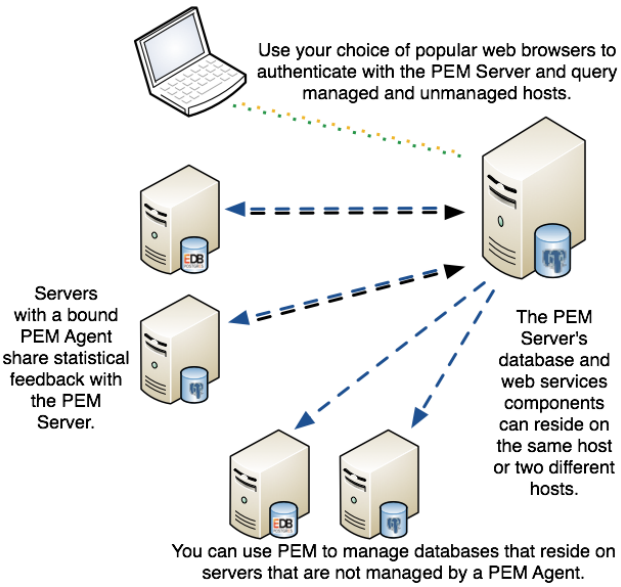
Postgres Enterprise Manager (PEM) consists of components that provide the management and analytical features of PEM:

- **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.

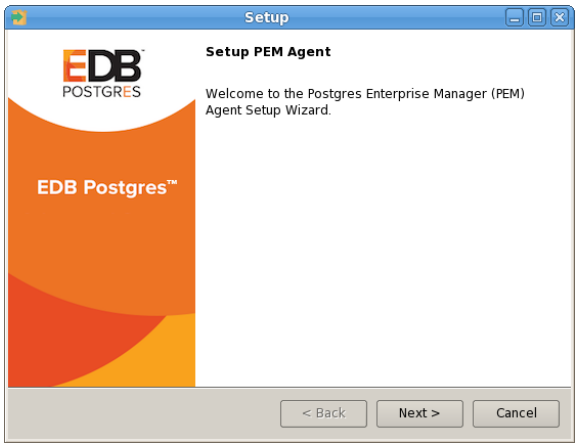
To install the Postgres Enterprise Manager agent on a Linux host, you must use an RPM package.

Installers are available from the EnterpriseDB website at:

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

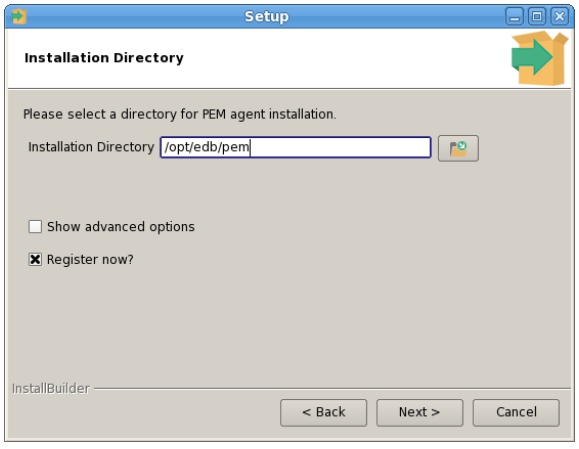
Installing an Agent on a Windows Host

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.

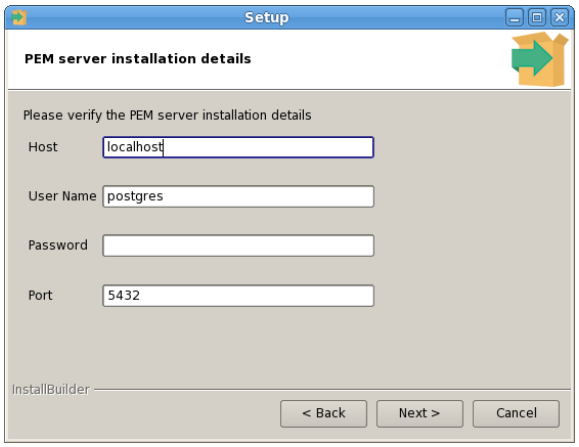
Carefully review the license agreement before highlighting the appropriate radio button and accepting the agreement; click Next to continue to the Installation Directory dialog.



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.



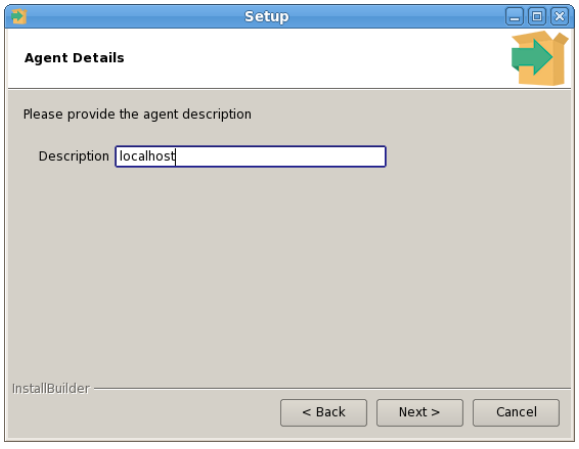
Enter the connection details for the PEM server on the PEM server installation details dialog:

- 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

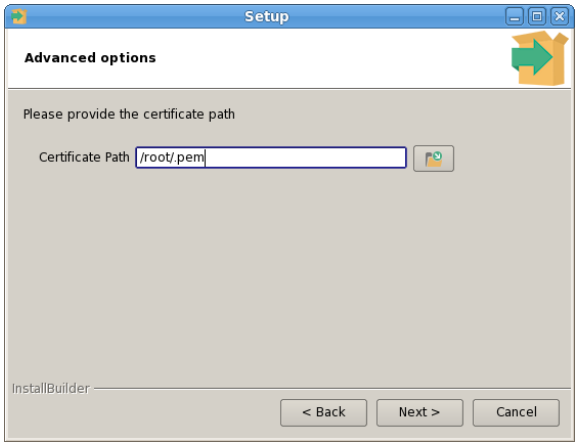
The PEM server must allow connections from the PEM agent installer. If you encounter a connection error, confirm the connection properties specified on the PEM Server Installation Details dialog are correct, and confirm that the pg_hba.conf file (on the PEM server) will allow a connection to the server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



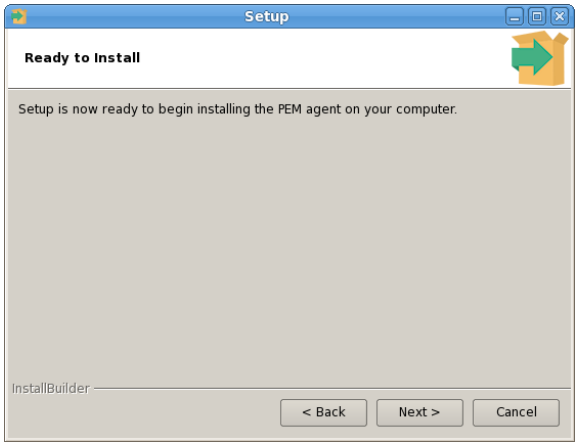
The tree control displayed in the Browser panel of the PEM web interface displays the value entered in the

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.

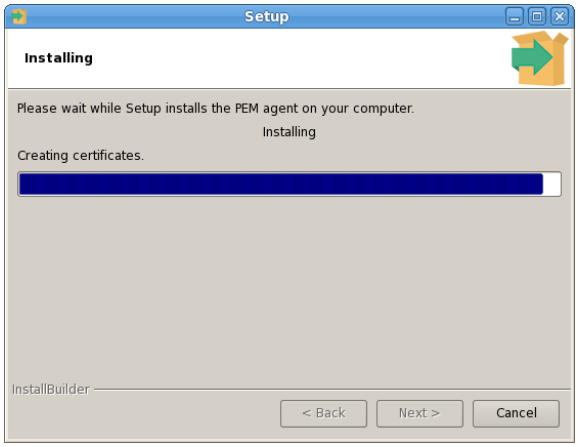
If you checked the Show advanced options checkbox, the Advanced options dialog opens:



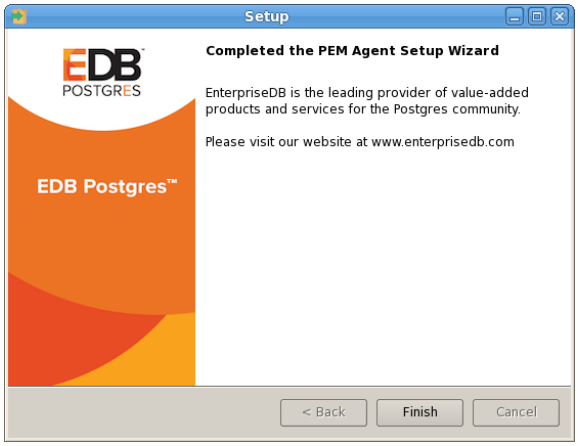
By default, the PEM agent installer places the certificate in the /root/.pem directory. Specify an alternate path for the certificate or accept the default and click Next. The wizard is now ready to install the PEM agent; click Back to amend the installation directory, or Next to continue.



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.
```

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 RHEL or CentOS system, you can use the yum package manager to install a PEM agent.

Prerequsites: Before using a package manager to install the PEM agent, the host must contain the `epel-release` and `wxBase` packages. To install these packages, open a command line, assume `root` privileges, and invoke the commands:

- yum install epel-release
- yum install wxBase

You must also have credentials for the EnterpriseDB repository. To request credentials for the repository, contact EnterpriseDB .

After installing the pre-requisite packages, you can install the PEM agent:

1. Download the edb-repo installation package from: http://yum.enterprisedb.com/

The `edb-repo` package creates the repository configuration file named `edb.repo`. The edb.repo file defines multiple repositories hosted at EnterpriseDB.com.

1. Assume `superuser` privileges and use the following command to install the edb -repo package, and create the repository configuration file:

   `rpm -Uvh edb-repo-<x>.noarch.rpm`

Where *x* specifies the version of the file.

Then, use your choice of editor to modify the configuration file, enabling the `enterprisedb - tools` and `enterprisedb - dependencies` repositories. The configuration file is named edb.repo ; it resides in

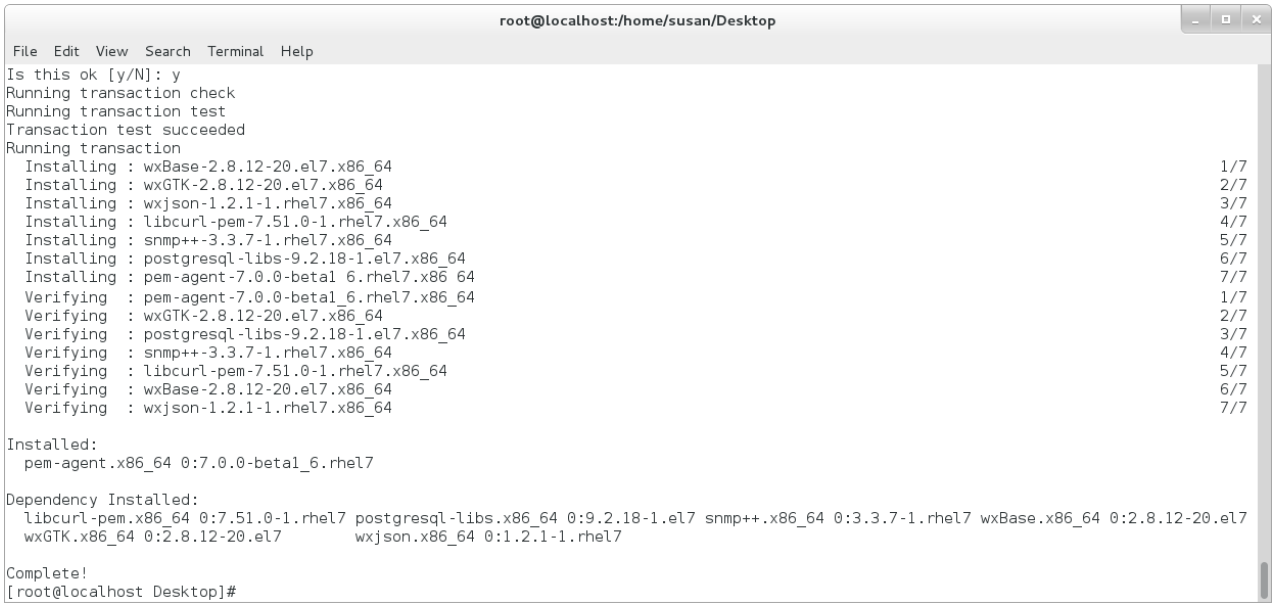
/etc/yum.repos.d. To enable a repository, change the value of the enabled parameter to 1 and replace the user _ name and password placeholders in the baseurl specification with your repository credentials. For example:

```
[enterprisedb-tools]

name=EnterpriseDB Tools $releasever - $basearch

baseurl=http://<user_name>:<password>@yum.enterprisedb.com/tools/r
edhat/rhel-$releasever-$basearch

enabled=1

gpgcheck=1

gpgkey=file:///etc/pki/rpm-gpg/ENTERPRISEDB-GPG-KEY

[enterprisedb-dependencies]

name=EnterpriseDB Dependencies $releasever - $basearch
Copyright ----------------------------------------------© 2013 - 2019 EnterpriseDB Corporation. All rights reserved.
77EDB Postgres Enterprise Manager Installation Guide

baseurl=http://user_name:password@yum.enterprisedb.com/depende
ncies/redhat/rhel-$releasever-$basearch

enabled=1

gpgcheck=1

gpgkey=file:///etc/pki/rpm-gpg/ENTERPRISEDB-GPG-KEY

[edbas96]

name=EnterpriseDB Advanced Server 9.6 $releasever - $basearch

baseurl=http://user_name:password@yum.enterprisedb.com/9.6/red
hat/rhel-$releasever-$basearch

enabled=1

gpgcheck=1

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

1. After modifying the content of the repository configuration file, you can use yum to install the PEM agent:

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

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



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 a `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/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
--pem-server	Specifies the IP address of the PEM server. This parameter is required.
--pem-user	Specifies the name of the PEM user. This parameter is required.
--pem-port	Specifies the port that PEM monitors for connections. The default value is 5432.
--cert-path	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, ~/.pem On Windows, %APPDATA%/pem
--display-name	Specifies a user-friendly name that will be displayed in the PEM Browser tree control. The default is the system hostname.
--group	The name of the group in which the agent will be displayed.
--team	The name of the group role that may access the PEM Agent.
--owner	The name of the owner of the PEM Agent.
--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.
--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 No.

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'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
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

Parameter Name	Description	Default Value
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:

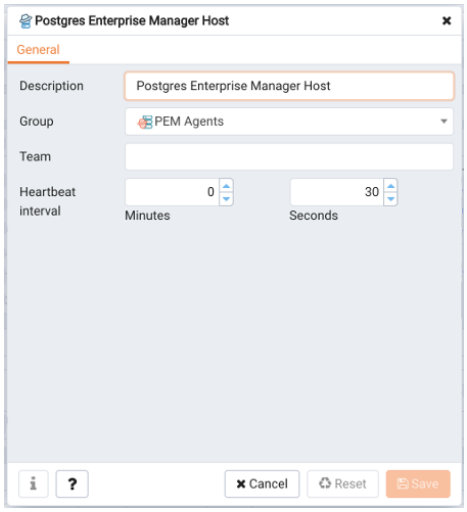
Parameter Name	Description	Default Value
PEM_HOST	The IP address or hostname of the PEM server.	127.0.0.1.
PEM_PORT	The database server port to which the agent connects to communicate with the PEM server.	Port 5432.
AgentID	A unique identifier assigned to the PEM agent.	The first agent is '1', the second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

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:

```
DELETE FROM pem.agent 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:

```
DELETE FROM pem.agent 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 Getting Started Guide

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.

2.1 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.

2.2 Registering a Server

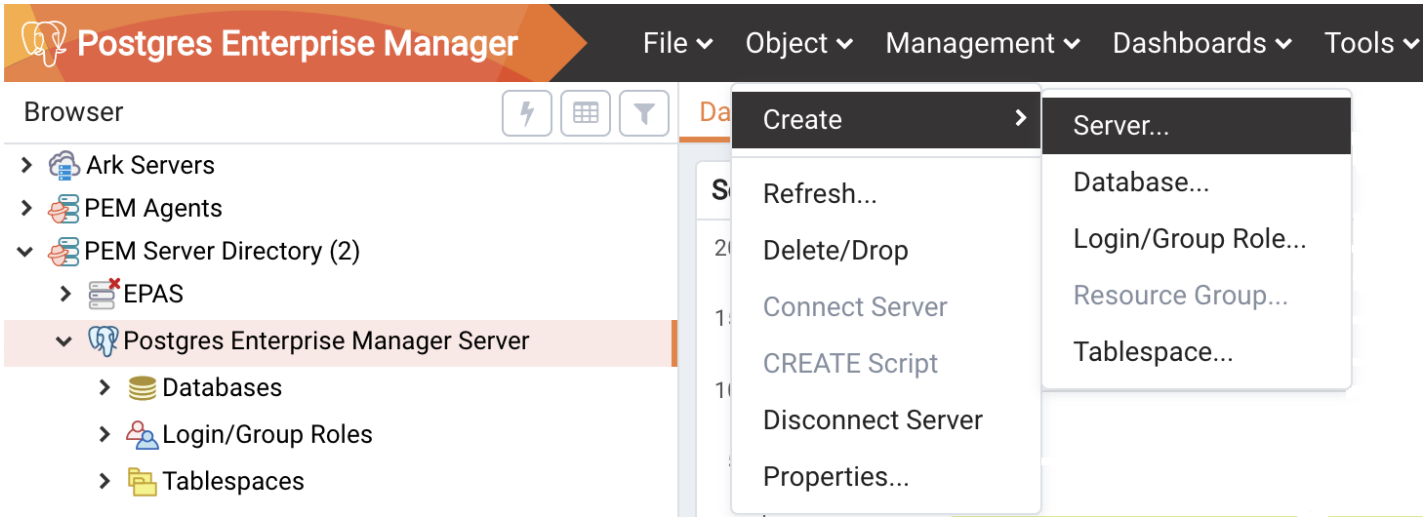
Before you can manage or monitor a server with PEM, you must register the server with PEM, and bind an agent. A server may be bound to a remote agent (an agent that resides on a different host), but if the agent does not reside on the same host, it will not have access to all of the statistical information about the instance.

Manually Registering a Server

To manage or monitor a server with PEM, you must:

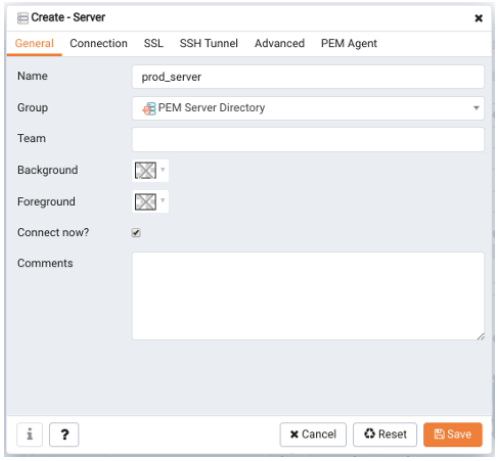
- Register your Advanced Server or PostgreSQL server with the PEM server.
- Bind the server to a PEM agent.

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….



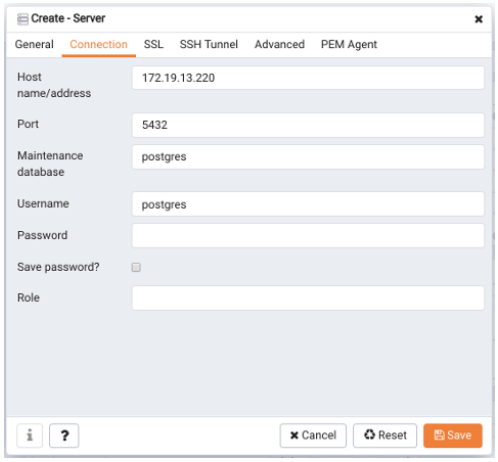
Note

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:

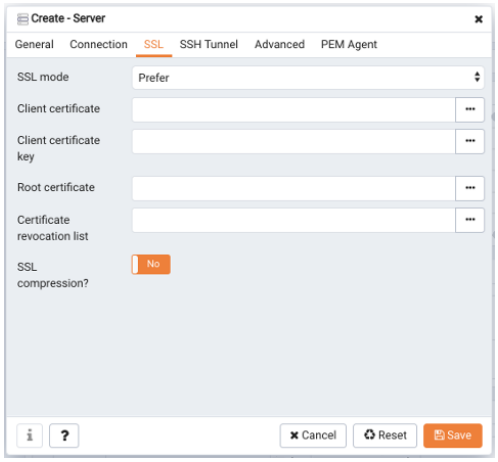
- Use the Name field to specify a user-friendly name for the server. The name specified will identify the server in the PEM Browser tree control.
- You can use groups to organize your servers and agents in the tree control. Using groups can help you manage large numbers of servers more easily. For example, 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 preferrable 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

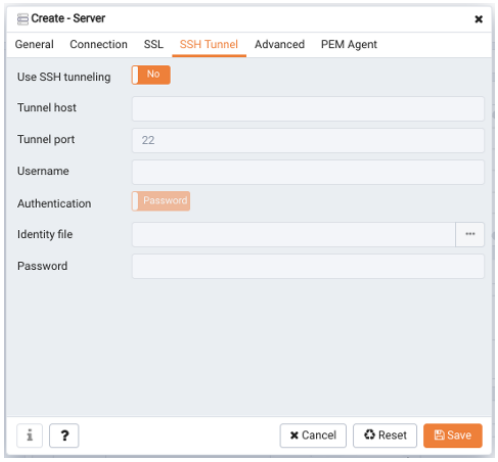
You can use the platform-specific `File` manager dialog to upload files that support SSL encryption to the server. To access the File manager, click the icon that is located to the right of each of the following fields:

- 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

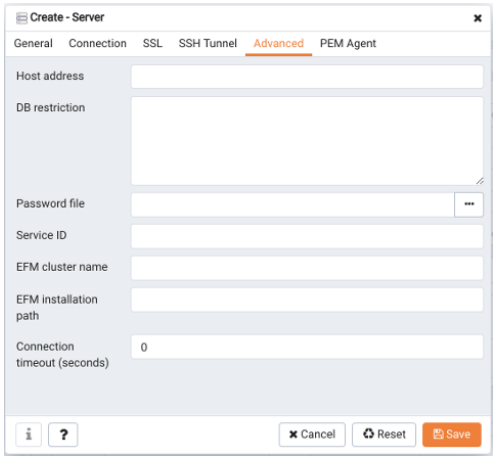
Certificates, private keys, and the revocation list are stored in the per-user file storage area on the server, which is owned by the user account under which the PEM server process is run. This means that administrators of the

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 Address1 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

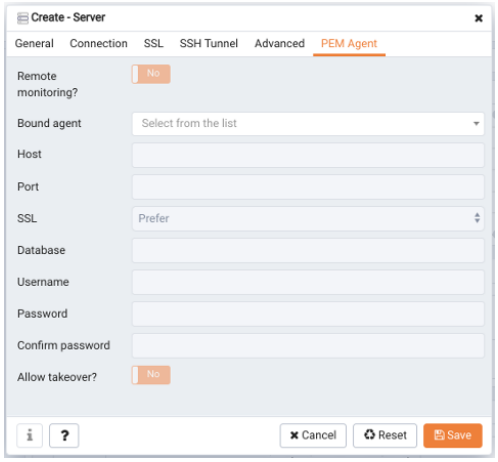
- Use the Service ID field to specify parameters to control the database service process. For servers that are stored in the Enterprise Manager directory, enter the service ID. On Windows machines, this is the identifier for the Windows service. On Linux machines, this is the name of the init script 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:

- 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).

- 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.
- 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.

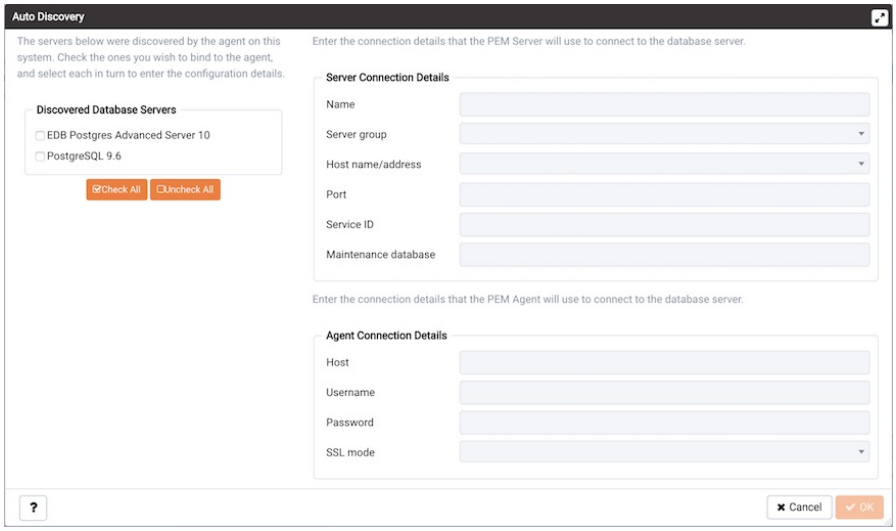
To view the properties of a server, right-click on the server name in the PEM client tree control, and select the Properties... option from the context menu. To modify a server's properties, disconnect from the server before opening the Properties dialog.

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.

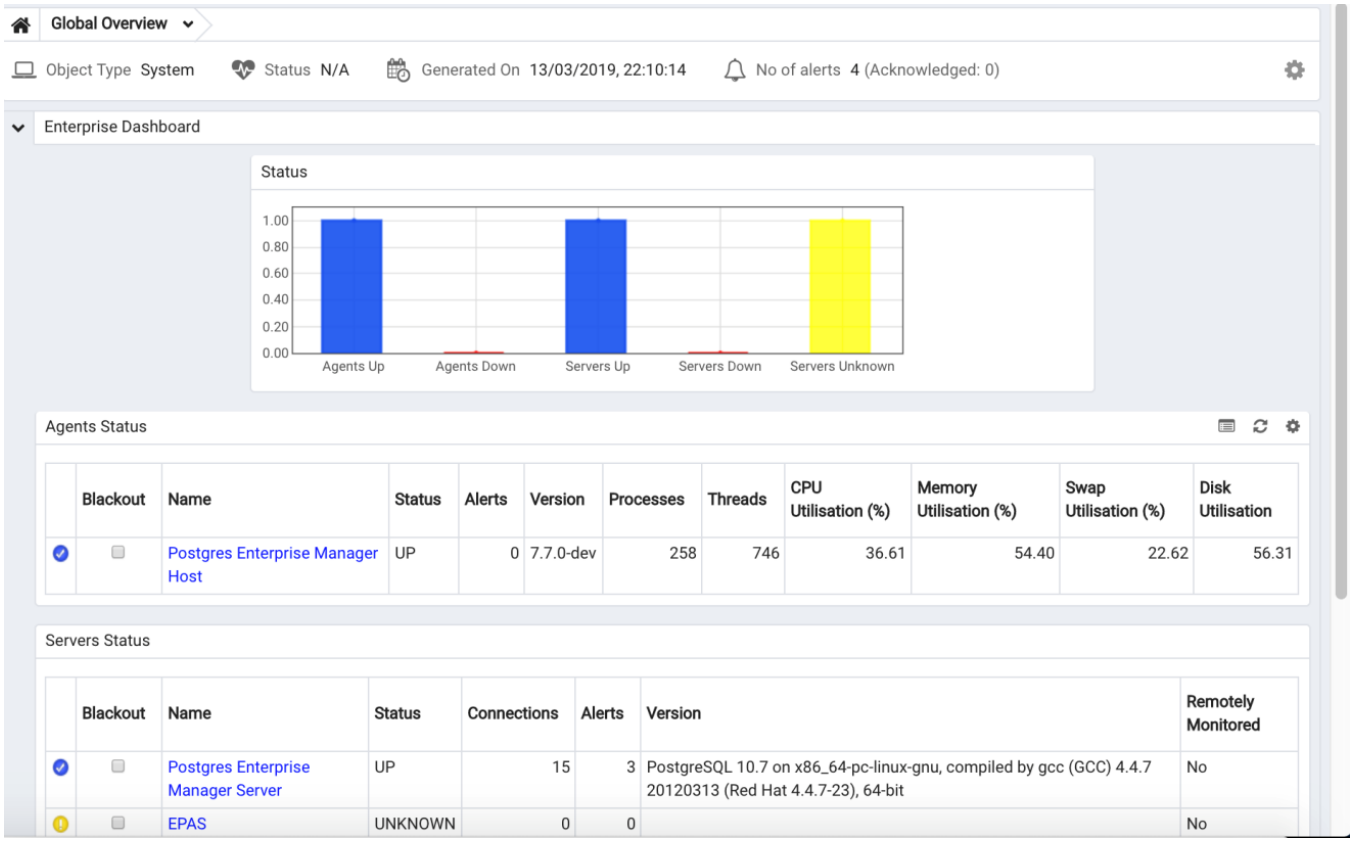
The fields in the Server Connection Details box provide information about the server that PEM will monitor:

- 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.
--server-port	Specifies the port number of the host. Required.

Option	Description
--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:

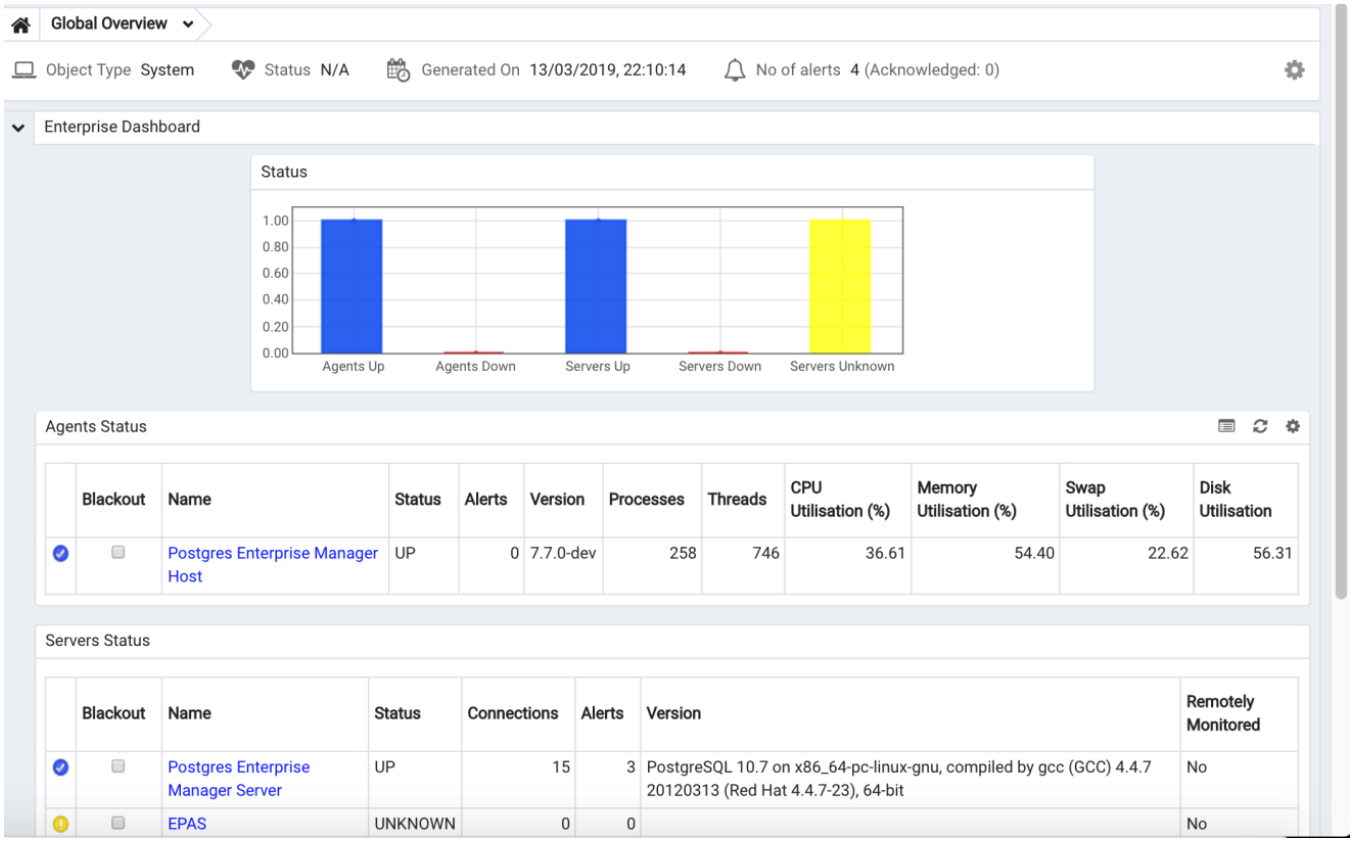
Option	Description
`--pem-user`	Specifies the name of the PEM administrative user. Required.
`--server-addr`	Specifies the IP address of the server host, or the fully qualified domain name. On Unix based systems, the address field may be left blank to use the default PostgreSQL Unix Domain Socket on 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.
`--server-port`	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.

2.3 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`.

2.4 Managing a PEM Server

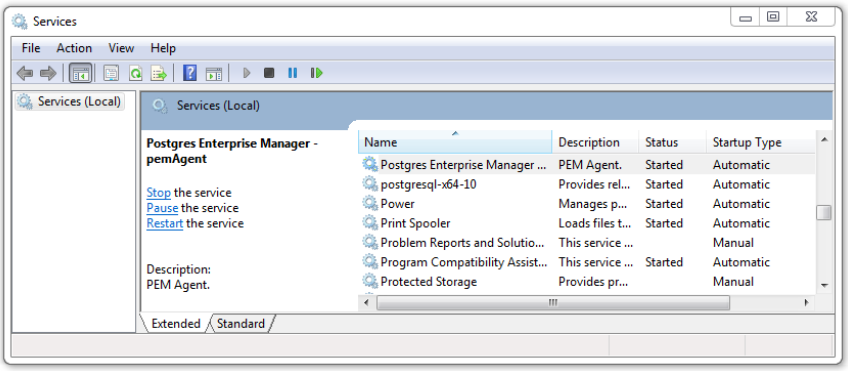
The sections that follow provide information about tasks related to PEM server such as restarting the PEM server and agent, controlling the PEM server or PEM agent, controlling the HTTPD service on Linux and Windows, controlling the HTTPD server, managing PEM authentication and security, modifying the `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

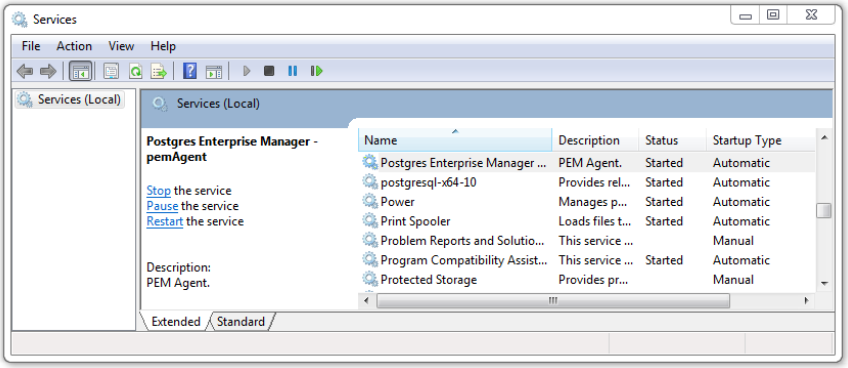
Remotely Starting and Stopping Monitored Servers

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

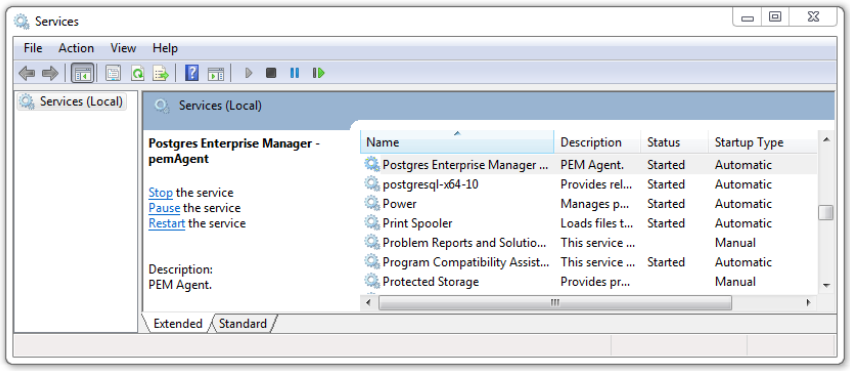
The Windows operating system includes a graphical service controller that displays the server status, and offers

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
```

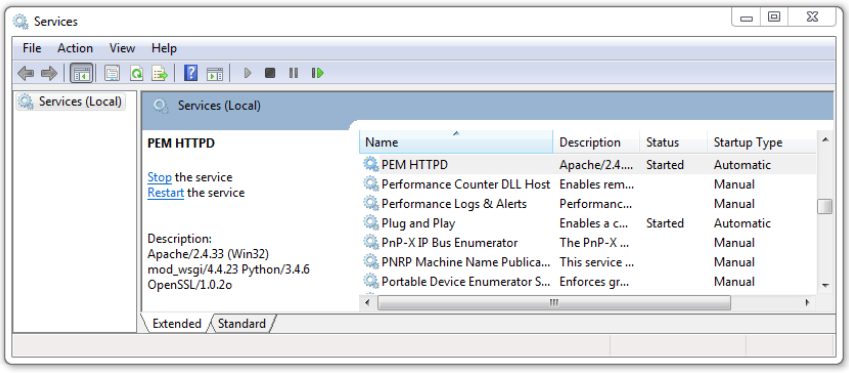
To start the service on a CentOS or RHEL 6.x system, use the command:

```
/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.

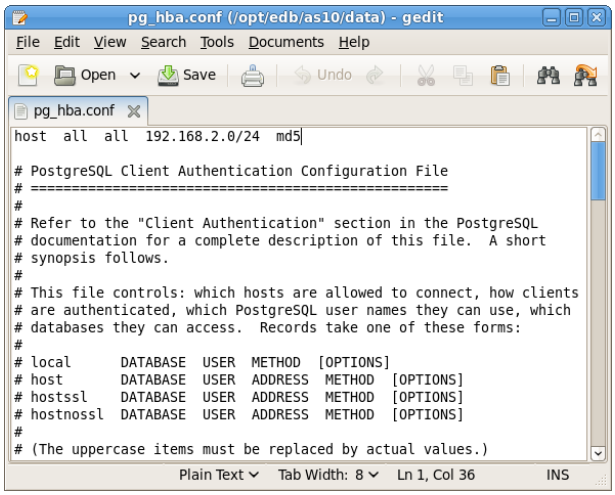


The Status column displays the current state of the server. Click the Start link to start PEM HTTPD if the service is not running.

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:

```
/opt/edb/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.

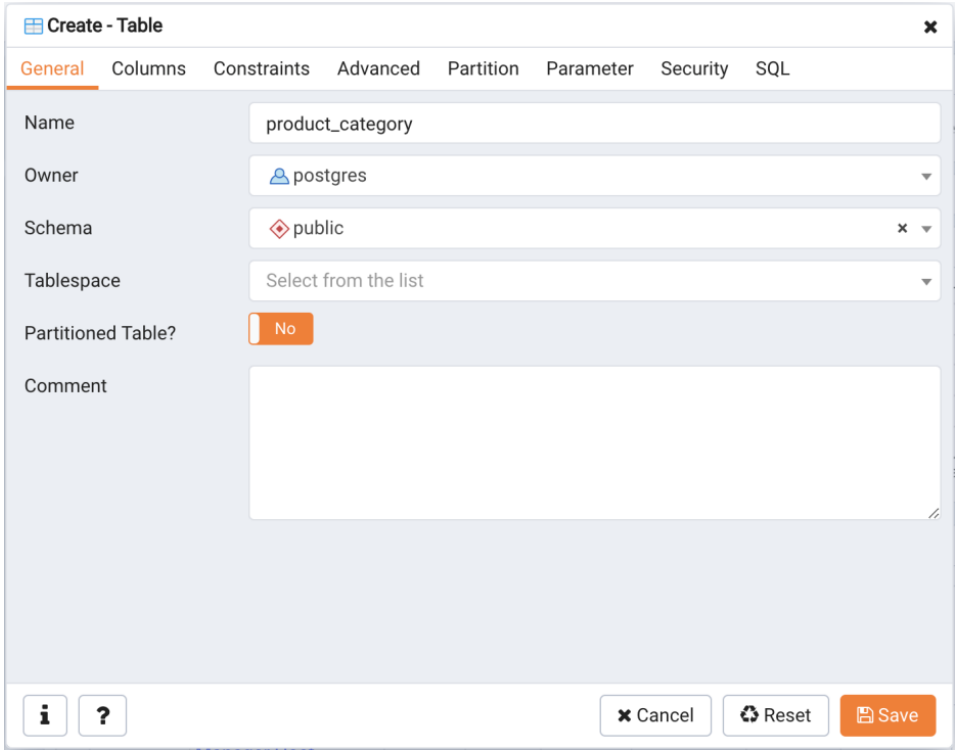
If you receive this error when connecting to the database server, modify the `pg_hba.conf` file, adding an entry that allows the connection.

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:

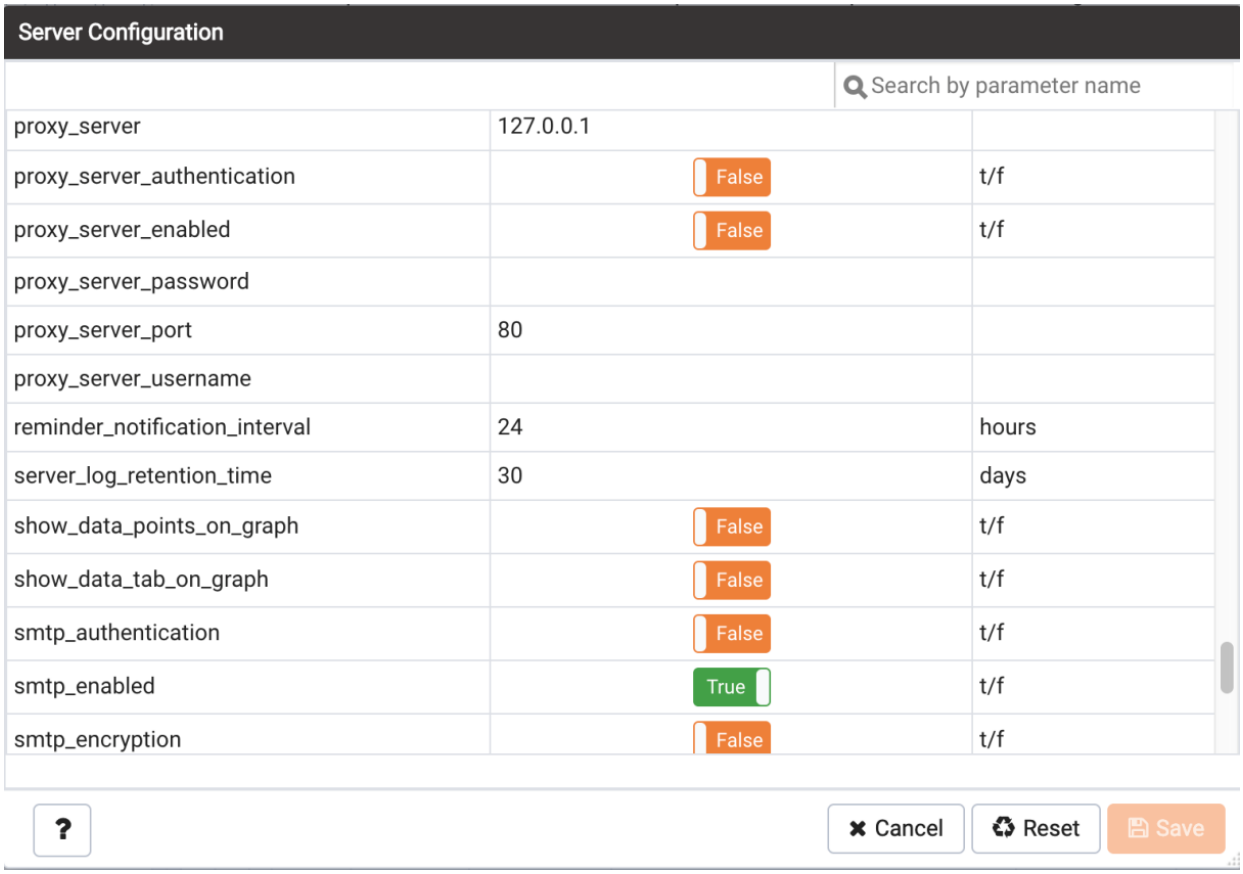
```
http://www.postgresql.org/docs/10/static/client-authentication.html
```

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.



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.

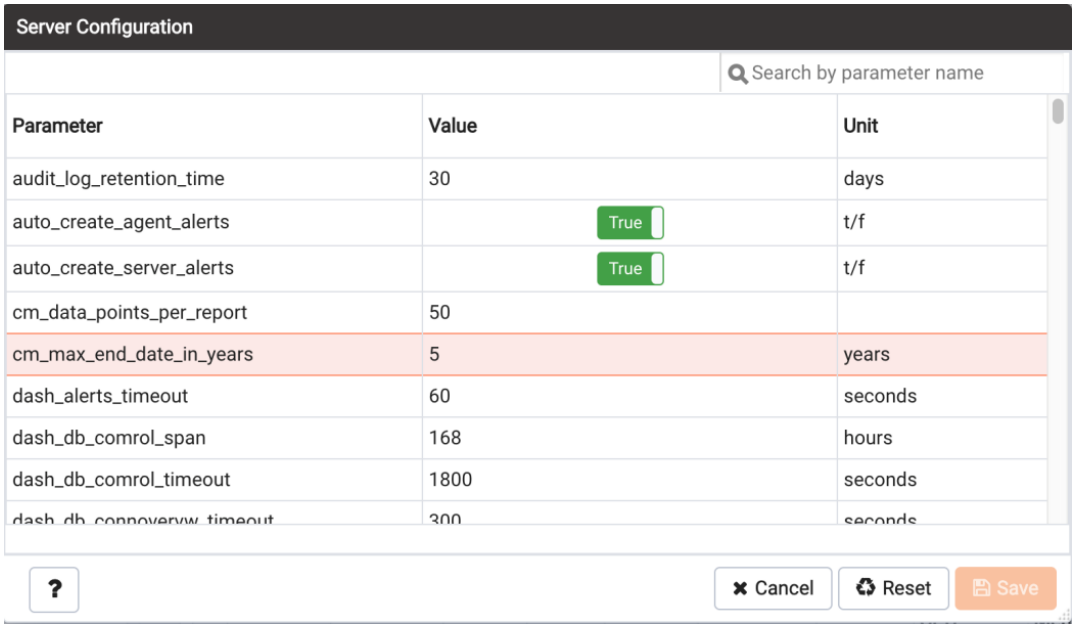
To modify a parameter value, locate the parameter, and modify the parameter value in the Value column. Use the following PEM Server configuration parameters to specify connection details that allow PEM to connect to the proxy server:

- 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.



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.

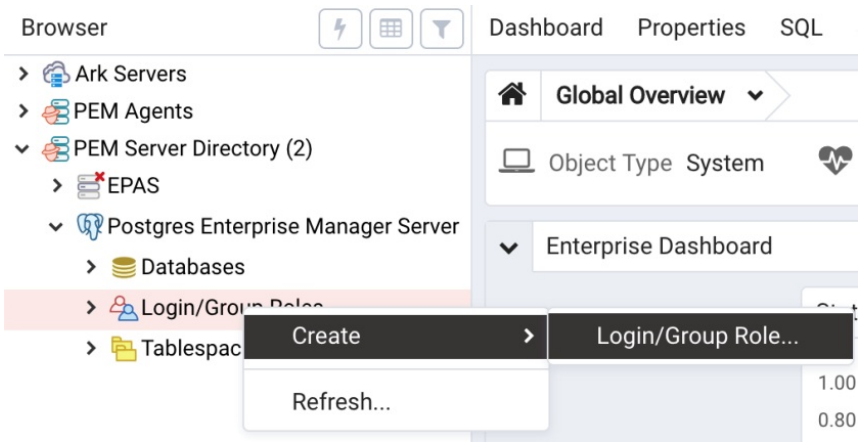
Managing Security

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.

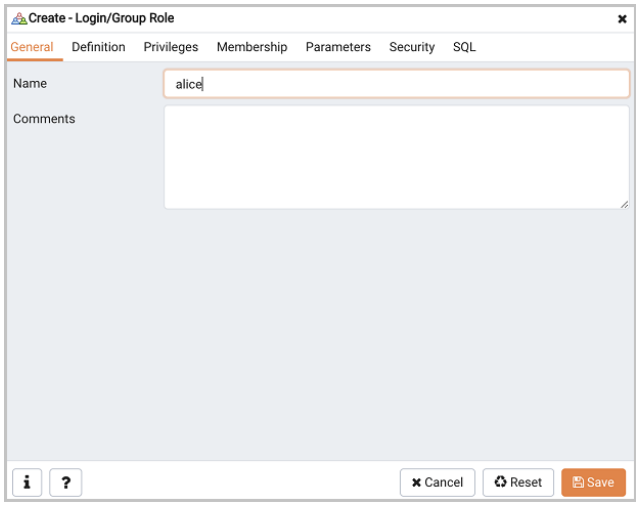
To use the Create – Login/Group Role dialog to create a role, expand the node for the server on which the role will reside in the PEM tree control, and right-click on the Login/Group Roles node to access the context menu. Then, select Login/Group Role… from the Create menu.



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

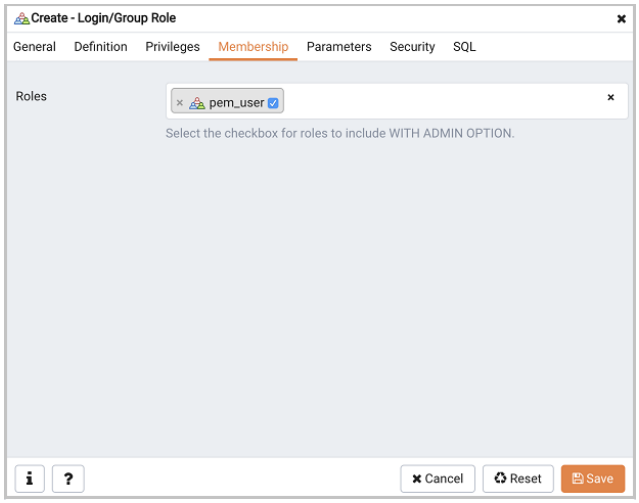
Group roles can serve as containers, used to dispense system privileges (such as creating databases) and object privileges (e.g. inserting data into a particular table). The primary purpose of a group role is to make the mass management of system and object permissions much easier for a DBA. Rather than 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

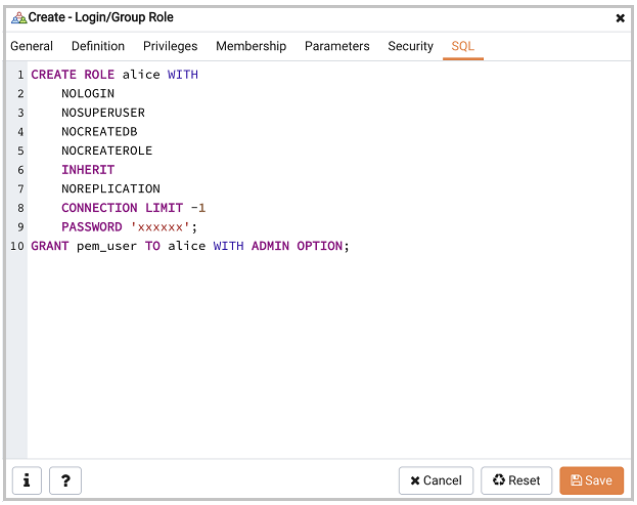
Using PEM Pre-Defined Roles to Manage Access to PEM Functionality

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
pem_super_admin		Role to manage/configure everything on Postgres Enteprise Manager.
pem_admin	pem_super_admin	Role for administration/management/configuration of all visible agents/servers, and monitored objects.
pem_config	pem_admin	Role for configuration management of Postgres Enterprise Manager.
pem_component	pem_admin	Role to run/execute all wizard/dialog based components.
pem_rest_api	pem_admin	Role to access the REST API.

Value	Parent Role	Description
pem_server_service_manager	pem_admin	Role for allowing to restart/reload the monitored database server (if server-id provided).
pem_manage_schedule_task	pem_admin	Role to configure the schedule tasks.
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

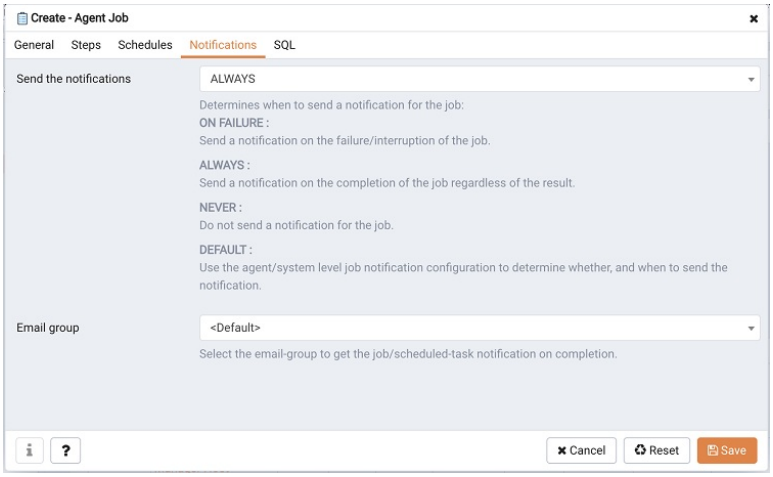
You can configure the settings in PEM console for sending the SMTP trap on success or failure of a system-generated job (listed under scheduled tasks) or a custom-defined agent job. For information on custom-defined agent job, see 'Creating PEM Scheduled Jobs'. These email notification settings can be 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.



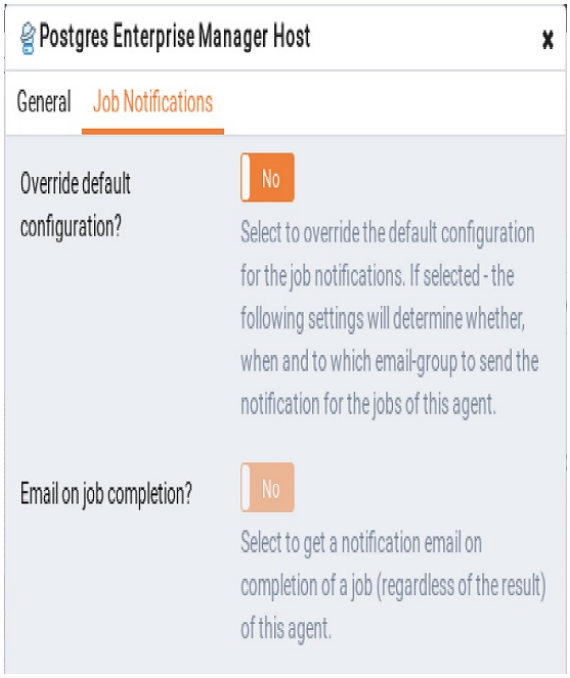
Use the fields on the Notifications tab to configure the email notification settings on job level:

- 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.

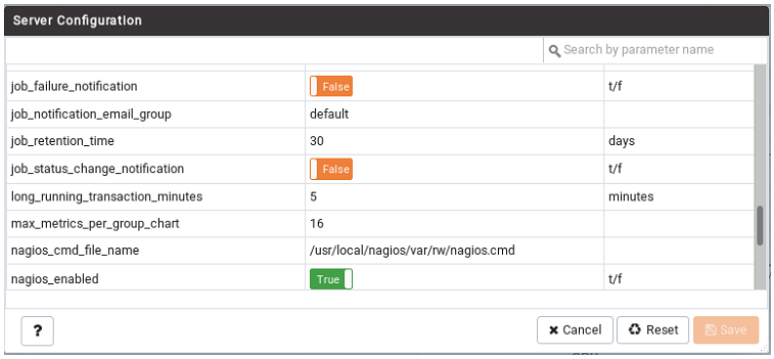


Use the fields on the Job notifications tab to configure the email notification settings on agent level:

- 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.



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.

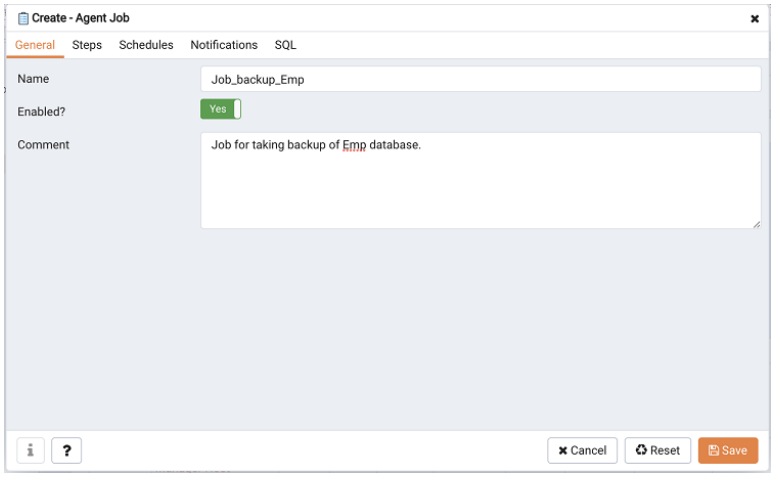
- Use the *job_notification_email_group* parameter to specify the email group that should receive the email notification.
- Use the *job_retention_time parameter* to specify the number of days that non-recurring scheduled tasks should be retained in the system.
- Use the *job_status_change_notification* 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.

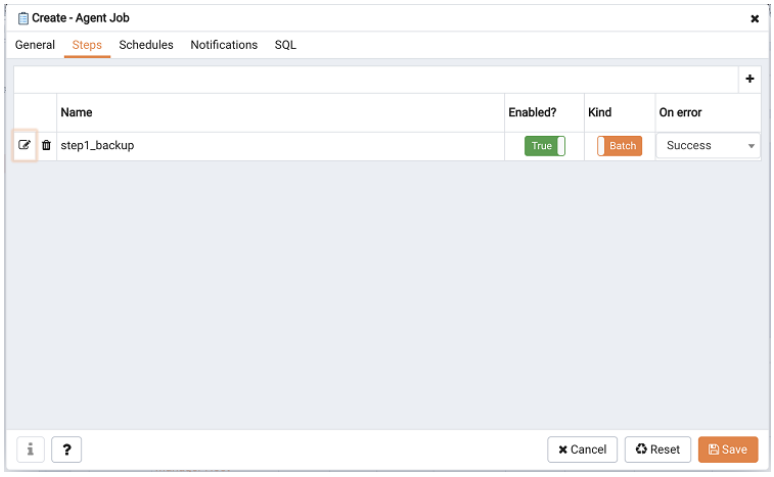
To create or manage a PEM scheduled job, use the PEM tree control to browse to the PEM agent for which you want to create the job. The tree control will display a Jobs node, under which currently defined jobs are displayed. To add a new job, right click on the Jobs node, and select Create Job... from 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.

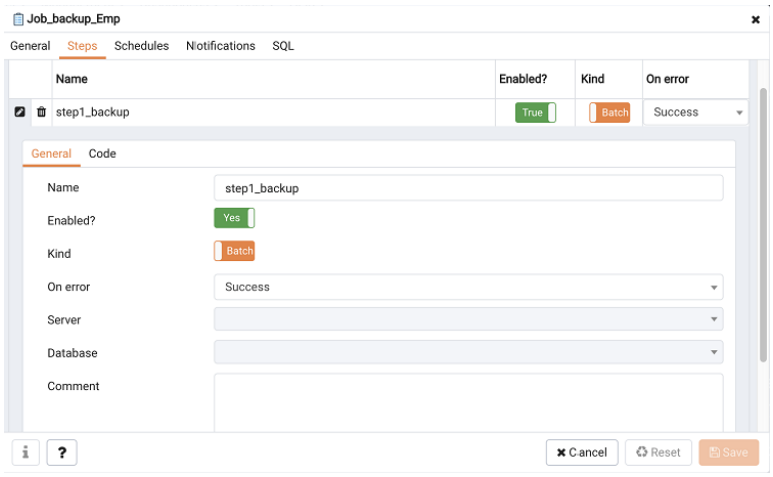


Use the fields on the General tab to provide general information about a job:

- 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.

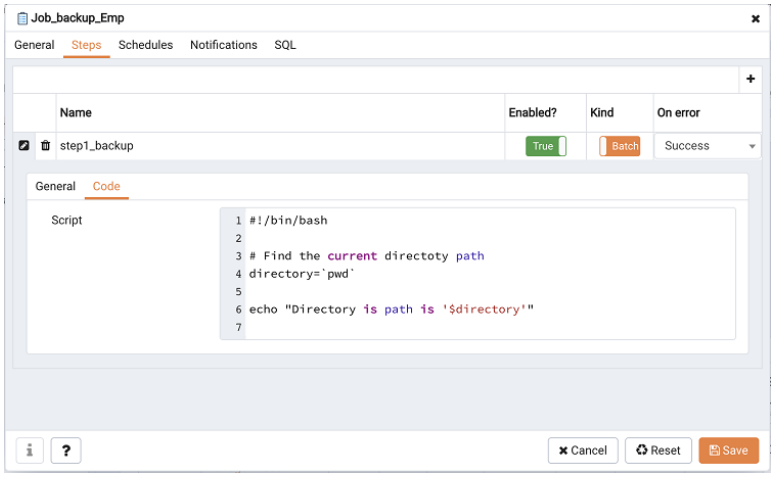


Use the Steps tab to define and manage the steps that the job will perform. Click the Add icon (+) to add a new step; then click the compose icon (located at the left side of the header) to open the step definition dialog:



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.

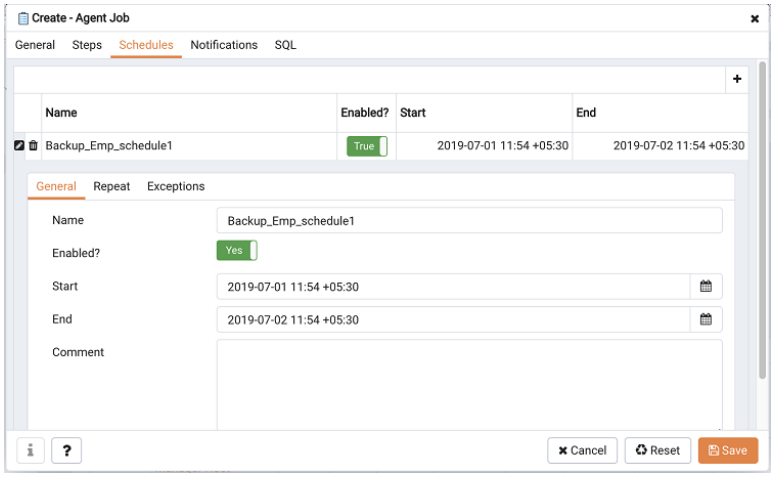


- Use the context-sensitive field on the step definition dialog's Code tab to provide the SQL code or batch script that will be executed during the step:
  - If the step invokes SQL code, provide one or more SQL statements in the SQL query field.
  - If the step invokes a batch script, provide the script 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.

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.

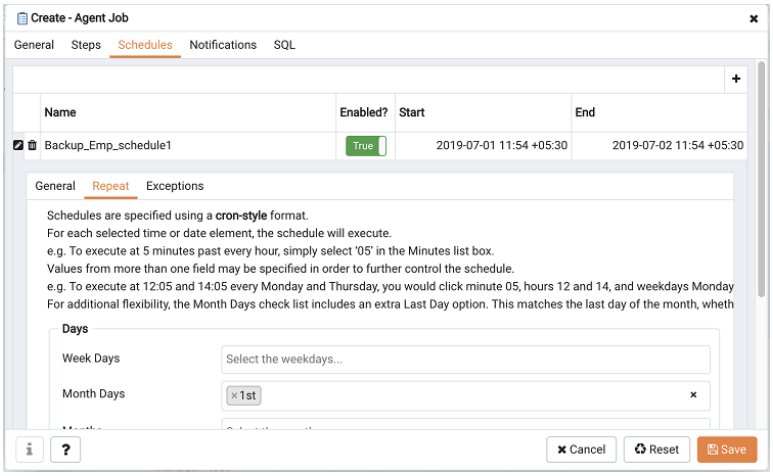
Click the Add icon (+) to add a schedule for the job; then click the compose icon (located at the left side of the header) to open the schedule definition dialog:



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.



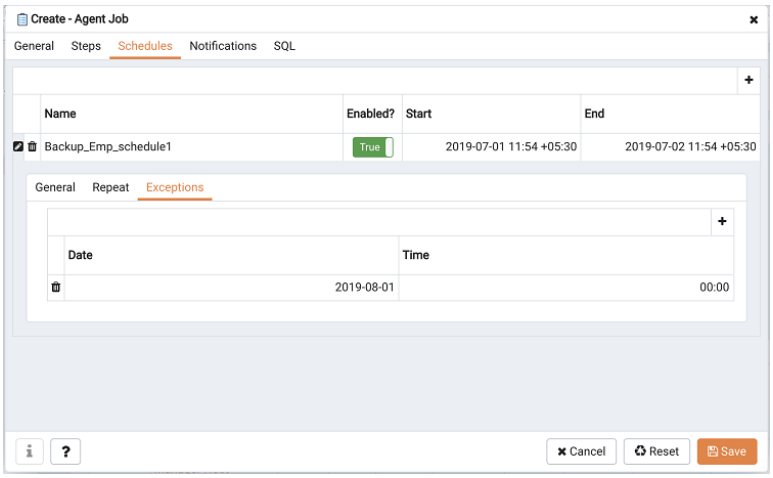
Use the fields on the Repeat tab to specify the details about the schedule in a cron-style format. The job will execute on each date or time element selected on the Repeat tab.

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, irregardless 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.

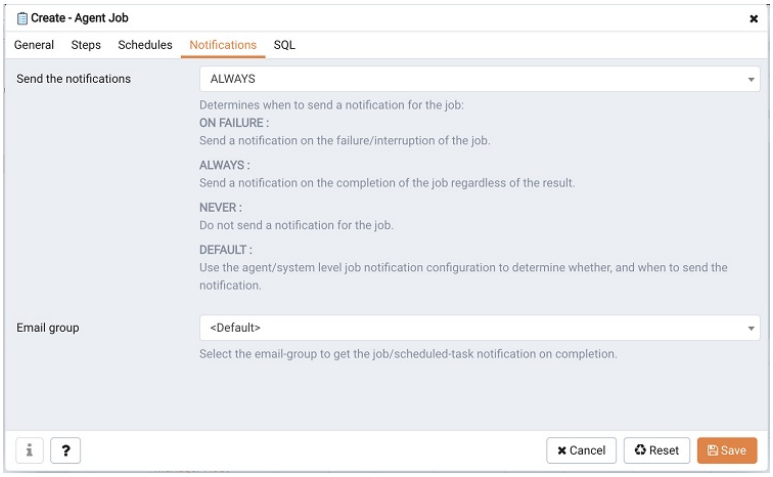


Use the fields on the Exceptions tab to specify days on which you wish the job to not execute; for example, you may wish for jobs to not execute on national holidays.

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.

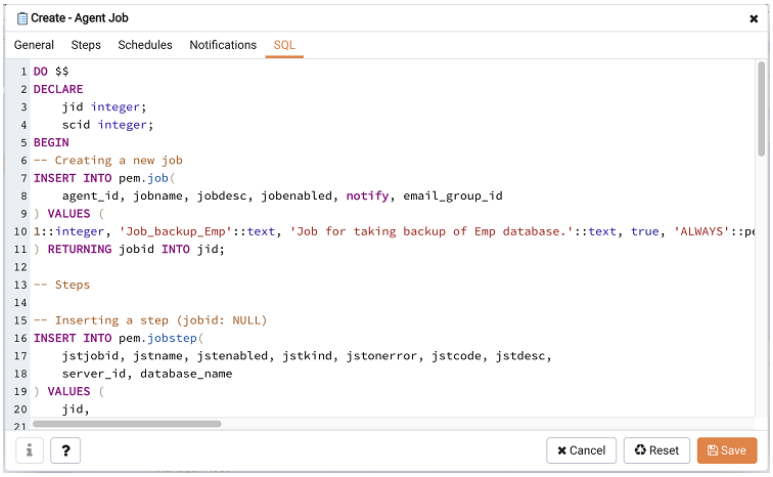
Select the Notifications tab to configure the email notification settings on job level:



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.

2.5 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.

Parameter Name	Description	Default Value
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.
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).

Parameter Name	Description	Default Value
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:

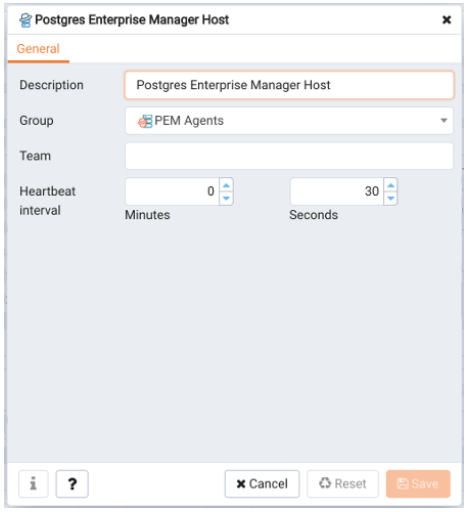
Parameter Name	Description	Default Value
PEM_HOST	The IP address or hostname of the PEM server.	127.0.0.1.
PEM_PORT	The database server port to which the agent connects to communicate with the PEM server.	Port 5432.
AgentID	A unique identifier assigned to the PEM agent.	The first agent is '1', the second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