



EDB Postgres Enterprise Manager[®]
Configuring pgBouncer for use with PEM
Agents

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EDB Postgres Enterprise Manager
Configuring pgBouncer for use with PEM Agents
by EnterpriseDB® Corporation
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1 Introduction

This document provides detailed information about using pgBouncer as a connection pooler for limiting the number of connections from the PEM Agent towards the Postgres Enterprise Manager (PEM) server on non-Windows machine:

- Preparing the PEM Database Server - Chapter [3](#) provides information about preparing the PEM database server to be used with pgBouncer.
- Configuring pgBouncer - Chapter [4](#) provides detailed information about configuring pgBouncer to make it work with the PEM database server.
- Configuring the PEM Agent – Chapter [5](#) provides detailed information about configuring a PEM agent to connect to pgBouncer.

For detailed information about using the PEM 7 web interface, please see the PEM Getting Started Guide.

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

1.1 *Typographical Conventions Used in this Guide*

Certain typographical conventions are used in this manual to clarify the meaning and usage of various commands, statements, programs, examples, etc. This section provides a summary of these conventions.

In the following descriptions a *term* refers to any word or group of words that are language keywords, user-supplied values, literals, etc. A term's exact meaning depends upon the context in which it is used.

- *Italic font* introduces a new term, typically, in the sentence that defines it for the first time.
- Fixed-width (mono-spaced) font is used for terms that must be given literally such as SQL commands, specific table and column names used in the examples, programming language keywords, etc. For example, `SELECT * FROM emp;`
- *Italic fixed-width font* is used for terms for which the user must substitute values in actual usage. For example, `DELETE FROM table_name;`
- A vertical pipe | denotes a choice between the terms on either side of the pipe. A vertical pipe is used to separate two or more alternative terms within square brackets (optional choices) or braces (one mandatory choice).
- Square brackets [] denote that one or none of the enclosed term(s) may be substituted. For example, [a | b], means choose one of “a” or “b” or neither of the two.
- Braces {} denote that exactly one of the enclosed alternatives must be specified. For example, { a | b }, means exactly one of “a” or “b” must be specified.
- Ellipses ... denote that the preceding term may be repeated. For example, [a | b] . . . means that you may have the sequence, “b a a b a”.

2 The PEM Server - PEM Agent Connection Management Mechanism

Each PEM agent connects to the PEM database server using the SSL certificates for each individual user. For example, an agent with ID#1 connects to the PEM database server using the `agent1` user.

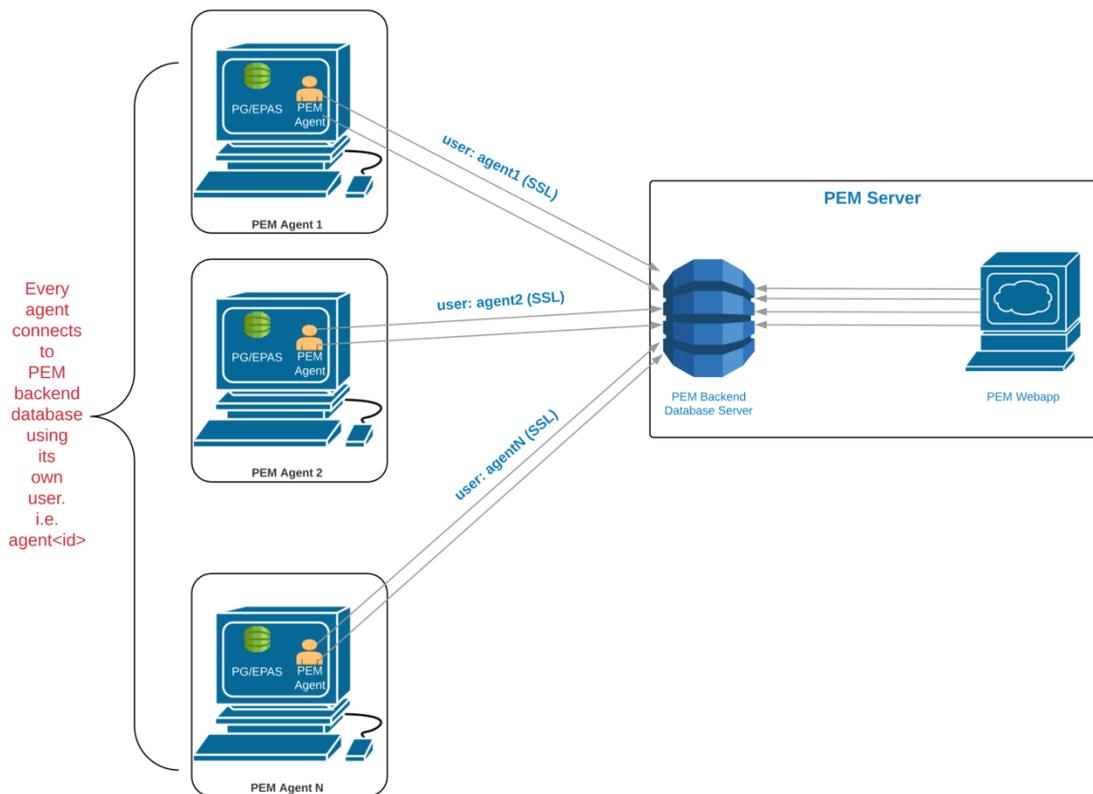


Figure 2.1 - Connecting to the PEM database without pgBouncer.

Prior to PEM version 7.5, the following limitations did not allow use of the connection pooler between the PEM server and PEM agent:

- The PEM agent uses an SSL Certificate to connect the PEM database server.
- It uses an individual user identifier when connecting to the PEM database server.

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EnterpriseDB has modified the PEM agent to allow the agent to use a common database user (instead of the dedicated agent users) to connect the PEM database server.

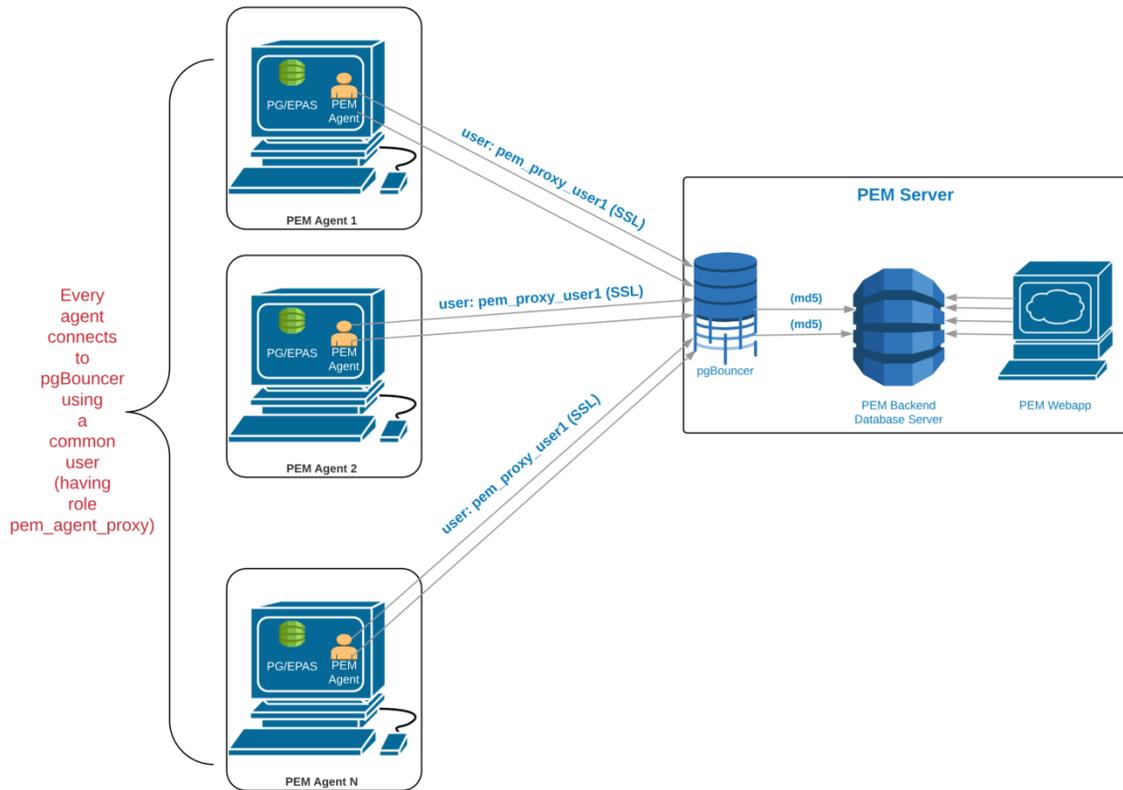


Figure 2.2 - Connecting to pgBouncer.

We recommend using pgBouncer versions equal to or later than version 1.9.0 as the connection pooler. Since versions 1.9.0 or later support `cert` authentication; PEM Agents can connect to pgBouncer using SSL certificates.

3 Preparing the PEM Database Server

You must configure the PEM database server to make it work with pgBouncer; the following example demonstrates the steps required to configure the PEM database server.

1. Create a dedicated user named `pgbouncer` on the PEM database server. For example:

```
pem=# CREATE USER pgbouncer PASSWORD 'ANY_PASSWORD' LOGIN;  
CREATE ROLE
```

2. Create a user named `pem_admin1` (a non-super user) with `pem_admin` and `pem_agent_pool` role membership on the PEM database server. For example:

```
pem=# CREATE USER pem_admin1 PASSWORD 'ANY_PASSWORD' LOGIN  
CREATEROLE;  
CREATE ROLE  
pem=# GRANT pem_admin, pem_agent_pool TO pem_admin1;  
GRANT ROLE
```

3. Grant `CONNECT` privilege to the `pgbouncer` user on the `pem` database. For example:

```
pem=# GRANT CONNECT ON DATABASE pem TO pgbouncer ;GRANT USAGE  
ON SCHEMA pem TO pgbouncer;  
GRANT
```

4. Grant `USAGE` privilege to the `pgbouncer` user for the `pem` schema on the `pem` database. For example:

```
pem=# GRANT USAGE ON SCHEMA pem TO pgbouncer;  
GRANT
```

5. Grant `EXECUTE` privilege to the `pgbouncer` user on the `pem.get_agent_pool_auth(text)` function in the `pem` database. For example:

```
pem=# GRANT EXECUTE ON FUNCTION pem.get_agent_pool_auth(text)  
TO pgbouncer;  
GRANT
```

6. Use the `pem.create_proxy_agent_user(varchar)` function to create a user named `pem_agent_user1` on the PEM database server. For example:

```
pem=# SELECT pem.create_proxy_agent_user('pem_agent_user1');  
  
create_proxy_agent_user  
-----  
(1 row)
```

The function will create a user with the same name with a random password, and grant `pem_agent` and `pem_agent_pool` roles to the user. This allows pgBouncer to use a proxy user on behalf of the agent.

7. Add the following entries to the start of the `pg_hba.conf` file of the PEM database server; this will allow pgBouncer user to connect to the pem database using the md5 authentication method. For example:

```
# Allow the PEM agent proxy user (used by  
# pgbouncer) to connect the to PEM server using  
# md5
```

```
local pem pgbouncer,pem_admin1 md5
```

4 Configuring pgBouncer

You must configure pgBouncer to work with the PEM database server. In our example, we will run pgBouncer as the `enterprisedb` system user. The following steps outline the process of configuring pgBouncer (version ≥ 1.9).

1. Open a terminal window and navigate into the pgBouncer directory.
2. Change the owner of the `etc` directory for pgBouncer (where `pgbouncer.ini` resides) to `enterprisedb`, and change the directory permissions to `0700`. For example:

```
$ chown enterprisedb:enterprisedb /etc/edb/pgbouncer1.9
$ chmod 0700 /etc/edb/pgbouncer1.9
```

3. Change the contents of the `pgbouncer.ini` or `edb-pgbouncer.ini` file as follows:

```
[databases]
;; Change the pool_size according to maximum connections
allowed
;; to the PEM database server as required.
;; 'auth_user' will be used for authenticate the db user
(proxy
;; agent user in our case)

pem = port=5444 host=/tmp dbname=pem auth_user=pgbouncer
pool_size=80 pool_mode=transaction
* = port=5444 host=/tmp dbname=pem auth_user=pgbouncer
pool_size=10

[pgbouncer]
logfile = /var/log/edb/pgbouncer1.9/edb-pgbouncer-1.9.log
pidfile = /var/run/edb/pgbouncer1.9/edb-pgbouncer-1.9.pid
listen_addr = *
;; Agent needs to use this port to connect the pem database
now
listen_port = 6432
;; Require to support for the SSL Certificate authentications
;; for PEM Agents
client_tls_sslmode = require
;; These are the root.crt, server.key, server.crt files
present
;; in the present under the data directory of the PEM database
;; server, used by the PEM Agents for connections.
client_tls_ca_file = /var/lib/edb/as11/data/root.crt
client_tls_key_file = /var/lib/edb/as11/data/server.key
client_tls_cert_file = /var/lib/edb/as11/data/server.crt
;; Use hba file for client connections
```

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```
auth_type = hba
;; Authentication file, Reference:
;; https://pgbouncer.github.io/config.html#auth_file
auth_file = /etc/edb/pgbouncer1.9/userlist.txt
;; HBA file
auth_hba_file = /etc/edb/pgbouncer1.9/hba_file
;; Use pem.get_agent_pool_auth(TEXT) function to authenticate
;; the db user (used as a proxy agent user).
auth_query = SELECT * FROM pem.get_agent_pool_auth($1)
;; DB User for administration of the pgbouncer
admin_users = pem_admin1
;; DB User for collecting the statistics of pgbouncer
stats_users = pem_admin1
server_reset_query = DISCARD ALL
;; Change based on the number of agents installed/required
max_client_conn = 500
;; Close server connection if its not been used in this time.
;; Allows to clean unnecessary connections from pool after
peak.
server_idle_timeout = 60
```

4. Use the following command to create and update the `/etc/edb/pgbouncer1.9/userlist.txt` authentication file for pgBouncer.

```
pem=# COPY (
    SELECT 'pgbouncer'::TEXT, 'pgbouncer_password'
    UNION ALL
    SELECT 'pem_admin1'::TEXT, 'pem_admin1_password'
) TO '/etc/edb/pgbouncer1.9/userlist.txt'
    WITH (FORMAT CSV, DELIMITER ' ', FORCE_QUOTE *);
```

```
COPY 2
```

NOTE: A super user cannot invoke the PEM authentication query function `pem.get_proxy_auth(text)`. If the `pem_admin` user is a super user, you must add the password to the authentication file, which is `enterprisedb` in the above example.

5. Create an HBA file (`/etc/edb/pgbouncer1.9/hba_file`) for pgBouncer that contains the following content:

```
# Use authentication method md5 for the local connections to
# connect pem database & pgbouncer (virtual) database.
local pgbouncer all md5

# Use authentication method md5 for the remote connections to
# connect to pgbouncer (virtual database) using enterprisedb
# user.
```

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```
host pgbouncer,pem pem_admin1 0.0.0.0/0 md5

# Use authentication method cert for the TCP/IP connections to
# connect the pem database using pem_agent_user1

hostssl pem pem_agent_user1 0.0.0.0/0 cert
```

6. Change the owner of the HBA file (/etc/edb/pgbouncer1.9/hba_file) to enterprisedb, and change the directory permissions to 0600. For example:

```
$ chown enterprisedb:enterprisedb
/etc/edb/pgbouncer1.9/hba_file
$ chmod 0600 /etc/edb/pgbouncer1.9/hba_file
```

7. Enable the pgBouncer service, and start the service. For example:

```
$ systemctl enable edb-pgbouncer-1.9

Created symlink from /etc/systemd/system/multi-
user.target.wants/edb-pgbouncer-1.9.service to
/usr/lib/systemd/system/edb-pgbouncer-1.9.service.

$ systemctl start edb-pgbouncer-1.9
```

5 Configuring the PEM Agent

You can use an RPM package to install a PEM Agent; for detailed installation information, please see the *PEM Installation Guide*, available from the EnterpriseDB website at:

<https://www.enterprisedb.com/resources/product-documentation>

5.1 Configuring a New PEM Agent (installed using an RPM)

After using an RPM package to install the PEM agent, you will need to configure it to work it against a particular PEM database server. Use the following command:

```
$ PGSSLMODE=require PEM_SERVER_PASSWORD=pem_admin1_password  
/usr/edb/pem/agent/bin/pemworker --register-agent --pem-server  
172.16.254.22 --pem-port 6432 --pem-user pem_admin1 --pem-agent-  
user pem_agent_user1 --display-name "Agent Name"
```

```
Postgres Enterprise Manager Agent registered successfully!
```

In above command, the command line argument `--pem-agent-user` instructs the agent to create an SSL certificate and key pair for the `pem_agent_user1` database user in `/root/.pem` directory. For example:

```
/root/.pem/pem_agent_user1.crt
```

```
/root/.pem/pem_agent_user1.key
```

They will be used by the PEM agent to connect to the PEM database server as `pem_agent_user1`. It will also create `/usr/edb/pem/agent/etc/agent.cfg`.

You will find a line mentioning the agent-user to be used in the `agent.cfg` configuration file. For example:

```
$ cat /usr/edb/pem/agent/etc/agent.cfg  
[PEM/agent]  
pem_host=172.16.254.22  
pem_port=6432  
agent_id=12  
agent_user=pem_agent_user1  
agent_ssl_key=/root/.pem/pem_agent_user1.key  
agent_ssl_cert=/root/.pem/pem_agent_user1.crt  
log_level=warning  
log_location=/var/log/pem/worker.log
```

```
agent_log_location=/var/log/pem/agent.log
long_wait=30
short_wait=10
alert_threads=0
enable_smtp=false
enable_snmp=false
allow_server_restart=true
allow_package_management=false
allow_streaming_replication=false
max_connections=0
connect_timeout=-1
connection_lifetime=0
allow_batch_probes=false
heartbeat_connection=false
```

5.2 Configuring an Existing PEM Agent (installed using an RPM)

If you are using an existing PEM agent, you can copy the SSL certificate and key files to the target machine, and reuse the files. You will need to modify the files, adding a new parameter and replacing some parameters in the existing agent.cfg file:

Add a line for agent_user to be used for the agent. For example:

```
agent_user=pem_agent_user1
```

Update the port to specify the pgBouncer port. For example:

```
pem_port=6432
```

Update the certificate and key path locations. For example:

```
agent_ssl_key=/root/.pem/pem_agent_user1.key
agent_ssl_cert=/root/.pem/pem_agent_user1.crt
```

Please note: as an alternative, you can run the agent self registration, but that will create a new agent id. If you do run the agent self-registration, you must replace the new agent id with existing id, and disable the entry for the new agent id in the pem.agent table. For example:

```
pem=# UPDATE pem.agent SET active = false WHERE id =
<new_agent_id>;

UPDATE 1
```

Please keep a backup of the existing SSL certificate, key file, and agent configuration file.