

# Percona Server for MongoDB Documentation 5.0

5.0.13-11 (October 11, 2022)

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# 1. Home

# 1.1 Percona Server for MongoDB 5.0 Documentation

Percona Server for MongoDB is a free, enhanced, fully compatible, source available, drop-in replacement for MongoDB 5.0 Community Edition with enterprise-grade features. It requires no changes to MongoDB applications or code.

To see which version of Percona Server for MongoDB you are using check the value of the <code>[psmdbVersion]</code> key in the output of the <code>buildInfo</code> database command. If this key does not exist, Percona Server for MongoDB is not installed on the server.

This is the documentation for the latest release, **Percona Server for MongoDB 5.0.14-12** (Release Notes).

# 1.1.1 Features

- MongoDB's default WiredTiger engine
- Percona Memory Engine storage engine
- Data at Rest Encryption
- External authentication using OpenLDAP or Active Directory
- Audit logging to track and query database interactions of users or applications
- Hot Backup for the default WiredTiger
- Profiling Rate Limit to decrease the impact of the profiler on performance

To learn more about the features, available in Percona Server for MongoDB, see Percona Server for MongoDB Feature Comparison

# 1.1.2 Get started

• Install Percona Server for MongoDB

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# 2. Percona Server for MongoDB feature comparison

Percona Server for MongoDB 4.2 is based on MongoDB 4.2. Percona Server for MongoDB extends MongoDB Community Edition to include the functionality that is otherwise only available in MongoDB Enterprise Edition.

	PSMDB	MongoDB
Storage Engines	<ul><li>WiredTiger (default)</li><li>Percona Memory Engine</li></ul>	<ul><li>WiredTiger (default)</li><li>In-Memory (Enterprise only)</li></ul>
Encryption-at-Rest	<ul><li>Key servers = Hashicorp Vault,</li><li>KMIP</li><li>Fully open source</li></ul>	<ul><li>- Key server = KMIP</li><li>- Enterprise only</li></ul>
Hot Backup	YES (replica set)	NO
LDAP Authentication	(legacy) LDAP authentication with SASL	Enterprise only
LDAP Authorization	YES	Enterprise only
Kerberos Authentication	YES	Enterprise only
Audit Logging	YES	Enterprise only
Log redaction	YES	Enterprise only
SNMP Monitoring	NO	Enterprise only
Database profiler	YES with therateLimit argument	YES

# 2.1 Profiling Rate Limiting

Profiling Rate Limiting was added to *Percona Server for MongoDB* in v3.4 with the --rateLimit argument. Since v3.6, MongoDB Community (and Enterprise) Edition includes a similar option slowOpSampleRate. Please see Profiling Rate Limit for more information.

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# 3. Install PSMDB

# 3.1 Install Percona Server for MongoDB

Percona provides installation packages of Percona Server for MongoDB for the most 64-bit Linux distributions. Find the full list of supported platforms on the Percona Software and Platform Lifecycle page.

Choose how you wish to install Percona Server for MongoDB:

- From Percona repositories (recommended):
- on Debian or Ubuntu
- on RHEL or CentOS
- From binary tarballs
- Manually from Percona website



Make sure that all dependencies are satisfied

• Run in Docker

# 3.1.1 Upgrade instructions

If you are currently using MongoDB, see Upgrading from MongoDB.

If you are running an earlier version of Percona Server for MongoDB, see Upgrading from Version 4.4.

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# 3.2 Installing Percona Server for MongoDB on Debian and Ubuntu

This document describes how to install Percona Server for MongoDB from Percona repositories on DEB-based distributions such as Debian and Ubuntu.



Percona Server for MongoDB should work on other DEB-based distributions, but it is tested only on platforms listed on the Percona Software and Platform Lifecycle page.

# 3.2.1 Package Contents

Package	Contains
percona-server-mongodb	The mongo shell, import/export tools, other client
utilities, server software, default configuration, and init.d scripts.	
percona-server-mongodb-server	The mongod server, default configuration files, and init.d` scripts
percona-server-mongodb-shell	The mongo shell
percona-server-mongodb-mongos	The mongos sharded cluster query router
percona-server-mongodb-tools	Mongo tools for high-performance MongoDB fork from Percona
percona-server-mongodb-dbg	Debug symbols for the server

# 3.2.2 Procedure

# **Configure Percona repository**

Percona provides the percona-release configuration tool that simplifies operating repositories and enables to install and update both Percona Backup for MongoDB packages and required dependencies smoothly.

1. Fetch **percona-release** packages from Percona web:

```
$ wget https://repo.percona.com/apt/percona-release_latest.$(lsb_release -sc)_all.deb
```

2. Install the downloaded package with dpkg:

```
$ sudo dpkg -i percona-release_latest.$(lsb_release -sc)_all.deb
```

After you install this package, you have the access to Percona repositories. You can check the repository setup in the /etc/apt/sources.list.d/percona-release.list file.

# 1. Enable the repository:

\$ sudo percona-release enable psmdb-50 release

# 2. Remember to update the local cache:

\$ sudo apt update

# Install Percona Server for MongoDB

# Install the latest version

Run the following command to install the latest version of Percona Server for MongoDB:

```
$ sudo apt install percona-server-mongodb
```

# Install a specific version

To install a specific version of Percona Server for MongoDB, do the following:

1. List available versions:

```
$ sudo apt-cache madison percona-server-mongodb
```

Sample output:

```
percona-server-mongodb | 5.0.13-11.jammy | http://repo.percona.com/psmdb-50/apt jammy/main amd64 Packages percona-server-mongodb | 5.0.11-10.jammy | http://repo.percona.com/psmdb-50/apt jammy/main amd64 Packages percona-server-mongodb | 5.0.10-9.jammy | http://repo.percona.com/psmdb-50/apt jammy/main amd64 Packages percona-server-mongodb | 5.0.9-8.jammy | http://repo.percona.com/psmdb-50/apt jammy/main amd64 Packages percona-server-mongodb | 5.0.13-11 | http://repo.percona.com/psmdb-50/apt jammy/main Sources percona-server-mongodb | 5.0.11-10 | http://repo.percona.com/psmdb-50/apt jammy/main Sources percona-server-mongodb | 5.0.10-9 | http://repo.percona.com/psmdb-50/apt jammy/main Sources percona-server-mongodb | 5.0.9-8 | http://repo.percona.com/psmdb-50/apt jammy/main Sources
```

2. Install a specific version packages. You must specify each package with the version number. For example, to install Percona Server for MongoDB 5.0.13-11, run the following command:

```
$ sudo apt install percona-server-mongodb=5.0.13-11.buster \
percona-server-mongodb-mongos=5.0.13-11.buster \
percona-server-mongodb-shell=5.0.13-11.buster \
percona-server-mongodb-server=5.0.13-11.buster \
percona-server-mongodb-tools=5.0.13-11.buster
```

# 3.2.3 Running Percona Server for MongoDB

By default, Percona Server for MongoDB stores data files in /var/lib/mongodb/ and configuration parameters in /etc/mongod.conf.

# Starting the service

Percona Server for MongoDB is started automatically after installation unless it encounters errors during the installation process.

You can also manually start it using the following command:

\$ sudo systemctl start mongod

# Confirming that the service is running

Check the service status using the following command:

\$ sudo systemctl status mongod

# **Stopping the service**

Stop the service using the following command:

\$ sudo systemctl stop mongod

# **Restarting the service**

Restart the service using the following command:

\$ sudo systemctl restart mongod

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# 3.3 Installing Percona Server for MongoDB on Red Hat Enterprise Linux and CentOS

This document describes how to install Percona Server for MongoDB on RPM-based distributions such as Red Hat Enterprise Linux and compatible derivatives.



Percona Server for MongoDB should work on other RPM-based distributions (for example, Amazon Linux AMI and Oracle Linux), but it is tested only on platforms listed on the Percona Software and Platform Lifecycle page.

# 3.3.1 Package Contents

Package	Contains
percona-server-mongodb	The mongo shell, import/export tools, other client
utilities, server software, default configuration, and init.d scripts.	
percona-server-mongodb-server	The mongod server, default configuration files, and init.d` scripts
percona-server-mongodb-shell	The mongo shell
percona-server-mongodb-mongos	The mongos sharded cluster query router
percona-server-mongodb-tools	Mongo tools for high-performance MongoDB fork from Percona
percona-server-mongodb-dbg	Debug symbols for the server

# 3.3.2 Procedure

Percona provides the percona-release configuration tool that simplifies operating repositories and enables to install and update both Percona Backup for MongoDB packages and required dependencies smoothly.

# **Configure Percona repository**

# 1. Install percona-release:

\$ sudo yum install https://repo.percona.com/yum/percona-release-latest.noarch.rpm

# 2. Enable the repository:

\$ sudo percona-release enable psmdb-50 release

# Install Percona Server for MongoDB packages

# Install the latest version

To install the latest version of Percona Server for MongoDB, use the following command:

```
$ sudo yum install percona-server-mongodb
```

# Install a specific version

To install a specific version of *Percona Server for MongoDB*, do the following:

1. List available versions:

```
$ sudo yum list percona-server-mongodb --showduplicates
```

Sample output:

```
Available Packages
percona-server-mongodb.x86_64 5.0.2-1.el8 psmdb-50-release-x86_64
percona-server-mongodb.x86_64 5.0.3-2.el8 psmdb-50-release-x86_64
percona-server-mongodb.x86_64 5.0.5-4.el8 psmdb-50-release-x86_64
percona-server-mongodb.x86_64 5.0.6-5.el8 psmdb-50-release-x86_64
percona-server-mongodb.x86_64 5.0.7-6.el8 psmdb-50-release-x86_64
percona-server-mongodb.x86_64 5.0.8-7.el8 psmdb-50-release-x86_64
percona-server-mongodb.x86_64 5.0.9-8.el8 psmdb-50-release-x86_64
percona-server-mongodb.x86_64 5.0.10-9.el8 psmdb-50-release-x86_64
percona-server-mongodb.x86_64 5.0.11-10.el8 psmdb-50-release-x86_64
percona-server-mongodb.x86_64 5.0.11-10.el8 psmdb-50-release-x86_64
percona-server-mongodb.x86_64 5.0.13-11.el8 psmdb-50-release-x86_64
```

2. Install a specific version packages. For example, to install Percona Server for MongoDB 5.0.13-11, run the following command:

```
$ sudo yum install percona-server-mongodb-5.0.13-11.el8
```

# 3.3.3 Run Percona Server for MongoDB



If you use SELinux in enforcing mode, you must customize your SELinux user policies to allow access to certain /sys and /proc files for OS-level statistics. Also, you must customize directory and port access policies if you are using non-default locations.

Please refer to Configure SELinux section of MongoDB Documentation for policy configuration guidelines.

By default, Percona Server for MongoDB stores data files in /var/lib/mongodb/ and configuration parameters in /etc/mongod.conf.

# Starting the service

Percona Server for MongoDB is not started automatically after installation. Start it manually using the following command:

\$ sudo systemctl start mongod

# Confirming that service is running

Check the service status using the following command: service mongod status

\$ sudo systemctl status mongod

# Stopping the service

Stop the service using the following command: service mongod stop

\$ sudo systemctl stop mongod

# **Restarting the service**

Restart the service using the following command: service mongod restart

\$ sudo systemctl restart mongod

# Run after reboot

The mongod service is not automatically started after you reboot the system.

For RHEL or CentOS versions 5 and 6, you can use the chkconfig utility to enable auto-start as follows:

\$ sudo chkconfig --add mongod

For RHEL or CentOS version 7, you can use the systemctl utility:

\$ sudo systemctl enable mongod

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# 3.4 Installing Percona Server for MongoDB from binary tarball

You can find links to the binary tarballs under the Generic Linux menu item on the Percona website

There are two tarballs available:

- percona-server-mongodb-<version>-x86\_64.glibc2.17.tar.gz is the general tarball, compatible with any supported operating system except Ubuntu 22.04.
- percona-server-mongodb-<version>-x86 64.glibc2.35.tar.gz is the tarball for Ubuntu 22.04.

# 3.4.1 Preconditions

The following packages are required for the installation.

# On Debian and Ubuntu

- libcurl4
- libsasl2-modules
- libsasl2-modules-gssapi-mit

# On Red Hat Enterprise Linux and derivatives

- libcurl
- cyrus-sasl-gssapi
- cyrus-sasl-plain

Check that they are installed in your operating system. Otherwise install them.

# 3.4.2 Procedure

1. Fetch and extract the binary tarball. For example, if you are running Debian 10 ("buster"), use the following command:

```
$ wget https://www.percona.com/downloads/percona-server-mongodb-5.0/percona-server-mongodb-5.0.2-1/binary/tarball/percona-server-mongodb-5.0.2-1-x86_64.glibc2.17.tar.gz\
$ tar -xf percona-server-mongodb-5.0.2-1-x86_64.glibc2.17.tar.gz
```

2. Add the location of the binaries to the PATH variable:

```
$ export PATH=~/percona-server-mongodb-5.0.2-1/bin/:$PATH
```

3. Create the default data directory:

```
$ mkdir -p /data/db
```

4. Make sure that you have read and write permissions for the data directory and run mongod.

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# 3.5 Running Percona Server for MongoDB in a Docker Container

Docker images of Percona Server for MongoDB are hosted publicly on Docker Hub.

For more information about using Docker, see the Docker Docs.



Make sure that you are using the latest version of Docker. The ones provided via apt and yum may be outdated and cause errors.

By default, Docker will pull the image from Docker Hub if it is not available locally.

To run the latest Percona Server for MongoDB 5.0 in a Docker container, use the following command:

Run this command as root or by using the **sudo** command

```
$ docker run -d --name psmdb --restart always \
percona/percona-server-mongodb:5.0
```

The command does the following:

- The docker run command instructs the docker daemon to run a container from an image.
- The -d option starts the container in detached mode (that is, in the background).
- The --name option assigns a custom name for the container that you can use to reference the container within a Docker network. In this case: psmdb.
- The --restart option defines the container's restart policy. Setting it to always ensures that the Docker daemon will start the container on startup and restart it if the container exits.
- percona/percona-server-mongodb:5.0 is the name and version tag of the image to derive the container from.

# 3.5.1 Connecting from another Docker container

The Percona Server for MongoDB container exposes standard MongoDB port (27017), which can be used for connection from an application running in another container. To link the application container to the psmdb container, use the --link psmdb option when running the container with your app.

# 3.5.2 Connecting with the mongo shell

To start another container with the mongo shell that connects to your Percona Server for MongoDB container, run the following command:

```
$ docker run -it --link psmdb --rm percona/percona-server-mongodb:mongo mongo -h psmdb
```

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# 4. Features

# 4.1 Storage

# 4.1.1 Percona Memory Engine

Percona Memory Engine is a special configuration of WiredTiger that does not store user data on disk. Data fully resides in the main memory, making processing much faster and smoother. Keep in mind that you need to have enough memory to hold the data set, and ensure that the server does not shut down.

The Percona Memory Engine is available in Percona Server for MongoDB along with the default MongoDB engine WiredTiger.

# Usage

As of version 3.2, Percona Server for MongoDB runs with WiredTiger by default. You can select a storage engine using the --storageEngine command-line option when you start mongod. Alternatively, you can set the storage.engine variable in the configuration file (by default, /etc/mongod.conf):

```
storage:
  dbPath: <dataDir>
  engine: inMemory
```

# Configuration

You can configure Percona Memory Engine using either command-line options or corresponding parameters in the /etc/mongod.conf file. The following are the configuration examples:

# Configuration file

The configuration file is formatted in YAML

```
storage:
  engine: inMemory
  inMemory:
    engineConfig:
      inMemorySizeGB: 140
      statisticsLogDelaySecs: 0
```

# **Command line**

Setting parameters in the configuration file is the same as starting the mongod daemon with the following options:

```
mongod --storageEngine=inMemory \
--inMemorySizeGB=140 \
--inMemoryStatisticsLogDelaySecs=0
```

### OPTIONS

The following options are available (with corresponding YAML configuration file parameters):

Command line	Configuration file	Default	Description
inMemorySizeGB()	storage.inMemory.engineConfig.inMemorySizeGB	50% of total memory minus 1024 MB, but not less than 256 MB	Specifies the maximum memory in gigabytes to use for data
inMemoryStatisticsLogDelaySecs()	storage.inMemory.engineConfig.statisticsLogDelaySecs	0	Specifies the number of seconds between writes to statistics log. If 0 is specified then statistics are not logged

# Switching storage engines

# CONSIDERATIONS

If you have data files in your database and want to change to Percona Memory Engine, consider the following:

- Data files created by one storage engine are not compatible with other engines, because each one has its own data model.
- When changing the storage engine, the mongod node requires an empty dbPath data directory when it is restarted. Though Percona Memory Engine stores all data in memory, some metadata files, diagnostics logs and statistics metrics are still written to disk. This is controlled with the --- inMemoryStatisticsLogDelaySecs option.

Creating a new dbPath data directory for a different storage engine is the simplest solution. Yet when you switch between disk-using storage engines (e.g. from WiredTiger to Percona Memory Engine), you may have to delete the old data if there is not enough disk space for both. Double-check that your backups are solid and/or the replica set nodes are healthy before you switch to the new storage engine.

# PROCEDURE

To change a storage engine, you have the following options:

# **Temporarily test Percona Memory Engine**

Set a different data directory for the dbPath variable in the configuration file. Make sure that the user running mongod has read and write permissions for the new data directory.

1. Stop mongod

```
$ service mongod stop
```

2. Edit the configuration file

```
storage:
  dbPath: <newDataDir>
  engine: inmemory
```

3. Start mongod

```
$ service mongod start
```

Permanent switch to Percona Memory Engine without any valuable data in your database

Clean out the dbPath data directory (by default, /var/lib/mongodb) and edit the configuration file:

1. Stop mongod

```
$ service mongod stop
```

2. Clean out the dbPath data directory

```
$ sudo rm -rf <dbpathDataDir>
```

3. Edit the configuration file

```
storage:
  dbPath: <newDataDir>
  engine: inmemory
```

4. Start mongod

```
$ service mongod start
```

Switch to Percona Memory Engine with data migration and compatibility

# Standalone instance

For a standalone instance or a single-node replica set, use the mongodump and mongorestore utilities:

1. Export the dataDir contents

```
$ mongodump --out <dumpDir>
```

2. Stop mongod

```
$ service mongod stop
```

3. Clean out the dbPath data directory

```
$ sudo rm -rf <dbpathDataDir>
```

- 4. Update the configuration file by setting the new value for the storage.engine variable. Set the engine-specific settings such as storage.inMemory.engineConfig.inMemorySizeGB
- 5. Start mongod

```
$ service mongod start
```

6. Restore the database

```
$ mongorestore <dumpDir>
```

# Replica set

Use the "rolling restart" process.

- 1. Switch to the Percona Memory Engine on the secondary node. Clean out the dbPath data directory and edit the configuration file:
- 2. Stop mongod

```
$ service mongod stop
```

3. Clean out the dbPath data directory

```
$ sudo rm -rf <dbpathDataDir>
```

4. Edit the configuration file

```
storage:
  dbPath: <newDataDir>
  engine: inmemory
```

5. Start mongod

```
$ service mongod start
```

- 6. Wait for the node to rejoin with the other nodes and report the SECONDARY status.
- 7. Repeat the procedure to switch the remaining nodes to Percona Memory Engine.

# DATA AT REST ENCRYPTION

Using Data at Rest Encryption means using the same storage.\\* configuration options as for WiredTiger. To change from normal to Data at Rest Encryption mode or backward, you must clean up the dbPath data directory, just as if you change the storage engine. This is because **mongod** cannot convert the data files to an encrypted format 'in place'. It must get the document data again either via the initial sync from another replica set member, or from imported backup dump.

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# 4.2 Backup

# 4.2.1 Hot backup

Percona Server for MongoDB includes an integrated open source hot backup system for the default WiredTiger storage engine. It creates a physical data backup on a running server without notable performance and operating degradation.



Hot backups are done on <code>mongod</code> servers independently, without synchronizing them across replica set members and shards in a cluster. To ensure data consistency during backups and restores, we recommend using Percona Backup for MongoDB.

# Make a backup

To take a hot backup of the database in your current dbpath, do the following:

1. Provide access to the backup directory for the mongod user:

```
$ sudo chown mongod:mongod <backupDir>
```

2. Run the createBackup command as administrator on the admin database and specify the backup directory.

```
> use admin
switched to db admin
> db.runCommand({createBackup: 1, backupDir: "<backup_data_path>"})
{ "ok" : 1 }
```

The backup taken is the snapshot of the mongod server's dataDir at the moment of the createBackup command start.

If the backup was successful, you should receive an { "ok" : 1 } object. If there was an error, you will receive a failing ok status with the error message, for example:

```
> db.runCommand({createBackup: 1, backupDir: ""})
{ "ok" : 0, "errmsg" : "Destination path must be absolute" }
```

# Save a backup to a TAR archive

To save a backup as a tar archive, use the archive field to specify the destination path:

```
> use admin
...
> db.runCommand({createBackup: 1, archive: <path_to_archive>.tar })
```

# Streaming hot backups to a remote destination

Percona Server for MongoDB enables uploading hot backups to an Amazon S3 or a compatible storage service, such as MinIO.

This method requires that you provide the *bucket* field in the *s3* object:

```
> use admin
...
> db.runCommand({createBackup: 1, s3: {bucket: "backup20190510", path:
<some_optional_path>} })
```

In addition to the mandatory bucket field, the s3 object may contain the following fields:

Field	Туре	Description
bucket	string	The only mandatory field. Names are subject to restrictions described in the Bucket Restrictions and Limitations section of Amazon S3 documentation
path	string	The virtual path inside the specified bucket where the backup will be created. If the path is not specified, then the backup is created in the root of the bucket. If there are any objects under the specified path, the backup will not be created and an error will be reported.
endpoint	string	The endpoint address and port - mainly for AWS S3 compatible servers such as the $\it MinIO$ server. For a local MinIO server, this can be "127.0.0.1:9000". For AWS S3 this field can be omitted.
scheme	string	"HTTP" or "HTTPS" (default). For a local MinIO server started with the <i>minio server</i> command this should field should contain <i>HTTP</i> .
useVirtualAddressing	bool	The style of addressing buckets in the URL. By default `true'. For MinIO servers, set this field to <b>false</b> . For more information, see Virtual Hosting of Buckets in the Amazon S3 documentation.
region	string	The name of an AWS region. The default region is <b>US_EAST_1</b> . For more information see AWS Service Endpoints in the Amazon S3 documentation.
profile	string	The name of a credentials profile in the <i>credentials</i> configuration file. If not specified, the profile named <b>default</b> is used.
accessKeyId	string	The access key id
secretAccessKey	string	The secret access key

# CREDENTIALS

If the user provides the *access key id* and the *secret access key* parameters, these are used as credentials.

If the access  $key\ id$  parameter is not specified then the credentials are loaded from the credentials configuration file. By default, it is  $\sim$ /.aws/credentials.

# Example credentials file

```
[default]
aws_access_key_id = ABC123XYZ456QQQAAAFFF
aws_secret_access_key = zuf+secretkey0secretkey1secretkey2
[localminio]
aws_access_key_id = ABCABCABCABC55566678
aws_secret_access_key = secretaccesskey1secretaccesskey2secretaccesskey3
```

# **EXAMPLES**

# Backup in root of bucket on local instance of MinIO server

```
> db.runCommand({createBackup: 1, s3: {bucket: "backup20190901500",
scheme: "HTTP",
endpoint: "127.0.0.1:9000",
useVirtualAddressing: false,
profile: "localminio"}})
```

# Backup on MinIO testing server with the default credentials profile

The following command creates a backup under the virtual path "year2019/day42" in the backup bucket:

```
> db.runCommand({createBackup: 1, s3: {bucket: "backup",
path: "year2019/day42",
endpoint: "sandbox.min.io:9000",
useVirtualAddressing: false}})
```

# Backup on AWS S3 service using default settings

```
> db.runCommand({createBackup: 1, s3: {bucket: "backup", path: "year2019/day42"}})
```



AWS Documentation: Providing AWS Credentials

# Restoring data from backup

# RESTORING FROM BACKUP ON A STANDALONE SERVER

To restore your database on a standalone server, stop the <code>mongod</code> service, clean out the data directory and copy files from the backup directory to the data directory. The <code>mongod</code> user requires access to those files to start the service. Therefore, make the <code>mongod</code> user the owner of the data directory and all files and subdirectories under it, and restart the <code>mongod</code> service.



If you try to restore the node into the existing replica set and there is more recent data, the restored node detects that it is out of date with the other replica set members, deletes the data and makes an initial sync.

Run the following commands as root or by using the sudo command

1. Stop the mongod service

\$ systemctl stop mongod

2. Clean out the data directory

\$ rm -rf /var/lib/mongodb/\*

3. Copy backup files

\$ cp -RT <backup\_data\_path> /var/lib/mongodb/

4. Grant permissions to data files for the mongod user

\$ chown -R mongod:mongod /var/lib/mongodb/

5. Start the mongod service

\$ systemctl start mongod

# RESTORING FROM BACKUP IN A REPLICA SET

The recommended way to restore the replica set from a backup is to restore it into a standalone node and then initiate it as the first member of a new replica set.



If you try to restore the node into the existing replica set and there is more recent data, the restored node detects that it is out of date with the other replica set members, deletes the data and makes an initial sync.

Run the following commands as root or by using the **sudo** command

1. Stop the mongod service:

```
$ systemctl stop mongod
```

2. Clean the data directory and then copy the files from the backup directory to your data directory. Assuming that the data directory is /var/lib/mongodb/, use the following commands:

```
$ rm -rf /var/lib/mongodb/*
$ cp -RT <backup_data_path> /var/lib/mongodb/
```

3. Grant permissions to the data files for the mongod user

```
$ chown -R mongod:mongod /var/lib/mongodb/
```

4. Make sure the replication is disabled in the config file and start the mongod service.

```
$ systemctl start mongod
```

5. Connect to your standalone node via the mongo shell and drop the local database

```
> mongo
> use local
> db.dropDatabase()
```

- 6. Restart the node with the replication enabled
- Shut down the node.

```
$ systemctl stop mongod
```

- Edit the configuration file and specify the replication.replSetname option
- Start the mongod node:

```
$ systemctl start mongod
```

- 7. Initiate a new replica set
- Start the mongo shell

```
> mongo
```

• Initiate a new replica set

```
> rs.initiate()
```

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# 4.2.2 \$backupCursor and \$backupCursorExtend aggregation stages

\$backupCursor and \$backupCursorExtend aggregation stages expose the WiredTiger API which allows making consistent backups. Running these stages allows listing and freezing the files so you can copy them without the files being deleted or necessary parts within them being overwritten.

- \$backupCursor outputs the list of files and their size to copy.
- \$backupCursorExtend outputs the list of WiredTiger transaction log files that have been updated or newly added since the \$backupCursor was first run. Saving these files enables restoring the database to any arbitrary time between the \$backupCursor and \$backupCursorExtend execution times.

They are available in Percona Server for MongoDB starting with version 4.4.6-8.

Percona provides Percona Backup for MongoDB (PBM) – a light-weight open source solution for consistent backups and restores across sharded clusters. PBM relies on these aggregation stages for physical backups and restores. However, if you wish to develop your own backup application, this document describes the \$backupCursor and \$backupCursorExtend aggregation stages.

# Usage

You can run these stages in any type of MongoDB deployment. If you need to back up a single node in a replica set, first run the <code>\$backupCursor</code>, then the <code>\$backupCursorExtend</code> and save the output files to the backup storage.

To make a consistent backup of a sharded cluster, run both aggregation stages on one node from each shard and the config server replica set. It can be either the primary or the secondary node. Note that since the secondary node may lag in syncing the data from the primary one, you will have to wait for the exact same time before running the \$backupCursorExtend.

Note that for standalone MongoDB node with disabled oplogs, you can only run the \$backupCursor aggregation stage.

GET A LIST OF ALL FILES TO COPY WITH \$BACKUPCURSOR

```
var bkCsr = db.getSiblingDB("admin").aggregate([{$backupCursor: {}}])
bkCsrMetadata = bkCsr.next().metadata
```

Sample output:

```
[
    metadata: {
        backupId: UUID("35c34101-0107-44cf-bdec-fad285e07534"),
        dbpath: '/var/lib/mongodb',
        oplogStart: { ts: Timestamp({ t: 1666631297, i: 1 }), t: Long("-1") },
        oplogEnd: { ts: Timestamp({ t: 1666631408, i: 1 }), t: Long("1") },
        checkpointTimestamp: Timestamp({ t: 1666631348, i: 1 })
    }
},
```

Store the metadata document somewhere, because you need to pass the backupId parameter from this document as the input parameter for the <code>\$backupCursorExtend</code> stage. Also you need the <code>oplogEnd</code> timestamp. Make sure that the <code>\$backupCursor</code> is complete on all shards in your cluster.



Note that when running <code>\$backupCursor</code> in a standalone node deployment, <code>oplogStart</code>, <code>oplogEnd</code>, <code>checkpointTimesatmp</code> values may be absent. This is because standalone node deployments don't have oplogs.

# RUN \$BACKUPCURSOREXTEND TO RETRIEVE THE WIREDTIGER TRANSACTION LOGS

Pass the backupId from the metadata document as the first parameter. For the timestamp parameter, use the maximum (latest) value among the oplogEnd timestamps from all shards and config server replica set. This will be the target time to restore.

```
\label{eq:var_bkExtCsr} var \ bkExtCsr = db.aggregate([\{\$backupCursorExtend: \{backupId: bkCsrMetadata.backupId, timestamp: new Timestamp(1666631418, 1)\}\}])
```

# Sample output:

```
{ "filename" : "/data/plain_rs/n1/data/journal/WiredTigerLog.0000000042" }
{ "filename" : "/data/plain_rs/n1/data/journal/WiredTigerLog.0000000043" }
{ "filename" : "/data/plain_rs/n1/data/journal/WiredTigerLog.0000000044" }
```

# LOOP THE \$BACKUPCURSOR

Prevent the backup cursor from closing on timeout (default – 10 minutes). This is crucial since it prevents overwriting backup snapshot file blocks with new ones if the files take longer than 10 minutes to copy. Use the **getMore** command for this purpose.

# COPY THE FILES TO THE STORAGE

Now you can copy the output of both aggregation stages to your backup storage.

After the backup is copied to the storage, terminate the getMore command and close the cursor.



Save the timestamp that you passed for the \\$backupCursorExtend stage somewhere since you will need it for the restore.

This document is based on the blog post Experimental Feature: \$backupCursorExtend in Percona Server for MongoDB by Akira Kurogane

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# 4.3 Authentication

# 4.3.1 Authentication

Authentication is the process of verifying a client's identity. Normally, a client needs to authenticate themselves against the MongoDB server user database before doing any work or reading any data from a mongod or mongos instance.

By default, Percona Server for MongoDB provides a SCRAM authentication mechanism where clients authenticate themselves by providing their user credentials. In addition, you can integrate Percona Server for MongoDB with a separate service, such as OpenLDAP or Active Directory. This enables users to access the database with the same credentials they use for their emails or workstations.

You can use any of these authentication mechanisms supported in Percona Server for MongoDB:

- SCRAM(default)
- x.509 certificate authentication
- LDAP authentication with SASL
- Kerberos Authentication
- Authentication and authorization with direct binding to LDAP

### **SCRAM**

SCRAM is the default authentication mechanism. *Percona Server for MongoDB* verifies the credentials against the user's name, password and the database where the user record is created for a client (authentication database). For how to enable this mechanism, see Enabling Authentication.

# x.509 certificate authentication

This authentication mechanism enables a client to authenticate in Percona Server for MongoDB by providing an x.509 certificate instead of user credentials. Each certificate contains the <code>subject</code> field defined in the format. In Percona Server for MongoDB, each certificate has a corresponding user record in the <code>\$external</code> database. When a user connects to the database, Percona Server for MongoDB matches the <code>subject</code> value against the usernames defined in the <code>\$external</code> database.

For production use, we recommend using valid certificates. For testing purposes, you can generate and use self-signed certificates.

x.509 authentication is compatible with with LDAP authorization to enable you to control user access and operations in Percona Server for MongoDB. For configuration guidelines, refer to Set up x.509 authentication and LDAP authorization.



MongoDB Documentation: x.509

Percona Blog: Setting up MongoDB with Member x509 auth and SSL + easy-rsa

### LDAP authentication with SASL

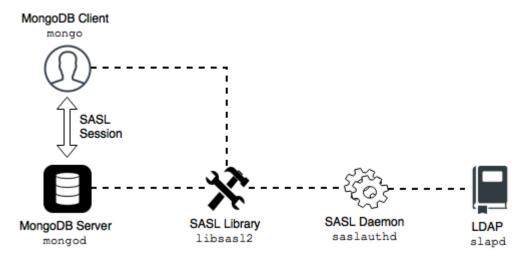
# Overview

LDAP authentication with means that both the client and the server establish a SASL session using the SASL library. Then authentication (bind) requests are sent to the LDAP server through the SASL authentication daemon (saslauthd) that acts as a remote proxy for the mongod server.

The following components are necessary for external authentication to work:

- LDAP Server: Remotely stores all user credentials (i.e. user name and associated password).
- SASL Daemon: Used as a MongoDB server-local proxy for the remote LDAP service.
- **SASL Library**: Used by the MongoDB client and server to create data necessary for the authentication mechanism.

The following image illustrates this architecture:



An authentication session uses the following sequence:

- 1. A mongo client connects to a running mongod instance.
- 2. The client creates a PLAIN authentication request using the SASL library.
- 3. The client then sends this SASL request to the server as a special mongo command.
- 4. The mongod server receives this SASL Message, with its authentication request payload.
- 5. The server then creates a SASL session scoped to this client, using its own reference to the SASL library.
- 6. Then the server passes the authentication payload to the SASL library, which in turn passes it on to the saslauthd daemon.
- 7. The saslauthd daemon passes the payload on to the LDAP service to get a YES or NO authentication response (in other words, does this user exist and is the password correct).
- 8. The YES/NO response moves back from  $\,$  saslauthd  $\,$  , through the SASL library, to  $\,$  mongod  $\,$  .
- 9. The mongod server uses this YES/NO response to authenticate the client or reject the request.
- 10. If successful, the client has authenticated and can proceed.

For configuration instructions, refer to Setting up LDAP authentication with SASL.

# **Kerberos Authentication**

Percona Server for MongoDB supports Kerberos authentication starting from release 4.2.6-6.

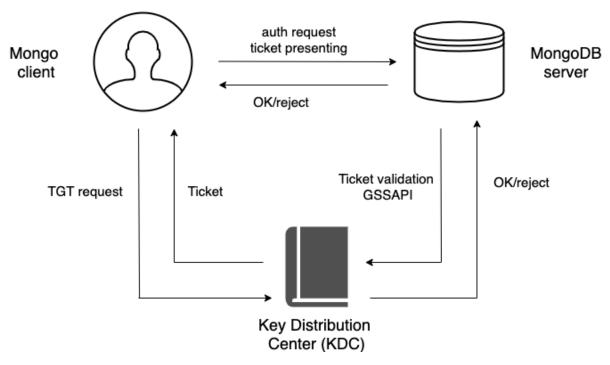
This authentication mechanism involves the use of a Key Distribution Center (KDC) - a symmetric encryption component which operates with tickets. A ticket is a small amount of encrypted data which is used for authentication. It is issued for a user session and has a limited lifetime.

When using Kerberos authentication, you also operate with principals and realms.

A realm is the logical network, similar to a domain, for all Kerberos nodes under the same master KDC.

A principal is a user or a service which is known to Kerberos. A principal name is used for authentication in Kerberos. A service principal represents the service, e.g. mongodb. A user principal represents the user. The user principal name corresponds to the username in the \$external database in Percona Server for MongoDB.

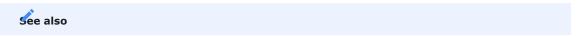
The following diagram shows the authentication workflow:



The sequence is the following:

- 1. A mongo client sends the Ticket-Grantng Ticket (TGT) request to the Key Distribution Center (KDC)
- 2. The KDC issues the ticket and sends it to the mongo client.
- 3. The mongo client sends the authentication request to the mongo server presenting the ticket.
- 4. The mongo server validates the ticket in the KDC.
- 5. Upon successful ticket validation, the authentication request is approved and the user is authenticated.

Kerberos authentication in *Percona Server for MongoDB* is implemented the same way as in MongoDB Enterprise.



MongoDB Documentation: Kerberos Authentication

\*[SCRAM]: Salted Challenge Response Authentication Mechanism

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### 4.3.2 Enable authentication

By default, Percona Server for MongoDB does not restrict access to data and configuration.

Enabling authentication enforces users to identify themselves when accessing the database. This documents describes how to enable built-in authentication mechanism. *Percona Server for MongoDB* also supports the number of external authentication mechanisms. To learn more, refer to Authentication.

You can enable authentication either automatically or manually.

### Automatic setup

To enable authentication and automatically set it up, run the /usr/bin/percona-server-mongodb-enable-auth.sh script as root or using sudo.

This script creates the dba user with the root role. The password is randomly generated and printed out in the output. Then the script restarts *Percona Server for MongoDB* with access control enabled. The dba user has full superuser privileges on the server. You can add other users with various roles depending on your needs.

For usage information, run the script with the -h option.

#### Manual setup

To enable access control manually:

1. Add the following lines to the configuration file:

```
security:
authorization: enabled
```

2. Run the following command on the admin database:

```
> db.createUser({user: 'USER', pwd: 'PASSWORD', roles: ['root'] });
```

3. Restart the mongod service:

```
$ service mongod restart
```

4. Connect to the database as the newly created user:

```
$ mongo --port 27017 -u 'USER' -p 'PASSWORD' --authenticationDatabase "admin"
```



MongoDB Documentation: Enable Access Control

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## 4.3.3 Set up LDAP authentication with SASL

This document describes an example configuration suitable only to test out the external authentication functionality in a non-production environment. Use common sense to adapt these guidelines to your production environment.

To learn more about how the authentication works, see LDAP authentication with SASL.

## **Environment setup and configuration**

The following components are required:

- slapd: OpenLDAP server.
- libsasl2 version 2.1.25 or later.
- saslauthd: Authentication Daemon (distinct from libsasl2).

The following steps will help you configure your environment:

#### **ASSUMPTIONS**

Before we move on to the configuration steps, we assume the following:

- 1. You have the LDAP server up and running and have configured users on it. The LDAP server is accessible to the server with Percona Server for MongoDB installed. This document focuses on OpenLDAP server. If you use Microsoft Windows Active Directory, see the Microsoft Windows Active Directory section for saslauthd configuration.
- 2. You must place these two servers behind a firewall as the communications between them will be in plain text. This is because the SASL mechanism of PLAIN can only be used when authenticating and credentials will be sent in plain text.
- 3. You have sudo privilege to the server with the Percona Server for MongoDB installed.

CONFIGURE SASLAUTHD

1. Install the SASL packages. Depending on your OS, use the following command:

### **Debian and Ubuntu**

```
$ sudo apt install -y sasl2-bin
```

# **RHEL** and derivatives

```
$ sudo yum install -y cyrus-sasl
```

**NOTE**: For Percona Server for MongoDB versions earlier than 4.0.26-21, 4.4.8-9, 4.2.16-17, also install the cyrus-sasl-plain package.

2. Configure SASL to use ldap as the authentication mechanism.



Back up the original configuration file before making changes.

### **Debian and Ubuntu**

Use the following commands to enable the saslauthd to auto-run on startup and to set the ldap value for the --MECHANISMS option:

```
$ sudo sed -i -e s/^MECH=pam/MECH=ldap/g /etc/sysconfig/saslauthdsudo sed -i -e s/
^MECHANISMS="pam"/MECHANISMS="ldap"/g /etc/default/saslauthd
$ sudo sed -i -e s/^START=no/START=yes/g /etc/default/saslauthd
```

Alternatively, you can edit the /etc/default/sysconfig/saslauthd configuration file:

```
START=yes
MECHANISMS="ldap
```

### **RHEL** and derivatives

Specify the ldap value for the --MECH option using the following command:

```
$ sudo sed -i -e s/^MECH=pam/MECH=ldap/g /etc/sysconfig/saslauthd
```

Alternatively, you can edit the /etc/sysconfig/saslauthd configuration file:

MECH=ldap

3. Create the <code>//etc/saslauthd.conf</code> configuration file and specify the settings that <code>saslauthd</code> requires to connect to a local LDAP service:

### OpenLDAP server

The following is the example configuration file. Note that the server address **MUST** match the OpenLDAP installation:

```
ldap_servers: ldap://localhost
ldap_mech: PLAIN
ldap_search_base: dc=example,dc=com
ldap_filter: (cn=%u)
ldap_bind_dn: cn=admin,dc=example,dc=com
ldap_password: secret
```

Note the LDAP password (ldap\_password) and bind domain name (ldap\_bind\_dn). This allows the saslauthd service to connect to the LDAP service as admin. In production, this would not be the case; users should not store administrative passwords in unencrypted files.

## **Microsoft Windows Active Directory**

In order for LDAP operations to be performed against a Windows Active Directory server, a user record must be created to perform the lookups.

The following example shows configuration parameters for saslauthd to communicate with an Active Directory server:

```
ldap_servers: ldap://localhost
ldap_mech: PLAIN
ldap_search_base: CN=Users,DC=example,DC=com
ldap_filter: (sAMAccountName=%u)
ldap_bind_dn: CN=ldapmgr,CN=Users,DC=<AD Domain>,DC=<AD TLD>
ldap_password: ld@pmgr_Pa55word
```

In order to determine and test the correct search base and filter for your Active Directory installation, the Microsoft LDP GUI Tool can be used to bind and search the LDAP-compatible directory.

4. Start the saslauthd process and set it to run at restart:

```
$ sudo systemctl start saslauthd
$ sudo systemctl enable saslauthd
```

5. Give write permissions to the /run/saslauthd folder for the mongod. Either change permissions to the /run/saslauthd folder:

```
$ sudo chmod 755 /run/saslauthd
```

Or add the mongod user to the sas1 group:

```
$ sudo usermod -a -G sasl mongod
```

## SANITY CHECK

Verify that the saslauthd service can authenticate against the users created in the LDAP service:

```
$ testsaslauthd -u christian -p secret -f /var/run/saslauthd/mux
```

This should return 0:0K "Success". If it doesn't, then either the user name and password are not in the LDAP service, or sasaluthd is not configured properly.

#### **CONFIGURE LIBSASL2**

The mongod also uses the SASL library for communications. To configure the SASL library, create a configuration file.

The configuration file **must** be named <code>mongodb.conf</code> and placed in a directory where <code>libsasl2</code> can find and read it. <code>libsasl2</code> is hard-coded to look in certain directories at build time. This location may be different depending on the installation method.

In the configuration file, specify the following:

```
pwcheck_method: saslauthd
saslauthd_path: /var/run/saslauthd/mux
log_level: 5
mech_list: plain
```

The first two entries (pwcheck\_method and saslauthd\_path) are required for mongod to successfully use the saslauthd service. The log\_level is optional but may help determine configuration errors.



### SASL documentation

#### CONFIGURE MONGOD SERVER

The configuration consists of the following steps:

- Creating a user with the **root** privileges. This user is required to log in to Percona Server for MongoDB after the external authentication is enabled.
- Editing the configuration file to enable the external authentication

### Create a root user

Create a user with the **root** privileges in the admin database. If you have already created this user, skip this step. Otherwise, run the following command to create the admin user:

```
> use admin
switched to db admin
> db.createUser({"user": "admin", "pwd": "$3cr3tP4ssw0rd", "roles": ["root"]})
Successfully added user: { "user" : "admin", "roles" : [ "root" ] }
```

## Enable external authentication

Edit the etc/mongod.conf configuration file to enable the external authentication:

```
security:
   authorization: enabled

setParameter:
   authenticationMechanisms: PLAIN, SCRAM-SHA-1
```

Restart the mongod service:

```
$ sudo systemctl restart mongod
```

#### Add an external user to Percona Server for MongoDB

User authentication is done by mapping a user object on the LDAP server against a user created in the <code>\$external</code> database. Thus, at this step, you create the user in the <code>\$external</code> database and they inherit the roles and privileges. Note that the username must exactly match the name of the user object on the LDAP server.

Connect to Percona Server for MongoDB and authenticate as the root user.

```
$ mongo --host localhost --port 27017 -u admin -p '$3cr3tP4ssw0rd' --authenticationDatabase 'admin'
```

Use the following command to add an external user to Percona Server for MongoDB:

```
> db.getSiblingDB("$external").createUser( {user : "christian", roles: [ {role: "read", db: 
"test"} ]} );
```

### Authenticate as an external user in Percona Server for MongoDB

When running the mongo client, a user can authenticate against a given database using the following command:

```
> db.getSiblingDB("$external").auth({ mechanism:"PLAIN", user:"christian", pwd:"secret",
digestPassword:false})
```

Alternatively, a user can authenticate while connecting to Percona Server for MongoDB:

```
$ mongo --host localhost --port 27017 --authenticationMechanism PLAIN --
authenticationDatabase \$external -u christian -p
```

This section is based on the blog post Percona Server for MongoDB Authentication Using Active Directory by Doug Duncan:

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## 4.3.4 Set up x.509 authentication and LDAP authorization

x.509 certificate authentication is one of the supported authentication mechanisms in Percona Server for MongoDB. It is compatible with LDAP authorization to enable you to control user access and operations in your database environment.

This document provides the steps on how to configure and use x.509 certificates for authentication in Percona Server for MongoDB and authorize users in the LDAP server.

#### Considerations

- 1. For testing purposes, in this tutorial we use OpenSSL to issue self-signed certificates. For production use, we recommend using certificates issued and signed by the CA in Percona Server for MongoDB. Client certificates must meet the client certificate requirements.
- 2. The setup of the LDAP server and the configuration of the LDAP schema is out of scope of this document. We assume that you have the LDAP server up and running and accessible to Percona Server for MongoDB.

### Setup procedure

#### ISSUE CERTIFICATES

1. Create a directory to store the certificates. For example, /var/lib/mongocerts.

```
$ sudo mkdir -p /var/lib/mongocerts
```

2. Grant access to the mongod user to this directory:

```
$ sudo chown mongod:mongod /var/lib/mongocerts
```

### Generate the root Certificate Authority certificate

The root Certificate Authority certificate will be used to sign the SSL certificates.

Run the following command and in the <code>-subj</code> flag, provide the details about your organization:

- C Country Name (2 letter code);
- ST State or Province Name (full name);
- L Locality Name (city);
- O Organization Name (company);
- CN Common Name (your name or your server's hostname) .

```
$ cd /var/lib/mongocerts
$ sudo openssl req -nodes -x509 -newkey rsa:4096 -keyout ca.key -out ca.crt -subj "/C=US/
ST=California/L=SanFrancisco/O=Percona/OU=root/CN=localhost"
```

#### Generate server certificate

- 1. Create the server certificate request and key. In the -subj flag, provide the details about your organization:
- C Country Name (2 letter code);
- ST State or Province Name (full name);
- L Locality Name (city);
- O Organization Name (company);
- CN Common Name (your name or your server's hostname) .

```
$ sudo openssl req -nodes -newkey rsa:4096 -keyout server.key -out server.csr -subj "/C=US/ST=California/L=SanFrancisco/O=Percona/OU=server/CN=localhost"
```

2. Sign the server certificate request with the root CA certificate:

```
$ sudo openssl x509 -req -in server.csr -CA ca.crt -CAkey ca.key -set_serial 01 -out server.crt
```

3. Combine the server certificate and key to create a certificate key file. Run this command as the root user:

```
$ cat server.key server.crt > server.pem
```

#### Generate client certificates

1. Generate client certificate request and key. In the -subj flag, specify the information about clients in the DN format.

```
$ openssl req -nodes -newkey rsa:4096 -keyout client.key -out client.csr -subj "/DC=com/
DC=percona/CN=John Doe"
```

2. Sign the client certificate request with the root CA certificate.

```
$ openssl x509 -req -in client.csr -CA ca.crt -CAkey ca.key -set_serial 02 -out client.crt
```

3. Combine the client certificate and key to create a certificate key file.

```
$ cat client.key client.crt > client.pem
```

## SET UP THE LDAP SERVER

The setup of the LDAP server is out of scope of this document. Please work with your LDAP administrators to set up the LDAP server and configure the LDAP schema.

# CONFIGURE THE MONGOD SERVER

The configuration consists of the following steps:

- Creating a role that matches the user group on the LDAP server
- Editing the configuration file to enable the x.509 authentication



When you use x.509 authentication with LDAP authorization, you don't need to create users in the \$external database. User management is done on the LDAP server so when a client connects to the database, they are authenticated and authorized through the LDAP server.

#### Create roles

At this step, create the roles in the admin database with the names that exactly match the names of the user groups on the LDAP server. These roles are used for user LDAP authorization in Percona Server for MongoDB.

In our example, we create the role cn=otherusers,dc=percona,dc=com that has the corresponding LDAP group.

## Output:

Enable x.509 authentication

1. Stop the mongod service

```
$ sudo systemctl stop mongod
```

2. Edit the /etc/mongod.conf configuration file.

```
net:
   port: 27017
bindIp: 127.0.0.1
tls:
   mode: requireTLS
   certificateKeyFile: /var/lib/mongocerts/server.pem
   CAFile: /var/lib/mongocerts/ca.crt
```

```
security:
   authorization: enabled
ldap:
    servers: "ldap.example.com"
    transportSecurity: none
   authz:
        queryTemplate: "dc=percona,dc=com??sub?(&(objectClass=groupOfNames)(member={USER}))"

setParameter:
   authenticationMechanisms: PLAIN,MONGODB-X509
```

Replace ldap.example.com with the hostname of your LDAP server. In the LDAP query template, replace the domain controllers percona and com with those relevant to your organization.

## 3. Start the mongod service

```
$ sudo systemctl start mongod
```

#### AUTHENTICATE WITH THE X.509 CERTIFICATE

To test the authentication, connect to Percona Server for MongoDB using the following command:

```
$ mongo --host localhost --tls --tlsCAFile /var/lib/mongocerts/ca.crt --
tlsCertificateKeyFile <path_to_client_certificate>/client.pem --authenticationMechanism
MONGODB-X509 --authenticationDatabase='$external'
```

The result should look like the following:

```
> db.runCommand({connectionStatus : 1})
{
     "authInfo" : {
             "authenticatedUsers" : [
                     {
                              "user" : "CN=John Doe, DC=percona, DC=com",
                              "db" : "$external"
             ],
             "authenticatedUserRoles" : [
                              "role" : "cn=otherreaders,dc=percona,dc=com",
                              "db" : "admin"
                     },
                     {
                              "role" : "clusterAdmin",
                              "db" : "admin"
                     },
                     {
                              "role" : "userAdminAnyDatabase",
                              "db" : "admin"
                     },
                      {
                              "role" : "clusterManager",
                              "db" : "admin"
                     },
                     {
                              "role" : "clusterMonitor",
                              "db" : "admin"
             ]
```

```
"ok" : 1
}
```

[CA]: Certificate Authority [DN]: Distinguished Name

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## 4.3.5 Set up Kerberos authentication

This document provides configuration steps for setting up Kerberos Authentication in Percona Server for MongoDB.

## **Assumptions**

The setup of the Kerberos server itself is out of scope of this document. Please refer to the Kerberos documentation for the installation and configuration steps relevant to your operation system.

We assume that you have successfully completed the following steps:

- Installed and configured the Kerberos server
- Added necessary realms
- Added service, admin and user principals
- Configured the A and PTR DNS records for every host running mongod instance to resolve the hostnames onto Kerberos realm.

### Add user principals to Percona Server for MongoDB

To get authenticated, users must exist both in the Kerberos and Percona Server for MongoDB servers with exactly matching names.

After you defined the user principals in the Kerberos server, add them to the <code>\$external</code> database in Percona Server for MongoDB and assign required roles:

```
> use $external
> db.createUser({user: "demo@PERCONATEST.COM",roles: [{role: "read", db: "admin"}]})
```

Replace demo@PERCONATEST.COM with your username and Kerberos realm.

## Configure Kerberos keytab files

A keytab file stores the authentication keys for a service principal representing a mongod instance to access the Kerberos admin server.

After you have added the service principal to the Kerberos admin server, the entry for this principal is added to the /etc/krb5.keytab keytab file.

The mongod server must have access to the keytab file to authenticate. To keep the keytab file secure, restrict the access to it only for the user running the mongod process.

1. Stop the mongod service

```
$ sudo systemctl stop mongod
```

2. Generate the keytab file or get a copy of it if you generated the keytab file on another host. Save the keyfile under a separate path (e.g. /etc/mongodb.keytab)

```
$ cp /etc/krb5.keytab /etc/mongodb.keytab
```

3. Change the ownership to the keytab file

```
$ sudo chown mongod:mongod /etc/mongodb.keytab
```

4. Set the KRB5\_KTNAME variable in the environment file for the mongod process.

### Debian and Ubuntu

Edit the environment file at the path /etc/default/mongod and specify the KRB5\_KTNAME variable:

```
KRB5_KTNAME=/etc/mongodb.keytab
```

If you have a different path to the keytab file, specify it accordingly.

### **RHEL** and derivatives

Edit the environment file at the path /etc/sysconfig/mongod and specify the KRB5\_KTNAME variable:

```
KRB5_KTNAME=/etc/mongodb.keytab
```

If you have a different path to the keytab file, specify it accordingly.

5. Restart the mongod service

```
$ sudo systemctl start mongod
```

# Percona Server for MongoDB configuration

Enable external authentication in Percona Server for MongoDB configuration. Edit the etc/mongod.conf configuration file and specify the following configuration:

```
security:
   authorization: "enabled"

setParameter:
   authenticationMechanisms: GSSAPI
```

Restart the mongod service to apply the configuration:

```
$ sudo systemctl start mongod
```

### Test the access to Percona Server for MongoDB

1. Obtain the Kerberos ticket for the user using the kinit command and specify the user password:

```
$ kinit demo
Password for demo@PERCONATEST.COM:
```

2. Check the user ticket:

```
$ klist -l
```

Output:

```
Principal name Cache name
-----
demo@PERCONATEST.COM FILE:/tmp/<ticket>
```

3. Connect to Percona Server for MongoDB:

```
$ mongo --host <hostname> --authenticationMechanism=GSSAPI --
authenticationDatabase='$external' --username demo@PERCONATEST.COM
```

The result should look like the following:

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### 4.3.6 LDAP authorization

LDAP authorization allows you to control user access and operations in your database environment using the centralized user management storage – an LDAP server. You create and manage user credentials and permission information in the LDAP server. In addition, you create roles in the admin database with the names that exactly match the LDAP group Distinguished Name. These roles define what privileges the users who belong to the corresponding LDAP group.

### Supported authentication mechanisms

LDAP authorization is compatible with the following authentication mechanisms:

- x.509 certificate authentication
- Kerberos Authentication
- Authentication and authorization with direct binding to LDAP

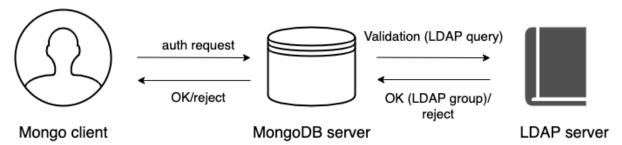
### Authentication and authorization with direct binding to LDAP

Starting with release 4.2.5-5, you can configure Percona Server for MongoDB to communicate with the LDAP server directly to authenticate and also authorize users.

The advantage of using this mechanism is that it is easy to setup and does not require pre-creating users in the dummy <code>\$external</code> db. Nevertheless, the <code>--authenticationDatabase</code> connection argument will still need to be specified as <code>\$external</code>.

The following example illustrates the connection to Percona Server for MongoDB from the mongo shell:

The following diagram illustrates the authentication and authorization flow:



- 1. A user connects to the db providing their credentials
- 2. If required, Percona Server for MongoDB transforms the username to match the user in the LDAP server according to the mapping rules specified for the --ldapUserToDNMapping parameter.
- 3. Percona Server for MongoDB queries the LDAP server for the user identity and /or the LDAP groups this user belongs to.
- 4. The LDAP server evaluates the query and if a user exists, returns their LDAP groups.
- 5. Percona Server for MongoDB authorizes the user by mapping the DN of the returned groups against the roles assigned to the user in the admin database. If a user belongs to several groups they receive permissions associated with every group.

#### **USERNAME TRANSFORMATION**

If clients connect to Percona Server for MongoDB with usernames that are not LDAP , these usernames must be converted to the format acceptable by LDAP.

To achieve this, the --ldapUserToDNMapping parameter is available in Percona Server for MongoDB configuration.

The --ldapUserToDNMapping parameter is a JSON string representing an ordered array of rules expressed as JSON documents. Each document provides a regex pattern (match field) to match against a provided username. If that pattern matches, there are two ways to continue:

- If there is the substitution value, then the matched pattern becomes the username of the user for further processing.
- If there is the <code>ldapQuery</code> value, the matched pattern is sent to the LDAP server and the result of that LDAP query becomes the of the user for further processing.

Both substitution and ldapQuery should contain placeholders to insert parts of the original username – those placeholders are replaced with regular expression submatches found on the match stage.

So having an array of documents, Percona Server for MongoDB tries to match each document against the provided name and if it matches, the name is replaced either with the substitution string or with the result of the LDAP query.

#### LDAP REFERRALS

As of version 4.2.10-11, Percona Server for MongoDB supports LDAP referrals as defined in RFC 4511 4.1.10. For security reasons, referrals are disabled by default. Double-check that using referrals is safe before enabling them.

To enable LDAP referrals, set the ldapFollowReferrals server parameter to true using the setParameter command or by editing the configuration file.

```
setParameter:
ldapFollowReferrals: true
```

### CONNECTION POOL

As of version 4.2.10-11, Percona Server for MongoDB always uses a connection pool to LDAP server to process bind requests. The connection pool is enabled by default. The default connection pool size is 2 connections.

You can change the connection pool size either at the server startup or dynamically by specifying the value for the <code>ldapConnectionPoolSizePerHost</code> server parameter.

For example, to set the number of connections in the pool to 5, use the setParameter command:

# Command line

```
>db.adminCommand( { setParameter: 1, ldapConnectionPoolSizePerHost: 5 } )
```

## Configuration file

```
setParameter:
ldapConnectionPoolSizePerHost: 5
```

#### SUPPORT FOR MULTIPLE LDAP SERVERS

As of version 4.2.12-13, you can specify multiple LDAP servers for failover. Percona Server for MongoDB sends bind requests to the first server defined in the list. When this server is down or unavailable, it sends requests to the next server and so on. Note that Percona Server for MongoDB keeps sending requests to this server even after the unavailable server recovers.

Specify the LDAP servers as a comma-separated list in the format <host>:<port> for the -ldapServers option.

You can define the option value at the server startup by editing the configuration file.

```
security:
  authorization: "enabled"
  ldap:
    servers: "ldap1.example.net,ldap2.example.net"
```

You can change IdapServers dynamically at runtime using the setParameter.

```
> db.adminCommand( { setParameter: 1,
ldapServers:"localhost,ldap1.example.net,ldap2.example.net"} )
{ "was" : "ldap1.example.net,ldap2.example.net", "ok" : 1 }
```



### MongoDB Documentation:

- Authenticate and Authorize Users Using Active Directory via Native LDAP
- LDAP referrals

## Configuration

For how to configure LDAP authorization with the native LDAP authentication, see Setting up LDAP authentication and authorization using NativeLDAP.

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# 4.3.7 Set up LDAP authentication and authorization using NativeLDAP

This document describes an example configuration of LDAP authentication and authorization using direct binding to an LDAP server (Native LDAP). We recommend testing this setup in a non-production environment first, before applying it in production.

### **Assumptions**

- 1. The setup of an LDAP server is out of scope of this document. We assume that you are familiar with the LDAP server schema.
- 2. You have the LDAP server up and running and it is accessible to the servers with Percona Server for MongoDB installed.
- 3. This document primarily focuses on OpenLDAP used as the LDAP server and the examples are given based on the OpenLDAP format. If you are using Active Directory, refer to the Active Directory configuration section.
- 4. You have the sudo privilege to the server with the Percona Server for MongoDB installed.

### **Prerequisites**

- In this setup we use anonymous binds to the LDAP server. If your LDAP server disallows anonymous binds, create the user that Percona Server for MongoDB will use to connect to and query the LDAP server. Define this user's credentials for the security.ldap.bind.queryUser and security.ldap.bind.queryPassword parameters in the mongod.conf configuration file.
- In this setup, we use the following OpenLDAP groups:

dn: cn=testusers,dc=percona,dc=com

objectClass: groupOfNames

cn: testusers

member: cn=alice,dc=percona,dc=com

dn: cn=otherusers,dc=percona,dc=com

 $object {\tt Class:} \ {\tt group Of Names}$ 

cn: otherusers

member: cn=bob,dc=percona,dc=com

### Setup procedure

#### CONFIGURE TLS/SSL CONNECTION FOR PERCONA SERVER FOR MONGODB

By default, Percona Server for MongoDB establishes the TLS connection when binding to the LDAP server and thus, it requires access to the LDAP certificates. To make Percona Server for MongoDB aware of the certificates, do the following:

- 1. Place the certificate in the certs directory. The path to the certs directory is:
- On Debian / Ubuntu: /etc/ssl/certs/
- On RHEL / CentOS: /etc/openldap/certs/
- 2. Specify the path to the certificates in the ldap.conf file:

### Debian / Ubuntu

```
tee -a /etc/openldap/ldap.conf <<EOF
TLS_CACERT /etc/ssl/certs/my_CA.crt
EOF</pre>
```

## **RHEL** and derivatives

```
tee -a /etc/openldap.conf <<EOF
TLS_CACERT /etc/openldap/certs/my_CA.crt
EOF</pre>
```

## CREATE ROLES FOR LDAP GROUPS IN PERCONA SERVER FOR MONGODB

Percona Server for MongoDB authorizes users based on LDAP group membership. For every group, you must create the role in the admin database with the name that exactly matches the DN of the LDAP group.

Percona Server for MongoDB maps the user's LDAP group to the roles and determines what role is assigned to the user. Percona Server for MongoDB then grants privileges defined by this role.

To create the roles, use the following command:

#### PERCONA SERVER FOR MONGODB CONFIGURATION

#### Access without username transformation

This section assumes that users connect to Percona Server for MongoDB by providing their LDAP DN as the username.

1. Edit the Percona Server for MongoDB configuration file (by default, /etc/mongod.conf) and specify the following configuration:

```
security:
   authorization: "enabled"
   ldap:
       servers: "ldap.example.com"
       transportSecurity: tls
       authz:
            queryTemplate: "dc=percona,dc=com??sub?(&(objectClass=groupOfNames)
(member={PROVIDED_USER}))"

setParameter:
   authenticationMechanisms: "PLAIN"
```

The {PROVIDED\_USER} variable substitutes the provided username before authentication or username transformation takes place.

Replace ldap.example.com with the hostname of your LDAP server. In the LDAP query template, replace the domain controllers percona and com with those relevant to your organization.

2. Restart the mongod service:

```
$ sudo systemctl restart mongod
```

3. Test the access to Percona Server for MongoDB:

```
$ mongo -u "cn=alice,dc=percona,dc=com" -p "secretpwd" --authenticationDatabase '$external' --
authenticationMechanism 'PLAIN'
```

### Access with username transformation

If users connect to Percona Server for MongoDB with usernames that are not LDAP DN, you need to transform these usernames to be accepted by the LDAP server.

Using the --ldapUserToDNMapping configuration parameter allows you to do this. You specify the match pattern as a regexp to capture a username. Next, specify how to transform it - either to use a substitution value or to query the LDAP server for a username.

If you don't know what the substitution or LDAP query string should be, please consult with the LDAP administrators to figure this out.

Note that you can use only the query or the substitution stage, the combination of two is not allowed.

### Substitution

1. Edit the Percona Server for MongoDB configuration file (by default, /etc/mongod.conf) and specify the userToDNMapping parameter:

The {USER} variable substitutes the username transformed during the userToDNMapping stage.

Modify the given example configuration to match your deployment.

2. Restart the mongod service:

```
$ sudo systemctl restart mongod
```

3. Test the access to Percona Server for MongoDB:

```
$ mongo -u "alice@percona.com" -p "secretpwd" --authenticationDatabase '$external' --
authenticationMechanism 'PLAIN'
```

# LDAP query

1. Edit the Percona Server for MongoDB configuration file (by default, /etc/mongod.conf) and specify the userToDNMapping parameter:

The {USER} variable substitutes the username transformed during the userToDNMapping stage.

Modify the given example configuration to match your Loap land completed planether to match of the hostname of your Loap server. Replace the domain controllers (DC) percona and com with those relevant to your organization. Depending on your Loap schema, further modifications of the Loap query may be required.

### **ACTIVE DIRECTORY CONFIGURATION**

Microsoft Active Directory uses a different schema for user and group definition. To illustrate Percona Server for MongoDB configuration, we will use the following AD users:

```
dn:CN=alice,CN=Users,DC=testusers,DC=percona,DC=com
userPrincipalName: alice@testusers.percona.com
memberOf: CN=testusers,CN=Users,DC=percona,DC=com

dn:CN=bob,CN=Users,DC=otherusers,DC=percona,DC=com
userPrincipalName: bob@otherusers.percona.com
memberOf: CN=otherusers,CN=Users,DC=percona,DC=com
```

The following are respective groups:

```
dn:CN=testusers,CN=Users,DC=percona,DC=com
member:CN=alice,CN=Users,DC=testusers,DC=example,DC=com
dn:CN=otherusers,CN=Users,DC=percona,DC=com
member:CN=bob,CN=Users,DC=otherusers,DC=example,DC=com
```

Use one of the given Percona Server for MongoDB configurations for user authentication and authorization in Active Directory:

### No username transformation

1. Edit the /etc/mongod.conf configuration file:

```
ldap:
    servers: "ldap.example.com"
    authz:
        queryTemplate: "DC=percona,DC=com??sub?(&(objectClass=group)(member:
1.2.840.113556.1.4.1941:={PROVIDED_USER}))"

setParameter:
    authenticationMechanisms: "PLAIN"
```

2. Restart the mongod service:

```
$ sudo systemctl restart mongod
```

3. Test the access to Percona Server for MongoDB:

```
$ mongo -u "CN=alice,CN=Users,DC=testusers,DC=percona,DC=com" -p "secretpwd" --
authenticationDatabase '$external' --authenticationMechanism 'PLAIN'
```

### Username substitution

1. Edit the /etc/mongod.conf configuration file:

2. Restart the mongod service:

```
$ sudo systemctl restart mongod
```

3. Test the access to Percona Server for MongoDB:

```
$ mongo -u "alice@percona.com" -p "secretpwd" --authenticationDatabase '$external' --
authenticationMechanism 'PLAIN'
```

### LDAP query

1. Edit the /etc/mongod.conf configuration file:

```
ldap:
    servers: "ldap.example.com"
    authz:
        queryTemplate: "DC=percona,DC=com??sul62(&fd23ectClass=group)(member:

1.2.840.113556.1.4.1941:={USER}))"
    userToDNMapping: >-
```

Modify one of this example configuration to match your deployment.

This document is based on the following posts from Percona Database Performance Blog:

- Percona Server for MongoDB LDAP Enhancements: User-to-DN Mapping by Igor Solodovnikov
- Authenticate Percona Server for MongoDB Users via Native LDAP by Ivan Groenewold

[DN]: Distinguished Name [AD]: Active Directory

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# 4.4 Encryption

# 4.4.1 Data at Rest Encryption

Data at rest encryption for the WiredTiger storage engine in MongoDB was introduced in MongoDB Enterprise version 3.2 to ensure that encrypted data files can be decrypted and read by parties with the decryption key.

### Differences from upstream

The data encryption at rest in Percona Server for MongoDB is introduced in version 3.6 to be compatible with data encryption at rest interface in MongoDB. In the current release of Percona Server for MongoDB, the data encryption at rest does not include support for Amazon AWS key management service. Instead, Percona Server for MongoDB is integrated with HashiCorp Vault.

Starting with release 5.0.7-6, Percona Server for MongoDB supports the secure transfer of keys using Key Management Interoperability Protocol (KMIP). This allows users to store encryption keys in their favorite KMIP-compatible key manager when they set up encryption at rest.

Two types of keys are used for data at rest encryption:

- Database keys to encrypt data. They are stored internally, near the data that they encrypt.
- The master key to encrypt database keys. It is kept separately from the data and database keys and requires external management.

To manage the master key, use one of the supported key management options:

- Integration with an external key server (recommended). Percona Server for MongoDB is integrated with HashiCorp Vault for this purpose and supports the secure transfer of keys using Key Management Interoperability Protocol (KMIP).
- Local key management using a keyfile.

Note that you can use only one of the key management options at a time. However, you can switch from one management option to another (e.g. from a keyfile to HashiCorp Vault). Refer to Migrating from Key File Encryption to HashiCorp Vault Encryption section for details.

# **1**mportant

You can only enable data at rest encryption and provide all encryption settings on an empty database, when you start the mongod instance for the first time. You cannot enable or disable encryption while the Percona Server for MongoDB server is already running and / or has some data. Nor can you change the effective encryption mode by simply restarting the server. Every time you restart the server, the encryption settings must be the same.

### Important configuration options

Percona Server for MongoDB supports the encryptionCipherMode option where you choose one of the following cipher modes:

- AES256-CBC
- AES256-GCM

By default, the AES256-CBC cipher mode is applied. The following example demonstrates how to apply the AES256-GCM cipher mode when starting the mongod service:

\$ mongod ... --encryptionCipherMode AES256-GCM



MongoDB Documentation: encryptionCipherMode Option

# **Encrypting rollback files**

Starting from version 3.6, Percona Server for MongoDB also encrypts rollback files when data at rest encryption is enabled. To inspect the contents of these files, use **perconadecrypt**. This is a tool that you run from the command line as follows:

 $\label{thm:condecrypt} $$\operatorname{perconadecrypt}$ $--\operatorname{encryptionKeyFile}$ $\operatorname{FILE}$ $--\operatorname{inputPath}$ $\operatorname{FILE}$ $--\operatorname{outputPath}$ $\operatorname{FILE}$ $[--\operatorname{encryptionCipherMode}$ MODE]$$ 

When decrypting, the cipher mode must match the cipher mode which was used for the encryption. By default, the --encryptionCipherMode option uses the AES256-CBC mode.

### PARAMETERS OF PERCONADECRYPT

Option	Purpose	
encryptionKeyFile	The path to the encryption key file	
encryptionCipherMode	The cipher mode for decryption. The supported values are AES256-CBC or AES256-GCM	
inputPath	The path to the encrypted rollback file	
outputPath	The path to save the decrypted rollback file	

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# 4.4.2 HashiCorp Vault integration

Percona Server for MongoDB is integrated with HashiCorp Vault. HashiCorp Vault supports different secrets engines. Percona Server for MongoDB only supports the HashiCorp Vault back end with KV Secrets Engine - Version 2 (API) with versioning enabled.



Percona Blog: Using Vault to Store the Master Key for Data at Rest Encryption on Percona Server for MongoDB

HashiCorp Vault Documentation: How to configure the KV Engine

### **HashiCorp Vault Parameters**

<b>Command line</b>	Configuration file	Туре	Description
vaultServerName	security.vault.serverName	string	The IP address of the Vault server
vaultPort	security.vault.port	int	The port on the Vault server
vaultTokenFile	security.vault.tokenFile	string	The path to the vault token file. The token file is used by MongoDB to access HashiCorp Vault. The vault token file consists of the raw vault token and does not include any additional strings or parameters.
			Example of a vault token file:
			s.uTrHtzsZnEE7KyHeA797CkWA

### Config file example

```
security:
  enableEncryption: true
vault:
    serverName: 127.0.0.1
  port: 8200
    tokenFile: /home/user/path/token
    secret: secret/data/hello
```

During the first run of the Percona Server for MongoDB, the process generates a secure key and writes the key to the vault.

During the subsequent start, the server tries to read the master key from the vault. If the configured secret does not exist, vault responds with HTTP 404 error.

### **Namespaces**

Namespaces are isolated environments in Vault that allow for separate secret key and policy management.

You can use Vault namespaces with Percona Server for MongoDB. Specify the namespace(s) for the security.vault.secret option value as follows:

```
<namespace>/secret/data/<secret_path>
```

For example, the path to secret keys for namespace test on the secrets engine secret will be test/secret/<my\_secret\_path>.

#### TARGETING A NAMESPACE IN VAULT CONFIGURATION

You have the following options of how to target a particular namespace when configuring Vault:

- 1. Set the VAULT\_NAMESPACE environment variable so that all subsequent commands are executed against that namespace. Use the following command to set the environment variable for the namespace test:
  - \$ export VAULT\_NAMESPACE=test
  - 2. Provide the namespace with the -namespace flag in commands



## HashiCorp Vault Documentation:

- Namespaces
- Secure Multi-Tenancy with Namespaces

### **Key Rotation**

Key rotation is replacing the old master key with a new one. This process helps to comply with regulatory requirements.

To rotate the keys for a single mongod instance, do the following:

- 1. Stop the mongod process
- 2. Add ---vaultRotateMasterKey option via the command line or security.vault.rotateMasterKey to the config file.
- 3. Run the mongod process with the selected option, the process will perform the key rotation and exit.
- 4. Remove the selected option from the startup command or the config file.
- 5. Start mongod again.

Rotating the master key process also re-encrypts the keystore using the new master key. The new master key is stored in the vault. The entire dataset is not re-encrypted.

### KEY ROTATION IN REPLICA SETS

Every mongod node in a replica set must have its own master key. The key rotation steps are the following:

- 1. Rotate the master key for the secondary nodes one by one.
- 2. Step down the primary and wait for another primary to be elected.
- 3. Rotate the master key for the previous primary node.

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# 4.4.3 Using the Key Management Interoperability Protocol (KMIP)

# Version added: 5.0.7-6

Percona Server for MongoDB adds support for secure transfer of keys using the OASIS Key Management Interoperability Protocol (KMIP). The KMIP implementation was tested with the PyKMIP server and the HashiCorp Vault Enterprise KMIP Secrets Engine.

KMIP enables the communication between key management systems and the database server. KMIP provides the following benefits:

- Streamlines encryption key management
- Eliminates redundant key management processes

Starting with version 5.0.9-8, you can specify multiple KMIP servers for failover. On startup, Percona Server for MongoDB connects to the servers in the order listed and selects the one with which the connection is successful.

Starting with version 5.0.11-10, the kmipKeyIdentifier option is no longer mandatory. When left blank, the database server creates a key on the KMIP server and uses that for encryption. When you specify the identifier, the key with such an ID must exist on the key storage.

### **KMIP** parameters

Option	Туре	Description
kmipServerName	string	The hostname or IP address of the KMIP server. As of version 4.2.21-21, multiple KMIP servers are supported as the comma-separated list, e.g. kmip1.example.com,kmip2.example.com
kmipPort	number	The port used to communicate with the KMIP server. When undefined, the default port 5696 will be used
kmipServerCAFile	string	The path to the CA certificate file. CA file is used to validate secure client connection to the KMIP server
kmipClientCertificateFile	string	The path to the PEM file with the KMIP client private key and the certificate chain. The database server uses this PEM file to authenticate the KMIP server
kmipKeyIdentifier	string	Optional starting with version 5.0.11-10. The identifier of the KMIP key. If the key does not exist, the database server creates a key on the KMIP server with the specified identifier. When you specify the identifier, the key with such an ID must exist on the key storage. You can only use this setting for the first time you enable encryption.
kmipRotateMasterKey	boolean	Controls master keys rotation. When enabled, generates the new master key version and re-encrypts the keystore. Available as of version 5.0.8-7. Requires the uniquekmipKeyIdentifier for every mongod node.
 kmipClientCertificatePassword	string	The password for the KMIP client private key or certificate. Use this parameter only if the KMIP client private key or certificate is encrypted. Available starting with version 5.0.9-8.

## 4.4.4 Key rotation

Starting with release 5.0.8-7, the support for master key rotation is added. This enables users to comply with data security regulations when using KMIP.

## 4.4.5 Configuration

#### CONSIDERATIONS

Make sure you have obtained the root certificate, and the keypair for the KMIP server and the mongod client. For testing purposes you can use the OpenSSL to issue self-signed certificates. For production use we recommend you use the valid certificates issued by the key management appliance.

To enable data-at-rest encryption in Percona Server for MongoDB using KMIP, edit the /etc/mongod.conf configuration file as follows:

```
security:
    enableEncryption: true
kmip:
    serverName: <kmip_server_name>
    port: <kmip_port>
    clientCertificateFile: </path/client_certificate.pem>
    clientKeyFile: </path/client_key.pem>
    serverCAFile: </path/ca.pem>
    keyIdentifier: <key_name>
```

Alternatively, you can start Percona Server for MongoDB using the command line as follows:

```
$ mongod --enableEncryption \
    --kmipServerName <kmip_servername> \
    --kmipPort <kmip_port> \
    --kmipServerCAFile <path_to_ca_file> \
    --kmipClientCertificateFile <path_to_client_certificate> \
    --kmipClientKeyFile <path_to_client_private_key> \
    --kmipKeyIdentifier <kmip_identifier>
```

## 4.4.6 Minor upgrade of Percona Server for MongoDB to version 5.0.11-10 and higher

With the kmipKeyIdentifier option becoming optional in version 5.0.11-10, the standard upgrade procedure doesn't work if you are upgrading from version 5.0.10-9 and earlier.

For Percona Server for MongoDB 5.0.13-11 and higher, follow the standard upgrade procedure

This section provides upgrade instructions from Percona Server for MongoDB 5.0.10-9 or lower to Percona Server for MongoDB version 5.0.11-10 and higher.

For a single-node deployment, use the mongodump / mongorestore tools to make a backup before the update and to restore from it after binaries are updated.

For replica sets, data must be re-encrypted with the **new** key during the upgrade. Go through the **encrypting existing data steps** but perform the **minor upgrade** between steps 1 and 2 to replace the mongod binary.

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# 4.4.7 Local key management using a keyfile

The key file must contain a 32 character string encoded in base64. You can generate a random key and save it to a file by using the openss1 command:

```
$ openssl rand -base64 32 > mongodb-keyfile
```

Then, as the owner of the mongod process, update the file permissions: only the owner should be able to read and modify this file. The effective permissions specified with the chmod command can be:

- 600 only the owner may read and modify the file
- 400 only the owner may read the file.

```
$ chmod 600 mongodb-keyfile
```

Enable the data encryption at rest in Percona Server for MongoDB by setting these options:

- --enableEncryption to enable data at rest encryption
- --encryptionKeyFile to specify the path to a file that contains the encryption key

```
$ mongod ... --enableEncryption --encryptionKeyFile <fileName>
```

By default, Percona Server for MongoDB uses the AES256-CBC cipher mode. If you want to use the AES256-CBC cipher mode, then use the --encryptionCipherMode parameter to change it.

If mongod is started with the --relaxPermChecks option and the key file is owned by root, then mongod can read the file based on the group bit set accordingly. The effective key file permissions in this case are:

- 440 both the owner and the group can only read the file, or
- 640 only the owner can read and the change the file, the group can only read the file.

All these options can be specified in the configuration file:

```
security:
    enableEncryption: <boolean>
    encryptionCipherMode: <string>
    encryptionKeyFile: <string>
    relaxPermChecks: <boolean>
```

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## 4.4.8 Migrating from key file encryption to HashiCorp Vault encryption

The steps below describe how to migrate from the key file encryption to using HashiCorp Vault.



This is a simple guideline and it should be used for testing purposes only. We recommend to use Percona Consulting Services to assist you with migration in production environment.

#### ASSUMPTIONS

We assume that you have installed and configured the vault server and enabled the KV Secrets Engine as the secrets storage for it.

1. Stop mongod.

```
$ sudo systemctl stop mongod
```

- 2. Insert the key from keyfile into the HashiCorp Vault server to the desired secret path.
- Retrieve the key value from the keyfile

```
$ sudo cat /data/key/mongodb.key
d0JTFcePmvROyLXwCbAH8fmiP/ZRm0nYbeJDMGaI7Zw=
```

• Insert the key into vault

\$ vault kv put secret/dc/psmongodb1 value=d0JTFcePmvR0yLXwCbAH8fmiP/ZRm0nYbeJDMGaI7Zw=



Vault KV Secrets Engine uses different read and write secrets paths. To insert data to vault, specify the secret path without the data/ prefix.

3. Edit the configuration file to provision the HashiCorp Vault configuration options instead of the key file encryption options.

```
security:
    enableEncryption: true
    vault:
        serverName: 10.0.2.15
    port: 8200
        secret: secret/data/dc/psmongodb1
        tokenFile: /etc/mongodb/token
        serverCAFile: /etc/mongodb/vault.crt
```

4. Start the mongod service

```
$ sudo systemctl start mongod
```

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# 4.5 Auditing

Auditing allows administrators to track and log user activity on a MongoDB server. With auditing enabled, the server will generate an audit log file. This file contains information about different user events including authentication, authorization failures, and so on.

To enable audit logging, specify where to send audit events using the --auditDestination option on the command line or the auditLog.destination variable in the configuration file.

If you want to output events to a file, also specify the format of the file using the --auditFormat option or the auditLog.format variable, and the path to the file using the --auditPath option or the auditLog.path variable.

To filter recorded events, use the --auditFilter option or the auditLog.filter variable.

For example, to log only events from a user named **tim** and write them to a JSON file /var/log/psmdb/audit.json, start the server with the following parameters:

```
$ mongod \
--dbpath data/db
--auditDestination file \
--auditFormat JSON \
--auditPath /var/log/psmdb/audit.json \
--auditFilter '{ "users.user" : "tim" }'
```

The options in the previous example can be used as variables in the MongoDB configuration file:

```
storage:
  dbPath: data/db
auditLog:
  destination: file
  format: JSON
  path: /var/log/psmdb/audit.json
  filter: '{ "users.user" : "tim" }'
```

This example shows how to send audit events to the syslog. Specify the following parameters:

```
mongod \
--dbpath data/db
--auditDestination syslog \
```

Alternatively, you can edit the MongoDB configuration file:

```
storage:
  dbPath: data/db
auditLog:
  destination: syslog
```



If you start the server with auditing enabled, you cannot disable auditing dynamically during runtime.

# 4.5.1 Audit options

The following options control audit logging:

<b>Command line</b>	Configuration file	Туре	Description
auditDestination()	auditLog.destination	string	Enables auditing and specifies where to send audit events: - console: Output audit events to stdout file: Output audit events to a file specified by theauditPath option in a format specified by theauditFormat Option syslog: Output audit events to syslog
auditFilter()	auditLog.filter	string	Specifies a filter to apply to incoming audit events, enabling the administrator to only capture a subset of them. The value must be interpreted as a query object with the following syntax:  { <field1>: <expression1>, }  Audit log events that match this query will be logged. Events that do not match this query will be ignored. For more information, see Audit filter examples</expression1></field1>
auditFormat()	auditLog.format	string	Specifies the format of the audit log file, if you set theauditDestination option to file.  The default value is JSON.  Alternatively, you can set it to BSON
auditPath()	auditLog.path	string	Specifies the fully qualified path to the file where audit log events are written, if you set theauditDestination option to file.  If this option is not specified, then the auditLog.json file is created in the server's configured log path. If log path is not configured on the server, then the auditLog.json file is created in the current directory (from which mongod was started).  NOTE: This file will rotate in the same
			manner as the system log path, either on server reboot or using the logRotate command. The time of rotation will be added to the old file's name.

# 4.5.2 Audit message syntax

Audit logging writes messages in JSON format with the following syntax:

```
atype: <String>,
  ts : { "$date": <timestamp> },
  local: { ip: <String>, port: <int> },
  remote: { ip: <String>, port: <int> },
  users : [ { user: <String>, db: <String> }, ... ],
  roles: [ { role: <String>, db: <String> }, ... ],
  param: <document>,
  result: <int>
}
```

Parameter	Description
atype	Event type
ts	Date and UTC time of the event
local	Local IP address and port number of the instance
remote	Remote IP address and port number of the incoming connection associated with the event
users	Users associated with the event
roles	Roles granted to the user
param	Details of the event associated with the specific type
result	Exit code ( 0 for success)

## 4.5.3 Audit filter examples

The following examples demonstrate the flexibility of audit log filters.

#### Standard query selectors

You can use query selectors, such as \$eq, \$in, \$gt, \$lt, \$ne, and others to log multiple event types.

For example, to log only the dropCollection and dropDatabase events:

#### Command line

#### Config file

```
auditLog:
  destination: file
  filter: '{ atype: { $in: [ "dropCollection", "dropDatabase" ] } }'
```

#### **Regular expressions**

Another way to specify multiple event types is using regular expressions.

For example, to filter all drop operations:

#### Command line

```
--auditDestination file --auditFilter '{ "atype" : /^drop.*/ }'
```

#### Config file

```
auditLog:
  destination: file
  filter: '{ "atype" : /^drop.*/ }'
```

#### Read and write operations

By default, operations with successful authorization are not logged, so for this filter to work, enable auditAuthorizationSuccess parameter, as described in Enabling auditing of authorization success.

For example, to filter read and write operations on all the collections in the  $\ensuremath{\,\text{test}}$  database:



The dot ( , ) after the database name in the regular expression must be escaped with two backslashes ( \\\\\).

#### **Command line**

```
--setParameter auditAuthorizationSuccess=true --auditDestination file --auditFilter
'{ atype: "authCheck", "param.command": { $in: [ "find", "insert", "delete", "update",
"findandmodify" ] }, "param.ns": /^test\\./ } }'
```

#### Config file

```
auditLog:
  destination: file
  filter: '{ atype: "authCheck", "param.command": { $in: [ "find", "insert", "delete",
"update", "findandmodify" ] }, "param.ns": /^test\\./ } }'
setParameter: { auditAuthorizationSuccess: true }
```

## 4.5.4 Enabling auditing of authorization success

By default, only authorization failures for the authCheck action are logged by the audit system. authCheck is for authorization by role-based access control, it does not concern authentication at logins.

To enable logging of authorization successes, set the auditAuthorizationSuccess parameter to true. Audit events will then be triggered by every command, including CRUD ones.



Enabling the <code>lauditAuthorizationSuccess</code> parameter heavily impacts the performance compared to logging only authorization failures.

You can enable it on a running server using the following command:

```
db.adminCommand( { setParameter: 1, auditAuthorizationSuccess: true } )
```

To enable it on the command line, use the following option when running mongod or mongos process:

```
--setParameter auditAuthorizationSuccess=true
```

You can also add it to the configuration file as follows:

```
setParameter:
auditAuthorizationSuccess: true
```

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# 4.6 Profiling Rate Limit

Percona Server for MongoDB can limit the number of queries collected by the database profiler to decrease its impact on performance. Rate limit is an integer between 1 and 1000 and represents the fraction of queries to be profiled. For example, if you set it to 20, then every 20th query will be logged. For compatibility reasons, rate limit of 0 is the same as setting it to 1, and will effectively disable the feature meaning that every query will be profiled.

The MongoDB database profiler can operate in one of three modes:

- 0 : Profiling is disabled. This is the default setting.
- 1: The profiler collects data only for *slow* queries. By default, queries that take more than 100 milliseconds to execute are considered *slow*.
- 2 : Collects profiling data for all database operations.

Mode 1 ignores all *fast* queries, which may be the cause of problems that you are trying to find. Mode 2 provides a comprehensive picture of database performance, but may introduce unnecessary overhead.

With rate limiting you can collect profiling data for all database operations and reduce overhead by sampling queries. Slow queries ignore rate limiting and are always collected by the profiler.

## 4.6.1 Comparing to the sampleRate option

The sampleRate option (= slowOpSampleRate config file option) is a similar concept to rateLimit. But it works at different profile level, completely ignores operations faster than slowOpsThresholdMs (a.k.a. slowMs), and affects the log file printing, too.

	sampleRate	rateLimit
Affects profiling level 1	yes	no
Affects profiling level 2	no	yes
Discards/filters slow ops	yes	no
Discards/filters fast ops	no	yes
Affects log file	yes	no
Example value of option	0.02	50

rateLimit is a better way to have continuous profiling for monitoring or live analysis purposes. sampleRate requires setting slowOpsThresholdMs to zero if you want to sample all types of operations. sampleRate has an effect on the log file which may either decrease or increase the log volume.

## 4.6.2 Enabling the rate limit

To enable rate limiting, set the profiler mode to [2] and specify the value of the rate limit. Optionally, you can also change the default threshold for slow queries, which will not be sampled by rate limiting.

For example, to set the rate limit to 100 (profile every 100th *fast* query) and the slow query threshold to 200 (profile all queries slower than 200 milliseconds), run the mongod instance as follows:

```
$ mongod --profile 2 --slowms 200 --rateLimit 100
```

To do the same at runtime, use the profile command. It returns the *previous* settings and "ok" : 1 indicates that the operation was successful:

```
> db.runCommand( { profile: 2, slowms: 200, ratelimit: 100 } );
{ "was" : 0, "slowms" : 100, "ratelimit" : 1, "ok" : 1 }
```

To check the current settings, run profile: -1:

```
> db.runCommand( { profile: -1 } );
{ "was" : 2, "slowms" : 200, "ratelimit" : 100, "ok" : 1 }
```

If you want to set or get just the rate limit value, use the profilingRateLimit parameter on the admin database:

```
> db.getSiblingDB('admin').runCommand( { setParameter: 1, "profilingRateLimit": 100 } );
{ "was" : 1, "ok" : 1 }
> db.getSiblingDB('admin').runCommand( { getParameter: 1, "profilingRateLimit": 1 } );
{ "profilingRateLimit" : 100, "ok" : 1 }
```

If you want rate limiting to persist when you restart <code>mongod</code>, set the corresponding variables in the <code>MongoDB</code> configuration file (by default, <code>/etc/mongod.conf</code>):

```
operationProfiling:
  mode: all
  slowOpThresholdMs: 200
  rateLimit: 100
```



The value of the operationProfiling.mode variable is a string, which you can set to either off, slowOp, or all, corresponding to profiling modes 0, 1, and 2.

## 4.6.3 Profiler collection extension

Each document in the system.profile collection includes an additional rateLimit field. This field always has the value of 1 for slow queries and the current rate limit value for fast queries.

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# 4.7 Log Redaction

Percona Server for MongoDB can prevent writing sensitive data to the diagnostic log by redacting messages of events before they are logged. To enable log redaction, run mongod with the redactClientLogData option.



Metadata such as error or operation codes, line numbers, and source file names remain visible in the logs.

Log redaction is important for complying with security requirements, but it can make troubleshooting and diagnostics more difficult due to the lack of data related to the log event. For this reason, debug messages are not redacted even when log redaction is enabled. Keep this in mind when switching between log levels.

You can permanently enable log redaction by adding the following to the configuration file:

```
security:
redactClientLogData: true
```

To enable log redaction at runtime, use the setParameter command as follows:

```
db.adminCommand(
    { setParameter: 1, redactClientLogData : true }
)
```

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# 4.8 Additional text search algorithm - ngram

The ngram text search algorithm is useful for searching text for a specific string of characters in a field of a collection. This feature can be used to find exact sub-string matches, which provides an alternative to parsing text from languages other than the list of European languages already supported by MongoDB Community's full text search engine. It may also turn out to be more convenient when working with the text where symbols like dash('-'), underscore('\_'), or slash("/") are not token delimiters.

Unlike MongoDB full text search engine, *ngram* search algorithm uses only the following token delimiter characters that do not count as word characters in human languages:

- Horizontal tab
- Vertical tab
- Line feed
- Carriage return
- Space

The *ngram* text search is slower than MongoDB full text search.

#### 4.8.1 Usage

To use ngram, create a text index on a collection setting the default\_language parameter to ngram:

```
> db.collection.createIndex({name:"text"}, {default_language: "ngram"})
```

ngram search algorithm treats special characters like individual terms. Therefore, you don't have to enclose the search string in escaped double quotes (\\") to query the text index. For example, to search for documents that contain the date 2021-02-12, specify the following:

```
> db.collection.find({ $text: { $search: "2021-02-12" } })
```

However, both *ngram* and MongoDB full text search engine treat words with the hyphen-minus sign in front of them as negated (e.g. "-coffee") and exclude such words from the search results.

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# 5. Manage PSMDB

# 5.1 Percona Server for MongoDB Parameter Tuning Guide

Percona Server for MongoDB includes several parameters that can be changed in one of the following ways:

• The setParameter admonitions in the configuration file for persistent changes in production:

```
setParameter:
   cursorTimeoutMillis: <int>
   failIndexKeyTooLong: <boolean>
   internalQueryPlannerEnableIndexIntersection: <boolean>
   ttlMonitorEnabled: <boolean>
   ttlMonitorSleepSecs: <int>
```

• The --setParameter option arguments when running the mongod process for development or testing purposes:

```
$ mongod \
--setParameter cursorTimeoutMillis=<int> \
--setParameter failIndexKeyTooLong=<boolean> \
--setParameter internalQueryPlannerEnableIndexIntersection=<boolean> \
--setParameter ttlMonitorEnabled=<boolean> \
--setParameter ttlMonitorSleepSecs=<int>
```

• The setParameter command on the admin database to make changes at runtime:

```
> db = db.getSiblingDB('admin')
> db.runCommand( { setParameter: 1, cursorTimeoutMillis: <int> } )
> db.runCommand( { setParameter: 1, failIndexKeyTooLong: <boolean> } )
> db.runCommand( { setParameter: 1, internalQueryPlannerEnableIndexIntersection: <boolean> } )
> db.runCommand( { setParameter: 1, ttlMonitorEnabled: <int> } )
> db.runCommand( { setParameter: 1, ttlMonitorSleepSecs: <int> } )
```

#### 5.1.1 Parameters

#### cursorTimeoutMillis

**Type**: integer

Default: 600000 (ten minutes)

Sets the duration of time after which idle query cursors are removed from memory.

#### failIndexKeyTooLong

Type: boolean
Default: true

Versions of MongoDB prior to 2.6 would insert and update documents even if an index key was too long. The documents would not be included in the index. Newer versions of MongoDB ignore documents with long index key. By setting this value to <code>false</code>, the old behavior is enabled.

#### internalQueryPlannerEnableIndexIntersection

Type: boolean
Default: true

Due to changes introduced in MongoDB 2.6.4, some queries that reference multiple indexed fields, where one field matches no documents, may choose a non-optimal single-index plan. Setting this value to false will enable the old behavior and select the index intersection plan.

#### ttlMonitorEnabled

Type: boolean
Default: true

If this option is set to false, the worker thread that monitors TTL Indexes and removes old documents will be disabled.

#### ttlMonitorSleepSecs

Type: integer

Default: 60 (one minute)

Defines the number of seconds to wait between checking TTL Indexes for old documents and removing them.

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# 5.2 Upgrade

## 5.2.1 Upgrading from Percona Server for MongoDB 4.4 to 5.0

To upgrade Percona Server for MongoDB to version 5.0, you must be running version 4.4. Upgrades from earlier versions are not supported.

Before upgrading your production Percona Server for MongoDB deployments, test all your applications in a testing environment to make sure they are compatible with the new version. For more information, see Compatibility Changes in MongoDB 5.0

We recommend to upgrade Percona Server for MongoDB from official Percona repositories using perconarelease repository management tool and the corresponding package manager for your system.

This document describes this method for the in-place upgrade (where your existing data and configuration files are preserved).

# **W**arning

Perform a full backup of your data and configuration files before upgrading.

#### Upgrade on Debian and Ubuntu

- 1. Stop the mongod service:
  - \$ sudo systemctl stop mongod
- 2. Enable Percona repository for Percona Server for MongoDB 5.0:
  - \$ sudo percona-release enable psmdb-50
- 3. Update the local cache:
  - \$ sudo apt update
- 4. Install Percona Server for MongoDB 5.0 packages:
  - \$ sudo apt install percona-server-mongodb
- 5. Start the mongod instance:
  - \$ sudo systemctl start mongod

For more information, see Installing Percona Server for MongoDB on Debian and Ubuntu.

## Upgrade on Red Hat Enterprise Linux and derivatives

- 1. Stop the mongod service:
  - \$ sudo systemctl stop mongod
- 2. Enable Percona repository for Percona Server for MongoDB 5.0:
  - \$ sudo percona-release enable psmdb-50
- 3. Install Percona Server for MongoDB 5.0 packages:
  - \$ sudo yum install percona-server-mongodb
- 4. Start the mongod instance:
  - \$ sudo systemctl start mongod

After the upgrade, Percona Server for MongoDB is started with the feature set of 4.4 version. Assuming that your applications are compatible with the new version, enable 5.0 version features. Run the following command against the admin database:

db.adminCommand( { setFeatureCompatibilityVersion: "5.0" } )

# see also

### MongoDB Documentation:

- Upgrade a Standalone
- Upgrade a Replica Set
- Upgrade a Sharded Cluster

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## 5.2.2 Upgrading Percona Server for MongoDB

An in-place upgrade is done by keeping the existing data in the server. It involves changing out the MongoDB binaries. Generally speaking, the upgrade steps include:

- 1. Stopping the mongod service
- 2. Removing the old binaries
- 3. Installing the new server version binaries
- 4. Restarting the mongod service with the same dbpath data directory.

An in-place upgrade is suitable for most environments except the ones that use ephemeral storage and/or host addresses.

This document provides upgrade instructions for the following use cases:

- Upgrading from MongoDB 5.0 Community Edition
- Minor upgrade of Percona Server for MongoDB

#### **Upgrading from MongoDB 5.0 Community Edition**

**NOTE**: MongoDB creates a user that belongs to two groups, which is a potential security risk. This is fixed in Percona Server for MongoDB: the user is included only in the mongod group. To avoid problems with current MongoDB setups, existing user group membership is not changed when you migrate to Percona Server for MongoDB. Instead, a new mongod user is created during installation, and it belongs to the mongod group.

This section describes an in-place upgrade of a mongod instance. If you are using data at rest encryption, refer to the Upgrading to Percona Server for MongoDB with data at rest encryption enabled section.

#### PREREQUISITES

Before you start the upgrade, update the MongoDB configuration file (/etc/mongod.conf) to contain the following settings.

```
processManagement:
   fork: true
   pidFilePath: /var/run/mongod.pid
```

**Troubleshooting tip:** The pidFilePath setting in mongod.conf must match the PIDFile option in the systemd mongod service unit. Otherwise, the service will kill the mongod process after a timeout.

**WARNING**: Before starting the upgrade, we recommend to perform a full backup of your data.

To upgrade a replica set or a sharded cluster, use the rolling restart method. It allows you to perform the upgrade with minimum downtime. You upgrade the nodes one by one, while the whole cluster / replica set remains operational.

Before you start the upgrade, update the MongoDB configuration file (/etc/mongod.conf) to contain the following settings.

```
processManagement:
   fork: true
   pidFilePath: /var/run/mongod.pid
```

**Troubleshooting tip:** The pidFilePath setting in mongod.conf must match the PIDFile option in the systemd mongod service unit. Otherwise, the service will kill the mongod process after a timeout.



Before starting the upgrade, we recommend to perform a full backup of your data.

#### **Upgrade on Debian and Ubuntu**

1. Stop the mongod service:

```
$ sudo systemctl stop mongod
```

2. Check for installed packages:

```
$ sudo dpkg -l | grep mongod
```

#### Output:

```
ii mongodb-org
                         5.0.2
                                 amd64
                                         MongoDB open source document-oriented database
system (metapackage)
ii mongodb-org-database
                         5.0.2
                                 amd64
                                         MongoDB open source document-oriented database
system (metapackage)
ii mongodb-org-database-tools-extra 5.0.2 amd64
                                                Extra MongoDB database tools
ii mongodb-org-mongos 5.0.2 amd64 MongoDB sharded cluster query router
ii mongodb-org-server
                       5.0.2
                                 amd64 MongoDB database server
ii mongodb-org-shell
                        5.0.2
                                 amd64
                                        MongoDB shell client
ii mongodb-org-tools
                         5.0.2
                                 amd64
                                        MongoDB tools
```

3. Remove the installed packages:

```
$ sudo apt remove \
mongodb-org \
mongodb-org-mongos \
mongodb-org-server \
mongodb-org-shell \
mongodb-org-tools
```

4. Remove log files:

```
$ sudo rm -r /var/log/mongodb
```

- 5. Install Percona Server for MongoDB
- 6. Verify that the configuration file includes the correct options. For example, Percona Server for MongoDB stores data files in /var/lib/mongodb by default. If you used another dbPath data directory, edit the configuration file accordingly
- 7. Start the mongod service:

```
$ sudo systemctl start mongod
```

### Upgrade on Red Hat Enterprise Linux and derivatives

1. Stop the mongod service:

```
$ sudo systemctl stop mongod
```

2. Check for installed packages:

```
$ sudo rpm -qa | grep mongo
```

Output:

```
mongodb-org-shell-5.0.2-1.el8.x86_64
mongodb-org-database-5.0.0-1.el8.x86_64
mongodb-org-5.0.0-1.el8.x86_64
mongodb-database-tools-100.4.1-1.x86_64
```

To upgrade a replica set or a sharded cluster, use the rolling restart method. It allows you to perform the upgrade with minimum downtime. You upgrade the nodes one by one, while the whole cluster / replica set remains operational.



### MongoDB Documentation:

- Upgrade a Replica Set
- Upgrade a Sharded Cluster

#### Minor upgrade of Percona Server for MongoDB

To upgrade Percona Server for MongoDB to the latest version, follow these steps:

1. Stop the mongod service:

\$ sudo systemctl stop mongod

- 2. Install the latest version packages. Use the command relevant to your operating system.
- 3. Start the mongod service:

\$ sudo systemctl start mongod

To upgrade a replica set or a sharded cluster, use the rolling restart method. It allows you to perform the upgrade with minimum downtime. You upgrade the nodes one by one, while the whole cluster / replica set remains operational.

## Upgrading to Percona Server for MongoDB with data at rest encryption enabled

Steps to upgrade from MongoDB 5.0 Community Edition with data encryption enabled to Percona Server for MongoDB are different. |mongod| requires an empty |dbPath| data directory because it cannot encrypt data files in place. It must receive data from other replica set members during the initial sync. Please refer to the Switching storage engines for more information on migration of encrypted data. Contact us for working at the detailed migration steps, if further assistance is needed.

#### Contact Us

For free technical help, visit the Percona Community Forum.

To report bugs or submit feature requests, open a JIRA ticket.

For paid support and managed or consulting services , contact Percona Sales.

# 5.3 Uninstall Percona Server for MongoDB

To completely remove Percona Server for MongoDB you need to remove all the installed packages, data and configuration files. If you need the data, consider making a backup before uninstalling Percona Server for MongoDB.

Follow the instructions, relevant to your operating system:

#### **Uninstall on Debian and Ubuntu**

You can remove Percona Server for MongoDB packages with one of the following commands:

- apt remove will only remove the packages and leave the configuration and data files.
- apt purge will remove all the packages with configuration files and data.

Choose which command better suits you depending on your needs.

1. Stop the mongod server:

```
$ sudo systemctl stop mongod
```

2. Remove the packages. There are two options.

#### Keep the configuration and data files

\$ sudo apt remove percona-server-mongodb\*

#### Delete configuration and data files

\$ sudo apt purge percona-server-mongodb\*

#### Uninstall on Red Hat Enterprise Linux and derivatives

1. Stop the mongod service:

```
$ sudo systemctl stop mongod
```

2. Remove the packages:

```
$ sudo yum remove percona-server-mongodb*
```

3. Remove the data and configuration files:

```
$ sudo rm -rf /var/lib/mongodb
$ sudo rm -f /etc/mongod.conf
```



This will remove all the packages and delete all the data files (databases, tables, logs, etc.). You might want to back up your data before doing this in case you need the data later.

## CONTACT US

For free technical help, visit the Percona Community Forum.

To report bugs or submit feature requests, open a JIRA ticket.

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# 6. Release notes

# 6.1 Percona Server for MongoDB 5.0 Release Notes

- Percona Server for MongoDB 5.0.13-11 (2022-10-12)
- Percona Server for MongoDB 5.0.11-10 (2022-09-01)
- Percona Server for MongoDB 5.0.10-9 (2022-08-09)
- Percona Server for MongoDB 5.0.9-8 (2022-06-20)
- Percona Server for MongoDB 5.0.8-7 (2022-05-10)
- Percona Server for MongoDB 5.0.7-6 (2022-04-20)
- Percona Server for MongoDB 5.0.6-5 (2022-02-10)
- Percona Server for MongoDB 5.0.5-4 (2021-12-28)
- Percona Server for MongoDB 5.0.4-3 (2021-12-08)
- Percona Server for MongoDB 5.0.3-2 (2021-10-14)
- Percona Server for MongoDB 5.0.2-1 (2021-08-16)

#### **CONTACT US**

For free technical help, visit the Percona Community Forum.

To report bugs or submit feature requests, open a JIRA ticket.

For paid support and managed or consulting services , contact Percona Sales.

# 6.2 Percona Server for MongoDB 5.0.13-11 (2022-10-12)

Release date October 12, 2022

**Installation** Installing Percona Server for MongoDB

Percona Server for MongoDB 5.0.13-12 is an enhanced, source-available, and highly-scalable database that is a fully-compatible, drop-in replacement for MongoDB 5.0.13 and MongoDB 5.0.13 Community Edition.

It supports protocols and drivers of both MongoDB 5.0.12 and 5.0.13.

This release of Percona Server for MongoDB includes the improvements and bug fixes of MongoDB Community Edition 5.0.12 and 5.0.13.

### 6.2.1 Release Highlights

- Data at rest encryption using the KMIP protocol is now generally available, enabling you to use this functionality in production environments.
- Percona Server for MongoDB Docker container now includes the mongodb-tools utility set to align with the upstream container. This enables users to manage backup/restore operations of Percona Server for MongoDB.
- Updated exit code and status message during the master key rotation improves the user experience while using data-at-rest encryption with KMIP.
- Fixed security vulnerability CVE-2022-3602 for Percona Server for MongoDB version 5.0.9-8 and higher installed from tarballs on Ubuntu 22.04.

The bug fixes, provided by MongoDB and included in Percona Server for MongoDB, are the following:

- SERVER-68925 Detect and resolve table logging inconsistencies for WiredTiger tables at startup
- SERVER-60958 Prevent the server from hanging in chunk migration when a step-down occurs.
- SERVER-65382 Fixed the issue with incorrect chunk size comparison during split by preventing the AutoSplitVector from using the clientReadable.
- SERVER-63843 Fixed the logger deadlock by adding a check against recursive logging
- WT-9870 Fixed the global time window state before performing the rollback to stable operation by updating the pinned timestamp as part of the transaction setup.
- SERVER-69220 Fixed the issue that could lead to data inconsistency by introducing the additional validation of field types for shard key patterns. Users should not modify the type (hashed or range) for the existing shard key fields
- SERVER-67650 Fixed the issue with failing resharding operation by introducing the start and end time metrics for resharding recipient
- SERVER-68094 Fixed the projection error during the resharding operation by using the \$replaceRoot stage instead of the \$project one

Find the full list of changes in the MongoDB 5.0.12 Community Edition and MongoDB 5.0.13 Community Edition release notes.

#### 6.2.2 New Features

• PSMDB-776: Align Docker container with upstream by adding missing mongodb-tools utilities (Thanks to Denys Holius for reporting this issue)

### 6.2.3 Improvements

• PSMDB-1116: Use proper exit code and logging severity for successful master key rotation

## 6.2.4 Bugs Fixed

- PSMDB-1172: Fixed CVE-2022-3602 by updating the libssl for Ubuntu 22.04 tarballs
- PSMDB-1134: Prevent the server crash by ensuring the backup cursor is closed before the server shutdown
- PSMDB-1130: Improve handling of the missing encryption key during KMIP key rotation
- PSMDB-1129: Prevent Percona Server for MongoDB from starting if the configured encryption key doesn't match the one used for data encryption
- PSMDB-1082: Improve error handling for PSMDB when the wrong encryption key is used

#### **CONTACT US**

For free technical help, visit the Percona Community Forum.

To report bugs or submit feature requests, open a JIRA ticket.

For paid support and managed or consulting services, contact Percona Sales.

# 6.3 Percona Server for MongoDB 5.0.11-10 (2022-09-01)

Release date September 01, 2022

**Installation** Installing Percona Server for MongoDB

Percona Server for MongoDB 5.0.11-10 is an enhanced, source available, and highly-scalable database that is a fully-compatible, drop-in replacement for MongoDB 5.0.11 Community Edition. It supports MongoDB 5.0.11 protocols and drivers.

#### 6.3.1 Release Highlights

- SERVER-68511 Fixed the issue that caused inconsistency in sharding metadata when running the movePrimary command on the database that has the Feature Compatibility Version (FCV) set to 4.4 or earlier. Affects MongoDB versions 5.0.0 through 5.0.10 and MongoDB 6.0.0. Upgrade to the fixed version of MongoDB 5.0.11 / Percona Server for MongoDB 5.0.11-10 as soon as possible.
- SERVER-61321, SERVER-60607 Improved handling of large/NaN (Not a Number) values for text index and geo index version.
- SERVER-68628 Prevented potential server crash or lost writes when a resharding retry happens after the primary node failover. This is fixed by refreshing the routing information on the primary node during resharding.
- WT-9500 Prevent rollback to stable operation to generate wrong updates/tombstones by always reading the cell time window information to decide the history store update visibility.
- WT-9004 Fixed memory leak in update restore eviction.
- SERVER-67492 Failed chunk migrations can lead to recipient shard having different config.transactions records between primaries and secondaries inconsistent data.
- SERVER-68495 Fixed the issue when resharding a collection with a very large number of zones configured may have stalled on config server primary indefinitely.
- SERVER-68628 Fixed the issue when retrying a failed resharding operation after a primary failover could lead to server crash or lost writes.
- SERVER-68193 Prevented sharding DDL coordinator to lock itself out in distlock retry loop.

Find the full list of changes in the MongoDB 5.0.11 Community Edition release notes.

## 6.3.2 Improvements

• PSMDB-1046: Make the kmipKeyIdentifier option not mandatory

#### 6.3.3 Bugs Fixed

• PSMDB-1119: Fixed the issue with backup cursor not opening if data-at-rest encryption is enabled

#### **CONTACT US**

For free technical help, visit the Percona Community Forum.

To report bugs or submit feature requests, open a JIRA ticket.

For paid support and managed or consulting services, contact Percona Sales.

# 6.4 Percona Server for MongoDB 5.0.10-9 (2022-08-09)

Release date August 09, 2022

**Installation** Installing Percona Server for MongoDB

Percona Server for MongoDB 5.0.10-9 is an enhanced, source available, and highly-scalable database that is a fully-compatible, drop-in replacement for MongoDB 5.0.10 Community Edition.

It is rebased on MongoDB 5.0.10 Community Edition and supports MongoDB 5.0.10 protocols and drivers.

# **W**arning

We don't recommend this version for the production use due to the critical issue with sharding metadata inconsistency: SERVER-68511. The metadata inconsistency is observed when running the movePrimary command on the database that has the Feature Compatibility Version (FCV) set to 4.4 or earlier. Affects MongoDB versions 5.0.0 through 5.0.10 and MongoDB 6.0.0. Upgrade to the fixed version of MongoDB 5.0.11 / Percona Server for MongoDB 5.0.11-10 as soon as possible.

Please follow closely the upstream recommendations outlined in SERVER-68511 to work around this issue and for the remediation steps, if your cluster is affected.

## 6.4.1 Release Highlights

This release includes bug fixes and improvements provided by MongoDB and included in Percona Server for MongoDB. It specifically includes multiple fixes relate to sharding and the resharding operation. Bugs of note are the following:

- SERVER-66418 Fixed the issue with bad projection created during dependency analysis due to string order assumption. It resulted in the PathCollision error. The issue is fixed by improving dependency analysis for projections by folding dependencies into ancestor dependencies where possible.
- SERVER-65821 Fixed the deadlock situation in cross shard transactions that could occur when the FCV (Feature Compatibility Version) was set after the "prepared" state of the transactions. That ended up with both the the setFCV thread and the TransactionCoordinator hung.
- SERVER-65131 This is a v6.0 backport fix to v5.0 that disables opportunistic read targeting (except for specified hedged reads) in order to prevent possible performance problems associated with uneven read distribution across the secondaries.
- SERVER-66433 Backported the check for user errors in case deadline on the migration destination manager is hit while waiting for a range to be cleared up. This prevents the balancer from getting blocked.
- SERVER-67457 Fixed the situation where the shards may skip certain steps in the resharding process but respond to the resharding coordinator as if they had. This can cause the resharding coordinator to continue to wait for updated states in the config.reshardingOperations document on the primary config server and stall indefinitely.
- SERVER-66866 Fixed the potential for the range deleter to wait unnecessarily during concurrent migrations between batches.
- SERVER-66727 Fixed the issue where 2 very different measurements (one in the past and one in future) could be incorrectly included in the same buckettime-series bucket.
- SERVER-64433 Resolved potential problem when adding or removing shards and incorrectly gossiping a new topology time without it being majorly committed.

Find the full list of changes in the MongoDB 5.0.10 Community Edition release notes.

## 6.4.2 Packaging Notes

Debian 9 ("Stretch") is no longer supported.

#### CONTACT US

For free technical help, visit the Percona Community Forum.

To report bugs or submit feature requests, open a JIRA ticket.

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# 6.5 Percona Server for MongoDB 5.0.9-8 (2022-06-20)

Release date June 20, 2022

**Installation** Installing Percona Server for MongoDB

Percona Server for MongoDB 5.0.9-8 is an enhanced, source available, and highly-scalable database that is a fully-compatible, drop-in replacement for MongoDB 5.0.9 Community Edition. It supports MongoDB 5.0.9 protocols and drivers.



We don't recommend this version for the production use due to the critical issue with sharding metadata inconsistency: SERVER-68511. The metadata inconsistency is observed when running the movePrimary command on the database that has the Feature Compatibility Version (FCV) set to 4.4 or earlier. Affects MongoDB versions 5.0.0 through 5.0.10 and MongoDB 6.0.0. Upgrade to the fixed version of MongoDB 5.0.11 / Percona Server for MongoDB 5.0.11-10 as soon as possible.

Please follow closely the upstream recommendations outlined in SERVER-68511 to work around this issue and for the remediation steps, if your cluster is affected.

## 6.5.1 Release Highlights

- Support of multiple KMIP servers adds failover to your data-at-rest encryption setup.
- Allow users to set KMIP client certificate password through a flag to simplify the migration from MongoDB Enterprise to Percona Server for MongoDB.
- Percona Server for MongoDB is now available on Ubuntu 22.04 (Jammy Jellyfish).
- Improvements to initial syncs from a secondary sync source.

The bug fixes, provided by MongoDB and included in Percona Server for MongoDB, are the following:

- SERVER-65137 Detect namespace changes when refreshing Collection after yielding to maintain data consistency and avoid stale catalogs.
- SERVER-64822 Fixed the issue with releasing the critical state too early when sharding an empty collection. This could result in unwanted writes to that collection.
- WT-9096 Fixed the wrong key/value returning during search near when the key doesn't exist
- SERVER-66041 Prevented shard imbalances due to chunk cloner disregarding oversized chunks that contain only 1 oversized document

Find the full list of changes in the MongoDB 5.0.9 Community Edition release notes.

# 6.5.2 Improvements

- PSMDB-1045: Add support for several KMIP servers
- PSMDB-1043: Remove the kmipClientKeyFile option and include both the client private key and public certificate in the file specified by the ``kmipClientCertificateFile`` option.
- PSMDB-1044: Make the kmipPort option not mandatory and assign the default value
- PSMDB-1054: Add the ability to specify the password for the KMIP client keys and certificates to simplify migration from MongoDB Enterprise.

#### CONTACT US

For free technical help, visit the Percona Community Forum.

To report bugs or submit feature requests, open a JIRA ticket.

For paid support and managed or consulting services , contact Percona Sales.

# 6.6 Percona Server for MongoDB 5.0.8-7 (2022-05-10)

Release date May 10, 2022

**Installation** Installing Percona Server for MongoDB

Percona Server for MongoDB 5.0.8-7 is an enhanced, source available, and highly-scalable database that is a fully-compatible, drop-in replacement for MongoDB 5.0.8 Community Edition. It supports MongoDB 5.0.8 protocols and drivers.



We don't recommend this version for the production use due to the critical issue with sharding metadata inconsistency: SERVER-68511. The metadata inconsistency is observed when running the movePrimary command on the database that has the Feature Compatibility Version (FCV) set to 4.4 or earlier. Affects MongoDB versions 5.0.0 through 5.0.10 and MongoDB 6.0.0. Upgrade to the fixed version of MongoDB 5.0.11 / Percona Server for MongoDB 5.0.11-10 as soon as possible.

Please follow closely the upstream recommendations outlined in SERVER-68511 to work around this issue and for the remediation steps, if your cluster is affected.

## 6.6.1 Release Highlights

Percona Server for MongoDB now supports master key rotation for data encrypted using the Keys Management Interoperability Protocol (KMIP) protocol (tech preview feature). This improvement allows users to comply with regulatory standards for data security.

Other improvements and bug fixes introduced by MongoDB and included in Percona Server for MongoDB are the following:

• WT-8924 - Fixed a bug that causes replication to stall on secondary replica set members in a sharded cluster handling cross-shard transactions. It is caused by WiredTger to erroneously return a write conflict when deciding if an update to a record is allowed. If MongoDB decides to retry the operation that caused the conflict in WiredTiger, it will enter an indefinite retry loop, and oplog application will stall on secondary nodes.

If this bug is hit, the secondary nodes will experience indefinite growth in replication lag. Restart the secondary nodes to resume replication.

This bug affects MongoDB 4.4.10 through 4.4.13 and 5.0.4 to 5.0.7.

Update to the latest version to avoid the secondary replication stall and lag issues.

- SERVER-63531 Fixed the issue with a commitQuorum incorrectly allowing non-voting buildIndexes:false nodes to be included in the commitQuorum count. It also fixed an error message relating to databearing nodes and quorum regarding to non-voting nodes.
- SERVER-63387 Fixed the order of backup blocks returned to the user to match the order retrieved from WiredTiger.
- SERVER-65261 Fixed the issue reporting an incorrect number of documents deleted from a capped collection when utilizing a collection scan to perform the delete action.

Find the full list of changes in the MongoDB 5.0.8 Community Edition release notes.

## 6.6.2 Improvements

• PSMDB-1011: Add KMIP master key rotation

## 6.6.3 Bugs Fixed

• PSMDB-1030: Fix descriptions and mutual dependencies of KMIP related options for mongod and perconadecrypt

#### CONTACT US

For free technical help, visit the Percona Community Forum.

To report bugs or submit feature requests, open a JIRA ticket.

For paid support and managed or consulting services , contact Percona Sales.

## 6.7 Percona Server for MongoDB 5.0.7-6 (2022-04-20)

Release date April 20, 2022

**Installation** Installing Percona Server for MongoDB

Percona Server for MongoDB 5.0.7-6 is an enhanced, source-available and highly-scalable database that is a fully-compatible, drop-in replacement for MongoDB 5.0.7 Community Edition. It supports MongoDB 5.0.7 protocols and drivers.



We don't recommend this version for the production use due to the critical issue with sharding metadata inconsistency: SERVER-68511. The metadata inconsistency is observed when running the movePrimary command on the database that has the Feature Compatibility Version (FCV) set to 4.4 or earlier. Affects MongoDB versions 5.0.0 through 5.0.10 and MongoDB 6.0.0. Upgrade to the fixed version of MongoDB 5.0.11 / Percona Server for MongoDB 5.0.11-10 as soon as possible.

Please follow closely the upstream recommendations outlined in SERVER-68511 to work around this issue and for the remediation steps, if your cluster is affected.

### 6.7.1 Release Highlights

Percona Server for MongoDB now supports Keys Management Interoperability Protocol (KMIP) so that users can store encryption keys in their favorite KMIP-compatible key manager to set up encryption at rest. This is a tech preview feature.

The list of bug fixes introduced by MongoDB and included in Percona Server for MongoDB is the following:

- SERVER-63203 Fixed the issue where having a large number of split points causes the chunk splitter to not function correctly and huge chunks would not be split without manual intervention. This can be caused when having small shard key ranges and a very high number of documents and where more than 8192 split points would be needed.
- SERVER-64517 Recover the RecoverableCriticalSection service after the initialSync and startupRecovery stages have completed. This prevents a started up shard to miss an in-memory critical section of a resharded collection.
- SERVER-64403 Fixed an issue that occurred during the attempt to perform the collation-encoding of a document with a missing sort attribute. In this case an invariant is violated and mongod crashes.
- SERVER-63722 Fixed an issue when the rename collection (sharding step) participants can get stuck.
- SERVER-61769 Fixed an issue with idle cursors remaining open when the client attempts to run an aggregation with <code>\$out</code> or <code>\$merge</code> in a transaction on a sharded cluster.
- SERVER-60412 Check if the host has cgroups v2 enabled and read the memory limits according to that.
- WT-7922 Report an error when the WiredTiger version file is empty or missing during a startup.

Find the full list of changes in the MongoDB 5.0.7 Community Edition Release notes.

### 6.7.2 New Features

• PSMDB-971: Added support for KMIP encryption. Now users can store encryption keys in their favorite KMIP-compatible key manager to set up encryption at rest.

## 6.7.3 Bugs Fixed

- PSMDB-1010: Fixed the parameters order in the LOGV2\_DEBUG statement for LDAP logging.
- PSMDB-957: Fixed server crash caused by LDAP misconfiguration. Now the server logs an error message and exits.

### CONTACT US

For free technical help, visit the Percona Community Forum.

To report bugs or submit feature requests, open a JIRA ticket.

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## 6.8 Percona Server for MongoDB 5.0.6-5 (2022-02-10)

Release date February 10, 2022

**Installation** Installing Percona Server for MongoDB

Percona Server for MongoDB 5.0.6-5 is an enhanced, source-available, and highly-scalable database that is a fully-compatible, drop-in replacement for MongoDB 5.0.6 Community Edition. It supports MongoDB 5.0.6 protocols and drivers.

## **W**arning

Inconsistent data is observed after the upgrade from MongoDB 4.4.3 and 4.4.4 to versions 4.4.8+ and 5.0.2+. This issue is fixed upstream in versions 4.4.11 and 5.0.6. Percona Server for MongoDB also includes the fix in versions 4.4.12-12 and 5.0.6-5

See the upgrade recommendations below:

- Clusters on versions 4.4.0 and 4.4.1 are safe to upgrade to 4.4.8+ or 5.0.2+ but should upgrade to recommended versions 4.4.11+ or 5.0.5+
- Clusters on versions 4.4.2, 4.4.3, or 4.4.4 should **downgrade** to 4.4.1 and then upgrade to versions 4.4.11+ or 5.0.5+
- Clusters running versions 4.4.5 4.4.7 can and should upgrade to versions 4.4.11+ or 5.0.5+.

Note that clusters running versions 4.4.2 - 4.4.8 are affected by the bug WT-7995. See WT-7995 for specific explanation and instructions on running the validate command to check for data inconsistencies. These data inconsistencies can lead to data loss if not identified and repaired at this point between versions 4.4.8 and 4.4.9.

If the validate command output reports any failures, resync the impacted node from an unaffected node. The validate command must be run against all collections in the database. This process can be resource intensive and can negatively impact performance.

Another critical issue that affects the production use of this version is SERVER-68511. It causes inconsistency in sharding metadata when running the movePrimary command on the database that has the Feature Compatibility Version (FCV) set to 4.4 or earlier. Affects MongoDB versions 5.0.0 through 5.0.10 and MongoDB 6.0.0. Upgrade to the fixed version of MongoDB 5.0.11 / Percona Server for MongoDB 5.0.11-10 as soon as possible.

Follow the upstream recommendations in SERVER-68511 to check your clusters and remediate any negative impact if the clusters are affected with this issue.

### 6.8.1 Release Highlights

- WT-8395 Fixed an issue with inconsistent data observed during the direct upgrade from from 4.4.3 and 4.4.4 to 4.4.8+ and 5.0.2+. Data inconsistency was caused by the incorrect checkpoint metadata to sometimes be recorded by MongoDB versions 4.4.3 and 4.4.4. WiredTiger used this metadata during node startup that could lead to data corruption and could cause the DuplicateKey error. The fix requires the upgrade to versions 4.4.11+ or 5.0.5+.
- SERVER-62245 Fixed an issue unavailability of a shard in sharded clusters. Affects MongoDB versions 5.0.0 5.0.5. Requires the following steps:
- Restarting the shards as replica sets
- Checking that range deletion tasks are consistent with migration coordinators
- Majority-deleting all migration coordinators with a definitive decision
- Restarting the nodes as shards.

- SERVER-61194 Fixed time-series bucket OID collisions by adding the difference between the actual timestamp and the rounded timestamp to the instance portion of the OID.
- SERVER-62147 Fixed broken OP\_QUERY exhaust cursor implementation.

### 6.8.2 Bugs Fixed

• PSMDB-950: Fixed LDAP authentication using mongo CLI for Percona Server for MongoDB installed from a tarball.

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## 6.9 Percona Server for MongoDB 5.0.5-4 (2021-12-28)

Release date December 28, 2021

**Installation** Installing Percona Server for MongoDB



We don't recommend this version for the production use due to the critical issue with sharding metadata inconsistency: SERVER-68511. The metadata inconsistency is observed when running the movePrimary command on the database that has the Feature Compatibility Version (FCV) set to 4.4 or earlier. Affects MongoDB versions 5.0.0 through 5.0.10 and MongoDB 6.0.0. Upgrade to the fixed version of MongoDB 5.0.11 / Percona Server for MongoDB 5.0.11-10 as soon as possible.

Please follow closely the upstream recommendations outlined in SERVER-68511 to work around this issue and for the remediation steps, if your cluster is affected.

Percona Server for MongoDB 5.0.5-4 is an enhanced, source-available, and highly-scalable database that is a fully-compatible, drop-in replacement for MongoDB 5.0.5 Community Edition. It supports MongoDB 5.0.5 protocols and drivers.

### 6.9.1 Release Highlights

The bug fixes and improvements, provided by MongoDB and included in Percona Server for MongoDB, are the following:

- SERVER-59858 Added histograms to track latency for tasks scheduled on the reactor thread.
- SERVER-61483 Fixed an issue when resharding a collection that could cause data inconsistency (lost writes) due to incorrect actions by the ReshardingCoordinator and attempts to commit anyway. Also could cause fassert() to config server primary.
- SERVER-61482 Fixed an issue with stalls on the config server. Updates to config server during resharding may wait too long for oplog slot thus stalling replication on config server indefinitely.
- SERVER-61633 Fixed a resharding issue relating to RecipientStateMachine that caused the server to crash

Find the full list of changes in the MongoDB 5.0.5 Community Edition release notes.

### 6.9.2 Bugs Fixed

• PSMDB-756: Fixed an issue with unmet dependencies for installing MongoDB on Debian (Thanks to Stefan Schlesi for reporting this issue)

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## 6.10 Percona Server for MongoDB 5.0.4-3 (Release Candidate) (2021-12-08)

Release date December 8, 2021

**Installation** Installing Percona Server for MongoDB

Percona Server for MongoDB 5.0.4-3 is an enhanced, source-available, and highly-scalable database that is a fully-compatible, drop-in replacement for MongoDB 5.0.4 Community Edition.

It is rebased on MongoDB 5.0.4 Community Edition and supports MongoDB 5.0.4 protocols and drivers.



Due to many core changes to WiredTiger and the core server introduced to facilitate new features such as resharding, time series collections, and API versioning, MongoDB 5.0.x is still unstable. We do not recommend using this release candidate for production environments.



We don't recommend this version for the production use due to the critical issue with sharding metadata inconsistency: SERVER-68511. The metadata inconsistency is observed when running the movePrimary command on the database that has the Feature Compatibility Version (FCV) set to 4.4 or earlier. Affects MongoDB versions 5.0.0 through 5.0.10 and MongoDB 6.0.0. Upgrade to the fixed version of MongoDB 5.0.11 / Percona Server for MongoDB 5.0.11-10 as soon as possible.

Please follow closely the upstream recommendations outlined in SERVER-68511 to work around this issue and for the remediation steps, if your cluster is affected.

### 6.10.1 Release Highlights

The bug fixes, provided by MongoDB and included in Percona Server for MongoDB, are the following:

- Fixed delays in establishing egress connections on mongos due to delayed responses from libcrypto.so
- Allowed replication state changes to interrupt lock acquisition. This interruption fixes deadlocks that may occur when a primary node steps down with profiling enabled.

Find the full list of changes in the MongoDB 5.0.4 Community Edition release notes.

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## 6.11 Percona Server for MongoDB 5.0.3-2 (Release Candidate) (2021-10-14)

Release date October 14, 2021

**Installation** Installing Percona Server for MongoDB

Percona Server for MongoDB 5.0.3-2 is an enhanced, source-available, and highly-scalable database that is a fully-compatible, drop-in replacement for MongoDB 5.0.3 Community Edition. It supports MongoDB 5.0.3 protocols and drivers.



Due to many core changes to WiredTiger and the core server introduced to facilitate new features such as resharding, time series collections, and API versioning, MongoDB 5.0.x is still unstable. We do not recommend using this release candidate for production environments.



Beginning with MongoDB 5.0.1, several data impacting or corrupting bugs were introduced. Details are listed below

These bugs are fixed in MongoDB 5.0.3. Percona Server for MongoDB 5.0.3-2 includes the upstream fixes of these bugs.

Unless you are already running a version of MongoDB 5.0.x in your production environments, consider waiting a while longer for any other issues to be worked through.

If you are running any version of MongoDB 5.0.x already, please upgrade to MongoDB 5.0.3 or Percona Server for MongoDB 5.0.3-2 as soon as possible. Please follow closely all MongoDB Inc upstream recommendations regarding avoiding unclean shutdowns, check collections with the validate command (watch for performance impacts), and make sure and resync any impacted nodes from unaffected nodes as recommended in WT-7995.

Another critical issue that affects the production use of this version is SERVER-68511. It causes inconsistency in sharding metadata when running the <code>movePrimary</code> command on the database that has the Feature Compatibility Version (FCV) set to 4.4 or earlier. Affects MongoDB versions 5.0.0 through 5.0.10 and MongoDB 6.0.0. Upgrade to the fixed version of MongoDB 5.0.11 / Percona Server for MongoDB 5.0.11-10 as soon as possible.

Follow the upstream recommendations in SERVER-68511 to check your clusters and remediate any negative impact if the clusters are affected with this issue.

### 6.11.1 Release Highlights

The bug fixes, provided by MongoDB and included in Percona Server for MongoDB, are the following:

- WT-7995 Checkpoint thread can read and persist inconsistent version of data to disk. Can cause Duplicate Key error on startup and prevent the node from starting. Unclean shutdowns can cause data inconsistency within documents, deleted documents to still exist, incomplete query results due to lost or inaccurate index entries, and/or missing documents. Affects MongoDB versions 5.0.0 through 5.0.2. Upgrade to fixed version of MongoDB 5.0.3 / Percona Server for MongoDB 5.0.3-2 as soon as possible.
- WT-7984 Bug that could cause Checkpoint thread to omit a page of data. If the server experiences an unclean shutdown, an inconsistent checkpoint is used for recovery and causes data corruption. Fixed in version 5.0.3.

Requires the validate command to be run and possible data remediation via complete initial sync.

Find the full list of changes in the MongoDB 5.0.3 Community Edition release notes.

## 6.11.2 Improvements

• PSMDB-918: Disable the deletion of the mongod user in RPM packages - This preserves the permissions to the MongoDB data directory for the mongod user since its user ID and group ID remain unchanged.

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## 6.12 Percona Server for MongoDB 5.0.2-1 (Release Candidate) (2021-08-16)

Release date August 16, 2021

**Installation** Installing Percona Server for MongoDB

Note

With a lot of new features and modifications introduced, we recommend using this release candidate in testing environments only.



Percona Server for MongoDB 5.0.2-1 is not recommended for production use due to the following critical issues: WT-7984 and WT-7995. These issues are fixed in MongoDB 5.0.3 Community Edition and Percona Server for MongoDB 5.0.3-2 (Release Candidate).

Another critical issue that affects the production use of this version is SERVER-68511. It causes inconsistency in sharding metadata when running the movePrimary command on the database that has the Feature Compatibility Version (FCV) set to 4.4 or earlier. Affects MongoDB versions 5.0.0 through 5.0.10 and MongoDB 6.0.0. Upgrade to the fixed version of MongoDB 5.0.11 / Percona Server for MongoDB 5.0.11-10 as soon as possible.

We recommend you to upgrade to Percona Server for MongoDB 5.0.11-10 and run the validate command on every collection on every replica set node.

Read more about the post-upgrade steps in WT-7984 and WT-7995.

Learn how to check if your cluster is affected with sharding metadata inconsistency and remediate from this impact in SERVER-68511.

We are pleased to announce the release candidate of Percona Server for MongoDB 5.0.2-1. It is available for download from Percona website and for installation from Percona Software Repositories.

Percona Server for MongoDB 5.0.2-1 is an enhanced, source-available, and highly-scalable database that is a fully-compatible, drop-in replacement for MongoDB 5.0.2 Community Edition. It includes all features of MongoDB 5.0.2 Community Edition. The most notable among these are the following:

- Resharding allows you to select a new shard key for a collection and then works in the background to correct any data distribution problems caused by bad shard keys and improve performance.
- Time Series Collections are aimed at storing sequences of measurements over a period of time. These specialized collections will store data in a highly optimized way that will improve query efficiency, allow data analysis in real-time, and optimize disk usage.
- Resumable Index Builds means that the index build for a collection continues if a primary node in a replica set is switched to another server or when a server restarts. The build process is saved to disk and resumes from the saved position. This allows DBAs to perform maintenance and not worry about losing the index build in the process.
- Window operators allow operations on a specified span of documents known as window. \$setWindowFields is a new pipeline stage to operate with these documents.
- Versioned API allows specifying which API version your application communicating with MongoDB runs against. Versioned API detaches the application's lifecycle from that of the database. As a result, you modify the application only to introduce new features instead of having to maintain compatibility with the new version of MongoDB.

In addition, new aggregation operators such as \$count, \$dateAdd, \$dateDiff, \$dateSubtract, \$sampleRate and \$rand are available with this release.

Percona Server for MongoDB 5.0.2-1 extends this feature set by providing enterprise-level enhancements for free.

Percona Server for MongoDB 5.0.2-1 fully supports MongoDB 5.0.2 Community Edition protocols and drivers and requires no changes to MongoDB applications or code.

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## 7. Glossary

## 7.1 ACID

Set of properties that guarantee database transactions are processed reliably. Stands for Atomicity, Consistency, Isolation, Durability.

## 7.2 Atomicity

Atomicity means that database operations are applied following a "all or nothing" rule. A transaction is either fully applied or not at all.

## 7.3 Consistency

Consistency means that each transaction that modifies the database takes it from one consistent state to another

## 7.4 Durability

Once a transaction is committed, it will remain so.

## 7.5 Foreign Key

A referential constraint between two tables. Example: A purchase order in the purchase\_orders table must have been made by a customer that exists in the customers table.

### 7.6 Isolation

The Isolation requirement means that no transaction can interfere with another.

### 7.7 Jenkins

Jenkins is a continuous integration system that we use to help ensure the continued quality of the software we produce. It helps us achieve the aims of:

- no failed tests in trunk on any platform,
- aid developers in ensuring merge requests build and test on all platforms,
- no known performance regressions (without a damn good explanation).

## 7.8 Kerberos

Kerberos is an authentication protocol for client/server authentication without sending the passwords over an insecure network. Kerberos uses symmetric encryption in the form of tickets - small pieces of encrypted data used for authentication. A ticket is issued for the client and validated by the server.

## 7.9 Rolling restart

A rolling restart (rolling upgrade) is shutting down and upgrading nodes one by one. The whole cluster remains operational. There is no interruption to clients assuming the elections are short and all writes directed to the old primary use the retryWrite mechanism.

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# 8. Copyright and Licensing

## 8.1 Copyright and Licensing Information

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# 9. Trademark policy

## 9.1 Trademark Policy

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