PERCONA

Operator for MongoDB 1.19.1 Documentation

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Percona Technical Documentation Team

Table of Contents

- Verifying the cluster operation
- Troubleshooting
- Removing the EKS cluster

Install Percona Server for MongoDB on Azure Kubernetes Service (AKS)

- Prerequisites
- Create and configure the AKS cluster
- Install the Operator and deploy your MongoDB cluster
- Verifying the cluster operation
- Troubleshooting
- Removing the AKS cluster

Install Percona server for MongoDB on Kubernetes

- Verifying the cluster operation

Install Percona Server for MongoDB on OpenShift

- Install the Operator
- Install Percona Server for MongoDB
- Verifying the cluster operation

Users

- Unprivileged users
- System Users
- Development Mode
- MongoDB Internal Authentication Key (optional)

Configuration

Changing MongoDB Options

- Edit the
- Use a ConfigMap
- Use a Secret Object

Binding Percona Server for MongoDB components to Specific Kubernetes/OpenShift Nodes

- Node selector
- Affinity and anti-affinity
- Topology Spread Constraints
- Tolerations
- Priority Classes

- Pod Disruption Budgets

Labels and annotations

- Setting labels and annotations in the Custom Resource

Exposing the cluster

- Using a single entry point in a sharded cluster
- Accessing replica set Pods
- Connecting from outside Kubernetes
- Service per Pod
- Controlling hostnames in replset configuration
- Exposing replica set with split-horizon DNS

Local Storage support for the Percona Operator for MongoDB

- emptyDir
- hostPath

Using Replica Set Arbiter nodes and non-voting nodes

- Adding Arbiter nodes
- Adding non-voting nodes

Percona Server for MongoDB Sharding

- About sharding
- Turning sharding on and off
- Configuring instances of a sharded cluster
- Checking connectivity to sharded and non-sharded cluster

Transport Layer Security (TLS)

- Install and use the
- Generate certificates manually
- Update certificates
- Run Percona Server for MongoDB without TLS

Data at rest encryption

- Using encryption key Secret

Telemetry

Management

About backups

- Backup storage
- Backup types

Backup and restore

Configure storage for backups

- Amazon S3 or S3-compatible storage
- Microsoft Azure Blob storage
- Remote file server

Making scheduled backups

Making on-demand backup

Storing operations logs for point-in-time recovery

Enable server-side encryption for backups

- Encryption with keys stored in AWS KMS
- Encryption with localy-stored keys on any S3-compatible storage

Restore the cluster from a previously saved backup

- Without point-in-time recovery
- With point-in-time recovery
- Selective restore

Delete the unneeded backup

Update Database and Operator

- Upgrading the Operator and CRD
- Upgrading Percona Server for MongoDB
- More on upgrade strategies

Scale Percona Server for MongoDB on Kubernetes and OpenShift

- Vertical scaling
- Horizontal scaling

Set up Percona Server for MongoDB cross-site replication

- Prerequisites
- Glossary
- Topologies
- Exposing instances of the MongoDB cluster

Multi-cluster and multi-region deployment

Configuring cross-site replication on the Main site

- Getting the cluster secrets and certificates to be copied from Main to Replica

Configuring cross-site replication on Replica instances

Use Docker images from a custom registry

Creating a private S3-compatible cloud for backups

How to restore backup to a new Kubernetes-based environment

- Without point-in-time recovery
- With point-in-time recovery

How to use backups to move the external database to Kubernetes

Install Percona Operator for MongoDB in multi-namespace (cluster-wide) mode

- Difference between single-namespace and multi-namespace Operator deployment
- Installing the Operator in cluster-wide mode
- Verifying the cluster operation

How to carry on low-level manual upgrades of Percona Server for MongoDB

- Rolling Update strategy and semi-automatic updates
- Manual upgrade (the On Delete strategy)

Upgrade Database and Operator on OpenShift

- Upgrading the Operator and CRD
- Upgrading Percona Server for MongoDB

Monitor Kubernetes

- Pre-requisites
- Install the Victoria Metrics Kubernetes monitoring stack
- Validate the successful installation
- Verify metrics capture
- Uninstall Victoria metrics Kubernetes stack

Delete Percona Operator for MongoDB

- Delete the database cluster
- Delete the Operator
- Clean up resources

Custom Resource options

- Toplevel
- Roles section

Reference

Percona certified images

Versions compatibility

- Release Highlights
- New Features
- Improvements
- Bugs Fixed
- Known Issues and Limitations
- Supported Platforms

Percona Operator for MongoDB 1.13.0

- Release Highlights
- New Features
- Improvements
- Bugs Fixed
- Deprecation, Rename and Removal
- Supported Platforms

Percona Operator for MongoDB 1.12.0

- Release Highlights
- New Features
- Improvements
- Bugs Fixed
- Known Issues
- Deprecation, Rename and Removal
- Supported Platforms

Percona Distribution for MongoDB Operator 1.11.0

- Release Highlights
- New Features
- Improvements
- Bugs Fixed
- Supported Platforms

Percona Distribution for MongoDB Operator 1.10.0

- Release Highlights
- New Features
- Improvements
- Bugs Fixed
- Supported Platforms

Percona Distribution for MongoDB Operator 1.9.0

- Release Highlights

Percona Kubernetes Operator for Percona Server for MongoDB 1.0.0

- Installation

Percona Operator for MongoDB

The Percona Operator for MongoDB automates the creation, modification, or deletion of items in your Percona Server for MongoDB environment. The Operator contains the necessary Kubernetes settings to maintain a consistent Percona Server for MongoDB instance.

The Percona Kubernetes Operators are based on best practices for the configuration of a Percona Server for MongoDB replica set. The Operator provides many benefits but saving time, a consistent environment are the most important.

Get more help

This guide is packed with information, but it can't cover everything you need to know about the Percona Operator for MongoDB or every scenario you might encounter. Think of this guide as a solid starting point. There's always more to learn, and you'll keep discovering new things as you get hands-on experience. And remember, the more you experiment and work with Percona Operator for MongoDB, the more confident and skilled you'll become. Don't be afraid to try things out and ask questions when you get stuck.

Ask a question in the Community Forum

Be a part of a space where you can tap into a wealth of knowledge from other database enthusiasts and experts who work with Percona's software every day. While our service is entirely free, keep in mind that response times can vary depending on the complexity of the question. You are engaging with people who genuinely love solving database challenges.

We recommend visiting our Community Forum. It's an excellent place for discussions, technical insights, and support around Percona database software. If you're new and feeling a bit unsure, our FAQ and Guide for New Users ease you in.

If you have thoughts, feedback, or ideas, the community team would like to hear from you at Any ideas on how to make the forum better?. We're always excited to connect and improve everyone's experience.

Work with a Percona Expert

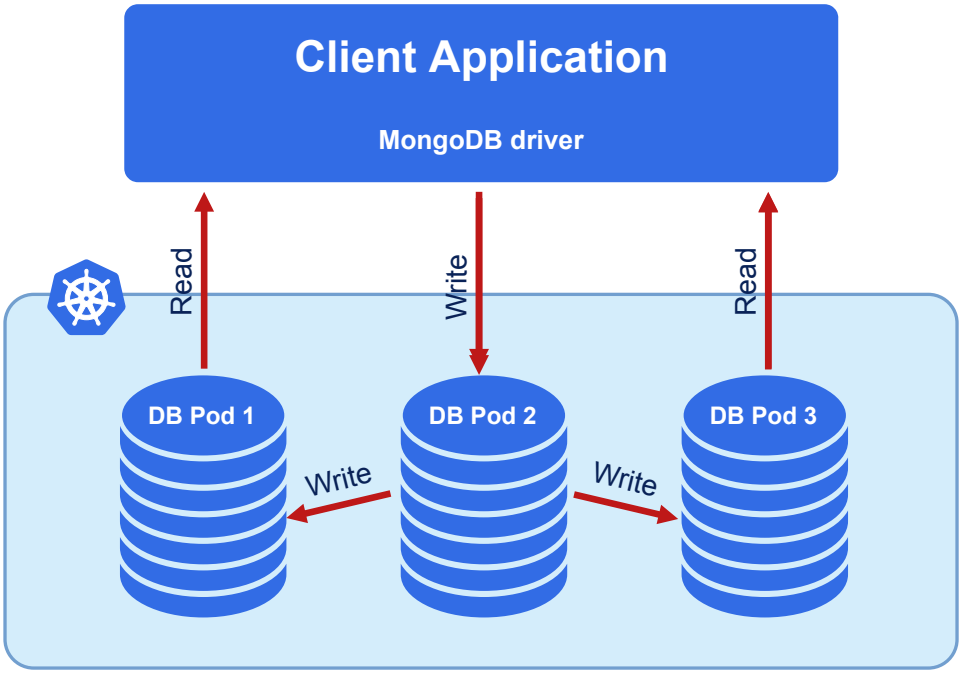
Percona experts bring years of experience in tackling tough database performance issues and design challenges. We understand your challenges when managing complex database environments. That's why we offer various services to help you simplify your operations and achieve your goals.

Service	Description
24/7 Expert Support	Our dedicated team of database experts is available 24/7 to assist you with any database issues. We provide flexible support plans tailored to your specific needs.
Hands-On Database Management	Our managed services team can take over the day-to-day management of your database infrastructure, freeing up your time to focus on other priorities.
Expert Consulting	Our experienced consultants provide guidance on database topics like architecture design, migration planning, performance optimization, and security best practices.
Comprehensive Training	Our training programs help your team develop skills to manage databases effectively, offering virtual and in-person courses.

We’re here to help you every step of the way. Whether you need a quick fix or a long-term partnership, we’re ready to provide your expertise and support.

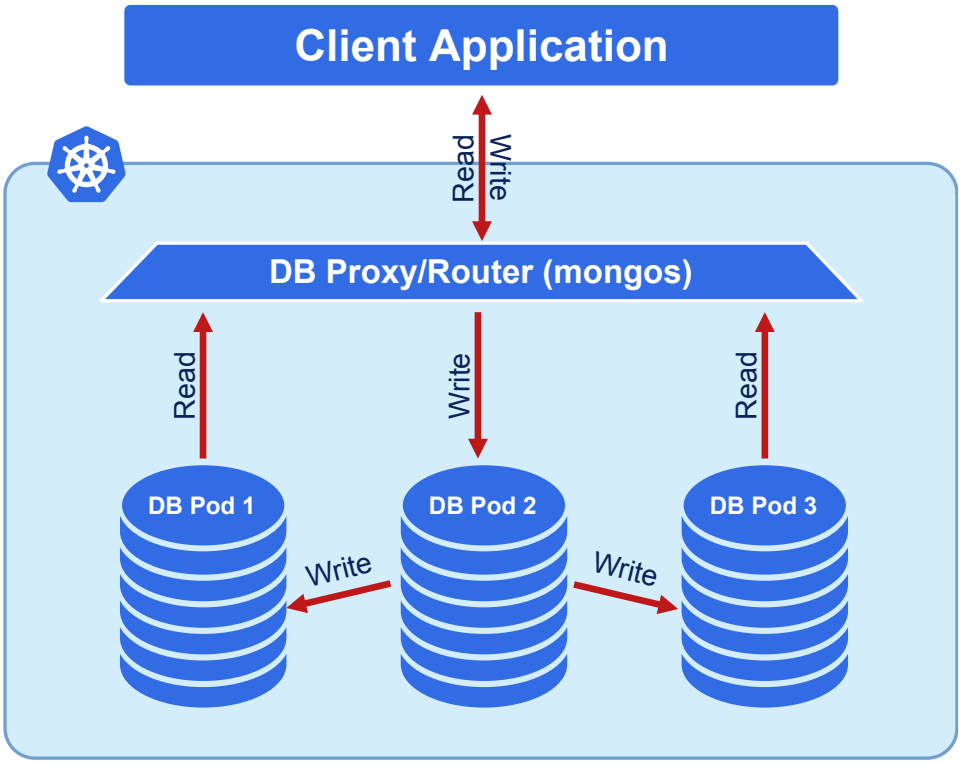
Design overview

The design of the Operator is tighly bound to the Percona Server for MongoDB replica set or sharded cluster. Replica set cluster is briefly described in the following diagram.



A replica set consists of one primary server and several secondary ones (two in the picture), and the client application accesses the servers via a driver.

In the case of a sharded cluster, each shard is a replica set which contains a subset of data stored in the database, and the `mongos` query router acts as an entry point for client applications. You can find out more details about sharding on a dedicated documentation page, and a simplified diagram is as follows:

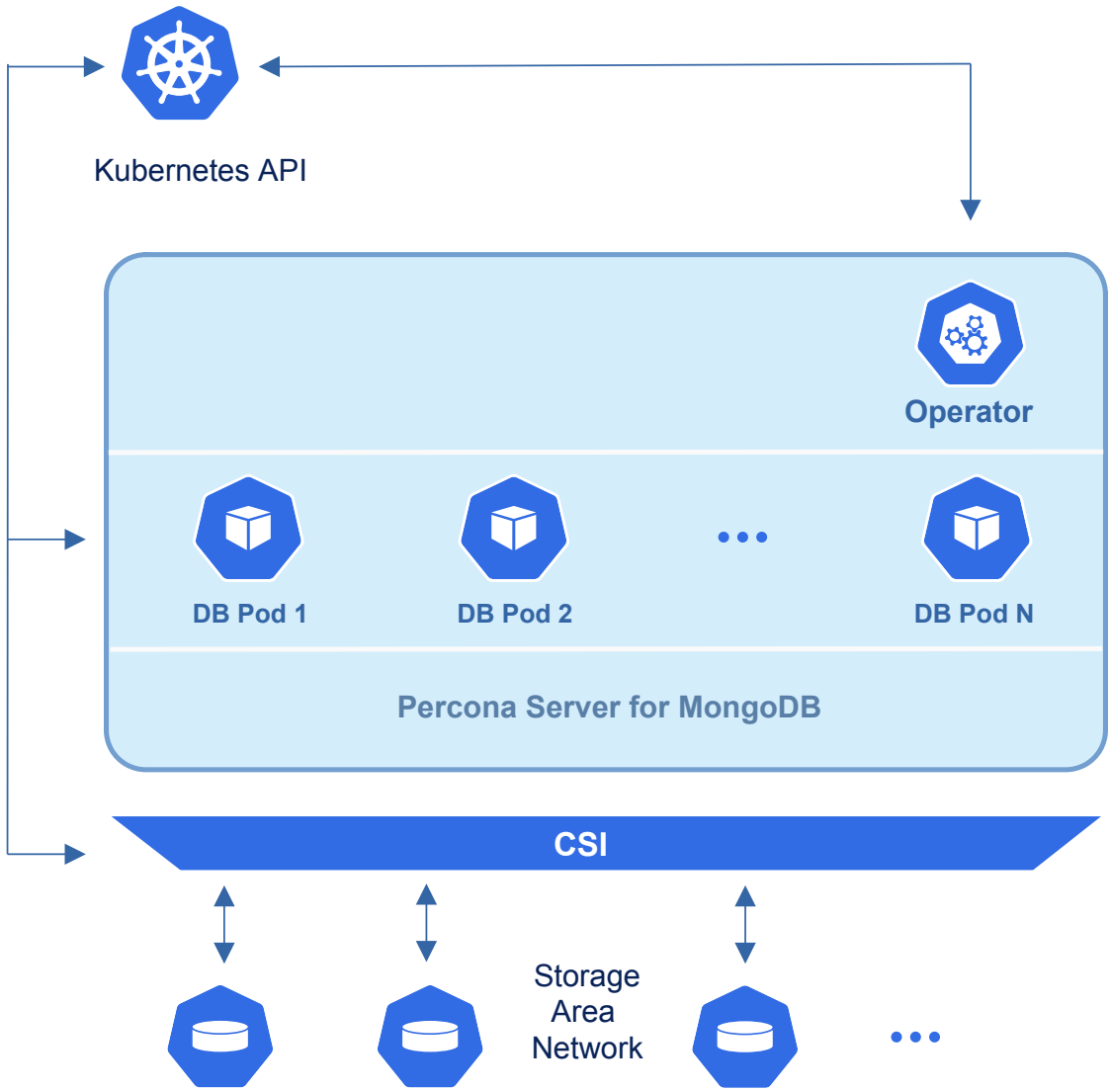


To provide high availability the Operator uses node affinity to run MongoDB instances on separate worker nodes if possible, and the database cluster is deployed as a single Replica Set with at least three nodes. If a node fails, the pod with the mongod process is automatically re-created on another node. If the failed node was hosting the primary server, the replica set initiates elections to select a new primary. If the failed node was running the Operator, Kubernetes will restart the Operator on another node, so normal operation will not be interrupted.

Client applications should use a mongo+srv URI for the connection. This allows the drivers (4.2 and up) to retrieve the list of replica set members from DNS SRV entries without having to list hostnames for the dynamically assigned nodes.

Note

The Operator uses security settings which are more secure than the default Percona Server for MongoDB setup. The initial configuration contains default passwords for all needed user accounts, which should be changed in the production environment, as stated in the installation instructions.



To provide data storage for stateful applications, Kubernetes uses Persistent Volumes. A *PersistentVolumeClaim* (PVC) is used to implement the automatic storage provisioning to pods. If a failure occurs, the Container Storage Interface (CSI) should be able to re-mount storage on a different node. The PVC StorageClass must support this feature (Kubernetes and OpenShift support this in versions 1.9 and 3.9 respectively).

The Operator functionality extends the Kubernetes API with *PerconaServerMongoDB* object, and it is implemented as a golang application. Each *PerconaServerMongoDB* object maps to one separate Percona Server for MongoDB setup. The Operator listens to all events on the created objects. When a new PerconaServerMongoDB object is created, or an existing one undergoes some changes or deletion, the operator automatically creates/changes/deletes all needed Kubernetes objects with the appropriate settings to provide a properly operating replica set.

Features

Compare various solutions to deploy MongoDB in Kubernetes

There are multiple ways to deploy and manage MongoDB in Kubernetes. Here we will focus on comparing the following open source solutions:

- Bitnami Helm chart
- KubeDB
- MongoDB Community Operator
- Percona Operator for MongoDB

Generic

Here is the review of generic features, such as supported MongoDB versions, open source models and more.

Feature/ Product	Percona Operator for MongoDB	Bitnami Helm Chart	KubeDB for MongoDB	MongoDB Community Operator	MongoDB Enterprise Operator
Open source model	Apache 2.0	Apache 2.0	Open core	Open core	Open core
MongoDB versions	MongoDB 5.0, 6.0, 7.0	MongoDB 5.0	MongoDB 3.4, 3.6. 4.0, 4.1, 4.2	MongoDB 4.2, 4.4, 5.0, 6.0, 7.0	MongoDB 4.2, 4.4, 5.0, 6.0, 7.0
Kubernetes conformance	Various versions are tested	No guarantee	No guarantee	No guarantee	No guarantee
Cluster-wide mode	Yes	Not an operator	Enterprise only	Yes	Yes
Network exposure	Yes	Yes	No, only through manual config	No	Yes
Web-based GUI	Percona Everest	🚫	kubedb-ui	🚫	Ops Manager

Maintenance

Upgrade and scaling are the two most common maintenance tasks that are executed by database administrators and developers.

Feature/ Product	Percona Operator for MongoDB	Bitnami Helm Chart	KubeDB for MongoDB	MongoDB Community Operator	MongoDB Enterprise Operator
Operator upgrade	Yes	Helm upgrade	Image change	Yes	Yes
Database upgrade	Automated minor, manual major	No	Manual minor	Manual minor and major	Yes
Compute scaling	Horizontal and vertical	Horizontal and vertical	Enterprise only	Horizontal only	Yes
Storage scaling	Yes	Manual	Enterprise only	No	Yes

MongoDB topologies

The next comparison is focused on replica sets, arbiters, sharding and other node types.

Feature/ Product	Percona Operator for MongoDB	Bitnami Helm Chart	KubeDB for MongoDB	MongoDB Community Operator	MongoDB Enterprise Operator
Multi-cluster deployment	Yes	No	No	No	Yes
Sharding	Yes	Yes, another chart	Yes	No	Yes
Arbiter	Yes	Yes	Yes	Yes	Yes
Non-voting nodes	Yes	No	No	No	Yes
Hidden nodes	No	Yes	Yes	Yes	Yes

Feature/ Product	Percona Operator for MongoDB	Bitnami Helm Chart	KubeDB for MongoDB	MongoDB Community Operator	MongoDB Enterprise Operator
Network exposure	Yes	Yes	Manual	No	Yes

Backups

Here are the backup and restore capabilities of each solution.

Feature/ Product	Percona Operator for MongoDB	Bitnami Helm Chart	KubeDB for MongoDB	MongoDB Community Operator	MongoDB Enterprise Operator
Scheduled backups	Yes	No	Enterprise only	No	Yes
Incremental backups	No	No	Enterprise only	No	No
Point-in-time recovery	Yes	No	No	No	Yes
Logical backups	Yes	No	No	No	Yes
Physical backups	Yes	No	No	No	Yes

Monitoring

Monitoring is crucial for any operations team.

Feature/Product	Percona Operator for MongoDB	Bitnami Helm Chart	KubeDB for MongoDB	MongoDB Community Operator	MongoDB Enterprise Operator

Feature/Product	Percona Operator for MongoDB	Bitnami Helm Chart	KubeDB for MongoDB	MongoDB Community Operator	MongoDB Enterprise Operator
Custom exporters	Yes, through sidecars	mongodb-exporter as a sidecar	mongodb-exporter as a sidecar	Integrate with prometheus operator	Integrate with prometheus operator
Percona Monitoring and Management (PMM)	Yes	No	No	No	No

Miscellaneous

Finally, let's compare various features that are not a good fit for other categories.

Feature/Product	Percona Operator for MongoDB	Bitnami Helm Chart	KubeDB for MongoDB	MongoDB Community Operator	MongoDB Enterprise Operator
Customize MongoDB configuration	Yes	Yes	Yes	No, only some params	No, only some params
Helm	Yes	Yes	Yes, for operator only	Yes, for operator only	Yes, for operator only
SSL/TLS	Yes	Yes	Enterprise only	Yes	Yes
Create users/ roles	Yes	Yes	No	Yes	Yes

Overview

Ready to get started with the Percona Operator for MongoDB? In this section, you will learn some basic operations, such as:

- Install and deploy an Operator
- Connect to Percona Server for MongoDB
- Insert sample data to the database
- Set up and make a logical backup
- Monitor the database health with Percona Monitoring and Management (PMM)

Next steps

Install the Operator →

Quickstart guides

Install Percona Server for MongoDB using Helm

Helm is the package manager for Kubernetes. A Helm chart is a package that contains all the necessary resources to deploy an application to a Kubernetes cluster.

You can find Percona Helm charts in percona/percona-helm-charts repository in Github.

Prerequisites

To install and deploy the Operator, you need the following:

1. Helm v3.
2. kubectl command line utility.
3. A Kubernetes environment. You can deploy it locally on Minikube for testing purposes or using any cloud provider of your choice. Check the list of our officially supported platforms.

See also

- Set up Minikube
- Create and configure the GKE cluster
- Set up Amazon Elastic Kubernetes Service
- Create and configure the AKS cluster

Installation

Here's a sequence of steps to follow:

1. Add the Percona's Helm charts repository and make your Helm client up to date with it:

```
$ helm repo add percona https://percona.github.io/percona-helm-charts/
$ helm repo update
```

2. It is a good practice to isolate workloads in Kubernetes via namespaces. Create a namespace:

```
$ kubectl create namespace <namespace>
```

3. Install Percona Operator for MongoDB:

```
$ helm install my-op percona/psmdb-operator --namespace <namespace>
```

The `namespace` is the name of your namespace. The `my-op` parameter in the above example is the name of a new release object which is created for the Operator when you install its Helm chart (use any name you like).

4. Install Percona Server for MongoDB:

```
$ helm install cluster1 percona/psmdb-db --namespace <namespace>
```

The `cluster1` parameter is the name of a new release object which is created for the Percona Server for MongoDB when you install its Helm chart (use any name you like).

5. Check the Operator and the Percona Server for MongoDB Pods status.

```
$ kubectl get psmdb -n <namespace>
```

The creation process may take some time. When the process is over your cluster obtains the `ready` status.

Expected output

```
NAME              ENDPOINT                                        STATUS   AGE
my-cluster-name   cluster1-mongos.default.svc.cluster.local   ready    5m26s
```

You have successfully installed and deployed the Operator with default parameters.

The default Percona Server for MongoDB configuration includes three mongod, three mongos, and three config server instances with enabled sharding.

You can check the rest of the Operator's parameters in the Custom Resource options reference.

Next steps

Connect to Percona Server for MongoDB →

Useful links

Install Percona Server for MongoDB with customized parameters

1. Quick install

Install Percona Server for MongoDB using kubectl

A Kubernetes Operator is a special type of controller introduced to simplify complex deployments. The Operator extends the Kubernetes API with custom resources.

The Percona Operator for MongoDB is based on best practices for configuration and setup of a Percona Distribution for MongoDB in a Kubernetes-based environment on-premises or in the cloud.

We recommend installing the Operator with the kubectl command line utility. It is the universal way to interact with Kubernetes. Alternatively, you can install it using the Helm package manager.

Install with kubectl ↓ | Install with Helm →

Prerequisites

To install Percona Distribution for MongoDB, you need the following:

1. The **kubectl** tool to manage and deploy applications on Kubernetes, included in most Kubernetes distributions. Install not already installed, follow its official installation instructions.
2. A Kubernetes environment. You can deploy it on Minikube for testing purposes or using any cloud provider of your choice. Check the list of our officially supported platforms.

See also

- Set up Minikube
- Create and configure the GKE cluster
- Set up Amazon Elastic Kubernetes Service
- Create and configure the AKS cluster

Procedure

Here's a sequence of steps to follow:

1. Create the Kubernetes namespace for your cluster. It is a good practice to isolate workloads in Kubernetes by installing the Operator in a custom namespace. Replace the `<namespace>` placeholder with your value.

```
$ kubectl create namespace <namespace>
```

Expected output

```
namespace/<namespace> was created
```

2. Deploy the Operator using the following command:

```
$ kubectl apply --server-side -f https://raw.githubusercontent.com/percona/
percona-server-mongodb-operator/v1.19.1/deploy/bundle.yaml -n <namespace>
```

Expected output

```
customresourcedefinition.apiextensions.k8s.io/perconaservermongodbs.psmdb.percona.com
serverside-applied
customresourcedefinition.apiextensions.k8s.io/
perconaservermongodbbackups.psmdb.percona.com serverside-applied
customresourcedefinition.apiextensions.k8s.io/
perconaservermongodbrestores.psmdb.percona.com serverside-applied
role.rbac.authorization.k8s.io/percona-server-mongodb-operator serverside-applied
serviceaccount/percona-server-mongodb-operator serverside-applied
rolebinding.rbac.authorization.k8s.io/service-account-percona-server-mongodb-operator
serverside-applied
deployment.apps/percona-server-mongodb-operator serverside-applied
```

As the result you will have the Operator Pod up and running.

3. Deploy Percona Server for MongoDB:

```
$ kubectl apply -f https://raw.githubusercontent.com/percona/percona-server-
mongodb-operator/v1.19.1/deploy/cr.yaml -n <namespace>
```

Expected output

```
perconaservermongodb.psmdb.percona.com/my-cluster-name created
```

4. Check the Operator and the Percona Server for MongoDB Pods status.

```
$ kubectl get psmdb -n <namespace>
```

The creation process may take some time. When the process is over your cluster obtains the `ready` status.

Expected output

```
NAME              ENDPOINT                                          STATUS   AGE
my-cluster-name   my-cluster-name-mongos.default.svc.cluster.local  ready    5m26s
```

You have successfully installed and deployed the Operator with default parameters.

The default Percona Server for MongoDB configuration includes three mongod, three mongos, and three config server instances with enabled sharding.

You can check the rest of the Operator's parameters in the Custom Resource options reference.

Next steps

Connect to Percona Server for MongoDB →

Useful links

Install Percona Server for MongoDB with customized parameters

2. Connect to Percona Server for MongoDB

In this tutorial, you will connect to the Percona Server for MongoDB cluster you deployed previously.

To connect to Percona Server for MongoDB you need to construct the MongoDB connection URI string. It includes the credentials of the admin user, which are stored in the Secrets object.

Here's how to do it:

1. List the Secrets objects

   ```
   $ kubectl get secrets -n <namespace>
   ```

   The Secrets object we target is named as `<cluster_name>-secrets`. The `<cluster_name>` value is the name of your Percona Distribution for MongoDB. The default variant is:

   via kubectl

   `my-cluster-name-secrets`

   via Helm

   `cluster1-psmdb-db-secrets`

2. Retrieve the admin user credentials. Replace the `secret-name` and `namespace` with your values in the following commands:

   → Retrieve the login

   ```
   $ kubectl get secret <secret-name> -n <namespace> -o yaml -o
   jsonpath='{.data.MONGODB_DATABASE_ADMIN_USER}' | base64 --decode | tr '\n' ' '
   && echo " "
   ```

   The default value is `databaseAdmin`

   → Retrieve the password

   ```
   $ kubectl get secret <secret-name> -n <namespace> -o yaml -o
   jsonpath='{.data.MONGODB_DATABASE_ADMIN_PASSWORD}' | base64 --decode | tr '\n'
   ' ' && echo " "
   ```

3. Run a container with a MongoDB client and connect its console output to your terminal. The following command does this, naming the new Pod `percona-client`:

```
$ kubectl -n <namespace> run -i --rm --tty percona-client --image=percona/
percona-server-mongodb:6.0.18-15 --restart=Never -- bash -il
```

4. Connect to Percona Server for MongoDB. The format of the MongoDB connection URI string is the following:

   sharding is on

   ```
   mongosh "mongodb://databaseAdmin:<databaseAdminPassword>@<cluster-name>-
   mongos.<namespace>.svc.cluster.local/admin?ssl=false"
   ```

   sharding is off

   ```
   mongosh  "mongodb://databaseAdmin:<databaseAdminPassword>@<cluster-name>-
   rs0.<namespace>.svc.cluster.local/admin?replicaSet=rs0&ssl=false"
   ```

   If you run MongoDB 5.0 and earlier, use the old `mongo` client instead of `mongosh`.

   Example

   The following example connects to the `admin` database of Percona Server for MongoDB 6.0 sharded cluster with the name `my-cluster-name`. The cluster runs in the namespace `mongodb-operator`:

   ```
   mongosh "mongodb://databaseAdmin:databaseAdminPassword@my-cluster-name-mongos.mongodb-
   operator.svc.cluster.local/admin?ssl=false"
   ```

Congratulations! You have connected to Percona Server for MongoDB.

Next steps

Insert sample data →

3. Insert sample data

In this tutorial you will learn to insert sample data to Percona Server for MongoDB.

MongoDB provides multiple methods for data insert. We will use a `For` loop to insert some sample documents.

1. Run the following command:

```
admin> for (var i = 1; i <= 50; i++) {
   db.test.insertOne( { x : i } )
}
```

If there is no `test` collection created, MongoDB creates when inserting documents.

Output

```
{
  acknowledged: true,
  insertedId: ObjectId("652567e5eedca48f97e1868f")
}
```

2. Query the collection to verify the data insertion

```
admin> db.test.find()
```

Output

```
[
  { _id: ObjectId("652567e4eedca48f97e1865e"), x: 1 },
  { _id: ObjectId("652567e4eedca48f97e1865f"), x: 2 },
  { _id: ObjectId("652567e4eedca48f97e18660"), x: 3 },
  { _id: ObjectId("652567e4eedca48f97e18661"), x: 4 },
  { _id: ObjectId("652567e4eedca48f97e18662"), x: 5 },
  { _id: ObjectId("652567e4eedca48f97e18663"), x: 6 },
  { _id: ObjectId("652567e4eedca48f97e18664"), x: 7 },
  { _id: ObjectId("652567e4eedca48f97e18665"), x: 8 },
  { _id: ObjectId("652567e4eedca48f97e18666"), x: 9 },
  { _id: ObjectId("652567e4eedca48f97e18667"), x: 10 },
  { _id: ObjectId("652567e4eedca48f97e18668"), x: 11 },
  { _id: ObjectId("652567e4eedca48f97e18669"), x: 12 },
  { _id: ObjectId("652567e4eedca48f97e1866a"), x: 13 },
  { _id: ObjectId("652567e4eedca48f97e1866b"), x: 14 },
  { _id: ObjectId("652567e4eedca48f97e1866c"), x: 15 },
  { _id: ObjectId("652567e4eedca48f97e1866d"), x: 16 },
  { _id: ObjectId("652567e4eedca48f97e1866e"), x: 17 },
  { _id: ObjectId("652567e4eedca48f97e1866f"), x: 18 },
  { _id: ObjectId("652567e4eedca48f97e18670"), x: 19 },
  { _id: ObjectId("652567e4eedca48f97e18671"), x: 20 }
]
```

You will have different `_id` values.

Now your cluster has some data in it.

Next steps

Make a backup →

4. Make a backup

In this tutorial you will learn how to make a logical backup of your data manually. To learn more about backups, see the Backup and restore section.

Considerations and prerequisites

In this tutorial we use the AWS S3 as the backup storage. You need the following S3-related information:

- the name of the S3 storage
- the name of the S3 bucket
- the region - the location of the bucket
- the S3 credentials to be used to access the storage.

If you don't have access to AWS, you can use any S3-compatible storage like MinIO. Also check the list of supported storages.

Also, we will use some files from the Operator repository for setting up backups. So, clone the percona-server-mongodb-operator repository:

```
$ git clone -b v1.19.1 https://github.com/percona/percona-server-mongodb-operator
$ cd percona-server-mongodb-operator
```

Note

It is crucial to specify the right branch with `-b` option while cloning the code on this step. Please be careful.

Configure backup storage

1. Encode S3 credentials, substituting `AWS_ACCESS_KEY_ID` and `AWS_SECRET_ACCESS_KEY` with your real values:

on Linux

```
$ echo -n 'AWS_ACCESS_KEY_ID' | base64 --wrap=0
$ echo -n 'AWS_SECRET_ACCESS_KEY' | base64 --wrap=0
```

on MacOS

```
$ echo -n 'AWS_ACCESS_KEY_ID' | base64
$ echo -n 'AWS_SECRET_ACCESS_KEY' | base64
```

2. Edit the `deploy/backup-s3.yaml` example Secrets configuration file and specify the following:

   - the `metadata.name` key is the name which you use to refer your Kubernetes Secret
   - the base64-encoded S3 credentials

deploy/backup-s3.yaml

```
apiVersion: v1
kind: Secret
metadata:
  name: my-cluster-name-backup-s3
type: Opaque
data:
  AWS_ACCESS_KEY_ID: <YOUR_AWS_ACCESS_KEY_ID>
  AWS_SECRET_ACCESS_KEY: <YOUR_AWS_SECRET_ACCESS_KEY>
```

3. Create the Secrets object from this yaml file. Specify your namespace instead of the `<namespace>` placeholder:

```
$ kubectl apply -f deploy/backup-s3.yaml -n <namespace>
```

4. Update your `deploy/cr.yaml` configuration. Specify the following parameters in the `backups` section:

   - set the `storages.<NAME>.type` to `s3`. Substitute the `<NAME>` part with some arbitrary name that you will later use to refer this storage when making backups and restores.
   - set the `storages.<NAME>.s3.credentialsSecret` to the name you used to refer your Kubernetes Secret (`my-cluster-name-backup-s3` in the previous step).
   - specify the S3 bucket name for the `storages.<NAME>.s3.bucket` option
   - specify the region in the `storages.<NAME>.s3.region` option. Also you can use the

`storages.<NAME>.s3.prefix` option to specify the path (a sub-folder) to the backups inside the S3 bucket. If prefix is not set, backups are stored in the root directory.

```
...
backup:
  ...
  storages:
    s3-us-west:
      type: s3
      s3:
        bucket: "S3-BACKUP-BUCKET-NAME-HERE"
        region: "<AWS_S3_REGION>"
        credentialsSecret: my-cluster-name-backup-s3
  ...
```

If you use a different S3-compatible storage instead of AWS S3, add the `endpointURL` key in the `s3` subsection, which should point to the actual cloud used for backups. This value is specific to the cloud provider. For example, using Google Cloud involves the following `endpointUrl`:

```
endpointUrl: https://storage.googleapis.com
```

5. Apply the configuration. Specify your namespace instead of the `<namespace>` placeholder:

```
$ kubectl apply -f deploy/cr.yaml -n <namespace>
```

Make a logical backup

1. Before you start, verify the backup configuration in the `deploy/cr.yaml` file:
   - the `backup.enabled` key is set to `true`
   - the `backup.storages` subsection contains the configured storage.
2. To make a backup, you need the configuration file. Edit the sample `deploy/backup/backup.yaml` configuration file and specify the following:
   - `metadata.name` - specify the backup name. You will use this name to restore from this backup
   - `spec.clusterName` - specify the name of your cluster. This is the name you specified when deploying Percona Server for MongoDB.
   -

`spec.storageName` - specify the name of your already configured storage.

deploy/backup/backup.yaml

```
apiVersion: psmdb.percona.com/v1
kind: PerconaServerMongoDBBackup
metadata:
  finalizers:
  - percona.com/delete-backup
  name: backup1
spec:
  clusterName: my-cluster-name
  storageName: s3-us-west
  type: logical
```

3. Apply the configuration. This instructs the Operator to start a backup. Specify your namespace instead of the `<namespace>` placeholder:

```
$ kubectl apply -f deploy/backup/backup.yaml -n <namespace>
```

4. Track the backup progress.

```
$ kubectl get psmdb-backup -n <namespace>
```

Output

```
NAME      CLUSTER           STORAGE      DESTINATION
TYPE      STATUS   COMPLETED   AGE
backup1   my-cluster-name   s3-us-west   s3://pg-operator-testing/2023-10-10T16:36:46Z
logical   running                43s
```

When the status changes to `Ready`, backup is made.

Troubleshooting

You may face issues with the backup. To identify the issue, you can do the following:

- View the information about the backup with the following command:

```
$ kubectl get psmdb-backup <backup-name> -n <namespace> -o yaml
```

- View the backup-agent logs. Use the previous command to find the name of the pod where the backup

was made:

```
$ kubectl logs pod/<pod-name> -c backup-agent -n <namespace>
```

Congratulations! You have made the first backup manually. Want to learn more about backups? See the Backup and restore section for how to configure point-in-time recovery, enable server-side encryption and how to automatically make backups according to the schedule.

Next steps

Monitor the database →

5. Monitor database with Percona Monitoring and Management (PMM)

In this section you will learn how to monitor Percona Server for MongoDB with Percona Monitoring and Management (PMM).

> **Note**
>
> Only PMM 2.x versions are supported by the Operator.

PMM is a client/server application. It includes the PMM Server and the number of PMM Clients running on each node with the database you wish to monitor.

A PMM Client collects needed metrics and sends gathered data to the PMM Server. As a user, you connect to the PMM Server to see database metrics on a number of dashboards.

PMM Server and PMM Client are installed separately.

Install PMM Server

You must have PMM server up and running. You can run PMM Server as a *Docker image*, a *virtual appliance*, or on an *AWS instance*. Please refer to the official PMM documentation for the installation instructions.

Install PMM Client

To install PMM Client as a side-car container in your Kubernetes-based environment, do the following:

1. Authorize PMM Client within PMM Server.

Token-based authorization (recommended)

1. Generate the PMM Server API Key. Specify the Admin role when getting the API Key.

Warning: The API key is not rotated automatically.

1. Edit the deploy/secrets.yaml secrets file and specify the PMM API key for the `PMM_SERVER_API_KEY` option.
2. Apply the configuration for the changes to take effect.

```
$ kubectl apply -f deploy/secrets.yaml -n <namespace>
```

Password-based authorization (deprecated since version 1.13.0)

1. Edit the deploy/secrets.yaml secrets file and specify the following:
2. The user name of your PMM Server (`admin` by default) in the `PMM_SERVER_USER` key
3. The password you set for the PMM Server during its installation in the `PMM_SERVER_PASSWORD` key.
4. Apply the configuration for the changes to take effect.

```
$ kubectl apply -f deploy/secrets.yaml -n <namespace>
```

2. Update the `pmm` section in the deploy/cr.yaml file:

- Set `pmm.enabled` = `true`.
- Specify your PMM Server hostname / an IP address for the `pmm.serverHost` option. The PMM Server IP address should be resolvable and reachable from within your cluster.

```
pmm:
  enabled: true
  image: percona/pmm-client:2.44.0
  serverHost: monitoring-service
```

3. Apply the changes:

```
$ kubectl apply -f deploy/cr.yaml -n <namespace>
```

3. Check that corresponding Pods are not in a cycle of stopping and restarting. This cycle occurs if there are errors on the previous steps:

```
$ kubectl get pods -n <namespace>
$ kubectl logs <cluster-name>-rs0-0 -c pmm-client -n <namespace>
```

Check the metrics

Let's see how the collected data is visualized in PMM.

1. Log in to PMM server.
2. Click **MongoDB** from the left-hand navigation menu. You land on the **Instances Overview** page.
3. Select your cluster from the **Clusters** drop-down menu and the desired time range on the top of the page. You should see the metrics.
4. Click **MongoDB** → **Other dashboards** to see the list of available dashboards that allow you to drill down to the metrics you are interested in.

Next steps

What's next →

What's next?

Congratulations! You have completed all the steps in the Get started guide.

You have the following options to move forward with the Operator:

- Deepen your monitoring insights by setting up Kubernetes monitoring with PMM
- Control Pods assignment on specific Kubernetes Nodes by setting up affinity / anti-affinity
- Ready to adopt the Operator for production use and need to delete the testing deployment? Use this guide to do it
- You can also try operating the Operator and database clusters via the web interface with Percona Everest - an open-source web-based database provisioning tool based on Percona Operators. See Get started with Percona Everest on how to start using it

System Requirements

The Operator was developed and tested with Percona Server for MongoDB 6.0.18-15, 7.0.14-8, and 8.0.4-1. Other options may also work but have not been tested. The Operator 1.19.1 also uses Percona Backup for MongoDB 2.8.0.

Officially supported platforms

The following platforms were tested and are officially supported by the Operator 1.19.1:

- Google Kubernetes Engine (GKE) 1.28-1.30
- Amazon Elastic Container Service for Kubernetes (EKS) 1.29-1.31
- OpenShift Container Platform 4.14.44 - 4.17.11
- Azure Kubernetes Service (AKS) 1.28-1.31
- Minikube 1.34.0 based on Kubernetes 1.31.0

Other Kubernetes platforms may also work but have not been tested.

Resource Limits

A cluster running an officially supported platform contains at least 3 Nodes and the following resources (if sharding is turned off):

- 2GB of RAM,
- 2 CPU threads per Node for Pods provisioning,
- at least 60GB of available storage for Private Volumes provisioning.

Consider using 4 CPU and 6 GB of RAM if sharding is turned on (the default behavior).

Also, the number of Replica Set Nodes should not be odd if Arbiter is not enabled.

Note

Use Storage Class with XFS as the default filesystem if possible to achieve better MongoDB performance.

Installation guidelines

Choose how you wish to install the Operator:

- with Helm
- with `kubectl`
- on Minikube
- on Google Kubernetes Engine (GKE)
- on Amazon Elastic Kubernetes Service (AWS EKS)
- on Microsoft Azure Kubernetes Service (AKS)
- on Openshift
- in a Kubernetes-based environment

Installation

Install Percona Server for MongoDB on Minikube

Installing the Percona Operator for MongoDB on Minikube is the easiest way to try it locally without a cloud provider. Minikube runs Kubernetes on GNU/Linux, Windows, or macOS system using a system-wide hypervisor, such as VirtualBox, KVM/QEMU, VMware Fusion or Hyper-V. Using it is a popular way to test Kubernetes application locally prior to deploying it on a cloud.

The following steps are needed to run Percona Operator for MongoDB on minikube:

1. Install minikube, using a way recommended for your system. This includes the installation of the following three components:

   a. kubectl tool,

   b. a hypervisor, if it is not already installed,

   c. actual minikube package

   After the installation, run `minikube start --memory=5120 --cpus=4 --disk-size=30g` (parameters increase the virtual machine limits for the CPU cores, memory, and disk, to ensure stable work of the Operator). Being executed, this command will download needed virtualized images, then initialize and run the cluster. After Minikube is successfully started, you can optionally run the Kubernetes dashboard, which visually represents the state of your cluster. Executing `minikube dashboard` will start the dashboard and open it in your default web browser.

2. Deploy the operator using the following command:

```
$ kubectl apply --server-side -f https://raw.githubusercontent.com/percona/
percona-server-mongodb-operator/v1.19.1/deploy/bundle.yaml
```

3. Deploy MongoDB cluster with:

```
$ kubectl apply -f https://raw.githubusercontent.com/percona/percona-server-
mongodb-operator/v1.19.1/deploy/cr-minimal.yaml
```

Note

This deploys a one-shard MongoDB cluster with one replica set with one node, one mongos node and one config server node. The deploy/cr-minimal.yaml is for minimal non-production deployment. For more configuration options please see deploy/cr.yaml and Custom Resource Options. You can clone the repository with all manifests and source code by executing the following command:

```
$ git clone -b v1.19.1 https://github.com/percona/percona-server-mongodb-operator
```

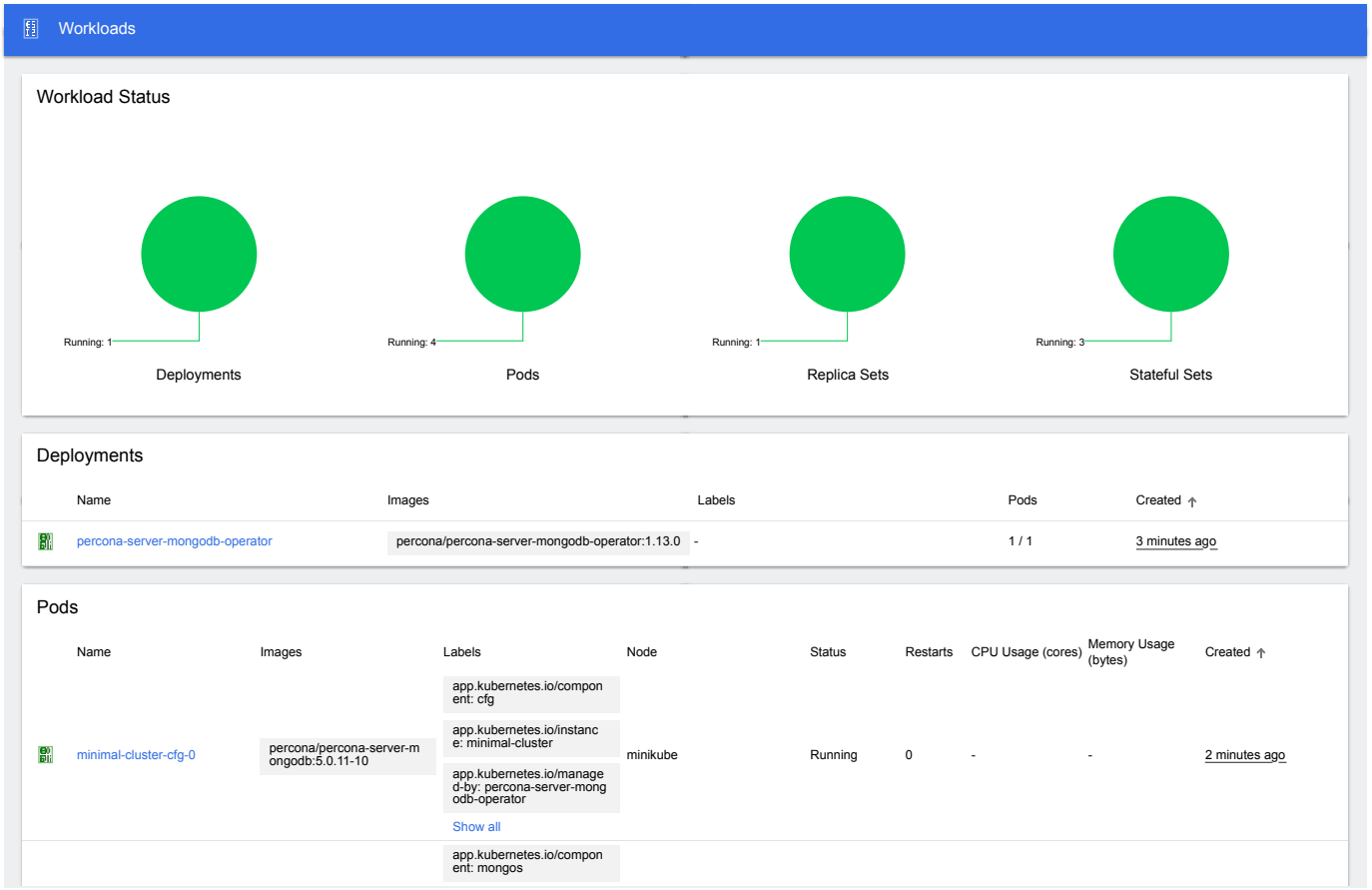
After editing the needed options, apply your modified `deploy/cr.yaml` file as follows:

```
$ kubectl apply -f deploy/cr.yaml
```

The creation process may take some time.

The process is over when both operator and replica set pod have reached their Running status. `kubectl get pods` output should look like this:

You can also track the progress via the Kubernetes dashboard:



Verifying the cluster operation

It may take ten minutes to get the cluster started. When `kubectl get pods` command finally shows you the cluster is ready, you can try to connect to the cluster.

To connect to Percona Server for MongoDB you need to construct the MongoDB connection URI string. It includes the credentials of the admin user, which are stored in the Secrets object.

1. List the Secrets objects

   ```
   $ kubectl get secrets -n <namespace>
   ```

   The Secrets object you are interested in has the `minimal-cluster-secrets` name by default.

2. View the Secret contents to retrive the admin user credentials.

   ```
   $ kubectl get secret minimal-cluster-secrets -o yaml
   ```

   The command returns the YAML file with generated Secrets, including the `MONGODB_DATABASE_ADMIN_USER` and `MONGODB_DATABASE_ADMIN_PASSWORD` strings, which should look as follows:

   Sample output

   ```
   ...
   data:
     ...
     MONGODB_DATABASE_ADMIN_PASSWORD: aDAzQ0pCY3NSWEZ2ZUIzS1I=
     MONGODB_DATABASE_ADMIN_USER: ZGF0YWJhc2VBZG1pbg==
   ```

   The actual login name and password on the output are base64-encoded. To bring it back to a human-readable form, run:

   ```
   $ echo 'MONGODB_DATABASE_ADMIN_USER' | base64 --decode
   $ echo 'MONGODB_DATABASE_ADMIN_PASSWORD' | base64 --decode
   ```

3. Run a container with a MongoDB client and connect its console output to your terminal. The following command does this, naming the new Pod `percona-client`:

   ```
   $ kubectl run -i --rm --tty percona-client --image=percona/percona-server-
   mongodb:7.0.14-8 --restart=Never -- bash -il
   ```

   Executing it may require some time to deploy the corresponding Pod.

4.

Now run `mongosh` tool inside the `percona-client` command shell using the admin user credentialds you obtained from the Secret, and a proper namespace name instead of the `<namespace name>` placeholder. The command will look different depending on whether sharding is on (the default behavior) or off:

if sharding is on

```
$ mongosh "mongodb://databaseAdmin:databaseAdminPassword@minimal-cluster-mongos.<namespace name>.svc.cluster.local/admin?ssl=false"
```

if sharding is off

```
$ mongosh "mongodb+srv://databaseAdmin:databaseAdminPassword@minimal-cluster-rs0.<namespace name>.svc.cluster.local/admin?replicaSet=rs0&ssl=false"
```

Note

If you are using MongoDB versions earler than 6.x (such as 5.0.29-25 instead of the default 7.0.14-8 variant), substitute `mongosh` command with `mongo` in the above examples.

Install Percona Server for MongoDB cluster using Everest

Percona Everest is an open source cloud-native database platform that helps developers deploy code faster, scale deployments rapidly, and reduce database administration overhead while regaining control over their data, database configuration, and DBaaS costs.

It automates day-one and day-two database operations for open source databases on Kubernetes clusters. Percona Everest provides API and Web GUI to launch databases with just a few clicks and scale them, do routine maintenance tasks, such as software updates, patch management, backups, and monitoring.

You can try it in action by Installing Percona Everest and managing your first cluster.

Install Percona Server for MongoDB on Google Kubernetes Engine (GKE)

This guide shows you how to deploy Percona Operator for MongoDB on Google Kubernetes Engine (GKE). The document assumes some experience with the platform. For more information on the GKE, see the Kubernetes Engine Quickstart.

Prerequisites

All commands from this guide can be run either in the **Google Cloud shell** or in **your local shell**.

To use *Google Cloud shell*, you need nothing but a modern web browser.

If you would like to use *your local shell*, install the following:

1. gcloud. This tool is part of the Google Cloud SDK. To install it, select your operating system on the official Google Cloud SDK documentation page and then follow the instructions.
2. kubectl. It is the Kubernetes command-line tool you will use to manage and deploy applications. To install the tool, run the following command:

```
$ gcloud auth login
$ gcloud components install kubectl
```

Create and configure the GKE cluster

You can configure the settings using the `gcloud` tool. You can run it either in the Cloud Shell or in your local shell (if you have installed Google Cloud SDK locally on the previous step). The following command will create a cluster named `my-cluster-name`:

```
$ gcloud container clusters create my-cluster-name --project <project ID> --zone
us-central1-a --cluster-version 1.30 --machine-type n1-standard-4 --num-nodes=3
```

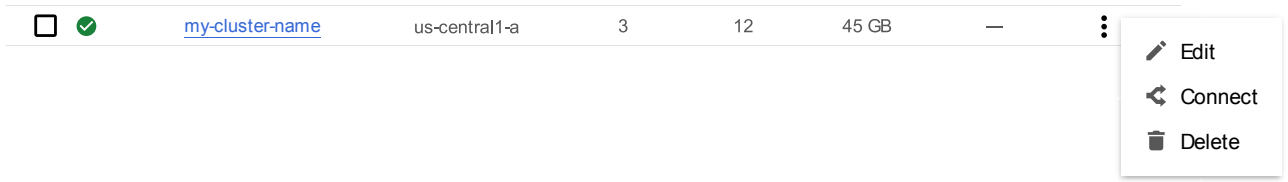
Note

You must edit the following command and other command-line statements to replace the `<project ID>` placeholder with your project ID (see available projects with `gcloud projects list` command). You may also be required to edit the *zone location*, which is set to `us-central1` in the above example. Other parameters specify that we are creating a cluster with 3 nodes and with machine type of 4 x86_64 vCPUs. If you need ARM64, use different `--machine-type`, for example, `t2a-standard-4`.

You may wait a few minutes for the cluster to be generated.

When the process is over, you can see it listed in the Google Cloud console

Select *Kubernetes Engine → Clusters* in the left menu panel:



Now you should configure the command-line access to your newly created cluster to make `kubectl` be able to use it.

In the Google Cloud Console, select your cluster and then click the *Connect* shown on the above image. You will see the connect statement which configures the command-line access. After you have edited the statement, you may run the command in your local shell:

```
$ gcloud container clusters get-credentials my-cluster-name --zone us-central1-a --
project <project name>
```

Finally, use your Cloud Identity and Access Management (Cloud IAM) to control access to the cluster. The following command will give you the ability to create Roles and RoleBindings:

```
$ kubectl create clusterrolebinding cluster-admin-binding --clusterrole cluster-
admin --user $(gcloud config get-value core/account)
```

Expected output

```
clusterrolebinding.rbac.authorization.k8s.io/cluster-admin-binding created
```

Install the Operator and deploy your MongoDB cluster

1. Deploy the Operator. By default deployment will be done in the `default` namespace. If that's not the desired one, you can create a new namespace and/or set the context for the namespace as follows (replace the `<namespace name>` placeholder with some descriptive name):

   ```
   $ kubectl create namespace <namespace name>
   $ kubectl config set-context $(kubectl config current-context) --
   namespace=<namespace name>
   ```

At success, you will see the message that `namespace/<namespace name>` was created, and the context (`gke_<project name>_<zone location>_<cluster name>`) was modified.

Deploy the Operator by applying the `deploy/bundle.yaml` manifest from the Operator source tree.

For x86_64 architecture

You can apply it without downloading, using the following command:

```
$ kubectl apply --server-side -f https://raw.githubusercontent.com/percona/
percona-server-mongodb-operator/v1.19.1/deploy/bundle.yaml
```

Expected output

```
customresourcedefinition.apiextensions.k8s.io/perconaservermongodbs.psmdb.percona.com
serverside-applied
customresourcedefinition.apiextensions.k8s.io/
perconaservermongodbbackups.psmdb.percona.com serverside-applied
customresourcedefinition.apiextensions.k8s.io/
perconaservermongodbrestores.psmdb.percona.com serverside-applied
role.rbac.authorization.k8s.io/percona-server-mongodb-operator serverside-applied
serviceaccount/percona-server-mongodb-operator serverside-applied
rolebinding.rbac.authorization.k8s.io/service-account-percona-server-mongodb-operator
serverside-applied
deployment.apps/percona-server-mongodb-operator serverside-applied
```

For ARM64 architecture

Clone the repository with all manifests and source code by executing the following command:

```
$ git clone -b v1.19.1 https://github.com/percona/percona-server-mongodb-
operator
```

Edit the `deploy/bundle.yaml` file: add the following affinity rules to the `spec` part of the `percona-server-mongodb-operator` Deployment:

```
    apiVersion: apps/v1
    kind: Deployment
    metadata:
      name: percona-server-mongodb-operator
    spec:
      replicas: 1
      selector:
        matchLabels:
          name: percona-server-mongodb-operator
      template:
        metadata:
          labels:
            name: percona-server-mongodb-operator
        spec:
          affinity:
            nodeAffinity:
              requiredDuringSchedulingIgnoredDuringExecution:
                nodeSelectorTerms:
                  - matchExpressions:
                    - key: kubernetes.io/arch
                      operator: In
                      values:
                        - arm64
```

After editing, apply your modified `deploy/bundle.yaml` file as follows:

```
$ kubectl apply --server-side -f deploy/bundle.yaml
```

Expected output

```
customresourcedefinition.apiextensions.k8s.io/perconaservermongodbs.psmdb.percona.com
serverside-applied
customresourcedefinition.apiextensions.k8s.io/
perconaservermongodbbackups.psmdb.percona.com serverside-applied
customresourcedefinition.apiextensions.k8s.io/
perconaservermongodbrestores.psmdb.percona.com serverside-applied
role.rbac.authorization.k8s.io/percona-server-mongodb-operator serverside-applied
serviceaccount/percona-server-mongodb-operator serverside-applied
rolebinding.rbac.authorization.k8s.io/service-account-percona-server-mongodb-operator
serverside-applied
deployment.apps/percona-server-mongodb-operator serverside-applied
```

2. The Operator has been started, and you can deploy your MongoDB cluster:

For x86_64 architecture

```
$ kubectl apply -f https://raw.githubusercontent.com/percona/percona-server-mongodb-operator/v1.19.1/deploy/cr.yaml
```

Expected output

```
perconaservermongodb.psmdb.percona.com/my-cluster-name created
```

Note

This deploys default MongoDB cluster configuration, three mongod, three mongos, and three config server instances. Please see deploy/cr.yaml and Custom Resource Options for the configuration options. You can clone the repository with all manifests and source code by executing the following command:

```
$ git clone -b v1.19.1 https://github.com/percona/percona-server-mongodb-operator
```

After editing the needed options, apply your modified `deploy/cr.yaml` file as follows:

```
$ kubectl apply -f deploy/cr.yaml
```

For ARM64 architecture

Edit the `deploy/cr.yaml` file: set the following affinity rules in **all** `affinity` **subsections**:

```
....
affinity:
  advanced:
    nodeAffinity:
      requiredDuringSchedulingIgnoredDuringExecution:
        nodeSelectorTerms:
        - matchExpressions:
          - key: kubernetes.io/arch
            operator: In
            values:
            - arm64
```

Also, set `image` and `backup.image` Custom Resource options to special multi-architecture image versions by adding a `-multi` suffix to their tags:

```
....
image: percona/percona-server-mongodb:7.0.14-8-multi
...
backup:
  ...
  image: percona/percona-backup-mongodb:2.8.0-multi
```

Please note, that currently monitoring with PMM is not supported on ARM64 configurations.

After editing, apply your modified `deploy/cr.yaml` file as follows:

```
$ kubectl apply -f deploy/cr.yaml
```

Expected output

```
perconaservermongodb.psmdb.percona.com/my-cluster-name created
```

The creation process may take some time. When the process is over your cluster will obtain the `ready` status. You can check it with the following command:

```
$ kubectl get psmdb
```

Expected output

```
NAME              ENDPOINT                                          STATUS   AGE
my-cluster-name   my-cluster-name-mongos.default.svc.cluster.local   ready    5m26s
```

You can also track the creation process in Google Cloud console via the Object Browser

When the creation process is finished, it will look as follows:

Name	Status	Type	Namespace	Cluster
core		API Group		
Pod		Kind		
my-cluster-name-cfg-0	Running	Pod	default	my-cluster-name
my-cluster-name-cfg-1	Running	Pod	default	my-cluster-name
my-cluster-name-cfg-2	Running	Pod	default	my-cluster-name
my-cluster-name-mongos-0	Running	Pod	default	my-cluster-name
my-cluster-name-mongos-1	Running	Pod	default	my-cluster-name
my-cluster-name-mongos-2	Running	Pod	default	my-cluster-name
my-cluster-name-rs0-0	Running	Pod	default	my-cluster-name
my-cluster-name-rs0-1	Running	Pod	default	my-cluster-name
my-cluster-name-rs0-2	Running	Pod	default	my-cluster-name
percona-server-mongodb-operator-665cd69f9b-xg5dl	Running	Pod	default	my-cluster-name

Verifying the cluster operation

It may take ten minutes to get the cluster started. When `kubectl get psmdb` command finally shows you the cluster status as `ready`, you can try to connect to the cluster.

To connect to Percona Server for MongoDB you need to construct the MongoDB connection URI string. It includes the credentials of the admin user, which are stored in the Secrets object.

1. List the Secrets objects

   ```
   $ kubectl get secrets -n <namespace>
   ```

   The Secrets object you are interested in has the `my-cluster-name-secrets` name by default.

2. View the Secret contents to retrive the admin user credentials.

   ```
   $ kubectl get secret my-cluster-name-secrets -o yaml
   ```

   The command returns the YAML file with generated Secrets, including the `MONGODB_DATABASE_ADMIN_USER` and `MONGODB_DATABASE_ADMIN_PASSWORD` strings, which should look as follows:

Sample output

```
...
data:
  ...
  MONGODB_DATABASE_ADMIN_PASSWORD: aDAzQ0pCY3NSWEZ2ZUIzS1I=
  MONGODB_DATABASE_ADMIN_USER: ZGF0YWJhc2VBZG1pbg==
```

The actual login name and password on the output are base64-encoded. To bring it back to a human-readable form, run:

```
$ echo 'MONGODB_DATABASE_ADMIN_USER' | base64 --decode
$ echo 'MONGODB_DATABASE_ADMIN_PASSWORD' | base64 --decode
```

3. Run a container with a MongoDB client and connect its console output to your terminal. The following command does this, naming the new Pod `percona-client`:

```
$ kubectl run -i --rm --tty percona-client --image=percona/percona-server-mongodb:7.0.14-8 --restart=Never -- bash -il
```

Executing it may require some time to deploy the corresponding Pod.

4. Now run `mongosh` tool inside the `percona-client` command shell using the admin user credentialds you obtained from the Secret, and a proper namespace name instead of the `<namespace name>` placeholder. The command will look different depending on whether sharding is on (the default behavior) or off:

if sharding is on

```
$ mongosh "mongodb://databaseAdmin:databaseAdminPassword@my-cluster-name-mongos.<namespace name>.svc.cluster.local/admin?ssl=false"
```

if sharding is off

```
$ mongosh "mongodb+srv://databaseAdmin:databaseAdminPassword@my-cluster-name-rs0.<namespace name>.svc.cluster.local/admin?replicaSet=rs0&ssl=false"
```

Note

If you are using MongoDB versions earler than 6.x (such as 5.0.29-25 instead of the default 7.0.14-8 variant), substitute `mongosh` command with `mongo` in the above examples.

Troubleshooting

If `kubectl get psmdb` command doesn't show `ready` status too long, you can check the creation process with the `kubectl get pods` command:

```
$ kubectl get pods
```

Expected output

```
NAME                                               READY   STATUS    RESTARTS   AGE
my-cluster-name-cfg-0                              2/2     Running   0          11m
my-cluster-name-cfg-1                              2/2     Running   1          10m
my-cluster-name-cfg-2                              2/2     Running   1          9m
my-cluster-name-mongos-0                           1/1     Running   0          11m
my-cluster-name-mongos-1                           1/1     Running   0          11m
my-cluster-name-mongos-2                           1/1     Running   0          11m
my-cluster-name-rs0-0                              2/2     Running   0          11m
my-cluster-name-rs0-1                              2/2     Running   0          10m
my-cluster-name-rs0-2                              2/2     Running   0          9m
percona-server-mongodb-operator-665cd69f9b-xg5dl   1/1     Running   0          37m
```

If the command output had shown some errors, you can examine the problematic Pod with the `kubectl describe <pod name>` command as follows:

```
$ kubectl describe pod my-cluster-name-rs0-2
```

Review the detailed information for `Warning` statements and then correct the configuration. An example of a warning is as follows:

`Warning  FailedScheduling  68s (x4 over 2m22s)  default-scheduler  0/1 nodes are available: 1 node(s) didn't match pod affinity/anti-affinity, 1 node(s) didn't satisfy existing pods anti-affinity rules.`

Alternatively, you can examine your Pods via the object browser

The errors will look as follows:

Name	Status	Type	Namespace	Cluster
core		API Group		
Pod		Kind		
my-cluster-name-cfg-0	Running	Pod	default	my-cluster-name
my-cluster-name-cfg-1	Running	Pod	default	my-cluster-name
my-cluster-name-cfg-2	Running	Pod	default	my-cluster-name
my-cluster-name-mongos-0	Running	Pod	default	my-cluster-name
my-cluster-name-mongos-1	Running	Pod	default	my-cluster-name
my-cluster-name-mongos-2	Running	Pod	default	my-cluster-name
my-cluster-name-rs0-0	Running	Pod	default	my-cluster-name
my-cluster-name-rs0-1	Running	Pod	default	my-cluster-name
my-cluster-name-rs0-2	Unschedulable	Pod	default	my-cluster-name
percona-server-mongodb-operator-665cd69f9b-xg5dl	Running	Pod	default	my-cluster-name

Clicking the problematic Pod will bring you to the details page with the same warning:

0/3 nodes are available: 3 node(s) didn't match Pod's node affinity/selector. SHOW DETAILS

Removing the GKE cluster

There are several ways that you can delete the cluster.

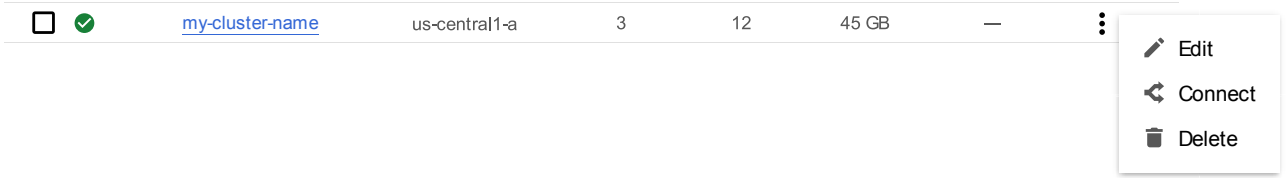
You can clean up the cluster with the `gcloud` command as follows:

```
$ gcloud container clusters delete <cluster name> --zone us-central1-a --project
<project ID>
```

The return statement requests your confirmation of the deletion. Type `y` to confirm.

Also, you can delete your cluster via the Google Cloud console

Just click the `Delete` popup menu item in the clusters list:



The cluster deletion may take time.

Warning

After deleting the cluster, all data stored in it will be lost!

Install Percona Server for MongoDB on Amazon Elastic Kubernetes Service (EKS)

This guide shows you how to deploy Percona Operator for MongoDB on Amazon Elastic Kubernetes Service (EKS). The document assumes some experience with the platform. For more information on the EKS, see the Amazon EKS official documentation.

Prerequisites

The following tools are used in this guide and therefore should be preinstalled:

1. **AWS Command Line Interface (AWS CLI)** for interacting with the different parts of AWS. You can install it following the official installation instructions for your system.
2. **eksctl** to simplify cluster creation on EKS. It can be installed along its installation notes on GitHub.
3. **kubectl** to manage and deploy applications on Kubernetes. Install it following the official installation instructions.

Also, you need to configure AWS CLI with your credentials according to the official guide.

Create the EKS cluster

1. To create your cluster, you will need the following data:
   - name of your EKS cluster,
   - AWS region in which you wish to deploy your cluster,
   - the amount of nodes you would like tho have,
   - the desired ratio between on-demand and spot instances in the total number of nodes.

   > **Note**
   >
   > spot instances are not recommended for production environment, but may be useful e.g. for testing purposes.

   After you have settled all the needed details, create your EKS cluster following the official cluster creation instructions.
2. After you have created the EKS cluster, you also need to install the Amazon EBS CSI driver on your cluster. See the official documentation on adding it as an Amazon EKS add-on.

Install the Operator and deploy your MongoDB cluster

1. Deploy the Operator. By default deployment will be done in the `default` namespace. If that's not the desired one, you can create a new namespace and/or set the context for the namespace as follows (replace the `<namespace name>` placeholder with some descriptive name):

   ```
   $ kubectl create namespace <namespace name>
   $ kubectl config set-context $(kubectl config current-context) --
   namespace=<namespace name>
   ```

   At success, you will see the message that `namespace/<namespace name>` was created, and the context was modified.

   Deploy the Operator by applying the `deploy/bundle.yaml` manifest from the Operator source tree.

For x86_64 architecture

You can apply it without downloading, using the following command:

```
$ kubectl apply --server-side -f https://raw.githubusercontent.com/percona/
percona-server-mongodb-operator/v1.19.1/deploy/bundle.yaml
```

Expected output

```
customresourcedefinition.apiextensions.k8s.io/perconaservermongodbs.psmdb.percona.com
serverside-applied
customresourcedefinition.apiextensions.k8s.io/
perconaservermongodbbackups.psmdb.percona.com serverside-applied
customresourcedefinition.apiextensions.k8s.io/
perconaservermongodbrestores.psmdb.percona.com serverside-applied
role.rbac.authorization.k8s.io/percona-server-mongodb-operator serverside-applied
serviceaccount/percona-server-mongodb-operator serverside-applied
rolebinding.rbac.authorization.k8s.io/service-account-percona-server-mongodb-operator
serverside-applied
deployment.apps/percona-server-mongodb-operator serverside-applied
```

For ARM64 architecture

Clone the repository with all manifests and source code by executing the following command:

```
$ git clone -b v1.19.1 https://github.com/percona/percona-server-mongodb-
operator
```

Edit the `deploy/bundle.yaml` file: add the following affinity rules to the `spec` part of the `percona-server-mongodb-operator` Deployment:

```
    apiVersion: apps/v1
    kind: Deployment
    metadata:
      name: percona-server-mongodb-operator
    spec:
      replicas: 1
      selector:
        matchLabels:
          name: percona-server-mongodb-operator
      template:
        metadata:
          labels:
            name: percona-server-mongodb-operator
        spec:
          affinity:
            nodeAffinity:
              requiredDuringSchedulingIgnoredDuringExecution:
                nodeSelectorTerms:
                  - matchExpressions:
                    - key: kubernetes.io/arch
                      operator: In
                      values:
                        - arm64
```

After editing, apply your modified `deploy/bundle.yaml` file as follows:

```
$ kubectl apply --server-side -f deploy/bundle.yaml
```

Expected output

```
customresourcedefinition.apiextensions.k8s.io/perconaservermongodbs.psmdb.percona.com
serverside-applied
customresourcedefinition.apiextensions.k8s.io/
perconaservermongodbbackups.psmdb.percona.com serverside-applied
customresourcedefinition.apiextensions.k8s.io/
perconaservermongodbrestores.psmdb.percona.com serverside-applied
role.rbac.authorization.k8s.io/percona-server-mongodb-operator serverside-applied
serviceaccount/percona-server-mongodb-operator serverside-applied
rolebinding.rbac.authorization.k8s.io/service-account-percona-server-mongodb-operator
serverside-applied
deployment.apps/percona-server-mongodb-operator serverside-applied
```

2. The Operator has been started, and you can deploy your MongoDB cluster:

For x86_64 architecture

```
$ kubectl apply -f https://raw.githubusercontent.com/percona/percona-server-mongodb-operator/v1.19.1/deploy/cr.yaml
```

Expected output

```
perconaservermongodb.psmdb.percona.com/my-cluster-name created
```

Note

This deploys default MongoDB cluster configuration, three mongod, three mongos, and three config server instances. Please see deploy/cr.yaml and Custom Resource Options for the configuration options. You can clone the repository with all manifests and source code by executing the following command:

```
$ git clone -b v1.19.1 https://github.com/percona/percona-server-mongodb-operator
```

After editing the needed options, apply your modified `deploy/cr.yaml` file as follows:

```
$ kubectl apply -f deploy/cr.yaml
```

For ARM64 architecture

Edit the `deploy/cr.yaml` file: set the following affinity rules in **all** `affinity` **subsections**:

```
....
affinity:
  advanced:
    nodeAffinity:
      requiredDuringSchedulingIgnoredDuringExecution:
        nodeSelectorTerms:
        - matchExpressions:
          - key: kubernetes.io/arch
            operator: In
            values:
            - arm64
```

Also, set `image` and `backup.image` Custom Resource options to special multi-architecture image versions by adding a `-multi` suffix to their tags:

```
...
image: percona/percona-server-mongodb:7.0.14-8-multi
...
backup:
  ...
  image: percona/percona-backup-mongodb:2.8.0-multi
```

Please note, that currently monitoring with PMM is not supported on ARM64 configurations.

After editing, apply your modified `deploy/cr.yaml` file as follows:

```
$ kubectl apply -f deploy/cr.yaml
```

Expected output

```
perconaservermongodb.psmdb.percona.com/my-cluster-name created
```

The creation process may take some time. When the process is over your cluster will obtain the `ready` status. You can check it with the following command:

```
$ kubectl get psmdb
```

Expected output

```
NAME              ENDPOINT                                          STATUS   AGE
my-cluster-name   my-cluster-name-mongos.default.svc.cluster.local   ready    5m26s
```

Verifying the cluster operation

It may take ten minutes to get the cluster started. When `kubectl get psmdb` command finally shows you the cluster status as `ready`, you can try to connect to the cluster.

To connect to Percona Server for MongoDB you need to construct the MongoDB connection URI string. It includes the credentials of the admin user, which are stored in the Secrets object.

1. List the Secrets objects

```
$ kubectl get secrets -n <namespace>
```

The Secrets object you are interested in has the `my-cluster-name-secrets` name by default.

2. View the Secret contents to retrive the admin user credentials.

```
$ kubectl get secret my-cluster-name-secrets -o yaml
```

The command returns the YAML file with generated Secrets, including the `MONGODB_DATABASE_ADMIN_USER` and `MONGODB_DATABASE_ADMIN_PASSWORD` strings, which should look as follows:

Sample output

```
...
data:
  ...
  MONGODB_DATABASE_ADMIN_PASSWORD: aDAzQ0pCY3NSWEZ2ZUIzS1I=
  MONGODB_DATABASE_ADMIN_USER: ZGF0YWJhc2VBZG1pbg==
```

The actual login name and password on the output are base64-encoded. To bring it back to a human-readable form, run:

```
$ echo 'MONGODB_DATABASE_ADMIN_USER' | base64 --decode
$ echo 'MONGODB_DATABASE_ADMIN_PASSWORD' | base64 --decode
```

3. Run a container with a MongoDB client and connect its console output to your terminal. The following command does this, naming the new Pod `percona-client`:

```
$ kubectl run -i --rm --tty percona-client --image=percona/percona-server-
mongodb:7.0.14-8 --restart=Never -- bash -il
```

Executing it may require some time to deploy the corresponding Pod.

4. Now run `mongosh` tool inside the `percona-client` command shell using the admin user credentialds you obtained from the Secret, and a proper namespace name instead of the `<namespace name>` placeholder. The command will look different depending on whether sharding is on (the default behavior) or off:

if sharding is on

```
$ mongosh "mongodb://databaseAdmin:databaseAdminPassword@my-cluster-name-mongos.<namespace name>.svc.cluster.local/admin?ssl=false"
```

if sharding is off

```
$ mongosh "mongodb+srv://databaseAdmin:databaseAdminPassword@my-cluster-name-rs0.<namespace name>.svc.cluster.local/admin?replicaSet=rs0&ssl=false"
```

Note

If you are using MongoDB versions earler than 6.x (such as 5.0.29-25 instead of the default 7.0.14-8 variant), substitute `mongosh` command with `mongo` in the above examples.

Troubleshooting

If `kubectl get psmdb` command doesn't show `ready` status too long, you can check the creation process with the `kubectl get pods` command:

```
$ kubectl get pods
```

Expected output

```
NAME                                               READY   STATUS    RESTARTS   AGE
my-cluster-name-cfg-0                              2/2     Running   0          11m
my-cluster-name-cfg-1                              2/2     Running   1          10m
my-cluster-name-cfg-2                              2/2     Running   1          9m
my-cluster-name-mongos-0                           1/1     Running   0          11m
my-cluster-name-mongos-1                           1/1     Running   0          11m
my-cluster-name-mongos-2                           1/1     Running   0          11m
my-cluster-name-rs0-0                              2/2     Running   0          11m
my-cluster-name-rs0-1                              2/2     Running   0          10m
my-cluster-name-rs0-2                              2/2     Running   0          9m
percona-server-mongodb-operator-665cd69f9b-xg5dl   1/1     Running   0          37m
```

If the command output had shown some errors, you can examine the problematic Pod with the `kubectl describe <pod name>` command as follows:

```
$ kubectl describe pod my-cluster-name-rs0-2
```

Review the detailed information for `Warning` statements and then correct the configuration. An example of a warning is as follows:

```
Warning  FailedScheduling  68s (x4 over 2m22s)  default-scheduler  0/1 nodes are available: 1 node(s) didn't match pod affinity/anti-affinity, 1 node(s) didn't satisfy existing pods anti-affinity rules.
```

Removing the EKS cluster

To delete your cluster, you will need the following data:

- name of your EKS cluster,
- AWS region in which you have deployed your cluster.

You can clean up the cluster with the `eksctl` command as follows (with real names instead of `<region>` and `<cluster name>` placeholders):

```
$ eksctl delete cluster --region=<region> --name="<cluster name>"
```

The cluster deletion may take time.

> **Warning**
>
> After deleting the cluster, all data stored in it will be lost!

Install Percona Server for MongoDB on Azure Kubernetes Service (AKS)

This guide shows you how to deploy Percona Operator for MongoDB on Microsoft Azure Kubernetes Service (AKS). The document assumes some experience with the platform. For more information on the AKS, see the Microsoft AKS official documentation.

Prerequisites

The following tools are used in this guide and therefore should be preinstalled:

1. **Azure Command Line Interface (Azure CLI)** for interacting with the different parts of AKS. You can install it following the official installation instructions for your system.
2. **kubectl** to manage and deploy applications on Kubernetes. Install it following the official installation instructions.

Also, you need to sign in with Azure CLI using your credentials according to the official guide.

Create and configure the AKS cluster

To create your cluster, you will need the following data:

- name of your AKS cluster,
- an Azure resource group, in which resources of your cluster will be deployed and managed.
- the amount of nodes you would like tho have.

You can create your cluster via command line using `az aks create` command. The following command will create a 3-node cluster named `my-cluster-name` within some already existing resource group named `my-resource-group`:

```
$ az aks create --resource-group my-resource-group --name my-cluster-name --enable-
managed-identity --node-count 3 --node-vm-size Standard_B4ms --node-osdisk-size 30
--network-plugin kubenet  --generate-ssh-keys --outbound-type loadbalancer
```

Other parameters in the above example specify that we are creating a cluster with x86_64 machine type of Standard_B4ms and OS disk size reduced to 30 GiB. If you need ARM64, use different machine type, for example, Standard_D4ps_v5. You can see detailed information about cluster creation options in the AKS official documentation.

You may wait a few minutes for the cluster to be generated.

Now you should configure the command-line access to your newly created cluster to make `kubectl` be able to use it.

```
az aks get-credentials --resource-group my-resource-group --name my-cluster-name
```

Install the Operator and deploy your MongoDB cluster

1. Deploy the Operator. By default deployment will be done in the `default` namespace. If that's not the desired one, you can create a new namespace and/or set the context for the namespace as follows (replace the `<namespace name>` placeholder with some descriptive name):

   ```
   $ kubectl create namespace <namespace name>
   $ kubectl config set-context $(kubectl config current-context) --
   namespace=<namespace name>
   ```

   At success, you will see the message that `namespace/<namespace name>` was created, and the context (`<cluster name>`) was modified.

   Deploy the Operator, using the following command:

   ```
   $ kubectl apply --server-side -f https://raw.githubusercontent.com/percona/
   percona-server-mongodb-operator/v1.19.1/deploy/bundle.yaml
   ```

   Expected output

   ```
   customresourcedefinition.apiextensions.k8s.io/perconaservermongodbs.psmdb.percona.com
   serverside-applied
   customresourcedefinition.apiextensions.k8s.io/
   perconaservermongodbbackups.psmdb.percona.com serverside-applied
   customresourcedefinition.apiextensions.k8s.io/
   perconaservermongodbrestores.psmdb.percona.com serverside-applied
   role.rbac.authorization.k8s.io/percona-server-mongodb-operator serverside-applied
   serviceaccount/percona-server-mongodb-operator serverside-applied
   rolebinding.rbac.authorization.k8s.io/service-account-percona-server-mongodb-operator
   serverside-applied
   deployment.apps/percona-server-mongodb-operator serverside-applied
   ```

2. The Operator has been started, and you can deploy your MongoDB cluster:

For x86_64 architecture

```
$ kubectl apply -f https://raw.githubusercontent.com/percona/percona-server-mongodb-operator/v1.19.1/deploy/cr.yaml
```

Expected output

```
perconaservermongodb.psmdb.percona.com/my-cluster-name created
```

Note

This deploys default MongoDB cluster configuration, three mongod, three mongos, and three config server instances. Please see deploy/cr.yaml and Custom Resource Options for the configuration options. You can clone the repository with all manifests and source code by executing the following command:

```
$ git clone -b v1.19.1 https://github.com/percona/percona-server-mongodb-operator
```

After editing the needed options, apply your modified `deploy/cr.yaml` file as follows:

```
$ kubectl apply -f deploy/cr.yaml
```

For ARM64 architecture

Clone the repository with all manifests and source code by executing the following command:

```
$ git clone -b v1.19.1 https://github.com/percona/percona-server-mongodb-operator
```

Edit the `deploy/cr.yaml` configuration file: set `image` and `backup.image` Custom Resource options to special multi-architecture image versions by adding a `-multi` suffix to their tags:

```
....
image: percona/percona-server-mongodb:7.0.14-8-multi
...
backup:
  ...
  image: percona/percona-backup-mongodb:2.8.0-multi
```

Please note, that currently monitoring with PMM is not supported on ARM64 configurations.

After editing, apply your modified `deploy/cr.yaml` file as follows:

```
$ kubectl apply -f deploy/cr.yaml
```

Expected output

```
perconaservermongodb.psmdb.percona.com/my-cluster-name created
```

The creation process may take some time. When the process is over your cluster will obtain the `ready` status. You can check it with the following command:

```
$ kubectl get psmdb
```

Expected output

```
NAME              ENDPOINT                                          STATUS   AGE
my-cluster-name   my-cluster-name-mongos.default.svc.cluster.local   ready    5m26s
```

Verifying the cluster operation

It may take ten minutes to get the cluster started. When `kubectl get psmdb` command finally shows you the cluster status as `ready`, you can try to connect to the cluster.

To connect to Percona Server for MongoDB you need to construct the MongoDB connection URI string. It includes the credentials of the admin user, which are stored in the Secrets object.

1. List the Secrets objects

   ```
   $ kubectl get secrets -n <namespace>
   ```

   The Secrets object you are interested in has the `my-cluster-name-secrets` name by default.

2. View the Secret contents to retrive the admin user credentials.

   ```
   $ kubectl get secret my-cluster-name-secrets -o yaml
   ```

   The command returns the YAML file with generated Secrets, including the `MONGODB_DATABASE_ADMIN_USER` and `MONGODB_DATABASE_ADMIN_PASSWORD` strings, which should look as follows:

Sample output

```
...
data:
  ...
  MONGODB_DATABASE_ADMIN_PASSWORD: aDAzQ0pCY3NSWEZ2ZUIzS1I=
  MONGODB_DATABASE_ADMIN_USER: ZGF0YWJhc2VBZG1pbg==
```

The actual login name and password on the output are base64-encoded. To bring it back to a human-readable form, run:

```
$ echo 'MONGODB_DATABASE_ADMIN_USER' | base64 --decode
$ echo 'MONGODB_DATABASE_ADMIN_PASSWORD' | base64 --decode
```

3. Run a container with a MongoDB client and connect its console output to your terminal. The following command does this, naming the new Pod `percona-client`:

```
$ kubectl run -i --rm --tty percona-client --image=percona/percona-server-mongodb:7.0.14-8 --restart=Never -- bash -il
```

Executing it may require some time to deploy the corresponding Pod.

4. Now run `mongosh` tool inside the `percona-client` command shell using the admin user credentialds you obtained from the Secret, and a proper namespace name instead of the `<namespace name>` placeholder. The command will look different depending on whether sharding is on (the default behavior) or off:

if sharding is on

```
$ mongosh "mongodb://databaseAdmin:databaseAdminPassword@my-cluster-name-mongos.<namespace name>.svc.cluster.local/admin?ssl=false"
```

if sharding is off

```
$ mongosh "mongodb+srv://databaseAdmin:databaseAdminPassword@my-cluster-name-rs0.<namespace name>.svc.cluster.local/admin?replicaSet=rs0&ssl=false"
```

Note

If you are using MongoDB versions earler than 6.x (such as 5.0.29-25 instead of the default 7.0.14-8 variant), substitute `mongosh` command with `mongo` in the above examples.

Troubleshooting

If `kubectl get psmdb` command doesn't show `ready` status too long, you can check the creation process with the `kubectl get pods` command:

```
$ kubectl get pods
```

Expected output

```
NAME                                               READY   STATUS    RESTARTS   AGE
my-cluster-name-cfg-0                              2/2     Running   0          11m
my-cluster-name-cfg-1                              2/2     Running   1          10m
my-cluster-name-cfg-2                              2/2     Running   1          9m
my-cluster-name-mongos-0                           1/1     Running   0          11m
my-cluster-name-mongos-1                           1/1     Running   0          11m
my-cluster-name-mongos-2                           1/1     Running   0          11m
my-cluster-name-rs0-0                              2/2     Running   0          11m
my-cluster-name-rs0-1                              2/2     Running   0          10m
my-cluster-name-rs0-2                              2/2     Running   0          9m
percona-server-mongodb-operator-665cd69f9b-xg5dl   1/1     Running   0          37m
```

If the command output had shown some errors, you can examine the problematic Pod with the `kubectl describe <pod name>` command as follows:

```
$ kubectl describe pod my-cluster-name-rs0-2
```

Review the detailed information for `Warning` statements and then correct the configuration. An example of a warning is as follows:

`Warning  FailedScheduling  68s (x4 over 2m22s)  default-scheduler  0/1 nodes are available: 1 node(s) didn't match pod affinity/anti-affinity, 1 node(s) didn't satisfy existing pods anti-affinity rules.`

Removing the AKS cluster

To delete your cluster, you will need the following data:

- name of your AKS cluster,
- AWS region in which you have deployed your cluster.

You can clean up the cluster with the `az aks delete` command as follows (with real names instead of `<resource group>` and `<cluster name>` placeholders):

```
$ az aks delete --name <cluster name> --resource-group <resource group> --yes --no-
wait
```

It may take ten minutes to get the cluster actually deleted after executing this command.

> **Warning**
>
> After deleting the cluster, all data stored in it will be lost!

Install Percona server for MongoDB on Kubernetes

1. Clone the percona-server-mongodb-operator repository:

   ```
   $ git clone -b v1.19.1 https://github.com/percona/percona-server-mongodb-operator
   $ cd percona-server-mongodb-operator
   ```

   Note

   It is crucial to specify the right branch with `-b` option while cloning the code on this step. Please be careful.

2. The Custom Resource Definition for Percona Server for MongoDB should be created from the `deploy/crd.yaml` file. The Custom Resource Definition extends the standard set of resources which Kubernetes "knows" about with the new items, in our case these items are the core of the operator. Apply it as follows:

   ```
   $ kubectl apply --server-side -f deploy/crd.yaml
   ```

   This step should be done only once; the step does not need to be repeated with any other Operator deployments.

3. Create a namespace and set the context for the namespace. The resource names must be unique within the namespace and provide a way to divide cluster resources between users spread across multiple projects.

   So, create the namespace and save it in the namespace context for subsequent commands as follows (replace the `<namespace name>` placeholder with some descriptive name):

   ```
   $ kubectl create namespace <namespace name>
   $ kubectl config set-context $(kubectl config current-context) --namespace=<namespace name>
   ```

   At success, you will see the message that `namespace/<namespace name>` was created, and the context was modified.

4. The role-based access control (RBAC) for Percona Server for MongoDB is configured with the `deploy/rbac.yaml` file. Role-based access is based on defined roles and the available actions which correspond to each role. The role and actions are defined for Kubernetes resources in the yaml file. Further details about users and roles can be found in Kubernetes documentation.

```
$ kubectl apply -f deploy/rbac.yaml
```

Note

Setting RBAC requires your user to have cluster-admin role privileges. For example, those using Google Kubernetes Engine can grant user needed privileges with the following command:

```
$ kubectl create clusterrolebinding cluster-admin-binding --clusterrole=cluster-admin --
user=$(gcloud config get-value core/account)
```

5. Start the operator within Kubernetes:

```
$ kubectl apply -f deploy/operator.yaml
```

6. Add the MongoDB Users secrets to Kubernetes. These secrets should be placed as plain text in the stringData section of the `deploy/secrets.yaml` file as login name and passwords for the user accounts (see Kubernetes documentation for details).

   After editing the yaml file, MongoDB Users secrets should be created using the following command:

```
$ kubectl create -f deploy/secrets.yaml
```

   More details about secrets can be found in Users.

7. Now certificates should be generated. By default, the Operator generates certificates automatically, and no actions are required at this step. Still, you can generate and apply your own certificates as secrets according to the TLS instructions.

8. After the operator is started, Percona Server for MongoDB cluster can be created with the following command:

```
$ kubectl apply -f deploy/cr.yaml
```

   The creation process may take some time. When the process is over your cluster will obtain the `ready` status. You can check it with the following command:

```
$ kubectl get psmdb
```

Expected output

```
NAME              ENDPOINT                                          STATUS   AGE
my-cluster-name   my-cluster-name-mongos.default.svc.cluster.local   ready    5m26s
```

Verifying the cluster operation

It may take ten minutes to get the cluster started. When `kubectl get psmdb` command finally shows you the cluster status as `ready`, you can try to connect to the cluster.

To connect to Percona Server for MongoDB you need to construct the MongoDB connection URI string. It includes the credentials of the admin user, which are stored in the Secrets object.

1. List the Secrets objects

   ```
   $ kubectl get secrets -n <namespace>
   ```

   The Secrets object you are interested in has the `my-cluster-name-secrets` name by default.

2. View the Secret contents to retrive the admin user credentials.

   ```
   $ kubectl get secret my-cluster-name-secrets -o yaml
   ```

   The command returns the YAML file with generated Secrets, including the `MONGODB_DATABASE_ADMIN_USER` and `MONGODB_DATABASE_ADMIN_PASSWORD` strings, which should look as follows:

   Sample output

   ```
   ...
   data:
     ...
     MONGODB_DATABASE_ADMIN_PASSWORD: aDAzQ0pCY3NSWEZ2ZUIzS1I=
     MONGODB_DATABASE_ADMIN_USER: ZGF0YWJhc2VBZG1pbg==
   ```

   The actual login name and password on the output are base64-encoded. To bring it back to a human-readable form, run:

   ```
   $ echo 'MONGODB_DATABASE_ADMIN_USER' | base64 --decode
   $ echo 'MONGODB_DATABASE_ADMIN_PASSWORD' | base64 --decode
   ```

3. Run a container with a MongoDB client and connect its console output to your terminal. The following command does this, naming the new Pod `percona-client`:

   ```
   $ kubectl run -i --rm --tty percona-client --image=percona/percona-server-
   mongodb:7.0.14-8 --restart=Never -- bash -il
   ```

   Executing it may require some time to deploy the corresponding Pod.

4. Now run `mongosh` tool inside the `percona-client` command shell using the admin user credentialds you obtained from the Secret, and a proper namespace name instead of the `<namespace name>` placeholder. The command will look different depending on whether sharding is on (the default behavior) or off:

   if sharding is on

   ```
   $ mongosh "mongodb://databaseAdmin:databaseAdminPassword@my-cluster-name-mongos.<namespace name>.svc.cluster.local/admin?ssl=false"
   ```

   if sharding is off

   ```
   $ mongosh "mongodb+srv://databaseAdmin:databaseAdminPassword@my-cluster-name-rs0.<namespace name>.svc.cluster.local/admin?replicaSet=rs0&ssl=false"
   ```

   Note

   If you are using MongoDB versions earler than 6.x (such as 5.0.29-25 instead of the default 7.0.14-8 variant), substitute `mongosh` command with `mongo` in the above examples.

Install Percona Server for MongoDB on OpenShift

Percona Operator for Percona Server for MongoDB is a Red Hat Certified Operator. This means that Percona Operator is portable across hybrid clouds and fully supports the Red Hat OpenShift lifecycle.

Installing Percona Server for MongoDB on OpenShift includes two steps:

- Installing the Percona Operator for MongoDB,
- Install Percona Server for MongoDB using the Operator.

Install the Operator

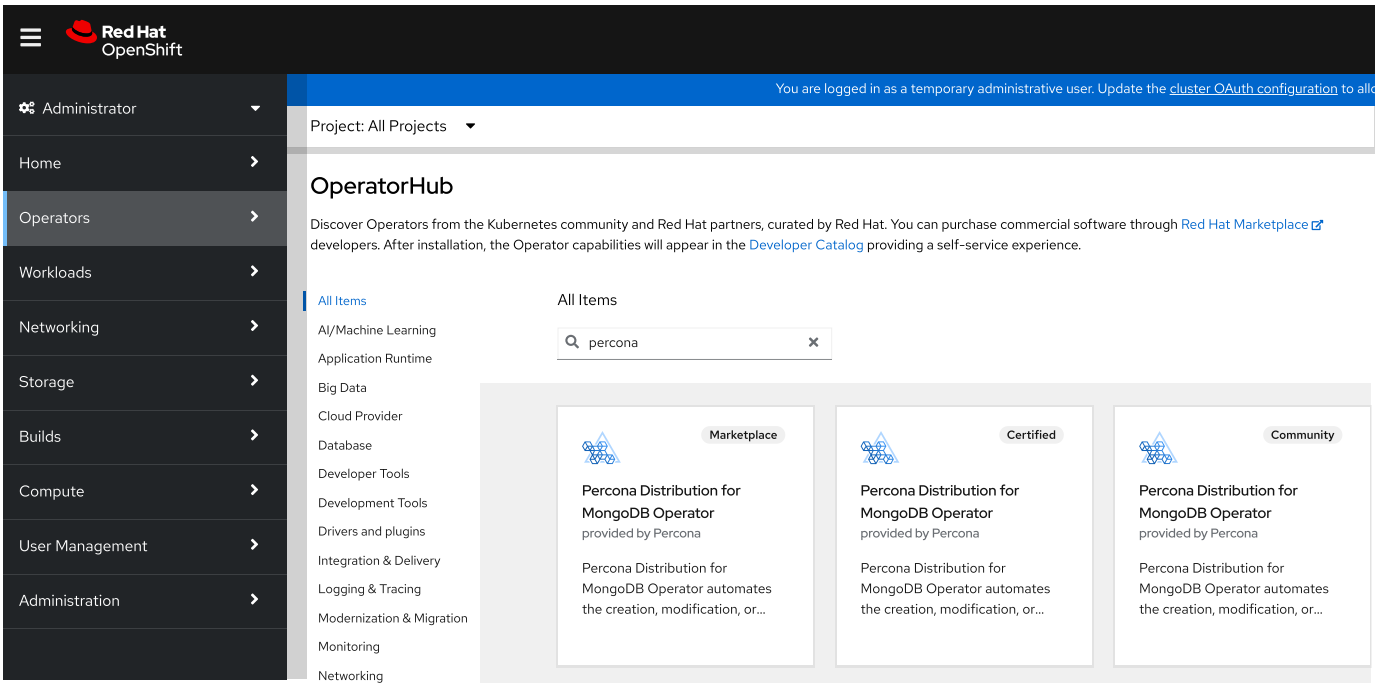
You can install Percona Operator for MongoDB on OpenShift using the web interface (the Operator Lifecycle Manager or Red Hat Marketplace), or using the command line interface.

Install the Operator via the Operator Lifecycle Manager (OLM)

Operator Lifecycle Manager (OLM) is a part of the Operator Framework that allows you to install, update, and manage the Operators lifecycle on the OpenShift platform.

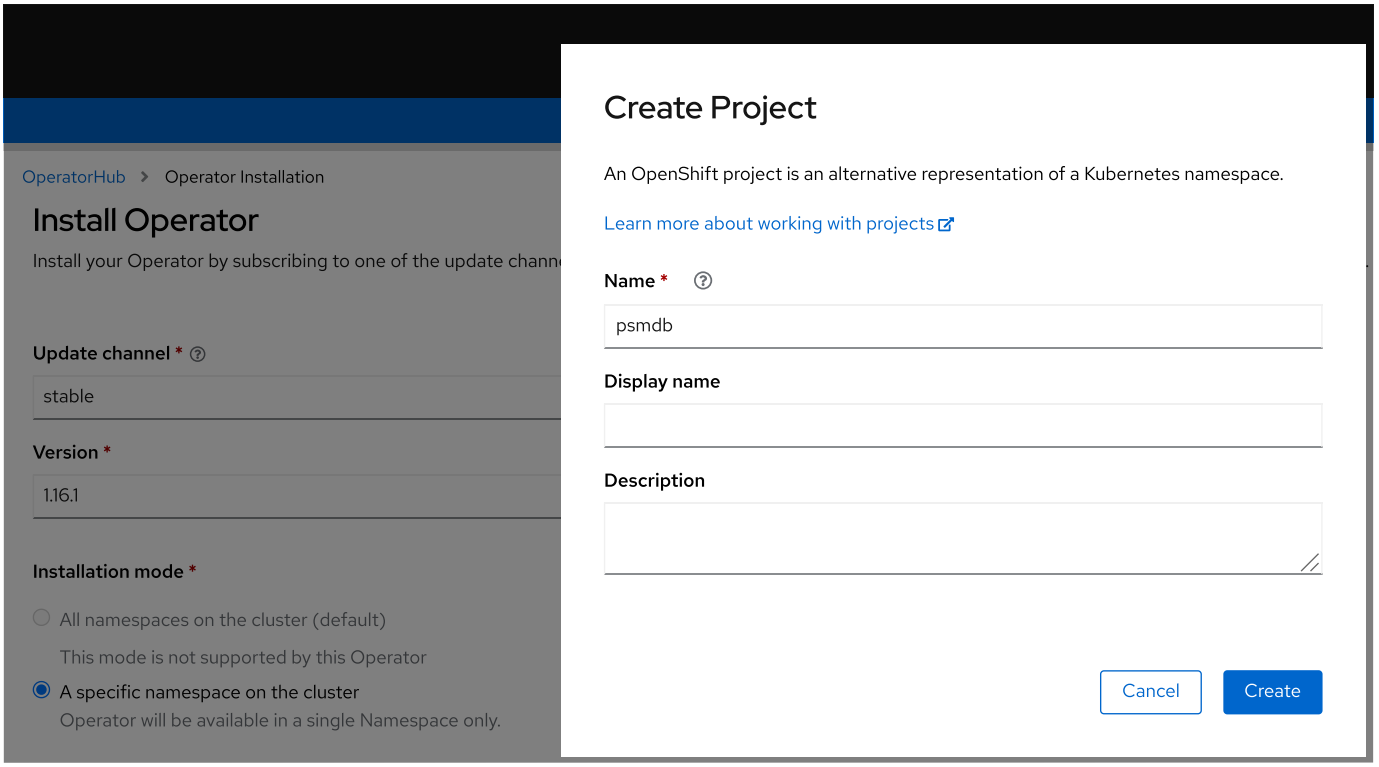
Following steps will allow you to deploy the Operator and Percona Server for MongoDB on your OLM installation:

1. Login to the OLM and click the needed Operator on the OperatorHub page:



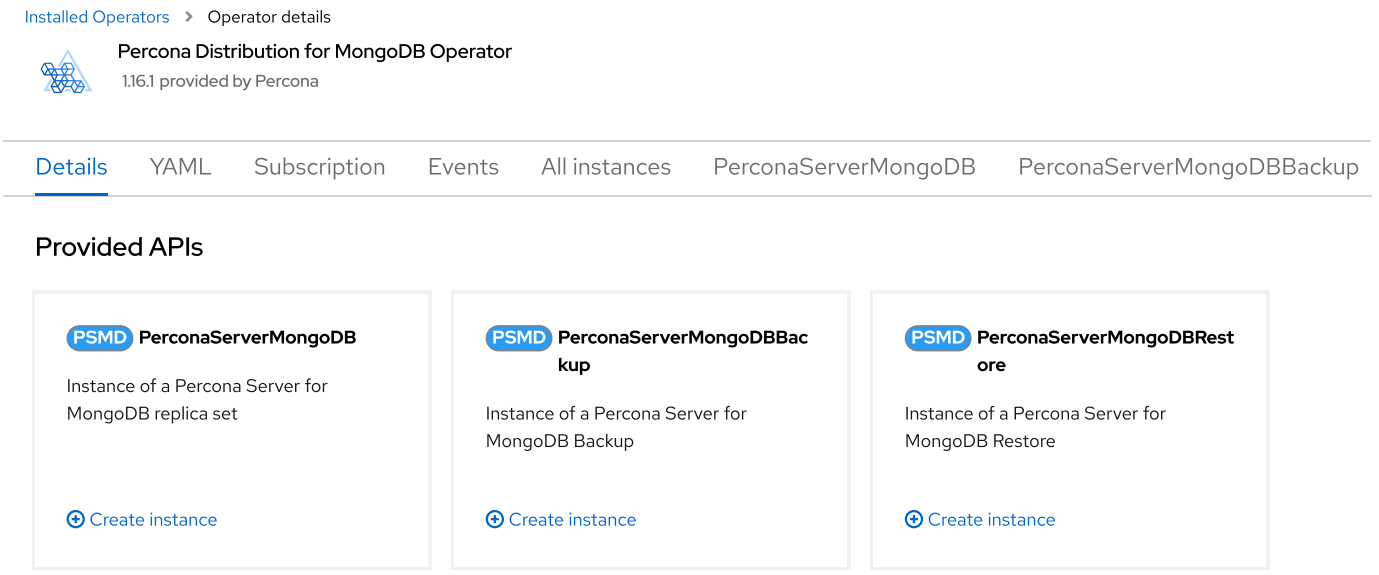
Then click “Contiune”, and “Install”.

2. A new page will allow you to choose the Operator version and the Namespace / OpenShift project you would like to install the Operator into.



Click “Install” button to actually install the Operator.

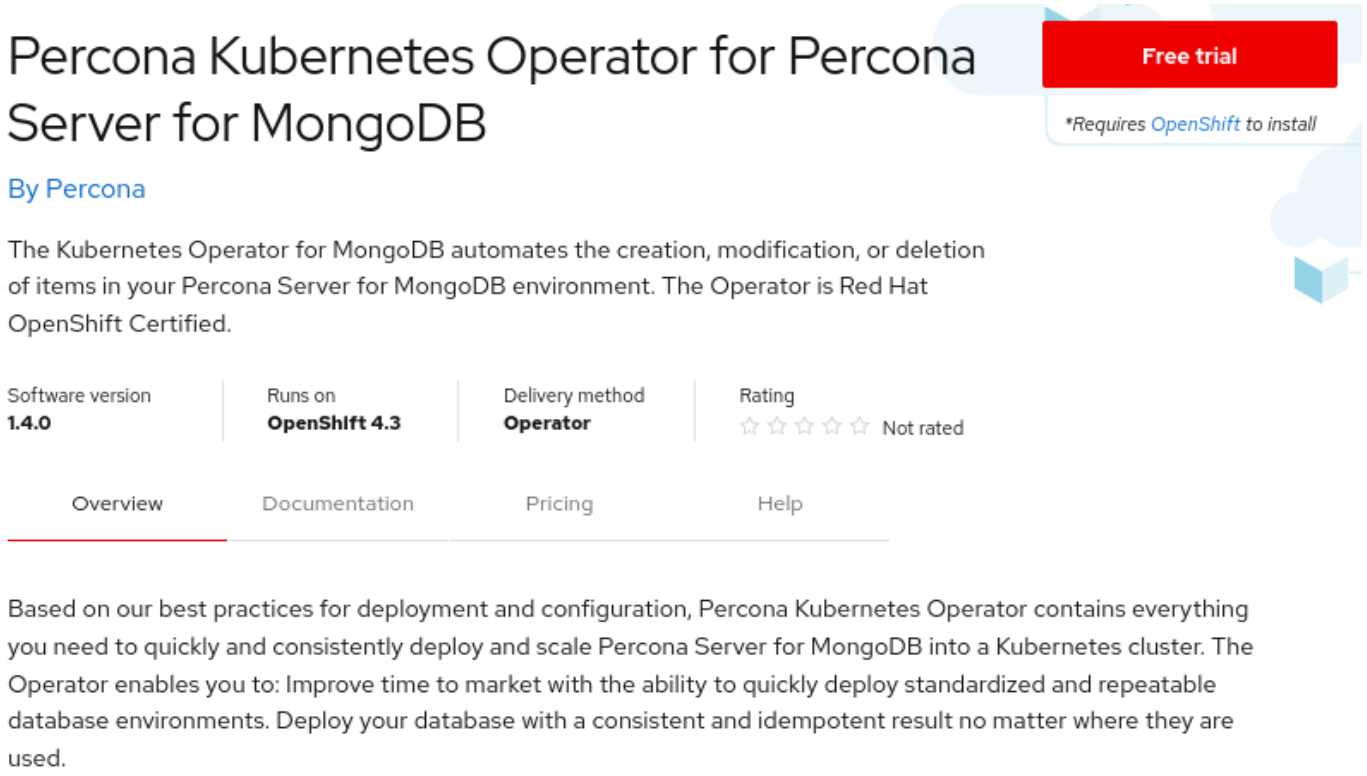
3. When the installation finishes, you can deploy your MongoDB cluster. In the “Operator Details” you will see Provided APIs (Custom Resources, available for installation). Click “Create instance” for the `PerconaServerMongoDB` Custom Resource.



You will be able to edit manifest to set needed Custom Resource options, and then click “Create” button to deploy your database cluster.

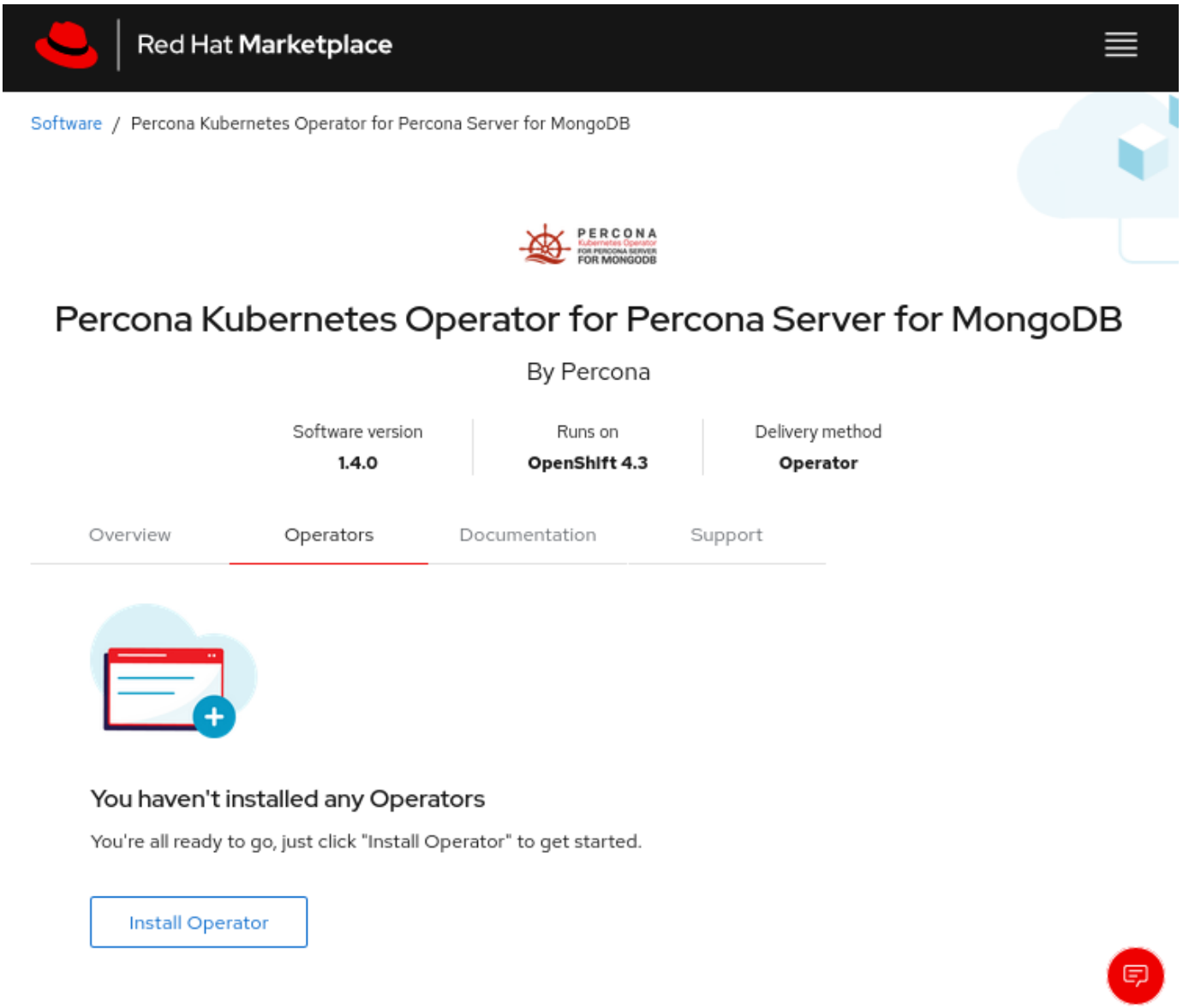
Install the Operator via the Red Hat Marketplace

1. login to the Red Hat Marketplace and register your cluster following the official instructions.
2. Go to the Percona Operator for MongoDB page and click the Free trial button:



   Here you can “purchase” the Operator for 0.0 USD.

3. When finished, chose `Workspace->Software` in the system menu on the top and choose the Operator:



Click the `Install Operator` button.

Install the Operator via the command-line interface

1. Clone the percona-server-mongodb-operator repository:

```
$ git clone -b v1.19.1 https://github.com/percona/percona-server-mongodb-operator
$ cd percona-server-mongodb-operator
```

> **Note**
>
> It is crucial to specify the right branch with `-b` option while cloning the code on this step. Please be careful.

2.

The Custom Resource Definition for Percona Server for MongoDB should be created from the `deploy/crd.yaml` file. The Custom Resource Definition extends the standard set of resources which Kubernetes "knows" about with the new items, in our case these items are the core of the operator.

This step should be done only once; it does not need to be repeated with other deployments.

Apply it as follows:

```
$ oc apply --server-side -f deploy/crd.yaml
```

> **Note**
>
> Setting Custom Resource Definition requires your user to have cluster-admin role privileges.

If you want to manage Percona Server for MongoDB cluster with a non-privileged user, the necessary permissions can be granted by applying the next clusterrole:

```
$ oc create clusterrole psmdb-admin --verb="*" --
resource=perconaservermongodbs.psmdb.percona.com,perconaservermongodbs.psmdb.perco
status,perconaservermongodbbackups.psmdb.percona.com,perconaservermongodbbackups.p
status,perconaservermongodbrestores.psmdb.percona.com,perconaservermongodbrestores
status
$ oc adm policy add-cluster-role-to-user psmdb-admin <some-user>
```

If you have a cert-manager installed, then you have to execute two more commands to be able to manage certificates with a non-privileged user:

```
$ oc create clusterrole cert-admin --verb="*" --
resource=iissuers.certmanager.k8s.io,certificates.certmanager.k8s.io
$ oc adm policy add-cluster-role-to-user cert-admin <some-user>
```

3. Create a new `psmdb` project:

```
$ oc new-project psmdb
```

4. Add role-based access control (RBAC) for Percona Server for MongoDB is configured with the `deploy/rbac.yaml` file. RBAC is based on clearly defined roles and corresponding allowed actions. These actions are allowed on specific Kubernetes resources. The details about users and roles can be found in OpenShift documentation.

```
$ oc apply -f deploy/rbac.yaml
```

5. Start the Operator within OpenShift:

```
$ oc apply -f deploy/operator.yaml
```

Install Percona Server for MongoDB

1. Add the MongoDB Users secrets to OpenShift. These secrets should be placed as plain text in the stringData section of the `deploy/secrets.yaml` file as login name and passwords for the user accounts (see Kubernetes documentation for details).

   After editing the yaml file, the secrets should be created with the following command:

   ```
   $ oc create -f deploy/secrets.yaml
   ```

   More details about secrets can be found in Users.

2. Now certificates should be generated. By default, the Operator generates certificates automatically, and no actions are required at this step. Still, you can generate and apply your own certificates as secrets according to the TLS instructions.

3. Percona Server for MongoDB cluster can be created at any time with the following steps:

   a. Uncomment the `deploy/cr.yaml` field `#platform:` and edit the field to `platform: openshift`. The result should be like this:

   ```
   apiVersion: psmdb.percona.com/v1alpha1
   kind: PerconaServerMongoDB
   metadata:
     name: my-cluster-name
   spec:
     platform: openshift
   ...
   ```

   b. (optional) In you're using minishift, please adjust antiaffinity policy to `none`

   ```
      affinity:
        antiAffinityTopologyKey: "none"
   ...
   ```

   c. Create/apply the Custom Resource file:

   ```
   $ oc apply -f deploy/cr.yaml
   ```

   The creation process will take time. When the process is over your cluster will obtain the `ready` status. You can check it with the following command:

```
$ oc get psmdb
```

Expected output

```
NAME              ENDPOINT                                          STATUS   AGE
my-cluster-name   my-cluster-name-mongos.default.svc.cluster.local   ready    5m26s
```

Verifying the cluster operation

It may take ten minutes to get the cluster started. When `oc get psmdb` command finally shows you the cluster status as `ready`, you can try to connect to the cluster.

To connect to Percona Server for MongoDB you need to construct the MongoDB connection URI string. It includes the credentials of the admin user, which are stored in the Secrets object.

1. List the Secrets objects

   ```
   $ oc get secrets -n <namespace>
   ```

   The Secrets object you are interested in has the `my-cluster-name-secrets` name by default.

2. View the Secret contents to retrive the admin user credentials.

   ```
   $ oc get secret my-cluster-name-secrets -o yaml
   ```

   The command returns the YAML file with generated Secrets, including the `MONGODB_DATABASE_ADMIN_USER` and `MONGODB_DATABASE_ADMIN_PASSWORD` strings, which should look as follows:

   Sample output

   ```
   ...
   data:
     ...
     MONGODB_DATABASE_ADMIN_PASSWORD: aDAzQ0pCY3NSWEZ2ZUIzS1I=
     MONGODB_DATABASE_ADMIN_USER: ZGF0YWJhc2VBZG1pbg==
   ```

   The actual login name and password on the output are base64-encoded. To bring it back to a human-readable form, run:

```
$ echo 'MONGODB_DATABASE_ADMIN_USER' | base64 --decode
$ echo 'MONGODB_DATABASE_ADMIN_PASSWORD' | base64 --decode
```

3. Run a container with a MongoDB client and connect its console output to your terminal. The following command does this, naming the new Pod `percona-client`:

```
$ oc run -i --rm --tty percona-client --image=percona/percona-server-
mongodb:7.0.14-8 --restart=Never -- bash -il
```

   Executing it may require some time to deploy the corresponding Pod.

4. Now run `mongosh` tool inside the `percona-client` command shell using the admin user credentialds you obtained from the Secret, and a proper namespace name instead of the `<namespace name>` placeholder. The command will look different depending on whether sharding is on (the default behavior) or off:

   if sharding is on

```
$ mongosh "mongodb://databaseAdmin:databaseAdminPassword@my-cluster-name-
mongos.<namespace name>.svc.cluster.local/admin?ssl=false"
```

   if sharding is off

```
$ mongosh "mongodb+srv://databaseAdmin:databaseAdminPassword@my-cluster-name-
rs0.<namespace name>.svc.cluster.local/admin?replicaSet=rs0&ssl=false"
```

> **Note**
>
> If you are using MongoDB versions earler than 6.x (such as 5.0.29-25 instead of the default 7.0.14-8 variant), substitute `mongosh` command with `mongo` in the above examples.

Users

MongoDB user accounts within the Cluster can be divided into two different groups:

- *application-level users*: the unprivileged user accounts,
- *system-level users*: the accounts needed to automate the cluster deployment and management tasks, such as MongoDB Health checks.

As these two groups of user accounts serve different purposes, they are considered separately in the following sections.

Unprivileged users

The Operator does not create unprivileged (general purpose) user accounts by default. There are two ways to create general purpose users:

- manual creation of custom MongoDB users,
- automated users creation via Custom Resource (Operator versions 1.17.0 and newer).

Create users in the Custom Resource

Starting from the Operator version 1.17.0 declarative creation of custom MongoDB users is supported via the `users` subsection in the Custom Resource.

> **Warning**
>
> Declarative user management has technical preview status and is not yet recommended for production environments.

You can change `users` section in the `deploy/cr.yaml` configuration file at the cluster creation time, and adjust it over time.

You can specify a new user in `deploy/cr.yaml` configuration file, setting the user's login name and database, as well as MongoDB roles on various databases which should be assigned to this user. Also you can specify a reference to a key in some Secret resource that contains user's password, if you don't want it to be generated automatically. You can find detailed description of the corresponding options in the Custom Resource reference, and here is a self-explanatory example:

```
...
users:
  - name: my-user
    db: admin
    passwordSecretRef:
      name: my-user-password
      key: password
    roles:
      - name: clusterAdmin
        db: admin
      - name: userAdminAnyDatabase
        db: admin
```

The Secret mentioned in the `users.passwordSecretRef.name` option should look as follows:

```
apiVersion: v1
kind: Secret
metadata:
  name: my-user-password
type: Opaque
stringData:
  password: mypassword
```

If the Secret name was not specified in the Custom Resource, the Operator creates a Secret named `<cluster-name>-custom-user-secret`, generates a password for the user and sets it by the key named after the user name.

Note

Password will not be generated if the user is created in the `$external` database (which is used when mongod should query an external authentication source for the user, such as an LDAP server). For obvious reasons, setting `passwordSecretRef` for such users is not allowed as well.

The Operator tracks password changes in the Sectet object, and updates the user password in the database. This applies to the manually created users as well: if a user was created manually in the database before creating user via Custom Resource, the existing user is updated. But manual password updates in the database are not tracked: the Operator doesn't overwrite changed passwords with the old ones from the users Secret.

Custom MongoDB roles

Custom MongoDB roles allow providing fine-grained access control over your MongoDB deployment.

Custom MongoDB roles can be defined in a declarative way via the `roles` subsection in the Custom Resource.

Warning

Custom roles were introduced in the Operator version 1.18.0. It has technical preview status and is not yet recommended for production environments.

This subsection contains array of roles each with the defined custom name (`roles.name`), database in which you want to store the user-defined role (`roles.db`). The `roles.privileges.actions` allows to set List of custom role actions that users granted this role can perform. For a list of accepted values, see Privilege Actions in the manual of the corresponding MongoDB version. Actions can be granted for the whole cluster (if `roles.privileges.resource.cluster` set to true), or be related to a specific database or collection. Adding existing role and database names to the `roles.roles` subsection allows you to inherit privileges from existing roles. Finally, you can apply authentication restrictions for your custom role based on the IP address ranges for the client and server. The following example shows how `roles` subsection may look like:

```
roles:
    - role: my-role
      db: admin
      privileges:
        - resource:
            db: ''
            collection: ''
          actions:
            - find
      authenticationRestrictions:
        - clientSource:
            - 127.0.0.1
          serverAddress:
            - 127.0.0.1
      roles:
        - role: read
          db: admin
        - role: readWrite
          db: admin
```

Find more infromation about available options and their accepted values in the roles subsection of the Custom Resource reference.

Create users manually

You can create unprivileged users manually. Please run commands below, substituting the `<namespace name>` placeholder with the real namespace of your database cluster:

if sharding is on

```
$ kubectl run -i --rm --tty percona-client --image=percona/percona-server-
mongodb:7.0.14-8 --restart=Never -- bash -il
mongodb@percona-client:/$
$ mongosh "mongodb://userAdmin:userAdmin123456@my-cluster-name--mongos.<namespace
name>.svc.cluster.local/admin?ssl=false"
rs0:PRIMARY> db.createUser({
    user: "myApp",
    pwd: "myAppPassword",
    roles: [
      { db: "myApp", role: "readWrite" }
    ],
    mechanisms: [
       "SCRAM-SHA-1"
    ]
})
```

Now check the newly created user:

```
$ kubectl run -i --rm --tty percona-client --image=percona/percona-server-
mongodb:7.0.14-8 --restart=Never -- bash -il
mongodb@percona-client:/$ mongosh "mongodb+srv://myApp:myAppPassword@my-cluster-
name-rs0.<namespace name>.svc.cluster.local/admin?replicaSet=rs0&ssl=false"
rs0:PRIMARY> use myApp
rs0:PRIMARY> db.test.insert({ x: 1 })
rs0:PRIMARY> db.test.findOne()
```

if sharding is off

```
$ kubectl run -i --rm --tty percona-client --image=percona/percona-server-
mongodb:7.0.14-8 --restart=Never -- bash -il
mongodb@percona-client:/$
$ mongosh "mongodb+srv://userAdmin:userAdmin123456@my-cluster-name-rs0.<namespace
name>.svc.cluster.local/admin?replicaSet=rs0&ssl=false"
rs0:PRIMARY> db.createUser({
    user: "myApp",
    pwd: "myAppPassword",
    roles: [
      { db: "myApp", role: "readWrite" }
    ],
    mechanisms: [
       "SCRAM-SHA-1"
    ]
})
```

Now check the newly created user:

```
$ kubectl run -i --rm --tty percona-client --image=percona/percona-server-
mongodb:7.0.14-8 --restart=Never -- bash -il
mongodb@percona-client:/$ mongosh "mongodb+srv://myApp:myAppPassword@my-cluster-
name-rs0.<namespace name>.svc.cluster.local/admin?replicaSet=rs0&ssl=false"
rs0:PRIMARY> use myApp
rs0:PRIMARY> db.test.insert({ x: 1 })
rs0:PRIMARY> db.test.findOne()
```

System Users

To automate the deployment and management of the cluster components, the Operator requires system-level MongoDB users.

Credentials for these users are stored as a Kubernetes Secrets object. The Operator requires Kubernetes Secret before the database cluster is started. It will either use existing Secret or create a new Secret with randomly generated passwords if it didn't exist. The name of the required Secret should be set in the `spec.secrets.users` option of the `deploy/cr.yaml` configuration file.

Default Secret name: `my-cluster-name-secrets`

Secret name field: `spec.secrets.users`

Warning

These users should not be used to run an application.

User Purpose	Username Secret Key	Password Secret Key
Backup/Restore	MONGODB_BACKUP_USER	MONGODB_BACKUP_PASSWORD
Cluster Admin	MONGODB_CLUSTER_ADMIN_USER	MONGODB_CLUSTER_ADMIN_PASSWORD
Cluster Monitor	MONGODB_CLUSTER_MONITOR_USER	MONGODB_CLUSTER_MONITOR_PASSWORD
Database Admin	MONGODB_DATABASE_ADMIN_USER	MONGODB_DATABASE_ADMIN_PASSWORD
User Admin	MONGODB_USER_ADMIN_USER	MONGODB_USER_ADMIN_PASSWORD
PMM Server	PMM_SERVER_USER	PMM_SERVER_PASSWORD

Password-based authorization method for PMM is deprecated since the Operator 1.13.0. Use token-based authorization instead.

- Backup/Restore - MongoDB Role: backup, restore, clusterMonitor, readWrite, pbmAnyAction
- Cluster Admin - MongoDB Roles: clusterAdmin
- Cluster Monitor - MongoDB Role: clusterMonitor, read (on the `local` database), explainRole
- Database Admin - MongoDB Roles: readWriteAnyDatabase, readAnyDatabase, dbAdminAnyDatabase, backup, restore, clusterMonitor
- User Admin - MongoDB Role: userAdminAnyDatabase

If you change credentials for the `MONGODB_CLUSTER_MONITOR` user, the cluster Pods will go into restart cycle, and the cluster can be not accessible through the `mongos` service until this cycle finishes.

Note

In some situations it can be needed to reproduce system users in a bare-bone MongoDB. For example, that's a required step in the migration scenarios to move existing on-prem MongoDB database to Kubernetes-based MongoDB cluster managed by the Operator. You can use the following example script which produces a text file with mongo shell commands to create needed system users with appropriate roles:

gen_users.sh

```
clusterAdminPass="clusterAdmin"
userAdminPass="userAdmin"
clusterMonitorPass="clusterMonitor"
backupPass="backup"

# mongo shell
cat <<EOF > user-mongo-shell.txt
use admin
db.createRole(
{
"roles": [],
role: "pbmAnyAction",
"privileges" : [
                {
                        "resource" : {
                                "anyResource" : true
                        },
                        "actions" : [
                                "anyAction"
                        ]
                }
        ],

})

db.createUser( { user: "clusterMonitor", pwd: "$clusterMonitorPass", roles: [
"clusterMonitor" ] } )
db.createUser( { user: "userAdmin", pwd: "$userAdminPass", roles: [ "userAdminAnyDatabase"
] } )
db.createUser( { user: "clusterAdmin", pwd: "$clusterAdminPass", roles: [ "clusterAdmin" ]
} )
db.createUser( { user: "backup", pwd: "$backupPass", roles: [ "readWrite", "backup",
"clusterMonitor", "restore", "pbmAnyAction" ] } )
EOF
```

YAML Object Format

The default name of the Secrets object for these users is `my-cluster-name-secrets` and can be set in the CR for your cluster in `spec.secrets.users` to something different. When you create the object yourself, the corresponding YAML file should match the following simple format:

```
apiVersion: v1
kind: Secret
metadata:
  name: my-cluster-name-secrets
type: Opaque
stringData:
  MONGODB_BACKUP_USER: backup
  MONGODB_BACKUP_PASSWORD: backup123456
  MONGODB_DATABASE_ADMIN_USER: databaseAdmin
  MONGODB_DATABASE_ADMIN_PASSWORD: databaseAdmin123456
  MONGODB_CLUSTER_ADMIN_USER: clusterAdmin
  MONGODB_CLUSTER_ADMIN_PASSWORD: clusterAdmin123456
  MONGODB_CLUSTER_MONITOR_USER: clusterMonitor
  MONGODB_CLUSTER_MONITOR_PASSWORD: clusterMonitor123456
  MONGODB_USER_ADMIN_USER: userAdmin
  MONGODB_USER_ADMIN_PASSWORD: userAdmin123456
  PMM_SERVER_USER: admin
  PMM_SERVER_PASSWORD: admin
  PMM_SERVER_API_KEY: apikey
```

The example above matches what is shipped in `deploy/secrets.yaml` which contains default passwords and default API key. You should NOT use these in production, but they are present to assist in automated testing or simple use in a development environment.

As you can see, because we use the `stringData` type when creating the Secrets object, all values for each key/value pair are stated in plain text format convenient from the user's point of view. But the resulting Secrets object contains passwords stored as `data` - i.e., base64-encoded strings. If you want to update any field, you'll need to encode the value into base64 format. To do this, you can run `echo -n "password" | base64 --wrap=0` (or just `echo -n "password" | base64` in case of Apple macOS) in your local shell to get valid values. For example, setting the Database Admin user's password to `new_password` in the `my-cluster-name-secrets` object can be done with the following command:

in Linux

```
$ kubectl patch secret/my-cluster-name-secrets -p '{"data":
{"MONGODB_DATABASE_ADMIN_PASSWORD": "'$(echo -n new_password | base64 --
wrap=0)'"}}'
```

in macOS

```
$ kubectl patch secret/my-cluster-name-secrets -p '{"data":
{"MONGODB_DATABASE_ADMIN_PASSWORD": "'$(echo -n new_password | base64)'"}}'
```

Note

The operator creates and updates an additional Secrets object named based on the cluster name, like `internal-my-cluster-name-users`. It is used only by the Operator and should undergo no manual changes by the user. This object contains secrets with the same passwords as the one specified in `spec.secrets.users` (e.g. `my-cluster-name-secrets`). When the user updates `my-cluster-name-secrets`, the Operator propagates these changes to the internal `internal-my-cluster-name-users` Secrets object.

Password Rotation Policies and Timing

When there is a change in user secrets, the Operator creates the necessary transaction to change passwords. This rotation happens almost instantly (the delay can be up to a few seconds), and it's not needed to take any action beyond changing the password.

Note

Please don't change `secrets.users` option in CR, make changes inside the secrets object itself.

Development Mode

To make development and testing easier, `deploy/secrets.yaml` secrets file contains default passwords for MongoDB system users.

These development-mode credentials from `deploy/secrets.yaml` are:

Secret Key	Secret Value
MONGODB_BACKUP_USER	backup
MONGODB_BACKUP_PASSWORD	backup123456
MONGODB_DATABASE_ADMIN_USER	databaseAdmin
MONGODB_DATABASE_ADMIN_PASSWORD	databaseAdmin123456
MONGODB_CLUSTER_ADMIN_USER	clusterAdmin
MONGODB_CLUSTER_ADMIN_PASSWORD	clusterAdmin123456
MONGODB_CLUSTER_MONITOR_USER	clusterMonitor

Secret Key	Secret Value
MONGODB_CLUSTER_MONITOR_PASSWORD	clusterMonitor123456
MONGODB_USER_ADMIN_USER	userAdmin
MONGODB_USER_ADMIN_PASSWORD	userAdmin123456
PMM_SERVER_USER	admin
PMM_SERVER_PASSWORD	admin
PMM_SERVER_API_KEY	apikey

Warning

Do not use the default MongoDB Users and/or default PMM API key in production!

MongoDB Internal Authentication Key (optional)

Default Secret name: `my-cluster-name-mongodb-keyfile`

Secret name field: `spec.secrets.key`

By default, the operator will create a random, 1024-byte key for MongoDB Internal Authentication if it does not already exist. If you would like to deploy a different key, create the secret manually before starting the operator. Example:

```
apiVersion: v1
kind: Secret
metadata:
  name: my-cluster-name-mongodb-keyfile
type: Opaque
data:
  mongodb-key: <replace-this-value-with-base-64-encoded-text>
```

Configuration

Changing MongoDB Options

You may require a configuration change for your application. MongoDB allows configuring the database with a configuration file, as many other database management systems do. You can pass options to MongoDB instances in the cluster in one of the following ways:

- edit the `deploy/cr.yaml` file,
- use a ConfigMap,
- use a Secret object.

You can pass configuration settings separately for **mongod** Pods, **mongos** Pods, and **Config Server** Pods.

Often there's no need to add custom options, as the Operator takes care of providing MongoDB with reasonable defaults. Also, attempt to change some MongoDB options will be ignored: you can't change TLS/SSL options, as it would break the behavior of the Operator.

Edit the `deploy/cr.yaml` file

You can add MongoDB configuration options to the replsets.configuration, sharding.mongos.configuration, and sharding-configsvrreplset-configuration keys of the `deploy/cr.yaml`. Here is an example:

```
spec:
  ...
  replsets:
    - name: rs0
      size: 3
      configuration: |
        operationProfiling:
          mode: slowOp
        systemLog:
          verbosity: 1
      ...
```

See the official manual for the complete list of options, as well as specific Percona Server for MongoDB documentation pages.

Use a ConfigMap

You can use a ConfigMap and the cluster restart to reset configuration options. A ConfigMap allows Kubernetes to pass or update configuration data inside a containerized application.

You should give the ConfigMap a specific name, which is composed of your cluster name and a specific suffix:

- `my-cluster-name-rs0-mongod` for the Replica Set (mongod) Pods,
- `my-cluster-name-cfg-mongod` for the Config Server Pods,
- `my-cluster-name-mongos` for the mongos Pods,

Note

To find the cluster name, you can use the following command:

```
$ kubectl get psmdb
```

For example, let's define a `mongod.conf` configuration file and put there several MongoDB options we used in the previous example:

```
operationProfiling:
  mode: slowOp
systemLog:
  verbosity: 1
```

You can create a ConfigMap from the `mongod.conf` file with the `kubectl create configmap` command. It has the following syntax:

```
$ kubectl create configmap <configmap-name> <resource-type=resource-name>
```

The following example defines `my-cluster-name-rs0-mongod` as the ConfigMap name and the `mongod.conf` file as the data source:

```
$ kubectl create configmap my-cluster-name-rs0-mongod --from-
file=mongod.conf=mongod.conf
```

To view the created ConfigMap, use the following command:

```
$ kubectl describe configmaps my-cluster-name-rs0-mongod
```

Note

Do not forget to restart Percona Server for MongoDB to ensure the cluster has updated the configuration (see details on how to connect in the Install Percona Server for MongoDB on Kubernetes page).

Use a Secret Object

The Operator can also store configuration options in Kubernetes Secrets. This can be useful if you need additional protection for some sensitive data.

You should create a Secret object with a specific name, composed of your cluster name and a specific suffix:

- `my-cluster-name-rs0-mongod` for the Replica Set Pods,
- `my-cluster-name-cfg-mongod` for the Config Server Pods,
- `my-cluster-name-mongos` for the mongos Pods,

> **Note**
>
> To find the cluster name, you can use the following command:
>
> ```
> $ kubectl get psmdb
> ```

Configuration options should be put inside a specific key:

- `data.mongod` key for Replica Set (mongod) and Config Server Pods,
- `data.mongos` key for mongos Pods.

Actual options should be encoded with Base64.

For example, let's define a `mongod.conf` configuration file and put there several MongoDB options we used in the previous example:

```
operationProfiling:
  mode: slowOp
systemLog:
  verbosity: 1
```

You can get a Base64 encoded string from your options via the command line as follows:

in Linux

```
$ cat mongod.conf | base64 --wrap=0
```

in macOS

```
$ cat mongod.conf | base64
```

Note

Similarly, you can read the list of options from a Base64 encoded string:

```
$ echo "ICAgICAgb3BlcmF0aW9uUHJvZmlsaW5nOgogICAgICAgIG1vZGU6IHNsb3dPc\
AogICAgICBzeXN0ZW1Mb2c6CiAgICAgICAgdmVyYm9zaXR5OiAxCg==" | base64 --decode
```

Finally, use a yaml file to create the Secret object. For example, you can create a `deploy/my-mongod-secret.yaml` file with the following contents:

```
apiVersion: v1
kind: Secret
metadata:
  name: my-cluster-name-rs0-mongod
data:
  mongod.conf: "ICAgICAgb3BlcmF0aW9uUHJvZmlsaW5nOgogICAgICAgIG1vZGU6IHNsb3dPc\
   AogICAgICBzeXN0ZW1Mb2c6CiAgICAgICAgdmVyYm9zaXR5OiAxCg=="
```

When ready, apply it with the following command:

```
$ kubectl create -f deploy/my-mongod-secret.yaml
```

Note

Do not forget to restart Percona Server for MongoDB to ensure the cluster has updated the configuration (see details on how to connect in the Install Percona Server for MongoDB on Kubernetes page).

Binding Percona Server for MongoDB components to Specific Kubernetes/OpenShift Nodes

The operator does a good job of automatically assigning new pods to nodes to achieve balanced distribution across the cluster. There are situations when you must ensure that pods land on specific nodes: for example, for the advantage of speed on an SSD-equipped machine, or reduce costs by choosing nodes in the same availability zone.

The appropriate (sub)sections (`replsets`, `replsets.arbiter`, `backup`, etc.) of the deploy/cr.yaml file contain the keys which can be used to do assign pods to nodes.

Node selector

The `nodeSelector` contains one or more key-value pairs. If the node is not labeled with each key-value pair from the Pod's `nodeSelector`, the Pod will not be able to land on it.

The following example binds the Pod to any node having a self-explanatory `disktype: ssd` label:

```
nodeSelector:
  disktype: ssd
```

Affinity and anti-affinity

Affinity defines eligible pods that can be scheduled on the node which already has pods with specific labels. Anti-affinity defines pods that are not eligible. This approach is reduces costs by ensuring several pods with intensive data exchange occupy the same availability zone or even the same node or, on the contrary, to spread the pods on different nodes or even different availability zones for high availability and balancing purposes.

Percona Operator for MongoDB provides two approaches for doing this:

- simple way to set anti-affinity for Pods, built-in into the Operator,
- more advanced approach based on using standard Kubernetes constraints.

Simple approach - use antiAffinityTopologyKey of the Percona Operator for MongoDB

Percona Operator for MongoDB provides an `antiAffinityTopologyKey` option, which may have one of the following values:

- `kubernetes.io/hostname` - Pods will avoid residing within the same host,
- `topology.kubernetes.io/zone` - Pods will avoid residing within the same zone,
- `topology.kubernetes.io/region` - Pods will avoid residing within the same region,
- `none` - no constraints are applied.

The following example forces Percona Server for MongoDB Pods to avoid occupying the same node:

```
affinity:
  antiAffinityTopologyKey: "kubernetes.io/hostname"
```

Advanced approach – use standard Kubernetes constraints

The previous method can be used without special knowledge of the Kubernetes way of assigning Pods to specific nodes. Still, in some cases, more complex tuning may be needed. In this case, the `advanced` option placed in the deploy/cr.yaml file turns off the effect of the `antiAffinityTopologyKey` and allows the use of the standard Kubernetes affinity constraints of any complexity:

```
affinity:
   advanced:
     podAffinity:
       requiredDuringSchedulingIgnoredDuringExecution:
       - labelSelector:
           matchExpressions:
           - key: security
             operator: In
             values:
             - S1
         topologyKey: failure-domain.beta.kubernetes.io/zone
     podAntiAffinity:
       preferredDuringSchedulingIgnoredDuringExecution:
       - weight: 100
         podAffinityTerm:
           labelSelector:
             matchExpressions:
             - key: security
               operator: In
               values:
               - S2
           topologyKey: kubernetes.io/hostname
     nodeAffinity:
       requiredDuringSchedulingIgnoredDuringExecution:
         nodeSelectorTerms:
         - matchExpressions:
           - key: kubernetes.io/e2e-az-name
             operator: In
             values:
             - e2e-az1
             - e2e-az2
       preferredDuringSchedulingIgnoredDuringExecution:
       - weight: 1
         preference:
           matchExpressions:
           - key: another-node-label-key
             operator: In
             values:
             - another-node-label-value
```

See explanation of the advanced affinity options in Kubernetes documentation.

Topology Spread Constraints

Topology Spread Constraints allow you to control how Pods are distributed across the cluster based on regions, zones, nodes, and other topology specifics. This can be useful for both high availability and resource efficiency.

Pod topology spread constraints are controlled by the `topologySpreadConstraints` subsection, which can be put into `replsets`, `sharding.configsvrReplSet`, and `sharding.mongos` sections of the `deploy/cr.yaml` configuration file as follows:

```
topologySpreadConstraints:
  - labelSelector:
      matchLabels:
        app.kubernetes.io/name: percona-server-mongodb
    maxSkew: 1
    topologyKey: kubernetes.io/hostname
    whenUnsatisfiable: DoNotSchedule
```

You can see the explanation of these affinity options in Kubernetes documentation.

Tolerations

Tolerations allow Pods having them to be able to land onto nodes with matching *taints*. Toleration is expressed as a `key` with and `operator`, which is either `exists` or `equal` (the equal variant requires a corresponding `value` for comparison).

Toleration should have a specified `effect`, such as the following:

- `NoSchedule` - less strict
- `PreferNoSchedule`
- `NoExecute`

When a *taint* with the `NoExecute` effect is assigned to a Node, any Pod configured to not tolerating this *taint* is removed from the node. This removal can be immediate or after the `tolerationSeconds` interval. The following example defines this effect and the removal interval:

```
tolerations:
- key: "node.alpha.kubernetes.io/unreachable"
  operator: "Exists"
  effect: "NoExecute"
  tolerationSeconds: 6000
```

The Kubernetes Taints and Toleratins contains more examples on this topic.

Priority Classes

Pods may belong to some *priority classes*. This flexibility allows the scheduler to distinguish more and less important Pods when needed, such as the situation when a higher priority Pod cannot be scheduled without evicting a lower priority one. This ability can be accomplished by adding one or more PriorityClasses in your Kubernetes cluster, and specifying the `PriorityClassName` in the deploy/cr.yaml file:

```
priorityClassName: high-priority
```

See the Kubernetes Pods Priority and Preemption documentation to find out how to define and use priority classes in your cluster.

Pod Disruption Budgets

Creating the Pod Disruption Budget is the Kubernetes method to limit the number of Pods of an application that can go down simultaneously due to *voluntary disruptions* such as the cluster administrator's actions during a deployment update. Distribution Budgets allow large applications to retain their high availability during maintenance and other administrative activities. The `maxUnavailable` and `minAvailable` options in the deploy/cr.yaml file can be used to set these limits. The recommended variant is the following:

```
podDisruptionBudget:
   maxUnavailable: 1
```

Labels and annotations

Labels and annotations are used to attach additional metadata information to Kubernetes resources.

Labels and annotations are rather similar. The difference between them is that labels are used by Kubernetes to identify and select objects, while annotations are assigning additional *non-identifying* information to resources. Therefore, typical role of Annotations is facilitating integration with some external tools.

Setting labels and annotations in the Custom Resource

You can set labels and/or annotations as key/value string pairs in the Custom Resource metadata section of the `deploy/cr.yaml` as follows:

```
apiVersion: psmdb.percona.com/v1
kind: PerconaServerMongoDB
metadata:
  name: my-cluster-name
  annotations:
    percona.com/issue-vault-token: "true"
  labels:
    ...
```

The easiest way to check which labels are attached to a specific object with is using the additional `--show-labels` option of the `kubectl get` command. Checking the annotations is not much more difficult: it can be done as in the following example:

```
$ kubectl get pod my-cluster-name-rs0-0 -o jsonpath='{.metadata.annotations}'
```

Using labels and annotations with objects created by the Operator

You can assign labels and annotations to various objects created by the Operator (e.g. Services used to expose components of the cluster, Persistent Volume Claims, etc.) with labels and annotations options in the appropriate subsections of the Custom Resource, as seen in the Custom Resource options reference and the deploy/cr.yaml configuration file.

Sometimes various Kubernetes flavors can add their own annotations to the objects managed by the Operator.

The Operator keeps track of all changes to its objects and can remove annotations that appeared without its participation.

If there are no annotations or labels in the Custom Resource expose subsections, the Operator does nothing if a new label or annotation is added to the object.

If the Service per Pod mode is not used, the Operator **won't remove any annotations and labels** from any Services related to *this expose subsection*. Though, it is still possible to add annotations and labels via the Custom Resource in this case. Use the appropriate `expose.serviceAnnotations` and `expose.serviceLabels` fields.

Else, if the Service per Pod mode is active, the Operator removes unknown annotations and labels from Services *created by the Operator for Pods*. Yet it is still possible to specify which annotations and labels should be preserved (not wiped out) by the Operator. List them in the `spec.ignoreAnnotations` or `spec.ignoreLabels` fields of the `deploy/cr.yaml`, as follows:

```
spec:
  ignoreAnnotations:
    - some.custom.cloud.annotation/smth
  ignoreLabels:
    - some.custom.cloud.label/smth
...
```

The Operator will keep any Service annotation or label, key of which **starts** with the specified string. For example, the following annotations and labels will be **not removed** after applying the above `cr.yaml` fragment:

```
kind: Service
apiVersion: v1
metadata:
  name: my-cluster-name-cfg
  ...
  labels:
    some.custom.cloud.label/smth: somethinghere
    ...
  annotations:
    some.custom.cloud.annotation/smth: somethinghere
    ...
```

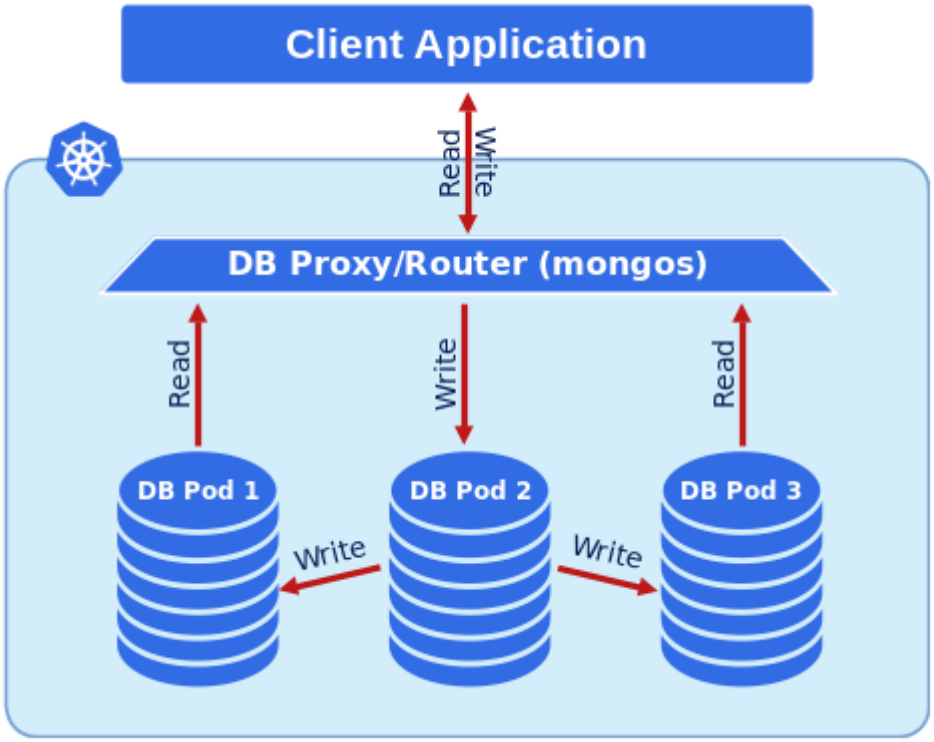
Exposing the cluster

The Operator provides entry points for accessing the database by client applications in several scenarios. In either way the cluster is exposed with regular Kubernetes Service objects, configured by the Operator.

This document describes the usage of Custom Resource manifest options to expose clusters deployed with the Operator.

Using a single entry point in a sharded cluster

If Percona Server for MongoDB sharding mode is turned **on** (the default behavior), then the database cluster runs special `mongos` Pods - query routers, which act as entry points for client applications:



By default, a ClusterIP type Service is created (this is controlled by sharding.mongos.expose.type). The Service works in a round-robin fashion between all the `mongos` Pods.

The URI looks like this (taking into account the need for a proper password obtained from the Secret, and a proper namespace name instead of the `<namespace name>` placeholder):

```
$ mongosh "mongodb://userAdmin:userAdminPassword@my-cluster-name-mongos.<namespace name>.svc.cluster.local/admin?ssl=false"
```

You can get the actual Service endpoints by running the following command:

```
$ kubectl get psmdb
```

Expected output

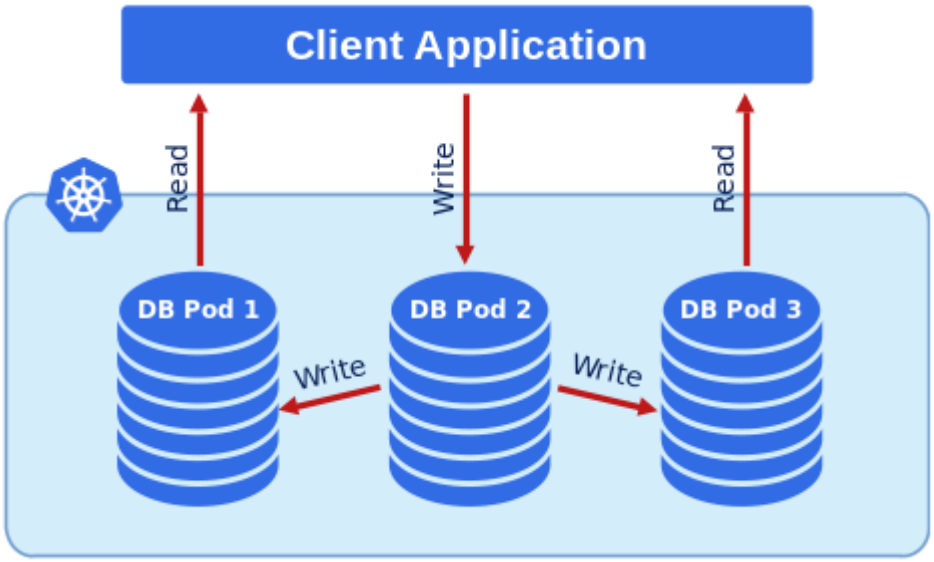
```
NAME              ENDPOINT                                        STATUS   AGE
my-cluster-name   my-cluster-name-mongos.default.svc.cluster.local   ready    85m
```

Warning

A ClusterIP Service endpoint is only reachable inside Kubernetes. If you need to connect from the outside, you need to expose the mongos Pods by using the NodePort or Load Balancer Service types. See the Connecting from outside Kubernetes section below for details.

Accessing replica set Pods

If Percona Server for MongoDB sharding mode mode is turned **off**, the application needs to connect to all the MongoDB Pods of the replica set:



When Kubernetes creates Pods, each Pod has an IP address in the internal virtual network of the cluster. Creating and destroying Pods is a dynamic process, therefore binding communication between Pods to specific IP addresses would cause problems as things change over time as a result of the cluster scaling, maintenance, etc. Due to this changing environment, you should connect to Percona Server for MongoDB by using Kubernetes internal DNS names in the URI.

By default, a ClusterIP type Service is created (this is controlled by replsets.expose.type). The Service works in a round-robin fashion between all the mongod Pods of the replica set.

In this case, the URI looks like this (taking into account the need for a proper password obtained from the Secret, and a proper namespace name instead of the `<namespace name>` placeholder):

```
$ mongosh "mongodb://databaseAdmin:databaseAdminPassword@my-cluster-name-
rs0.<namespace name>.svc.cluster.local/admin?replicaSet=rs0&ssl=false"
```

You can get the actual Service endpoints by running the following command:

```
$ kubectl get psmdb
```

Expected output

```
NAME              ENDPOINT                                        STATUS   AGE
my-cluster-name   my-cluster-name-rs0.default.svc.cluster.local   ready    2m19s
```

Warning

A ClusterIP Service endpoint is only reachable inside Kubernetes. If you need to connect from the outside, you need to expose the mongod Pods by using the NodePort or Load Balancer Service types. See the Connecting from outside Kubernetes section below for details.

Connecting from outside Kubernetes

If connecting to a cluster from outside Kubernetes, you cannot reach the Pods using the Kubernetes internal DNS names. To make the Pods accessible, Percona Operator for MongoDB can create Kubernetes Services.

- set `expose.enabled` option to `true` to allow exposing the Pods via Services,
- set `expose.type` option specifying the type of Service to be used:
  - `ClusterIP` - expose the Pod with an internal static IP address. This variant makes the Service reachable only from within the Kubernetes cluster.
  - `NodePort` - expose the Pod on each Kubernetes Node's IP address at a static port. A ClusterIP Service, to which the Node port will be routed, is automatically created in this variant. As an advantage, the Service will be reachable from outside the cluster by Node address and port number, however the address will be bound to a specific Kubernetes Node. The `expose.externalTrafficPolicy` Custom Resource option available in `replsets`, `sharding.configsvrReplSet`, and `sharding.mongos` subsections of the `deploy/cr.yaml` manifest, controlls if the external traffic will be node-local (`Local`, external requests will be dropped if there is no available Pod on the Node) or cluster-wide (`Cluster`, requests can be routed to another

Node at the cost of extra latency and not preserving the client IP address).

- `LoadBalancer` - expose the Pod externally using a cloud provider's load balancer. Both ClusterIP and NodePort Services are automatically created in this variant.

If the NodePort type is used, the URI looks like this:

```
mongodb://
databaseAdmin:databaseAdminPassword@<node1>:<port1>,<node2>:<port2>,<node3>:<port3>/
admin?replicaSet=rs0&ssl=false
```

All Node addresses should be *directly* reachable by the application.

Service per Pod

To make all database Pods accessible, Percona Operator for MongoDB can assign a Kubernetes Service to each Pod. Particularly, the Service per Pod option allows the application to take care of Cursor tracking instead of relying on a single Service. This solves the problem of CursorNotFound errors when the Service transparently cycles between the mongos instances while client is still iterating the cursor on some large collection.

This feature can be enabled for both sharded and non-sharded clusters by setting the sharding.mongos.expose.servicePerPod Custom Resource option to `true` in the deploy/cr.yaml file.

If this feature is enabled with the `expose.type: NodePort`, the created Services look like this:

```
$ kubectl get svc
NAME                       TYPE           CLUSTER-IP      EXTERNAL-IP    PORT(S)
AGE
my-cluster-name-mongos-0   NodePort       10.38.158.103   <none>
27017:31689/TCP              12s
my-cluster-name-mongos-1   NodePort       10.38.155.250   <none>
27017:31389/TCP              12s
...
```

Controlling hostnames in replset configuration

Starting from v1.14, the Operator configures replica set members using local fully-qualified domain names (FQDN), which are resolvable and available only from inside the Kubernetes cluster. Exposing the replica set using the options described above will not affect hostname usage in the replica set configuration.

> **Note**
>
> Before v1.14, the Operator used the exposed IP addresses in the replica set configuration in the case of the exposed replica set.

It is still possible to restore the old behavior. For example, it may be useful to have the replica set configured with external IP addresses for multi-cluster deployments. The `clusterServiceDNSMode` field in the Custom Resource controls this Operator behavior. You can set `clusterServiceDNSMode` to one of the following values:

1. **`Internal`**: Use local FQDNs (i.e., `cluster1-rs0-0.cluster1-rs0.psmdb.svc.cluster.local`) in replica set configuration even if the replica set is exposed. **This is the default value.**
2. **`ServiceMesh`**: Use a special FQDN using the Pod name (i.e., `cluster1-rs0-0.psmdb.svc.cluster.local`), assuming it's resolvable and available in all clusters.
3. **`External`**: Use exposed IP in replica set configuration if replica set is exposed; else, use local FQDN. **This copies the behavior of the Operator v1.13.**

If backups are enabled in your cluster, you need to restart replset and config servers after changing `clusterServiceDNSMode`. This option changes the hostnames inside the replset configuration and running pbm-agents don't discover the change until they're restarted. You may have errors in `backup-agent` container logs and your backups may not work until you restarted the agents.

Restart can be done manually with the `kubectl rollout restart sts <clusterName>-<replsetName>` command executed for each replica set in the `spec.replsets`; also, if sharding enabled, do the same for config servers with `kubectl rollout restart sts <clusterName>-cfg`. Alternatively, you can simply restart your cluster.

> **Warning**
>
> You should be careful with the `clusterServiceDNSMode=External` variant. Using IP addresses instead of DNS hostnames is discouraged in MongoDB. IP addresses make reconfiguration and recovery more complicated, and are **generally problematic in scenarios where IP addresses change**. In particular, if you delete and recreate the cluster with `clusterServiceDNSMode=External` without deleting its volumes (having `percona.com/delete-psmdb-pvc` finalizer unset), your cluster will crash and there will be no straightforward way to recover it.

Exposing replica set with split-horizon DNS

Split-horizon DNS provides each replica set Pod with a set of DNS URIs for external usage. This allows to communicate with replica set Pods both from inside the Kubernetes cluster and from outside of Kubernetes.

Split-horizon can be configured via the `replset.splitHorizons` subsection in the Custom Resource options. Set it in the `deploy/cr.yaml` configuration file as follows:

```
...
replsets:
  - name: rs0
    expose:
      enabled: true
      type: LoadBalancer
    splitHorizons:
      cluster1-rs0-0:
        external: rs0-0.mycluster.xyz
        external-2: rs0-0.mycluster2.xyz
      cluster1-rs0-1:
        external: rs0-1.mycluster.xyz
        external-2: rs0-1.mycluster2.xyz
      cluster1-rs0-2:
        external: rs0-2.mycluster.xyz
        external-2: rs0-2.mycluster2.xyz
```

URIs for external usage are specified as key-value pairs, where the key is an arbitrary name and the value is the actual URI. The URI may include a port number. If nothing is set, the default MongoDB port will be used.

Split horizon has following limitations:

- connecting with horizon domains is only supported if client connects using TLS certificates, and these TLS certificates need to be generated manually
- duplicating domain names in horizons is not allowed by MongoDB
- using IP addresses in horizons is not allowed by MongoDB
- horizons should be set for *all Pods of a replica set* or not set at all

Local Storage support for the Percona Operator for MongoDB

Among the wide rage of volume types, supported by Kubernetes, there are two volume types which allow Pod containers to access part of the local filesystem on the node the *emptyDir* and *hostPath*.

emptyDir

A Pod emptyDir volume is created when the Pod is assigned to a Node. The volume is initially empty and is erased when the Pod is removed from the Node. The containers in the Pod can read and write the files in the emptyDir volume.

The `emptyDir` options in the deploy/cr.yaml file can be used to turn the emptyDir volume on by setting the directory name.

The `emptyDir` is useful when you use Percona Memory Engine.

hostPath

A hostPath volume mounts an existing file or directory from the host node's filesystem into the Pod. If the pod is removed, the data persists in the host node's filesystem.

The `volumeSpec.hostPath` subsection in the deploy/cr.yaml file may include `path` and `type` keys to set the node's filesystem object path and to specify whether it is a file, a directory, or something else (e.g. a socket):

```
volumeSpec:
  hostPath:
    path: /data
    type: Directory
```

Please note, you must created the hostPath manually and should have following attributes:

- access permissions,
- ownership,
- SELinux security context.

The `hostPath` volume is useful when you perform manual actions during the first run and require improved disk performance. Consider using the tolerations settings to avoid a cluster migration to different hardware in case of a reboot or a hardware failure.

More details can be found in the official hostPath Kubernetes documentation.

Using Replica Set Arbiter nodes and non-voting nodes

Percona Server for MongoDB replication model is based on elections, when nodes of the Replica Set choose which node becomes the primary node.

The need for elections influences the choice of the number of nodes in the cluster. Elections are the reason to avoid even number of nodes, and to have at least three and not more than seven participating nodes.

Still, sometimes there is a contradiction between the number of nodes suitable for elections and the number of nodes needed to store data. You can solve this contradiction in two ways:

- Add *Arbiter* nodes, which participate in elections, but do not store data,
- Add *non-voting* nodes, which store data but do not participate in elections.

Adding Arbiter nodes

Normally, each node stores a complete copy of the data, but there is also a possibility, to reduce disk IO and space used by the database, to add an arbiter node. An arbiter cannot become a primary and does not have a complete copy of the data. The arbiter does have one election vote and can be the odd number for elections. The arbiter does not demand a persistent volume.

Percona Operator for MongoDB has the ability to create Replica Set Arbiter nodes if needed. This feature can be configured in the Replica Set section of the deploy/cr.yaml file:

- set `arbiter.enabled` option to `true` to allow Arbiter instances,
- use `arbiter.size` option to set the desired amount of Arbiter instances.

For example, the following keys in `deploy/cr.yaml` will create a cluster with 4 data instances and 1 Arbiter:

```
....
replsets:
  ....
  size: 4
  ....
  arbiter:
    enabled: true
    size: 1
    ....
```

Note

You can find description of other possible options in the replsets.arbiter section of the Custom Resource options reference.

Preventing Arbiter instances to share Kubernetes Nodes with Replica Set

By default Arbiter instances are allowed to run on the same host as regular Replica Set instances. This may be reasonable in terms of the number of Kubernetes Nodes required for the cluster. But as a result it increases possibility to have 50/50 votes division in case of network partitioning. You can use anti-affinity constraints to avoid such Pod alocation as follows:

```
....
arbiter:
  enabled: true
  size: 1
  affinity:
    antiAffinityTopologyKey: "kubernetes.io/hostname"
    advanced:
      podAntiAffinity:
        requiredDuringSchedulingIgnoredDuringExecution:
        - labelSelector:
            matchLabels:
              app.kubernetes.io/component: mongod
              app.kubernetes.io/instance: cluster1
              app.kubernetes.io/managed-by: percona-server-mongodb-operator
              app.kubernetes.io/name: percona-server-mongodb
              app.kubernetes.io/part-of: percona-server-mongodb
              app.kubernetes.io/replset: rs0
          topologyKey: kubernetes.io/hostname
```

Adding non-voting nodes

Non-voting member is a Replica Set node which does not participate in the primary election process. This feature is required to have more than 7 nodes, or if there is a node in the edge location, which obviously should not participate in the voting process.

Note

Non-voting nodes support has technical preview status and is not recommended for production environments.

Note

It is possible to add a non-voting node in the edge location through the `externalNodes` option. Please see cross-site replication documentation for details.

Percona Operator for MongoDB has the ability to configure non-voting nodes in the Replica Set section of the deploy/cr.yaml file:

- set `nonvoting.enabled` option to `true` to allow non-voting instances,
- use `nonvoting.size` option to set the desired amount of non-voting instances.

For example, the following keys in `deploy/cr.yaml` will create a cluster with 3 data instances and 1 non-voting instance:

```
....
replsets:
  ....
  size: 3
  ....
  nonvoting:
    enabled: true
    size: 1
    ....
```

Note

You can find description of other possible options in the replsets.nonvoting section of the Custom Resource options reference.

Percona Server for MongoDB Sharding

About sharding

Sharding provides horizontal database scaling, distributing data across multiple MongoDB Pods. It is useful for large data sets when a single machine's overall processing speed or storage capacity turns out to be not enough. Sharding allows splitting data across several machines with a special routing of each request to the necessary subset of data (so-called *shard*).

A MongoDB Sharding involves the following components:

- `shard` - a replica set which contains a subset of data stored in the database (similar to a traditional MongoDB replica set),
- `mongos` - a query router, which acts as an entry point for client applications,
- `config servers` - a replica set to store metadata and configuration settings for the sharded database cluster.

> **Note**
>
> Percona Operator for MongoDB 1.6.0 supported only one shard of a MongoDB cluster; still, this limited sharding support allowed using `mongos` as an entry point instead of provisioning a load-balancer per replica set node. Multiple shards are supported starting from the Operator 1.7.0. Also, before the Operator 1.12.0 mongos were deployed by the Deployment object, and starting from 1.12.0 they are deployed by the StatefulSet one.

Turning sharding on and off

Sharding is controlled by the `sharding` section of the `deploy/cr.yaml` configuration file and is turned on by default.

To enable sharding, set the `sharding.enabled` key to `true`. This will turn existing MongoDB replica set nodes into sharded ones).

To disable sharding, set the `sharding.enabled` key to `false`. If backups are disabled (the `backup.enabled` Custom Resource option set to `false`), the Operator will turn sharded MongoDB instances into unsharded one by one, so the database cluster will operate without downtime. If backups are enabled (the `backup.enabled` Custom Resource option is `true`), the Operator will pause the cluster (to avoid Percona Backup for MongoDB misconfiguration), update the instances, and then unpause it back.

Configuring instances of a sharded cluster

When sharding is turned on, the Operator runs replica sets with config servers and mongos instances. Their number is controlled by `configsvrReplSet.size` and `mongos.size` keys, respectively.

Config servers have `cfg` replica set name by default, which is used by the Operator in StatefulSet and Service names. If this name needs to be customized (for example when migrating MongoDB cluster from barebone installation to Kubernetes), you can override the default `cfg` variant using `replsets.configuration` Custom Resource option in `deploy/cr.yaml` as follows:

```
...
configuration: |
  replication:
    replSetName: customCfgRS
    ...
```

Note

Config servers for now can properly work only with WiredTiger engine, and sharded MongoDB nodes can use either WiredTiger or InMemory one.

By default replsets section of the `deploy/cr.yaml` configuration file contains only one replica set, `rs0`. You can add more replica sets with different names to the `replsets` section in a similar way. Please take into account that having more than one replica set is possible only with the sharding turned on.

Note

The Operator will be able to remove a shard only when it contains no application (non-system) collections.

Checking connectivity to sharded and non-sharded cluster

With sharding turned on, you have `mongos` service as an entry point to access your database. If you do not use sharding, you have to access `mongod` processes of your replica set.

To connect to Percona Server for MongoDB you need to construct the MongoDB connection URI string. It includes the credentials of the admin user, which are stored in the Secrets object.

1. List the Secrets objects

   ```
   $ kubectl get secrets -n <namespace>
   ```

   The Secrets object you are interested in has the `my-cluster-name-secrets` name by default.
2. View the Secret contents to retrive the admin user credentials.

```
$ kubectl get secret my-cluster-name-secrets -o yaml
```

The command returns the YAML file with generated Secrets, including the `MONGODB_DATABASE_ADMIN_USER` and `MONGODB_DATABASE_ADMIN_PASSWORD` strings, which should look as follows:

Sample output

```
...
data:
  ...
  MONGODB_DATABASE_ADMIN_PASSWORD: aDAzQ0pCY3NSWEZ2ZUIzS1I=
  MONGODB_DATABASE_ADMIN_USER: ZGF0YWJhc2VBZG1pbg==
```

The actual login name and password on the output are base64-encoded. To bring it back to a human-readable form, run:

```
$ echo 'MONGODB_DATABASE_ADMIN_USER' | base64 --decode
$ echo 'MONGODB_DATABASE_ADMIN_PASSWORD' | base64 --decode
```

3. Run a container with a MongoDB client and connect its console output to your terminal. The following command does this, naming the new Pod `percona-client`:

```
$ kubectl run -i --rm --tty percona-client --image=percona/percona-server-
mongodb:7.0.14-8 --restart=Never -- bash -il
```

Executing it may require some time to deploy the corresponding Pod.

4. Now run `mongosh` tool inside the `percona-client` command shell using the admin user credentialds you obtained from the Secret, and a proper namespace name instead of the `<namespace name>` placeholder. The command will look different depending on whether sharding is on (the default behavior) or off:

if sharding is on

```
$ mongosh "mongodb://databaseAdmin:databaseAdminPassword@my-cluster-name-
mongos.<namespace name>.svc.cluster.local/admin?ssl=false"
```

if sharding is off

```
$ mongosh "mongodb+srv://databaseAdmin:databaseAdminPassword@my-cluster-name-
rs0.<namespace name>.svc.cluster.local/admin?replicaSet=rs0&ssl=false"
```

Note

If you are using MongoDB versions earler than 6.x (such as 5.0.29-25 instead of the default 7.0.14-8 variant), substitute `mongosh` command with `mongo` in the above examples.

Transport Layer Security (TLS)

The Percona Operator for MongoDB uses Transport Layer Security (TLS) cryptographic protocol for the following types of communication:

- Internal - communication between Percona Server for MongoDB instances in the cluster
- External - communication between the client application and the cluster

The internal certificate is also used as an authorization method.

TLS usage is controlled by the `tls.mode` Custom Resource option, which can be set to `allowTLS`, `preferTLS` (default choice), `requireTLS`, or `disabled`:

```
...
spec:
  ...
  tls:
    mode: preferTLS
```

- `allowTLS` means that both TLS and non-TLS incoming connections are accepted, but server doesn't use TLS internally,
- `preferTLS` turns on TLS for internal communication, and allows both TLS and non-TLS external traffic,
- `requireTLS` **enforces** the use of TLS encrypted connections only,
- `disabled` completely turns TLS off.

Certificates for TLS security can be generated in several ways. By default, the Operator generates long-term certificates automatically if there are no certificate secrets available.

Other options are the following ones:

- the Operator can use a specifically installed *cert-manager*, which will automatically generate and renew short-term TLS certificates,
- certificates can be generated manually.

> **Note**
>
> The tls.allowInvalidCertificates Custom Resource option is set to `true` by default to allow certificates automatically generated by the Operator. It can be set to `false` with other variants, such as certificates generated by cert-manager.

You can also use pre-generated certificates available in the `deploy/ssl-secrets.yaml` file for test purposes, but we strongly recommend **avoiding their usage on any production system**!

The following subsections explain how to configure TLS security with the Operator yourself, as well as how to temporarily disable it if needed.

Please note that you will need to additionally configure your client application if you are going to use TLS for external traffic. See this blog post for detailed instruction with examples. Also, you can check the official MongoDB documentation. For clients outside of your Kubernetes-based environment, don't forget about exposing your cluster.

Install and use the *cert-manager*

About the *cert-manager*

The cert-manager is a Kubernetes certificate management controller which widely used to automate the management and issuance of TLS certificates. It is community-driven, and open source.

When you have already installed *cert-manager* and deploy the operator, the operator requests a certificate from the *cert-manager*. The *cert-manager* acts as a self-signed issuer and generates certificates. The Percona Operator self-signed issuer is local to the operator namespace. This self-signed issuer is created because Percona Server for MongoDB requires all certificates issued by the same CA (Certificate authority).

Self-signed issuer allows you to deploy and use the Percona Operator without creating a cluster issuer separately.

Installation of the *cert-manager*

The steps to install the *cert-manager* are the following:

- create a namespace,
- disable resource validations on the cert-manager namespace,
- install the cert-manager.

The following commands perform all the needed actions:

```
$ kubectl apply -f https://github.com/jetstack/cert-manager/releases/download/v
1.16.2/cert-manager.yaml --validate=false
```

After the installation, you can verify the *cert-manager* by running the following command:

```
$ kubectl get pods -n cert-manager
```

The result should display the *cert-manager* and webhook active and running:

```
NAME                                       READY   STATUS    RESTARTS   AGE
cert-manager-7d59dd4888-tmjqq              1/1     Running   0          3m8s
cert-manager-cainjector-85899d45d9-8ncw9   1/1     Running   0          3m8s
cert-manager-webhook-84fcdcd5d-697k4       1/1     Running   0          3m8s
```

Once you create the database with the Operator, it will automatically trigger cert-manager to create certificates. Whenever you check certificates for expiration, you will find that they are valid and short-term.

Generate certificates manually

> **Warning**
>
> Using manually generated certificates didn't work in the Operator version 1.16.0. The problem is fixed starting from the version 1.16.1.

To generate certificates manually, follow these steps:

1. Provision a Certificate Authority (CA) to generate TLS certificates,
2. Generate a CA key and certificate file with the server details,
3. Create the server TLS certificates using the CA keys, certs, and server details.

The set of commands generate certificates with the following attributes:

- `Server-pem` - Certificate
- `Server-key.pem` - the private key
- `ca.pem` - Certificate Authority

You should generate certificates twice: one set is for external communications, and another set is for internal ones. A secret created for the external use must be added to the `spec.secrets.ssl` key of the `deploy/cr.yaml` file. A certificate generated for internal communications must be added to the `spec.secrets.sslInternal` key of the `deploy/cr.yaml` file.

You can explore pre-generated / development mode sample certificates available as base64-encoded data in the `deploy/ssl-secrets.yaml` file. Also, check MongoDB certificate requirements in the upstream documentation.

> **Note**
>
> If you only create the external certificate, then the Operator will not generate the internal one, but instead use certificate you have provided for both external and internal communications.

Supposing that your cluster name is `my-cluster-name`, the instructions to generate certificates manually are as follows:

if sharding is off

```
$ CLUSTER_NAME=my-cluster-name
$ NAMESPACE=default
$ cat <<EOF | cfssl gencert -initca - | cfssljson -bare ca
  {
    "CN": "Root CA",
    "names": [
      {
        "O": "PSMDB"
      }
    ],
    "key": {
      "algo": "rsa",
      "size": 2048
    }
  }
EOF

$ cat <<EOF > ca-config.json
  {
    "signing": {
      "default": {
        "expiry": "87600h",
        "usages": ["signing", "key encipherment", "server auth", "client auth"]
      }
    }
  }
EOF

$ cat <<EOF | cfssl gencert -ca=ca.pem  -ca-key=ca-key.pem -config=./ca-config.json
- | cfssljson -bare server
  {
    "hosts": [
      "localhost",
      "${CLUSTER_NAME}-rs0",
      "${CLUSTER_NAME}-rs0.${NAMESPACE}",
      "${CLUSTER_NAME}-rs0.${NAMESPACE}.svc.cluster.local",
      "*.${CLUSTER_NAME}-rs0",
      "*.${CLUSTER_NAME}-rs0.${NAMESPACE}",
      "*.${CLUSTER_NAME}-rs0.${NAMESPACE}.svc.cluster.local"
    ],
    "names": [
      {
        "O": "PSMDB"
      }
    ],
    "CN": "${CLUSTER_NAME/-rs0}",
    "key": {
      "algo": "rsa",
      "size": 2048
    }
  }
```

```
$ CLUSTER_NAME=my-cluster-name
$ NAMESPACE=default
$ cat <<EOF | cfssl gencert -initca - | cfssljson -bare ca
  {
    "CN": "Root CA",
    "names": [
      {
        "O": "PSMDB"
      }
    ],
    "key": {
      "algo": "rsa",
      "size": 2048
    }
  }
EOF

$ cat <<EOF > ca-config.json
  {
    "signing": {
      "default": {
        "expiry": "87600h",
        "usages": ["signing", "key encipherment", "server auth", "client auth"]
      }
    }
  }
EOF

$ cat <<EOF | cfssl gencert -ca=ca.pem  -ca-key=ca-key.pem -config=./ca-config.json
- | cfssljson -bare server
  {
    "hosts": [
      "localhost",
      "${CLUSTER_NAME}-rs0",
      "${CLUSTER_NAME}-rs0.${NAMESPACE}",
      "${CLUSTER_NAME}-rs0.${NAMESPACE}.svc.cluster.local",
      "*.${CLUSTER_NAME}-rs0",
      "*.${CLUSTER_NAME}-rs0.${NAMESPACE}",
      "*.${CLUSTER_NAME}-rs0.${NAMESPACE}.svc.cluster.local",
      "${CLUSTER_NAME}-mongos",
      "${CLUSTER_NAME}-mongos.${NAMESPACE}",
      "${CLUSTER_NAME}-mongos.${NAMESPACE}.svc.cluster.local",
      "*.${CLUSTER_NAME}-mongos",
      "*.${CLUSTER_NAME}-mongos.${NAMESPACE}",
      "*.${CLUSTER_NAME}-mongos.${NAMESPACE}.svc.cluster.local",
      "${CLUSTER_NAME}-cfg",
      "${CLUSTER_NAME}-cfg.${NAMESPACE}",
      "${CLUSTER_NAME}-cfg.${NAMESPACE}.svc.cluster.local",
      "*.${CLUSTER_NAME}-cfg",
      "*.${CLUSTER_NAME}-cfg.${NAMESPACE}",
      "*.${CLUSTER_NAME}-cfg.${NAMESPACE}.svc.cluster.local"
```

```
    ],
    "names": [
      {
        "O": "PSMDB"
      }
    ],
    "CN": "${CLUSTER_NAME/-rs0}",
    "key": {
      "algo": "rsa",
      "size": 2048
    }
  }
EOF
$ cfssl bundle -ca-bundle=ca.pem -cert=server.pem | cfssljson -bare server

$ kubectl create secret generic my-cluster-name-ssl-internal --from-
file=tls.crt=server.pem --from-file=tls.key=server-key.pem --from-
file=ca.crt=ca.pem --type=kubernetes.io/tls

$ cat <<EOF | cfssl gencert -ca=ca.pem  -ca-key=ca-key.pem -config=./ca-config.json
- | cfssljson -bare client
  {
    "hosts": [
      "${CLUSTER_NAME}-rs0",
      "${CLUSTER_NAME}-rs0.${NAMESPACE}",
      "${CLUSTER_NAME}-rs0.${NAMESPACE}.svc.cluster.local",
      "*.${CLUSTER_NAME}-rs0",
      "*.${CLUSTER_NAME}-rs0.${NAMESPACE}",
      "*.${CLUSTER_NAME}-rs0.${NAMESPACE}.svc.cluster.local",
      "${CLUSTER_NAME}-mongos",
      "${CLUSTER_NAME}-mongos.${NAMESPACE}",
      "${CLUSTER_NAME}-mongos.${NAMESPACE}.svc.cluster.local",
      "*.${CLUSTER_NAME}-mongos",
      "*.${CLUSTER_NAME}-mongos.${NAMESPACE}",
      "*.${CLUSTER_NAME}-mongos.${NAMESPACE}.svc.cluster.local",
      "${CLUSTER_NAME}-cfg",
      "${CLUSTER_NAME}-cfg.${NAMESPACE}",
      "${CLUSTER_NAME}-cfg.${NAMESPACE}.svc.cluster.local",
      "*.${CLUSTER_NAME}-cfg",
      "*.${CLUSTER_NAME}-cfg.${NAMESPACE}",
      "*.${CLUSTER_NAME}-cfg.${NAMESPACE}.svc.cluster.local"
    ],
    "names": [
      {
        "O": "PSMDB"
      }
    ],
    "CN": "${CLUSTER_NAME/-rs0}",
    "key": {
      "algo": "rsa",
      "size": 2048
    }
```

```
  }
EOF

$ kubectl create secret generic my-cluster-name-ssl --from-file=tls.crt=client.pem
--from-file=tls.key=client-key.pem --from-file=ca.crt=ca.pem --type=kubernetes.io/
tls
```

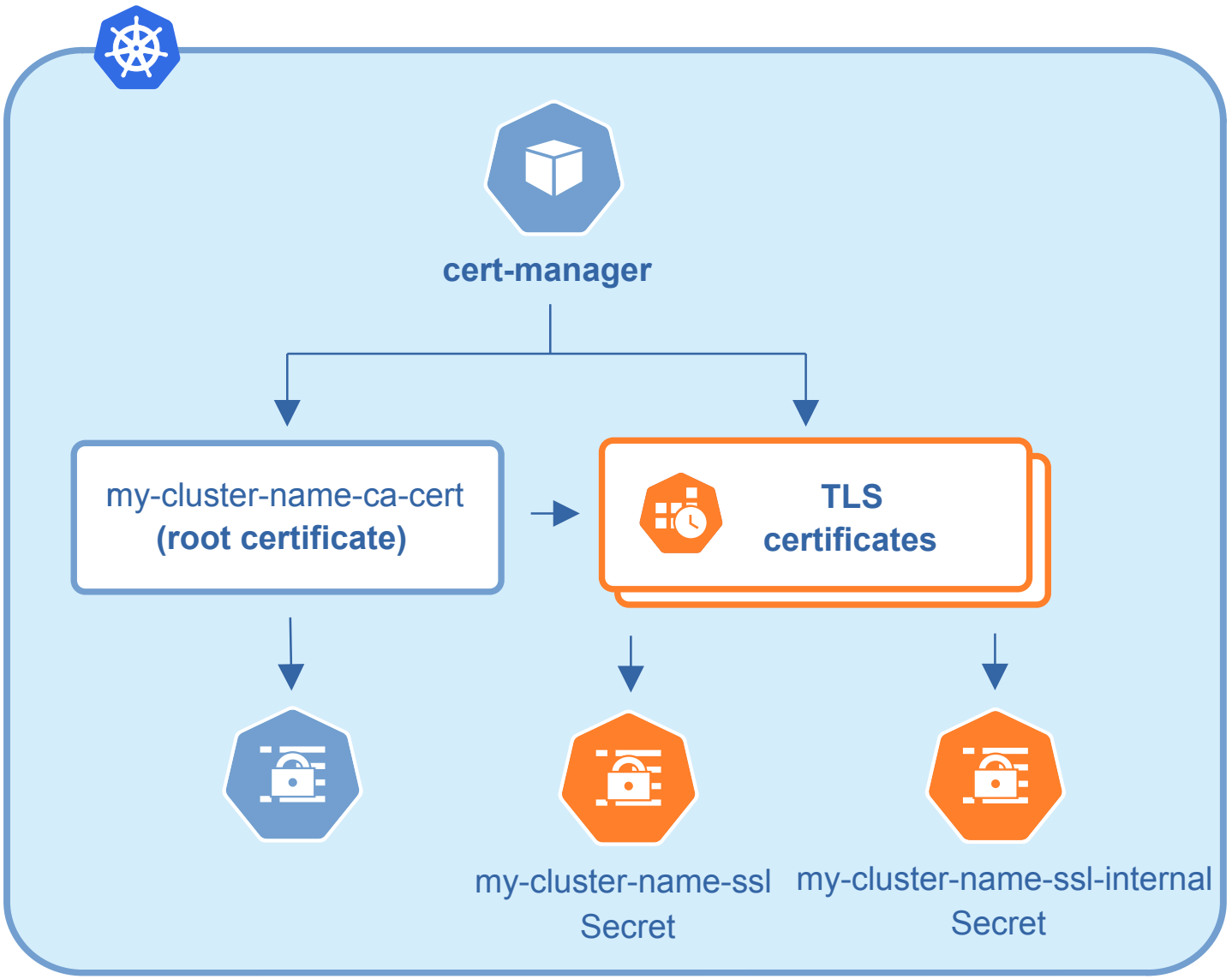
Note

Commands in the above example use `rs0` replica set name (the default one). If you set different name in `replsets.name` Custom Resource option, change these commands accordingly.

Update certificates

If a cert-manager is used, it should take care of updating the certificates. If you generate certificates manually, you should take care of updating them in proper time.

TLS certificates issued by cert-manager are short-term ones, valid for 3 months. They are reissued automatically on schedule and without downtime.



Check your certificates for expiration

1. First, check the necessary secrets names (`my-cluster-name-ssl` and `my-cluster-name-ssl-internal` by default):

   ```
   $ kubectl get certificate
   ```

   You will have the following response:

   ```
   NAME                          READY   SECRET                        AGE
   my-cluster-name-ssl           True    my-cluster-name-ssl           49m
   my-cluster-name-ssl-internal  True    my-cluster-name-ssl-internal  49m
   ```

This command is available if you have cert-manager installed; if not, you can still check the necessary secrets names with `kubectl get secrets` command.

1. Optionally you can also check that the certificates issuer is up and running:

   ```
   $ kubectl get issuer
   ```

   The response should be as follows:

   ```
   NAME                                READY   AGE
   my-cluster-name-psmdb-issuer        True    61m
   my-cluster-name-psmdb-ca-issuer     True    61m
   ```

   Again, this command is provided by cert-manager; if you don't have it installed, you can still use `kubectl get secrets`.

   > **Note**
   >
   > The presence of two issuers has the following meaning. The `my-cluster-name-psmdb-ca-issuer` issuer is used to create a self signed CA certificate (`my-cluster-name-ca-cert`), and then the `my-cluster-name-psmdb-issuer` issuer is used to create SSL certificates (`my-cluster-name-ssl` and `my-cluster-name-ssl-internal`) signed by the `my-cluster-name-ca-cert` CA certificate.

2. Now use the following command to find out the certificates validity dates, substituting Secrets names if necessary:

   ```
   $ {
     kubectl get secret/my-cluster-name-ssl-internal -o
   jsonpath='{.data.tls\.crt}' | base64 --decode | openssl x509 -noout -dates
     kubectl get secret/my-cluster-name-ssl -o jsonpath='{.data.ca\.crt}' | base64
   --decode | openssl x509 -noout -dates
     }
   ```

   The resulting output will be self-explanatory:

   ```
   notBefore=Apr 25 12:09:38 2022 GMT notAfter=Jul 24 12:09:38 2022 GMT
   notBefore=Apr 25 12:09:38 2022 GMT notAfter=Jul 24 12:09:38 2022 GMT
   ```

Update certificates without downtime

If you don't use cert-manager and have *created certificates manually*, you can follow the next steps to perform a no-downtime update of these certificates *if they are still valid*.

> **Note**
>
> For already expired certificates, follow the alternative way.

Having non-expired certificates, you can roll out new certificates (both CA and TLS) with the Operator as follows.

1. Generate a new CA certificate (`ca.pem`). Optionally you can also generate a new TLS certificate and a key for it, but those can be generated later on step 6.
2. Get the current CA (`ca.pem.old`) and TLS (`tls.pem.old`) certificates and the TLS certificate key (`tls.key.old`):

```
$ kubectl get secret/my-cluster-name-ssl-internal -o jsonpath='{.data.ca\.crt}'
| base64 --decode > ca.pem.old
$ kubectl get secret/my-cluster-name-ssl-internal -o
jsonpath='{.data.tls\.crt}' | base64 --decode > tls.pem.old
$ kubectl get secret/my-cluster-name-ssl-internal -o
jsonpath='{.data.tls\.key}' | base64 --decode > tls.key.old
```

3. Combine new and current `ca.pem` into a `ca.pem.combined` file:

```
$ cat ca.pem ca.pem.old >> ca.pem.combined
```

4. Create a new Secrets object with *old* TLS certificate (`tls.pem.old`) and key (`tls.key.old`), but a *new combined* `ca.pem` (`ca.pem.combined`):

```
$ kubectl delete secret/my-cluster-name-ssl-internal
$ kubectl create secret generic my-cluster-name-ssl-internal --from-
file=tls.crt=tls.pem.old --from-file=tls.key=tls.key.old --from-
file=ca.crt=ca.pem.combined --type=kubernetes.io/tls
```

5. The cluster will go through a rolling reconciliation, but it will do it without problems, as every node has old TLS certificate/key, and both new and old CA certificates.
6. If new TLS certificate and key weren't generated on step 1, do that now.
7. Create a new Secrets object for the second time: use new TLS certificate (`server.pem` in the example) and its key (`server-key.pem`), and again the combined CA certificate (`ca.pem.combined`):

```
$ kubectl delete secret/my-cluster-name-ssl-internal
$ kubectl create secret generic my-cluster-name-ssl-internal --from-
file=tls.crt=server.pem --from-file=tls.key=server-key.pem --from-
file=ca.crt=ca.pem.combined --type=kubernetes.io/tls
```

8. The cluster will go through a rolling reconciliation, but it will do it without problems, as every node already has a new CA certificate (as a part of the combined CA certificate), and can successfully allow joiners with new TLS certificate to join. Joiner node also has a combined CA certificate, so it can authenticate against older TLS certificate.
9. Create a final Secrets object: use new TLS certificate (`server.pmm`) and its key (`server-key.pem`), and just the new CA certificate (`ca.pem`):

```
$ kubectl delete secret/my-cluster-name-ssl-internal
$ kubectl create secret generic my-cluster-name-ssl-internal --from-
file=tls.crt=server.pem --from-file=tls.key=server-key.pem --from-
file=ca.crt=ca.pem --type=kubernetes.io/tls
```

10. The cluster will go through a rolling reconciliation, but it will do it without problems: the old CA certificate is removed, and every node is already using new TLS certificate and no nodes rely on the old CA certificate any more.

Update certificates with downtime

If your certificates have been already expired (or if you continue to use the Operator version prior to 1.9.0), you should move through the *pause - update Secrets - unpause* route as follows.

1. Pause the cluster in a standard way, and make sure it has reached its paused state.
2. If cert-manager is used, delete issuer and TLS certificates:

```
$ {
  kubectl delete issuer/my-cluster-name-psmdb-ca-issuer issuer/my-cluster-name-
psmdb-issuer
  kubectl delete certificate/my-cluster-name-ssl certificate/my-cluster-name-
ssl-internal
  }
```

3. Delete Secrets to force the SSL reconciliation:

```
$ kubectl delete secret/my-cluster-name-ssl secret/my-cluster-name-ssl-internal
```

4. Check certificates to make sure reconciliation have succeeded.
5. Unpause the cluster in a standard way, and make sure it has reached its running state.

Modify certificates generation

There may be reasons to tweak the certificates generation, making it better fit some needs. Of course, maximum flexibility can be obtained with manual certificates generation, but sometimes slight tweaking the already automated job may be enough.

The following example shows how to increase CA duration with cert-manager for a cluster named `cluster1`:

1. Delete the `psmdb` Custom Resource in the proper namespace (this will cause deletion of all Pods of the cluster, but later you will recreate the cluster using the same `deploy/cr.yaml` flie from which it was originally created).

   > **Note**
   >
   > you may need to make sure that `finalizers.percona.com/delete-psmdb-pvc` is not set if you want to preserver Persistent Volumes with the data.

   Deletion command should look as follows:

   ```
   $ kubectl -n <namespace_name> delete psmdb cluster1
   ```

2. Deletion takes time. Check that all Pods disappear with `kubectl -n <namespace_name> get pods` command, and delete certificate related resources:

   ```
   $ kubectl -n <namespace_name> delete issuer.cert-manager.io/cluster1-psmdb-ca-
   issuer issuer.cert-manager.io/cluster1-psmdb-issuer certificate.cert-
   manager.io/cluster1-ssl-internal certificate.cert-manager.io/cluster1-ssl
   certificate.cert-manager.io/cluster1-ca-cert secret/cluster1-ca-cert secret/
   cluster1-ssl secret/cluster1-ssl-internal
   ```

3. Create your own custom CA:

   my_new_ca.yml

```
apiVersion: cert-manager.io/v1
kind: Issuer
metadata:
  name: cluster1-psmdb-ca-issuer
spec:
  selfSigned: {}
---
apiVersion: cert-manager.io/v1
kind: Certificate
metadata:
  name: cluster1-ca-cert
spec:
  commonName: cluster1-ca
  duration: 10000h0m0s
  isCA: true
  issuerRef:
    kind: Issuer
    name: cluster1-psmdb-ca-issuer
  renewBefore: 730h0m0s
  secretName: cluster1-ca-cert
```

Apply it as usual, with the `kubectl -n <namespace_name> apply -f my_new_ca.yml` command.

4. Recreate the cluster from the original `deploy/cr.yaml` configuration file:

```
$ kubectl -n <namespace_name> apply -f deploy/cr.yaml
```

5. Verify certificate duration in usual way.

Run Percona Server for MongoDB without TLS

Omitting TLS is also possible, but we recommend that you run your cluster with the TLS protocol enabled.

To disable TLS protocol (e.g. for demonstration purposes) set the `tls.mode` key to `disabled` and set `unsafeFlags.tls` to `true` in the `deploy/cr.yaml`: file.

```
...
spec:
  ...
  unsafeFlags
    tls: true
    ...
  tls:
    mode: disabled
```

Data at rest encryption

Data at rest encryption in Percona Server for MongoDB is supported by the Operator since version 1.1.0.

> **Note**
>
> Data at rest means inactive data stored as files, database records, etc.

Data at rest encryption is turned on by default. The Operator implements it by either using encryption key stored in a Secret, or obtaining encryption key from the HashiCorp Vault key storage.

Using encryption key Secret

1. The `secrets.encryptionKey` key in the `deploy/cr.yaml` file should specify the name of the encryption key Secret:

   ```
   secrets:
     ...
     encryptionKey: my-cluster-name-mongodb-encryption-key
   ```

   Encryption key Secret will be created automatically by the Operator if it doesn't exist. If you would like to create it yourself, take into account that the key must be a 32 character string encoded in base64.

2. The `replsets.configuration`, `replsets.nonvoting.configuration`, and `sharding.configsvrReplSet.configuration` keys should include the following two MongoDB encryption-specific options:

   ```
   ...
   configuration: |
     ...
     security:
       enableEncryption: true
       encryptionCipherMode: "AES256-CBC"
       ...
   ```

   The `enableEncryption` option should be set to `true` (the default value). The `security.encryptionCipherMode` option should specify a proper cipher mode for decryption: either `AES256-CBC` (the default value) or `AES256-GCM`.

Don't forget to apply the modified `cr.yaml` configuration file as usual:

```
$ kubectl deploy -f deploy/cr.yaml
```

Using HashiCorp Vault storage for encryption keys

Starting from the version 1.13, the Operator supports using HashiCorp Vault storage for encryption keys - a universal, secure and reliable way to store and distribute secrets without depending on the operating system, platform or cloud provider.

> **Warning**
>
> Vault integration has technical preview status and is not yet recommended for production environments.

The Operator will use Vault if the `deploy/cr.yaml` configuration file contains the following items:

- a `secrets.vault` key equal to the name of a specially created Secret,
- `configuration` keys for mongod and config servers with a number of Vault-specific options.

The Operator itself neither installs Vault, nor configures it; both operations should be done manually, as described in the following parts.

Installing Vault

The following steps will deploy Vault on Kubernetes with the Helm 3 package manager. Other Vault installation methods should also work, so the instruction placed here is not obligatory and is for illustration purposes. Read more about installation in Vault's documentation.

1. Add helm repo and install:

   ```
   $ helm repo add hashicorp https://helm.releases.hashicorp.com
   "hashicorp" has been added to your repositories

   $ helm install vault hashicorp/vault
   ```

2. After installation, Vault should be first initialized and then *unsealed*. Initializing Vault is done with the following commands:

   ```
   $ kubectl exec -it pod/vault-0 -- vault operator init -key-shares=1 -key-
   threshold=1 -format=json > /tmp/vault-init
   $ unsealKey=$(jq -r ".unseal_keys_b64[]" < /tmp/vault-init)
   ```

   To unseal Vault, execute the following command **for each Pod** of Vault running:

   ```
   $ kubectl exec -it pod/vault-0 -- vault operator unseal "$unsealKey"
   ```

Configuring Vault

1. First, you should enable secrets within Vault. For this you will need a Vault token. Percona Server for MongoDB can use any regular token which allows all operations inside the secrets mount point. In the following example we are using the *root token* to be sure the permissions requirement is met, but actually there is no need in root permissions. We don't recommend using the root token on the production system.

```
$ cat /tmp/vault-init | jq -r ".root_token"
```

The output will show you the token:

```
s.VgQvaXl8xGFO1RUxAPbPbsfN
```

Now login to Vault with this token to enable the key-value secret engine:

```
$ kubectl exec -it vault-0 -- /bin/sh
$ vault login s.VgQvaXl8xGFO1RUxAPbPbsfN
```

Expected output

```
Success! You are now authenticated. The token information displayed below
is already stored in the token helper. You do NOT need to run "vault login"
again. Future Vault requests will automatically use this token.

Key                  Value
---                  -----
token                s.VgQvaXl8xGFO1RUxAPbPbsfN
token_accessor       iMGp477aReYkPBWrR42Z3L6R
token_duration       ∞
token_renewable      false
token_policies       ["root"]
identity_policies    []
policies             ["root"]`
```

Now enable the key-value secret engine with the following command:

```
$ vault secrets enable -path secret kv-v2
```

Expected output

```
Success! Enabled the kv-v2 secrets engine at: secret/
```

Note

You can also enable audit, which is not mandatory, but useful:

```
$ vault audit enable file file_path=/vault/vault-audit.log
```

Expected output

```
Success! Enabled the file audit device at: file/
```

2. Now generate Secret with the Vault root token using `kubectl command` (don't forget to substitute the token from the example with your real root token) and add necessary options to `configuration` keys in your `deploy/cr.yaml`:

without TLS, to access the Vault server via HTTP

Generate Secret:

```
$ kubectl create secret generic vault-secret --from-
literal=token="s.VgQvaXl8xGFO1RUxAPbPbsfN"
```

Now modify your `deploy/cr.yaml`:

First set the `secrets.encryptionKey` key to the name of your Secret created on the previous step. Then Add Vault-specific options to the `replsets.configuration`, `replsets.nonvoting.configuration`, and `sharding.configsvrReplSet.configuration` keys, using the following template:

```
...
configuration: |
  ...
  security:
    enableEncryption: true
    vault:
      serverName: vault
      port: 8200
      tokenFile: /etc/mongodb-vault/token
      secret: secret/data/dc/<cluster name>/<path>
      disableTLSForTesting: true
    ...
```

with TLS, to access the Vault server via HTTPS

Generate Secret, using the path to your `ca.crt` certificate instead of the `<path to CA>` placeholder (see the Operator TLS guide, if needed):

```
kubectl create secret generic vault-secret --from-
literal=token="s.VgQvaXl8xGFO1RUxAPbPbsfN" --from-file=ca.crt=<path to CA>/
ca.crt
```

Now modify your `deploy/cr.yaml`:

First set the `secrets.encryptionKey` key to the name of your Secret created on the previous step. Then Add Vault-specific options to the `replsets.configuration`, `replsets.nonvoting.configuration`, and `sharding.configsvrReplSet.configuration` keys, using the following template:

```
...
configuration: |
  ...
  security:
    enableEncryption: true
    vault:
      serverName: vault
      port: 8200
      tokenFile: /etc/mongodb-vault/token
      secret: secret/data/dc/<cluster name>/<path>
      serverCAFile: /etc/mongodb-vault/ca.crt
    ...
```

While adding options, modify this template as follows: * substitute the `<cluster name>` placeholder with your real cluster name, * substitute the placeholder with `rs0` when adding options to `replsets.configuration` and `replsets.nonvoting.configuration`, * substitute the placeholder with `cfg` when adding options to `sharding.configsvrReplSet.configuration`.

Finally, apply your modified `cr.yaml` as usual:

```
$ kubectl deploy -f deploy/cr.yaml
```

3. To verify that everything was configured properly, use the following log filtering command (substitute the `<cluster name>` and `<namespace>` placeholders with your real cluster name and namespace):

```
$ kubectl logs <cluster name>-rs0-0 -c mongod -n <namespace> | grep -i
"Encryption keys DB is initialized successfully"
```

More details on how to install and configure Vault can be found in the official documentation.

Telemetry

The Telemetry function enables the Operator gathering and sending basic anonymous data to Percona, which helps us to determine where to focus the development and what is the uptake for each release of Operator.

The following information is gathered:

- ID of the Custom Resource (the `metadata.uid` field)
- Kubernetes version
- Platform (is it Kubernetes or Openshift)
- Is PMM enabled, and the PMM Version
- Operator version
- Mongo version
- Percona Backup for MongoDB (PBM) version
- Is sharding enabled (starting from the Operator version 1.13)
- Is Hashicorp Vault enabled (starting from the Operator version 1.13)
- Is the Operator deployed in a cluster-wide mode (starting from the Operator version 1.13)
- Is Volume Expansion enabled (starting from the Operator version 1.19)
- Are multi-cluster Services enabled (starting from the Operator version 1.19)
- Does the Operator manage custom MongoDB users and/or custom MongoDB roles (starting from the Operator version 1.19)
- Is the Operator deployed with Helm
- Are sidecar containers used
- Are backups used, are point-in-time recovery and/or scheduled physical backup features used, if so
- How large is the cluster

We do not gather anything that identify a system, but the following thing should be mentioned: Custom Resource ID is a unique ID generated by Kubernetes for each Custom Resource.

Telemetry is enabled by default and is sent to the Version Service server when the Operator connects to it at scheduled times to obtain fresh information about version numbers and valid image paths needed for the upgrade.

The landing page for this service, check.percona.com, explains what this service is.

You can disable telemetry with a special option when installing the Operator:

- if you install the Operator with helm, use the following installation command:

```
$ helm install my-db percona/psmdb-db --version 1.19.1 --namespace my-namespace --
set disable_telemetry="true"
```

- if you don't use helm for installation, you have to edit the `operator.yaml` before applying it with the `kubectl apply -f deploy/operator.yaml` command. Open the `operator.yaml` file with your text editor, find the value of the `DISABLE_TELEMETRY` environment variable and set it to `true`:

```
env:
  ...
  - name: DISABLE_TELEMETRY
    value: "true"
  ...
```

Management

About backups

You can backup your data in two ways:

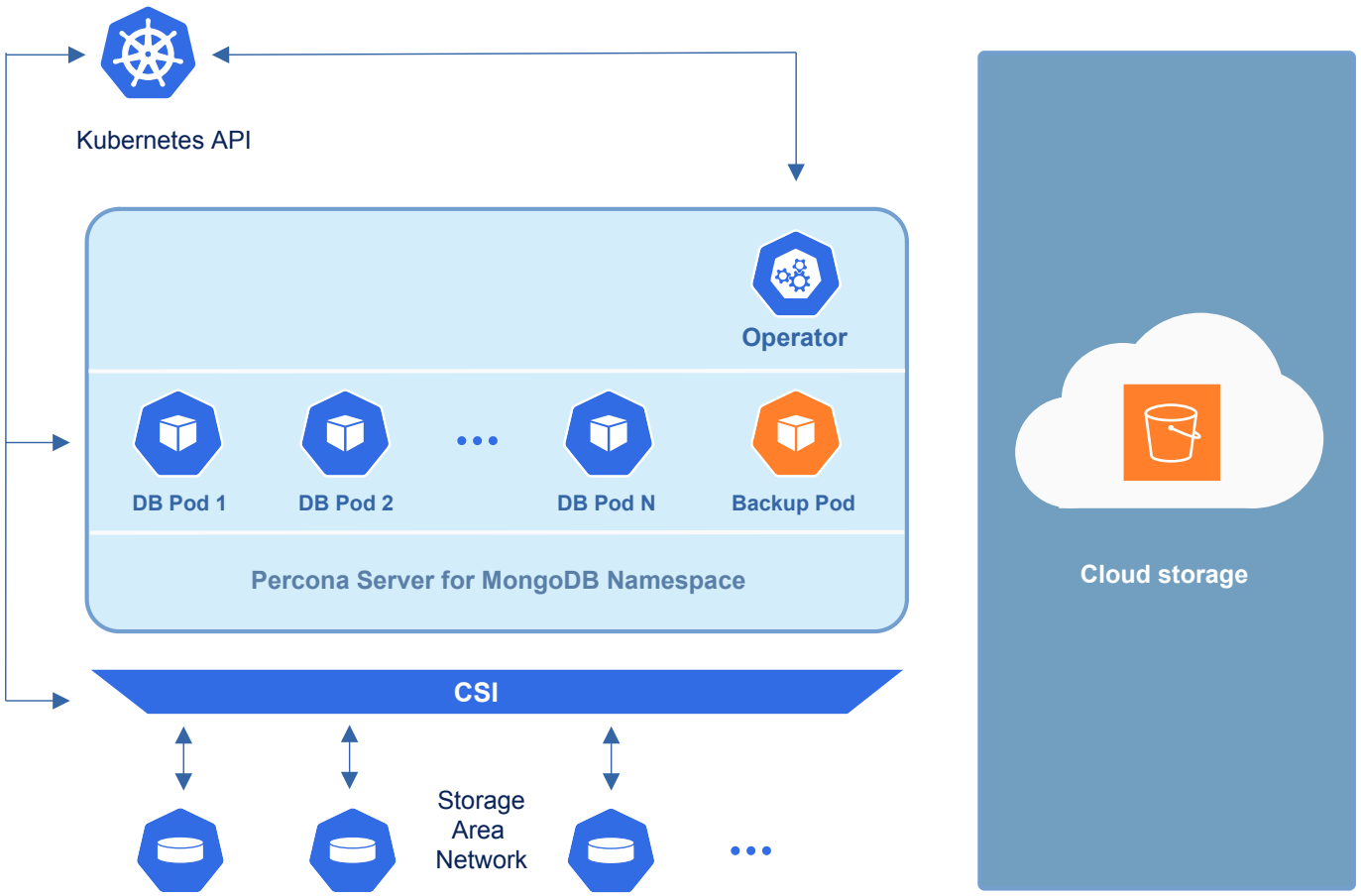
- *On-demand*. You can do them manually at any moment.
- *Scheduled backups*. Configure backups and their schedule in the deploy/cr.yaml. The Operator makes them automatically according to the specified schedule.

To make backups and restores, the Operator uses the Percona Backup for MongoDB tool.

Backup storage

You can store Percona Server for MongoDB backups outside the Kubernetes cluster using the following remote backup storages:

- Amazon S3 or S3-compatible storage,
- Azure Blob Storage



Backup types

The Operator can do either *logical* or *physical* backups.

- *Logical backup* means querying the Percona Server for MongoDB for the database data and writing the retrieved data to the remote backup storage.
- *Physical backup* means copying physical files from the Percona Server for MongoDB `dbPath` data directory to the remote backup storage.

Logical backups use less storage, but are much slower than physical backup/restore.

Warning

Logical backups made with the Operator versions before 1.9.0 are incompatible for restore with the Operator 1.9.0 and later. That is because Percona Backup for MongoDB 1.5.0 used by the newer Operator versions processes system collections Users and Roles differently. The recommended approach is to **make a fresh backup after upgrading the Operator to version 1.9.0**.

Backup and restore

Configure storage for backups

You can configure storage for backups in the `backup.storages` subsection of the Custom Resource, using the deploy/cr.yaml configuration file.

Warning

Remote storage for backups has the **technical preview status**.

You should also create the Kubernetes Secret object with credentials needed to access the storage.

Amazon S3 or S3-compatible storage

1. To store backups on the Amazon S3, you need to create a Secret with the following values:
   - the `metadata.name` key is the name which you will further use to refer your Kubernetes Secret,
   - the `data.AWS_ACCESS_KEY_ID` and `data.AWS_SECRET_ACCESS_KEY` keys are base64-encoded credentials used to access the storage (obviously these keys should contain proper values to make the access possible).

   Create the Secrets file with these base64-encoded keys following the deploy/backup-s3.yaml example:

```
apiVersion: v1
kind: Secret
metadata:
  name: my-cluster-name-backup-s3
type: Opaque
data:
  AWS_ACCESS_KEY_ID: UkVQTEFDRS1XSVRILUFXUy1BQ0NFU1MtS0VZ
  AWS_SECRET_ACCESS_KEY: UkVQTEFDRS1XSVRILUFXUy1TRUNSRVQtS0VZ
```

Note

You can use the following command to get a base64-encoded string from a plain text one:

in Linux

```
$ echo -n 'plain-text-string' | base64 --wrap=0
```

in macOS

```
$ echo -n 'plain-text-string' | base64
```

Once the editing is over, create the Kubernetes Secret object as follows:

```
$ kubectl apply -f deploy/backup-s3.yaml
```

2. Put the data needed to access the S3-compatible cloud into the `backup.storages` subsection of the Custom Resource.

   - `storages.<NAME>.type` should be set to `s3` (substitute the part with some arbitrary name you will later use to refer this storage when making backups and restores).
   - `storages.<NAME>.s3.credentialsSecret` key should be set to the name used to refer your Kubernetes Secret (`my-cluster-name-backup-s3` in the last example).
   - `storages.<NAME>.s3.bucket` and `storages.<NAME>.s3.region` should contain the S3 bucket and region. Also you can use `storages.<NAME>.s3.prefix` option to specify the path (sub-folder) to the backups inside the S3 bucket. If prefix is not set, backups are stored in the root directory.
   - if you use some S3-compatible storage instead of the original Amazon S3, add the endpointURL key in the `s3` subsection, which should point to the actual cloud used for backups. This value and is specific to the cloud provider. For example, using Google Cloud involves the following endpointUrl:

     ```
     endpointUrl: https://storage.googleapis.com
     ```

   The options within the `storages.<NAME>.s3` subsection are further explained in the Operator Custom Resource options.

   Here is an example of the deploy/cr.yaml configuration file which configures Amazon S3 storage for backups:

   ```
   ...
   backup:
     ...
     storages:
       s3-us-west:
         type: s3
         s3:
           bucket: S3-BACKUP-BUCKET-NAME-HERE
           region: us-west-2
           credentialsSecret: my-cluster-name-backup-s3
     ...
   ```

Finally, make sure that your storage has enough resources to store backups, which is especially important in the case of large databases. It is clear that you need enough free space on the storage. Beside that, S3 storage upload limitats include the maximum number 10000 parts, and backing up large data will result in larger chunk sizes, which in turn may cause S3 server to run out of RAM, especially within the default memory limits.

Automating access to Amazon s3 based on IAM roles

Using AWS EC2 instances for backups makes it possible to automate access to AWS S3 buckets based on Identity Access Management (IAM) roles for Service Accounts with *no need to specify the S3 credentials explicitly*.

You can use either make and use the *IAM instance profile*, or configure *IAM roles for Service Accounts* (both ways heavily rely on AWS specifics, and need following the official Amazon documentation to be configured).

Using IAM instance profile

Following steps are needed to turn this feature on:

1. Create the IAM instance profile and the permission policy within where you specify the access level that grants the access to S3 buckets.
2. Attach the IAM profile to an EC2 instance.
3. Configure an S3 storage bucket in the Custom Resource and verify the connection from the EC2 instance to it.
4. *Do not provide* `s3.credentialsSecret` for the storage in `deploy/cr.yaml`.

Using IAM role for service account

IRSA is the native way for the cluster running on Amazon Elastic Kubernetes Service (AWS EKS) to access the AWS API using permissions configured in AWS IAM roles.

Assuming that you have deployed the MongoDB Operator and the database cluster on EKS, following our installation steps, and your EKS cluster has OpenID Connect issuer URL (OIDC) enabled, the the high-level steps to configure it are the following:

1. Create an IAM role for your OIDC, and attach to the created role the policy that defines the access to an S3 bucket. See official Amazon documentation for details.
2. Find out service accounts used for the Operator and for the database cluster. Service account for the Operator is `percona-server-mongodb-operator` (it is set by the `serviceAccountName` key in the `deploy/operator.yaml` or `deploy/bundle.yaml` manifest) The cluster's default account is `default` (it can be set with `serviceAccountName` Custom Resource option in the `replsets`, `sharding.configsvrReplSet`, and `sharding.mongos` subsections of the `deploy/cr.yaml` manifest).
3. Annotate both service accounts with the needed IAM roles. The commands should look as follows:

   ```
   $ kubectl -n <cluster namespace> annotate serviceaccount default
   eks.amazonaws.com/role-arn: arn:aws:iam::111122223333:role/my-role --overwrite
   $ kubectl -n <operator namespace> annotate serviceaccount percona-server-
   mongodb-operator eks.amazonaws.com/role-arn: arn:aws:iam::111122223333:role/my-
   role --overwrite
   ```

   Don't forget to substitute the `<operator namespace>` and `<cluster namespace>` placeholders with the real namespaces, and use your IAM role instead of the `eks.amazonaws.com/role-arn: arn:aws:iam::111122223333:role/my-role` example.
4. Configure an S3 storage bucket in the Custom Resource and verify the connection from the EC2 instance to it. *Do not provide* `s3.credentialsSecret` for the storage in `deploy/cr.yaml`.

> **Note**
>
> If IRSA-related credentials are defined, they have the priority over any IAM instance profile. S3 credentials in a secret, if present, override any IRSA/IAM instance profile related credentials and are used for authentication instead.

Microsoft Azure Blob storage

1. To store backups on the Azure Blob storage, you need to create a Secret with the following values:

   - the `metadata.name` key is the name which you wll further use to refer your Kubernetes Secret,
   - the `data.AZURE_STORAGE_ACCOUNT_NAME` and `data.AZURE_STORAGE_ACCOUNT_KEY` keys are base64-encoded credentials used to access the storage (obviously these keys should contain proper values to make the access possible).

   Create the Secrets file with these base64-encoded keys following the `deploy/backup-azure.yaml` example:

   ```
   apiVersion: v1
   kind: Secret
   metadata:
     name: my-cluster-azure-secret
   type: Opaque
   data:
     AZURE_STORAGE_ACCOUNT_NAME: UkVQTEFDRS1XSVRILUFXUy1BQ0NFU1MtS0VZ
     AZURE_STORAGE_ACCOUNT_KEY: UkVQTEFDRS1XSVRILUFXUy1TRUNSRVQtS0VZ
   ```

   > **Note**
   >
   > You can use the following command to get a base64-encoded string from a plain text one:
   >
   > **in Linux**
   >
   > ```
   > $ echo -n 'plain-text-string' | base64 --wrap=0
   > ```
   >
   > **in macOS**
   >
   > ```
   > $ echo -n 'plain-text-string' | base64
   > ```

   Once the editing is over, create the Kubernetes Secret object as follows:

   ```
   $ kubectl apply -f deploy/backup-azure.yaml
   ```

2.

Put the data needed to access the Azure Blob storage into the `backup.storages` subsection of the Custom Resource.

- `storages.<NAME>.type should be set to` azure` (substitute the part with some arbitrary name you will later use to refer this storage when making backups and restores).
- `storages.<NAME>.azure.credentialsSecret` key should be set to the name used to refer your Kubernetes Secret (`my-cluster-azure-secret` in the last example).
- `storages.<NAME>.azure.container` option should contain the name of the Azure container. Also you can use `storages.<NAME>.azure.prefix` option to specify the path (sub-folder) to the backups inside the container. If prefix is not set, backups are stored in the root directory of the container.

These and other options within the `storages.<NAME>.azure` subsection are further described in the Operator Custom Resource options.

Here is an example of the deploy/cr.yaml configuration file which configures Azure Blob storage for backups:

```
...
backup:
  ...
  storages:
    azure-blob:
      type: azure
      azure:
        container: <your-container-name>
        prefix: psmdb
        credentialsSecret: my-cluster-azure-secret
      ...
```

Remote file server

You can use `fileystem` backup storage type to mount a *remote file server* to a local directory as a *sidecar volume*, and make Percona Backup for MongoDB using this directory as a storage for backups.

The approach is based on using common Network File System (NFS) protocol. Particularly, this storage type is useful in network-restricted environments without S3-compatible storage, or in cases with a non-standard storage service that still supports NFS access.

1. Add the remote storage as a sidecar volume in the `replset` section of the Custom Resource (and also in `configsvrReplSet` in case of a sharded cluster). You will need to specify the server hostname and some directory on it, as in the following example:

```
replsets:
- name: rs0
  ...
  sidecarVolumes:
  - name: backup-nfs-vol
    nfs:
      server: "nfs-service.storage.svc.cluster.local"
      path: "/psmdb-my-cluster-name-rs0"
  ...
```

The `backup-nfs-vol` name specified above will be used to refer this sidecar volume in the backup section.

2. Now put the mount point (the local directory path to which the remote storage will be mounted) and the name of your sidecar volume into the `backup.volumeMounts` subsection of the Custom Resource:

```
backup:
  ...
  volumeMounts:
  - mountPath: /mnt/nfs/
    name: backup-nfs-vol
  ...
```

3. Finally, storage of the `filesystem` type needs to be configured in the `backup.storages` subsection. It needs only the mount point:

```
backup:
  enabled: true
  ...
  storages:
    backup-nfs:
      type: filesystem
      filesystem:
        path: /mnt/nfs/
```

Making scheduled backups

Backups schedule is defined in the `backup` section of the Custom Resource and can be configured via the deploy/cr.yaml file.

1. The `backup.enabled` key should be set to `true`,
2. The `backup.storages` subsection should contain at least one configured storage.
3. The `backup.tasks` subsection allows to actually schedule backups:
   - set the `name` key to some arbitray backup name (this name will be needed later to restore the bakup).
   - specify the `schedule` option with the desired backup schedule in crontab format).
   - set the `enabled` key to `true` (this enables making the `<backup name>` backup along with the specified schedule.
   - set the `storageName` key to the name of your already configured storage.
   - you can optionally set the `keep` key to the number of backups which should be kept in the storage.
   - you can optionally set the `type` key to `physical` if you would like to make physical backups instead of logical ones (please see the physical backups limitations). Otherwise set this key to `logical`, or just omit it.

Here is an example of the `deploy/cr.yaml` with a scheduled Saturday night backup kept on the Amazon S3 storage:

```
...
backup:
  enabled: true
  storages:
    s3-us-west:
      type: s3
      s3:
        bucket: S3-BACKUP-BUCKET-NAME-HERE
        region: us-west-2
        credentialsSecret: my-cluster-name-backup-s3
  tasks:
   - name: "sat-night-backup"
     enabled: true
     schedule: "0 0 * * 6"
     keep: 3
     type: logical
     storageName: s3-us-west
  ...
```

Note

If you plan to restore backup to a new Kubernetes-based environment, make sure you will be able to create there a Secrets object with the same user passwords as in the original cluster. More details about secrets can be found in System Users. The name of the current Secrets object you will need to recreate can be found out from the `spec.secrets` key in the `deploy/cr.yaml` (`my-cluster-name-secrets` by default).

Making on-demand backup

1. To make an on-demand backup, you should first check your Custom Resource for the necessary options and make changes, if needed, using the `deploy/cr.yaml` configuration file:

   - the `backup.enabled` key should be set to `true`,
   - `backup.storages` subsection should contain at least one configured storage.

   You can apply changes in the `deploy/cr.yaml` file with the usual `kubectl apply -f deploy/cr.yaml` command.

2. Now use *a special backup configuration YAML file* with the following keys:

   - `metadata.name` key should be set to the **backup name** (this name will be needed later to restore the bakup),
   - `spec.clusterName` key should be set to the name of your cluster (prior to the Operator version 1.12.0 this key was named `spec.psmdbCluster`),
   - `spec.storageName` key should be set to the name of your already configured storage.
   - optionally you can set the `spec.type` key to `physical` if you would like to make physical backups instead of logical ones (please see the physical backups limitations). Otherwise set this key to `logical`, or just omit it.

   You can find the example of such file in deploy/backup/backup.yaml:

   ```
   apiVersion: psmdb.percona.com/v1
   kind: PerconaServerMongoDBBackup
   metadata:
     finalizers:
     - percona.com/delete-backup
     name: backup1
   spec:
     clusterName: my-cluster-name
     storageName: s3-us-west
     type: logical
   ```

3. Run the actual backup command using this file:

   ```
   $ kubectl apply -f deploy/backup/backup.yaml
   ```

Note

If you plan to restore backup to a new Kubernetes-based environment, make sure you will be able to create there a Secrets object with the same user passwords as in the original cluster. More details about secrets can be found in System Users. The name of the current Secrets object you will need to recreate can be found out from the `spec.secrets` key in the `deploy/cr.yaml` (`my-cluster-name-secrets` by default).

1. You can track the backup process with the `PerconaServerMongoDBBackup` Custom Resource as follows:

   ```
   $ kubectl get psmdb-backup
   ```

   Expected output

   ```
   NAME      CLUSTER           STORAGE      DESTINATION             STATUS    COMPLETED   AGE
   backup1   my-cluster-name   s3-us-west   2022-09-08T03:22:19Z    running               49s
   ```

   It should show the status as `READY` when the backup process is over.

   If you have any issues with the backup, you can view logs from the backup-agent container of the appropriate Pod as follows:

   ```
   $ kubectl logs pod/my-cluster-name-rs0 -c backup-agent
   ```

   Alternatively, getting ssh access to the same container will allow you to carry on Percona Backup for MongoDB diagnostics.

   Note

   In both cases you will need the name of the Pod that made the backup. You can find the `pbmPodName` field in the output of the `kubectl get psmdb-backup <backup_name> -o yaml` command.

Storing operations logs for point-in-time recovery

Point-in-time recovery functionality allows users to roll back the cluster to a specific date and time. Technically, this feature involves saving operations log updates to the cloud storage.

Starting from the Operator version 1.15.0, point-in-time recovery functionality can be used with both logical and physical backups. Previous versions supported point-in-time recovery only with logical backups.

To be used, it requires setting the backup.pitr.enabled key in the `deploy/cr.yaml` configuration file:

```
backup:
  ...
  pitr:
    enabled: true
    oplogOnly: true
```

Setting `backup.pitr.oplogOnly` option to `true` is needed only for physical backups. For logical backups this option can be omitted (or set to `false`, which is the default value).

It is necessary to have at least one full backup to use point-in-time recovery. By default Percona Backup for MongoDB will not upload operations logs if there is no full backup (`backup.pitr.oplogOnly` option controls this behavior). The rule of having at least one full backup is true for new clusters and also true for clusters which have been just recovered from backup.

Note

There is also the 'backup.pitr.oplogSpanMin` option which sets the time period between the uploads of oplogs, with default value of 10 minutes.

Percona Backup for MongoDB uploads operations logs to the same bucket/container, where full backup is stored. This makes point-in-time recovery functionality available only if there is a single bucket/container in spec.backup.storages. Otherwise point-in-time recovery will not be enabled and there will be an error message in the operator logs.

Note

Adding a new bucket or container when point-in-time recovery is enabled will not break it, but put error message about the additional bucket in the Operator logs as well.

Enable server-side encryption for backups

Encrypting database backups is done separately for physical and logical backups. Physical backups are encrypted if data-at-rest encryption is turned on. Logical backups need to be encrypted on the cloud.

There is a possibility to enable server-side encryption for backups stored on S3. Starting from the version 1.15.0, the Operator supports Server Side Encryption either with AWS Key Management Service (KMS), or just encrypt/decrypt backups with AES-256 encryption algorithm with any S3-compatible storage.

To enable server-side encryption for backups, use backup.storages.<storage-name>.s3.serverSideEncryption section in the `deploy/cr.yaml` configuration file.

Encryption with keys stored in AWS KMS

To use the server-side AWS KMS encryption, specify the ID of your customer-managed key and other needed options as follows:

with kmsKeyID in Custom Resource

Set the following Custom Resource options in the `deploy/cr.yaml` configuration file:

```
backup:
  ...
  storages:
    my-s3:
      type: s3
      s3:
        bucket: my-backup-bucket
        serverSideEncryption:
          kmsKeyID: <kms_key_ID>
          sseAlgorithm: aws:kms
```

Here `<kms_key_ID>` should be substituted with the ID of your customer-managed key stored in the AWS KMS. It should look similar to the following example value: `128887dd-d583-43f2-b3f9-d12036d32b12`.

with kmsKeyID in Secret object

You can avoid storing your `kmsKeyID` in Custom Resource, and put it into a dedicated Secrets object. Define your secret in YAML as follows:

deploy/sse-secret.yaml

```
apiVersion: v1
kind: Secret
metadata:
  name: my-cluster-name-sse
type: Opaque
stringData:
  KMS_KEY_ID: <kms_key_ID>
```

Here `<kms_key_ID>` should be substituted with the ID of your customer-managed key stored in the AWS KMS. It should look similar to the following example value: `128887dd-d583-43f2-b3f9-d12036d32b12`.

When the YAML file is ready, apply it to create the Secret:

```
$ kubectl create -f deploy/sse-secret.yaml
```

After creating the Secret, set the following Custom Resource options in the `deploy/cr.yaml` configuration file:

```
secrets:
  ...
  sse: my-cluster-name-sse
...
backup:
  ...
  storages:
    my-s3:
      type: s3
      s3:
        bucket: my-backup-bucket
        serverSideEncryption:
          sseAlgorithm: aws:kms
```

Encryption with localy-stored keys on any S3-compatible storage

The Operator also supports server-side encryption with customer-provided keys that are stored on the client side. During the backup/restore process, encryption key will be provided by the Operator as part of the requests to the S3 storage, and the S3 storage will use them to encrypt/decrypt the data with the AES-256 encryption algorithm. This allows to use server-side encryption on S3-compatible storages different from AWS KMS (the feature was tested with the AWS and MinIO storages).

To use the server-side encryption with locally-stored keys, specify your encryption key and other needed options:

with encryption key in Custom Resource

Set the following Custom Resource options in the `deploy/cr.yaml` configuration file:

```
backup:
  ...
  storages:
    my-s3:
      type: s3
      s3:
        bucket: my-backup-bucket
        serverSideEncryption:
          sseCustomerAlgorithm: AES256
          sseCustomerKey: <your_encryption_key_in_base64>
    ...
```

Here `<your_encryption_key_in_base64>` should be substituted with the actual encryption key encoded in base64.

with encryption key in Secret object

You can avoid storing your encryption key in Custom Resource, and put it into a dedicated Secrets object. Define your secret in YAML as follows:

deploy/sse-secret.yaml

```
apiVersion: v1
kind: Secret
metadata:
  name: my-cluster-name-sse
type: Opaque
stringData:
  SSE_CUSTOMER_KEY: <your_encryption_key_in_base64>
```

Here `<your_encryption_key_in_base64>` should be substituted with the actual encryption key encoded in base64.

When the YAML file is ready, apply it to create the Secret:

```
$ kubectl create -f deploy/sse-secret.yaml
```

After creating the Secret, set the following Custom Resource options in the `deploy/cr.yaml` configuration file:

```
secrets:
  ...
  sse: my-cluster-name-sse
...
backup:
  ...
  storages:
    my-s3:
      type: s3
      s3:
        bucket: my-backup-bucket
        serverSideEncryption:
          sseCustomerAlgorithm: AES256
    ...
```

Note

You can use the following command to get a base64-encoded string from a plain text one:

in Linux

```
$ echo -n 'plain-text-string' | base64 --wrap=0
```

in macOS

```
$ echo -n 'plain-text-string' | base64
```

Restore the cluster from a previously saved backup

The backup is normally restored on the Kubernetes cluster where it was made, but restoring it on a different Kubernetes-based environment with the installed Operator is also possible.

Following things are needed to restore a previously saved backup:

- Make sure that the cluster is running.
- Find out correct names for the **backup** and the **cluster**. Available backups can be listed with the following command:

  ```
  $ kubectl get psmdb-backup
  ```

  And the following command will list available clusters:

  ```
  $ kubectl get psmdb
  ```

> **Note**
>
> If you have configured storing operations logs for point-in-time recovery, you will have possibility to roll back the cluster to a specific date and time. Otherwise, restoring backups without point-in-time recovery is the only option.

When the correct names for the backup and the cluster are known, backup restoration can be done in the following way.

Without point-in-time recovery

1. Set appropriate keys in the deploy/backup/restore.yaml file.
   - set `spec.clusterName` key to the name of the target cluster to restore the backup on,
   - set `spec.backupName` key to the name of your backup,

   ```
   apiVersion: psmdb.percona.com/v1
   kind: PerconaServerMongoDBRestore
   metadata:
     name: restore1
   spec:
     clusterName: my-cluster-name
     backupName: backup1
   ```

2. After that, the actual restoration process can be started as follows:

```
$ kubectl apply -f deploy/backup/restore.yaml
```

> **Note**
>
> Storing backup settings in a separate file can be replaced by passing its content to the `kubectl apply` command as follows:
>
> ```
> $ cat <<EOF | kubectl apply -f-
> apiVersion: psmdb.percona.com/v1
> kind: PerconaServerMongoDBRestore
> metadata:
>   name: restore1
> spec:
>   clusterName: my-cluster-name
>   backupName: backup1
> EOF
> ```

With point-in-time recovery

1. Set appropriate keys in the deploy/backup/restore.yaml file.
   - set `spec.clusterName` key to the name of the target cluster to restore the backup on
   - set `spec.backupName` key to the name of your backup
   - put additional restoration parameters to the `pitr` section:
     - `type` key can be equal to one of the following options
       - `date` - roll back to specific date
       - `latest` - recover to the latest possible transaction
     - `date` key is used with `type=date` option and contains value in datetime format The resulting `restore.yaml` file may look as follows:

```
apiVersion: psmdb.percona.com/v1
kind: PerconaServerMongoDBRestore
metadata:
  name: restore1
spec:
  clusterName: my-cluster-name
  backupName: backup1
  pitr:
    type: date
    date: YYYY-MM-DD hh:mm:ss
```

Note

Full backup objects available with the `kubectl get psmdb-backup` command have a “Latest restorable time” information field handy when selecting a backup to restore. You can easily query the backup for this information as follows:

```
$ kubectl get psmdb-backup <backup_name> -o jsonpath='{.status.latestRestorableTime}'
```

2. Run the actual restoration process:

```
$ kubectl apply -f deploy/backup/restore.yaml
```

Note

Storing backup settings in a separate file can be replaced by passing its content to the `kubectl apply` command as follows:

```
$ cat <<EOF | kubectl apply -f-
apiVersion: psmdb.percona.com/v1
kind: PerconaServerMongoDBRestore
metadata:
  name: restore1
spec:
  clusterName: my-cluster-name
  backupName: backup1
  pitr:
    type: date
    date: YYYY-MM-DD hh:mm:ss
EOF
```

Selective restore

Starting with the version 1.18.0, the Operator allows doing partial restores, which means to do a selective restore only with the desired subset of data. This feature allows you to restore a specific database or a collection from a backup.

Selective restores are controlled by the additional `selective` section in the `PerconaServerMongoDBRestore` Custom Resource:

```
spec:
  selective:
    withUsersAndRoles: true
    namespaces:
    - "db1.collection1"
    - "db2.collection2"
```

The `selective.namespaces` field allows you to specify several “namespaces” (subsets of data) as a list. Each “namespace” is represented as a pair of database and collection names, or just `database_name.*` to get everything from the specific database. Specifying “*” as an item in the `namespaces` means restoring all databases and collections.

Also, you can use `selective.withUsersAndRoles` set to `true` to restore a custom database with users and roles from a full backup.

Selective restores support only logical backups and have a number of other limitations. See the full list of current selective restore limitations in Percona Backup for MongoDB documentation.

Delete the unneeded backup

The maximum amount of stored backups is controlled by the backup.tasks.keep option (only successful backups are counted). Older backups are automatically deleted, so that amount of stored backups do not exceed this number. Setting `keep=0` or removing this option from `deploy/cr.yaml` disables automatic deletion of backups.

Manual deleting of a previously saved backup requires not more than the backup name. This name can be taken from the list of available backups returned by the following command:

```
$ kubectl get psmdb-backup
```

When the name is known, backup can be deleted as follows:

```
$ kubectl delete psmdb-backup/<backup-name>
```

Note

Deleting a backup used as a base for point-in-time recovery (PITR) is possible only starting from the Operator version 1.15.0. Also, deleting such a backup will delete the stored operations log updates based on this backup.

Update Database and Operator

Starting from the version 1.1.0 the Percona Operator for MongoDB allows upgrades to newer versions. The upgradable components of the cluster are the following ones:

- the Operator;
- Custom Resource Definition (CRD),
- Database Management System (Percona Server for MongoDB).

> **Note**
>
> Additional steps are needed to upgrade database and Operator on Red Hat Marketplace or to upgrade Red Hat certified Operators on OpenShift. See this HOWTO for details.

The list of recommended upgrade scenarios includes two variants:

- Upgrade to the new versions of the Operator *and* Percona Server for MongoDB,
- Minor Percona Server for MongoDB version upgrade *without* the Operator upgrade.

Upgrading the Operator and CRD

> **Note**
>
> The Operator supports **last 3 versions of the CRD**, so it is technically possible to skip upgrading the CRD and just upgrade the Operator. If the CRD is older than the new Operator version *by no more than three releases*, you will be able to continue using the old CRD and even carry on Percona Server for MongoDB minor version upgrades with it. But the recommended way is to update the Operator *and* CRD.

The Operator version includes three numbers: `major`, `minor`, and `patch` (for example, the Operator version `1.18.0` has major version `1`, minor version `18`, and patch version `0`). Only the incremental update to a nearest `major.minor` version of the Operator is supported. To update to a newer version, which differs from the current `minor.major` version by more than one, make several incremental updates sequentially.

For example, to upgrade the Operator and CRD from the version 1.15.0 to 1.17.0, the following sequence of upgrades will be the shortest recommended path:

1. upgrading the Operator and CRD from 1.15.0 to 1.16.2,
2. upgrading from 1.16.2 to 1.17.0.

You can find Operator versions listed here.

Note

Starting from version 1.14.0, the Operator configures replica set members using local fully-qualified domain names (FQDN). Before this version, it used exposed IP addresses in the replica set configuration in case of the exposed replica set. If you have your replica set exposed and upgrade to 1.14.0, the replica set configuration will change to use FQDN. If you don't want such reconfiguration to happen, set `clusterServiceDNSMode` Custom Resource option to `External` before the upgrade.

Warning

Starting from the Operator version 1.15.0 the `spec.mongod` section (deprecated since 1.12.0) is finally removed from the Custom Resource configuration. If you have encryption disabled using the deprecated `mongod.security.enableEncryption` option, you need to set encryption disabled via the custom configuration before upgrade:

```
spec:
  ...
  replsets:
    - name: rs0
      ...
      configuration: |
        security:
          enableEncryption: false
        ...
```

Warning

Starting from the Operator version 1.16.0 MongoDB 4.4 support in the Operator has reached its end-of-life. Make sure that you have a supported MongoDB version before upgrading the Operator to 1.16.0 (you can use major version upgrade functionality to fix it.

Warning

Operator versions 1.19.0 and 1.19.1 have a recommended MongoDB version set to 7.0 because point-in-time recovery may fail on MongoDB 8.0 if sharding is enabled and the Operator version is 1.19.x. Therefore, upgrading to Operator 1.19.0/1.19.1 is not recommended for sharded MongoDB 8.0 clusters.

Manual upgrade

The upgrade includes the following steps.

1. Update the Custom Resource Definition for the Operator, taking it from the official repository on Github, and do the same for the Role-based access control:

```
$ kubectl apply --server-side -f https://raw.githubusercontent.com/percona/
percona-server-mongodb-operator/v1.19.1/deploy/crd.yaml
$ kubectl apply -f https://raw.githubusercontent.com/percona/percona-server-
mongodb-operator/v1.19.1/deploy/rbac.yaml
```

2. Now you should apply a patch to your deployment, supplying necessary image name with a newer version tag. You can find the proper image name for the current Operator release in the list of certified images. updating to the `1.19.1` version should look as follows:

```
$ kubectl patch deployment percona-server-mongodb-operator \
   -p'{"spec":{"template":{"spec":{"containers":[{"name":"percona-server-
mongodb-operator","image":"percona/percona-server-mongodb-
operator:1.19.1"}]}}}}'
```

3. The deployment rollout will be automatically triggered by the applied patch. You can track the rollout process in real time with the `kubectl rollout status` command with the name of your cluster:

```
$ kubectl rollout status deployments percona-server-mongodb-operator
```

> **Note**
>
> Labels set on the Operator Pod will not be updated during upgrade.

Upgrade via helm

If you have installed the Operator using Helm, you can upgrade the Operator with the `helm upgrade` command.

> **Note**
>
> You can use `helm upgrade` to upgrade the Operator only. The Database (Percona Server for MongoDB) should be upgraded in the same way whether you used helm to install it or not.

1. Update the Custom Resource Definition for the Operator, taking it from the official repository on Github, and do the same for the Role-based access control:

```
$ kubectl apply --server-side -f https://raw.githubusercontent.com/percona/
percona-server-mongodb-operator/v1.19.1/deploy/crd.yaml
$ kubectl apply -f https://raw.githubusercontent.com/percona/percona-server-
mongodb-operator/v1.19.1/deploy/rbac.yaml
```

2. If you installed the Operator with no customized parameters, the upgrade can be done as follows:

```
$ helm upgrade my-op percona/psmdb-operator --version 1.19.1
```

The `my-op` parameter in the above example is the name of a release object which which you have chosen for the Operator when installing its Helm chart.

If the Operator was installed with some customized parameters, you should list these options in the upgrade command.

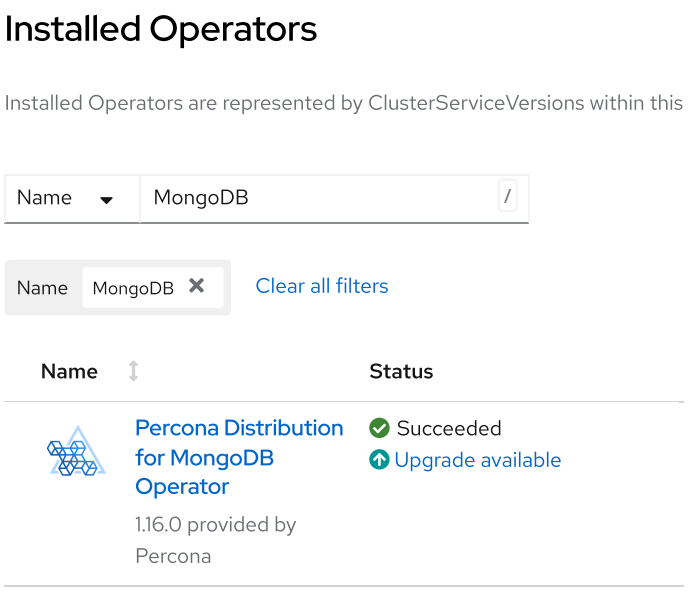
You can get list of used options in YAML format with the `helm get values my-op -a > my-values.yaml` command, and this file can be directly passed to the upgrade command as follows:

```
$ helm upgrade my-op percona/psmdb-operator --version 1.19.1 -f my-values.yaml
```

Upgrade via Operator Lifecycle Manager (OLM)

If you have installed the Operator on the OpenShift platform using OLM, you can upgrade the Operator within it.

1. List installed Operators for your Namespace to see if there are upgradable items.



2. Click the “Upgrade available” link to see upgrade details, then click “Preview InstallPlan” button, and finally “Approve” to upgrade the Operator.

Upgrading Percona Server for MongoDB

The following section presumes that you are upgrading your cluster within the *Smart Update strategy*, when the Operator controls how the objects are updated. Smart Update strategy is on when the `updateStrategy` key in the Custom Resource configuration file is set to `SmartUpdate` (this is the default value and the recommended way for upgrades).

> **Note**
>
> As an alternative, the `updateStrategy` key can be used to turn off *Smart Update strategy*. You can find out more on this in the appropriate section.

Manual upgrade

Manual update of Percona Server for MongoDB can be done as follows:

1. Make sure that `spec.updateStrategy` option in the Custom Resource is set to `SmartUpdate`, `spec.upgradeOptions.apply` option is set to `Never` or `Disabled` (this means that the Operator will not carry on upgrades automatically).

   ```
   ...
   spec:
     updateStrategy: SmartUpdate
     upgradeOptions:
       apply: Disabled
       ...
   ```

2. Now apply a patch to your Custom Resource, setting necessary Custom Resource version and image names with a newer version tag.

   > **Note**
   >
   > Check the version of the Operator you have in your Kubernetes environment. Please refer to the Operator upgrade guide to upgrade the Operator and CRD, if needed.

   Patching Custom Resource is done with the `kubectl patch psmdb` command. Actual image names can be found in the list of certified images. For example, updating `my-cluster-name` cluster to the `1.19.1` version should look as follows:

```
$ kubectl patch psmdb my-cluster-name --type=merge --patch '{
   "spec": {
      "crVersion":"1.19.1",
      "image": "percona/percona-server-mongodb:7.0.14-8",
      "backup": { "image": "percona/percona-backup-mongodb:2.8.0" },
      "pmm": { "image": "percona/pmm-client:2.44.0" }
   }}'
```

Warning

The above command upgrades various components of the cluster including PMM Client. It is highly recommended to upgrade PMM Server **before** upgrading PMM Client. If it wasn't done and you would like to avoid PMM Client upgrade, remove it from the list of images, reducing the last of two patch commands as follows:

```
$ kubectl patch psmdb my-cluster-name --type=merge --patch '{
   "spec": {
      "crVersion":"1.19.1",
      "backup": { "image": "percona/percona-backup-mongodb:2.8.0" }
   }}'
```

3. The deployment rollout will be automatically triggered by the applied patch. You can track the rollout process in real time using the `kubectl rollout status` command with the name of your cluster:

   ```
   $ kubectl rollout status sts my-cluster-name-rs0
   ```

   The update process is successfully finished when all Pods have been restarted (including the mongos and Config Server nodes, if Percona Server for MongoDB Sharding is on).

Automated upgrade

If you have *Smart Update strategy* turned on, you can automate upgrades even more with the `upgradeOptions.apply` option. In this case the Operator can either detect the availability of the new Percona Server for MongoDB version, or rely on your choice of the version. To check the availability of the new version, the Operator will query a special *Version Service* server at scheduled times to obtain fresh information about version numbers and valid image paths.

If the current version should be upgraded, the Operator updates the Custom Resource to reflect the new image paths and carries on sequential Pods deletion, allowing StatefulSet to redeploy the cluster Pods with the new image. You can configure Percona Server for MongoDB upgrade via the `deploy/cr.yaml` configuration file as follows:

1. Make sure that `spec.updateStrategy` option is set to `SmartUpdate`.
2.

Change `spec.crVersion` option to match the version of the Custom Resource Definition upgrade you have done while upgrading the Operator:

```
...
spec:
  crVersion: 1.19.1
  ...
```

Note

If you don't update crVersion, minor version upgrade is the only one to occur. For example, the image `percona-server-mongodb:6.0.15-12` can be upgraded to `percona-server-mongodb:6.0.16-13`.

3. Set the `upgradeOptions.apply` option from `Disabled` to one of the following values:

- `Recommended` - automatic upgrade will choose the most recent version of software flagged as Recommended (for clusters created from scratch, the Percona Server for MongoDB 8.0 version will be selected instead of the Percona Server for MongoDB 7.0 or 6.0 version regardless of the image path; for already existing clusters, the 8.0 vs. 7.0 vs. 6.0 branch choice will be preserved),
- `8.0-recommended`, `7.0-recommended`, `6.0-recommended` - same as above, but preserves specific major MongoDB version for newly provisioned clusters (ex. 8.0 will not be automatically used instead of 7.0),
- `Latest` - automatic upgrade will choose the most recent version of the software available (for clusters created from scratch, the Percona Server for MongoDB 8.0 version will be selected instead of the Percona Server for MongoDB 7.0 or 6.0 version regardless of the image path; for already existing clusters, the 8.0 vs. 7.0 vs. 6.0 branch choice will be preserved),
- `8.0-latest`, `7.0-latest`, `6.0-latest` - same as above, but preserves specific major MongoDB version for newly provisioned clusters (ex. 8.0 will not be automatically used instead of 7.0),
- *version number* - specify the desired version explicitly (version numbers are specified as 6.0.18-15, 7.0.14-8, etc.). Actual versions can be found in the list of certified images.

Note

- Prior to the Operator version 1.19.0 Percona Server for MongoDB 5.0 could be used with `upgradeOptions.apply` set to `5.0-recommended` or `5.0-latest`. MongoDB 5.0 support has reached its end-of-life in the Operator version 1.19.0. Users of existing clusters based on Percona Server for MongoDB 5.0 should explicitly switch to newer database versions before upgrading the Operator to 1.19.0.
- Prior to the Operator version 1.16.0 Percona Server for MongoDB 4.4 could be used with `upgradeOptions.apply` set to `4.4-recommended` or `4.4-latest`. MongoDB 4.4 support has reached its end-of-life in the Operator version 1.16.0. Users of existing clusters based on Percona Server for MongoDB 4.4 should explicitly switch to newer database versions before upgrading the Operator to 1.16.0.

4. Make sure the `versionServiceEndpoint` key is set to a valid Version Server URL (otherwise Smart Updates will not occur).

Percona's Version Service (default)

You can use the URL of the official Percona's Version Service (default). Set `upgradeOptions.versionServiceEndpoint` to `https://check.percona.com`.

Version Service inside your cluster

Alternatively, you can run Version Service inside your cluster. This can be done with the `kubectl` command as follows:

```
$ kubectl run version-service --image=perconalab/version-service --
env="SERVE_HTTP=true" --port 11000 --expose
```

> **Note**
>
> Version Service is never checked if automatic updates are disabled in the `upgradeOptions.apply` option. If automatic updates are enabled, but the Version Service URL can not be reached, no updgrades will be performed.

5. Use the `upgradeOptions.schedule` option to specify the update check time in CRON format.

   The following example sets the midnight update checks with the official Percona's Version Service:

```
spec:
  updateStrategy: SmartUpdate
  upgradeOptions:
    apply: Recommended
    versionServiceEndpoint: https://check.percona.com
    schedule: "0 0 * * *"
...
```

> **Note**
>
> You can force an immediate upgrade by changing the schedule to `* * * * *` (continuously check and upgrade) and changing it back to another more conservative schedule when the upgrade is complete.

6. Don't forget to apply your changes to the Custom Resource in the usual way:

```
$ kubectl apply -f deploy/cr.yaml
```

> **Note**
>
> When automatic upgrades are disabled by the `apply` option, Smart Update functionality will continue working for changes triggered by other events, such as rotating a password, or changing resource values.

Major version automated upgrades

Normally automatic upgrade takes place within minor versions (for example, from `6.0.15-12` to `6.0.16-13`) of MongoDB. Major versions upgrade (for example moving from `6.0-recommended` to `7.0-recommended`) is more complicated task which might potentially affect how data is stored and how applications interacts with the database (in case of some API changes).

Such upgrade is supported by the Operator within one major version at a time: for example, to change Percona Server for MongoDB major version from 6.0 to 8.0, you should first upgrade it to 7.0, and later make a separate upgrade from 7.0 to 8.0. The same is true for major version downgrades.

> **Note**
>
> It is recommended to take a backup before upgrade, as well as to perform upgrade on staging environment.

Major version upgrade can be initiated using the upgradeOptions.apply key in the `deploy/cr.yaml` configuration file:

```
spec:
  upgradeOptions:
    apply: 6.0-recommended
```

> **Note**
>
> When making downgrades (e.g. changing version from 7.0 to 6.0), make sure to remove incompatible features that are persisted and/or update incompatible configuration settings. Compatibility issues between major MongoDB versions can be found in upstream documentation.

By default the Operator doesn't set FeatureCompatibilityVersion (FCV) to match the new version, thus making sure that backwards-incompatible features are not automatically enabled with the major version upgrade (which is recommended and safe behavior). You can turn this backward compatibility off at any moment (after the upgrade or even before it) by setting the upgradeOptions.setFCV flag in the `deploy/cr.yaml` configuration file to `true`.

Note

With setFeatureCompatibilityVersion set major version rollback is not currently supported by the Operator. Therefore it is recommended to stay without enabling this flag for some time after the major upgrade to ensure the likelihood of downgrade is minimal. Setting `setFCV` flag to `true` simultaneously with the `apply` flag should be done only if the whole procedure is tested on staging and you are 100% sure about it.

More on upgrade strategies

The recommended way to upgrade your cluster is to use the *Smart Update strategy*, when the Operator controls how the objects are updated. Smart Update strategy is on when the `updateStrategy` key in the Custom Resource configuration file is set to `SmartUpdate` (this is the default value and the recommended way for upgrades).

Alternatively, you can set this key to `RollingUpdate` or `OnDelete`, which means that you will have to follow the low-level Kubernetes way of database upgrades. But take into account, that `SmartUpdate` strategy is not just for simplifying upgrades. Being turned on, it allows to disable automatic upgrades, and still controls restarting Pods in a proper order for changes triggered by other events, such as updating a ConfigMap, rotating a password, or changing resource values. That's why `SmartUpdate` strategy is useful even when you have no plans to automate upgrades at all.

Scale Percona Server for MongoDB on Kubernetes and OpenShift

One of the great advantages brought by Kubernetes and the OpenShift platform is the ease of an application scaling. Scaling a Deployment up or down ensures new Pods are created and set to available Kubernetes nodes.

Scaling can be vertical and horizontal. Vertical scaling adds more compute or storage resources to MongoDB nodes; horizontal scaling is about adding more nodes to the cluster. High availability looks technically similar, because it also involves additional nodes, but the reason is maintaining liveness of the system in case of server or network failures.

Vertical scaling

Scale compute

There are multiple components that Operator deploys and manages: MongoDB replica set instances, mongos and config server instances, etc. To add or reduce CPU or Memory you need to edit corresponding sections in the Custom Resource. We follow the structure for requests and limits that Kubernetes provides.

To add more resources to your MongoDB replica set instances, edit the following section in the Custom Resource:

```
spec:
  replsets:
    resources:
      requests:
        memory: 4G
        cpu: 2
      limits:
        memory: 4G
        cpu: 2
```

Use our reference documentation for the Custom Resource options for more details about other components.

Scale storage

Kubernetes manages storage with a PersistentVolume (PV), a segment of storage supplied by the administrator, and a PersistentVolumeClaim (PVC), a request for storage from a user. In Kubernetes v1.11 the feature was added to allow a user to increase the size of an existing PVC object (considered stable since Kubernetes v1.24). The user cannot shrink the size of an existing PVC object.

Starting from the version 1.16.0, the Operator allows to scale Percona Server for MongoDB storage automatically by changing the appropriate Custom Resource option, if the volume type supports PVCs expansion.

Automated scaling with Volume Expansion capability

Warning

Automated storage scaling by the Operator is in a technical preview stage and is not recommended for production environments.

Certain volume types support PVCs expansion (exact details about PVCs and the supported volume types can be found in Kubernetes documentation).

You can run the following command to check if your storage supports the expansion capability:

```
$ kubectl describe sc <storage class name> | grep AllowVolumeExpansion
```

Expected output

```
AllowVolumeExpansion: true
```

You can enable automated scaling with the enableVolumeExpansion Custom Resource option (turned off by default). When enabled, the Operator will automatically expand such storage for you when you change the `replsets.<NAME>.volumeSpec.persistentVolumeClaim.resources.requests.storage` and/or `configsvrReplSet.volumeSpec.persistentVolumeClaim.resources.requests.storage` options in the Custom Resource.

For example, you can do it by editing and applying the `deploy/cr.yaml` file:

```
spec:
  ...
  enableVolumeExpansion: true
  ...
  replsets:
    ...
    volumeSpec:
      persistentVolumeClaim:
        resources:
          requests:
            storage: <NEW STORAGE SIZE>
```

Apply changes as usual:

```
$ kubectl apply -f cr.yaml
```

Manual scaling without Volume Expansion capability

Manual scaling is the way to go if your version of the Operator is older than 1.16.0, your volumes have type which does not support Volume Expansion, or you just do not rely on automated scaling.

You will need to delete Pods one by one and their persistent volumes to resync the data to the new volumes. **This can also be used to shrink the storage.**

1. Update the Custom Resource with the new storage size by editing and applying the `deploy/cr.yaml` file:

   ```
   spec:
     ...
     replsets:
       ...
       volumeSpec:
         persistentVolumeClaim:
           resources:
             requests:
               storage: <NEW STORAGE SIZE>
   ```

   Apply the Custom Resource update in a usual way:

   ```
   $ kubectl apply -f deploy/cr.yaml
   ```

2. Delete the StatefulSet with the `orphan` option

   ```
   $ kubectl delete sts <statefulset-name> --cascade=orphan
   ```

The Pods will not go down and the Operator is going to recreate the StatefulSet:

```
$ kubectl get sts <statefulset-name>
```

Expected output

```
my-cluster-name-rs0      3/3     39s
```

3. Scale up the cluster (Optional)

   Changing the storage size would require us to terminate the Pods, which decreases the computational power of the cluster and might cause performance issues. To improve performance during the operation we are going to change the size of the cluster from 3 to 5 nodes:

```
spec:
  ...
  replsets:
    ...
    size: 5
```

Apply the change:

```
$ kubectl apply -f deploy/cr.yaml
```

New Pods will already have new storage:

```
$ kubectl get pvc
```

Expected output

```
NAME                                 STATUS   VOLUME
CAPACITY   ACCESS MODES   STORAGECLASS   AGE
mongod-data-my-cluster-name-cfg-0   Bound    pvc-a2b37f4d-6f11-443c-8670-de82ce9fc335
10Gi       RWO            standard       110m
mongod-data-my-cluster-name-cfg-1   Bound    pvc-ded949e5-0f93-4f57-ab2c-7c5fd9528fa0
10Gi       RWO            standard       109m
mongod-data-my-cluster-name-cfg-2   Bound    pvc-f3a441dd-94b6-4dc0-b96c-58b7851dfaa0
10Gi       RWO            standard       108m
mongod-data-my-cluster-name-rs0-0   Bound    pvc-b183c40b-c165-445a-aacd-9a34b8fff227
19Gi       RWO            standard       49m
mongod-data-my-cluster-name-rs0-1   Bound    pvc-f186426b-cbbe-4c31-860e-97a4dfca3de0
19Gi       RWO            standard       47m
mongod-data-my-cluster-name-rs0-2   Bound    pvc-6beb6ccd-8b3a-4580-b3ef-a2345a2c21d6
19Gi       RWO            standard       45m
```

4. Delete PVCs and Pods with old storage size one by one. Wait for data to sync before you proceeding to the next node.

   ```
   $ kubectl delete pvc <PVC NAME>
   $ kubectl delete pod <POD NAME>
   ```

   The new PVC is going to be created along with the Pod.

Horizontal scaling

The size of the cluster is controlled by the `size` key in the Custom Resource options configuration.

> **Note**
>
> The Operator will not allow to scale Percona Server for MongoDB with the `kubectl scale statefulset <StatefulSet name>` command as it puts `size` configuration options out of sync.

You can change size separately for different components of your cluster by setting this option in the appropriate subsections:

- replsets.size allows to set the size of the MongoDB Replica Set,
- replsets.arbiter.size allows to set the number of Replica Set Arbiter instances,
- sharding.configsvrReplSet.size allows to set the number of Config Server instances,
- sharding.mongos.size allows to set the number of mongos instances.

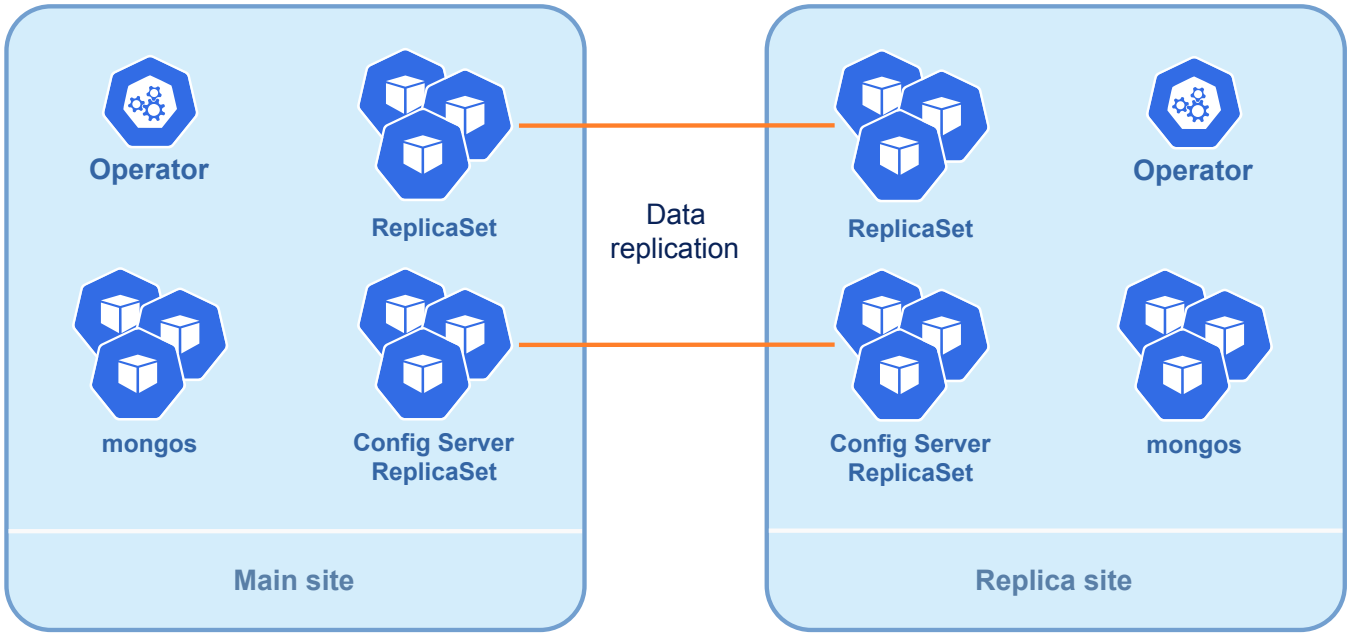
For example, the following update in `deploy/cr.yaml` will set the size of the MongoDB Replica Set to `5` nodes:

```
spec:
  ...
  replsets:
    ...
    size: 5
```

Don't forget to apply changes as usual, running the `kubectl apply -f deploy/cr.yaml` command.

Set up Percona Server for MongoDB cross-site replication

The cross-site replication involves configuring one MongoDB site as *Main*, and another MongoDB site as *Replica* to allow replication between them:



This feature can be useful in several cases:

- simplify the migration of the MongoDB cluster to and from Kubernetes
- add remote nodes to the replica set for disaster recovery
- keep the replica set of the database cluster in different data centers to get a fault-tolerant system.

Prerequisites

- Every node in *Main* and *Replica* clusters need to be reachable through network.
- User credentials should be the same in each cluster.
- TLS certificates should be the same in each cluster.

Glossary

- **Main cluster**: The cluster which the primary node runs and accepts write traffic. It's the **managed cluster** if it's running on Kubernetes.

- **Replica cluster**: The cluster which is configured to replicate from **main cluster**. It's the **unmanaged cluster** if it's running on Kubernetes.
- **Managed cluster**: The cluster controlled by operator. The operator controls everything from Replica Set configuration to users credentials. It's the default deployment of the operator.
- **Unmanaged cluster**: The cluster controlled by operator but the operator isn't responsible for managing Replica Set configuration.

Topologies

The Operator automates configuration of *Main* and *Replica* MongoDB sites, but the feature itself is not bound to Kubernetes. Either *Main* or *Replica* can run outside of Kubernetes, be regular MongoDB and be out of the Operators' control.

You need to have a single *Main* cluster but you can have multiple *Replica* clusters as long as you don't have more than 50 members in Replica Set. This limitation comes from MongoDB itself, for more information please check MongoDB docs.

Main and Replica clusters on Kubernetes

If you want both *Main* and *Replica* clusters to run on Kubernetes, overall steps will look like:

1. Deploy the *Main* cluster on a Kubernetes cluster (or use an existing one)
2. Get TLS secrets from the *Main* cluster and apply them to the namespace in Kubernetes cluster to which you'll deploy the *Replica* cluster
3. Deploy *Replica* cluster on a Kubernetes cluster
4. Add nodes from the *Replica* cluster to the *Main* cluster as external nodes

Main cluster on Kubernetes and Replica cluster outside of Kubernetes

If you want *Main* cluster to run on Kubernetes, but *Replica* cluster outside of Kubernetes, overall steps will look like:

1. Deploy the *Main* cluster on a Kubernetes cluster (or use an existing one)
2. Get TLS secrets from the *Main* cluster to configure the *Replica* cluster
3. Deploy the *Replica* cluster on wherever you want
4. Add nodes from the *Replica* cluster to the *Main* cluster as external nodes

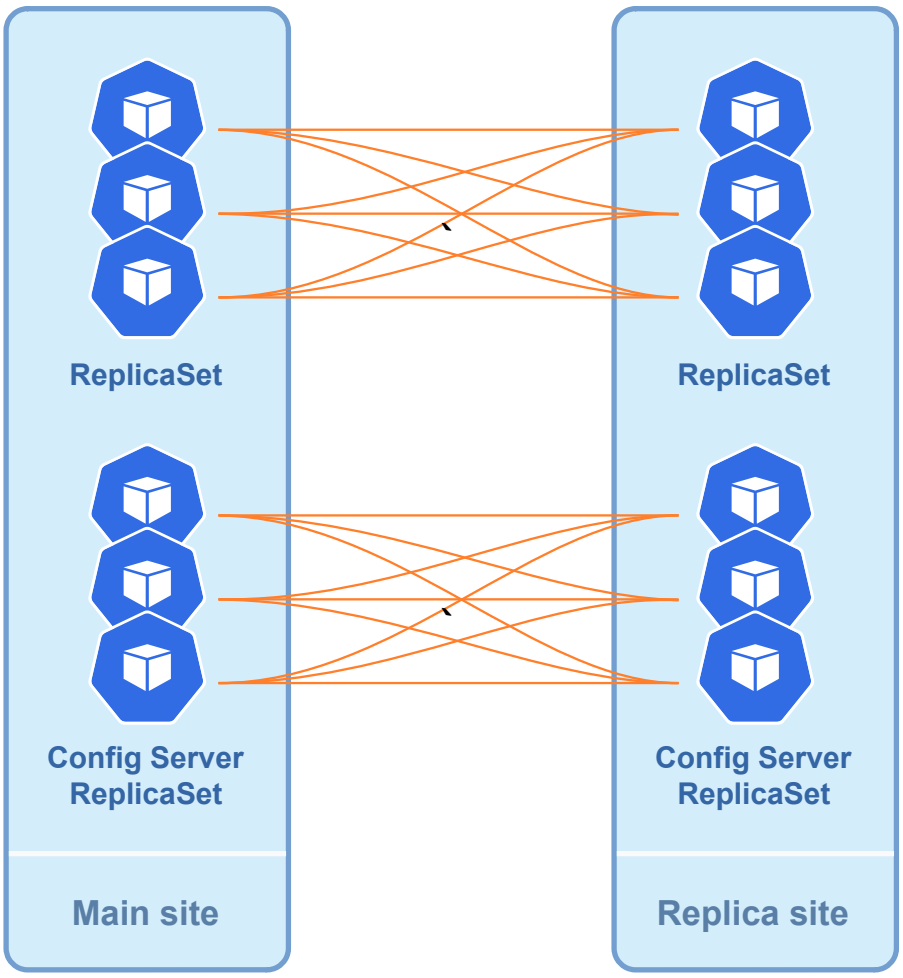
Main cluster outside of Kubernetes and Replica cluster on Kubernetes

If you want *Main* cluster to run outside of Kubernetes but *Replica* cluster on Kubernetes, overall steps will look like:

1. Deploy the *Main* cluster on wherever you want (or use an existing one)
2. Get TLS certificates and create a Kubernetes Secret with them
3. Get user credentials and create a Kubernetes Secret with them
4. Deploy the *Replica* cluster on a Kubernetes cluster
5. Add nodes from the *Replica* cluster to the *Main* cluster using Mongo client

Exposing instances of the MongoDB cluster

You need to expose all Replica Set nodes (including Config Servers) through a dedicated Service to ensure that both the *Main* and the *Replica* can reach each other, like in a full mesh:



This is done through the `replsets.expose`, `sharding.configsvrReplSet.expose`, and `sharding.mongos.expose` sections in the `deploy/cr.yaml` configuration file as follows.

```
spec:
  replsets:
  - rs0:
    expose:
      enabled: true
      type: LoadBalancer
    ...
  sharding:
    configsvrReplSet:
      expose:
        enabled: true
        type: LoadBalancer
      ...
```

The above example is using the LoadBalancer Kubernetes Service object, and the result will be a LoadBalancer per each Replica Set Pod. In most cases, this Load Balancer should be Internet-facing for cross-region replication to work. Also, there are other options except the LoadBalancer (ClusterIP, NodePort, etc.).

Note

Starting from v1.14, the Operator configures the replset using local DNS hostnames even if the replset is exposed. If you want to have IP addresses in the replset configuration to achieve a multi-cluster deployment, you need to set `clusterServiceDNSMode` to `External`.

To list the endpoints assigned to Pods, list the Kubernetes Service objects by executing `kubectl get services -l "app.kubernetes.io/instance=CLUSTER_NAME"` command.

Multi-cluster and multi-region deployment

Configuring cross-site replication on the Main site

The cluster managed by the Operator should be able to reach external nodes of the Replica Sets. You can provide needed information in the `replsets.externalNodes` and `sharding.configsvrReplset.externalNodes` subsections of the `deploy/cr.yaml` configuration file. Following keys can be set to specify each external *Replica*, both for its Replica Set and Config Server instances:

- set `host` to URL or IP address of the external replset instance,
- set `port` to the port number of the external node (or rely on the `27017` default value),
- set `priority` to define the priority of the external node (`2` is default for all local members of the cluster; external nodes should have lower priority to avoid unmanaged node being elected as a primary; `0` adds the node as a non-voting member),
- set `votes` to the number of votes an external node can cast in a replica set election (`0` is default and should be used for non-voting members of the cluster).

Here is an example:

```
spec:
  unmanaged: false
  replsets:
  - name: rs0
    externalNodes:
    - host: rs0-1.percona.com
      port: 27017
      priority: 0
      votes: 0
    - host: rs0-2.percona.com
    ...
  sharding:
    configsvrReplSet:
      size: 3
      externalNodes:
        - host: cfg-1.percona.com
          port: 27017
          priority: 0
          votes: 0
        - host: cfg-2.percona.com
        ...
```

The *Main* site will be ready for replication when you apply changes as usual:

```
$ kubectl apply -f deploy/cr.yaml
```

Note

Don't forget to expose instances of the Main cluster!

Getting the cluster secrets and certificates to be copied from Main to Replica

Main and *Replica* should have same Secrets objects (to have same users credentials) and certificates. So you may need to copy them from *Main*. Names of the corresponding objects are set in the `secrets.ssl`, `secrets.sslInternal`, `secrets.users`, and `secrets.keyfile` Custom Resource options. The default names are the following ones:

```
* `my-cluster-name-ssl` (SSL certificates for client connections),

* `my-cluster-name-ssl-internal` (SSL certificates for replication),

* `my-cluster-name-secrets` (user credentials),

* `my-cluster-name-mongodb-keyfile` (encryption key file).
```

If you can get Secrets from an existing cluster by executing the `kubectl get secret` command for *each* Secrets object you want to acquire:

```
$ kubectl get secret my-cluster-name-secrets -o yaml > my-cluster-secrets.yaml
```

Next remove the `annotations`, `creationTimestamp`, `resourceVersion`, `selfLink`, and `uid` metadata fields from the resulting file to make it ready for the *Replica*.

You will need to further apply these secrets on Replica.

Configuring cross-site replication on Replica instances

When the Operator creates a new cluster, a lot of things are happening, such as electing the Primary, generating certificates, and picking specific names. This should not happen if we want the Operator to run the *Replica* site, so first of all the cluster should be put into unmanaged state by setting the `unmanaged` key in the `deploy/cr.yaml` configuration file to true. Also you should set `updateStrategy` key to `OnDelete`, because Smart Updates are not allowed on unmanaged clusters. Also, the Operator versions prior to 1.19.0 did not support backups on unmanaged clusters, so set `backup.enabled` to `false` for the Operator 1.18.0 and older.

> **Note**
>
> Setting `unmanaged` to true will not only prevent the Operator from controlling the Replica Set configuration, but it will also result in not generating certificates and users credentials for new clusters.

Here is an example:

```
spec:
  unmanaged: true
  updateStrategy: OnDelete
  replsets:
  - name: rs0
    size: 3
    ...
```

The *Main* and *Replica* sites should have the same Secrets objects, so don't forget to apply Secrets from your *Main* site. Names of the corresponding objects are set in the `secrets.ssl`, `secrets.sslInternal`, `secrets.users`, and `secrets.keyfile` Custom Resource options (`my-cluster-name-ssl`, `my-cluster-name-ssl-internal`, `my-cluster-name-secrets`, and `my-cluster-name-mongodb-keyfile` by default).

> **Note**
>
> Replica will not start if the TLS secrets and the encryption key are not copied. If users are not copied, the replica will join the replica set, but it will be restarting due to failed liveness checks.

Copy your secrets from an existing cluster and apply each of them on your *Replica* site as follows:

```
$  kubectl apply -f my-cluster-secrets.yaml
```

The *Replica* site will be ready for replication when you apply changes as usual:

```
$ kubectl apply -f deploy/cr.yaml
```

Note

Don't forget that you need to expose instances of the Replica cluster!

Backups with cross-site replication

Before the Operator version 1.19.0 Backups were supported for the primary (managed) cluster only. Now backups can be taken on primary and replica clusters.

Still, backups on cross-site configurations have some specifics.

- Even though you can run backups in unmanaged clusters, you can't run restores on them.
- Even if the backup is started in primary (managed) cluster, most likely it will be taken from a secondary instance, even if such instance is on a separate cluster, because Percona Backup for MongoDB (PBM) automatically assigns lower priority to primary member to avoid affecting the write performance. This can be overwritten with custom PBM configuration.
- PBM configuration is shared across all clusters. The Operator will reconfigure PBM every time it runs a backup, and setting PBM configuration in one cluster will affect other clusters too. For example, setting `backup.configuration.backupOptions.oplogSpanMin` to 2 in a secondary cluster will be applied to primary cluster as well.

Splitting replica set across multiple data centers

Splitting the replica set of the database cluster over multiple Kubernetes clusters can be useful to get a fault-tolerant system in which all replicas are in different data centers.

The Operator cannot deploy MongoDB replicas to other data centers, but this solution can be achieved with a number of Operator deployments, equal to the size of your replica set. So, you will need at least 3 Operator instances: one Operator to control the replica set via cross-site replication, and at least two Operators to bootstrap the unmanaged clusters. Each cluster will contain replica set with only one member, and the *Main* site will manage instances from other sites as external nodes. All configuration of the replica set is done manually.

The solution has the following limitations to consider:

- setting it up involves a number of manual operations, and the same applies to scaling such a manually configured replica,
- backups are supported on the *Main* site only, not on the *Replica* sites.

Configuring the *Main* site

You will use the externally reachable URI for each of your replica set instances, manually overwiriting its default local fully-qualified domain name (FQDN) in the Custom Resouce manifest. Also you will need including all these host names into TLS certificates. So the first thing needed is the list of these externally reachable names. In the above example we will use the following ones:

- `r1.percona.local:443` URI for the `cluster-name-rs0-0` (1st replica set instance),
- `r2.percona.local:443` for the 2nd replica set instance,
- `r3.percona.local:443` for the 3rd replica set instance.

Following steps will allow you to prepare the *Main* site for cross-site replication, keeping in mind the multiple data centers deployment:

TLS certificates generated by the Operator are not suitable and it's required to generate certificates manually on the *Main* site before creating a database cluster, with all names from `replsetOverrides` and `externalNodes`.

1. Use TLS ceritficates manual generation instruction to prepare TLS certificates with the host names from your prepared list.
2.

Deploy your Main site as usual, with these manually generated certificates. Don't forget to turn on Pods exposure on your Main cluster.

3. Now override hostname of the first replica in the replica set configuration by using the `replsets.replsetOverrides` subsection in the Custom Resource options manifest with the externally reachable endpoint from your externally reachable URI list:

```
...
unsafeFlags:
  replsetSize: true
replsets:
- name: rs0
   size: 1
   replsetOverrides:
     cluster-name-rs0-0:
       host: r1.percona.local:443
   ...
```

The `unsafeFlags.replsetSize` option in the above example is needed to create replica set with less than 3 instances.

The actual approach to make the URI reachable from the outside of your Kubernetes culster depends on the exposure type. It is different in case of the NodePort exposure, Load balancer of the cloud provider, etc. Operator won't perform any validation for hostnames. It's user's responsibility to ensure connectivity.

Note

You can also add custom tags to the replset members, just to make their identication easier:

```
...
replsetOverrides:
  cluster-name-rs0-0:
    host: r1.percona.local:443
    tags:
      team: cloud
...
```

Configuring *Replica* sites

To configure *Replica* sites, you should deploy your Relica sites, repeating the following steps for each Kubernetes cluster you are adding:

1. Copy secrets from the *Main* site, rename them according to the cluster name you use on the *Replica* site (if needed), and apply.

- `cluster1-ssl` (SSL certificates for client connections),
- `cluster1-ssl-internal` (SSL certificates for replication),
- `cluster1-secrets` (user credentials),
- `cluster1-mongodb-encryption-key` (encryption key).

2. Deploy the database cluster on the *Replica* site. Don't forgetting the following:

   a. All *Replica* sites must be deployed with the `unmanaged: true` Custom Resource option. This will stop the Operator in the *Replica* cluster from touching the MongoDB replset configuration. Starting from this moment, only the Operator of the *Main* cluster will be able to modify it.

   b. Backups must be disabled with the `backup.enabaled: false` Custom Resource option.

   c. The `updateStrategy` Custom Resource option must be set to `RollingUpdate` or `OnDelete`.

   d. In order to create a single-instance replica set, you will need to the `unsafeFlags.replsetSize` option to `true` as you did on the *Main* site.

3. Now add the new *Replica* site's Pod **to your *Main* site's** `externalNodes` subsection of the Custom Resource options manifest:

```
replsets:
- name: rs0
  size: 1
  replsetOverrides:
    cluster1-rs0-0:
      host: r1.percona.local:443
  externalNodes:
  - host: r2.percona.local:443
    votes: 1
    priority: 1
```

Enabling multi-cluster Services

Kubernetes multi-cluster Services (MCS) is a cross-cluster discovery and invocation of Services. MCS-enabled Services become discoverable and accessible across clusters with a virtual IP address.

This feature allows splitting applications into multiple clusters combined in one *fleet*, which can be useful to separate logically standalone parts (i.e. stateful and stateless ones), or to address privacy and scalability requirements, etc.

Multi-cluster Services should be supported by the cloud provider. It is supported by Google Kubernetes Engine (GKE), and by Amazon Elastic Kubernetes Service (EKS).

Configuring your cluster for multi-cluster Services includes two parts:

- configure MCS with your cloud provider,
- make needed preparations with the Operator.

To set up MCS for a specific cloud provider you should follow official guides, for example ones from Google Kubernetes Engine (GKE), or from Amazon Elastic Kubernetes Service (EKS).

Warning

For EKS, you also need to create ClusterProperty objects prior to enabling multi-cluster services.

```
apiVersion: about.k8s.io/v1alpha1
  kind: ClusterProperty
metadata:
  name: cluster.clusterset.k8s.io
spec:
  value: [Your Cluster identifier]
---
apiVersion: about.k8s.io/v1alpha1
kind: ClusterProperty
metadata:
  name: clusterset.k8s.io
spec:
  value: [Your ClusterSet identifier]
```

Check AWS MCS controller repository for more information.

Setting up the Operator for MCS results in registering Services for export to other clusters using the ServiceExport object, and using ServiceImport one to import external services. Set the following options in the `multiCluster` subsection of the `deploy/cr.yaml` configuration file to make it happen:

- `multiCluster.enabled` should be set to `true`,
- `multiCluster.DNSSuffix` string should be equal to the cluster domain suffix for multi-cluster Services

used by Kubernetes (`svc.clusterset.local` by default ↗).

The following example in the `deploy/cr.yaml` configuration file is rather straightforward:

```
...
multiCluster:
  enabled: true
  DNSSuffix: svc.clusterset.local
...
```

Apply changes as usual with the `kubectl apply -f deploy/cr.yaml` command.

Note

If you want to enable multi-cluster services in a new cluster, we recommended deploying the cluster first with `multiCluster.enabled` set to `false` and enable it after replset is initialized. Having MCS enabled from the start is prone to errors on replset initialization.

The initial ServiceExport creation and sync with the clusters of the fleet takes approximately five minutes. You can check the list of services for export and import with the following commands:

```
$ kubectl get serviceexport
```

Expected output

```
NAME                    AGE
my-cluster-name-cfg     22m
my-cluster-name-cfg-0   22m
my-cluster-name-cfg-1   22m
my-cluster-name-cfg-2   22m
my-cluster-name-mongos  22m
my-cluster-name-rs0     22m
my-cluster-name-rs0-0   22m
my-cluster-name-rs0-1   22m
my-cluster-name-rs0-2   22m
```

```
$ kubectl get serviceimport
```

Expected output

```
NAME                    TYPE           IP                  AGE
my-cluster-name-cfg     Headless                           22m
my-cluster-name-cfg-0   ClusterSetIP   ["10.73.200.89"]    22m
my-cluster-name-cfg-1   ClusterSetIP   ["10.73.192.104"]   22m
my-cluster-name-cfg-2   ClusterSetIP   ["10.73.207.254"]   22m
my-cluster-name-mongos  ClusterSetIP   ["10.73.196.213"]   22m
my-cluster-name-rs0     Headless                           22m
my-cluster-name-rs0-0   ClusterSetIP   ["10.73.206.24"]    22m
my-cluster-name-rs0-1   ClusterSetIP   ["10.73.207.20"]    22m
my-cluster-name-rs0-2   ClusterSetIP   ["10.73.193.92"]    22m
```

Note

ServiceExport objects are created automatically by the Percona Server for MongoDB Operator. ServiceImport objects, on the other hand, are not controlled by the operator. If you need to troubleshoot ServiceImport objects you must check the MCS controller installed by your cloud provider.

After ServiceExport object is created, exported Services can be resolved from any Pod in any fleet cluster as `SERVICE_EXPORT_NAME.NAMESPACE.svc.clusterset.local`.

Note

This means that ServiceExports with the same name and namespace will be recognized as a single combined Service.

MCS can charge cross-site replication with additional limitations specific to the cloud provider. For example, GKE demands all participating Pods to be in the same project. Also, `default` Namespace should be used with caution: your cloud provider may not allow exporting Services from it to other clusters.

Applying MCS to an existing cluster

Additional actions are needed to turn on MCS for the **already-existing non-MCS cluster**.

- You need to restart the Operator after editing the `multiCluster` subsection keys and applying `deploy/cr.yaml`. Find the Operator's Pod name in the output of the `kubectl get pods` command (it will be something like `percona-server-mongodb-operator-d859b69b6-t44vk`) and delete it as follows:

  ```
  $ kubectl delete percona-server-mongodb-operator-d859b69b6-t44vk
  ```

- If you are enabling MCS for a running cluster after upgrading from the Operator version `1.11.0` or below, you need rotating multi-domain (SAN) certificates. Do this by pausing the cluster and deleting TLS Secrets.

Monitor database with Percona Monitoring and Management (PMM)

In this section you will learn how to monitor Percona Server for MongoDB with Percona Monitoring and Management (PMM).

> **Note**
>
> Only PMM 2.x versions are supported by the Operator.

PMM is a client/server application. It includes the PMM Server and the number of PMM Clients running on each node with the database you wish to monitor.

A PMM Client collects needed metrics and sends gathered data to the PMM Server. As a user, you connect to the PMM Server to see database metrics on a number of dashboards.

PMM Server and PMM Client are installed separately.

Install PMM Server

You must have PMM server up and running. You can run PMM Server as a *Docker image*, a *virtual appliance*, or on an *AWS instance*. Please refer to the official PMM documentation for the installation instructions.

Install PMM Client

To install PMM Client as a side-car container in your Kubernetes-based environment, do the following:

1. Authorize PMM Client within PMM Server.

Token-based authorization (recommended)

1. Generate the PMM Server API Key. Specify the Admin role when getting the API Key.

Warning: The API key is not rotated automatically.

1. Edit the deploy/secrets.yaml secrets file and specify the PMM API key for the `PMM_SERVER_API_KEY` option.
2. Apply the configuration for the changes to take effect.

```
$ kubectl apply -f deploy/secrets.yaml -n <namespace>
```

Password-based authorization (deprecated since version 1.13.0)

1. Edit the deploy/secrets.yaml secrets file and specify the following:
2. The user name of your PMM Server (`admin` by default) in the `PMM_SERVER_USER` key
3. The password you set for the PMM Server during its installation in the `PMM_SERVER_PASSWORD` key.
4. Apply the configuration for the changes to take effect.

```
$ kubectl apply -f deploy/secrets.yaml -n <namespace>
```

2. Update the `pmm` section in the deploy/cr.yaml file:

- Set `pmm.enabled` = `true`.
- Specify your PMM Server hostname / an IP address for the `pmm.serverHost` option. The PMM Server IP address should be resolvable and reachable from within your cluster.

```
pmm:
  enabled: true
  image: percona/pmm-client:2.44.0
  serverHost: monitoring-service
```

3. Apply the changes:

```
$ kubectl apply -f deploy/cr.yaml -n <namespace>
```

3. Check that corresponding Pods are not in a cycle of stopping and restarting. This cycle occurs if there are errors on the previous steps:

```
$ kubectl get pods -n <namespace>
$ kubectl logs <cluster-name>-rs0-0 -c pmm-client -n <namespace>
```

Check the metrics

Let's see how the collected data is visualized in PMM.

1. Log in to PMM server.
2. Click **MongoDB** from the left-hand navigation menu. You land on the **Instances Overview** page.
3. Select your cluster from the **Clusters** drop-down menu and the desired time range on the top of the page. You should see the metrics.
4. Click **MongoDB** → **Other dashboards** to see the list of available dashboards that allow you to drill down to the metrics you are interested in.

Enable profiling

Starting from the Operator version 1.12.0, MongoDB operation profiling is disabled by default. To analyze query execution on the PMM Query Analytics dashboard, you should enable profiling explicitly. You can pass options to MongoDB in several ways.

For example, update the `configuration` subsection of the `deploy/cr.yaml`:

```
spec:
  ...
  replsets:
    - name: rs0
      size: 3
      configuration: |
        operationProfiling:
          slowOpThresholdMs: 200
          mode: slowOp
          rateLimit: 100
```

Optionally, you can specify additional parameters for the `pmm-admin add mongodb` command in the `pmm.mongodParams` and `pmm.mongosParams` keys for `mongod` and `mongos` Pods respectively.

Info: Please take into account that the Operator automatically manages common MongoDB Service Monitoring parameters, such as username, password, service-name, host, etc. Assigning values to these parameters is not recommended and can negatively affect the functionality of the PMM setup carried out by the Operator.

When done, apply the edited `deploy/cr.yaml` file:

```
$ kubectl apply -f deploy/cr.yaml
```

Update the secrets file

The `deploy/secrets.yaml` file contains all values for each key/value pair in a convenient plain text format. But the resulting Secrets Objects contains passwords stored as base64-encoded strings. If you want to *update* the password field, you need to encode the new password into the base64 format and pass it to the Secrets Object.

To encode a password or any other parameter, run the following command:

on Linux

```
$ echo -n "password" | base64 --wrap=0
```

on macOS

```
$ echo -n "password" | base64
```

For example, to set the new PMM API key in the `my-cluster-name-secrets` object, do the following:

in Linux

```
$ kubectl patch secret/my-cluster-name-secrets -p '{"data":{"PMM_SERVER_API_KEY":
'$(echo -n new_key | base64 --wrap=0)'}}'
```

on macOS

```
$ kubectl patch secret/my-cluster-name-secrets -p '{"data":{"PMM_SERVER_API_KEY":
'$(echo -n new_key | base64)'}}'
```

Using sidecar containers

The Operator allows you to deploy additional (so-called *sidecar*) containers to the Pod. You can use this feature to run debugging tools, some specific monitoring solutions, etc.

> **Note**
>
> Custom sidecar containers can easily access other components of your cluster. Therefore they should be used carefully and by experienced users only.

Adding a sidecar container

You can add sidecar containers to Percona Distribution for MongoDB Replica Set, Config Servers, and mongos Pods. Just use `sidecars` subsection in the `replsets`, `sharding.configsvrReplSet`, and `sharding.mongos` of the `deploy/cr.yaml` configuration file. In this subsection, you should specify the name and image of your container and possibly a command to run:

```
spec:
  replsets:
    ....
    sidecars:
    - image: busybox
      command: ["/bin/sh"]
      args: ["-c", "while true; do echo echo $(date -u) 'test' >> /dev/null; sleep
5; done"]
      name: rs-sidecar-0
    ....
```

Apply your modifications as usual:

```
$ kubectl apply -f deploy/cr.yaml
```

Running `kubectl describe` command for the appropriate Pod can bring you the information about the newly created container:

```
$ kubectl describe pod my-cluster-name-rs0-0
```

Expected output

```
....
Containers:
....
rs-sidecar-0:
  Container ID:  docker://f0c3437295d0ec819753c581aae174a0b8d062337f80897144eb8148249ba742
  Image:         busybox
  Image ID:      docker-pullable://
busybox@sha256:139abcf41943b8bcd4bc5c42ee71ddc9402c7ad69ad9e177b0a9bc4541f14924
  Port:          <none>
  Host Port:     <none>
  Command:
    /bin/sh
  Args:
    -c
    while true; do echo echo $(date -u) 'test' >> /dev/null; sleep 5; done
  State:          Running
    Started:      Thu, 11 Nov 2021 10:38:15 +0300
  Ready:          True
  Restart Count:  0
  Environment:    <none>
  Mounts:
    /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-fbrbn (ro)
....
```

Getting shell access to a sidecar container

You can login to your sidecar container as follows:

```
$ kubectl exec -it my-cluster-name-rs0-0 -c rs-sidecar-0 -- sh
/ #
```

Mount volumes into sidecar containers

It is possible to mount volumes into sidecar containers.

Following subsections describe different volume types, which were tested with sidecar containers and are known to work. They allow either dynamically provisioning volumes for sidecar containers or mounting existing volumes.

Persistent Volume

You can use Persistent volumes when you need dynamically provisioned storage which doesn't depend on the Pod lifecycle. To use such volume, you should *claim* durable storage with persistentVolumeClaim without specifying any non-important details.

The following example requests 1G storage with `sidecar-volume-claim` PersistentVolumeClaim, and mounts the correspondent Persistent Volume to the `rs-sidecar-0` container's filesystem under the `/volume0` directory:

```
...
sidecars:
- image: busybox
  command: ["/bin/sh"]
  args: ["-c", "while true; do echo echo $(date -u) 'test' >> /dev/null; sleep 5;
done"]
  name: rs-sidecar-0
  volumeMounts:
  - mountPath: /volume0
    name: sidecar-volume-claim
sidecarPVCs:
- apiVersion: v1
  kind: PersistentVolumeClaim
  metadata:
    name: sidecar-volume-claim
  spec:
    resources:
      requests:
        storage: 1Gi
    volumeMode: Filesystem
    accessModes:
      - ReadWriteOnce
```

Note

Sidecar containers for *mongos* Pods have limited Persistent volumes support: `sharding.mongos.sidecarPVCs` option can be used if there is a single mongos in deployment or when `ReadWriteMany/ReadOnlyMany` access modes are used (but these modes are available not in every storage).

Secret

You can use a secret volume to pass the information which needs additional protection (e.g. passwords), to the container. Secrets are stored with the Kubernetes API and mounted to the container as RAM-stored files.

You can mount a secret volume via the `sidecarVolumes` subsection as follows:

```
...
sidecars:
- image: busybox
  command: ["/bin/sh"]
  args: ["-c", "while true; do echo echo $(date -u) 'test' >> /dev/null; sleep 5;
done"]
  name: rs-sidecar-0
  volumeMounts:
  - mountPath: /secret
    name: sidecar-secret
sidecarVolumes:
- name: sidecar-secret
  secret:
    secretName: mysecret
```

The above example creates a `sidecar-secret` volume (based on already existing `mysecret` Secret object) and mounts it to the `rs-sidecar-0` container's filesystem under the `/secret` directory.

> **Note**
>
> Don't forget you need to create a Secret Object before you can use it.

configMap

You can use a configMap volume to pass some configuration data to the container. Secrets are stored with the Kubernetes API and mounted to the container as RAM-stored files.

You can mount a configMap volume via the `sidecarVolumes` subsection as follows:

```
...
sidecars:
- image: busybox
  command: ["/bin/sh"]
  args: ["-c", "while true; do echo echo $(date -u) 'test' >> /dev/null; sleep 5;
done"]
  name: rs-sidecar-0
  volumeMounts:
  - mountPath: /config
    name: sidecar-config
sidecarVolumes:
- name: sidecar-config
  configMap:
    name: myconfigmap
```

The above example creates a `sidecar-config` volume (based on already existing `myconfigmap` configMap object) and mounts it to the `rs-sidecar-0` container's filesystem under the `/config` directory.

> **Note**
>
> Don't forget you need to create a configMap Object before you can use it.

Pause/resume Percona Server for MongoDB

There may be external situations when it is needed to shutdown the cluster for a while and then start it back up (some works related to the maintenance of the enterprise infrastructure, etc.).

The `deploy/cr.yaml` file contains a special `spec.pause` key for this. Setting it to `true` gracefully stops the cluster:

```
spec:
  .......
  pause: true
```

To start the cluster after it was shut down just revert the `spec.pause` key to `false`.

Initial troubleshooting

Percona Operator for MongoDB uses Custom Resources to manage options for the various components of the cluster.

- `PerconaServerMongoDB` Custom Resource with Percona Server for MongoDB options (it has handy `psmdb` shortname also),
- `PerconaServerMongoDBBackup` and `PerconaServerMongoDBRestore` Custom Resources contain options for Percona Backup for MongoDB used to backup Percona Server for MongoDB and to restore it from backups (`psmdb-backup` and `psmdb-restore` shortnames are available for them).

The first thing you can check for the Custom Resource is to query it with `kubectl get` command:

```
$ kubectl get psmdb
```

Expected output

```
NAME              ENDPOINT                                          STATUS   AGE
my-cluster-name   my-cluster-name-mongos.default.svc.cluster.local   ready    5m26s
```

The Custom Resource should have `Ready` status.

Note

You can check which Percona's Custom Resources are present and get some information about them as follows:

```
$ kubectl api-resources | grep -i percona
```

Expected output

```
perconaservermongodbbackups       psmdb-backup    psmdb.percona.com/v1
true         PerconaServerMongoDBBackup
perconaservermongodbrestores      psmdb-restore   psmdb.percona.com/v1
true         PerconaServerMongoDBRestore
perconaservermongodbs             psmdb           psmdb.percona.com/v1
true         PerconaServerMongoDB
```

Check the Pods

If Custom Resource is not getting `Ready` status, it makes sense to check individual Pods. You can do it as follows:

```
$ kubectl get pods
```

Expected output

```
NAME                                               READY   STATUS    RESTARTS   AGE
my-cluster-name-cfg-0                              2/2     Running   0          11m
my-cluster-name-cfg-1                              2/2     Running   1          10m
my-cluster-name-cfg-2                              2/2     Running   1          9m
my-cluster-name-mongos-0                           1/1     Running   0          11m
my-cluster-name-mongos-1                           1/1     Running   0          11m
my-cluster-name-mongos-2                           1/1     Running   0          11m
my-cluster-name-rs0-0                              2/2     Running   0          11m
my-cluster-name-rs0-1                              2/2     Running   0          10m
my-cluster-name-rs0-2                              2/2     Running   0          9m
percona-server-mongodb-operator-665cd69f9b-xg5dl   1/1     Running   0          37m
```

The above command provides the following insights:

- `READY` indicates how many containers in the Pod are ready to serve the traffic. In the above example, `my-cluster-name-rs0-0` Pod has all two containers ready (2/2). For an application to work properly, all containers of the Pod should be ready.
- `STATUS` indicates the current status of the Pod. The Pod should be in a `Running` state to confirm that the application is working as expected. You can find out other possible states in the official Kubernetes documentation.
- `RESTARTS` indicates how many times containers of Pod were restarted. This is impacted by the Container Restart Policy. In an ideal world, the restart count would be zero, meaning no issues from the beginning. If the restart count exceeds zero, it may be reasonable to check why it happens.
- `AGE`: Indicates how long the Pod is running. Any abnormality in this value needs to be checked.

You can find more details about a specific Pod using the `kubectl describe pods <pod-name>` command.

```
$ kubectl describe pods my-cluster-name-rs0-0
```

Expected output

```
...
Name:         my-cluster-name-rs0-0
Namespace:    default
...
Controlled By:  StatefulSet/my-cluster-name-rs0
Init Containers:
 mongo-init:
...
Containers:
 mongod:
...
   Restart Count:  0
   Limits:
     cpu:     300m
     memory:  500M
   Requests:
     cpu:      300m
     memory:   500M
   Liveness:   exec [/opt/percona/mongodb-healthcheck k8s liveness --ssl --sslInsecure --
sslCAFile /etc/mongodb-ssl/ca.crt --sslPEMKeyFile /tmp/tls.pem --startupDelaySeconds 7200]
delay=60s timeout=10s period=30s #success=1 #failure=4
   Readiness:  tcp-socket :27017 delay=10s timeout=2s period=3s #success=1 #failure=8
   Environment Variables from:
     internal-my-cluster-name-users  Secret  Optional: false
   Environment:
...
   Mounts:
...
Volumes:
...
Events:                      <none>
```

This gives a lot of information about containers, resources, container status and also events. So, describe output should be checked to see any abnormalities.

Troubleshooting

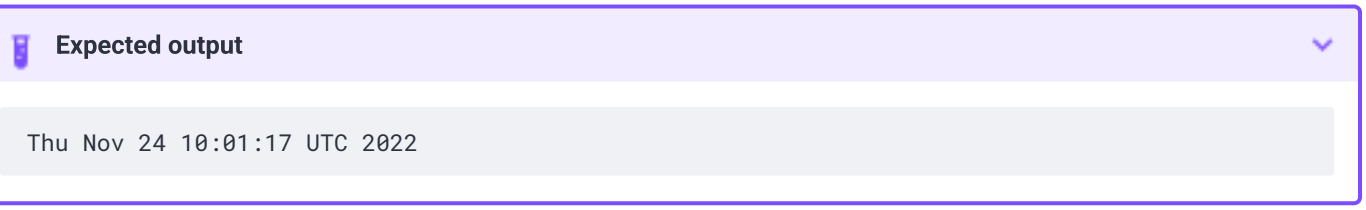
Exec into the containers

If you want to examine the contents of a container “in place” using remote access to it, you can use the `kubectl exec` command. It allows you to run any command or just open an interactive shell session in the container. Of course, you can have shell access to the container only if container supports it and has a “Running” state.

In the following examples we will access the container `mongod` of the `my-cluster-name-rs0-0` Pod.

- Run `date` command:

```
$ kubectl exec -ti my-cluster-name-rs0-0 -c mongod -- date
```



  You will see an error if the command is not present in a container. For example, trying to run the `time` command, which is not present in the container, by executing `kubectl exec -ti my-cluster-name-rs0-0 -c mongod -- time` would show the following result:

```
OCI runtime exec failed: exec failed: unable to start container process: exec:
"time": executable file not found in $PATH: unknown command terminated with exit
code 126
```

- Print `/var/log/mongo/mongod.log` file to a terminal:

```
$ kubectl exec -ti my-cluster-name-rs0-0 -c mongod -- cat /var/log/mongo/
mongod.log
```

- Similarly, opening an Interactive terminal, executing a pair of commands in the container, and exiting it may look as follows:

```
$ kubectl exec -ti my-cluster-name-rs0-0 -c mongod -- bash
[mongodb@my-cluster-name-rs0-0 db]$ cat /etc/hostname
my-cluster-name-rs0-0
[mongodb@my-cluster-name-rs0-0 db]$ ls /var/log/mongo/mongod.log
/var/log/mongo/mongod.log
[mongodb@my-cluster-name-rs0-0 db]$ exit
exit
$
```

Avoid the restart-on-fail loop for Percona Server for MongoDB containers

The restart-on-fail loop takes place when the container entry point fails (e.g. `mongod` crashes). In such a situation, Pod is continuously restarting. Continuous restarts prevent to get console access to the container, and so a special approach is needed to make fixes.

You can prevent such infinite boot loop by putting the Percona Server for MongoDB containers into the “infinite sleep” *without* starting mongod. This behavior of the container entry point is triggered by the presence of the `/data/db/sleep-forever` file. The feature is available for both replica set and confg server Pods.

For example, you can do it for the `mongod` container of an appropriate Percona Server for MongoDB Pod as follows:

```
$ kubectl exec -it my-cluster-name-cfg-0 -c mongod -- sh -c 'touch /data/db/sleep-forever'
```

If `mongod` container can’t start, you can use `backup-agent` container instead:

```
$ kubectl exec -it my-cluster-name-cfg-0 -c backup-agent -- sh -c 'touch /data/db/sleep-forever'
```

The instance will restart automatically and run in its usual way as soon as you remove this file (you can do it with a command similar to the one you have used to create the file, just substitute `touch` to `rm` in it).

Check the Logs

Logs provide valuable information. It makes sense to check the logs of the database Pods and the Operator Pod. Following flags are helpful for checking the logs with the `kubectl logs` command:

Flag	Description
`--container=<container-name>`	Print log of a specific container in case of multiple containers in a Pod
`--follow`	Follows the logs for a live output
`--since=<time>`	Print logs newer than the specified time, for example: `--since="10s"`
`--timestamps`	Print timestamp in the logs (timezone is taken from the container)
`--previous`	Print previous instantiation of a container. This is extremely useful in case of container restart, where there is a need to check the logs on why the container restarted. Logs of previous instantiation might not be available in all the cases.

In the following examples we will access containers of the `my-cluster-name-rs0-0` Pod.

- Check logs of the `mongod` container:

```
$ kubectl logs my-cluster-name-rs0-0 -c mongod
```

- Check logs of the `pmm-client` container:

```
$ kubectl logs my-cluster-name-rs0-0 -c pmm-client
```

- Filter logs of the `mongod` container which are not older than 600 seconds:

```
$ kubectl logs my-cluster-name-rs0-0 -c mongod --since=600s
```

- Check logs of a previous instantiation of the `mongod` container, if any:

```
$ kubectl logs my-cluster-name-rs0-0 -c mongod --previous
```

- Check logs of the `mongod` container, parsing the output with jq JSON processor:

```
$ kubectl logs my-cluster-name-rs0-0 -c mongod -f | jq -R 'fromjson?'
```

Changing logs representation

You can also change the representation of logs: either use structured representation, which produces a parsing-friendly JSON, or use traditional console-frienldy logging with specific level. Changing representation of logs is possible by editing the `deploy/operator.yml` file, which sets the following environment variables with self-speaking names and values:

```
env:
    ...
    name: LOG_STRUCTURED
    value: 'false'
    name: LOG_LEVEL
    value: INFO
    ...
```

Special debug images

For the cases when Pods are failing for some reason or just show abnormal behavior, the Operator can be used with a special *debug image* of the Percona Server for MongoDB, which has the following specifics:

- it avoids restarting on fail,
- it contains additional tools useful for debugging (sudo, telnet, gdb, mongodb-debuginfo package, etc.),
- extra verbosity is added to the mongodb daemon.

Images are available for Percona server for MongoDB versions 5.0 and 6.0, not for 7.0.

Particularly, using this image is useful if the container entry point fails (`mongod` crashes). In such a situation, Pod is continuously restarting. Continuous restarts prevent to get console access to the container, and so a special approach is needed to make fixes.

To use the debug image instead of the normal one, set the following image name for the `image` key in the `deploy/cr.yaml` configuration file:

`percona/percona-server-mongodb:6.0.18-15-debug`

The Pod should be restarted to get the new image.

Note

When the Pod is continuously restarting, you may have to delete it to apply image changes.

Install Percona Server for MongoDB with customized parameters

You can customize the configuration of Percona Server for MongoDB and install it with customized parameters.

To check available configuration options, see `deploy/cr.yaml` and Custom Resource Options.

`kubectl`

To customize the configuration, do the following:

1. Clone the repository with all manifests and source code by executing the following command:

   ```
   $ git clone -b v1.19.1 https://github.com/percona/percona-server-mongodb-operator
   ```

2. Edit the required options and apply the modified `deploy/cr.yaml` file as follows:

   ```
   $ kubectl apply -f deploy/cr.yaml
   ```

Helm

To install Percona Server for MongoDB with custom parameters, use the following command:

```
$ helm install --set key=value
```

You can pass any of the Operator's Custom Resource options as a `--set key=value[,key=value]` argument.

The following example deploys a Percona Server for MongoDB Cluster in the `psmdb` namespace, with disabled backups and 20 Gi storage:

Command line

```
$ helm install my-db percona/psmdb-db --version 1.19.1 --namespace psmdb \
  --set "replsets.rs0.name=rs0" --set "replsets.rs0.size=3" \
  --set "replsets.rs0.volumeSpec.pvc.resources.requests.storage=20Gi" \
  --set backup.enabled=false --set sharding.enabled=false
```

YAML file

You can specify customized options in a YAML file instead of using separate command line parameters. The resulting file similar to the following example looks as follows:

values.yaml

```
allowUnsafeConfigurations: true
sharding:
  enabled: false
replsets:
- name: rs0
  size: 3
  volumeSpec:
    pvc:
      resources:
        requests:
          storage: 2Gi
backup:
  enabled: false
```

Apply the resulting YAML file as follows:

```
$ helm install my-db percona/psmdb-db --namespace psmdb -f values.yaml
```

HOWTOs

How to integrate Percona Operator for MongoDB with OpenLDAP

LDAP services provided by software like OpenLDAP, Microsoft Active Directory, etc. are widely used by enterprises to control information about users, systems, networks, services and applications and the corresponding access rights for the authentication/authorization process in a centralized way.

The following guide covers a simple integration of the already-installed OpenLDAP server with Percona Distribution for MongoDB and the Operator. You can know more about LDAP concepts and LDIF files used to configure it, and find how to install and configure OpenLDAP in the official OpenLDAP and Percona Server for MongoDB documentation.

The OpenLDAP side

You can add needed OpenLDAP settings will the following LDIF portions:

```
0-percona-ous.ldif: |-
  dn: ou=perconadba,dc=ldap,dc=local
  objectClass: organizationalUnit
  ou: perconadba
1-percona-users.ldif: |-
  dn: uid=percona,ou=perconadba,dc=ldap,dc=local
  objectClass: top
  objectClass: account
  objectClass: posixAccount
  objectClass: shadowAccount
  cn: percona
  uid: percona
  uidNumber: 1100
  gidNumber: 100
  homeDirectory: /home/percona
  loginShell: /bin/bash
  gecos: percona
  userPassword: {crypt}x
  shadowLastChange: -1
  shadowMax: -1
  shadowWarning: -1
2-group-cn.ldif: |-
  dn: cn=admin,ou=perconadba,dc=ldap,dc=local
  cn: admin
  objectClass: groupOfUniqueNames
  objectClass: top
  ou: perconadba
  uniqueMember: uid=percona,ou=perconadba,dc=ldap,dc=local
```

Also a read-only user should be created for the database-issued user lookups. If everything is done correctly, the following command should work, resetting the percona user password:

```
$ ldappasswd -s percona -D "cn=admin,dc=ldap,dc=local" -w password -x
"uid=percona,ou=perconadba,dc=ldap,dc=local"
```

Note

If you are not sure about the approach to make references between user and group objects, OpenDAP overlays provide one of the possible ways to go.

The MongoDB and Operator side

The following steps will look different depending on whether sharding is on (the default behavior) or off.

If sharding is off

In order to get MongoDB connected with OpenLDAP in case of a a non-sharded (ReplicaSet) MongoDB cluster we need to configure two things:

- Mongod
- Internal mongodb role

Create configuration Secrets for mongod:

my_mongod.conf

```
security:
  authorization: "enabled"
  ldap:
    authz:
      queryTemplate: '{USER}?memberOf?base'
    servers: "openldap"
    transportSecurity: none
    bind:
      queryUser: "cn=readonly,dc=ldap,dc=local"
      queryPassword: "password"
    userToDNMapping:
      '[
          {
            match : "(.+)",
            ldapQuery: "OU=perconadba,DC=ldap,DC=local??sub?(uid={0})"
          }
   ]'
setParameter:
  authenticationMechanisms: 'PLAIN,SCRAM-SHA-1'
```

Note

This fragment provides mongod with LDAP-specific parameters, such as FQDN of the LDAP server (`server`), explicit lookup user, domain rules, etc.

Put the snippet on you local machine and create a Kubernetes Secret object named based on your MongoDB cluster name:

```
$ kubectl create secret generic <your_cluster_name>-rs0-mongod --from-
file=mongod.conf=my_mongod.conf
```

Next step is to start the MongoDB cluster up as it's described in Install Percona server for MongoDB on Kubernetes. On successful completion of the steps from this doc, we are to proceed with setting the roles for the 'external' (managed by LDAP) user inside the MongoDB. For this, log into MongoDB as administrator:

```
$ mongo "mongodb+srv://userAdmin:<userAdmin_password>@<your_cluster_name>-
rs0.<your_namespace>.svc.cluster.local/admin?replicaSet=rs0&ssl=false"
```

When logged in, execute the following:

```
mongos> db.getSiblingDB("admin").createRole(
{
 role: "cn=admin,ou=perconadba,dc=ldap,dc=local",
 privileges: [],
 roles : [
   {
     "role" : "readAnyDatabase",
     "db" : "admin"
   },
   {
     "role" : "dbAdminAnyDatabase",
     "db" : "admin"
   },
   {
     "role" : "clusterMonitor",
     "db" : "admin"
   },
   {
     "role" : "readWriteAnyDatabase",
     "db" : "admin"
   },
   {
     "role" : "restore",
     "db" : "admin"
   },
   {
     "role" : "backup",
     "db" : "admin"
   }
 ],
}
)
```

Note

Extra roles listed in the above example are just to show more than one possible variant.

Now the new `percona` user created inside OpenLDAP is able to login to MongoDB as administrator. Verify whether the user role has been identified correctly with the following command:

```
$ mongo --username percona --password 'percona' --authenticationMechanism 'PLAIN'
--authenticationDatabase '$external' --host <mongodb-rs-endpoint> --port 27017
```

When logged in, execute the following:

```
mongos> db.runCommand({connectionStatus:1})
```

The output should be like follows:

```
{
 "authInfo" : {
   "authenticatedUsers" : [
     {
       "user" : "percona",
       "db" : "$external"
     }
   ],
   "authenticatedUserRoles" : [
     {
       "role" : "restore",
       "db" : "admin"
     },
     {
       "role" : "readAnyDatabase",
       "db" : "admin"
     },
     {
       "role" : "clusterMonitor",
       "db" : "admin"
     },
     {
       "role" : "dbAdminAnyDatabase",
       "db" : "admin"
     },
     {
       "role" : "backup",
       "db" : "admin"
     },
     {
       "role" : "cn=admin,ou=perconadba,dc=ldap,dc=local",
       "db" : "admin"
     },
     {
       "role" : "readWriteAnyDatabase",
       "db" : "admin"
     }
   ]
 },
 "ok" : 1,
 "$clusterTime" : {
   "clusterTime" : Timestamp(1663067287, 4),
   "signature" : {
     "hash" : BinData(0,"ZaLGSVj4ZwZrngXZSOqXB5rx+oo="),
     "keyId" : NumberLong("7142816031004688408")
   }
 },
 "operationTime" : Timestamp(1663067287, 4)
}
mongos>
```

If sharding is on

In order to get MongoDB connected with OpenLDAP in this case we need to configure three things:

- Mongod
- Internal mongodb role
- Mongos

Both the routing interface (mongos) and the configuraion ReplicaSet (mongod) have to be configured to make the LDAP server a part of the Authentication/Authorization chain.

> **Note**
>
> mongos is just a router between shards and underlying database instances, and configuration ReplicaSet is responsible for keeping information about database users and roles. Thus, the router can perform only authentication, while authorization is the responsibility of the configuration ReplicaSet.

Create configuration Secrets for the router and the configuration ReplicaSet respectively.

Secret for the router should look as follows:

my_mongos.conf

```
security:
  ldap:
    servers: "openldap"
    transportSecurity: none
    bind:
      queryUser: "cn=readonly,dc=ldap,dc=local"
      queryPassword: "password"
    userToDNMapping:
      '[
          {
            match : "(.+)",
            ldapQuery: "OU=perconadba,DC=ldap,DC=local??sub?(uid={0})"
          }
    ]'
setParameter:
  authenticationMechanisms: 'PLAIN,SCRAM-SHA-1'
```

Put the snippet on you local machine and create a Kubernetes Secret object named based on your MongoDB cluster name:

```
$ kubectl create secret generic <your_cluster_name>-mongos --from-
file=mongos.conf=my_mongos.conf
```

Secret for the configuration ReplicaSet should look as follows:

my_mongod.conf

```
security:
  authorization: "enabled"
  ldap:
    authz:
      queryTemplate: '{USER}?memberOf?base'
    servers: "openldap"
    transportSecurity: none
    bind:
      queryUser: "cn=readonly,dc=ldap,dc=local"
      queryPassword: "password"
    userToDNMapping:
      '[
          {
            match : "(.+)",
            ldapQuery: "OU=perconadba,DC=ldap,DC=local??sub?(uid={0})"
          }
    ]'
setParameter:
  authenticationMechanisms: 'PLAIN,SCRAM-SHA-1'
```

Put the snippet on you local machine and create a Kubernetes Secret object named based on your MongoDB cluster name:

```
$ kubectl create secret generic <your_cluster_name>-cfg-mongod --from-
file=mongod.conf=my_mongod.conf
```

Both files are pretty much the same except the `authz` subsection, which is only present for the configuration ReplicaSet.

Next step is to start the MongoDB cluster up as it's described in Install Percona server for MongoDB on Kubernetes. On successful completion of the steps from this doc, we are to proceed with setting the roles for the 'external' (managed by LDAP) user inside the MongoDB. For this, log into MongoDB as administrator:

```
$ mongo "mongodb://userAdmin:<userAdmin_password>@<your_cluster_name>-
mongos.<your_namespace>.svc.cluster.local/admin?ssl=false"
```

When logged in, execute the following:

```
mongos> db.getSiblingDB("admin").createRole(
{
 role: "cn=admin,ou=perconadba,dc=ldap,dc=local",
 privileges: [],
 roles : [
   {
     "role" : "readAnyDatabase",
     "db" : "admin"
   },
   {
     "role" : "dbAdminAnyDatabase",
     "db" : "admin"
   },
   {
     "role" : "clusterMonitor",
     "db" : "admin"
   },
   {
     "role" : "readWriteAnyDatabase",
     "db" : "admin"
   },
   {
     "role" : "restore",
     "db" : "admin"
   },
   {
     "role" : "backup",
     "db" : "admin"
   }
 ],
}
)
```

Note

Extra roles listed in the above example are just to show more than one possible variant.

Now the new `percona` user created inside OpenLDAP is able to login to MongoDB as administrator. Verify whether the user role has been identified correctly with the following command:

```
$ mongo --username percona --password 'percona' --authenticationMechanism 'PLAIN'
--authenticationDatabase '$external' --host <your_cluster_name>-mongos --port 27017
```

When logged in, execute the following:

```
mongos> db.runCommand({connectionStatus:1})
```

The output should be like follows:

```
{
 "authInfo" : {
   "authenticatedUsers" : [
     {
       "user" : "percona",
       "db" : "$external"
     }
   ],
   "authenticatedUserRoles" : [
     {
       "role" : "restore",
       "db" : "admin"
     },
     {
       "role" : "readAnyDatabase",
       "db" : "admin"
     },
     {
       "role" : "clusterMonitor",
       "db" : "admin"
     },
     {
       "role" : "dbAdminAnyDatabase",
       "db" : "admin"
     },
     {
       "role" : "backup",
       "db" : "admin"
     },
     {
       "role" : "cn=admin,ou=perconadba,dc=ldap,dc=local",
       "db" : "admin"
     },
     {
       "role" : "readWriteAnyDatabase",
       "db" : "admin"
     }
   ]
 },
 "ok" : 1,
 "$clusterTime" : {
   "clusterTime" : Timestamp(1663067287, 4),
   "signature" : {
     "hash" : BinData(0,"ZaLGSVj4ZwZrngXZSOqXB5rx+oo="),
     "keyId" : NumberLong("7142816031004688408")
   }
 },
 "operationTime" : Timestamp(1663067287, 4)
}
mongos>
```

Using LDAP over TLS connection

LDAP over TLS allows you to use Transport Layer Security, encrypting your communication between MongoDB and OpenLDAP server.

Here are the needed modifications to The MongoDB and Operator side subsection which will enable it:

1. First, create a secret that contains the SSL certificate to connect to LDAP. The following example creates it from the file with CA certificate (the one you use in `/etc/openldap/ldap.conf`), naming the new secret `my-ldap-secret`:

   ```
   $ kubectl create secret generic my-ldap-secret --from-file=ca.crt=ldap-ca.pem
   ```

2. Set the `secrets.ldapSecret` Custom Resource option to the name of your newly created secret. Your modified `deploy/cr.yaml` may look as follows:

   ```
   ...
     secrets:
       ...
       ldapSecret: my-ldap-secret
   ```

3. It is also necessary to change the value of transportSecurity to `tls` in mongod and mongos configurations. The configuration is similar to one described at the The MongoDB and Operator side subsection:

Changed mongod configuration should look as follows:

```` yaml title="my_mongod.conf"  hl_lines="7"
security:
  authorization: "enabled"
  ldap:
    authz:
      queryTemplate: '{USER}?memberOf?base'
    servers: "openldap"
    transportSecurity: tls
    bind:
      queryUser: "cn=readonly,dc=ldap,dc=local"
      queryPassword: "password"
    userToDNMapping:
      '[
          {
            match : "(.+)",
            ldapQuery: "OU=perconadba,DC=ldap,DC=local??sub?(uid={0})"
          }
   ]'
setParameter:
  authenticationMechanisms: 'PLAIN,SCRAM-SHA-1'
```

If **sharding is on**, you will also need to change mongos configuration:

```yaml title="my_mongos.conf" hl_lines="4"
security:
  ldap:
    servers: "openldap"
    transportSecurity: tls
    bind:
      queryUser: "cn=readonly,dc=ldap,dc=local"
      queryPassword: "password"
    userToDNMapping:
      '[
          {
            match : "(.+)",
            ldapQuery: "OU=perconadba,DC=ldap,DC=local??sub?(uid={0})"
          }
    ]'
setParameter:
  authenticationMechanisms: 'PLAIN,SCRAM-SHA-1'
```

# Use Docker images from a custom registry

Using images from a private Docker registry may required for privacy, security or other reasons. In these cases, Percona Operator for MongoDB allows the use of a custom registry This following example of the Operator deployed in the OpenShift environment demonstrates the process:

1. Log into the OpenShift and create a project.

```
$ oc login
```

**Expected output**

```
Authentication required for https://192.168.1.100:8443 (openshift)
Username: admin
Password:
Login successful.
```

```
$ oc new-project psmdb
```

**Expected output**

```
Now using project "psmdb" on server "https://192.168.1.100:8443".
```

2. You need obtain the following objects to configure your custom registry access:

   - A user token
   - the registry IP address

   You can view the token with the following command:

```
$ oc whoami -t
```

**Expected output**

```
ADO8CqCDappWR4hxjfDqwijEHei31yXAvWg61Jg210s
```

   The following command returns the registry IP address:

```
$ kubectl get services/docker-registry -n default
```

**Expected output**

```
NAME              TYPE        CLUSTER-IP       EXTERNAL-IP   PORT(S)    AGE
docker-registry   ClusterIP   172.30.162.173   <none>        5000/TCP   1d
```

3. Use the user token and the registry IP address to login to the registry:

```
$ docker login -u admin -p ADO8CqCDappWR4hxjfDqwijEHei31yXAvWg61Jg210s
172.30.162.173:5000
```

**Expected output**

```
Login Succeeded
```

4. Use the Docker commands to pull the needed image by its SHA digest:

```
$ docker pull docker.io/perconalab/percona-server-
mongodb@sha256:991d6049059e5eb1a74981290d829a5fb4ab0554993748fde1e67b2f46f26bf0
```

**Expected output**

```
Trying to pull repository docker.io/perconalab/percona-server-mongodb ...
sha256:991d6049059e5eb1a74981290d829a5fb4ab0554993748fde1e67b2f46f26bf0: Pulling from
docker.io/perconalab/percona-server-mongodb
Digest: sha256:991d6049059e5eb1a74981290d829a5fb4ab0554993748fde1e67b2f46f26bf0
Status: Image is up to date for docker.io/perconalab/percona-server-
mongodb@sha256:991d6049059e5eb1a74981290d829a5fb4ab0554993748fde1e67b2f46f26bf0
```

You can find correct names and SHA digests in the current list of the Operator-related images officially certified by Percona.

5. The following method can push an image to the custom registry for the example OpenShift `psmdb` project:

```
$ docker tag \
    docker.io/perconalab/percona-server-
mongodb@sha256:991d6049059e5eb1a74981290d829a5fb4ab0554993748fde1e67b2f46f26bf0
\
    172.30.162.173:5000/psmdb/percona-server-mongodb:7.0.14-8
$ docker push 172.30.162.173:5000/psmdb/percona-server-mongodb:7.0.14-8
```

6. Verify the image is available in the OpenShift registry with the following command:

```
$ oc get is
```

**Expected output**

```
NAME                              DOCKER REPO
TAGS            UPDATED
percona-server-mongodb            docker-registry.default.svc:5000/psmdb/percona-server-
mongodb  7.0.14-8  2 hours ago
```

7. When the custom registry image is available, edit the the `image:` option in `deploy/operator.yaml` configuration file with a Docker Repo + Tag string (it should look like `docker-registry.default.svc:5000/psmdb/percona-server-mongodb:7.0.14-8`)

**Note**

If the registry requires authentication, you can specify the `imagePullSecrets` option for all images.

8. Repeat steps 3-5 for other images, and update corresponding options in the `deploy/cr.yaml` file.

**Note**

Don't forget to set upgradeoptions.apply option to `Disabled`. Otherwise Smart Upgrade functionality will try using the image recommended by the Version Service instead of the custom one.

9. Now follow the standard Percona Operator for MongoDB installation instruction.

# Creating a private S3-compatible cloud for backups

As it is mentioned in backups, any cloud storage which implements the S3 API can be used for backups. The one way to setup and implement the S3 API storage on Kubernetes or OpenShift is Minio - the S3-compatible object storage server deployed via Docker on your own infrastructure.

Setting up Minio to be used with Percona Operator for MongoDB backups involves the following steps:

1. Install Minio in your Kubernetes or OpenShift environment and create the correspondent Kubernetes Service as follows:

   ```
   $ helm install \
     --name minio-service \
     --version 8.0.5 \
     --set accessKey=some-access-key \
     --set secretKey=some-secret-key \
     --set service.type=ClusterIP \
     --set configPath=/tmp/.minio/ \
     --set persistence.size=2G \
     --set environment.MINIO_REGION=us-east-1 \
     stable/minio
   ```

   Don't forget to substitute default `some-access-key` and `some-secret-key` strings in this command with actual unique key values. The values can be used later for access control. The `storageClass` option is needed if you are using the special Kubernetes Storage Class for backups. Otherwise, this setting may be omitted. You may also notice the `MINIO_REGION` value which is may not be used within a private cloud. Use the same region value here and on later steps (`us-east-1` is a good default choice).

2. Create an S3 bucket for backups:

   ```
   $ kubectl run -i --rm aws-cli --image=perconalab/awscli --restart=Never -- \
     bash -c 'AWS_ACCESS_KEY_ID=some-access-key \
     AWS_SECRET_ACCESS_KEY=some-secret-key \
     AWS_DEFAULT_REGION=us-east-1 \
     /usr/bin/aws \
     --endpoint-url http://minio-service:9000 \
     s3 mb s3://operator-testing'
   ```

   This command creates the bucket named `operator-testing` with the selected access and secret keys (substitute `some-access-key` and `some-secret-key` with the values used on the previous step).

3.

Now edit the backup section of the deploy/cr.yaml file to set proper values for the `bucket` (the S3 bucket for backups created on the previous step), `region`, `credentialsSecret` and the `endpointUrl` (which should point to the previously created Minio Service).

```
...
backup:
  enabled: true
  version: 0.3.0
  ...
  storages:
    minio:
      type: s3
      s3:
        bucket: operator-testing
        region: us-east-1
        credentialsSecret: my-cluster-name-backup-minio
        endpointUrl: http://minio-service:9000
  ...
```

The option which should be specially mentioned is `credentialsSecret` which is a Kubernetes secret for backups. Sample backup-s3.yaml can be used to create this secret object. Check that the object contains the proper `name` value and is equal to the one specified for `credentialsSecret`, i.e. `my-cluster-name-backup-minio` in the backup to Minio example, and also contains the proper `AWS_ACCESS_KEY_ID` and `AWS_SECRET_ACCESS_KEY` keys. After you have finished editing the file, the secrets object are created or updated when you run the following command:

```
$ kubectl apply -f deploy/backup-s3.yaml
```

4. When the setup process is completed, making the backup is based on a script. Following example illustrates how to make an on-demand backup:

```
$ kubectl run -it --rm pbmctl --image=percona/percona-server-mongodb-
operator:0.3.0-backup-pbmctl --restart=Never -- \
   run backup \
   --server-address=<cluster-name>-backup-coordinator:10001 \
   --storage <storage> \
   --compression-algorithm=gzip \
   --description=my-backup
```

Don't forget to specify the name of your cluster instead of the `<cluster-name>` part of the Backup Coordinator URL (the cluster name is specified in the deploy/cr.yaml file). Also substitute `<storage>` with the actual storage name located in a subsection inside of the `backups` in the deploy/cr.yaml file. In the earlier example this value is `minio`.

5. To restore a previously saved backup you must specify the backup name. With the proper Backup Coordinator URL and storage name, you can obtain a list of the available backups:

```
$ kubectl run -it --rm pbmctl --image=percona/percona-server-mongodb-
operator:0.3.0-backup-pbmctl --restart=Never -- list backups --server-
address=<cluster-name>-backup-coordinator:10001
```

Now, restore the backup, using backup name instead of the `backup-name` parameter:

```
$ kubectl run -it --rm pbmctl --image=percona/percona-server-mongodb-
operator:0.3.0-backup-pbmctl --restart=Never -- \
   run restore \
   --server-address=<cluster-name>-backup-coordinator:10001 \
   --storage <storage> \
   backup-name
```

# How to restore backup to a new Kubernetes-based environment

The Operator allows restoring a backup not only on the Kubernetes cluster where it was made, but also on any Kubernetes-based environment with the installed Operator.

When restoring to a new Kubernetes-based environment, make sure it has a Secrets object with the same user passwords as in the original cluster. More details about secrets can be found in System Users. The name of the required Secrets object can be found out from the `spec.secrets` key in the `deploy/cr.yaml` (`my-cluster-name-secrets` by default).

You will need correct names for the **backup** and the **cluster**. If you have access to the original cluster, available backups can be listed with the following command:

```
$ kubectl get psmdb-backup
```

And the following command will list available clusters:

```
$ kubectl get psmdb
```

**Note**

If you have configured storing operations logs for point-in-time recovery, you will have possibility to roll back the cluster to a specific date and time. Otherwise, restoring backups without point-in-time recovery is the only option.

When the correct names for the backup and the cluster are known, backup restoration can be done in the following way.

## Without point-in-time recovery

1. Set appropriate keys in the deploy/backup/restore.yaml file.

   - set `spec.clusterName` key to the name of the target cluster to restore the backup on,
   - set `spec.backupSource` subsection to point on the appropriate cloud storage. This `backupSource` subsection should contain the backup type (either `logical` or `physical`), and a `destination` key, followed by necessary storage configuration keys, same as in the `deploy/cr.yaml` file:

```
...
backupSource:
  type: logical
  destination: s3://S3-BUCKET-NAME/BACKUP-NAME
  s3:
    credentialsSecret: my-cluster-name-backup-s3
    region: us-west-2
    endpointUrl: https://URL-OF-THE-S3-COMPATIBLE-STORAGE
```

As you have noticed, `destination` value is composed of three parts in case of S3-compatible storage: the `s3://` prefix, the s3 bucket name, and the actual backup name, which you have already found out using the `kubectl get psmdb-backup` command). For Azure Blob storage, you don't put the prefix, and use your container name as an equivalent of a bucket.

- you can also use a `storageName` key to specify the exact name of the storage (the actual storage should be already defined in the `backup.storages` subsection of the `deploy/cr.yaml` file):

```
...
storageName: s3-us-west
backupSource:
  destination: s3://S3-BUCKET-NAME/BACKUP-NAME
```

2. After that, the actual restoration process can be started as follows:

```
$ kubectl apply -f deploy/backup/restore.yaml
```

## With point-in-time recovery

1. Set appropriate keys in the deploy/backup/restore.yaml file.
   - set `spec.clusterName` key to the name of the target cluster to restore the backup on
   - put additional restoration parameters to the `pitr` section:
     - `type` key can be equal to one of the following options
       - `date` - roll back to specific date
       - `latest` - recover to the latest possible transaction
     - `date` key is used with `type=date` option and contains value in datetime format
   -

set `spec.backupSource` subsection to point on the appropriate cloud storage. For S3-compatible storage this `backupSource` subsection should contain a `destination` key equal to the s3 bucket with a special `s3://` prefix, followed by necessary S3 configuration keys, same as in `deploy/cr.yaml` file:

```
apiVersion: psmdb.percona.com/v1
kind: PerconaServerMongoDBRestore
metadata:
  name: restore1
spec:
  clusterName: my-cluster-name
  pitr:
    type: date
    date: YYYY-MM-DD hh:mm:ss
  backupSource:
    destination: s3://S3-BUCKET-NAME/BACKUP-NAME
    s3:
      credentialsSecret: my-cluster-name-backup-s3
      region: us-west-2
      endpointUrl: https://URL-OF-THE-S3-COMPATIBLE-STORAGE
```

- you can also use a `storageName` key to specify the exact name of the storage (the actual storage should be already defined in the `backup.storages` subsection of the `deploy/cr.yaml` file):

```
...
storageName: s3-us-west
backupSource:
  destination: s3://S3-BUCKET-NAME/BACKUP-NAME
```

2. Run the actual restoration process:

```
$ kubectl apply -f deploy/backup/restore.yaml
```

# How to use backups to move the external database to Kubernetes

The Operator allows restoring a backup not only on the Kubernetes cluster where it was made, but also on any Kubernetes-based environment with the installed Operator, and the backup/restore tool actually used by the Operator is the Percona Backup for MongoDB. That makes it possible to *move* external MongoDB Cluster to Kubernetes with Percona Backup for MongoDB.

> **Note**
>
> There are other scenarios for migrating MongoDB database to Kubernetes as well. For example, this blogpost covers migration based on the regular MongoDB replication capabilities.

Backups can be stored either locally, or remotely (on Amazon S3 or S3-compatible storage, or on Azure Blob Storage). S3-compatible storage to be used for backups.

1. Make sure the following prerequisite requirements are satisfied within your setup:

   - Percona Backup for MongoDB packages are installed on the replica set nodes of the source cluster following the official installation instructions, and the authentication of the pbm-agent is configured to allow it accessing your database.
   - The Operator and the *destination* cluster should be installed in the Kuberentes-based environment. For simplicity, it's reasonable to have the same topology of the *source* and *destination* clusters, although Percona Backup for MongoDB allows replset-remapping as well.

2. Configure the cloud storage for backups on your *source* cluster following the official guide. For example, using the Amazon S3 storage can be configured with the following YAML file:

   **pbm_config.yaml**

   ```
   type: s3
   s3:
     region: us-west-2
     bucket: pbm-test-bucket
     credentials:
       access-key-id: <your-access-key-id-here>
       secret-access-key: <your-secret-key-here>
   ```

   After putting all needed details into the file (`AWS_ACCESS_KEY_ID`, `AWS_SECRET_ACCESS_KEY`, the S3 bucket and region in the above example), provide the config file to the pbm-agent on all nodes as follows:

```
$ pbm config --file pbm_config.yaml
```

3. Start the pbm-agent:

```
$ sudo systemctl start pbm-agent
```

4. Now you can make backup as follows:

```
$ pbm backup --wait
```

   The command output will contain the *backup name*, which you will further use to restore the backup:

```
Starting backup '2022-06-15T08:18:44Z'....
Waiting for '2022-06-15T08:18:44Z' backup.......... done

pbm-conf> pbm status -s backups

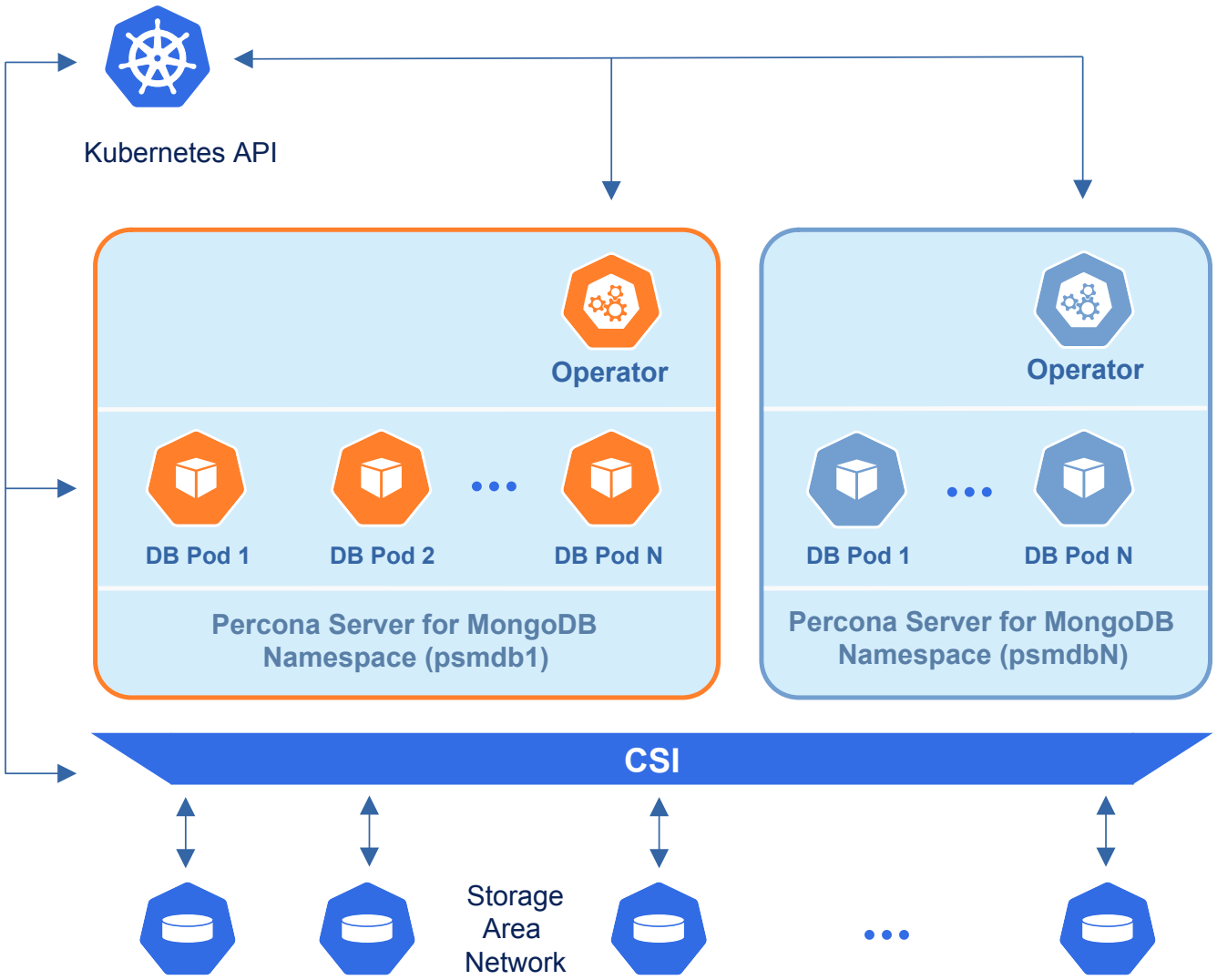
Backups:
========
FS  /data/pbm
  Snapshots:
    2022-06-15T08:18:44Z 28.23KB <logical> [complete: 2022-06-15T08:18:49Z]
```

5. The rest of operations will be carried out on your *destination* cluster in a Kubernetes-based environment of your choice. These actions are described in the How to restore backup to a new Kubernetes-based environment guide. Just use the proper name of the backup (`2022-06-15T08:18:44Z`) in the above example, and proper parameters specific to your cloud storage (e.g. the `pbm-test-bucket` bucket name we used above).

# Install Percona Operator for MongoDB in multi-namespace (cluster-wide) mode

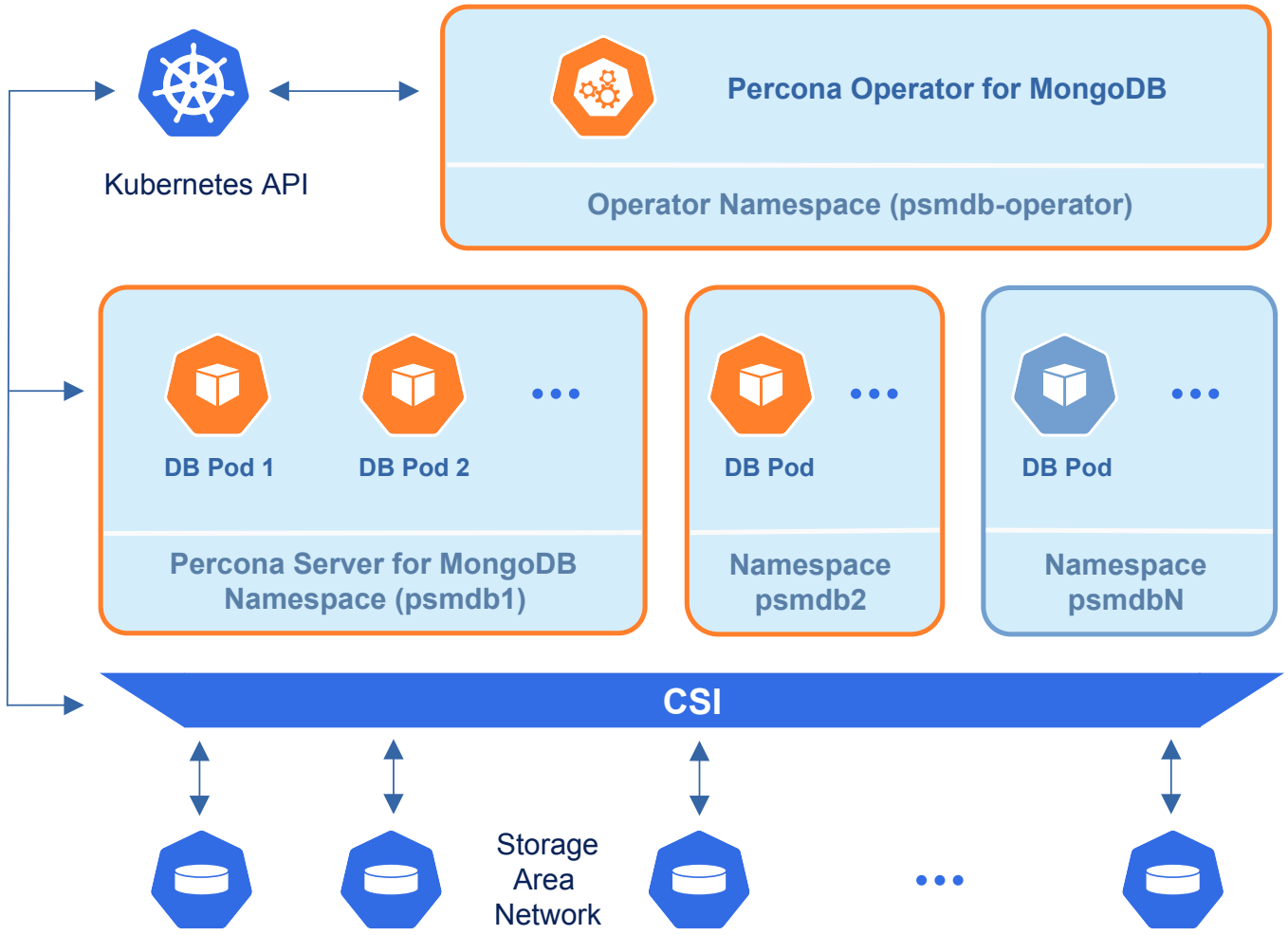
## Difference between single-namespace and multi-namespace Operator deployment

By default, Percona Operator for MongoDB functions in a specific Kubernetes namespace. You can create one during installation (like it is shown in the installation instructions) or just use the `default` namespace. This approach allows several Operators to co-exist in one Kubernetes-based environment, being separated in different namespaces:




Still, sometimes it is more convenient to have one Operator watching for Percona Server for MongoDB Custom Resources in several namespaces.

We recommend running Percona Operator for MongoDB in a traditional way, limited to a specific namespace. But it is possible to run it in so-called *cluster-wide* mode, one Operator watching several namespaces, if needed:




**Note**

Please take into account that if several Operators are configured to watch the same namespace, it is entirely unpredictable which one will get ownership of the Custom Resource in it, so this situation should be avoided.

## Installing the Operator in cluster-wide mode

To use the Operator in such *cluster-wide* mode, you should install it with a different set of configuration YAML files, which are available in the `deploy` folder and have filenames with a special `cw-` prefix: e.g. `deploy/cw-bundle.yaml`.

While using this cluster-wide versions of configuration files, you should set the following information there:

- `subjects.namespace` option should contain the namespace which will host the Operator,

- `WATCH_NAMESPACE` key-value pair in the `env` section should have `value` equal to a comma-separated list of the namespaces to be watched by the Operator, *and* the namespace in which the Operator resides (or just a blank string to make the Operator deal with *all namespaces* in a Kubernetes cluster).

The following simple example shows how to install Operator cluster-wide on Kubernetes.

1. First of all, clone the percona-server-mongodb-operator repository:

   ```
   $ git clone -b v1.19.1 https://github.com/percona/percona-server-mongodb-operator
   $ cd percona-server-mongodb-operator
   ```

2. Let's suppose that Operator's namespace should be the `psmdb-operator` one. Create it as follows:

   ```
   $ kubectl create namespace psmdb-operator
   ```

   Namespaces to be watched by the Operator should be created in the same way if not exist. Let's say the Operator should watch the `psmdb` namespace:

   ```
   $ kubectl create namespace psmdb
   ```

3. Edit the `deploy/cw-bundle.yaml` configuration file to set proper namespaces:

   ```
   ...
   subjects:
   - kind: ServiceAccount
     name: percona-server-mongodb-operator
     namespace: "psmdb-operator"
   ...
   env:
            - name: WATCH_NAMESPACE
              value: "psmdb"
   ...
   ```

4. Apply the `deploy/cw-bundle.yaml` file with the following command:

   ```
   $ kubectl apply -f deploy/cw-bundle.yaml --server-side -n psmdb-operator
   ```

5. After the Operator is started, Percona Server for MongoDB can be created at any time by applying the `deploy/cr.yaml` configuration file, like in the case of normal installation:

   ```
   $ kubectl apply -f deploy/cr.yaml -n psmdb
   ```

The creation process may take some time. When the process is over your cluster will obtain the `ready` status. You can check it by quering the `PerconaServerMongoDB` Custom Resource (it has handy `psmdb` shortname also) with the following command:

```
$ kubectl get psmdb -n psmdb
```

**Expected output**

```
NAME              ENDPOINT                                        STATUS   AGE
my-cluster-name   my-cluster-name-mongos.psmdb.svc.cluster.local   ready    5m26s
```

## Verifying the cluster operation

It may take ten minutes to get the cluster started. When `kubectl get psmdb` command finally shows you the cluster status as `ready`, you can try to connect to the cluster.

1. You will need the login and password for the admin user to access the cluster. Use `kubectl get secrets` command to see the list of Secrets objects (by default the Secrets object you are interested in has `my-cluster-name-secrets` name). Then `kubectl get secret my-cluster-name-secrets -o yaml` command will return the YAML file with generated Secrets, including the `MONGODB_DATABASE_ADMIN` and `MONGODB_DATABASE_ADMIN_PASSWORD` strings, which should look as follows:

   ```
   ...
   data:
     ...
     MONGODB_DATABASE_ADMIN_PASSWORD: aDAzQ0pCY3NSWEZ2ZUIzS1I=
     MONGODB_DATABASE_ADMIN_USER: ZGF0YWJhc2VBZG1pbg==
   ```

   Here the actual login name and password are base64-encoded. Use `echo 'aDAzQ0pCY3NSWEZ2ZUIzS1I=' | base64 --decode` command to bring it back to a human-readable form.

2. Run a container with a MongoDB client and connect its console output to your terminal. The following command will do this, naming the new Pod `percona-client`:

   ```
   $ kubectl run -i --rm --tty percona-client --image=percona/percona-server-
   mongodb:6.0.18-15 --restart=Never --env="POD_NAMESPACE=psmdb" -- bash -il
   ```

   Executing it may require some time to deploy the correspondent Pod.

3. Now run `mongo` tool in the percona-client command shell using the login (which is normally `databaseAdmin`) and a proper password obtained from the Secret. The command will look different depending on whether sharding is on (the default behavior) or off:

**if sharding is on**

```
$ mongosh "mongodb://databaseAdmin:databaseAdminPassword@my-cluster-name-mongos.psmdb.svc.cluster.local/admin?ssl=false"
```

**if sharding is off**

```
$ mongosh "mongodb+srv://databaseAdmin:databaseAdminPassword@my-cluster-name-rs0.psmdb.svc.cluster.local/admin?replicaSet=rs0&ssl=false"
```

# How to carry on low-level manual upgrades of Percona Server for MongoDB

Percona Operator for MongoDB supports upgrades of the database management system (Percona Server for MongoDB) starting from the Operator version 1.1.0. The Operator 1.5.0 had automated such upgrades with a new upgrade strategy called Smart Update. Smart Update automates the upgrade process while giving the user full control over updates, so it is the most convenient upgrade strategy.

Still there may be use cases when automatic upgrade of Percona Server for MongoDB is not an option (for example, you may be using Percona Server for MongoDB with the Operator version 1.5.0 or earlier), and you have to carry on upgrades manually.

Percona Server for MongoDB can be upgraded manually using one of the following *upgrade strategies*:

- *Rolling Update*, initiated manually and controlled by Kubernetes,
- *On Delete*, done by Kubernetes on per-Pod basis when Pods are manually deleted.

**Warning**

In case of Smart Updates, the Operator can either detect the availability of the Percona Server for MongoDB version or rely on the user's choice of the version. In both cases Pods are restarted by the Operator automatically in the order, which assures the primary instance to be updated last, preventing possible connection issues until the whole cluster is updated to the new settings. Kubernetes-controlled Rolling Update can't guarantee that Pods update order is optimal from the Percona Server for MongoDB point of view.

## Rolling Update strategy and semi-automatic updates

Semi-automatic update of Percona Server for MongoDB can be done as follows:

1. Edit the `deploy/cr.yaml` file, setting `updateStrategy` key to `RollingUpdate`.
2. Now you should apply a patch to your Custom Resource, setting necessary image names with a newer version tag.

**Note**

Check the version of the Operator you have in your Kubernetes environment. Please refer to the Operator upgrade guide to upgrade the Operator and CRD, if needed.

Patching Custom Resource is done with the `kubectl patch psmdb` command. Actual image names can be found in the list of certified images. For example, updating to the `1.19.1` version should look as follows:

```
$ kubectl patch psmdb my-cluster-name --type=merge --patch '{
   "spec": {
      "crVersion":"1.19.1",
      "image": "percona/percona-server-mongodb:7.0.14-8",
      "backup": { "image": "percona/percona-backup-mongodb:2.8.0" },
      "pmm": { "image": "percona/pmm-client:2.44.0" }
   }}'
```

**Warning**

The above command upgrades various components of the cluster including PMM Client. It is highly recommended to upgrade PMM Server **before** upgrading PMM Client. If it wasn't done and you would like to avoid PMM Client upgrade, remove it from the list of images, reducing the last of two patch commands as follows:

```
$ kubectl patch psmdb my-cluster-name --type=merge --patch '{
   "spec": {
      "crVersion":"1.19.1",
      "image": "percona/percona-server-mongodb:7.0.14-8",
      "backup": { "image": "percona/percona-backup-mongodb:2.8.0" }
   }}'
```

3. The deployment rollout will be automatically triggered by the applied patch. You can track the rollout process in real time with the `kubectl rollout status` command with the name of your cluster:

```
$ kubectl rollout status sts my-cluster-name-rs0
```

## Manual upgrade (the On Delete strategy)

Manual update of Percona Server for MongoDB can be done as follows:

1. Edit the `deploy/cr.yaml` file, setting `updateStrategy` key to `OnDelete`.
2. Now you should apply a patch to your Custom Resource, setting necessary image names with a newer version tag.

**Note**

Check the version of the Operator you have in your Kubernetes environment. Please refer to the Operator upgrade guide to upgrade the Operator and CRD, if needed.

Patching Custom Resource is done with the `kubectl patch psmdb` command. Actual image names can be found in the list of certified images. For example, updating to the `1.19.1` version should look as follows.

```
$ kubectl patch psmdb my-cluster-name --type=merge --patch '{
   "spec": {
      "crVersion":"1.19.1",
      "image": "percona/percona-server-mongodb:7.0.14-8",
      "backup": { "image": "percona/percona-backup-mongodb:2.8.0" },
      "pmm": { "image": "percona/pmm-client:2.44.0" }
   }}'
```

**Warning**

The above command upgrades various components of the cluster including PMM Client. It is highly recommended to upgrade PMM Server **before** upgrading PMM Client. If it wasn't done and you would like to avoid PMM Client upgrade, remove it from the list of images, reducing the last of two patch commands as follows:

```
$ kubectl patch psmdb my-cluster-name --type=merge --patch '{
   "spec": {
      "crVersion":"1.19.1",
      "image": "percona/percona-server-mongodb:7.0.14-8",
      "backup": { "image": "percona/percona-backup-mongodb:2.8.0" }
   }}'
```

3. The Pod with the newer Percona Server for MongoDB image will start after you delete it. Delete targeted Pods manually one by one to make them restart in the desired order:

   a. Delete the Pod using its name with the command like the following one:

   ```
   $ kubectl delete pod my-cluster-name-rs0-2
   ```

   b. Wait until Pod becomes ready:

   ```
   $ kubectl get pod my-cluster-name-rs0-2
   ```

   The output should be like this:

   ```
   NAME                    READY   STATUS    RESTARTS   AGE
   my-cluster-name-rs0-2   1/1     Running   0          3m33s
   ```

4. The update process is successfully finished when all Pods have been restarted (including the mongos and Config Server nodes, if Percona Server for MongoDB Sharding is on).

# Upgrade Database and Operator on OpenShift

Upgrading database and Operator on Red Hat Marketplace or to upgrade Red Hat certified Operators on OpenShift generally follows the standard upgrade scenario, but includes a number of special steps specific for these platforms.

## Upgrading the Operator and CRD

1. First of all you need to manually update `initImage` Custom Resource option with the value of an alternative initial Operator installation image. You need doing this for all database clusters managed by the Operator. Without this step the cluster will go into error state after the Operator upgrade.

    a. Find the initial Operator installation image with `kubectl get deploy` command:

    ```
    $ kubectl get deploy percona-server-mongodb-operator -o yaml
    ```

    **Expected output**

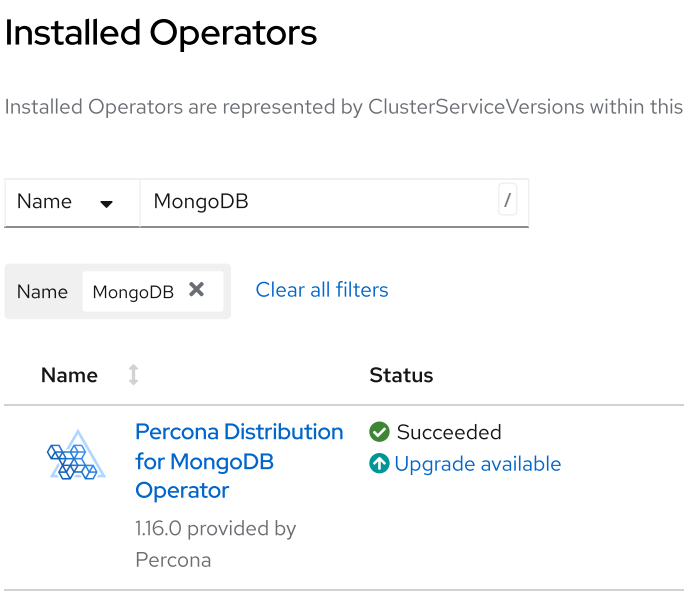
    ```
    ...
    "containerImage": "registry.connect.redhat.com/percona/percona-server-mongodb-
    operator@sha256:201092cf97c9ceaaaf3b60dd1b24c7c5228d35aab2674345893f4cd4d9bb0e2e",
    ...
    ```

    b. Apply a patch to update the `initImage` option of your cluster Custom Resource with this value taken from `containerImage`. Supposing that your cluster name is `my-cluster-name`, the command should look as follows:

    ```
    $ kubectl patch psmdb my-cluster-name --type=merge --patch '{
        "spec": {
           "initImage":"registry.connect.redhat.com/percona/percona-server-
    mongodb-
    operator@sha256:201092cf97c9ceaaaf3b60dd1b24c7c5228d35aab2674345893f4cd4d9bb0e2
        }}'
    ```

2. Now you can actually update the Operator via the Operator Lifecycle Manager (OLM) web interface.

    Login to your OLM installation and list installed Operators for your Namespace to see if there are upgradable items:




Click the “Upgrade available” link to see upgrade details, then click “Preview InstallPlan” button, and finally “Approve” to upgrade the Operator.

# Upgrading Percona Server for MongoDB

1. Make sure that `spec.updateStrategy` option in the Custom Resource is set to `SmartUpdate`, `spec.upgradeOptions.apply` option is set to `Never` or `Disabled` (this means that the Operator will not carry on upgrades automatically).

```
...
spec:
  updateStrategy: SmartUpdate
  upgradeOptions:
    apply: Disabled
    ...
```

2. Find the **new** initial Operator installation image name (it had changed during the Operator upgrade) and other image names for the components of your cluster with the `kubectl get deploy` command:

```
$ kubectl get deploy percona-server-mongodb-operator -o yaml
```

**Expected output**

```
...
"image": "registry.connect.redhat.com/percona/percona-server-mongodb-operator-
containers@sha256:5d29132a60b89e660ab738d463bcc0707a17be73dc955aa8da9e50bed4d9ad3e",
...
"initImage": "registry.connect.redhat.com/percona/percona-server-mongodb-
operator@sha256:8adc57e9445cfcea1ae02798a8f9d6a4958ac89f0620b9c6fa6cf969545dd23f",
...
"pmm": {
  "enabled": true,
  "image": "registry.connect.redhat.com/percona/percona-server-mongodb-operator-
containers@sha256:165f97cdae2b6def546b0df7f50d88d83c150578bdb9c992953ed866615016f1",
...
"backup": {
  "enabled": true,
  "image": "registry.connect.redhat.com/percona/percona-server-mongodb-operator-
containers@sha256:a73889d61e996bc4fbc6b256a1284b60232565e128a64e4f94b2c424966772eb",
...
```

3. Apply a patch to set the necessary `crVersion` value (equal to the Operator version) and update images in your cluster Custom Resource. Supposing that your cluster name is `cluster1`, the command should look as follows:

```
$ kubectl patch psmdb my-cluster-name --type=merge --patch '{
    "spec": {
       "crVersion":"1.19.1",
       "image": "registry.connect.redhat.com/percona/percona-server-mongodb-
operator-
containers@sha256:5d29132a60b89e660ab738d463bcc0707a17be73dc955aa8da9e50bed4d9ad3e
       "initImage": "registry.connect.redhat.com/percona/percona-server-
mongodb-
operator@sha256:8adc57e9445cfcea1ae02798a8f9d6a4958ac89f0620b9c6fa6cf969545dd23f",
       "pmm": {"image": "registry.connect.redhat.com/percona/percona-server-
mongodb-operator-
containers@sha256:165f97cdae2b6def546b0df7f50d88d83c150578bdb9c992953ed866615016f1
       "backup": {"image": "registry.connect.redhat.com/percona/percona-server-
mongodb-operator-
containers@sha256:a73889d61e996bc4fbc6b256a1284b60232565e128a64e4f94b2c424966772eb
    }}'
```

**Warning**

The above command upgrades various components of the cluster including PMM Client. If you didn't follow the official recommendation to upgrade PMM Server before upgrading PMM Client, you can avoid PMM Client upgrade by removing it from the list of images as follows:

```
$ kubectl patch psmdb my-cluster-name --type=merge --patch '{
    "spec": {
       "crVersion":"1.19.1",
       "image": "registry.connect.redhat.com/percona/percona-server-mongodb-operator-
containers@sha256:5d29132a60b89e660ab738d463bcc0707a17be73dc955aa8da9e50bed4d9ad3e",
       "initImage": "registry.connect.redhat.com/percona/percona-server-mongodb-
operator@sha256:8adc57e9445cfcea1ae02798a8f9d6a4958ac89f0620b9c6fa6cf969545dd23f",
       "backup": {"image": "registry.connect.redhat.com/percona/percona-server-mongodb-
operator-
containers@sha256:a73889d61e996bc4fbc6b256a1284b60232565e128a64e4f94b2c424966772eb"}
    }}'
```

4. The deployment rollout will be automatically triggered by the applied patch.

# Monitor Kubernetes

Monitoring the state of the database is crucial to timely identify and react to performance issues. Percona Monitoring and Management (PMM) solution enables you to do just that.

However, the database state also depends on the state of the Kubernetes cluster itself. Hence it's important to have metrics that can depict the state of the Kubernetes cluster.

This document describes how to set up monitoring of the Kubernetes cluster health. This setup has been tested with the PMM server as the centralized data storage and the Victoria Metrics Kubernetes monitoring stack as the metrics collector. These steps may also apply if you use another Prometheus-compatible storage.

## Pre-requisites

To set up monitoring of Kubernetes, you need the following:

1. PMM Server up and running. You can run PMM Server as a Docker image, a virtual appliance, or on an AWS instance. Please refer to the official PMM documentation for the installation instructions.
2. Helm v3.
3. kubectl.
4. The PMM Server API key. The key must have the role "Admin".

   Get the PMM API key:

From PMM UI

Generate the PMM API key

From command line

You can query your PMM Server installation for the API Key using `curl` and `jq` utilities. Replace `<login>:<password>@<server_host>` placeholders with your real PMM Server login, password, and hostname in the following command:

```
$ API_KEY=$(curl --insecure -X POST -H "Content-Type: application/json" -d
{"name":"operator", "role": "Admin"}' "https://
<login>:<password>@<server_host>/graph/api/auth/keys" | jq .key)
```

**Note**

The API key is not rotated.

# Install the Victoria Metrics Kubernetes monitoring stack

## Quick install

1. To install the Victoria Metrics Kubernetes monitoring stack with the default parameters, use the quick install command. Replace the following placeholders with your values:

   - `API-KEY` - The API key of your PMM Server
   - `PMM-SERVER-URL` - The URL to access the PMM Server
   - `UNIQUE-K8s-CLUSTER-IDENTIFIER` - Identifier for the Kubernetes cluster. It can be the name you defined during the cluster creation.

     You should use a unique identifier for each Kubernetes cluster. The use of the same identifer for more than one Kubernetes cluster will result in the conflicts during the metrics collection.
   - `NAMESPACE` - The namespace where the Victoria metrics Kubernetes stack will be installed. If you haven't created the namespace before, it will be created during the command execution.

     We recommend to use a separate namespace like `monitoring-system`.

     ```
     $ curl -fsL  https://raw.githubusercontent.com/Percona-Lab/k8s-monitoring/
     refs/tags/v0.1.1/vm-operator-k8s-stack/quick-install.sh | bash -s -- --api-
     key <API-KEY> --pmm-server-url <PMM-SERVER-URL> --k8s-cluster-id <UNIQUE-K8s-
     CLUSTER-IDENTIFIER> --namespace <NAMESPACE>
     ```

**Note**

The Prometheus node exporter is not installed by default since it requires privileged containers with the access to the host file system. If you need the metrics for Nodes, add the `--node-exporter-enabled` flag as follows:

```
$ curl -fsL  https://raw.githubusercontent.com/Percona-Lab/k8s-monitoring/refs/tags/
v0.1.1/vm-operator-k8s-stack/quick-install.sh | bash -s -- --api-key <API-KEY> --pmm-
server-url <PMM-SERVER-URL> --k8s-cluster-id <UNIQUE-K8s-CLUSTER-IDENTIFIER> --namespace
<NAMESPACE> --node-exporter-enabled
```

## Install manually

You may need to customize the default parameters of the Victoria metrics Kubernetes stack.

- Since we use the PMM Server for monitoring, there is no need to store the data in Victoria Metrics Operator. Therefore, the Victoria Metrics Helm chart is installed with the `vmsingle.enabled` and `vmcluster.enabled` parameters set to `false` in this setup.
- Check all the role-based access control (RBAC) rules of the `victoria-metrics-k8s-stack` chart and the dependencies chart, and modify them based on your requirements.

### Configure authentication in PMM

To access the PMM Server resources and perform actions on the server, configure authentication.

1. Encode the PMM Server API key with base64.

   Linux

   ```
   $ echo -n <API-key> | base64 --wrap=0
   ```

   macOS

   ```
   $ echo -n <API-key> | base64
   ```

2. Create the Namespace where you want to set up monitoring. The following command creates the Namespace `monitoring-system`. You can specify a different name. In the latter steps, specify your namespace instead of the `<namespace>` placeholder.

   ```
   $ kubectl create namespace monitoring-system
   ```

3. Create the YAML file for the Kubernetes Secrets and specify the base64-encoded API key value within. Let's name this file `pmm-api-vmoperator.yaml`.

**pmm-api-vmoperator.yaml**

```
apiVersion: v1
data:
  api_key: <base-64-encoded-API-key>
kind: Secret
metadata:
  name: pmm-token-vmoperator
  #namespace: default
type: Opaque
```

4. Create the Secrets object using the YAML file you created previously. Replace the `<filename>` placeholder with your value.

```
$ kubectl apply -f pmm-api-vmoperator.yaml -n <namespace>
```

5. Check that the secret is created. The following command checks the secret for the resource named `pmm-token-vmoperator` (as defined in the `metadata.name` option in the secrets file). If you defined another resource name, specify your value.

```
$ kubectl get secret pmm-token-vmoperator -n <namespace>
```

### Create a ConfigMap to mount for `kube-state-metrics`

The `kube-state-metrics` (KSM) is a simple service that listens to the Kubernetes API server and generates metrics about the state of various objects - Pods, Deployments, Services and Custom Resources.

To define what metrics the `kube-state-metrics` should capture, create the ConfigMap and mount it to a container.

Use the example `configmap.yaml` configuration file to create the ConfigMap.

```
$ kubectl apply -f https://raw.githubusercontent.com/Percona-Lab/k8s-monitoring/
refs/tags/v0.1.1/vm-operator-k8s-stack/ksm-configmap.yaml -n <namespace>
```

As a result, you have the `customresource-config-ksm` ConfigMap created.

### Install the Victoria Metrics Kubernetes monitoring stack

1. Add the dependency repositories of victoria-metrics-k8s-stack chart.

```
$ helm repo add grafana https://grafana.github.io/helm-charts
$ helm repo add prometheus-community https://prometheus-community.github.io/
helm-charts
```

2. Add the Victoria Metrics Kubernetes monitoring stack repository.

```
$ helm repo add vm https://victoriametrics.github.io/helm-charts/
```

3. Update the repositories.

```
$ helm repo update
```

4. Install the Victoria Metrics Kubernetes monitoring stack Helm chart. You need to specify the following configuration:

   - the URL to access the PMM server in the `externalVM.write.url` option in the format `<PMM-SERVER-URL>/victoriametrics/api/v1/write`. The URL can contain either the IP address or the hostname of the PMM server.
   - the unique name or an ID of the Kubernetes cluster in the `vmagent.spec.externalLabels.k8s_cluster_id` option. Ensure to set different values if you are sending metrics from multiple Kubernetes clusters to the same PMM Server.
   - the `<namespace>` placeholder with your value. The Namespace must be the same as the Namespace for the Secret and ConfigMap.

```
$ helm install vm-k8s vm/victoria-metrics-k8s-stack \
-f https://raw.githubusercontent.com/Percona-Lab/k8s-monitoring/refs/tags/
v0.1.1/vm-operator-k8s-stack/values.yaml \
--set externalVM.write.url=<PMM-SERVER-URL>/victoriametrics/api/v1/write \
--set vmagent.spec.externalLabels.k8s_cluster_id=<UNIQUE-CLUSTER-IDENTIFER/
NAME> \
-n <namespace>
```

   To illustrate, say your PMM Server URL is `https://pmm-example.com`, the cluster ID is `test-cluster` and the Namespace is `monitoring-system`. Then the command would look like this:

```
$ helm install vm-k8s vm/victoria-metrics-k8s-stack \
-f https://raw.githubusercontent.com/Percona-Lab/k8s-monitoring/refs/tags/
v0.1.1/vm-operator-k8s-stack/values.yaml \
--set externalVM.write.url=https://pmm-example.com/victoriametrics/api/v1/write
\
--set vmagent.spec.externalLabels.k8s_cluster_id=test-cluster \
-n monitoring-system
```

## Validate the successful installation

```
$ kubectl get pods -n <namespace>
```

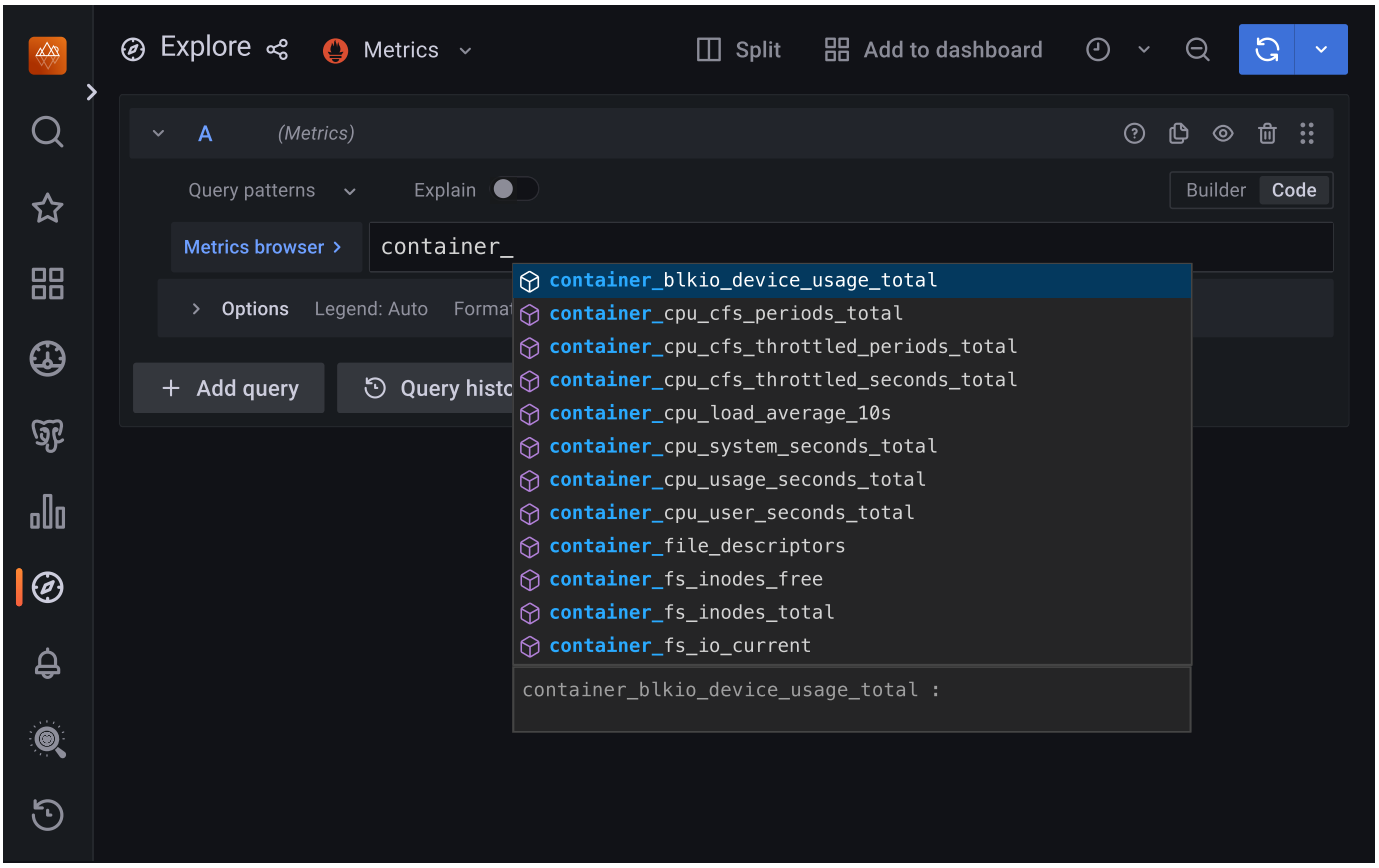
**Sample output**

```
vm-k8s-stack-kube-state-metrics-d9d85978d-9pzbs                   1/1     Running   0
28m
vm-k8s-stack-victoria-metrics-operator-844d558455-gvg4n           1/1     Running   0
28m
vmagent-vm-k8s-stack-victoria-metrics-k8s-stack-55fd8fc4fbcxwhx   2/2     Running   0
28m
```

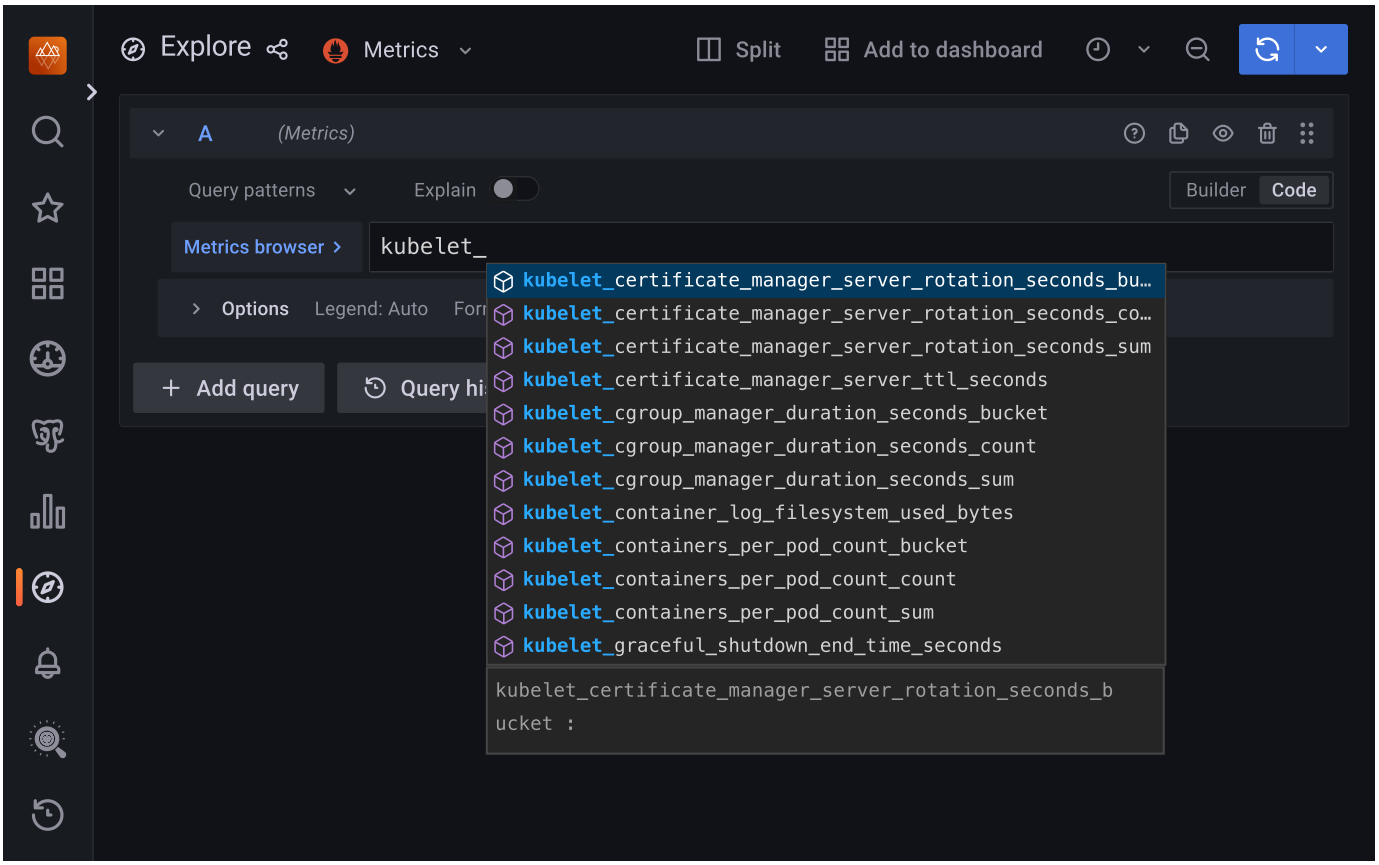
What Pods are running depends on the configuration chosen in values used while installing `victoria-metrics-k8s-stack` chart.

## Verify metrics capture

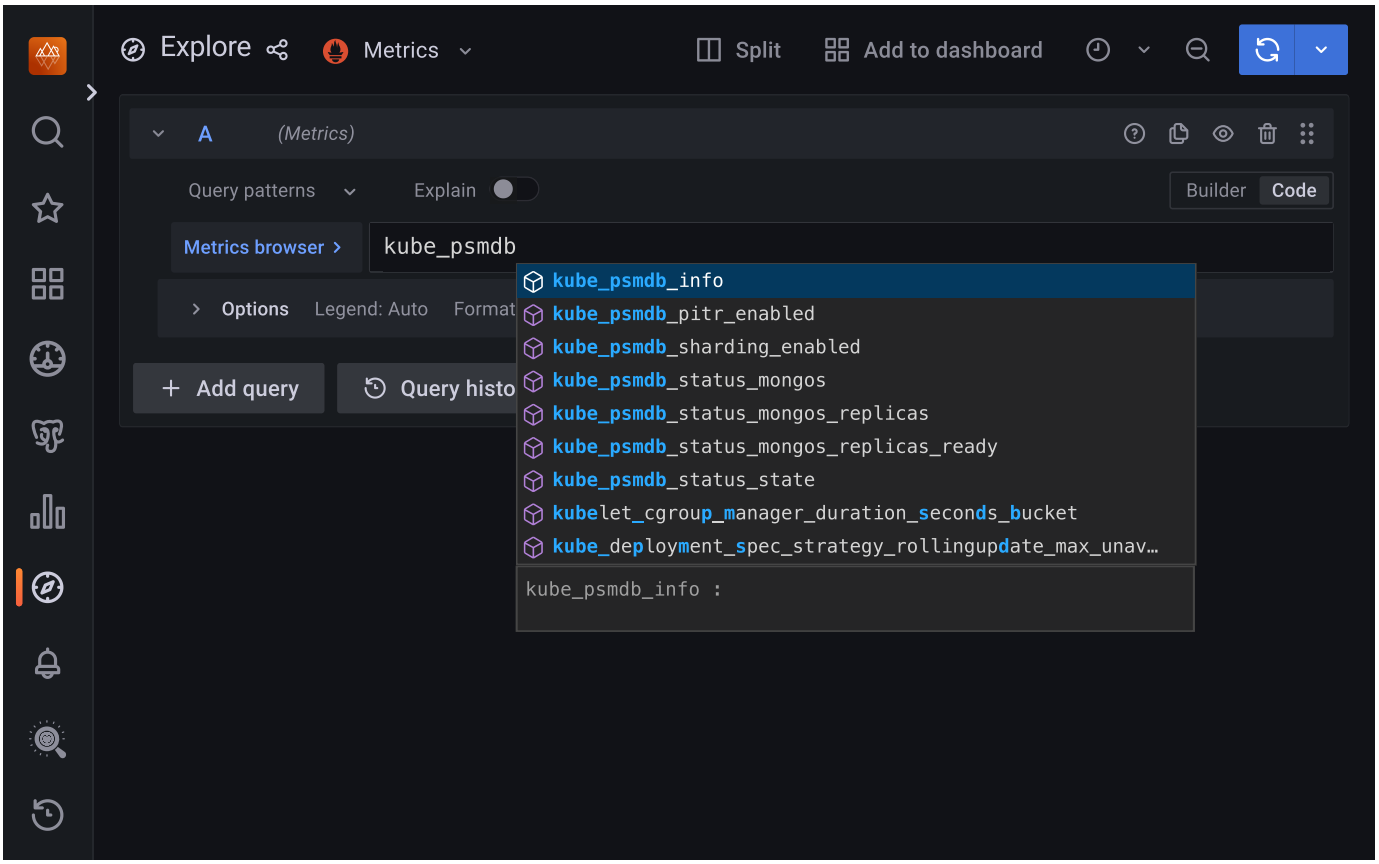
1. Connect to the PMM server.
2. Click **Explore** and switch to the **Code** mode.
3. Check that the required metrics are captured, type the following in the Metrics browser dropdown:
   - cadvisor:




   - kubelet:




- kube-state-metrics metrics that also include Custom resource metrics for the Operator and database deployed in your Kubernetes cluster:



# Uninstall Victoria metrics Kubernetes stack

To remove Victoria metrics Kubernetes stack used for Kubernetes cluster monitoring, use the cleanup script. By default, the script removes all the Custom Resource Definitions(CRD) and Secrets associated with the Victoria metrics Kubernetes stack. To keep the CRDs, run the script with the `--keep-crd` flag.

**Remove CRDs**

Replace the `<NAMESPACE>` placeholder with the namespace you specified during the Victoria metrics Kubernetes stack installation:

```
$ bash <(curl -fsL https://raw.githubusercontent.com/Percona-Lab/k8s-monitoring/
refs/tags/v0.1.1/vm-operator-k8s-stack/cleanup.sh) --namespace <NAMESPACE>
```

**Keep CRDs**

Replace the `<NAMESPACE>` placeholder with the namespace you specified during the Victoria metrics Kubernetes stack installation:

```
$ bash <(curl -fsL https://raw.githubusercontent.com/Percona-Lab/k8s-monitoring/
refs/tags/v0.1.1/vm-operator-k8s-stack/cleanup.sh) --namespace <NAMESPACE> --keep-
crd
```

Check that the Victoria metrics Kubernetes stack is deleted:

```
$ helm list -n <namespace>
```

The output should provide the empty list.

If you face any issues with the removal, uninstall the stack manually:

```
$ helm uninstall vm-k8s-stack -n < namespace>
```

# Delete Percona Operator for MongoDB

You may have different reasons to clean up your Kubernetes environment: moving from trial deployment to a production one, testing experimental configurations and the like. In either case, you need to remove some (or all) of these objects:

- Percona Distribution for MongoDB cluster managed by the Operator
- Percona Operator for MongoDB itself
- Custom Resource Definition deployed with the Operator
- Resources like PVCs and Secrets

## Delete the database cluster

To delete the database cluster means to delete the Custom Resource associated with it.

> **Note**
>
> There are two finalizers defined in the Custom Resource, which are related to cluster deletion:
>
> - `percona.com/delete-psmdb-pods-in-order`: if present, ensures the proper Pods deletion order at cluster deletion (on by default).
> - `percona.com/delete-psmdb-pvc`: if present, Persistent Volume Claims for the database cluster Pods are deleted along with the cluster deletion.
>
> Second one is off by default in the `deploy/cr.yaml` configuration file, allowing you to recreate the cluster without losing data. Also, you can delete TLS-related objects and PVCs manually, if needed.

The steps are the following:

1. List the Custom Resources. Replace the `<namespace>` placeholder with your value

   ```
   $ kubectl get psmdb -n <namespace>
   ```

2. Delete the Custom Resource with the name of your cluster

   ```
   $ kubectl delete psmdb <cluster_name> -n <namespace>
   ```

   It may take a while to stop and delete the cluster.

**Sample output**

```
perconaservermongodb.psmdb.percona.com "my-cluster-name" deleted
```

3. Check that the cluster is deleted by listing the Custom Resources again:

```
$ kubectl get psmdb -n <namespace>
```

**Sample output**

```
No resources found in <namespace> namespace.
```

## Delete the Operator

Choose the instructions relevant to the way you installed the Operator.

### Use kubectl

To uninstall the Operator, delete the Deployments related to it.

1. List the deployments. Replace the `<namespace>` placeholder with your namespace.

```
$ kubectl get deploy -n <namespace>
```

2. Delete the `percona-*` deployment

```
$ kubectl delete deploy percona-server-mongodb-operator -n <namespace>
```

3. Check that the Operator is deleted by listing the Pods. As a result you should have no Pods related to it.

```
$ kubectl get pods -n <namespace>
```

**Sample output**

```
No resources found in <namespace> namespace.
```

If you are not just deleting the Operator and MongoDB cluster from a specific namespace, but want to clean up your entire Kubernetes environment, you can also delete the CustomRecourceDefinitions (CRDs).

**Warning:** CRDs in Kubernetes are non-namespaced but are available to the whole environment. This means that you shouldn't delete CRDs if you still have the Operator and database cluster in some namespace.

Get the list of CRDs.

```
$ kubectl get crd
```

5. Delete the `percona*.psmdb.percona.com` CRDs

```
$ kubectl delete crd perconaservermongodbbackups.psmdb.percona.com
perconaservermongodbrestores.psmdb.percona.com
perconaservermongodbs.psmdb.percona.com
```

**Sample output**

```
customresourcedefinition.apiextensions.k8s.io
"perconaservermongodbbackups.psmdb.percona.com" deleted
customresourcedefinition.apiextensions.k8s.io
"perconaservermongodbrestores.psmdb.percona.com" deleted
customresourcedefinition.apiextensions.k8s.io "perconaservermongodbs.psmdb.percona.com"
deleted
```

## Use Helm

To delete the Operator, do the following:

1. List the Helm charts:

```
$ helm list -n <namespace>
```

**Sample output**

```
cluster1    <namespace>         1           2023-10-31 10:18:10.763049 +0100 CET
deployed    psmdb-db-1.14.4         1.19.1
my-op       <namespace>         1           2023-10-31 10:15:18.41444 +0100 CET
deployed    psmdb-operator-1.14.3   1.19.1
```

2. Delete the release object for Percona Server for MongoDB

```
$ helm uninstall cluster1 --namespace <namespace>
```

3. Delete the release object for the Operator

```
$ helm uninstall my-op --namespace <namespace>
```

## Clean up resources

By default, TLS-related objects and data volumes remain in Kubernetes environment after you delete the cluster to allow you to recreate it without losing the data. If you wish to delete them, do the following:

1. Delete Persistent Volume Claims.

    1. List PVCs. Replace the `<namespace>` placeholder with your namespace:

        ```
        $ kubectl get pvc -n <namespace>
        ```

        **Sample output**

        ```
        NAME                                 STATUS   VOLUME
        CAPACITY   ACCESS MODES   STORAGECLASS   AGE
        mongod-data-my-cluster-name-cfg-0   Bound    pvc-245641fe-b172-439b-8c9c-
        cba5ea4ccd80   3Gi        RWO            standard-rwo   10m
        mongod-data-my-cluster-name-cfg-1   Bound    pvc-4ff7c3c4-b91c-4938-
        a52e-591fd559f4a4   3Gi        RWO            standard-rwo   9m19s
        mongod-data-my-cluster-name-cfg-2   Bound    pvc-acbff4a3-784a-48e7-
        ad4b-8b00239982d3   3Gi        RWO            standard-rwo   8m36s
        mongod-data-my-cluster-name-rs0-0   Bound    pvc-0a56e9ab-e22b-47ce-95de-
        a55f2676456a   3Gi        RWO            standard-rwo   10m
        mongod-data-my-cluster-name-rs0-1   Bound    pvc-cd075679-a7f5-4182-
        a8ce-341db1fb12d3   3Gi        RWO            standard-rwo   9m19s
        mongod-data-my-cluster-name-rs0-2   Bound    pvc-9ff0d41d-c739-494d-
        a45c-576f3a1fb590   3Gi        RWO            standard-rwo   8m26s
        ```

    2. Delete PVCs related to your cluster. The following command deletes PVCs for the `my-cluster-name` cluster:

```
$ kubectl delete pvc mongod-data-my-cluster-name-cfg-0 mongod-data-my-
cluster-name-cfg-1 mongod-data-my-cluster-name-cfg-2 mongod-data-my-
cluster-name-rs0-0 mongod-data-my-cluster-name-rs0-1 mongod-data-my-
cluster-name-rs0-2 -n <namespace>
```

**Sample output**

```
persistentvolumeclaim "mongod-data-my-cluster-name-cfg-0" deleted
persistentvolumeclaim "mongod-data-my-cluster-name-cfg-1" deleted
persistentvolumeclaim "mongod-data-my-cluster-name-cfg-2" deleted
persistentvolumeclaim "mongod-data-my-cluster-name-rs0-0" deleted
persistentvolumeclaim "mongod-data-my-cluster-name-rs0-1" deleted
persistentvolumeclaim "mongod-data-my-cluster-name-rs0-2" deleted
```

2. Delete the Secrets

   1. List Secrets:

      ```
      $ kubectl get secrets -n <namespace>
      ```

   2. Delete the Secret:

      ```
      $ kubectl delete secret <secret_name> -n <namespace>
      ```

# Custom Resource options

The operator is configured via the spec section of the deploy/cr.yaml file.

## `metadata`

The metadata part of this file contains the following keys:

- `name` (`my-cluster-name` by default) sets the name of your Percona Server for MongoDB Cluster; it should include only URL-compatible characters, not exceed 22 characters, start with an alphabetic character, and end with an alphanumeric character
- `finalizers` subsection:
  - `percona.com/delete-psmdb-pods-in-order` if present, activates the Finalizer which controls the proper Pods deletion order in case of the cluster deletion event (on by default)
  - `percona.com/delete-psmdb-pvc` if present, activates the Finalizer which deletes appropriate Persistent Volume Claims after the cluster deletion event (off by default)
  - `percona.com/delete-pitr-chunks` if present, activates the Finalizer which deletes all point-in-time recovery chunks from the cloud storage on cluster deletion (off by default)

## Toplevel `spec` elements

The spec part of the deploy/cr.yaml file contains the following keys and sections:

### `platform`

Override/set the Kubernetes platform: `kubernetes` or `openshift`.

| Value type | Example |
| --- | --- |
| S string | `kubernetes` |

### `pause`

Pause/resume: setting it to `true` gracefully stops the cluster, and setting it to `false` after shut down starts the cluster back.

| Value type | Example |
| --- | --- |

| Value type | Example |
| --- | --- |
| boolean | `false` |

### `unmanaged`

Setting it to `true` instructs the Operator to run the cluster in unmanaged state - the Operator does not form replica sets, and does not generate TLS certificates or user credentials. This can be useful for migration scenarios and for cross-site replication.

| Value type | Example |
| --- | --- |
| boolean | `false` |

### `enableVolumeExpansion`

Enables or disables automatic storage scaling / volume expansion.

| Value type | Example |
| --- | --- |
| boolean | `false` |

### `crVersion`

Version of the Operator the Custom Resource belongs to.

| Value type | Example |
| --- | --- |
| string | `1.19.1` |

### `image`

The Docker image of Percona Server for MongoDB to deploy (actual image names can be found in the list of certified images).

| Value type | Example |
| --- | --- |

| Value type | Example |
| --- | --- |
| string | `percona/percona-server-mongodb:6.0.18-15` |

## `imagePullPolicy`

The policy used to update images.

| Value type | Example |
| --- | --- |
| string | `Always` |

## `imagePullSecrets.name`

The Kubernetes ImagePullSecret to access the custom registry.

| Value type | Example |
| --- | --- |
| string | `private-registry-credentials` |

## `initImage`

An alternative image for the initial Operator installation.

| Value type | Example |
| --- | --- |
| string | `percona/percona-server-mongodb-operator:1.19.1` |

## `initContainerSecurityContext`

A custom Kubernetes Security Context for a Container for the initImage (image, which can be used instead of the default one while the initial Operator installation).

| Value type | Example |
| --- | --- |
| subdoc | `{}` |

### `ClusterServiceDNSSuffix`

The (non-standard) cluster domain to be used as a suffix of the Service name.

| Value type | Example |
| --- | --- |
| S string | `svc.cluster.local` |

### `clusterServiceDNSMode`

Can be `internal` (local fully-qualified domain names will be used in replset configuration even if the replset is exposed - the default value), `external` (exposed MongoDB instances will use ClusterIP addresses, should be applied with caution) or `ServiceMesh` (use a special FQDN based on the Pod name). Being set, `ServiceMesh` value suprecedes multiCluster settings, and therefore these two modes cannot be combined together.

| Value type | Example |
| --- | --- |
| S string | `Internal` |

### `allowUnsafeConfigurations`

Prevents users from configuring a cluster with unsafe parameters: starting it with less than 3 replica set instances, with an even number of replica set instances without additional arbiter, or without TLS/SSL certificates, or running a sharded cluster with less than 3 config server Pods or less than 2 mongos Pods (if `false`, the Operator will automatically change unsafe parameters to safe defaults). *After switching to unsafe configurations permissive mode you will not be able to switch the cluster back by setting `spec.allowUnsafeConfigurations` key to `false`, the flag will be ignored.* **This option is deprecated and will be removed in future releases**. Use `unsafeFlags` subsection instead

| Value type | Example |
| --- | --- |
| boolean | `false` |

### `updateStrategy`

A strategy the Operator uses for upgrades. Possible values are SmartUpdate, RollingUpdate and OnDelete.

| Value type | Example |
| --- | --- |
| string | `SmartUpdate` |

### `ignoreAnnotations`

The list of annotations to be ignored by the Operator.

| Value type | Example |
| --- | --- |
| subdoc | `service.beta.kubernetes.io/aws-load-balancer-backend-protocol` |

### `ignoreLabels`

The list of labels to be ignored by the Operator.

| Value type | Example |
| --- | --- |
| subdoc | `rack` |

### `multiCluster.enabled`

Multi-cluster Services (MCS): setting it to `true` enables MCS cluster mode.

| Value type | Example |
| --- | --- |
| boolean | `false` |

### `multiCluster.DNSSuffix`

The cluster domain to be used as a suffix for multi-cluster Services used by Kubernetes (`svc.clusterset.local` by default).

| Value type | Example |
| --- | --- |
| string | `svc.clusterset.local` |

## Unsafe flags section

The `unsafeFlags` section in the deploy/cr.yaml file contains various configuration options to prevent users from configuring a cluster with unsafe parameters. *After switching to unsafe configurations permissive mode you will not be able to switch the cluster back by setting same keys to `false`, the flags will be ignored.*

### `unsafeFlags.tls`

Prevents users from configuring a cluster without TLS/SSL certificates (if `false`, the Operator will automatically change unsafe parameters to safe defaults).

| Value type | Example |
|---|---|
| boolean | `false` |

### `unsafeFlags.replsetSize`

Prevents users from configuring a cluster with unsafe parameters: starting it with less than 3 replica set instances or with an even number of replica set instances without additional arbiter (if `false`, the Operator will automatically change unsafe parameters to safe defaults).

| Value type | Example |
|---|---|
| boolean | `false` |

### `unsafeFlags.mongosSize`

Prevents users from configuring a sharded cluster with less than 3 config server Pods or less than 2 mongos Pods (if `false`, the Operator will automatically change unsafe parameters to safe defaults).

| Value type | Example |
|---|---|
| boolean | `false` |

### `unsafeFlags.terminationGracePeriod`

Prevents users from configuring a sharded cluster without termination grace period for replica set, config servers and mongos Pods.

| Value type | Example |
| --- | --- |
| boolean | `false` |

### `unsafeFlags.backupIfUnhealthy`

Prevents running backup on a cluster with failed health checks.

| Value type | Example |
| --- | --- |
| boolean | `false` |

## TLS (extended cert-manager configuration section)

The `tls` section in the deploy/cr.yaml file contains various configuration options for additional customization of the Transport Layer Security.

### `tls.mode`

Controls if the TLS encryption should be used and/or enforced. Can be `disabled`, `allowTLS`, `preferTLS`, or `requireTLS`. If set to `disabled`, it also requires setting `unsafeFlags.tls option to` true`.

| Value type | Example |
| --- | --- |
| string | `preferTLS` |

### `tls.certValidityDuration`

The validity duration of the external certificate for cert manager (90 days by default). This value is used only at cluster creation time and can't be changed for existing clusters.

| Value type | Example |
| --- | --- |
| string | `2160h` |

### `tls.allowInvalidCertificates`

If `true`, the mongo shell will not attempt to validate the server certificates. **Should be true (default variant) to use self-signed certificates generated by the Operator when there is no cert-manager.**

| Value type | Example |
| --- | --- |
| boolean | `true` |

### 'tls.issuerConf.name'

A cert-manager issuer name.

| Value type | Example |
| --- | --- |
| string | `special-selfsigned-issuer` |

### 'tls.issuerConf.kind'

A cert-manager issuer type.

### 'tls.issuerConf.group'

A cert-manager issuer group. Should be `cert-manager.io` for built-in cert-manager certificate issuers.

| Value type | Example |
| --- | --- |
| string | `cert-manager.io` |

## Upgrade Options Section

The `upgradeOptions` section in the deploy/cr.yaml file contains various configuration options to control Percona Server for MongoDB upgrades.

### `upgradeOptions.versionServiceEndpoint`

The Version Service URL used to check versions compatibility for upgrade.

| Value type | Example |
| --- | --- |

| Value type | Example |
| --- | --- |
| string | `https://check.percona.com` |

### `upgradeOptions.apply`

Specifies how updates are processed by the Operator. `Never` or `Disabled` will completely disable automatic upgrades, otherwise it can be set to `Latest` or `Recommended` or to a specific version stringof Percona Server for MongoDB (e.g. `6.0.18-15`) that is wished to be version-locked (so that the user can control the version running, but use automatic upgrades to move between them).

| Value type | Example |
| --- | --- |
| string | `disabled` |

### `upgradeOptions.schedule`

Scheduled time to check for updates, specified in the crontab format.

| Value type | Example |
| --- | --- |
| string | `0 2 \* \* \*` |

### `upgradeOptions.setFCV`

If enabled, FeatureCompatibilityVersion (FCV) will be set to match the version during major version upgrade.

| Value type | Example |
| --- | --- |
| boolean | `false` |

## Secrets section

Each spec in its turn may contain some key-value pairs. The secrets one has only two of them:

### `secrets.keyFile`

The secret name for the MongoDB Internal Auth Key file. This secret is auto-created by the operator if it doesn't exist.

| Value type | Example |
| --- | --- |
| S string | `my-cluster-name-mongodb-keyfile` |

### `secrets.users`

The name of the Secrets object for the MongoDB users required to run the operator.

| Value type | Example |
| --- | --- |
| S string | `my-cluster-name-secrets` |

### `secrets.sse`

The name of the Secrets object for server side encryption credentials

| Value type | Example |
| --- | --- |
| S string | `my-cluster-name-sse` |

### `secrets.ssl`

A secret with TLS certificate generated for *external* communications, see Transport Layer Security (TLS) for details.

| Value type | Example |
| --- | --- |
| S string | `my-custom-ssl` |

### `secrets.sslInternal`

A secret with TLS certificate generated for *internal* communications, see Transport Layer Security (TLS) for details.

| Value type | Example |
| --- | --- |
| S string | `my-custom-ssl-internal` |

### `secrets.encryptionKey`

Specifies a secret object with the encryption key.

| Value type | Example |
| --- | --- |
| S string | `my-cluster-name-mongodb-encryption-key` |

### `secrets.vault`

Specifies a secret object to provide integration with HashiCorp Vault.

| Value type | Example |
| --- | --- |
| S string | `my-cluster-name-vault` |

### `secrets.ldapSecret`

Specifies a secret object for LDAP over TLS connection between MongoDB and OpenLDAP server.

| Value type | Example |
| --- | --- |
| S string | `my-ldap-secret` |

## Replsets Section

The replsets section controls the MongoDB Replica Set.

### `replsets.name`

The name of the MongoDB Replica Set.

| Value type | Example |
| --- | --- |
| S string | `rs 0` |

### `replsets.size`

The size of the MongoDB Replica Set, must be >= 3 for High-Availability.

| Value type | Example |
| --- | --- |
| 1 int | `3` |

### `replsets.terminationGracePeriodSeconds`

The amount of seconds Kubernetes will wait for a clean replica set Pods termination.

| Value type | Example |
| --- | --- |
| 1 int | `300` |

### 'replsets.serviceAccountName'

Name of the separate privileged service account for Replica Set Pods.

| Value type | Example |
| --- | --- |
| S string | `default` |

### `replsets.topologySpreadConstraints.labelSelector.matchLabels`

The label selector for the Kubernetes Pod Topology Spread Constraints.

| Value type | Example |
| --- | --- |
| label | `app.kubernetes.io/name: percona-server-mongodb` |

### `replsets.topologySpreadConstraints.maxSkew`

The degree to which Pods may be unevenly distributed under the Kubernetes Pod Topology Spread Constraints.

| Value type | Example |
| --- | --- |
| 1 int | `1` |

### `replsets.topologySpreadConstraints.topologyKey`

The key of node labels for the Kubernetes Pod Topology Spread Constraints.

| Value type | Example |
| --- | --- |
| S string | `kubernetes.io/hostname` |

### `replsets.topologySpreadConstraints.whenUnsatisfiable`

What to do with a Pod if it doesn't satisfy the Kubernetes Pod Topology Spread Constraints.

| Value type | Example |
| --- | --- |
| S string | `DoNotSchedule` |

### `replsets.replsetOverrides.MEMBER-NAME.host`

Use if you need to override the replica set members FQDNs with custom host names. Each key (`MEMBER-NAME`) under `replsetOverrides` should be name of a Pod. The Operator won't perform any validation for hostnames, so it's the user's responsibility to ensure connectivity.

| Value type | Example |
| --- | --- |
| S string | `my-cluster-name-rs0-0.example.net:27017` |

### `replsets.replsetOverrides.MEMBER-NAME.priority`

Use if you need to override the replica set members priorities.

| Value type | Example |
| --- | --- |
| 1 int | `3` |

### `replsets.replsetOverrides.MEMBER-NAME.tags`

Optional custom tags which can be added to the replset members to make their identication easier.

| Value type | Example |
| --- | --- |
| label | `key: value-0` |

### `replsets.externalNodes.host`

The URL or IP address of the external replset instance.

| Value type | Example |
| --- | --- |
| S string | `34.124.76.90` |

### `replsets.externalNodes.port`

The port number of the external replset instance.

| Value type | Example |
| --- | --- |
| S string | `27017` |

### `replsets.externalNodes.votes`

The number of votes of the external replset instance.

| Value type | Example |
| --- | --- |
| S string | `0` |

### `replsets.externalNodes.priority`

The priority of the external replset instance.

| Value type | Example |
| --- | --- |
| S string | `0` |

### `replsets.configuration`

Custom configuration options for mongod. Please refer to the official manual for the full list of options, and specific Percona Server for MongoDB docs.

| Value type | Example |
| --- | --- |
| subdoc | `\|`<br>`operationProfiling:`<br>`  mode: slowOp`<br>`systemLog:`<br>`  verbosity: 1`<br>`storage:`<br>`  engine: wiredTiger`<br>`  wiredTiger:`<br>`  engineConfig:`<br>`  directoryForIndexes: false`<br>`  journalCompressor: snappy`<br>`  collectionConfig:`<br>`  blockCompressor: snappy`<br>`  indexConfig:`<br>`  prefixCompression: true` |

### `replsets.affinity.antiAffinityTopologyKey`

The Kubernetes topologyKey node affinity constraint for the Replica Set nodes.

| Value type | Example |
| --- | --- |
| S string | `kubernetes.io/hostname` |

### `replsets.affinity.advanced`

In cases where the pods require complex tuning the advanced option turns off the `topologykey` effect. This setting allows the standard Kubernetes affinity constraints of any complexity to be used.

| Value type | Example |
| --- | --- |
| subdoc | |

### `replsets.tolerations.key`

The Kubernetes Pod tolerations key for the Replica Set nodes.

| Value type | Example |
| --- | --- |
| string | `node.alpha.kubernetes.io/unreachable` |

### `replsets.tolerations.operator`

The Kubernetes Pod tolerations operator for the Replica Set nodes.

| Value type | Example |
| --- | --- |
| string | `Exists` |

### `replsets.tolerations.effect`

The Kubernetes Pod tolerations effect for the Replica Set nodes.

| Value type | Example |
| --- | --- |
| string | `NoExecute` |

### `replsets.tolerations.tolerationSeconds`

The Kubernetes Pod tolerations time limit for the Replica Set nodes.

| Value type | Example |
| --- | --- |

| Value type | Example |
| --- | --- |
| 1 int | `6000` |

## `replsets.primaryPreferTagSelector.region`

Ensures the MongoDB instance is selected as Primary based on specified region

| Value type | Example |
| --- | --- |
| S string | `us-west-2` |

## `replsets.primaryPreferTagSelector.zone`

Ensures the MongoDB instance is selected as Primary based on specified zone

| Value type | Example |
| --- | --- |
| S string | `us-west-2c` |

## `replsets.priorityClassName`

The Kuberentes Pod priority class for the Replica Set nodes.

| Value type | Example |
| --- | --- |
| S string | `high priority` |

## `replsets.annotations`

The Kubernetes annotations metadata for the Replica Set nodes.

| Value type | Example |
| --- | --- |
| S string | `iam.amazonaws.com/role: role-arn` |

## `replsets.labels`

The Kubernetes affinity labels for the Replica Set nodes.

| Value type | Example |
| --- | --- |
| label | `rack: rack-22` |

## `replsets.nodeSelector`

The Kubernetes nodeSelector affinity constraint for the Replica Set nodes.

| Value type | Example |
| --- | --- |
| label | `disktype: ssd` |

## `replsets.storage.engine`

Sets the storage.engine option https://docs.mongodb.com/manual/reference/configuration-options/#storage.engine`_ for the Replica Set nodes.

| Value type | Example |
| --- | --- |
| string | `wiredTiger` |

## `replsets.storage.wiredTiger.engineConfig.cacheSizeRatio`

The ratio used to compute the storage.wiredTiger.engineConfig.cacheSizeGB option for the Replica Set nodes.

| Value type | Example |
| --- | --- |
| float | `0.5` |

## `replsets.storage.wiredTiger.engineConfig.directoryForIndexes`

Sets the storage.wiredTiger.engineConfig.directoryForIndexes option for the Replica Set nodes.

| Value type | Example |
| --- | --- |
| boolean | `false` |

### `replsets.storage.wiredTiger.engineConfig.journalCompressor`

Sets the storage.wiredTiger.engineConfig.journalCompressor option for the Replica Set nodes.

| Value type | Example |
| --- | --- |
| string | `snappy` |

### `replsets.storage.wiredTiger.collectionConfig.blockCompressor`

Sets the storage.wiredTiger.collectionConfig.blockCompressor option for the Replica Set nodes.

| Value type | Example |
| --- | --- |
| string | `snappy` |

### `replsets.storage.wiredTiger.indexConfig.prefixCompression`

Sets the storage.wiredTiger.indexConfig.prefixCompression option for the Replica Set nodes.

| Value type | Example |
| --- | --- |
| boolean | `true` |

### `replsets.storage.inMemory.engineConfig.inMemorySizeRatio`

The ratio used to compute the storage.engine.inMemory.inMemorySizeGb option for the Replica Set nodes.

| Value type | Example |
| --- | --- |
| float | `0.9` |

### `replsets.livenessProbe.failureThreshold`

Number of consecutive unsuccessful tries of the liveness probe to be undertaken before giving up.

| Value type | Example |
| --- | --- |
| 1 int | `4` |

### `replsets.livenessProbe.initialDelaySeconds`

Number of seconds to wait after the container start before initiating the liveness probe.

| Value type | Example |
| --- | --- |
| 1 int | `60` |

### `replsets.livenessProbe.periodSeconds`

How often to perform a liveness probe (in seconds).

| Value type | Example |
| --- | --- |
| 1 int | `30` |

### `replsets.livenessProbe.timeoutSeconds`

Number of seconds after which the liveness probe times out.

| Value type | Example |
| --- | --- |
| 1 int | `10` |

### `replsets.livenessProbe.startupDelaySeconds`

Time after which the liveness probe is failed if the MongoDB instance didn't finish its full startup yet.

| Value type | Example |
| --- | --- |

| Value type | Example |
| --- | --- |
| 1 int | `7200` |

## `replsets.readinessProbe.failureThreshold`

Number of consecutive unsuccessful tries of the readiness probe to be undertaken before giving up.

| Value type | Example |
| --- | --- |
| 1 int | `8` |

## `replsets.readinessProbe.initialDelaySeconds`

Number of seconds to wait after the container start before initiating the readiness probe.

| Value type | Example |
| --- | --- |
| 1 int | `10` |

## `replsets.readinessProbe.periodSeconds`

How often to perform a readiness probe (in seconds).

| Value type | Example |
| --- | --- |
| 1 int | `3` |

## `replsets.readinessProbe.successThreshold`

Minimum consecutive successes for the readiness probe to be considered successful after having failed.

| Value type | Example |
| --- | --- |
| 1 int | `1` |

### `replsets.readinessProbe.timeoutSeconds`

Number of seconds after which the readiness probe times out.

| Value type | Example |
| --- | --- |
| 1 int | `2` |

### 'replsets.containerSecurityContext'

A custom Kubernetes Security Context for a Container to be used instead of the default one.

| Value type | Example |
| --- | --- |
| subdoc | `privileged: false` |

### 'replsets.podSecurityContext'

A custom Kubernetes Security Context for a Pod to be used instead of the default one.

| Value type | Example |
| --- | --- |
| subdoc | `runAsUser: 1001`<br>`runAsGroup: 1001`<br>`supplementalGroups: [1001]` |

### `replsets.runtimeClassName`

Name of the Kubernetes Runtime Class for Replica Set Pods.

| Value type | Example |
| --- | --- |
| S string | `image-rc` |

### `replsets.sidecars.image`

Image for the custom sidecar container for Replica Set Pods.

| Value type | Example |
| --- | --- |
| string | `busybox` |

## `replsets.sidecars.command`

Command for the custom sidecar container for Replica Set Pods.

| Value type | Example |
| --- | --- |
| array | `["/bin/sh"]` |

## `replsets.sidecars.args`

Command arguments for the custom sidecar container for Replica Set Pods.

| Value type | Example |
| --- | --- |
| array | `["-c", "while true; do echo echo $(date -u) 'test' >> /dev/null; sleep 5;done"]` |

## `replsets.sidecars.name`

Name of the custom sidecar container for Replica Set Pods.

| Value type | Example |
| --- | --- |
| string | `rs-sidecar-1` |

## `replsets.sidecars.volumeMounts.mountPath`

Mount path of the custom sidecar container volume for Replica Set Pods.

| Value type | Example |
| --- | --- |
| string | `/volume1` |

### `replsets.sidecars.volumeMounts.name`

Name of the custom sidecar container volume for Replica Set Pods.

| Value type | Example |
| --- | --- |
| S string | `sidecar-volume-claim` |

### `replsets.sidecarVolumes.name`

Name of the custom sidecar container volume for Replica Set Pods.

| Value type | Example |
| --- | --- |
| S string | `sidecar-config` |

### `replsets.sidecarVolumes.configMap.name`

Name of the ConfigMap for a custom sidecar container volume for Replica Set Pods.

| Value type | Example |
| --- | --- |
| S string | `myconfigmap` |

### `replsets.sidecarVolumes.secret.secretName`

Name of the Secret for a custom sidecar container volume for Replica Set Pods.

| Value type | Example |
| --- | --- |
| S string | `sidecar-secret` |

### `replsets.sidecarVolumes.nfs.server`

The hostname of the NFS server that will provide remote filesystem to the custom sidecar container volume for Replica Set Pods.

| Value type | Example |
| --- | --- |

| Value type | Example |
| --- | --- |
| string | `nfs-service.storage.svc.cluster.local` |

### `replsets.sidecarVolumes.nfs.path`

The path on the NFS server that will be provided as a remote filesystem to the custom sidecar container volume for Replica Set Pods.

| Value type | Example |
| --- | --- |
| string | `/psmdb-some-name-rs0` |

### `replsets.sidecarPVCs`

Persistent Volume Claim for the custom sidecar container volume for Replica Set Pods.

| Value type | Example |
| --- | --- |
| subdoc | |

### `replsets.podDisruptionBudget.maxUnavailable`

The Kubernetes Pod distribution budget limit specifying the maximum value for unavailable Pods.

| Value type | Example |
| --- | --- |
| int | 1 |

### `replsets.podDisruptionBudget.minAvailable`

The Kubernetes Pod distribution budget limit specifying the minimum value for available Pods.

| Value type | Example |
| --- | --- |
| int | 1 |

### `replsets.splitHorizons.REPLICASET-POD-NAME.external`

External URI for Split-horizon for replica set Pods of the exposed cluster.

| Value type | Example |
| --- | --- |
| S string | `rs0-0.mycluster.xyz` |

### `replsets.splitHorizons.REPLICASET-POD-NAME.external-2`

External URI for Split-horizon for replica set Pods of the exposed cluster.

| Value type | Example |
| --- | --- |
| S string | `rs0-0.mycluster2.xyz` |

### `replsets.expose.enabled`

Enable or disable exposing MongoDB Replica Set nodes with dedicated IP addresses.

| Value type | Example |
| --- | --- |
| boolean | `false` |

### `replsets.expose.type`

The IP address type to be exposed.

| Value type | Example |
| --- | --- |
| S string | `ClusterIP` |

### `replsets.expose.loadBalancerSourceRanges`

The range of client IP addresses from which the load balancer should be reachable (if not set, there is no limitations).

| Value type | Example |
| --- | --- |

| Value type | Example |
| --- | --- |
| string | `10.0.0.0/8` |

### `replsets.expose.annotations`

The Kubernetes annotations metadata for the MongoDB mongod daemon.

| Value type | Example |
| --- | --- |
| string | `service.beta.kubernetes.io/aws-load-balancer-backend-protocol: http` |

### `replsets.expose.labels`

The Kubernetes labels for the MongoDB Replica Set Service.

| Value type | Example |
| --- | --- |
| string | `rack: rack-22` |

### `replsets.expose.internalTrafficPolicy`

Specifies whether Service for MongoDB instances should route internal traffic to cluster-wide or to node-local endpoints (it can influence the load balancing effectiveness).

| Value type | Example |
| --- | --- |
| boolean | `Local` |

### `replsets.expose.externalTrafficPolicy`

Specifies whether Service for MongoDB instances should route external traffic to cluster-wide (`Cluster`) or to node-local (`Local`) endpoints. It can influence the load balancing effectiveness.

| Value type | Example |
| --- | --- |
| string | `Local` |

### `replsets.nonvoting.enabled`

Enable or disable creation of Replica Set non-voting instances within the cluster.

| Value type | Example |
| --- | --- |
| boolean | `false` |

### `replsets.nonvoting.size`

The number of Replica Set non-voting instances within the cluster.

| Value type | Example |
| --- | --- |
| int | `1` |

### `replsets.nonvoting.podSecurityContext`

A custom Kubernetes Security Context for a Pod to be used instead of the default one.

| Value type | Example |
| --- | --- |
| subdoc | `{}` |

### `replsets.nonvoting.containerSecurityContext`

A custom Kubernetes Security Context for a Container to be used instead of the default one.

| Value type | Example |
| --- | --- |
| subdoc | `{}` |

### `replsets.nonvoting.afinity.antiAffinityTopologyKey`

The Kubernetes topologyKey node affinity constraint for the non-voting nodes.

| Value type | Example |
| --- | --- |

| Value type | Example |
| --- | --- |
| string | `kubernetes.io/hostname` |

### `replsets.nonvoting.affinity.advanced`

In cases where the pods require complex tuning the advanced option turns off the `topologykey` effect. This setting allows the standard Kubernetes affinity constraints of any complexity to be used.

| Value type | Example |
| --- | --- |
| subdoc | |

### `replsets.nonvoting.tolerations.key`

The Kubernetes Pod tolerations key for the non-voting nodes.

| Value type | Example |
| --- | --- |
| string | `node.alpha.kubernetes.io/unreachable` |

### `replsets.nonvoting.tolerations.operator`

The Kubernetes Pod tolerations operator for the non-voting nodes.

| Value type | Example |
| --- | --- |
| string | `Exists` |

### `replsets.nonvoting.tolerations.effect`

The Kubernetes Pod tolerations effect for the non-voting nodes.

| Value type | Example |
| --- | --- |
| string | `NoExecute` |

### `replsets.nonvoting.tolerations.tolerationSeconds`

The Kubernetes Pod tolerations time limit for the non-voting nodes.

| Value type | Example |
| --- | --- |
| 1 int | `6000` |

### `replsets.nonvoting.priorityClassName`

The Kuberentes Pod priority class for the non-voting nodes.

| Value type | Example |
| --- | --- |
| S string | `high priority` |

### `replsets.nonvoting.annotations`

The Kubernetes annotations metadata for the non-voting nodes.

| Value type | Example |
| --- | --- |
| S string | `iam.amazonaws.com/role: role-arn` |

### `replsets.nonvoting.labels`

The Kubernetes affinity labels for the non-voting nodes.

| Value type | Example |
| --- | --- |
| label | `rack: rack-22` |

### `replsets.nonvoting.nodeSelector`

The Kubernetes nodeSelector affinity constraint for the non-voting nodes.

| Value type | Example |
| --- | --- |

| Value type | Example |
| --- | --- |
| label | `disktype: ssd` |

### `replsets.nonvoting.podDisruptionBudget.maxUnavailable`

The Kubernetes Pod distribution budget limit specifying the maximum value for unavailable Pods among non-voting nodes.

| Value type | Example |
| --- | --- |
| int | `1` |

### `replsets.nonvoting.podDisruptionBudget.minAvailable`

The Kubernetes Pod distribution budget limit specifying the minimum value for available Pods among non-voting nodes.

| Value type | Example |
| --- | --- |
| int | `1` |

### `replsets.nonvoting.resources.limits.cpu`

Kubernetes CPU limit for MongoDB container.

| Value type | Example |
| --- | --- |
| string | `300m` |

### `replsets.nonvoting.resources.limits.memory`

Kubernetes Memory limit for MongoDB container.

| Value type | Example |
| --- | --- |
| string | `0.5G` |

### `replsets.nonvoting.resources.requests.cpu`

The Kubernetes CPU requests for MongoDB container.

| Value type | Example |
| --- | --- |
| S string | `300m` |

### `replsets.nonvoting.resources.requests.memory`

The Kubernetes Memory requests for MongoDB container.

| Value type | Example |
| --- | --- |
| S string | `0.5G` |

### `replsets.nonvoting.volumeSpec.emptyDir`

The Kubernetes emptyDir volume, i.e. the directory which will be created on a node, and will be accessible to the MongoDB Pod containers.

| Value type | Example |
| --- | --- |
| S string | `{}` |

### `replsets.nonvoting.volumeSpec.hostPath.path`

Kubernetes hostPath volume, i.e. the file or directory of a node that will be accessible to the MongoDB Pod containers.

| Value type | Example |
| --- | --- |
| S string | `/data` |

### `replsets.nonvoting.volumeSpec.hostPath.type`

The Kubernetes hostPath volume type.

| Value type | Example |
| --- | --- |
| S string | `Directory` |

## `replsets.nonvoting.volumeSpec.persistentVolumeClaim.annotations`

The Kubernetes annotations metadata for Persistent Volume Claim.

| Value type | Example |
| --- | --- |
| S string | `service.beta.kubernetes.io/aws-load-balancer-backend-protocol: http` |

## `replsets.nonvoting.volumeSpec.persistentVolumeClaim.labels`

The Kubernetes labels metadata for Persistent Volume Claim.

| Value type | Example |
| --- | --- |
| S string | `rack: rack-22` |

## `replsets.nonvoting.volumeSpec.persistentVolumeClaim.storageClassName`

The Kubernetes Storage Class to use with the MongoDB container Persistent Volume Claim for the non-voting nodes. Use Storage Class with XFS as the default filesystem if possible, [for better MongoDB performance ](https://dba.stackexchange.com/questions/190578/is-xfs-still-the-best-choice-for-mongodb.

| Value type | Example |
| --- | --- |
| S string | `standard` |

## `replsets.nonvoting.volumeSpec.persistentVolumeClaim.accessModes`

The Kubernetes Persistent Volume access modes for the MongoDB container for the non-voting nodes.

| Value type | Example |
| --- | --- |

| Value type | Example |
| --- | --- |
| array | `[ "ReadWriteOnce" ]` |

## `replsets.nonvoting.volumeSpec.persistentVolumeClaim.resources.requests.storage`

The Kubernetes Persistent Volume size for the MongoDB container for the non-voting nodes.

| Value type | Example |
| --- | --- |
| string | `3Gi` |

## `replsets.arbiter.enabled`

Enable or disable creation of Replica Set Arbiter nodes within the cluster.

| Value type | Example |
| --- | --- |
| boolean | `false` |

## `replsets.arbiter.size`

The number of Replica Set Arbiter instances within the cluster.

| Value type | Example |
| --- | --- |
| int | `1` |

## `replsets.arbiter.afinity.antiAffinityTopologyKey`

The Kubernetes topologyKey node affinity constraint for the Arbiter.

| Value type | Example |
| --- | --- |
| string | `kubernetes.io/hostname` |

### `replsets.arbiter.affinity.advanced`

In cases where the pods require complex tuning the advanced option turns off the `topologykey` effect. This setting allows the standard Kubernetes affinity constraints of any complexity to be used.

| Value type | Example |
| --- | --- |
| subdoc | |

### `replsets.arbiter.tolerations.key`

The Kubernetes Pod tolerations key for the Arbiter nodes.

| Value type | Example |
| --- | --- |
| string | `node.alpha.kubernetes.io/unreachable` |

### `replsets.arbiter.tolerations.operator`

The Kubernetes Pod tolerations operator for the Arbiter nodes.

| Value type | Example |
| --- | --- |
| string | `Exists` |

### `replsets.arbiter.tolerations.effect`

The Kubernetes Pod tolerations effect for the Arbiter nodes.

| Value type | Example |
| --- | --- |
| string | `NoExecute` |

### `replsets.arbiter.tolerations.tolerationSeconds`

The Kubernetes Pod tolerations time limit for the Arbiter nodes.

| Value type | Example |
| --- | --- |

| Value type | Example |
| --- | --- |
| 1 int | `6000` |

## `replsets.arbiter.priorityClassName`

The Kuberentes Pod priority class for the Arbiter nodes.

| Value type | Example |
| --- | --- |
| S string | `high priority` |

## `replsets.arbiter.annotations`

The Kubernetes annotations metadata for the Arbiter nodes.

| Value type | Example |
| --- | --- |
| S string | `iam.amazonaws.com/role: role-arn` |

## `replsets.arbiter.labels`

The Kubernetes affinity labels for the Arbiter nodes.

| Value type | Example |
| --- | --- |
| label | `rack: rack-22` |

## `replsets.arbiter.nodeSelector`

The Kubernetes nodeSelector affinity constraint for the Arbiter nodes.

| Value type | Example |
| --- | --- |
| label | `disktype: ssd` |

### `replsets.resources.limits.cpu`

Kubernetes CPU limit for MongoDB container.

| Value type | Example |
| --- | --- |
| S string | `300m` |

### `replsets.resources.limits.memory`

Kubernetes Memory limit for MongoDB container.

| Value type | Example |
| --- | --- |
| S string | `0.5G` |

### `replsets.resources.requests.cpu`

The Kubernetes CPU requests for MongoDB container.

| Value type | Example |
| --- | --- |
| S string | `300m` |

### `replsets.resources.requests.memory`

The Kubernetes Memory requests for MongoDB container.

| Value type | Example |
| --- | --- |
| S string | `0.5G` |

### `replsets.volumeSpec.emptyDir`

The Kubernetes emptyDir volume, i.e. the directory which will be created on a node, and will be accessible to the MongoDB Pod containers.

| Value type | Example |
| --- | --- |

| Value type | Example |
| --- | --- |
| S string | `{}` |

### `replsets.volumeSpec.hostPath.path`

Kubernetes hostPath volume, i.e. the file or directory of a node that will be accessible to the MongoDB Pod containers.

| Value type | Example |
| --- | --- |
| S string | `/data` |

### `replsets.volumeSpec.hostPath.type`

The Kubernetes hostPath volume type.

| Value type | Example |
| --- | --- |
| S string | `Directory` |

### `replsets.volumeSpec.persistentVolumeClaim.annotations`

The Kubernetes annotations metadata for Persistent Volume Claim.

| Value type | Example |
| --- | --- |
| S string | `service.beta.kubernetes.io/aws-load-balancer-backend-protocol: http` |

### `replsets.volumeSpec.persistentVolumeClaim.labels`

The Kubernetes labels metadata for Persistent Volume Claim.

| Value type | Example |
| --- | --- |
| S string | `rack: rack-22` |

### `replsets.volumeSpec.persistentVolumeClaim.storageClassName`

The Kubernetes Storage Class to use with the MongoDB container Persistent Volume Claim. Use Storage Class with XFS as the default filesystem if possible, for better MongoDB performance.

| Value type | Example |
| --- | --- |
| string | `standard` |

### `replsets.volumeSpec.persistentVolumeClaim.accessModes`

The Kubernetes Persistent Volume access modes for the MongoDB container.

| Value type | Example |
| --- | --- |
| array | `[ "ReadWriteOnce" ]` |

### `replsets.volumeSpec.persistentVolumeClaim.resources.requests.storage`

The Kubernetes Persistent Volume size for the MongoDB container.

| Value type | Example |
| --- | --- |
| string | `3Gi` |

### `replsets.hostAliases.ip`

The IP address for Kubernetes host aliases for replica set Pods.

| Value type | Example |
| --- | --- |
| string | `"10.10.0.2"` |

### `replsets.hostAliases.hostnames`

Hostnames for Kubernetes host aliases for replica set Pods.

| Value type | Example |
| --- | --- |

| Value type | Example |
| --- | --- |
| subdoc | |

## PMM Section

The `pmm` section in the deploy/cr.yaml file contains configuration options for Percona Monitoring and Management.

### `pmm.enabled`

Enables or disables monitoring Percona Server for MongoDB with PMM.

| Value type | Example |
| --- | --- |
| boolean | `false` |

### `pmm.image`

PMM Client docker image to use.

| Value type | Example |
| --- | --- |
| string | `percona/pmm-client:2.44.0` |

### `pmm.serverHost`

Address of the PMM Server to collect data from the Cluster.

| Value type | Example |
| --- | --- |
| string | `monitoring-service` |

### `pmm.containerSecurityContext`

A custom Kubernetes Security Context for a Container to be used instead of the default one.

| Value type | Example |
| --- | --- |
| subdoc | `{}` |

### `pmm.mongodParams`

Additional parameters which will be passed to the pmm-admin add mongodb command for `mongod` Pods.

| Value type | Example |
| --- | --- |
| string | `--environment=DEV-ENV --custom-labels=DEV-ENV` |

### `pmm.mongosParams`

Additional parameters which will be passed to the pmm-admin add mongodb command for `mongos` Pods.

| Value type | Example |
| --- | --- |
| string | `--environment=DEV-ENV --custom-labels=DEV-ENV` |

## Sharding Section

The `sharding` section in the deploy/cr.yaml file contains configuration options for Percona Server for MondoDB sharding.

### `sharding.enabled`

Enables or disables Percona Server for MondoDB sharding.

| Value type | Example |
| --- | --- |
| boolean | `true` |

### `sharding.configsvrReplSet.size`

The number of Config Server instances within the cluster.

| Value type | Example |
| --- | --- |
| 1 int | `3` |

### `sharding.configsvrReplSet.terminationGracePeriodSeconds`

The amount of seconds Kubernetes will wait for a clean config server Pods termination.

| Value type | Example |
| --- | --- |
| 1 int | `300` |

### 'sharding.configsvrReplSet.serviceAccountName'

Name of the separate privileged service account for Config Server Pods.

| Value type | Example |
| --- | --- |
| S string | `default` |

### `sharding.configsvrReplSet.topologySpreadConstraints.labelSelector.matchLabels`

The label selector for the Kubernetes Pod Topology Spread Constraints.

| Value type | Example |
| --- | --- |
| label | `app.kubernetes.io/name: percona-server-mongodb` |

### `sharding.configsvrReplSet.topologySpreadConstraints.maxSkew`

The degree to which Pods may be unevenly distributed under the Kubernetes Pod Topology Spread Constraints.

| Value type | Example |
| --- | --- |

| Value type | Example |
| --- | --- |
| 1 int | `1` |

### `sharding.configsvrReplSet.topologySpreadConstraints.topologyKey`

The key of node labels for the Kubernetes Pod Topology Spread Constraints.

| Value type | Example |
| --- | --- |
| S string | `kubernetes.io/hostname` |

### `sharding.configsvrReplSet.topologySpreadConstraints.whenUnsatisfiable`

What to do with a Pod if it doesn't satisfy the Kubernetes Pod Topology Spread Constraints.

| Value type | Example |
| --- | --- |
| S string | `DoNotSchedule` |

### `sharding.configsvrReplSet.externalNodes.host`

The URL or IP address of the external config server instance.

| Value type | Example |
| --- | --- |
| S string | `34.124.76.90` |

### `sharding.configsvrReplSet.externalNodes.port`

The port number of the external config server instance.

| Value type | Example |
| --- | --- |
| S string | `27017` |

### `sharding.configsvrReplSet.externalNodes.votes`

The number of votes of the external config server instance.

| Value type | Example |
| --- | --- |
| S string | `0` |

### `sharding.configsvrReplSet.externalNodes.priority`

The priority of the external config server instance.

| Value type | Example |
| --- | --- |
| S string | `0` |

### `sharding.configsvrReplSet.configuration`

Custom configuration options for Config Servers. Please refer to the official manual for the full list of options.

| Value type | Example |
| --- | --- |
| S string | `\|`<br>`operationProfiling:`<br>`  mode: slowOp`<br>`systemLog:`<br>`  verbosity: 1` |

### `sharding.configsvrReplSet.livenessProbe.failureThreshold`

Number of consecutive unsuccessful tries of the liveness probe to be undertaken before giving up.

| Value type | Example |
| --- | --- |
| 1 int | `4` |

### `sharding.configsvrReplSet.livenessProbe.initialDelaySeconds`

Number of seconds to wait after the container start before initiating the liveness probe.

| Value type | Example |
| --- | --- |
| 1 int | `60` |

### `sharding.configsvrReplSet.livenessProbe.periodSeconds`

How often to perform a liveness probe (in seconds).

| Value type | Example |
| --- | --- |
| 1 int | `30` |

### `sharding.configsvrReplSet.livenessProbe.timeoutSeconds`

Number of seconds after which the liveness probe times out.

| Value type | Example |
| --- | --- |
| 1 int | `10` |

### `sharding.configsvrReplSet.livenessProbe.startupDelaySeconds`

Time after which the liveness probe is failed if the MongoDB instance didn't finish its full startup yet.

| Value type | Example |
| --- | --- |
| 1 int | `7200` |

### `sharding.configsvrReplSet.readinessProbe.failureThreshold`

Number of consecutive unsuccessful tries of the readiness probe to be undertaken before giving up.

| Value type | Example |
| --- | --- |
| 1 int | `3` |

### `sharding.configsvrReplSet.readinessProbe.initialDelaySeconds`

Number of seconds to wait after the container start before initiating the readiness probe.

| Value type | Example |
| --- | --- |
| 1 int | `10` |

### `sharding.configsvrReplSet.readinessProbe.periodSeconds`

How often to perform a readiness probe (in seconds).

| Value type | Example |
| --- | --- |
| 1 int | `3` |

### `sharding.configsvrReplSet.readinessProbe.successThreshold`

Minimum consecutive successes for the readiness probe to be considered successful after having failed.

| Value type | Example |
| --- | --- |
| 1 int | `1` |

### `sharding.configsvrReplSet.readinessProbe.timeoutSeconds`

Number of seconds after which the readiness probe times out.

| Value type | Example |
| --- | --- |
| 1 int | `2` |

## 'sharding.configsvrReplSet.containerSecurityContext'

A custom Kubernetes Security Context for a Container to be used instead of the default one.

| Value type | Example |
| --- | --- |

| Value type | Example |
| --- | --- |
| subdoc | `privileged: false` |

## 'sharding.configsvrReplSet.podSecurityContext'

A custom Kubernetes Security Context for a Pod to be used instead of the default one.

| Value type | Example |
| --- | --- |
| subdoc | `runAsUser: 1001`<br>`runAsGroup: 1001`<br>`supplementalGroups: [1001]` |

## `sharding.configsvrReplSet.runtimeClassName`

Name of the Kubernetes Runtime Class for Config Server Pods.

| Value type | Example |
| --- | --- |
| string | `image-rc` |

## `sharding.configsvrReplSet.sidecars.image`

Image for the custom sidecar container for Config Server Pods.

| Value type | Example |
| --- | --- |
| string | `busybox` |

## `sharding.configsvrReplSet.sidecars.command`

Command for the custom sidecar container for Config Server Pods.

| Value type | Example |
| --- | --- |
| array | `["/bin/sh"]` |

### `sharding.configsvrReplSet.sidecars.args`

Command arguments for the custom sidecar container for Config Server Pods.

| Value type | Example |
| --- | --- |
| array | `["-c", "while true; do echo echo $(date -u) 'test' >> /dev/null; sleep 5;done"]` |

### `sharding.configsvrReplSet.sidecars.name`

Name of the custom sidecar container for Config Server Pods.

| Value type | Example |
| --- | --- |
| string | `rs-sidecar-1` |

### `sharding.configsvrReplSet.sidecarVolumes.name`

Name of the custom sidecar container volume for Config Server Pods.

| Value type | Example |
| --- | --- |
| string | `sidecar-config` |

### `sharding.configsvrReplSet.sidecarVolumes.nfs.server`

The hostname of the NFS server that will provide remote filesystem to the custom sidecar container volume for Config Server Pods.

| Value type | Example |
| --- | --- |
| string | `nfs-service.storage.svc.cluster.local` |

### `sharding.configsvrReplSet.sidecarVolumes.nfs.path`

The path on the NFS server that will be provided as a remote filesystem to the custom sidecar container volume for Config Server Pods.

| Value type | Example |
| --- | --- |
| S string | `/psmdb-some-name-rs0` |

### `sharding.configsvrReplSet.limits.cpu`

Kubernetes CPU limit for Config Server container.

| Value type | Example |
| --- | --- |
| S string | `300m` |

### `sharding.configsvrReplSet.limits.memory`

Kubernetes Memory limit for Config Server container.

| Value type | Example |
| --- | --- |
| S string | `0.5G` |

### `sharding.configsvrReplSet.resources.requests.cpu`

The Kubernetes CPU requests for Config Server container.

| Value type | Example |
| --- | --- |
| S string | `300m` |

### `sharding.configsvrReplSet.requests.memory`

The Kubernetes Memory requests for Config Server container.

| Value type | Example |
| --- | --- |
| S string | `0.5G` |

### `sharding.configsvrReplSet.expose.enabled`

Enable or disable exposing Config Server nodes with dedicated IP addresses.

| Value type | Example |
| --- | --- |
| boolean | `false` |

### `sharding.configsvrReplSet.expose.type`

The IP address type to be exposed.

| Value type | Example |
| --- | --- |
| string | `ClusterIP` |

### `sharding.configsvrReplSet.expose.loadBalancerSourceRanges`

The range of client IP addresses from which the load balancer should be reachable (if not set, there is no limitations).

| Value type | Example |
| --- | --- |
| string | `10.0.0.0/8` |

### `sharding.configsvrReplSet.expose.annotations`

The Kubernetes annotations metadata for the Config Server daemon.

| Value type | Example |
| --- | --- |
| string | `service.beta.kubernetes.io/aws-load-balancer-backend-protocol: http` |

### `sharding.configsvrReplSet.expose.labels`

The Kubernetes labels for the Config Server Service.

| Value type | Example |
| --- | --- |

| Value type | Example |
| --- | --- |
| string | `rack: rack-22` |

### `sharding.configsvrReplSet.expose.internalTrafficPolicy`

Specifies whether Service for config servers should route internal traffic to cluster-wide or to node-local endpoints (it can influence the load balancing effectiveness).

| Value type | Example |
| --- | --- |
| boolean | `Local` |

### `sharding.configsvrReplSet.expose.externalTrafficPolicy`

Specifies whether Service for config servers should route external traffic to cluster-wide (`Cluster`) or to node-local (`Local`) endpoints. It can influence the load balancing effectiveness.

| Value type | Example |
| --- | --- |
| string | `Local` |

### `sharding.configsvrReplSet.volumeSpec.emptyDir`

The Kubernetes emptyDir volume, i.e. the directory which will be created on a node, and will be accessible to the Config Server Pod containers.

| Value type | Example |
| --- | --- |
| string | `{}` |

### `sharding.configsvrReplSet.volumeSpec.hostPath.path`

Kubernetes hostPath volume, i.e. the file or directory of a node that will be accessible to the Config Server Pod containers.

| Value type | Example |
| --- | --- |

| Value type | Example |
| --- | --- |
| S string | `/data` |

### `sharding.configsvrReplSet.volumeSpec.hostPath.type`

The Kubernetes hostPath volume type.

| Value type | Example |
| --- | --- |
| S string | `Directory` |

### `sharding.configsvrReplSet.volumeSpec.persistentVolumeClaim.annotations`

The Kubernetes annotations metadata for Persistent Volume Claim.

| Value type | Example |
| --- | --- |
| S string | `service.beta.kubernetes.io/aws-load-balancer-backend-protocol: http` |

### `sharding.configsvrReplSet.volumeSpec.persistentVolumeClaim.labels`

The Kubernetes labels metadata for Persistent Volume Claim.

| Value type | Example |
| --- | --- |
| S string | `rack: rack-22` |

### `sharding.configsvrReplSet.volumeSpec.persistentVolumeClaim.storageClassName`

The Kubernetes Storage Class to use with the Config Server container Persistent Volume Claim. Use Storage Class with XFS as the default filesystem if possible, for better MongoDB performance.

| Value type | Example |
| --- | --- |
| S string | `standard` |

### `sharding.configsvrReplSet.volumeSpec.persistentVolumeClaim.accessModes`

The Kubernetes Persistent Volume access modes for the Config Server container.

| Value type | Example |
| --- | --- |
| array | `[ "ReadWriteOnce" ]` |

### `sharding.configsvrReplSet.volumeSpec.persistentVolumeClaim.resources.requests.storage`

The Kubernetes Persistent Volume size for the Config Server container.

| Value type | Example |
| --- | --- |
| string | `3Gi` |

### `sharding.configsvrReplSet.hostAliases.ip`

The IP address for Kubernetes host aliases for replica set Pods.

| Value type | Example |
| --- | --- |
| string | `"10.10.0.2"` |

### `sharding.configsvrReplSet.hostAliases.hostnames`

Hostnames for Kubernetes host aliases for config server Pods.

| Value type | Example |
| --- | --- |
| subdoc | |

### `sharding.mongos.size`

The number of mongos instances within the cluster.

| Value type | Example |
| --- | --- |
| 1 int | `3` |

### `sharding.mongos.terminationGracePeriodSeconds`

The amount of seconds Kubernetes will wait for a clean mongos Pods termination.

| Value type | Example |
| --- | --- |
| 1 int | `300` |

### 'sharding.mongos.serviceAccountName'

Name of the separate privileged service account for mongos Pods.

| Value type | Example |
| --- | --- |
| S string | `default` |

### `sharding.mongos.topologySpreadConstraints.labelSelector.matchLabels`

The label selector for the Kubernetes Pod Topology Spread Constraints.

| Value type | Example |
| --- | --- |
| label | `app.kubernetes.io/name: percona-server-mongodb` |

### `sharding.mongos.topologySpreadConstraints.maxSkew`

The degree to which Pods may be unevenly distributed under the Kubernetes Pod Topology Spread Constraints.

| Value type | Example |
| --- | --- |
| 1 int | `1` |

### `sharding.mongos.topologySpreadConstraints.topologyKey`

The key of node labels for the Kubernetes Pod Topology Spread Constraints.

| Value type | Example |
| --- | --- |
| string | `kubernetes.io/hostname` |

### `sharding.mongos.topologySpreadConstraints.whenUnsatisfiable`

What to do with a Pod if it doesn't satisfy the Kubernetes Pod Topology Spread Constraints.

| Value type | Example |
| --- | --- |
| string | `DoNotSchedule` |

### `sharding.mongos.configuration`

Custom configuration options for mongos. Please refer to the official manual for the full list of options.

| Value type | Example |
| --- | --- |
| string | `\|`<br>`systemLog:`<br>`  verbosity: 1` |

### `sharding.mongos.afinity.antiAffinityTopologyKey`

The Kubernetes topologyKey node affinity constraint for mongos.

| Value type | Example |
| --- | --- |
| string | `kubernetes.io/hostname` |

### `sharding.mongos.affinity.advanced`

In cases where the Pods require complex tuning the advanced option turns off the `topologykey` effect. This setting allows the standard Kubernetes affinity constraints of any complexity to be used.

| Value type | Example |
| --- | --- |
| subdoc | |

## `sharding.mongos.tolerations.key`

The Kubernetes Pod tolerations key for mongos instances.

| Value type | Example |
| --- | --- |
| string | `node.alpha.kubernetes.io/unreachable` |

## `sharding.mongos.tolerations.operator`

The Kubernetes Pod tolerations operator for mongos instances.

| Value type | Example |
| --- | --- |
| string | `Exists` |

## `sharding.mongos.tolerations.effect`

The Kubernetes Pod tolerations effect for mongos instances.

| Value type | Example |
| --- | --- |
| string | `NoExecute` |

## `sharding.mongos.tolerations.tolerationSeconds`

The Kubernetes Pod tolerations time limit for mongos instances.

| Value type | Example |
| --- | --- |
| int | `6000` |

### `sharding.mongos.priorityClassName`

The Kuberentes Pod priority class for mongos instances.

| Value type | Example |
| --- | --- |
| string | `high priority` |

### `sharding.mongos.annotations`

The Kubernetes annotations metadata for the mongos instances.

| Value type | Example |
| --- | --- |
| string | `iam.amazonaws.com/role: role-arn` |

### `sharding.mongos.labels`

The Kubernetes affinity labels for mongos instances.

| Value type | Example |
| --- | --- |
| label | `rack: rack-22` |

### `sharding.mongos.nodeSelector`

The Kubernetes nodeSelector affinity constraint for mongos instances.

| Value type | Example |
| --- | --- |
| label | `disktype: ssd` |

### `sharding.mongos.livenessProbe.failureThreshold`

Number of consecutive unsuccessful tries of the liveness probe to be undertaken before giving up.

| Value type | Example |
| --- | --- |

| Value type | Example |
| --- | --- |
| 1 int | `4` |

### `sharding.mongos.livenessProbe.initialDelaySeconds`

Number of seconds to wait after the container start before initiating the liveness probe.

| Value type | Example |
| --- | --- |
| 1 int | `60` |

### `sharding.mongos.livenessProbe.periodSeconds`

How often to perform a liveness probe (in seconds).

| Value type | Example |
| --- | --- |
| 1 int | `30` |

### `sharding.mongos.livenessProbe.timeoutSeconds`

Number of seconds after which the liveness probe times out.

| Value type | Example |
| --- | --- |
| 1 int | `10` |

### `sharding.mongos.livenessProbe.startupDelaySeconds`

Time after which the liveness probe is failed if the MongoDB instance didn't finish its full startup yet.

| Value type | Example |
| --- | --- |
| 1 int | `7200` |

### `sharding.mongos.readinessProbe.failureThreshold`

Number of consecutive unsuccessful tries of the readiness probe to be undertaken before giving up.

| Value type | Example |
| --- | --- |
| 1 int | `3` |

### `sharding.mongos.readinessProbe.initialDelaySeconds`

Number of seconds to wait after the container start before initiating the readiness probe.

| Value type | Example |
| --- | --- |
| 1 int | `10` |

### `sharding.mongos.readinessProbe.periodSeconds`

How often to perform a readiness probe (in seconds).

| Value type | Example |
| --- | --- |
| 1 int | `3` |

### `sharding.mongos.readinessProbe.successThreshold`

Minimum consecutive successes for the readiness probe to be considered successful after having failed.

| Value type | Example |
| --- | --- |
| 1 int | `1` |

### `sharding.mongos.readinessProbe.timeoutSeconds`

Number of seconds after which the readiness probe times out.

| Value type | Example |
| --- | --- |

| Value type | Example |
| --- | --- |
| 1 int | `2` |

## ‘sharding.mongos.containerSecurityContext’

A custom Kubernetes Security Context for a Container to be used instead of the default one.

| Value type | Example |
| --- | --- |
| ≡ subdoc | `privileged: false` |

## ‘sharding.mongos.podSecurityContext’

A custom Kubernetes Security Context for a Pod to be used instead of the default one.

| Value type | Example |
| --- | --- |
| ≡ subdoc | `runAsUser: 1001`<br>`runAsGroup: 1001`<br>`supplementalGroups: [1001]` |

## `sharding.mongos.runtimeClassName`

Name of the Kubernetes Runtime Class for mongos Pods.

| Value type | Example |
| --- | --- |
| S string | `image-rc` |

## `sharding.mongos.sidecars.image`

Image for the custom sidecar container for mongos Pods.

| Value type | Example |
| --- | --- |
| S string | `busybox` |

### `sharding.mongos.sidecars.command`

Command for the custom sidecar container for mongos Pods.

| Value type | Example |
| --- | --- |
| array | `["/bin/sh"]` |

### `sharding.mongos.sidecars.args`

Command arguments for the custom sidecar container for mongos Pods.

| Value type | Example |
| --- | --- |
| array | `["-c", "while true; do echo echo $(date -u) 'test' >> /dev/null; sleep 5;done"]` |

### `sharding.mongos.sidecars.name`

Name of the custom sidecar container for mongos Pods.

| Value type | Example |
| --- | --- |
| string | `rs-sidecar-1` |

### `sharding.mongos.limits.cpu`

Kubernetes CPU limit for mongos container.

| Value type | Example |
| --- | --- |
| string | `300m` |

### `sharding.mongos.limits.memory`

Kubernetes Memory limit for mongos container.

| Value type | Example |
| --- | --- |

| Value type | Example |
| --- | --- |
| string | `0.5G` |

### `sharding.mongos.resources.requests.cpu`

The Kubernetes CPU requests for mongos container.

| Value type | Example |
| --- | --- |
| string | `300m` |

### `sharding.mongos.requests.memory`

The Kubernetes Memory requests for mongos container.

| Value type | Example |
| --- | --- |
| string | `0.5G` |

### `sharding.mongos.expose.type`

The IP address type to be exposed.

| Value type | Example |
| --- | --- |
| string | `ClusterIP` |

### `sharding.mongos.expose.servicePerPod`

If set to `true`, a separate ClusterIP Service is created for each mongos instance.

| Value type | Example |
| --- | --- |
| boolean | `true` |

### `sharding.mongos.expose.loadBalancerSourceRanges`

The range of client IP addresses from which the load balancer should be reachable (if not set, there is no limitations).

| Value type | Example |
| --- | --- |
| S string | `10.0.0.0/8` |

### `sharding.mongos.expose.annotations`

The Kubernetes annotations metadata for the MongoDB mongos daemon.

| Value type | Example |
| --- | --- |
| S string | `service.beta.kubernetes.io/aws-load-balancer-backend-protocol: http` |

### `sharding.mongos.expose.labels`

The Kubernetes labels for the MongoDB mongos Service.

| Value type | Example |
| --- | --- |
| S string | `rack: rack-22` |

## ‘sharding.mongos.expose.nodePort’

The Node port number to be allocated for the MongoDB mongos Service when the `sharding.mongos.expose.type` is set to the `NodePort`, and `sharding.mongos.expose.servicePerPod` is not turned on.

| Value type | Example |
| --- | --- |
| 1 int | `32017` |

### `sharding.mongos.internalTrafficPolicy`

Specifies whether Services for the mongos instances should route internal traffic to cluster-wide or to node-local endpoints (it can influence the load balancing effectiveness).

| Value type | Example |
| --- | --- |
| boolean | `Local` |

### `sharding.mongos.externalTrafficPolicy`

Specifies whether Service for the mongos instances should route external traffic to cluster-wide (`Cluster`) or to node-local (`Local`) endpoints. It can influence the load balancing effectiveness.

| Value type | Example |
| --- | --- |
| string | `Local` |

### `sharding.mongos.hostAliases.ip`

The IP address for Kubernetes host aliases for mongos Pods.

| Value type | Example |
| --- | --- |
| string | `"10.10.0.2"` |

### `sharding.mongos.hostAliases.hostnames`

Hostnames for Kubernetes host aliases for mongos Pods.

| Value type | Example |
| --- | --- |
| subdoc | |

## Roles section

The `roles` section in the deploy/cr.yaml file contains various configuration options to configure custom MongoDB user roles via the Custom Resource.

## `roles.role`

The cusom MongoDB role name.

| Value type | Example |
| --- | --- |
| string | `myClusterwideAdmin` |

## `roles.db`

Database in which you want to store the user-defined role.

| Value type | Example |
| --- | --- |
| string | `admin |

## `roles.authenticationRestrictions.clientSource`

List of the IP addresses or CIDR blocks *from which* users assigned this role can connect. MongoDB servers reject connection requests from users with this role if the requests come from a client that is not present in this array.

| Value type | Example |
| --- | --- |
| subdoc | `127.0.0.1` |

## `roles.authenticationRestrictions.serverAddress`

List of the IP addresses or CIDR blocks *to which* users assigned this role can connect. MongoDB servers reject connection requests from users with this role if the client requests to connect to a server that is not present in this array.

| Value type | Example |
| --- | --- |
| subdoc | `127.0.0.1` |

## `roles.privileges.actions`

List of custom role actions that users granted this role can perform: For a list of accepted values, see Privilege Actions in the MongoDB Manual.

| Value type | Example |
| --- | --- |
| subdoc | `addShard` |

### `roles.privileges.resource.db`

Database for which the custom role actions apply. An empty string (“”) indicates that the privilege actions apply to all databases.

| Value type | Example |
| --- | --- |
| string | `""` |

### `roles.privileges.resource.collection`

Collection for which the custom role actions apply. An empty string (“”) indicates that the privilege actions apply to all of the database’s collections.

| Value type | Example |
| --- | --- |
| string | `""` |

### `roles.privileges.resource.cluster`

If true, the custom role actions apply to all databases and collections in the MongoDB deployment. False by default. If set to true, values for `roles.privileges.resource.db` and `roles.privileges.resource.collection` shouldn’t be provided.

| Value type | Example |
| --- | --- |
| boolean | `true` |

### `roles.roles`

An array of roles (with names of the role and the database) from which this role inherits privileges, if any.

| Value type | Example |
| --- | --- |
| subdoc | `role: read`<br>`db: admin` |

## Users section

The `users` section in the deploy/cr.yaml file contains various configuration options to configure custom MongoDB users via the Custom Resource.

### `users.name`

The username of the MongoDB user.

| Value type | Example |
| --- | --- |
| string | `my-user` |

### `users.db`

Database that the user authenticates against.

| Value type | Example |
| --- | --- |
| string | `admin` |

### `users.passwordSecretRef.name`

Name of the secret that contains the user's password. If `passwordSecretRef` is not present, password will be generated automatically.

| Value type | Example |
| --- | --- |
| string | `my-user-password` |

### `users.passwordSecretRef.key`

Key in the secret that corresponds to the value of the user's password (`password` by default).

| Value type | Example |
|---|---|
| string | `password` |

### `users.roles.role.name`

Name of the MongoDB role assigned to the user. As built-in roles, so custom roles are supported.

| Value type | Example |
|---|---|
| string | `clusterAdmin` |

### `users.roles.role.db`

Database that the MongoDB role applies to.

| Value type | Example |
|---|---|
| string | `admin` |

## Backup Section

The `backup` section in the deploy/cr.yaml file contains the following configuration options for the regular Percona Server for MongoDB backups.

### `backup.enabled`

Enables or disables making backups.

| Value type | Example |
|---|---|
| boolean | `true` |

### `backup.image`

The Percona Server for MongoDB Docker image to use for the backup.

| Value type | Example |
| --- | --- |
| S string | `percona/percona-server-mongodb-operator:1.19.1-backup` |

### `backup.serviceAccountName`

Name of the separate privileged service account for backups; **service account for backups is not used by the Operator any more, and the option is deprecated since the Operator version 1.16.0**.

| Value type | Example |
| --- | --- |
| S string | `percona-server-mongodb-operator` |

### `backup.annotations`

The Kubernetes annotations metadata for the backup job.

| Value type | Example |
| --- | --- |
| S string | `sidecar.istio.io/inject: "false"` |

### `backup.resources.limits.cpu`

Kubernetes CPU limit for backups.

| Value type | Example |
| --- | --- |
| S string | `300m` |

### `backup.resources.limits.memory`

Kubernetes Memory limit for backups.

| Value type | Example |
| --- | --- |

| Value type | Example |
| --- | --- |
| string | `1.2G` |

### `backup.resources.requests.cpu`

The Kubernetes CPU requests for backups.

| Value type | Example |
| --- | --- |
| string | `300m` |

### `backup.resources.requests.memory`

The Kubernetes Memory requests for backups.

| Value type | Example |
| --- | --- |
| string | `1G` |

### 'backup.containerSecurityContext'

A custom Kubernetes Security Context for a Container to be used instead of the default one.

| Value type | Example |
| --- | --- |
| subdoc | `privileged: false` |

### `backup.storages.STORAGE-NAME.type`

The cloud storage type used for backups. Only `s3`, `azure`, and `filesystem` types are supported.

| Value type | Example |
| --- | --- |
| string | `s3` |

### `backup.storages.STORAGE-NAME.s3.insecureSkipTLSVerify`

Enable or disable verification of the storage server TLS certificate. Disabling it may be useful e.g. to skip TLS verification for private S3-compatible storage with a self-issued certificate.

| Value type | Example |
| --- | --- |
| boolean | `true` |

### `backup.storages.STORAGE-NAME.s3.credentialsSecret`

The Kubernetes secret for backups. It should contain `AWS_ACCESS_KEY_ID` and `AWS_SECRET_ACCESS_KEY` keys.

| Value type | Example |
| --- | --- |
| string | `my-cluster-name-backup-s3` |

### `backup.storages.STORAGE-NAME.s3.bucket`

The Amazon S3 bucket name for backups.

| Value type | Example |
| --- | --- |
| string | |

### `backup.storages.STORAGE-NAME.s3.prefix`

The path (sub-folder) to the backups inside the bucket.

| Value type | Example |
| --- | --- |
| string | `""` |

### `backup.storages.STORAGE-NAME.s3.uploadPartSize`

The size of data chunks in bytes to be uploaded to the storage bucket (10 MiB by default).

| Value type | Example |
| --- | --- |
| 1 int | `10485760` |

### `backup.storages.STORAGE-NAME.s3.maxUploadParts`

The maximum number of data chunks to be uploaded to the storage bucket (10000 by default).

| Value type | Example |
| --- | --- |
| 1 int | `10000` |

### `backup.storages.STORAGE-NAME.s3.storageClass`

The storage class name of the S3 storage.

| Value type | Example |
| --- | --- |
| S string | `STANDARD` |

### `backup.storages.STORAGE-NAME.s3.retryer.numMaxRetries`

The maximum number of retries to upload data to S3 storage.

| Value type | Example |
| --- | --- |
| 1 int | `3` |

### `backup.storages.STORAGE-NAME.s3.retryer.minRetryDelay`

The minimum time in milliseconds to wait till the next retry.

| Value type | Example |
| --- | --- |
| 1 int | `10` |

### `backup.storages.STORAGE-NAME.s3.retryer.maxRetryDelay`

The maximum time in minutes to wait till the next retry.

| Value type | Example |
| --- | --- |
| 1 int | `5` |

### `backup.storages.STORAGE-NAME.s3.region`

The AWS region to use. Please note **this option is mandatory** for Amazon and all S3-compatible storages.

| Value type | Example |
| --- | --- |
| S string | `us-east-1` |

### `backup.storages.STORAGE-NAME.s3.endpointUrl`

The URL of the S3-compatible storage to be used (not needed for the original Amazon S3 cloud).

| Value type | Example |
| --- | --- |
| S string | |

### `backup.storages.STORAGE-NAME.s3.serverSideEncryption.kmsKeyID`

The ID of the key stored in the AWS KMS used by the Operator for backups server-side encryption

| Value type | Example |
| --- | --- |
| S string | `""` |

### `backup.storages.STORAGE-NAME.s3.serverSideEncryption.sseAlgorithm`

The key management mode used for backups server-side encryption with the encryption keys stored in AWS KMS - `aws:kms` is the only supported value for now.

| Value type | Example |
| --- | --- |
| S string | `aws:kms` |

### `backup.storages.STORAGE-NAME.s3.serverSideEncryption.sseCustomerAlgorithm`

The key management mode for backups server-side encryption with customer-provided keys - `AES256` is the only supported value for now.

| Value type | Example |
| --- | --- |
| S string | `AES256` |

### `backup.storages.STORAGE-NAME.s3.serverSideEncryption.sseCustomerKey`

The locally-stored base64-encoded custom encryption key used by the Operator for backups server-side encryption on S3-compatible storages.

| Value type | Example |
| --- | --- |
| S string | `""` |

### `backup.storages.STORAGE-NAME.azure.credentialsSecret`

The Kubernetes secret for backups. It should contain `AZURE_STORAGE_ACCOUNT_NAME` and `AZURE_STORAGE_ACCOUNT_KEY` |

| Value type | Example |
| --- | --- |
| S string | `my-cluster-azure-secret` |

### `backup.storages.STORAGE-NAME.azure.container`

Name of the container for backups.

| Value type | Example |
| --- | --- |

| Value type | Example |
| --- | --- |
| S string | `my-container` |

### `backup.storages.STORAGE-NAME.azure.prefix`

The path (sub-folder) to the backups inside the container.

| Value type | Example |
| --- | --- |
| S string | `""` |

### 'backup.storages.STORAGE-NAME.azure.endpointUrl'

The private endpoint URL to use instead of the public endpoint.

| Value type | Example |
| --- | --- |
| S string | `https://accountName.blob.core.windows.net` |

### `backup.storages.STORAGE-NAME.filesystem.path`

The mount point for a remote filesystem configured to store backups.

| Value type | Example |
| --- | --- |
| S string | `/mnt/nfs/` |

### `backup.volumeMounts.mountPath`

Mount path for the remote backup storage.

| Value type | Example |
| --- | --- |
| S string | `/mnt/nfs/` |

### `backup.volumeMounts.name`

Name of the remote backup storage.

| Value type | Example |
| --- | --- |
| S string | `backup-nfs` |

### `backup.pitr.enabled`

Enables or disables point-in-time-recovery functionality.

| Value type | Example |
| --- | --- |
| ⊙ boolean | `false` |

### `backup.pitr.oplogOnly`

If true, Percona Backup for MongoDB saves oplog chunks even without the base logical backup snapshot (oplog chunks without a base backup can't be used with logical backups to restore a backup by the Operator, but can still be useful for manual restore operations ↗).

| Value type | Example |
| --- | --- |
| ⊙ boolean | false |

### `backup.pitr.oplogSpanMin`

Number of minutes between the uploads of oplogs.

| Value type | Example |
| --- | --- |
| 1 int | `10` |

### `backup.pitr.compressionType`

The point-in-time-recovery chunks compression format, can be gzip, snappy, lz4, pgzip, zstd, s2, or none ↗.

| Value type | Example |
| --- | --- |
| S string | `gzip` |

### `backup.pitr.compressionLevel`

The point-in-time-recovery chunks compression level (higher values result in better but slower compression).

| Value type | Example |
| --- | --- |
| 1 int | `6` |

### `backup.configuration.backupOptions.priority`

The list of mongod nodes and their priority for making backups.

| Value type | Example |
| --- | --- |
| ≡ subdoc | `“localhost:28019”: 2.5`<br>`“localhost:27018”: 2.5` |

### `backup.configuration.backupOptions.timeouts.startingStatus`

The wait time in seconds Percona Backup for MongoDB should use to start physical backups on all shards. The 0 (zero) value resets the timeout to the default 33 seconds.

| Value type | Example |
| --- | --- |
| 1 int | `33` |

### `backup.configuration.backupOptions.oplogSpanMin`

The duration (in minutes) of oplog slices saved by Percona Backup for MongoDB with the logical backup snapshot.

| Value type | Example |
| --- | --- |

| Value type | Example |
| --- | --- |
| 1 int | `10` |

## `backup.configuration.restoreOptions.batchSize`

The number of documents Percona Backup for MongoDB should buffer.

| Value type | Example |
| --- | --- |
| 1 int | `500` |

## `backup.configuration.restoreOptions.numInsertionWorkers`

The number of workers that Percona Backup for MongoDB should use to add the documents to buffer.

| Value type | Example |
| --- | --- |
| 1 int | `10` |

## `backup.configuration.restoreOptions.numDownloadWorkers`

The number of workers that Percona Backup for MongoDB should use to request data chunks from the storage during the restore.

| Value type | Example |
| --- | --- |
| 1 int | `4` |

## `backup.configuration.restoreOptions.maxDownloadBufferMb`

The maximum size of the in-memory buffer that Percona Backup for MongoDB should use use when downloading files from the S3 storage.

| Value type | Example |
| --- | --- |
| 1 int | `0` |

### `backup.configuration.restoreOptions.downloadChunkMb`

The size of the data chunk in MB, that Percona Backup for MongoDB should use when downloading from the S3 storage.

| Value type | Example |
|---|---|
| 1 int | `32` |

### `backup.configuration.restoreOptions.mongodLocation`

The custom path to mongod binaries which Percona Backup for MongoDB should use during restore.

| Value type | Example |
|---|---|
| S string | `/usr/bin/mongo` |

### `backup.configuration.restoreOptions.mongodLocationMap`

The list of custom paths to mongod binaries on every node, which Percona Backup for MongoDB should use during restore.

| Value type | Example |
|---|---|
| ≡ subdoc | `“node01:2017”: /usr/bin/mongo`<br>`“node03:27017”: /usr/bin/mongo` |

### `backup.tasks.name`

The name of the backup.

| Value type | Example |
|---|---|
| S string | |

### `backup.tasks.enabled`

Enables or disables this exact backup.

| Value type | Example |
| --- | --- |
| boolean | `true` |

## `backup.tasks.schedule`

The scheduled time to make a backup, specified in the crontab format.

| Value type | Example |
| --- | --- |
| string | `0 0 \* \* 6` |

## `backup.tasks.keep`

The amount of most recent backups to store. Older backups are automatically deleted. Set `keep` to zero or completely remove it to disable automatic deletion of backups.

| Value type | Example |
| --- | --- |
| int | `3` |

## `backup.tasks.storageName`

The name of the S3-compatible storage for backups, configured in the storages subsection.

| Value type | Example |
| --- | --- |
| string | `st-us-west` |

## `backup.tasks.compressionType`

The backup compression format, can be gzip, snappy, lz4, pgzip, zstd, s2, or none.

| Value type | Example |
| --- | --- |
| string | `gzip` |

## `backup.tasks.compressionLevel`

The backup compression level (higher values result in better but slower compression ).

| Value type | Example |
| --- | --- |
| 123 int | `6` |

## `backup.tasks.type`

The backup type: (can be either `logical` (default) or `physical`; see the Operator backups official documentation for details.

| Value type | Example |
| --- | --- |
| S string | `physical` |

# Reference

# Percona certified images

Following table presents Percona's certified docker images to be used with the Percona Operator for Percona Server for MongoDB:

| Image | Digest |
|---|---|
| percona/percona-server-mongodb-operator:1.19.1 (x86_64) | e822a948aa69baa6fe414622fab12a9e8d661296d0d7e7c3feef610d92e334b3 |
| percona/percona-server-mongodb-operator:1.19.1 (ARM64) | 27a280b44733db6ccbe0e77cca524c3f1c74d20045c7906517a8349cfc89e7f1 |
| percona/pmm-client:2.44.0 (x86_64) | 19a07dfa8c12a0554308cd11d7d38494ea02a14cfac6c051ce8ff254b7d0a4a7 |
| percona/pmm-client:2.44.0 (ARM64) | 43a542f24bdbd11d0c363c1d5002244b0b4840961a8e219a56df1becad77b068 |
| percona/percona-backup-mongodb:2.8.0-multi (x86_64) | 808045c4b328a90eea1c74bb213e06a56ebf5d5c6fff98193b7dfb63aa98f4e8 |
| percona/percona-backup-mongodb:2.8.0-multi (ARM64) | d9d2d8cc1fd06c4d49dc230bfd7709895231ceccb3bc4094779cbe36ccf44227 |
| percona/percona-server-mongodb:8.0.4-1-multi (x86_64) | 873b201ce3d66d97b1225c26db392c5043a73cc19ee8db6f2dc1b8efd4783bcf |
| percona/percona-server-mongodb:8.0.4-1-multi (ARM64) | 222ccf746ad4ffdfccf41b41edaa0d318d28f663e13c9629f8dad5a5078434e5 |
| percona/percona-server-mongodb:7.0.15-9-multi (x86_64) | 7bffdf2e71c121e2ab37b4fa7e2f513237abdd65266da384bf8197cee1316917 |
| percona/percona-server-mongodb:7.0.15-9-multi (ARM64) | fdc4875df82572267445811445ebf517f63e509be54d1a2599fe58e1c525e1d8 |
| percona/percona-server-mongodb:7.0.14-8-multi (x86_64) | ed932d4e7231dcb793bf609f781226a8393aa8958b103339f4a503a8f70ed17e |

| Image | Digest |
| --- | --- |
| percona/percona-server-mongodb:7.0.14-8-multi (ARM64) | 052f84ee926ad9b5146f08a7e887820342d65b757a284c2f0ea8e937bb51cd7b |
| percona/percona-server-mongodb:7.0.12-7 | 7f00e19878bd143119772cd5468f1f0f9857dfcd2ae2f814d52ef3fa7cff6899 |
| percona/percona-server-mongodb:7.0.8-5 | f81d1353d5497c5be36ee525f742d498ee6e1df9aba9502660c50f0fc98743b6 |
| percona/percona-server-mongodb:6.0.19-16-multi (x86_64) | c8ff08c4b8a96679e2daf4845873fdd4d2c48646b84db19f0c5fe02e8f3808b4 |
| percona/percona-server-mongodb:6.0.19-16-multi (ARM64) | 6908b28ced260b762cd38a642c06dd802cbef0a43ab5f22afe7b583b234ebcec |
| percona/percona-server-mongodb:6.0.18-15-multi (x86_64) | d197ce16ab0eed6df25e632b92dea5ce448e549e02028f39b78f5730c2ffef36 |
| percona/percona-server-mongodb:6.0.18-15-multi (ARM64) | 7fd1d8f74f71dea6ad423e8e202a0617bdd1e8783f2b5cb071b5281685ce0adf |
| percona/percona-server-mongodb:6.0.16-13 | 1497e58e39497d8425ccd053898dc323338d6eb3f0e3c4c223f9d5a468da7931 |
| percona/percona-server-mongodb:6.0.15-12 | f12dd271d78cf3e70088fea0c420e8c03703457d8a5959b645053546bff94dea |
| percona/percona-server-mongodb:6.0.9-7 | 5ef8404e200a680a67f0a94599963e17c029ebe5e0045b60b45062bba127c505 |

# Versions compatibility

Versions of the cluster components and platforms tested with different Operator releases are shown below. Other version combinations may also work but have not been tested.

Cluster components:

| Operator | MongoDB | Percona Backup for MongoDB |
|---|---|---|
| 1.19.1 | 6.0 - 8.0 | 2.8.0 |
| 1.19.0 | 6.0 - 8.0 | 2.8.0 |
| 1.18.0 | 5.0 - 7.0 | 2.7.0 |
| 1.17.0 | 5.0 - 7.0 | 2.5.0 |
| 1.16.2 | 5.0 - 7.0 | 2.4.1 |
| 1.16.1 | 5.0 - 7.0 | 2.4.1 |
| 1.16.0 | 5.0 - 7.0 | 2.4.1 |
| 1.15.0 | 4.4 - 6.0 | 2.3.0 |
| 1.14.0 | 4.4 - 6.0 | 2.0.4, 2.0.5 |
| 1.13.0 | 4.2 - 5.0 | 1.8.1 |
| 1.12.0 | 4.2 - 5.0 | 1.7.0 |
| 1.11.0 | 4.0, 4.2, 4.4, 5.0 | 1.6.1 |
| 1.10.0 | 4.0, 4.2, 4.4, 5.0 | 1.6.0 |
| 1.9.0 | 4.0, 4.2, 4.4 | 1.5.0 |
| 1.8.0 | 3.6, 4.0, 4.2, 4.4 | 1.4.1 |
| 1.7.0 | 3.6, 4.0, 4.2, 4.4 | 1.4.1 |
| 1.6.0 | 3.6, 4.0, 4.2 | 1.3.4 |

| Operator | MongoDB | Percona Backup for MongoDB |
|---|---|---|
| 1.5.0 | 3.6, 4.0, 4.2 | 1.3.1 |
| 1.4.0 | 3.6, 4.0, 4.2 | 1.1.0 |
| 1.3.0 | 3.6, 4.0 | 0.4.0 |
| 1.2.0 | 3.6, 4.0 | 0.4.0 |
| 1.1.0 | 3.6, 4.0 | 0.4.0 |

Platforms:

| Operator | GKE | EKS | Openshift | AKS | Minikube |
|---|---|---|---|---|---|
| 1.19.1 | 1.28 - 1.30 | 1.29 - 1.31 | 4.14.44 - 4.17.11 | 1.28 - 1.31 | 1.34.0 |
| 1.19.0 | 1.28 - 1.30 | 1.29 - 1.31 | 4.14.44 - 4.17.11 | 1.28 - 1.31 | 1.34.0 |
| 1.18.0 | 1.28 - 1.30 | 1.28 - 1.31 | 4.13.52 - 4.17.3 | 1.28 - 1.31 | 1.34.0 |
| 1.17.0 | 1.27 - 1.30 | 1.28 - 1.30 | 4.13.48 - 4.16.9 | 1.28 - 1.30 | 1.33.1 |
| 1.16.2 | 1.26 - 1.29 | 1.26 - 1.29 | 4.12.56 - 4.15.11 | 1.27 - 1.29 | 1.33 |
| 1.16.1 | 1.26 - 1.29 | 1.26 - 1.29 | 4.12.56 - 4.15.11 | 1.27 - 1.29 | 1.33 |
| 1.16.0 | 1.26 - 1.29 | 1.26 - 1.29 | 4.12.56 - 4.15.11 | 1.27 - 1.29 | 1.33 |
| 1.15.0 | 1.24 - 1.28 | 1.24 - 1.28 | 4.11 - 4.13 | 1.25 - 1.28 | 1.31.2 |
| 1.14.0 | 1.22 - 1.25 | 1.22 - 1.24 | 4.10 - 4.12 | 1.23 - 1.25 | 1.29 |
| 1.13.0 | 1.21 - 1.23 | 1.21 - 1.23 | 4.10 - 4.11 | 1.22 - 1.24 | 1.26 |
| 1.12.0 | 1.19 - 1.22 | 1.19 - 1.22 | 4.7 - 4.10 | - | 1.23 |
| 1.11.0 | 1.19 - 1.22 | 1.18 - 1.22 | 4.7 - 4.9 | - | 1.22 |
| 1.10.0 | 1.17 - 1.21 | 1.16 - 1.21 | 4.6 - 4.8 | - | 1.22 |

| Operator | GKE | EKS | Openshift | AKS | Minikube |
|---|---|---|---|---|---|
| 1.9.0 | 1.17 - 1.21 | 1.16-1.20 | 4.7 | - | 1.20 |
| 1.8.0 | 1.16 - 1.20 | 1.19 | 3.11, 4.7 | - | 1.19 |
| 1.7.0 | 1.15 - 1.17 | 1.15 | 3.11, 4.5 | - | 1.10 |
| 1.6.0 | 1.15 - 1.17 | 1.15 | 3.11, 4.5 | - | 1.10 |
| 1.5.0 | 1.15 - 1.17 | 1.15 | 3.11, 4.5 | - | 1.18 |
| 1.4.0 | 1.13, 1.15 | 1.15 | 3.11, 4.2 | - | 1.16 |
| 1.3.0 | 1.11, 1.14 | - | 3.11, 4.1 | - | 1.12 |
| 1.2.0 | - | - | 3.11, 4.0 | - | - |
| 1.1.0 | - | - | 3.11, 4.0 | - | - |

More detailed information about the cluster components for the current version of the Operator can be found in the system requirements and in the list of certified images. For previous releases of the Operator, you can check the same pages in the documentation archive.

# Percona Operator for MongoDB API Documentation

Percona Operator for MongoDB provides an aggregation-layer extension for the Kubernetes API. Please refer to the official Kubernetes API documentation on the API access and usage details. The following subsections describe the Percona XtraDB Cluster API provided by the Operator.

## Prerequisites

1. Create the namespace name you will use, if not exist:

   ```
   $ kubectl create namespace my-namespace-name
   ```

   Trying to create an already-existing namespace will show you a self-explanatory error message. Also, you can use the `defalut` namespace.

   > **Note**
   >
   > In this document `default` namespace is used in all examples. Substitute `default` with your namespace name if you use a different one.

2. Prepare:

   ```
   # set correct API address
   KUBE_CLUSTER=$(kubectl config view --minify -o jsonpath='{.clusters[0].name}')
   API_SERVER=$(kubectl config view -o jsonpath="{.clusters[?
   (@.name==\"$KUBE_CLUSTER\")].cluster.server}" | sed -e 's#https://##')

   # create service account and get token
   kubectl apply --server-side -f deploy/crd.yaml -f deploy/rbac.yaml -n default
   KUBE_TOKEN=$(kubectl get secret $(kubectl get serviceaccount percona-server-
   mongodb-operator -o jsonpath='{.secrets[0].name}' -n default) -o
   jsonpath='{.data.token}' -n default | base64 --decode )
   ```

## Create new Percona Server for MongoDB cluster

**Description:**

```
The command to create a new Percona Server for MongoDB cluster
```

**Kubectl Command:**

```
$ kubectl apply -f percona-server-mongodb-operator/deploy/cr.yaml
```

**URL:**

```
https://$API_SERVER/apis/psmdb.percona.com/v1/namespaces/default/
perconaservermongodbs
```

**Authentication:**

```
Authorization: Bearer $KUBE_TOKEN
```

**cURL Request:**

```
$ curl -k -v -XPOST "https://$API_SERVER/apis/psmdb.percona.com/v1/namespaces/
default/perconaservermongodbs" \
            -H "Content-Type: application/json" \
            -H "Accept: application/json" \
            -H "Authorization: Bearer $KUBE_TOKEN" \
            -d "@cluster.json"
```

**Request Body (cluster.json):**

Example

```
{
   "apiVersion": "psmdb.percona.com/v1-5-0",
   "kind": "PerconaServerMongoDB",
   "metadata": {
      "name": "my-cluster-name"
   },
   "spec": {
      "image": "percona/percona-server-mongodb:4.2.8-8",
      "imagePullPolicy": "Always",
      "allowUnsafeConfigurations": false,
      "updateStrategy": "SmartUpdate",
      "secrets": {
         "users": "my-cluster-name-secrets"
      },
      "pmm": {
         "enabled": false,
         "image": "percona/percona-server-mongodb-operator:1.5.0-pmm",
         "serverHost": "monitoring-service"
      },
      "replsets": [
         {
            "name": "rs0",
            "size": 3,
            "affinity": {
               "antiAffinityTopologyKey": "none"
            },
            "podDisruptionBudget": {
               "maxUnavailable": 1
            },
            "expose": {
               "enabled": false,
               "exposeType": "LoadBalancer"
            },
            "arbiter": {
               "enabled": false,
               "size": 1,
               "affinity": {
                  "antiAffinityTopologyKey": "none"
               }
            },
            "resources": {
               "limits": null
            },
            "volumeSpec": {
               "persistentVolumeClaim": {
                  "storageClassName": "standard",
                  "accessModes": [
                     "ReadWriteOnce"
                  ],
                  "resources": {
                     "requests": {
                        "storage": "3Gi"
                     }
                  }
               }
            }
         }
      ],
      "mongod": {
         "net": {
```

```
            "port": 27017,
            "hostPort": 0
         },
         "security": {
            "redactClientLogData": false,
            "enableEncryption": true,
            "encryptionKeySecret": "my-cluster-name-mongodb-encryption-key",
            "encryptionCipherMode": "AES256-CBC"
         },
         "setParameter": {
            "ttlMonitorSleepSecs": 60,
            "wiredTigerConcurrentReadTransactions": 128,
            "wiredTigerConcurrentWriteTransactions": 128
         },
         "storage": {
            "engine": "wiredTiger",
            "inMemory": {
               "engineConfig": {
                  "inMemorySizeRatio": 0.9
               }
            },
            "mmapv1": {
               "nsSize": 16,
               "smallfiles": false
            },
            "wiredTiger": {
               "engineConfig": {
                  "cacheSizeRatio": 0.5,
                  "directoryForIndexes": false,
                  "journalCompressor": "snappy"
               },
               "collectionConfig": {
                  "blockCompressor": "snappy"
               },
               "indexConfig": {
                  "prefixCompression": true
               }
            }
         },
         "operationProfiling": {
            "mode": "slowOp",
            "slowOpThresholdMs": 100,
            "rateLimit": 100
         }
      },
      "backup": {
         "enabled": true,
         "restartOnFailure": true,
         "image": "percona/percona-server-mongodb-operator:1.5.0-backup",
         "serviceAccountName": "percona-server-mongodb-operator",
         "storages": null,
         "tasks": null
      }
   }
}
```


**Inputs:**

**Metadata**:

1. Name (String, min-length: 1) : `contains name of cluster`

**Spec**:

1. secrets[users] (String, min-length: 1) : `contains name of secret for the users`
2. allowUnsafeConfigurations (Boolean, Default: false) : `allow unsafe configurations to run`
3. image (String, min-length: 1) : `name of the Percona Server for MongoDB cluster image`

replsets:

1. name (String, min-length: 1) : `name of monogo replicaset`
2. size (Integer, min-value: 1) : `contains size of MongoDB replicaset`
3. expose[exposeType] (Integer, min-value: 1) : `type of service to expose replicaset`
4. arbiter (Object) : `configuration for mongo arbiter`

mongod:

1. net:
    a. port (Integer, min-value: 0) : `contains mongod container port`
    b. hostPort (Integer, min-value: 0) : `host port to expose mongod on`
2. security:
    a. enableEncryption (Boolean, Default: true) : `enable encrypting mongod storage`
    b. encryptionKeySecret (String, min-length: 1) : `name of encryption key secret`
    c. encryptionCipherMode (String, min-length: 1) : `type of encryption cipher to use`
3. setParameter (Object): `configure mongod enginer paramters`
4. storage:
    a. engine (String, min-length: 1, default “wiredTiger”): `name of mongod storage engine`
    b. inMemory (Object) : `wiredTiger engine configuration`
    c. wiredTiger (Object) : `wiredTiger engine configuration`

pmm:

1. serverHost (String, min-length: 1) : `serivce name for monitoring`

> 2. image (String, min-length: 1) : `name of pmm image`
>
> backup:
>
> 1. image (String, min-length: 1) : `name of MngoDB backup docker image`
> 2. serviceAccountName (String, min-length: 1) `name of service account to use for backup`
> 3. storages (Object) : `storage configuration object for backup`

**Response:**

Example

```
{
   "apiVersion":"psmdb.percona.com/v1-5-0",
   "kind":"PerconaServerMongoDB",
   "metadata":{
      "annotations":{
         "kubectl.kubernetes.io/last-applied-configuration":"{\"apiVersion\":
\"psmdb.percona.com/v1-5-0\",\"kind\":\"PerconaServerMongoDB\",\"metadata\":{\"annotations\":
{},\"name\":\"my-cluster-name\",\"namespace\":\"default\"},\"spec\":
{\"allowUnsafeConfigurations\":false,\"backup\":{\"enabled\":true,\"image\":\"percona/percona-
server-mongodb-operator:1.5.0-backup\",\"restartOnFailure\":true,\"serviceAccountName\":
\"percona-server-mongodb-operator\",\"storages\":null,\"tasks\":null},\"image\":\"percona/
percona-server-mongodb:4.2.8-8\",\"imagePullPolicy\":\"Always\",\"mongod\":{\"net\":
{\"hostPort\":0,\"port\":27017},\"operationProfiling\":{\"mode\":\"slowOp\",\"rateLimit\":100,
\"slowOpThresholdMs\":100},\"security\":{\"enableEncryption\":true,\"encryptionCipherMode\":
\"AES256-CBC\",\"encryptionKeySecret\":\"my-cluster-name-mongodb-encryption-key\",
\"redactClientLogData\":false},\"setParameter\":{\"ttlMonitorSleepSecs\":60,
\"wiredTigerConcurrentReadTransactions\":128,\"wiredTigerConcurrentWriteTransactions\":128},
\"storage\":{\"engine\":\"wiredTiger\",\"inMemory\":{\"engineConfig\":
{\"inMemorySizeRatio\":0.9}},\"mmapv1\":{\"nsSize\":16,\"smallfiles\":false},\"wiredTiger\":
{\"collectionConfig\":{\"blockCompressor\":\"snappy\"},\"engineConfig\":
{\"cacheSizeRatio\":0.5,\"directoryForIndexes\":false,\"journalCompressor\":\"snappy\"},
\"indexConfig\":{\"prefixCompression\":true}}}},\"pmm\":{\"enabled\":false,\"image\":
\"percona/percona-server-mongodb-operator:1.5.0-pmm\",\"serverHost\":\"monitoring-service\"},
\"replsets\":[{\"affinity\":{\"antiAffinityTopologyKey\":\"none\"},\"arbiter\":{\"affinity\":
{\"antiAffinityTopologyKey\":\"none\"},\"enabled\":false,\"size\":1},\"expose\":
{\"enabled\":false,\"exposeType\":\"LoadBalancer\"},\"name\":\"rs0\",\"podDisruptionBudget\":
{\"maxUnavailable\":1},\"resources\":{\"limits\":null},\"size\":3,\"volumeSpec\":
{\"persistentVolumeClaim\":{\"accessModes\":[\"ReadWriteOnce\"],\"resources\":{\"requests\":
{\"storage\":\"3Gi\"}},\"storageClassName\":\"standard\"}}}],\"secrets\":{\"users\":\"my-
cluster-name-secrets\"},\"updateStrategy\":\"SmartUpdate\"}}\n"
      },
      "creationTimestamp":"2020-07-24T14:27:58Z",
      "generation":1,
      "managedFields":[
         {
            "apiVersion":"psmdb.percona.com/v1-5-0",
            "fieldsType":"FieldsV1",
            "fieldsV1":{
               "f:metadata":{
                  "f:annotations":{
                     ".":{

                     },
                     "f:kubectl.kubernetes.io/last-applied-configuration":{

                     }
                  }
               },
               "f:spec":{
                  ".":{

                  },
                  "f:allowUnsafeConfigurations":{

                  },
                  "f:backup":{
                     ".":{

                     },
                     "f:enabled":{
```

```
      },
      "f:image":{

      },
      "f:restartOnFailure":{

      },
      "f:serviceAccountName":{

      },
      "f:storages":{

      },
      "f:tasks":{

      }
   },
   "f:image":{

   },
   "f:imagePullPolicy":{

   },
   "f:mongod":{
      ".":{

      },
      "f:net":{
         ".":{

         },
         "f:hostPort":{

         },
         "f:port":{

         }
      },
      "f:operationProfiling":{
         ".":{

         },
         "f:mode":{

         },
         "f:rateLimit":{

         },
         "f:slowOpThresholdMs":{

         }
      },
      "f:security":{
         ".":{

         },
         "f:enableEncryption":{

         },
         "f:encryptionCipherMode":{
```

```
            },
            "f:encryptionKeySecret":{

            },
            "f:redactClientLogData":{

            }
         },
         "f:setParameter":{
            ".":{

            },
            "f:ttlMonitorSleepSecs":{

            },
            "f:wiredTigerConcurrentReadTransactions":{

            },
            "f:wiredTigerConcurrentWriteTransactions":{

            }
         },
         "f:storage":{
            ".":{

            },
            "f:engine":{

            },
            "f:inMemory":{
               ".":{

               },
               "f:engineConfig":{
                  ".":{

                  },
                  "f:inMemorySizeRatio":{

                  }
               }
            },
            "f:mmapv1":{
               ".":{

               },
               "f:nsSize":{

               },
               "f:smallfiles":{

               }
            },
            "f:wiredTiger":{
               ".":{

               },
               "f:collectionConfig":{
                  ".":{
```

```
                        },
                        "f:blockCompressor":{

                        }
                     },
                     "f:engineConfig":{
                        ".":{

                        },
                        "f:cacheSizeRatio":{

                        },
                        "f:directoryForIndexes":{

                        },
                        "f:journalCompressor":{

                        }
                     },
                     "f:indexConfig":{
                        ".":{

                        },
                        "f:prefixCompression":{

                        }
                     }
                  }
               }
            },
            "f:pmm":{
               ".":{

               },
               "f:enabled":{

               },
               "f:image":{

               },
               "f:serverHost":{

               }
            },
            "f:replsets":{

            },
            "f:secrets":{
               ".":{

               },
               "f:users":{

               }
            },
            "f:updateStrategy":{

            }
         }
      },
      "manager":"kubectl",
```

```
            "operation":"Update",
            "time":"2020-07-24T14:27:58Z"
         }
      ],
      "name":"my-cluster-name",
      "namespace":"default",
      "resourceVersion":"1268922",
      "selfLink":"/apis/psmdb.percona.com/v1-5-0/namespaces/default/perconaservermongodbs/my-
cluster-name",
      "uid":"5207e71a-c83f-4707-b892-63aa93fb615c"
   },
   "spec":{
      "allowUnsafeConfigurations":false,
      "backup":{
         "enabled":true,
         "image":"percona/percona-server-mongodb-operator:1.5.0-backup",
         "restartOnFailure":true,
         "serviceAccountName":"percona-server-mongodb-operator",
         "storages":null,
         "tasks":null
      },
      "image":"percona/percona-server-mongodb:4.2.8-8",
      "imagePullPolicy":"Always",
      "mongod":{
         "net":{
            "hostPort":0,
            "port":27017
         },
         "operationProfiling":{
            "mode":"slowOp",
            "rateLimit":100,
            "slowOpThresholdMs":100
         },
         "security":{
            "enableEncryption":true,
            "encryptionCipherMode":"AES256-CBC",
            "encryptionKeySecret":"my-cluster-name-mongodb-encryption-key",
            "redactClientLogData":false
         },
         "setParameter":{
            "ttlMonitorSleepSecs":60,
            "wiredTigerConcurrentReadTransactions":128,
            "wiredTigerConcurrentWriteTransactions":128
         },
         "storage":{
            "engine":"wiredTiger",
            "inMemory":{
               "engineConfig":{
                  "inMemorySizeRatio":0.9
               }
            },
            "mmapv1":{
               "nsSize":16,
               "smallfiles":false
            },
            "wiredTiger":{
               "collectionConfig":{
                  "blockCompressor":"snappy"
               },
               "engineConfig":{
                  "cacheSizeRatio":0.5,
```

```
                  "directoryForIndexes":false,
                  "journalCompressor":"snappy"
               },
               "indexConfig":{
                  "prefixCompression":true
               }
            }
         }
      },
      "pmm":{
         "enabled":false,
         "image":"percona/percona-server-mongodb-operator:1.5.0-pmm",
         "serverHost":"monitoring-service"
      },
      "replsets":[
         {
            "affinity":{
               "antiAffinityTopologyKey":"none"
            },
            "arbiter":{
               "affinity":{
                  "antiAffinityTopologyKey":"none"
               },
               "enabled":false,
               "size":1
            },
            "expose":{
               "enabled":false,
               "exposeType":"LoadBalancer"
            },
            "name":"rs0",
            "podDisruptionBudget":{
               "maxUnavailable":1
            },
            "resources":{
               "limits":null
            },
            "size":3,
            "volumeSpec":{
               "persistentVolumeClaim":{
                  "accessModes":[
                     "ReadWriteOnce"
                  ],
                  "resources":{
                     "requests":{
                        "storage":"3Gi"
                     }
                  },
                  "storageClassName":"standard"
               }
            }
         }
      ],
      "secrets":{
         "users":"my-cluster-name-secrets"
      },
      "updateStrategy":"SmartUpdate"
   }
}
```

# List Percona Server for MongoDB clusters

**Description:**

```
Lists all Percona Server for MongoDB clusters that exist in your kubernetes cluster
```

**Kubectl Command:**

```
$ kubectl get psmdb
```

**URL:**

```
https://$API_SERVER/apis/psmdb.percona.com/v1/namespaces/default/
perconaservermongodbs?limit=500
```

**Authentication:**

```
Authorization: Bearer $KUBE_TOKEN
```

**cURL Request:**

```
$ curl -k -v -XGET "https://$API_SERVER/apis/psmdb.percona.com/v1/namespaces/
default/perconaservermongodbs?limit=500" \
            -H "Accept: application/json;as=Table;v=v1;g=meta.k8s.io,application/
json;as=Table;v=v1beta1;g=meta.k8s.io,application/json" \
            -H "Authorization: Bearer $KUBE_TOKEN"
```

**Request Body:**

```
None
```

**Response:**

Example

```
{
   "kind":"Table",
   "apiVersion":"meta.k8s.io/v1",
   "metadata":{
      "selfLink":"/apis/psmdb.percona.com/v1/namespaces/default/perconaservermongodbs",
      "resourceVersion":"1273793"
   },
   "columnDefinitions":[
      {
         "name":"Name",
         "type":"string",
         "format":"name",
         "description":"Name must be unique within a namespace. Is required when creating
resources, although some resources may allow a client to request the generation of an
appropriate name automatically. Name is primarily intended for creation idempotence and
configuration definition. Cannot be updated. More info: http://kubernetes.io/docs/user-guide/
identifiers#names",
         "priority":0
      },
      {
         "name":"Status",
         "type":"string",
         "format":"",
         "description":"Custom resource definition column (in JSONPath format):
.status.state",
         "priority":0
      },
      {
         "name":"Age",
         "type":"date",
         "format":"",
         "description":"Custom resource definition column (in JSONPath format):
.metadata.creationTimestamp",
         "priority":0
      }
   ],
   "rows":[
      {
         "cells":[
            "my-cluster-name",
            "ready",
            "37m"
         ],
         "object":{
            "kind":"PartialObjectMetadata",
            "apiVersion":"meta.k8s.io/v1",
            "metadata":{
               "name":"my-cluster-name",
               "namespace":"default",
               "selfLink":"/apis/psmdb.percona.com/v1/namespaces/default/
perconaservermongodbs/my-cluster-name",
               "uid":"5207e71a-c83f-4707-b892-63aa93fb615c",
               "resourceVersion":"1273788",
               "generation":1,
               "creationTimestamp":"2020-07-24T14:27:58Z",
               "annotations":{
                  "kubectl.kubernetes.io/last-applied-configuration":"{\"apiVersion\":
\"psmdb.percona.com/v1-5-0\",\"kind\":\"PerconaServerMongoDB\",\"metadata\":{\"annotations\":
{},\"name\":\"my-cluster-name\",\"namespace\":\"default\"},\"spec\":
{\"allowUnsafeConfigurations\":false,\"backup\":{\"enabled\":true,\"image\":\"percona/percona-
```

```
server-mongodb-operator:1.5.0-backup\",\"restartOnFailure\":true,\"serviceAccountName\":
\"percona-server-mongodb-operator\",\"storages\":null,\"tasks\":null},\"image\":\"percona/
percona-server-mongodb:4.2.8-8\",\"imagePullPolicy\":\"Always\",\"mongod\":{\"net\":
{\"hostPort\":0,\"port\":27017},\"operationProfiling\":{\"mode\":\"slowOp\",\"rateLimit\":100,
\"slowOpThresholdMs\":100},\"security\":{\"enableEncryption\":true,\"encryptionCipherMode\":
\"AES256-CBC\",\"encryptionKeySecret\":\"my-cluster-name-mongodb-encryption-key\",
\"redactClientLogData\":false},\"setParameter\":{\"ttlMonitorSleepSecs\":60,
\"wiredTigerConcurrentReadTransactions\":128,\"wiredTigerConcurrentWriteTransactions\":128},
\"storage\":{\"engine\":\"wiredTiger\",\"inMemory\":{\"engineConfig\":
{\"inMemorySizeRatio\":0.9}},\"mmapv1\":{\"nsSize\":16,\"smallfiles\":false},\"wiredTiger\":
{\"collectionConfig\":{\"blockCompressor\":\"snappy\"},\"engineConfig\":
{\"cacheSizeRatio\":0.5,\"directoryForIndexes\":false,\"journalCompressor\":\"snappy\"},
\"indexConfig\":{\"prefixCompression\":true}}}},\"pmm\":{\"enabled\":false,\"image\":
\"percona/percona-server-mongodb-operator:1.5.0-pmm\",\"serverHost\":\"monitoring-service\"},
\"replsets\":[{\"affinity\":{\"antiAffinityTopologyKey\":\"none\"},\"arbiter\":{\"affinity\":
{\"antiAffinityTopologyKey\":\"none\"},\"enabled\":false,\"size\":1},\"expose\":
{\"enabled\":false,\"exposeType\":\"LoadBalancer\"},\"name\":\"rs0\",\"podDisruptionBudget\":
{\"maxUnavailable\":1},\"resources\":{\"limits\":null},\"size\":3,\"volumeSpec\":
{\"persistentVolumeClaim\":{\"accessModes\":[\"ReadWriteOnce\"],\"resources\":{\"requests\":
{\"storage\":\"3Gi\"}},\"storageClassName\":\"standard\"}}}],\"secrets\":{\"users\":\"my-
cluster-name-secrets\"},\"updateStrategy\":\"SmartUpdate\"}}\n"
               },
               "managedFields":[
                  {
                     "manager":"kubectl",
                     "operation":"Update",
                     "apiVersion":"psmdb.percona.com/v1-5-0",
                     "time":"2020-07-24T14:27:58Z",
                     "fieldsType":"FieldsV1",
                     "fieldsV1":{
                        "f:metadata":{
                           "f:annotations":{
                              ".":{

                              },
                              "f:kubectl.kubernetes.io/last-applied-configuration":{

                              }
                           }
                        },
                        "f:spec":{
                           ".":{

                           },
                           "f:allowUnsafeConfigurations":{

                           },
                           "f:backup":{
                              ".":{

                              },
                              "f:enabled":{

                              },
                              "f:image":{

                              },
                              "f:serviceAccountName":{

                              }
                           },
```

```
                        "f:image":{

                        },
                        "f:imagePullPolicy":{

                        },
                        "f:mongod":{
                           ".":{

                           },
                           "f:net":{
                              ".":{

                              },
                              "f:port":{

                              }
                           },
                           "f:operationProfiling":{
                              ".":{

                              },
                              "f:mode":{

                              },
                              "f:rateLimit":{

                              },
                              "f:slowOpThresholdMs":{

                              }
                           },
                           "f:security":{
                              ".":{

                              },
                              "f:enableEncryption":{

                              },
                              "f:encryptionCipherMode":{

                              },
                              "f:encryptionKeySecret":{

                              }
                           },
                           "f:setParameter":{
                              ".":{

                              },
                              "f:ttlMonitorSleepSecs":{

                              },
                              "f:wiredTigerConcurrentReadTransactions":{

                              },
                              "f:wiredTigerConcurrentWriteTransactions":{

                              }
                           },
                           "f:storage":{
```

```
                        ".":{

                        },
                        "f:engine":{

                        },
                        "f:inMemory":{
                           ".":{

                           },
                           "f:engineConfig":{
                              ".":{

                              },
                              "f:inMemorySizeRatio":{

                              }
                           }
                        },
                        "f:mmapv1":{
                           ".":{

                           },
                           "f:nsSize":{

                           }
                        },
                        "f:wiredTiger":{
                           ".":{

                           },
                           "f:collectionConfig":{
                              ".":{

                              },
                              "f:blockCompressor":{

                              }
                           },
                           "f:engineConfig":{
                              ".":{

                              },
                              "f:cacheSizeRatio":{

                              },
                              "f:journalCompressor":{

                              }
                           },
                           "f:indexConfig":{
                              ".":{

                              },
                              "f:prefixCompression":{

                              }
                           }
                        }
                     }
                  },
```

```
                        "f:pmm":{
                           ".":{

                           },
                           "f:image":{

                           },
                           "f:serverHost":{

                           }
                        },
                        "f:secrets":{
                           ".":{

                           },
                           "f:users":{

                           }
                        },
                        "f:updateStrategy":{

                        }
                     }
                  }
               },
               {
                  "manager":"percona-server-mongodb-operator",
                  "operation":"Update",
                  "apiVersion":"psmdb.percona.com/v1",
                  "time":"2020-07-24T15:04:55Z",
                  "fieldsType":"FieldsV1",
                  "fieldsV1":{
                     "f:spec":{
                        "f:backup":{
                           "f:containerSecurityContext":{
                              ".":{

                              },
                              "f:runAsNonRoot":{

                              },
                              "f:runAsUser":{

                              }
                           },
                           "f:podSecurityContext":{
                              ".":{

                              },
                              "f:fsGroup":{

                              }
                           }
                        },
                        "f:clusterServiceDNSSuffix":{

                        },
                        "f:replsets":{

                        },
                        "f:runUid":{
```

```
                        },
                        "f:secrets":{
                           "f:ssl":{

                           },
                           "f:sslInternal":{

                           }
                        }
                     },
                     "f:status":{
                        ".":{

                        },
                        "f:conditions":{

                        },
                        "f:observedGeneration":{

                        },
                        "f:replsets":{
                           ".":{

                           },
                           "f:rs0":{
                              ".":{

                              },
                              "f:ready":{

                              },
                              "f:size":{

                              },
                              "f:status":{

                              }
                           }
                        },
                        "f:state":{

                        }
                     }
                  }
               }
            ]
         }
      }
   ]
}
```


## Get status of Percona Server for MongoDB cluster

**Description:**

```
Gets all information about specified Percona Server for MongoDB cluster
```

**Kubectl Command:**

```
$ kubectl get psmdb/my-cluster-name -o json
```

**URL:**

```
https://$API_SERVER/apis/psmdb.percona.com/v1/namespaces/default/
perconaservermongodbs/my-cluster-name
```

**Authentication:**

```
Authorization: Bearer $KUBE_TOKEN
```

**cURL Request:**

```
$ curl -k -v -XGET "https://$API_SERVER/apis/psmdb.percona.com/v1/namespaces/
default/perconaservermongodbs/my-cluster-name" \
            -H "Accept: application/json" \
            -H "Authorization: Bearer $KUBE_TOKEN"
```

**Request Body:**

```
None
```

**Response:**

Example

```
{
   "apiVersion":"psmdb.percona.com/v1",
   "kind":"PerconaServerMongoDB",
   "metadata":{
      "annotations":{
         "kubectl.kubernetes.io/last-applied-configuration":"{\"apiVersion\":
\"psmdb.percona.com/v1-5-0\",\"kind\":\"PerconaServerMongoDB\",\"metadata\":{\"annotations\":
{},\"name\":\"my-cluster-name\",\"namespace\":\"default\"},\"spec\":
{\"allowUnsafeConfigurations\":false,\"backup\":{\"enabled\":true,\"image\":\"percona/percona-
server-mongodb-operator:1.5.0-backup\",\"restartOnFailure\":true,\"serviceAccountName\":
\"percona-server-mongodb-operator\",\"storages\":null,\"tasks\":null},\"image\":\"percona/
percona-server-mongodb:4.2.8-8\",\"imagePullPolicy\":\"Always\",\"mongod\":{\"net\":
{\"hostPort\":0,\"port\":27017},\"operationProfiling\":{\"mode\":\"slowOp\",\"rateLimit\":100,
\"slowOpThresholdMs\":100},\"security\":{\"enableEncryption\":true,\"encryptionCipherMode\":
\"AES256-CBC\",\"encryptionKeySecret\":\"my-cluster-name-mongodb-encryption-key\",
\"redactClientLogData\":false},\"setParameter\":{\"ttlMonitorSleepSecs\":60,
\"wiredTigerConcurrentReadTransactions\":128,\"wiredTigerConcurrentWriteTransactions\":128},
\"storage\":{\"engine\":\"wiredTiger\",\"inMemory\":{\"engineConfig\":
{\"inMemorySizeRatio\":0.9}},\"mmapv1\":{\"nsSize\":16,\"smallfiles\":false},\"wiredTiger\":
{\"collectionConfig\":{\"blockCompressor\":\"snappy\"},\"engineConfig\":
{\"cacheSizeRatio\":0.5,\"directoryForIndexes\":false,\"journalCompressor\":\"snappy\"},
\"indexConfig\":{\"prefixCompression\":true}}}},\"pmm\":{\"enabled\":false,\"image\":
\"percona/percona-server-mongodb-operator:1.5.0-pmm\",\"serverHost\":\"monitoring-service\"},
\"replsets\":[{\"affinity\":{\"antiAffinityTopologyKey\":\"none\"},\"arbiter\":{\"affinity\":
{\"antiAffinityTopologyKey\":\"none\"},\"enabled\":false,\"size\":1},\"expose\":
{\"enabled\":false,\"exposeType\":\"LoadBalancer\"},\"name\":\"rs0\",\"podDisruptionBudget\":
{\"maxUnavailable\":1},\"resources\":{\"limits\":null},\"size\":3,\"volumeSpec\":
{\"persistentVolumeClaim\":{\"accessModes\":[\"ReadWriteOnce\"],\"resources\":{\"requests\":
{\"storage\":\"3Gi\"}},\"storageClassName\":\"standard\"}}}],\"secrets\":{\"users\":\"my-
cluster-name-secrets\"},\"updateStrategy\":\"SmartUpdate\"}}\n"
      },
      "creationTimestamp":"2020-07-24T14:27:58Z",
      "generation":1,
      "managedFields":[
         {
            "apiVersion":"psmdb.percona.com/v1-5-0",
            "fieldsType":"FieldsV1",
            "fieldsV1":{
               "f:metadata":{
                  "f:annotations":{
                     ".":{

                     },
                     "f:kubectl.kubernetes.io/last-applied-configuration":{

                     }
                  }
               },
               "f:spec":{
                  ".":{

                  },
                  "f:allowUnsafeConfigurations":{

                  },
                  "f:backup":{
                     ".":{

                     },
                     "f:enabled":{
```

```
      },
      "f:image":{

      },
      "f:serviceAccountName":{

      }
   },
   "f:image":{

   },
   "f:imagePullPolicy":{

   },
   "f:mongod":{
      ".":{

      },
      "f:net":{
         ".":{

         },
         "f:port":{

         }
      },
      "f:operationProfiling":{
         ".":{

         },
         "f:mode":{

         },
         "f:rateLimit":{

         },
         "f:slowOpThresholdMs":{

         }
      },
      "f:security":{
         ".":{

         },
         "f:enableEncryption":{

         },
         "f:encryptionCipherMode":{

         },
         "f:encryptionKeySecret":{

         }
      },
      "f:setParameter":{
         ".":{

         },
         "f:ttlMonitorSleepSecs":{
```

```
            },
            "f:wiredTigerConcurrentReadTransactions":{

            },
            "f:wiredTigerConcurrentWriteTransactions":{

            }
         },
         "f:storage":{
            ".":{

            },
            "f:engine":{

            },
            "f:inMemory":{
               ".":{

               },
               "f:engineConfig":{
                  ".":{

                  },
                  "f:inMemorySizeRatio":{

                  }
               }
            },
            "f:mmapv1":{
               ".":{

               },
               "f:nsSize":{

               }
            },
            "f:wiredTiger":{
               ".":{

               },
               "f:collectionConfig":{
                  ".":{

                  },
                  "f:blockCompressor":{

                  }
               },
               "f:engineConfig":{
                  ".":{

                  },
                  "f:cacheSizeRatio":{

                  },
                  "f:journalCompressor":{

                  }
               },
               "f:indexConfig":{
                  ".":{
```

```
                        },
                        "f:prefixCompression":{

                        }
                     }
                  }
               }
            },
            "f:pmm":{
               ".":{

               },
               "f:image":{

               },
               "f:serverHost":{

               }
            },
            "f:secrets":{
               ".":{

               },
               "f:users":{

               }
            },
            "f:updateStrategy":{

            }
         }
      },
      "manager":"kubectl",
      "operation":"Update",
      "time":"2020-07-24T14:27:58Z"
   },
   {
      "apiVersion":"psmdb.percona.com/v1",
      "fieldsType":"FieldsV1",
      "fieldsV1":{
         "f:spec":{
            "f:backup":{
               "f:containerSecurityContext":{
                  ".":{

                  },
                  "f:runAsNonRoot":{

                  },
                  "f:runAsUser":{

                  }
               },
               "f:podSecurityContext":{
                  ".":{

                  },
                  "f:fsGroup":{

                  }
```

```
                  }
               },
               "f:clusterServiceDNSSuffix":{

               },
               "f:replsets":{

               },
               "f:runUid":{

               },
               "f:secrets":{
                  "f:ssl":{

                  },
                  "f:sslInternal":{

                  }
               }
            },
            "f:status":{
               ".":{

               },
               "f:conditions":{

               },
               "f:observedGeneration":{

               },
               "f:replsets":{
                  ".":{

                  },
                  "f:rs0":{
                     ".":{

                     },
                     "f:ready":{

                     },
                     "f:size":{

                     },
                     "f:status":{

                     }
                  }
               },
               "f:state":{

               }
            }
         },
         "manager":"percona-server-mongodb-operator",
         "operation":"Update",
         "time":"2020-07-24T15:09:40Z"
      }
   ],
   "name":"my-cluster-name",
   "namespace":"default",
```

```
      "resourceVersion":"1274523",
      "selfLink":"/apis/psmdb.percona.com/v1/namespaces/default/perconaservermongodbs/my-
cluster-name",
      "uid":"5207e71a-c83f-4707-b892-63aa93fb615c"
   },
   "spec":{
      "allowUnsafeConfigurations":false,
      "backup":{
         "enabled":true,
         "image":"percona/percona-server-mongodb-operator:1.5.0-backup",
         "restartOnFailure":true,
         "serviceAccountName":"percona-server-mongodb-operator",
         "storages":null,
         "tasks":null
      },
      "image":"percona/percona-server-mongodb:4.2.8-8",
      "imagePullPolicy":"Always",
      "mongod":{
         "net":{
            "hostPort":0,
            "port":27017
         },
         "operationProfiling":{
            "mode":"slowOp",
            "rateLimit":100,
            "slowOpThresholdMs":100
         },
         "security":{
            "enableEncryption":true,
            "encryptionCipherMode":"AES256-CBC",
            "encryptionKeySecret":"my-cluster-name-mongodb-encryption-key",
            "redactClientLogData":false
         },
         "setParameter":{
            "ttlMonitorSleepSecs":60,
            "wiredTigerConcurrentReadTransactions":128,
            "wiredTigerConcurrentWriteTransactions":128
         },
         "storage":{
            "engine":"wiredTiger",
            "inMemory":{
               "engineConfig":{
                  "inMemorySizeRatio":0.9
               }
            },
            "mmapv1":{
               "nsSize":16,
               "smallfiles":false
            },
            "wiredTiger":{
               "collectionConfig":{
                  "blockCompressor":"snappy"
               },
               "engineConfig":{
                  "cacheSizeRatio":0.5,
                  "directoryForIndexes":false,
                  "journalCompressor":"snappy"
               },
               "indexConfig":{
                  "prefixCompression":true
               }
```

```
            }
         }
      },
      "pmm":{
         "enabled":false,
         "image":"percona/percona-server-mongodb-operator:1.5.0-pmm",
         "serverHost":"monitoring-service"
      },
      "replsets":[
         {
            "affinity":{
               "antiAffinityTopologyKey":"none"
            },
            "arbiter":{
               "affinity":{
                  "antiAffinityTopologyKey":"none"
               },
               "enabled":false,
               "size":1
            },
            "expose":{
               "enabled":false,
               "exposeType":"LoadBalancer"
            },
            "name":"rs0",
            "podDisruptionBudget":{
               "maxUnavailable":1
            },
            "resources":{
               "limits":null
            },
            "size":3,
            "volumeSpec":{
               "persistentVolumeClaim":{
                  "accessModes":[
                     "ReadWriteOnce"
                  ],
                  "resources":{
                     "requests":{
                        "storage":"3Gi"
                     }
                  },
                  "storageClassName":"standard"
               }
            }
         }
      ],
      "secrets":{
         "users":"my-cluster-name-secrets"
      },
      "updateStrategy":"SmartUpdate"
   },
   "status":{
      "conditions":[
         {
            "lastTransitionTime":"2020-07-24T14:28:03Z",
            "status":"True",
            "type":"ClusterInitializing"
         },
         {
            "lastTransitionTime":"2020-07-24T14:28:39Z",
```

```
            "status":"True",
            "type":"Error"
         },
         {
            "lastTransitionTime":"2020-07-24T14:28:41Z",
            "status":"True",
            "type":"ClusterInitializing"
         },
         {
            "lastTransitionTime":"2020-07-24T14:28:41Z",
            "status":"True",
            "type":"Error"
         },
         {
            "lastTransitionTime":"2020-07-24T14:29:10Z",
            "status":"True",
            "type":"ClusterReady"
         },
         {
            "lastTransitionTime":"2020-07-24T14:49:46Z",
            "status":"True",
            "type":"ClusterInitializing"
         },
         {
            "lastTransitionTime":"2020-07-24T14:50:00Z",
            "status":"True",
            "type":"ClusterInitializing"
         },
         {
            "lastTransitionTime":"2020-07-24T14:52:31Z",
            "status":"True",
            "type":"ClusterInitializing"
         },
         {
            "lastTransitionTime":"2020-07-24T14:52:43Z",
            "status":"True",
            "type":"Error"
         },
         {
            "lastTransitionTime":"2020-07-24T14:53:01Z",
            "status":"True",
            "type":"ClusterInitializing"
         },
         {
            "lastTransitionTime":"2020-07-24T14:53:05Z",
            "status":"True",
            "type":"ClusterInitializing"
         },
         {
            "lastTransitionTime":"2020-07-24T14:53:05Z",
            "status":"True",
            "type":"ClusterReady"
         }
      ],
      "observedGeneration":1,
      "replsets":{
         "rs0":{
            "ready":3,
            "size":3,
            "status":"ready"
         }
```

```
        },
        "state":"ready"
    }
}
```

## Scale up/down Percona Server for MongoDB cluster

**Description:**

```
Increase or decrease the size of the Percona Server for MongoDB cluster nodes to
fit the current high availability needs
```

**Kubectl Command:**

```
$ kubectl patch psmdb my-cluster-name --type=merge --patch '{
"spec": {"replsets":{ "size": "5" }
}}'
```

**URL:**

```
https://$API_SERVER/apis/psmdb.percona.com/v1/namespaces/default/
perconaservermongodbs/my-cluster-name
```

**Authentication:**

```
Authorization: Bearer $KUBE_TOKEN
```

**cURL Request:**

```
$ curl -k -v -XPATCH "https://$API_SERVER/apis/psmdb.percona.com/v1/namespaces/
default/perconaservermongodbs/my-cluster-name" \
            -H "Authorization: Bearer $KUBE_TOKEN" \
            -H "Content-Type: application/merge-patch+json"
            -H "Accept: application/json" \
            -d '{
                  "spec": {"replsets":{ "size": "5" }
                  }}'
```

**Request Body:**

**Example**

```
{
"spec": {"replsets":{ "size": "5" }
}}
```

**Input:**

> **spec**:
>
> replsets
>
> 1. size (Int or String, Defaults: 3): `Specifiy the sie of the replsets cluster to scale up or down to`

**Response:**

Example

```
{
   "apiVersion":"psmdb.percona.com/v1",
   "kind":"PerconaServerMongoDB",
   "metadata":{
      "annotations":{
         "kubectl.kubernetes.io/last-applied-configuration":"{\"apiVersion\":
\"psmdb.percona.com/v1-5-0\",\"kind\":\"PerconaServerMongoDB\",\"metadata\":{\"annotations\":
{},\"name\":\"my-cluster-name\",\"namespace\":\"default\"},\"spec\":
{\"allowUnsafeConfigurations\":false,\"backup\":{\"enabled\":true,\"image\":\"percona/percona-
server-mongodb-operator:1.5.0-backup\",\"restartOnFailure\":true,\"serviceAccountName\":
\"percona-server-mongodb-operator\",\"storages\":null,\"tasks\":null},\"image\":\"percona/
percona-server-mongodb:4.2.8-8\",\"imagePullPolicy\":\"Always\",\"mongod\":{\"net\":
{\"hostPort\":0,\"port\":27017},\"operationProfiling\":{\"mode\":\"slowOp\",\"rateLimit\":100,
\"slowOpThresholdMs\":100},\"security\":{\"enableEncryption\":true,\"encryptionCipherMode\":
\"AES256-CBC\",\"encryptionKeySecret\":\"my-cluster-name-mongodb-encryption-key\",
\"redactClientLogData\":false},\"setParameter\":{\"ttlMonitorSleepSecs\":60,
\"wiredTigerConcurrentReadTransactions\":128,\"wiredTigerConcurrentWriteTransactions\":128},
\"storage\":{\"engine\":\"wiredTiger\",\"inMemory\":{\"engineConfig\":
{\"inMemorySizeRatio\":0.9}},\"mmapv1\":{\"nsSize\":16,\"smallfiles\":false},\"wiredTiger\":
{\"collectionConfig\":{\"blockCompressor\":\"snappy\"},\"engineConfig\":
{\"cacheSizeRatio\":0.5,\"directoryForIndexes\":false,\"journalCompressor\":\"snappy\"},
\"indexConfig\":{\"prefixCompression\":true}}}},\"pmm\":{\"enabled\":false,\"image\":
\"percona/percona-server-mongodb-operator:1.5.0-pmm\",\"serverHost\":\"monitoring-service\"},
\"replsets\":[{\"affinity\":{\"antiAffinityTopologyKey\":\"none\"},\"arbiter\":{\"affinity\":
{\"antiAffinityTopologyKey\":\"none\"},\"enabled\":false,\"size\":1},\"expose\":
{\"enabled\":false,\"exposeType\":\"LoadBalancer\"},\"name\":\"rs0\",\"podDisruptionBudget\":
{\"maxUnavailable\":1},\"resources\":{\"limits\":null},\"size\":3,\"volumeSpec\":
{\"persistentVolumeClaim\":{\"accessModes\":[\"ReadWriteOnce\"],\"resources\":{\"requests\":
{\"storage\":\"3Gi\"}},\"storageClassName\":\"standard\"}}}],\"secrets\":{\"users\":\"my-
cluster-name-secrets\"},\"updateStrategy\":\"SmartUpdate\"}}\n"
      },
      "creationTimestamp":"2020-07-24T14:27:58Z",
      "generation":4,
      "managedFields":[
         {
            "apiVersion":"psmdb.percona.com/v1-5-0",
            "fieldsType":"FieldsV1",
            "fieldsV1":{
               "f:metadata":{
                  "f:annotations":{
                     ".":{

                     },
                     "f:kubectl.kubernetes.io/last-applied-configuration":{

                     }
                  }
               },
               "f:spec":{
                  ".":{

                  },
                  "f:allowUnsafeConfigurations":{

                  },
                  "f:backup":{
                     ".":{

                     },
                     "f:enabled":{
```

```
      },
      "f:image":{

      },
      "f:serviceAccountName":{

      }
   },
   "f:image":{

   },
   "f:imagePullPolicy":{

   },
   "f:mongod":{
      ".":{

      },
      "f:net":{
         ".":{

         },
         "f:port":{

         }
      },
      "f:operationProfiling":{
         ".":{

         },
         "f:mode":{

         },
         "f:rateLimit":{

         },
         "f:slowOpThresholdMs":{

         }
      },
      "f:security":{
         ".":{

         },
         "f:enableEncryption":{

         },
         "f:encryptionCipherMode":{

         },
         "f:encryptionKeySecret":{

         }
      },
      "f:setParameter":{
         ".":{

         },
         "f:ttlMonitorSleepSecs":{
```

```
            },
            "f:wiredTigerConcurrentReadTransactions":{

            },
            "f:wiredTigerConcurrentWriteTransactions":{

            }
         },
         "f:storage":{
            ".":{

            },
            "f:engine":{

            },
            "f:inMemory":{
               ".":{

               },
               "f:engineConfig":{
                  ".":{

                  },
                  "f:inMemorySizeRatio":{

                  }
               }
            },
            "f:mmapv1":{
               ".":{

               },
               "f:nsSize":{

               }
            },
            "f:wiredTiger":{
               ".":{

               },
               "f:collectionConfig":{
                  ".":{

                  },
                  "f:blockCompressor":{

                  }
               },
               "f:engineConfig":{
                  ".":{

                  },
                  "f:cacheSizeRatio":{

                  },
                  "f:journalCompressor":{

                  }
               },
               "f:indexConfig":{
                  ".":{
```

```
                        },
                        "f:prefixCompression":{

                        }
                     }
                  }
               }
            },
            "f:pmm":{
               ".":{

               },
               "f:image":{

               },
               "f:serverHost":{

               }
            },
            "f:secrets":{
               ".":{

               },
               "f:users":{

               }
            },
            "f:updateStrategy":{

            }
         }
      },
      "manager":"kubectl",
      "operation":"Update",
      "time":"2020-07-24T14:27:58Z"
   },
   {
      "apiVersion":"psmdb.percona.com/v1",
      "fieldsType":"FieldsV1",
      "fieldsV1":{
         "f:spec":{
            "f:backup":{
               "f:containerSecurityContext":{
                  ".":{

                  },
                  "f:runAsNonRoot":{

                  },
                  "f:runAsUser":{

                  }
               },
               "f:podSecurityContext":{
                  ".":{

                  },
                  "f:fsGroup":{

                  }
```

```
                  }
               },
               "f:clusterServiceDNSSuffix":{

               },
               "f:runUid":{

               },
               "f:secrets":{
                  "f:ssl":{

                  },
                  "f:sslInternal":{

                  }
               }
            },
            "f:status":{
               ".":{

               },
               "f:conditions":{

               },
               "f:observedGeneration":{

               },
               "f:replsets":{
                  ".":{

                  },
                  "f:rs0":{
                     ".":{

                     },
                     "f:ready":{

                     },
                     "f:size":{

                     },
                     "f:status":{

                     }
                  }
               },
               "f:state":{

               }
            }
         },
         "manager":"percona-server-mongodb-operator",
         "operation":"Update",
         "time":"2020-07-24T15:35:14Z"
      },
      {
         "apiVersion":"psmdb.percona.com/v1",
         "fieldsType":"FieldsV1",
         "fieldsV1":{
            "f:spec":{
               "f:replsets":{
```

```
                     ".":{

                     },
                     "f:size":{

                     }
                  }
               }
            },
            "manager":"kubectl",
            "operation":"Update",
            "time":"2020-07-24T15:43:19Z"
         }
      ],
      "name":"my-cluster-name",
      "namespace":"default",
      "resourceVersion":"1279009",
      "selfLink":"/apis/psmdb.percona.com/v1/namespaces/default/perconaservermongodbs/my-
cluster-name",
      "uid":"5207e71a-c83f-4707-b892-63aa93fb615c"
   },
   "spec":{
      "allowUnsafeConfigurations":false,
      "backup":{
         "enabled":true,
         "image":"percona/percona-server-mongodb-operator:1.5.0-backup",
         "restartOnFailure":true,
         "serviceAccountName":"percona-server-mongodb-operator",
         "storages":null,
         "tasks":null
      },
      "image":"percona/percona-server-mongodb:4.2.8-8",
      "imagePullPolicy":"Always",
      "mongod":{
         "net":{
            "hostPort":0,
            "port":27017
         },
         "operationProfiling":{
            "mode":"slowOp",
            "rateLimit":100,
            "slowOpThresholdMs":100
         },
         "security":{
            "enableEncryption":true,
            "encryptionCipherMode":"AES256-CBC",
            "encryptionKeySecret":"my-cluster-name-mongodb-encryption-key",
            "redactClientLogData":false
         },
         "setParameter":{
            "ttlMonitorSleepSecs":60,
            "wiredTigerConcurrentReadTransactions":128,
            "wiredTigerConcurrentWriteTransactions":128
         },
         "storage":{
            "engine":"wiredTiger",
            "inMemory":{
               "engineConfig":{
                  "inMemorySizeRatio":0.9
               }
            },
```

```
            "mmapv1":{
               "nsSize":16,
               "smallfiles":false
            },
            "wiredTiger":{
               "collectionConfig":{
                  "blockCompressor":"snappy"
               },
               "engineConfig":{
                  "cacheSizeRatio":0.5,
                  "directoryForIndexes":false,
                  "journalCompressor":"snappy"
               },
               "indexConfig":{
                  "prefixCompression":true
               }
            }
         }
      },
      "pmm":{
         "enabled":false,
         "image":"percona/percona-server-mongodb-operator:1.5.0-pmm",
         "serverHost":"monitoring-service"
      },
      "replsets":{
         "size":"5"
      },
      "secrets":{
         "users":"my-cluster-name-secrets"
      },
      "updateStrategy":"SmartUpdate"
   },
   "status":{
      "conditions":[
         {
            "lastTransitionTime":"2020-07-24T14:28:03Z",
            "status":"True",
            "type":"ClusterInitializing"
         },
         {
            "lastTransitionTime":"2020-07-24T14:28:39Z",
            "status":"True",
            "type":"Error"
         },
         {
            "lastTransitionTime":"2020-07-24T14:28:41Z",
            "status":"True",
            "type":"ClusterInitializing"
         },
         {
            "lastTransitionTime":"2020-07-24T14:28:41Z",
            "status":"True",
            "type":"Error"
         },
         {
            "lastTransitionTime":"2020-07-24T14:29:10Z",
            "status":"True",
            "type":"ClusterReady"
         },
         {
            "lastTransitionTime":"2020-07-24T14:49:46Z",
```

```
            "status":"True",
            "type":"ClusterInitializing"
         },
         {
            "lastTransitionTime":"2020-07-24T14:50:00Z",
            "status":"True",
            "type":"ClusterInitializing"
         },
         {
            "lastTransitionTime":"2020-07-24T14:52:31Z",
            "status":"True",
            "type":"ClusterInitializing"
         },
         {
            "lastTransitionTime":"2020-07-24T14:52:43Z",
            "status":"True",
            "type":"Error"
         },
         {
            "lastTransitionTime":"2020-07-24T14:53:01Z",
            "status":"True",
            "type":"ClusterInitializing"
         },
         {
            "lastTransitionTime":"2020-07-24T14:53:05Z",
            "status":"True",
            "type":"ClusterInitializing"
         },
         {
            "lastTransitionTime":"2020-07-24T14:53:05Z",
            "status":"True",
            "type":"ClusterReady"
         }
      ],
      "observedGeneration":1,
      "replsets":{
         "rs0":{
            "ready":3,
            "size":3,
            "status":"ready"
         }
      },
      "state":"ready"
   }
}
```


# Update Percona Server for MongoDB cluster image

**Description:**

```
Change the image of Percona Server for MongoDB containers inside the cluster
```

**Kubectl Command:**

```
$ kubectl patch psmdb my-cluster-name --type=merge --patch '{
"spec": {"psmdb":{ "image": "percona/percona-server-mongodb-operator:1.4.0-
mongod4.2" }
}}'
```

**URL:**

```
https://$API_SERVER/apis/psmdb.percona.com/v1/namespaces/default/
perconaservermongodbs/my-cluster-name
```

**Authentication:**

```
Authorization: Bearer $KUBE_TOKEN
```

**cURL Request:**

```
$ curl -k -v -XPATCH "https://$API_SERVER/apis/psmdb.percona.com/v1/namespaces/
default/perconaservermongodbs/my-cluster-name" \
            -H "Authorization: Bearer $KUBE_TOKEN" \
            -H "Accept: application/json" \
            -H "Content-Type: application/merge-patch+json"
            -d '{
              "spec": {"psmdb":{ "image": "percona/percona-server-mongodb-
operator:1.4.0-mongod4.2" }
              }}'
```

**Request Body:**

**Example**

```
{
"spec": { "image ": "percona/percona-server-mongodb:4.2.8-8" }
}
```

**Input:**

> **spec**:
>
> psmdb:
>
> 1. image (String, min-length: 1) : `name of the image to update for Percona Server for MongoDB`

**Response:**

Example

```
{
   "apiVersion":"psmdb.percona.com/v1",
   "kind":"PerconaServerMongoDB",
   "metadata":{
      "annotations":{
         "kubectl.kubernetes.io/last-applied-configuration":"{\"apiVersion\":
\"psmdb.percona.com/v1-5-0\",\"kind\":\"PerconaServerMongoDB\",\"metadata\":{\"annotations\":
{},\"name\":\"my-cluster-name\",\"namespace\":\"default\"},\"spec\":
{\"allowUnsafeConfigurations\":false,\"backup\":{\"enabled\":true,\"image\":\"percona/percona-
server-mongodb-operator:1.5.0-backup\",\"restartOnFailure\":true,\"serviceAccountName\":
\"percona-server-mongodb-operator\",\"storages\":null,\"tasks\":null},\"image\":\"percona/
percona-server-mongodb:4.2.8-8\",\"imagePullPolicy\":\"Always\",\"mongod\":{\"net\":
{\"hostPort\":0,\"port\":27017},\"operationProfiling\":{\"mode\":\"slowOp\",\"rateLimit\":100,
\"slowOpThresholdMs\":100},\"security\":{\"enableEncryption\":true,\"encryptionCipherMode\":
\"AES256-CBC\",\"encryptionKeySecret\":\"my-cluster-name-mongodb-encryption-key\",
\"redactClientLogData\":false},\"setParameter\":{\"ttlMonitorSleepSecs\":60,
\"wiredTigerConcurrentReadTransactions\":128,\"wiredTigerConcurrentWriteTransactions\":128},
\"storage\":{\"engine\":\"wiredTiger\",\"inMemory\":{\"engineConfig\":
{\"inMemorySizeRatio\":0.9}},\"mmapv1\":{\"nsSize\":16,\"smallfiles\":false},\"wiredTiger\":
{\"collectionConfig\":{\"blockCompressor\":\"snappy\"},\"engineConfig\":
{\"cacheSizeRatio\":0.5,\"directoryForIndexes\":false,\"journalCompressor\":\"snappy\"},
\"indexConfig\":{\"prefixCompression\":true}}}},\"pmm\":{\"enabled\":false,\"image\":
\"percona/percona-server-mongodb-operator:1.5.0-pmm\",\"serverHost\":\"monitoring-service\"},
\"replsets\":[{\"affinity\":{\"antiAffinityTopologyKey\":\"none\"},\"arbiter\":{\"affinity\":
{\"antiAffinityTopologyKey\":\"none\"},\"enabled\":false,\"size\":1},\"expose\":
{\"enabled\":false,\"exposeType\":\"LoadBalancer\"},\"name\":\"rs0\",\"podDisruptionBudget\":
{\"maxUnavailable\":1},\"resources\":{\"limits\":null},\"size\":3,\"volumeSpec\":
{\"persistentVolumeClaim\":{\"accessModes\":[\"ReadWriteOnce\"],\"resources\":{\"requests\":
{\"storage\":\"3Gi\"}},\"storageClassName\":\"standard\"}}}],\"secrets\":{\"users\":\"my-
cluster-name-secrets\"},\"updateStrategy\":\"SmartUpdate\"}}\n"
      },
      "creationTimestamp":"2020-07-24T14:27:58Z",
      "generation":5,
      "managedFields":[
         {
            "apiVersion":"psmdb.percona.com/v1-5-0",
            "fieldsType":"FieldsV1",
            "fieldsV1":{
               "f:metadata":{
                  "f:annotations":{
                     ".":{

                     },
                     "f:kubectl.kubernetes.io/last-applied-configuration":{

                     }
                  }
               },
               "f:spec":{
                  ".":{

                  },
                  "f:allowUnsafeConfigurations":{

                  },
                  "f:backup":{
                     ".":{

                     },
                     "f:enabled":{
```

```
      },
      "f:image":{

      },
      "f:serviceAccountName":{

      }
   },
   "f:image":{

   },
   "f:imagePullPolicy":{

   },
   "f:mongod":{
      ".":{

      },
      "f:net":{
         ".":{

         },
         "f:port":{

         }
      },
      "f:operationProfiling":{
         ".":{

         },
         "f:mode":{

         },
         "f:rateLimit":{

         },
         "f:slowOpThresholdMs":{

         }
      },
      "f:security":{
         ".":{

         },
         "f:enableEncryption":{

         },
         "f:encryptionCipherMode":{

         },
         "f:encryptionKeySecret":{

         }
      },
      "f:setParameter":{
         ".":{

         },
         "f:ttlMonitorSleepSecs":{
```

```
            },
            "f:wiredTigerConcurrentReadTransactions":{

            },
            "f:wiredTigerConcurrentWriteTransactions":{

            }
         },
         "f:storage":{
            ".":{

            },
            "f:engine":{

            },
            "f:inMemory":{
               ".":{

               },
               "f:engineConfig":{
                  ".":{

                  },
                  "f:inMemorySizeRatio":{

                  }
               }
            },
            "f:mmapv1":{
               ".":{

               },
               "f:nsSize":{

               }
            },
            "f:wiredTiger":{
               ".":{

               },
               "f:collectionConfig":{
                  ".":{

                  },
                  "f:blockCompressor":{

                  }
               },
               "f:engineConfig":{
                  ".":{

                  },
                  "f:cacheSizeRatio":{

                  },
                  "f:journalCompressor":{

                  }
               },
               "f:indexConfig":{
                  ".":{
```

```
                        },
                        "f:prefixCompression":{

                        }
                     }
                  }
               }
            },
            "f:pmm":{
               ".":{

               },
               "f:image":{

               },
               "f:serverHost":{

               }
            },
            "f:secrets":{
               ".":{

               },
               "f:users":{

               }
            },
            "f:updateStrategy":{

            }
         }
      },
      "manager":"kubectl",
      "operation":"Update",
      "time":"2020-07-24T14:27:58Z"
   },
   {
      "apiVersion":"psmdb.percona.com/v1",
      "fieldsType":"FieldsV1",
      "fieldsV1":{
         "f:spec":{
            "f:backup":{
               "f:containerSecurityContext":{
                  ".":{

                  },
                  "f:runAsNonRoot":{

                  },
                  "f:runAsUser":{

                  }
               },
               "f:podSecurityContext":{
                  ".":{

                  },
                  "f:fsGroup":{

                  }
```

```
                  }
               },
               "f:clusterServiceDNSSuffix":{

               },
               "f:runUid":{

               },
               "f:secrets":{
                  "f:ssl":{

                  },
                  "f:sslInternal":{

                  }
               }
            },
            "f:status":{
               ".":{

               },
               "f:conditions":{

               },
               "f:observedGeneration":{

               },
               "f:replsets":{
                  ".":{

                  },
                  "f:rs0":{
                     ".":{

                     },
                     "f:ready":{

                     },
                     "f:size":{

                     },
                     "f:status":{

                     }
                  }
               },
               "f:state":{

               }
            }
         },
         "manager":"percona-server-mongodb-operator",
         "operation":"Update",
         "time":"2020-07-24T15:35:14Z"
      },
      {
         "apiVersion":"psmdb.percona.com/v1",
         "fieldsType":"FieldsV1",
         "fieldsV1":{
            "f:spec":{
               "f:image ":{
```

```
                  },
                  "f:replsets":{
                     ".":{

                     },
                     "f:size":{

                     }
                  }
               }
            },
            "manager":"kubectl",
            "operation":"Update",
            "time":"2020-07-27T12:21:39Z"
         }
      ],
      "name":"my-cluster-name",
      "namespace":"default",
      "resourceVersion":"1279853",
      "selfLink":"/apis/psmdb.percona.com/v1/namespaces/default/perconaservermongodbs/my-
cluster-name",
      "uid":"5207e71a-c83f-4707-b892-63aa93fb615c"
   },
   "spec":{
      "allowUnsafeConfigurations":false,
      "backup":{
         "enabled":true,
         "image":"percona/percona-server-mongodb-operator:1.5.0-backup",
         "restartOnFailure":true,
         "serviceAccountName":"percona-server-mongodb-operator",
         "storages":null,
         "tasks":null
      },
      "image ":"percona/percona-server-mongodb:4.2.8-8",
      "imagePullPolicy":"Always",
      "mongod":{
         "net":{
            "hostPort":0,
            "port":27017
         },
         "operationProfiling":{
            "mode":"slowOp",
            "rateLimit":100,
            "slowOpThresholdMs":100
         },
         "security":{
            "enableEncryption":true,
            "encryptionCipherMode":"AES256-CBC",
            "encryptionKeySecret":"my-cluster-name-mongodb-encryption-key",
            "redactClientLogData":false
         },
         "setParameter":{
            "ttlMonitorSleepSecs":60,
            "wiredTigerConcurrentReadTransactions":128,
            "wiredTigerConcurrentWriteTransactions":128
         },
         "storage":{
            "engine":"wiredTiger",
            "inMemory":{
               "engineConfig":{
```

```
                  "inMemorySizeRatio":0.9
               }
            },
            "mmapv1":{
               "nsSize":16,
               "smallfiles":false
            },
            "wiredTiger":{
               "collectionConfig":{
                  "blockCompressor":"snappy"
               },
               "engineConfig":{
                  "cacheSizeRatio":0.5,
                  "directoryForIndexes":false,
                  "journalCompressor":"snappy"
               },
               "indexConfig":{
                  "prefixCompression":true
               }
            }
         }
      },
      "pmm":{
         "enabled":false,
         "image":"percona/percona-server-mongodb-operator:1.5.0-pmm",
         "serverHost":"monitoring-service"
      },
      "replsets":{
         "size":"5"
      },
      "secrets":{
         "users":"my-cluster-name-secrets"
      },
      "updateStrategy":"SmartUpdate"
   },
   "status":{
      "conditions":[
         {
            "lastTransitionTime":"2020-07-24T14:28:03Z",
            "status":"True",
            "type":"ClusterInitializing"
         },
         {
            "lastTransitionTime":"2020-07-24T14:28:39Z",
            "status":"True",
            "type":"Error"
         },
         {
            "lastTransitionTime":"2020-07-24T14:28:41Z",
            "status":"True",
            "type":"ClusterInitializing"
         },
         {
            "lastTransitionTime":"2020-07-24T14:28:41Z",
            "status":"True",
            "type":"Error"
         },
         {
            "lastTransitionTime":"2020-07-24T14:29:10Z",
            "status":"True",
            "type":"ClusterReady"
```

```
          },
          {
             "lastTransitionTime":"2020-07-24T14:49:46Z",
             "status":"True",
             "type":"ClusterInitializing"
          },
          {
             "lastTransitionTime":"2020-07-24T14:50:00Z",
             "status":"True",
             "type":"ClusterInitializing"
          },
          {
             "lastTransitionTime":"2020-07-24T14:52:31Z",
             "status":"True",
             "type":"ClusterInitializing"
          },
          {
             "lastTransitionTime":"2020-07-24T14:52:43Z",
             "status":"True",
             "type":"Error"
          },
          {
             "lastTransitionTime":"2020-07-24T14:53:01Z",
             "status":"True",
             "type":"ClusterInitializing"
          },
          {
             "lastTransitionTime":"2020-07-24T14:53:05Z",
             "status":"True",
             "type":"ClusterInitializing"
          },
          {
             "lastTransitionTime":"2020-07-24T14:53:05Z",
             "status":"True",
             "type":"ClusterReady"
          }
       ],
       "observedGeneration":1,
       "replsets":{
          "rs0":{
             "ready":3,
             "size":3,
             "status":"ready"
          }
       },
       "state":"ready"
    }
 }
```


## Backup Percona Server for MongoDB cluster

**Description:**

```
Takes a backup of the Percona Server for MongoDB cluster containers data to be able
to recover from disasters or make a roll-back later
```

**Kubectl Command:**

```
$ kubectl apply -f percona-server-mongodb-operator/deploy/backup/backup.yaml
```

**URL:**

```
https://$API_SERVER/apis/psmdb.percona.com/v1/namespaces/default/
perconaservermongodbbackups
```

**Authentication:**

```
Authorization: Bearer $KUBE_TOKEN
```

**cURL Request:**

```
$ curl -k -v -XPOST "https://$API_SERVER/apis/psmdb.percona.com/v1/namespaces/
default/perconaservermongodbbackups" \
            -H "Accept: application/json" \
            -H "Content-Type: application/json" \
            -d "@backup.json" -H "Authorization: Bearer $KUBE_TOKEN"
```

**Request Body (backup.json):**

**Example**

```
{
   "apiVersion":"psmdb.percona.com/v1",
   "kind":"PerconaServerMongoDBBackup",
   "metadata":{
      "name":"backup1",
      "namespace":"default"
   },
   "spec":{
      "psmdbCluster":"my-cluster-name",
      "storageName":"s3-us-west"
   }
}
```

**Input:**

1. **metadata**:

> name(String, min-length:1) : `name of backup to create`

1. **spec**:

```
1. psmdbCluster(String, min-length:1) : `name of Percona Server for MongoDB
cluster`

2. storageName(String, min-length:1) : `name of storage claim to use`
```

**Response:**

**Example**


```
{
   "apiVersion":"psmdb.percona.com/v1",
   "kind":"PerconaServerMongoDBBackup",
   "metadata":{
      "annotations":{
         "kubectl.kubernetes.io/last-applied-configuration":"{\"apiVersion\":
\"psmdb.percona.com/v1\",\"kind\":\"PerconaServerMongoDBBackup\",\"metadata\":
{\"annotations\":{},\"name\":\"backup1\",\"namespace\":\"default\"},\"spec\":
{\"psmdbCluster\":\"my-cluster-name\",\"storageName\":\"s3-us-west\"}}\n"
      },
      "creationTimestamp":"2020-07-27T13:45:43Z",
      "generation":1,
      "managedFields":[
         {
            "apiVersion":"psmdb.percona.com/v1",
            "fieldsType":"FieldsV1",
            "fieldsV1":{
               "f:metadata":{
                  "f:annotations":{
                     ".":{

                     },
                     "f:kubectl.kubernetes.io/last-applied-configuration":{

                     }
                  }
               },
               "f:spec":{
                  ".":{

                  },
                  "f:psmdbCluster":{

                  },
                  "f:storageName":{

                  }
               }
            },
            "manager":"kubectl",
            "operation":"Update",
            "time":"2020-07-27T13:45:43Z"
         }
      ],
      "name":"backup1",
      "namespace":"default",
      "resourceVersion":"1290243",
      "selfLink":"/apis/psmdb.percona.com/v1/namespaces/default/perconaservermongodbbackups/
backup1",
      "uid":"e695d1c7-898e-44b0-b356-537284f6c046"
   },
   "spec":{
      "psmdbCluster":"my-cluster-name",
      "storageName":"s3-us-west"
   }
}
```

# Restore Percona Server for MongoDB cluster

**Description:**

```
Restores Percona Server for MongoDB cluster data to an earlier version to recover
from a problem or to make a roll-back
```

**Kubectl Command:**

```
$ kubectl apply -f percona-server-mongodb-operator/deploy/backup/restore.yaml
```

**URL:**

```
https://$API_SERVER/apis/psmdb.percona.com/v1/namespaces/default/
perconaservermongodbrestores
```

**Authentication:**

```
Authorization: Bearer $KUBE_TOKEN
```

**cURL Request:**

```
$ curl -k -v -XPOST "https://$API_SERVER/apis/psmdb.percona.com/v1/namespaces/
default/perconaservermongodbrestores" \
            -H "Accept: application/json" \
            -H "Content-Type: application/json" \
            -d "@restore.json" \
            -H "Authorization: Bearer $KUBE_TOKEN"
```

**Request Body (restore.json):**

**Example**

```
{
   "apiVersion":"psmdb.percona.com/v1",
   "kind":"PerconaServerMongoDBRestore",
   "metadata":{
      "name":"restore1",
      "namespace":"default"
   },
   "spec":{
      "backupName":"backup1",
      "clusterName":"my-cluster-name"
   }
}
```

**Input:**

1. **metadata**:

> name(String, min-length:1): `name of restore to create`

1. **spec**:

```
1. clusterName(String, min-length:1) : `name of Percona Server for MongoDB
cluster`

2. backupName(String, min-length:1) : `name of backup to restore from`
```

**Response:**

**Example**


```
{
   "apiVersion":"psmdb.percona.com/v1",
   "kind":"PerconaServerMongoDBRestore",
   "metadata":{
      "annotations":{
         "kubectl.kubernetes.io/last-applied-configuration":"{\"apiVersion\":
\"psmdb.percona.com/v1\",\"kind\":\"PerconaServerMongoDBRestore\",\"metadata\":
{\"annotations\":{},\"name\":\"restore1\",\"namespace\":\"default\"},\"spec\":{\"backupName\":
\"backup1\",\"clusterName\":\"my-cluster-name\"}}\n"
      },
      "creationTimestamp":"2020-07-27T13:52:56Z",
      "generation":1,
      "managedFields":[
         {
            "apiVersion":"psmdb.percona.com/v1",
            "fieldsType":"FieldsV1",
            "fieldsV1":{
               "f:metadata":{
                  "f:annotations":{
                     ".":{

                     },
                     "f:kubectl.kubernetes.io/last-applied-configuration":{

                     }
                  }
               },
               "f:spec":{
                  ".":{

                  },
                  "f:backupName":{

                  },
                  "f:clusterName":{

                  }
               }
            },
            "manager":"kubectl",
            "operation":"Update",
            "time":"2020-07-27T13:52:56Z"
         }
      ],
      "name":"restore1",
      "namespace":"default",
      "resourceVersion":"1291198",
      "selfLink":"/apis/psmdb.percona.com/v1/namespaces/default/perconaservermongodbrestores/
restore1",
      "uid":"17e982fe-ac41-47f4-afba-fea380b0c76e"
   },
   "spec":{
      "backupName":"backup1",
      "clusterName":"my-cluster-name"
   }
}
```

# Frequently Asked Questions

## Why do we need to follow “the Kubernetes way” when Kubernetes was never intended to run databases?

As it is well known, the Kubernetes approach is targeted at stateless applications but provides ways to store state (in Persistent Volumes, etc.) if the application needs it. Generally, a stateless mode of operation is supposed to provide better safety, sustainability, and scalability, it makes the already-deployed components interchangeable. You can find more about substantial benefits brought by Kubernetes to databases in this blog post.

The architecture of state-centric applications (like databases) should be composed in a right way to avoid crashes, data loss, or data inconsistencies during hardware failure. Percona Operator for MongoDB provides out-of-the-box functionality to automate provisioning and management of highly available MongoDB database clusters on Kubernetes.

## How can I contact the developers?

The best place to discuss Percona Operator for MongoDB with developers and other community members is the community forum.

If you would like to report a bug, use the Percona Operator for MongoDB project in JIRA.

## What is the difference between the Operator quickstart and advanced installation ways?

As you have noticed, the installation section of docs contains both quickstart and advanced installation guides.

The quickstart guide is simpler. It has fewer installation steps in favor of predefined default choices. Particularly, in advanced installation guides, you separately apply the Custom Resource Definition and Role-based Access Control configuration files with possible edits in them. At the same time, quickstart guides rely on the all-inclusive bundle configuration.

At another point, quickstart guides are related to specific platforms you are going to use (Minikube, Google Kubernetes Engine, etc.) and therefore include some additional steps needed for these platforms.

Generally, rely on the quickstart guide if you are a beginner user of the specific platform and/or you are new to the Percona Operator for MongoDB as a whole.

## Which versions of MongoDB does the Operator support?

Percona Operator for MongoDB works with Percona Server for MongoDB 5.0, 6.0, and 7.0, and the exact version is determined by the Docker image in use.

Percona-certified Docker images that can be used by the Operator are listed here. For example, Percona Server for MongoDB 6.0 is supported with the following recommended version: 6.0.18-15. More details on the exact Percona Server for MongoDB version can be found in the release notes (5.0, 6.0, and 7.0 ).

## How can I add custom sidecar containers to my cluster?

The Operator allows you to deploy additional (so-called *sidecar*) containers to the Pod. You can use this feature to run debugging tools, some specific monitoring solutions, etc. Add such sidecar container to the `deploy/cr.yaml` configuration file, specifying its name and image, and possibly a command to run:

```
spec:
  replsets:
  - name: rs0
    ....
    sidecars:
    - image: busybox
      command: ["/bin/sh"]
      args: ["-c", "while true; do echo echo $(date -u) 'test' >> /dev/null; sleep
5; done"]
      name: rs-sidecar-1
    ....
```

You can add `sidecars` subsection to `replsets`, `sharding.configsvrReplSet`, and `sharding.mongos` sections.

**Note**

Custom sidecar containers can easily access other components of your cluster. Therefore they should be used carefully and by experienced users only.

Find more information on sidecar containers in the appropriate documentation page.

## How to provoke the initial sync of a Pod?

There are certain situations where it might be necessary to delete all MongoDB instance data to force the resync. For example, there may be the following reasons:

- rebuilding the node to defragment the database,
- recreating the member failing to sync due to some bug.

In the case of a “regular” MongoDB, wiping the dbpath would trigger such resync. In the case of a MongoDB cluster controlled by the Operator, you will need to do the following steps:

1. Find out the names of the Persistent Volume Claim and Pod you are going to delete (use `kubectl get pvc` command for PVC and `kubectl get pod` one for Pods).
2. Delete the appropriate PVC and Pod. For example, wiping out the `my-cluster-name-rs0-2` Pod should look as follows:

   ```
   $ kubectl delete pod/my-cluster-name-rs0-2 pvc/mongod-data-my-cluster-name-rs0-2
   ```

The Operator will automatically recreate the needed Pod and PVC after deletion.

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## Documentation licensing

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# Percona Operator for MongoDB Release Notes

# Release notes

# Percona Operator for MongoDB 1.19.1

- **Date**

  February 20, 2025

- **Installation**

  Installing Percona Operator for MongoDB

## Bugs Fixed

- K8SPSMDB-1274: Revert to disabling MongoDB balancer during restores to follow requirements of Percona Backup for MongoDB 2.8.0.

## Known limitations

- PBM-1493: Operator versions 1.19.0 and 1.19.1 have a recommended MongoDB version set to 7.0 because point-in-time recovery may fail on MongoDB 8.0 if sharding is enabled and the Operator version is 1.19.x. Therefore, upgrading to Operator 1.19.0/1.19.1 is not recommended for sharded MongoDB 8.0 clusters.

## Supported Platforms

The Operator was developed and tested with Percona Server for MongoDB 6.0.19-16, 7.0.15-9, and 8.0.4-1. Other options may also work but have not been tested. The Operator also uses Percona Backup for MongoDB 2.8.0.

Percona Operators are designed for compatibility with all CNCF-certified Kubernetes distributions. Our release process includes targeted testing and validation on major cloud provider platforms and OpenShift, as detailed below for Operator version 1.19.1:

- Google Kubernetes Engine (GKE) 1.28-1.30
- Amazon Elastic Container Service for Kubernetes (EKS) 1.29-1.31
- OpenShift Container Platform 4.14.44 - 4.17.11
- Azure Kubernetes Service (AKS) 1.28-1.31
- Minikube 1.34.0 based on Kubernetes 1.31.0

This list only includes the platforms that the Percona Operators are specifically tested on as part of the release process. Other Kubernetes flavors and versions depend on the backward compatibility offered by Kubernetes itself.

# Percona Operator for MongoDB 1.19.0

- **Date**

  January 21, 2025

- **Installation**

  Installing Percona Operator for MongoDB

## Release Highlights

### Using remote file server for backups (tech preview)

The new `filesystem` backup storage type was added in this release in addition to already existing `s3` and `azure` types. It allows users to mount a remote file server to a local directory, and make Percona Backup for MongoDB using this directory as a storage for backups. The approach is based on common Network File System (NFS) protocol, and should be useful in network-restricted environments without S3-compatible storage or in cases with a non-standard storage service supporting NFS access.

To use NFS-capable remote file server as a backup storage, user needs to mount the remote storage as a sidecar volume in the `replsets` section of the Custom Resource (and also `configsvrReplSet` in case of a sharded cluster):

```
replsets:
  ...
  sidecarVolumes:
  - name: backup-nfs
    nfs:
      server: "nfs-service.storage.svc.cluster.local"
      path: "/psmdb-some-name-rs0"
  ...
```

Finally, this new storage needs to be configured in the same Custom Resource as a normal storage for backups:

```
backup:
  ...
  storages:
    backup-nfs:
      filesystem:
        path: /mnt/nfs/
          type: filesystem
  ...
  volumeMounts:
  - mountPath: /mnt/nfs/
    name: backup-nfs
```

See more in our documentation about this storage type.

### Generated passwords for custom MongoDB users

A new improvement for the declarative management of custom MongoDB users brings the possibility to use automatic generation of users passwords. When you specify a new user in `deploy/cr.yaml` configuration file, you can omit specifying a reference to an already existing Secret with the user's password, and the Operator will generate it automatically:

```
...
users:
  - name: my-user
    db: admin
    roles:
      - name: clusterAdmin
        db: admin
      - name: userAdminAnyDatabase
        db: admin
```

Find more details on this automatically created Secret in our documentation.

### Percona Server for MongoDB 8.0 support

Percona Server for MongoDB 8.0 is now supported by the Operator in addition to 6.0 and 7.0 versions. The appropriate images are now included into the list of Percona-certified images. See this blogpost for details about the latest MongoDB 8.0 features with the added reliability and performance improvements.

## New Features

- K8SPSMDB-1109: Backups can now be stored on a remote file server
- K8SPSMDB-921: IAM Roles for Service Accounts (IRSA) allow automating access to AWS S3 buckets

based on Identity Access Management with no need to specify the S3 credentials explicitly

- K8SPSMDB-1133: Manual change of Replica Set Member Priority in Percona Server MongoDB Operator is now possible with the new `replsetOverrides.MEMBER-NAME.priority` Custom Resource option
- K8SPSMDB-1164: Add the possibility to create users in the `$external` database for external authentication purposes

## Improvements

- K8SPSMDB-1123: Percona Server for MongoDB 8.0 is now supported
- K8SPSMDB-1171: The declarative user management was enchanced with the possibility to automatically generate passwords
- K8SPSMDB-1174: Telemetry was improved to to track whether the custom users and roles management, automatic volume expansion, and multi-cluster services features are enabled
- K8SPSMDB-1179: It is now possible to configure externalTrafficPolicy for mongod, configsvr and mongos instances
- K8SPSMDB-1205: Backups in unmanaged clusters are now supported, removing a long-standing limitation of cross-site replication that didn't allow backups on replica clusters

## Bugs Fixed

- K8SPSMDB-1215: Fix a bug where ExternalTrafficPolicy was incorrectly set for LoadBalancer and NodePort services (Thanks to Anton Averianov for contributing)
- K8SPSMDB-675: Fix a bug where disabling sharding failed on a running cluster with enabled backups
- K8SPSMDB-754: Fix a bug where some error messages had "INFO" log level and therefore were not seen in logs with the "ERROR" log level turned on
- K8SPSMDB-1088: Fix a bug which caused the Operator starting two backup operations if the user patches the backup object while its state is empty or Waiting
- K8SPSMDB-1156: Fix a bug that prevented the Operator with enabled backups to recover from invalid TLS configurations (Thanks to KOS for reporting)
- K8SPSMDB-1172: Fix a bug where backup user's password username with special characters caused Percona Backup for MongoDB to fail
- K8SPSMDB-1212: Stop disabling balancer during restores, because it is not required for Percona Backup for MongoDB 2.x

## Deprecation, Rename and Removal

- The `psmdbCluster` option from the `deploy/backup/backup.yaml` manifest used for on-demand backups, which was deprecated since the Operator version 1.12.0 in favor of the `clusterName` option, has been removed and is no longer supported.
- Percona Server for MongoDB 5.0 has reached its end of life and in no longer supported by the Operator

## Supported Platforms

The Operator was developed and tested with Percona Server for MongoDB 6.0.19-16, 7.0.15-9, and 8.0.4-1. Other options may also work but have not been tested. The Operator also uses Percona Backup for MongoDB 2.8.0.

Percona Operators are designed for compatibility with all CNCF-certified Kubernetes distributions. Our release process includes targeted testing and validation on major cloud provider platforms and OpenShift, as detailed below for Operator version 1.19.0:

- Google Kubernetes Engine (GKE) 1.28-1.30
- Amazon Elastic Container Service for Kubernetes (EKS) 1.29-1.31
- OpenShift Container Platform 4.14.44 - 4.17.11
- Azure Kubernetes Service (AKS) 1.28-1.31
- Minikube 1.34.0 based on Kubernetes 1.31.0

This list only includes the platforms that the Percona Operators are specifically tested on as part of the release process. Other Kubernetes flavors and versions depend on the backward compatibility offered by Kubernetes itself.

# Percona Operator for MongoDB 1.18.0

- **Date**

  November 14, 2024

- **Installation**

  Installing Percona Operator for MongoDB

## Release Highlights

### Enhancements of the declarative user management

The declarative management of custom MongoDB users was improved compared to its initial implementation in the previous release, where the Operator did not track and sync user-related changes in the Custom Resource and the database. Also, starting from now you can create custom MongoDB roles on various databases just like users in the `deploy/cr.yaml` manifest:

```
...
roles:
  - name: clusterAdmin
    db: admin
  - name: userAdminAnyDatabase
    db: admin
```

See the documentation to find more details about this feature.

### Support for selective restores

Percona Backup for MongoDB 2.0.0 has introduced a new functionality that allows partial restores, which means selectively restoring only with the desired subset of data. Now the Operator also supports this feature, allowing you to restore a specific database or a collection from a backup. You can achieve this by using an additional `selective` section in the `PerconaServerMongoDBRestore` Custom Resource:

```
spec:
  selective:
    withUsersAndRoles: true
    namespaces:
    - "db.collection"
```

You can find more on selective restores and their limitations in our documentation.

### Splitting the replica set of the database cluster over multiple Kubernetes clusters

Recent improvements in cross-site replication made it possible to keep the replica set of the database cluster in different data centers. The Operator itself cannot deploy MongoDB replicas to other data centers, but this still can be achieved with a number of Operator deployments, equal to the size of your replica set: one Operator to control the replica set via cross-site replication, and at least two Operators to bootstrap the unmanaged clusters with other MongoDB replica set instances. Splitting the replica set of the database cluster over multiple Kubernetes clusters can be useful to get a fault-tolerant system in which all replicas are in different data centers. You can find more about configuring such a multi-datacenter MongoDB cluster and the limitations of this solution on the dedicated documentation page.

## New Features

- K8SPSMDB-894: It is now possible to restore a subset of data (a specific database or a collection) from a backup which is useful to reduce time on restore operations when fixing corrupted data fragment
- K8SPSMDB-1113: The new `percona.com/delete-pitr-chunks` finalizer allows the deletion of PITR log files from the backup storage when deleting a cluster so that leftover data does not continue to take up space in the cloud
- K8SPSMDB-1124 and K8SPSMDB-1146: Declarative user management now covers creating and managing user roles, and syncs user-related changes between the Custom Resource and the database
- K8SPSMDB-1140 and K8SPSMDB-1141: Multi-datacenter cluster deployment is now possible

## Improvements

- K8SPSMDB-739: A number of Service exposure options in the `replsets`, `sharding.configsvrReplSet`, and `sharding.mongos` were renamed for unification with other Percona Operators
- K8SPSMDB-1002: New Custom Resource options under the replsets.primaryPreferTagSelector` subsection allow providing Primary instance selection preferences based on specific zone and region, which may be especially useful within the planned zone switchover process (Thanks to sergelogvinov for contribution)
- K8SPSMDB-1096: Restore logs were improved to contain pbm-agent logs in mongod containers, useful to debug failures in the backup restoration process
- K8SPSMDB-1135: Split-horizon DNS for external (unmanaged) nodes is now configurable via the `replsets.externalNodes` subsection in Custom Resource
- K8SPSMDB-1152: Starting from now, the Operator uses multi-architecture images of Percona Server for

MongoDB and Percona Backup for MongoDB, making it easier to deploy a cluster on ARM

- K8SPSMDB-1160: The PVC resize feature introduced in previous release can now be enabled or disabled via the `enableVolumeExpansion` Custom Resource option (`false` by default), which protects the cluster from storage resize triggered by mistake
- K8SPSMDB-1132: A new `secrets.keyFile` Custom Resource option allows to configure custom name for the Secret with the MongoDB internal auth key file

## Bugs Fixed

- K8SPSMDB-912: Fix a bug where the full backup connection string including the password was visible in logs in case of the Percona Backup for MongoDB errors
- K8SPSMDB-1047: Fix a bug where the Operator was changing writeConcernMajorityJournalDefault to "true" during the replica set reconfiguring, ignoring the value set by user
- K8SPSMDB-1168: Fix a bug where successful backups could obtain a failed state in case of the Operator configured with `watchAllNamespaces: true` and having the same name for MongoDB clusters across multiple namespaces (Thanks to Markus Küffner for contribution)
- K8SPSMDB-1170: Fix a bug that prevented deletion of a cluster with the active `percona.com/delete-psmdb-pods-in-order` finalizer in case of the cluster error state (e.g. when mongo replset failed to reconcile)
- K8SPSMDB-1184: Fix a bug where the Operator failed to reconcile when using the container security context with `readOnlyRootFilesystem` set to `true` (Thanks to applejag for contribution)
- K8SPSMDB-1180: Fix a bug where rotation functionality didn't work for scheduled backups

## Deprecation, Rename and Removal

- The new `enableVolumeExpansion` Custom Resource option allows users to disable the automated storage scaling with Volume Expansion capability. The default value of this option is `false`, which means that the automated scaling is turned off by default.
- A number of Service exposure Custom Resource options in the `replsets`, `sharding.configsvrReplSet`, and `sharding.mongos` subsections were renamed to provide a unified experience with other Percona Operators:
  - `expose.serviceAnnotations` option renamed to `expose.annotations`
  - `expose.serviceLabels` option renamed to `expose.labels`
  - `expose.exposeType` option renamed to `expose.type`

# Supported Platforms

The Operator was developed and tested with Percona Server for MongoDB 5.0.29-25, 6.0.18-15, and 7.0.14-8. Other options may also work but have not been tested. The Operator also uses Percona Backup for MongoDB 2.7.0.

The following platforms were tested and are officially supported by the Operator 1.18.0:

- Google Kubernetes Engine (GKE) 1.28-1.30
- Amazon Elastic Container Service for Kubernetes (EKS) 1.28-1.31
- OpenShift Container Platform 4.13.52 - 4.17.3
- Azure Kubernetes Service (AKS) 1.28-1.31
- Minikube 1.34.0 based on Kubernetes 1.31.0

This list only includes the platforms that the Percona Operators are specifically tested on as part of the release process. Other Kubernetes flavors and versions depend on the backward compatibility offered by Kubernetes itself.

# Percona Operator for MongoDB 1.17.0

- **Date**

  September 09, 2024

- **Installation**

  Installing Percona Operator for MongoDB

## Release Highlights

### Declarative user management (technical preview)

Before the Operator version 1.17.0 custom MongoDB users had to be created manually. Now the declarative creation of custom MongoDB users is supported via the `users` subsection in the Custom Resource. You can specify a new user in `deploy/cr.yaml` manifest, setting the user's login name and database, PasswordSecretRef (a reference to a key in a Secret resource containing user's password) and as well as MongoDB roles on various databases which should be assigned to this user:

```
...
users:
- name: my-user
  db: admin
  passwordSecretRef:
    name: my-user-password
    key: my-user-password-key
  roles:
    - name: clusterAdmin
      db: admin
    - name: userAdminAnyDatabase
      db: admin
```

See documentation to find more details about this feature with additional explanations and the list of current limitations.

### Liveness check improvements

Several improvements in logging were made related to the liveness checks, to allow getting more information for debugging, and to make these logs persist on failures to allow further examination.

Liveness check logs are stored in the `/data/db/mongod-data/logs/mongodb-healthcheck.log` file, which can be accessed in the corresponding Pod if needed. Starting from now, Liveness check generates more log messages, and the default log level is set to `DEBUG`.

Each time the health check fails, the current log is saved to a gzip compressed file named `mongodb-healthcheck-<timestamp>.log.gz`, and the `mongodb-healthcheck.log` log file is reset. Logs older than 24 hours are automatically deleted.

## New Features

- K8SPSMDB-253: It is now possible to create and manage users via the Custom Resource

## Improvements

- K8SPSMDB-899: Add Labels for all Kubernetes objects created by Operator (backups/restores, Secrets, Volumes, etc.) to make them clearly distinguishable
- K8SPSMDB-919: The Operator now checks if the needed Secrets exist and connects to the storage to check the validity of credentials and the existence of a backup before starting the restore process
- K8SPSMDB-934: Liveness checks are providing more debug information and keeping separate log archives for each failure with the 24 hours retention
- K8SPSMDB-1057: Finalizers were renamed to contain fully qualified domain names (FQDNs), avoiding potential conflicts with other finalizer names in the same Kubernetes environment
- K8SPSMDB-1108: The new Custom Resource option allows setting custom containerSecurityContext for PMM containers
- K8SPSMDB-994: Remove a limitation where it wasn't possible to create a new cluster with splitHorizon enabled, leaving the only way to enable it later on the running cluster

## Bugs Fixed

- K8SPSMDB-925: Fix a bug where the Operator generated "failed to start balancer" and "failed to get mongos connection" log messages when using Mongos with servicePerPod and LoadBalancer services, while the cluster was operating properly
- K8SPSMDB-1105: The memory requests and limits for backups were increased in the `deploy/cr.yaml` configuration file example to reflect the Percona Backup for MongoDB minimal pbm-agents requirement of 1 Gb RAM needed for stable operation
- K8SPSMDB-1074: Fix a bug where MongoDB Cluster could not failover in case of all Pods downtime and `exposeType` Custom Resource option set to either `NodePort` or `LoadBalancer`
- K8SPSMDB-1089: Fix a bug where it was impossible to delete a cluster in error state with finalizers present
- K8SPSMDB-1092: Fix a bug where Percona Backup for MongoDB log messages during physical restore

were not accessible with the `kubectl logs` command

- K8SPSMDB-1094: Fix a bug where it wasn't possible to create a new cluster with `upgradeOptions.setFCV` Custom Resource option set to `true`
- K8SPSMDB-1110: Fix a bug where nil Custom Resource annotations were causing the Operator panic

## Deprecation, Rename and Removal

Finalizers were renamed to contain fully qualified domain names to comply with the Kubernetes standards.

- `PerconaServerMongoDB` Custom Resource:
  - `delete-psmdb-pods-in-order` finalizer renamed to `percona.com/delete-psmdb-pods-in-order`
  - `delete-psmdb-pvc` finalizer renamed to `percona.com/delete-psmdb-pvc`
- `PerconaServerMongoDBBackup` Custom Resource:
  - `delete-backup` finalizer renamed to `percona.com/delete-backup`

Key change in `psmdb-db` Helm chart: the parameter for defining system users is renamed from `users` to `systemUsers`. The `users` parameter now handles the new Declarative user management feature. This change impacts users upgrading to this version via Helm: make sure that values manifests are changed accordingly.

## Supported Platforms

The Operator was developed and tested with Percona Server for MongoDB 5.0.28-24, 6.0.16-13, and 7.0.12-7. Other options may also work but have not been tested. The Operator also uses Percona Backup for MongoDB 2.5.0.

The following platforms were tested and are officially supported by the Operator 1.17.0:

- Google Kubernetes Engine (GKE) 1.27-1.30
- Amazon Elastic Container Service for Kubernetes (EKS) 1.28-1.30
- OpenShift Container Platform 4.13.48 - 4.16.9
- Azure Kubernetes Service (AKS) 1.28-1.30
- Minikube 1.33.1

This list only includes the platforms that the Percona Operators are specifically tested on as part of the release process. Other Kubernetes flavors and versions depend on the backward compatibility offered by Kubernetes itself.

# Percona Operator for MongoDB 1.16.2

- **Date**

  July 23, 2024

- **Installation**

  Installing Percona Operator for MongoDB

## Bugs Fixed

- K8SPSMDB-1117: Fix a bug where the Operator incorrectly compares `G` with `Gi` and and tries to downscale PVC size after upgrade

## Supported Platforms

The Operator was developed and tested with Percona Server for MongoDB 5.0.26-22, 6.0.15-12, and 7.0.8-5. Other options may also work but have not been tested. The Operator also uses Percona Backup for MongoDB 2.4.1.

The following platforms were tested and are officially supported by the Operator 1.16.2:

- Google Kubernetes Engine (GKE) 1.26-1.29
- Amazon Elastic Container Service for Kubernetes (EKS) 1.26-1.29
- OpenShift Container Platform 4.12.56 - 4.15.11
- Azure Kubernetes Service (AKS) 1.27-1.29
- Minikube 1.33.0

This list only includes the platforms that the Percona Operators are specifically tested on as part of the release process. Other Kubernetes flavors and versions depend on the backward compatibility offered by Kubernetes itself.

# Percona Operator for MongoDB 1.16.1

- **Date**

  June 24, 2024

- **Installation**

  Installing Percona Operator for MongoDB

## Bugs Fixed

- K8SPSMDB-1101: Fix a bug where manually generated TLS certificates couldn't be applied because Operator was replacing them with auto-generated ones

## Supported Platforms

The Operator was developed and tested with Percona Server for MongoDB 5.0.26-22, 6.0.15-12, and 7.0.8-5. Other options may also work but have not been tested. The Operator also uses Percona Backup for MongoDB 2.4.1.

The following platforms were tested and are officially supported by the Operator 1.16.1:

- Google Kubernetes Engine (GKE) 1.26-1.29
- Amazon Elastic Container Service for Kubernetes (EKS) 1.26-1.29
- OpenShift Container Platform 4.12.56 - 4.15.11
- Azure Kubernetes Service (AKS) 1.27-1.29
- Minikube 1.33.0

This list only includes the platforms that the Percona Operators are specifically tested on as part of the release process. Other Kubernetes flavors and versions depend on the backward compatibility offered by Kubernetes itself.

# Percona Operator for MongoDB 1.16.0

- **Date**

  May 24, 2024

- **Installation**

  Installing Percona Operator for MongoDB

## Release Highlights

### General availability of Physical Backups

Two releases ago we added experimental support for Physical Backups and Restores to significantly reduce Recovery Time Objective (RTO), especially for big data sets. With this release Percona announces the general availability of physical backups and restores for Percona Server for MongoDB with the Operator.

### Automated volume expansion

Kubernetes supports the Persistent Volume expansion as a stable feature since v1.24. Using it with the Operator previously involved manual operations. Now this is automated, and users can resize their PVCs by just changing the value of the `resources.requests.storage` option in the PerconaServerMongoDB custom resource. This feature is in a technical preview stage and is not recommended for production environments.

### Support for MongoDB 7

Starting from this release, MongoDB 7.0 is now supported. Read our take on top-5 changes in MongoDB version 7 in this blog post.

### Support for ARM architecture (technical preview)

ARM architecture meets the intensive growth of its usage nowadays, both in a segment of highly efficient cloud computing based on systems like AWS Graviton, and the Internet of Things or Edge. Officially certified images for ARM are now available for the Operator, as well as Percona Server for MongoDB and Percona Backup for MongoDB, while database monitoring based on PMM Client is yet to follow.

### Fixing the overloaded allowUnsafeConfigurations flag

In the previous Operator versions `allowUnsafeConfigurations` Custom Resource option was used to allow configuring a cluster with unsafe parameters, such as starting it with less than 3 replica set instances. In fact, setting this option to `true` resulted in a wide range of reduced safety features without the user's explicit intent: disabling TLS, allowing backups in unhealthy clusters, etc.

With this release, a separate `unsafeFlags` Custom Resource section is introduced for the fine-grained control of the safety loosening features:

```
unsafeFlags:
  tls: false
  replsetSize: false
  mongosSize: false
  terminationGracePeriod: false
  backupIfUnhealthy: false
```

Also, TLS configuration is now enabled or disabled by a special `tls.mode` Custom Resource option, which can be set to `disabled`, `allowTLS`, `preferTLS`, or `requireTLS` values.

## New Features

- K8SPSMDB-1000: Users who store backups on Azure Blob Storage can now use private endpoints
- K8SPSMDB-1055: The `kubectl get psmdb-backup` command now shows latest restorable time to make it easier to pick a point-in-time recovery target
- K8SPSMDB-491: It is now possible to specify the existing cert-manager issuer which should be used by the Operator
- K8SPSMDB-733: It is now possible to resize Persistent Volume Claims by patching the PerconaServerMongoDB custom resource: change `persistentVolumeClaim.resources.requests.storage` and let the Operator do the scaling

## Improvements

- K8SPSMDB-1004: Exposing replica set with split-horizon DNS allows to specify URIs with non-standard port numbers, which are particularly useful with the NodePort service type
- K8SPSMDB-1013: MongoDB 7.0 is now supported.
- K8SPSMDB-1015: Information about backup and restore operations is now included in the Operator's logs
- K8SPSMDB-951, K8SPSMDB-979 and K8SPSMDB-1021: The Operator now allows setting custom configuration for Percona Backup for MongoDB through the set of new Custom Resource options under `backup.configuration.backupOptions`, `backup.configuration.restoreOptions`, and

`backup.storages.s3.retryer` subsections

- K8SPSMDB-1029: Mongod is now run in quiet mode by default to reduce the amount of log messages
- K8SPSMDB-1032: It is now possible to define TCP port for mongos Service when it is exposed through a NodePort (thanks to Mike Devresse for contribution)
- K8SPSMDB-1062: The Operator now sets appProtocol to `mongo` for Service objects, which is useful for service mesh implementations (thanks to Søren Mathiasen for contribution)
- K8SPSMDB-732: Integration of the Operator with OpenLDAP can now be secured by using TLS connections
- K8SPSMDB-755: New `allowInvalidCertificates` option allows to enable or disable bypassing MongoDB Shell checks for the certificates presented by the mongod/mongos instance, useful for self-signed certificates
- K8SPSMDB-948: Officially certified images for ARM architecture are now available for the Operator, as well as Percona Server for MongoDB and Percona Backup for MongoDB
- K8SPSMDB-993: To avoid backup fail on clusters where Percona Backup for MongoDB resync process takes too long, the Operator now checks, if there is still a resync operation working, with exponentially increasing interval and total wait time until failure equal to 8715 seconds
- K8SPSMDB-995: The Operator now allows storing key for backups server-side AWS KMS encryption in a Secret configurable with the `secrets.sse` Custom Resource option
- K8SPSMDB-780: Removing `allowUnsafeConfigurations` Custom Resource option in favor of fine-grained safety control in the `unsafeFlags` subsection
- K8SPSMDB-1042: Helm chart for Percona Server for MongoDB now accepts replica set options as the map argument instead of the array one used in previous releases; this simplifies how arguments are specified in the command line and allows to specify only part of the replica set parameters, relying on the default values for the other part. **Take this change into account** if you are installing database via helm and want to use set of custom options from previous releases

## Bugs Fixed

- K8SPSMDB-1011: Fix a bug where custom logins for system users stopped working after deleting and recreating back the users Secret (thanks for Patrick Wolleb for report)
- K8SPSMDB-1014: Fix a bug that certificate rotation was bringing the sharded MongoDB cluster down for clusters originally created with the Operator version prior to 1.15.0 (thanks to Stiliyan Stefanov for reporting)
- K8SPSMDB-1018: Fix a bug where MongoDB container startup would fail if the MongoDB image being used contained the numactl package

- K8SPSMDB-1024: Fix a bug where environment variable wasn't properly updated in the Percona Backup for MongoDB container entry script (thanks to Rockawear for contribution)
- K8SPSMDB-1035: Fixed a bug where the empty `secretName` field was not allowed for backup jobs that might not need it when accessing AWS S3 buckets based on IAM roles (thanks to Sergey Zelenov for contribution)
- K8SPSMDB-1036: Fix a bug due to which restoring backup to a new cluster was broken by incompatibility with Percona Backup for MongoDB 2.3.0
- K8SPSMDB-1038: Fix a bug where mongos Services were deleted if the cluster was set to paused state
- K8SPSMDB-1039: Fix a bug which prevented deleting PMM agent from the PMM Server inventory on Pod termination
- K8SPSMDB-1058: A minor missing privileges issue caused flooding MongoDB logs with "Checking authorization failed" errors
- K8SPSMDB-1070: Fix a bug where panic was happening in `delete-psmdb-pods-in-order` finalizer if the cluster was deleted prior to creating Pods
- K8SPSMDB-940: Fix a bug due to which the Operator didn't allow to set serviceAccount for mongos Pods
- K8SPSMDB-985: Fix a bug where `pbmPod` key in backup object was only showing one replica/pod

## Deprecation and removal

- Starting from now, `allowUnsafeConfigurations` Custom Resource option is deprecated in favor of a number of options under the `unsafeFlags` subsection. Setting `allowUnsafeConfigurations` won't have any effect; upgrading existing clusters with `allowUnsafeConfigurations=true` will cause everything under unsafeFlags set to true and TLS funuctionality disabled
- MongoDB 4.4 support in the Operator has reached its end-of-life. Starting from now Percona will not provide officially certified images for it. Make sure that you have a supported MongoDB version before upgrading the Operator to 1.16.0. You can use major version upgrade functionality.

## Supported Platforms

The Operator was developed and tested with Percona Server for MongoDB 5.0.26-22, 6.0.15-12, and 7.0.8-5. Other options may also work but have not been tested. The Operator also uses Percona Backup for MongoDB 2.4.1.

The following platforms were tested and are officially supported by the Operator 1.16.0:

- Google Kubernetes Engine (GKE) 1.26-1.29

- Amazon Elastic Container Service for Kubernetes (EKS) 1.26-1.29
- OpenShift Container Platform 4.12.56 - 4.15.11
- Azure Kubernetes Service (AKS) 1.27-1.29
- Minikube 1.33.0

This list only includes the platforms that the Percona Operators are specifically tested on as part of the release process. Other Kubernetes flavors and versions depend on the backward compatibility offered by Kubernetes itself.

# Percona Operator for MongoDB 1.15.0

- **Date**

  October 9, 2023

- **Installation**

  Installing Percona Operator for MongoDB

## Release Highlights

### Physical Backups now support Point-in-time Recovery (in tech preview)

In the previous 1.14.0 release we added support for Physical Backups and Restores to significantly reduce Recovery Time Objective (RTO .)), especially for big data sets. But the problem with losing data between backups - in other words Recovery Point Objective (RPO) - for physical backups was not solved. With this release users can greatly reduce RPO by leveraging the Point-in-time Recovery feature in the Operators. Under the hood we store logical oplogs along with physical backups into the object storage. Read more about this feature in our documentation.

### Encrypted backups with Server Side Encryption (SSE)

Backups stored on S3 compatible storage can now be encrypted with Server Side Encryption (SSE) to pass certain compliance or security requirements. Users can leverage integration with AWS KMS or just encrypt/decrypt backups with AES-256 encryption algorithm. It is important to remember that Operator does not store keys and users can choose which key storage to use.

## New Features

- K8SPSMDB-227 The new `topologySpreadConstraints` Custom Resource option allows to use Pod Topology Spread Constraints to achieve even distribution of Pods across the Kubernetes cluster
- K8SPSMDB-792 and K8SPSMDB-974 The new “sleep infinity” mode available for replset and config server containers allows running the Pod without starting mongod useful to examine a problematic Pod that is constantly restarting
- K8SPSMDB-801 It is now possible to delete a backup with its PITR data on retention period or with `delete-backup` finalizer (there were no PITR files deletion in previous versions )
- K8SPSMDB-926 Point-in-time recovery is now supported with physical backups to significantly reduce Recovery Point Objective (RPO)

- K8SPSMDB-961 The new `sharding.balancer.enabled` Custom Resource option allows to disable Load Balancer on a cross-site replication managed cluster

## Improvements

- K8SPSMDB-662 Restoring a backup with point-in-time recovery can now be easily done to a latest available position by setting `pitr.type` PerconaServerMongoDBRestore Custom Resource option to `latest`
- K8SPSMDB-774 The Transport encryption documentation now includes details on updating TLS certificates
- K8SPSMDB-807 A custom name for a Replica Set config server instead of the default `cfg` one can be set in the custom configuration, which can be useful for migration purposes
- K8SPSMDB-814 and K8SPSMDB-927 The new `terminationGracePeriodSeconds` Custom Resource option allows to set termination period for Replica Set containers, useful to cleanly shutdown clusters with big data sets
- K8SPSMDB-850 Server Side Encryption for backups with for S3 and S3-compatible storage is now supported (thanks to Mert Gönül for contribution)
- K8SPSMDB-903 The backup destination URI now includes bucket/container name, allowing the user to specify the full path to the backup as an easy to read string
- K8SPSMDB-924 The token associated with the operator's ServiceAccount is no longer printed in the log when a scheduled backup is running; this improves security and avoids logging uninformative elements
- K8SPSMDB-938 Configuring Kubernetes host aliases is now possible for replica set, config server, and mongos Pods
- K8SPSMDB-946 The psmdb-backup object now includes the name of the Pod that made the backup, to save users from searching for the correct Pod to examine the Percona Backup for MongoDB logs (previously it was necessary to check replica set Pods one by one until logs were found)
- K8SPSMDB-976 The Operator now does not start backups if storages or credentials are not set, avoiding fruitless attempts to configure Percona Backup for MongoDB and cluster state repeatedly changing between ready and error
- K8SPSMDB-929 Using split-horizon DNS for the external access to MongoDB Replica Set Pods of the exposed cluster is now possible

## Bugs Fixed

-

K8SPSMDB-913 Fix a bug due to which restoring a backup on a cluster with mongos exposed via LoabBalancer resulted in recreating mongos Service with a new IP address

- K8SPSMDB-956 Fix a bug that certificate rotation was bringing the sharded MongoDB cluster down (thanks to Stiliyan for reporting)
- K8SPSMDB-854 Backup stucks after cluster was exposed
- K8SPSMDB-977 The out of memory problem could cause cluster got stuck in the “initializing” state at reconciliation
- K8SPSMDB-778 Fix a bug due to which the Operator did not delete arbiter instances during replica set deletion
- K8SPSMDB-791 Fix a bug which prevented setting `LoadBalancerSourceRanges` Custom Resource option when `replsets.expose.exposeType` is set to `Loadbalancer`
- K8SPSMDB-813 Fix a bug due to which secure connection was not used for MongoDB Liveness check (thanks to t-yrka for contribution)
- K8SPSMDB-818 Fix a bug where `clusterMonitor` user had not enough permissions for PMM monitoring with `--enable-all-collectors` flag turned on
- K8SPSMDB-872 The Operator didn’t prevent attempts to restore a backup with “error” status, which could cause the cluster got stuck in the “initializing” state
- K8SPSMDB-876 Fix a bug due to which `delete-psmdb-pods-in-order` finalizer, intended to shutdown primary Pod last, affected only shards and did not affect config replica set
- K8SPSMDB-911 Fix a bug where connection string with credentials was included in the backup-agent container logs
- K8SPSMDB-958 Fix insufficient permissions issue that didn’t allow to monitor mongos instances with Percona Monitoring and Management (PMM)
- K8SPSMDB-962 Fix a memory leak due to which the Operator’s Pod continually increased both CPU and memory usage in cluster-wide mode (with an unmanaged cluster)
- K8SPSMDB-968 Fix a bug due to which the endpoints list returned by `kubectl get psmdb` command contained fully qualified domain names (FQDN) instead of IP addresses when the replset was exposed as a LoadBalancer and the clusterServiceDNSMode was set to Internal

## Deprecation and removal

- K8SPSMDB-883 The `spec.mongod` section deprecated in the Operator version 1.12.0 is finally removed from the Custom Resource configuration. If you have encryption disabled using the deprecated `mongod.security.enableEncryption` option, you need to set encryption disabled with custom configuration before removing `mongod` section (and before upgrade):

```
spec:
  ...
  replsets:
    - name: rs0
      ...
      configuration: |
        security:
          enableEncryption: false
        ...
```

## Supported Platforms

The Operator was developed and tested with Percona Server for MongoDB 4.4.24, 5.0.20, and 6.0.9. Other options may also work but have not been tested. The Operator also uses Percona Backup for MongoDB 2.3.0.

The following platforms were tested and are officially supported by the Operator 1.15.0:

- Google Kubernetes Engine (GKE) 1.24-1.28
- Amazon Elastic Container Service for Kubernetes (EKS) 1.24-1.28
- OpenShift Container Platform 4.11 - 4.13
- Azure Kubernetes Service (AKS) 1.25-1.28
- Minikube 1.31.2 (based on Kubernetes 1.28)

This list only includes the platforms that the Percona Operators are specifically tested on as part of the release process. Other Kubernetes flavors and versions depend on the backward compatibility offered by Kubernetes itself.

# Percona Operator for MongoDB 1.14.0

- **Date**

  March 13, 2023

- **Installation**

  Installing Percona Operator for MongoDB

## Release Highlights

- Backups and Restores are critical for business continuity. With this release you can significantly reduce your Recovery Time Objective (RTO) with Physical backups support in the Operator. The feature is now in technical preview.
- MongoDB 6.0 comes with a variety of improvements and new features. It is now fully supported by the Operator. See our documentation to learn how to upgrade.

## New Features

- K8SPSMDB-713 Physical backups are now supported by the Operator to recover big data sets faster
- K8SPSMDB-737 MongoDB 6.0 is now officially supported in addition to 4.x and 5.x versions. Read more about version 6 in our blog post
- K8SPSMDB-824 New `ignoreAnnotations` and `ignoreLabels` Custom Resource options allow to list specific annotations and labels for Kubernetes Service objects, which the Operator should ignore (useful with various Kubernetes flavors which add annotations to the objects managed by the Operator)

## Improvements

- K8SPSMDB-658 The Operator log messages appearing during the pause/unpause of the cluster were improved to more clearly indicate this event
- K8SPSMDB-708 The new `initContainerSecurityContext` option allows to configure securityContext for the container which can be used instead of the official image during the initial Operator installation
- K8SPSMDB-721 The backup subsystem was improved so that database is not crashing in case if the backup agent is not able to connect to MongoDB (e.g. due to misconfigured password)
- K8SPSMDB-758 The ServiceMesh fully qualified domain names (FQDNs) for config servers are now prioritized if DNSMode is set to ServiceMesh (thanks to Jo Lyshoel for contribution)

- K8SPSMDB-793 It is now possible to set annotations and labels for Persistent Volume Claims for better integration with Cloud Native tools
- K8SPSMDB-803 The Operator now does not attempt to start Percona Monitoring and Management (PMM) client sidecar if the corresponding secret does not contain the `pmmserver` or `pmmserverkey` key
- K8SPSMDB-817 Adding external nodes to the cluster is now allowed even when the replica set is not exposed. This unblocks the creation of complex multi-cluster topologies
- K8SPSMDB-844 Update the RuntimeClass API version to `v1` from the `v1beta1`, which was already deprecated since the Kubernetes version 1.22
- K8SPSMDB-848 Remove formatted strings from log messages to avoid confronting with structured logging based on key-value pairs
- K8SPSMDB-882 Percona Server for MongoDB Helm chart now persists data by default instead of deleting Persistent Volumes after the cluster deletion
- CLOUD-768 Helm charts now use random passwords generated by the Operator by default instead of providing pre-configured passwords specified in the values file
- K8SPSMDB-853 To improve the operator we capture anonymous telemetry and usage data. In this release we add more data points to it
- K8SPSMDB-867 The Operator now configures replset members using local fully-qualified domain names (FQDN) resolvable and available only from inside the cluster instead of using IP addresses; the old behavior can be restored by setting the `clusterServiceDNSMode` option to `External`

## Bugs Fixed

- K8SPSMDB-784 Fix a bug due to which the `enableEncryption` MongoDB configuration option was always activated when using psmdb-db Helm Chart
- K8SPSMDB-796 Fix a bug due to which backup failed if replica set was exposed
- K8SPSMDB-854 Fix a bug due to which backup got stuck after the cluster was exposed
- K8SPSMDB-471 Fix a bug due to which in case of scheduled backups with error status `delete-backup` finalizer didn't allow to delete the appropriate failed resources and the Kubernetes namespace (thanks to Aliaksandr Karavai for reporting)
- K8SPSMDB-674 Fix a bug that caused the Operator not deleting unneeded Services after the replica set exposing is turned off
- K8SPSMDB-742 Fix a bug that caused the updates of the `sharding.mongos.expose.serviceAnnotations` option to be silently rejected
- K8SPSMDB-766 and K8SPSMDB-767 Fix a bug where the combination of `delete-psmdb-pods-in-order` and `delete-psmdb-pvc` finalizers was not working

- K8SPSMDB-770 We now mention the namespace name in the log message to ease debugging when the cluster-wide mode is used
- K8SPSMDB-797 Fix the backup/restore documentation not clearly mentioning that user should specify the bucket for the S3 storage
- K8SPSMDB-820 Fix a bug which prevented the parallel backup jobs execution for different MongoDB clusters in the cluster-wide mode
- K8SPSMDB-823 Fix a bug where backups were not working in case of ReplicaSet exposed with NodePort
- K8SPSMDB-836 Fix backups being incorrectly marked as error while still being in starting status
- K8SPSMDB-841 Fix a bug which turned the cluster into unready status after switching from the LoadBalancer expose to ClusterIP
- K8SPSMDB-843 Fix a bug which made the cluster unable to start if it was recreated with the same Custom Resource after delete without deleting PVCs and Secrets
- K8SPSMDB-846 Fix a bug due to which scaling the replica set down to 1 instance caused the last Pod to remain Secondary instead of becoming Primary
- K8SPSMDB-866 Fix the bug due to which the Operator was continuously flooding the log with error messages if the PMM server credentials were missing

## Known Issues and Limitations

- K8SPSMDB-875 Physical backups cannot be restored on the clusters with arbiter, non-voting, or delayed members due to current Percona Backup for MongoDB limitations
- K8SPSMDB-846 After switching the cluster to unsafe mode by setting allowUnsafeConfig: true, it is not possible to switch back into safe mode. The user can still scale the cluster safely, but the flag is ignored

## Supported Platforms

The Operator was developed and tested with Percona Server for MongoDB 4.4.18, 5.0.14, and 6.0.4. Other options may also work but have not been tested.

The following platforms were tested and are officially supported by the Operator 1.14.0:

- Google Kubernetes Engine (GKE) 1.22 - 1.25
- Amazon Elastic Container Service for Kubernetes (EKS) 1.22 - 1.24
- OpenShift Container Platform 4.10 - 4.12

- Azure Kubernetes Service (AKS) 1.23 - 1.25
- Minikube 1.29

This list only includes the platforms that the Percona Operators are specifically tested on as part of the release process. Other Kubernetes flavors and versions depend on the backward compatibility offered by Kubernetes itself.

# Percona Operator for MongoDB 1.13.0

- **Date**

  September 15, 2022

- **Installation**

  Installing Percona Operator for MongoDB

## Release Highlights

- Azure Kubernetes Service (AKS) is now officially supported platform, so developers and vendors of the solutions based on the Azure platform can take advantage of the official support from Percona or just use officially certified Percona Operator for MongoDB images
- Starting from now, the Operator can be installed in multi-namespace (so-called “cluster-wide”) mode, when a single Operator can be given a list of namespaces in which to manage Percona Server for MongoDB clusters

## New Features

- K8SPSMDB-203 Support for the cluster-wide operator mode allowing one Operator to watch for Percona Server for MongoDB Custom Resources in several namespaces
- K8SPSMDB-287 Support for the HashiCorp Vault for encryption keys as a universal, secure and reliable way to store and distribute secrets without depending on the operating system, platform or cloud provider
- K8SPSMDB-704 Support for the Azure Kubernetes Service (AKS)

## Improvements

- K8SPSMDB-515 Allow setting requireTLS mode for MongoDB through the Operator to enforce security by restricting each MongoDB server to use TLS/SSL encrypted connections only
- K8SPSMDB-636 An additional `databaseAdmin` user was added to the list of system users which are automatically created by the Operator. This user is intended to provision databases, collections and perform data modifications
- K8SPSMDB-699 Disable automated upgrade by default to prevent an unplanned downtime for user applications and to provide defaults more focused on strict user’s control over the cluster

- K8SPSMDB-725 Configuring the log structuring and leveling is now supported using the `LOG_STRUCTURED` and `LOG_LEVEL` environment variables. This reduces the information overload in logs, still leaving the possibility of getting more details when needed, for example, for debugging
- K8SPSMDB-719 Details about using sharding, Hashicorp Vault and cluster-wide mode were added to telemetry
- K8SPSMDB-715 Starting from now, the Opearator changed its API version to v1 instead of having a separate API version for each release. Three last API version are supported in addition to `v1`, which substantially reduces the size of Custom Resource Definition to prevent reaching the etcd limit
- K8SPSMDB-709 Make it possible to use API Key to authorize within Percona Monitoring and Management Server as a more convenient and modern alternative password-based authentication
- K8SPSMDB-707 Allow to set Service labels for replica set, config servers and mongos in Custom Resource to enable various integrations with cloud providers or service meshes

## Bugs Fixed

- K8SPSMDB-702 Fix a bug which resulted in always using the `force` option when reconfiguring MongoDB member, which is normally recommended only for special scenarios such as crash recovery
- K8SPSMDB-730 Fix a bug due to which point-in-time recovery was enabled and consequently disabled when setting Percona Backup for MongoDB compression options without checking whether it was enabled in the Custom Resource
- K8SPSMDB-660 Fix a bug due to which a successful backup could be erroneously marked as failed due to exceeding the start deadline in case of big number of nodes, especially on sharded clusters
- K8SPSMDB-686 Fix a bug that prevented downscaling sharded MongoDB cluster to a non-sharded replica set variant
- K8SPSMDB-691 Fix a bug that produced an error in the Operator log in case of the empty SSL Secret name in Custom Resource
- K8SPSMDB-696 Fix a bug that prevented removing additional annotations previously added under the `spec.replsets.annotations` field
- K8SPSMDB-724 Fix a bug which caused the delete-backup finalizer not working causing backups being not deleted from buckets
- K8SPSMDB-746 Fix a bug due to which the Operator was unable to initialize a three-member replica set with a primary-secondary-arbiter (PSA) architecture
- K8SPSMDB-762 Fix a bug due to which the Operator was running the replSetReconfig MongoDB command at every reconciliation if arbiter was enabled

## Deprecation, Rename and Removal

- K8SPSMDB-690 CCustom Resource options under the sharding.mongos.auditLog subsection, deprecated since the Operator version 1.9.0 in favor of using replsets.configuration, were finally removed and cannot be used with the Operator
- K8SPSMDB-709 Password-based authorization to Percona Monitoring and Management Server is now deprecated and will be removed in future releases in favor of a token-based one. Password-based authorization was used by the Operator before this release to provide MongoDB monitoring, but now using the API Key is the recommended authorization method

## Supported Platforms

The Operator was developed and tested with Percona Server for MongoDB 4.2.22, 4.4.8, 4.4.10, 4.4.13, 4.4.16, 5.0.2, 5.0.4, and 5.0.11. Other options may also work but have not been tested.

The following platforms were tested and are officially supported by the Operator 1.13.0:

- Google Kubernetes Engine (GKE) 1.21 - 1.23
- Amazon Elastic Container Service for Kubernetes (EKS) 1.21 - 1.23
- OpenShift Container Platform 4.10 - 4.11
- Azure Kubernetes Service (AKS) 1.22 - 1.24
- Minikube 1.26

This list only includes the platforms that the Percona Operators are specifically tested on as part of the release process. Other Kubernetes flavors and versions depend on the backward compatibility offered by Kubernetes itself.

# Percona Operator for MongoDB 1.12.0

- **Date**

  May 5, 2022

- **Installation**

  Installing Percona Operator for MongoDB

## Release Highlights

- With this release, the Operator turns to a simplified naming convention and changes its official name to **Percona Operator for MongoDB**
- The Operator is able now to use the Amazon Web Services feature of authenticating applications running on EC2 instances based on Identity and Access Management (IAM) roles assigned to the instance; this makes it possible to configure S3 backup on AWS without using IAM keys saved in Secrets
- This release brings support for the Multi Cluster Services (MCS). This allows users to deploy MongoDB with Percona Operator across multiple Kubernetes clusters using MCS, which extends the reach of the Service object beyond one cluster, so one Service can be used across multiple clusters. It can be used to provide disaster recovery or perform a migration for MongoDB clusters.
- The OpenAPI schema is now generated for the Operator , which allows Kubernetes to perform Custom Resource validation and saves user from occasionally applying `deploy/cr.yaml` with syntax typos

## New Features

- K8SPSMDB-185: Allow using AWS EC2 instances for backups with IAM roles assigned to the instance instead of using stored IAM credentials (Thanks to Oleksii for reporting this issue)
- K8SPSMDB-625: Integrate the Operator with Multi Cluster Services (MCS)
- K8SPSMDB-668: Adding support for enabling replication over a service mesh (Thanks to Jo Lyshoel for contribution)

## Improvements

- K8SPSMDB-473: Allow to skip TLS verification for backup storage, useful for self-hosted S3-compatible storage with a self-issued certificate
-

K8SPSMDB-644: Make `cacheSizeRatio` parameter available as a custom value in psmdb-db-1.11.0 helm chart (Thanks to Richard CARRE for reporting this issue)

- K8SPSMDB-574: Allow user to choose the validity duration of the external certificate for cert manager
- K8SPSMDB-634: Support point-in-time recovery compression levels for backups (Thanks to Damiano Albani for reporting this issue)
- K8SPSMDB-570: The Operator documentation now includes a How-To on using Percona Server for MongoDB with LDAP authentication and authorization
- K8SPSMDB-537: PMM container does not cause the crash of the whole database Pod if pmm-agent is not working properly
- K8SPSMDB-684: Generate OpenAPI schema for and validate Custom Resource

## Bugs Fixed

- K8SPSMDB-597: Fix a bug in the Operator helm chart which caused deleting the watched Namespace on uninstall (Thanks to Andrei Nistor for reporting this issue)
- K8SPSMDB-640: Fix a regression which prevented labels from being applied to Pods after the Custom Resource change
- K8SPSMDB-583: Fix a bug which caused backup crashing if `spec.mongod.net.port` not set or set to zero
- K8SPSMDB-540 and K8SPSMDB-563: Fix a bug which could cause a cluster crash when reducing the configured Replicaset size between deletion and re-creation of the cluster
- K8SPSMDB-608: Fix a bug due to which the password of backup user was printed in backup agent logs (Thanks to Antoine Ozenne for reporting this issue)
- K8SPSMDB-599: A new mongos.expose.servicePerPod option allows deploying a separate ClusterIP Service for each mongos instance, which prevents the failure of a multi-threaded transaction executed with the same driver instance and ended up on a different mongos. Starting from this release, mongos is deployed by StatefulSet instead of Deployment object
- K8SPSMDB-656: Fix a bug which caused cluster name being not displayed in the backup Custom Resource output with `psmdbCluster` set in the backup spec
- K8SPSMDB-653: Fix a bug due to which `spec.ImagePullPolicy` options from `deploy/cr.yaml` wasn't applied to backup and pmm-client images
- K8SPSMDB-632: Fix a bug which caused the Operator to perform Smart Update on the initial deployment
- K8SPSMDB-624: Fix a bug due to which the Operator didn't grant enough permissions to the Cluster Monitor user necessary for Percona Monitoring and Management (PMM) (Thanks to Richard CARRE for reporting this issue)

- K8SPSMDB-618: Improve security and meet compliance requirements by building MongoDB Operator based on Red Hat Universal Base Image (UBI) 8 instead of UBI 7
- K8SPSMDB-602: Fix a thread leak in a mongod container of the Replica Set Pods, which occurred when setting `setFCV` flag to `true` in Custom Resource
- K8SPSMDB-560: Fix a bug due to which `serviceName` tag was not set to all members in the Replica Set
- K8SPSMDB-533: Fix a bug due to which setting password with a special character for a system user was breaking the cluster

## Known Issues

- K8SPSMDB-686: The Operator versions 1.11.0 and 1.12.0 can not be downscaled from a sharding to non-sharding/Replica Set configuration on Google Kubernetes Engine (GKE) 1.19-1.21 (GKE 1.22 is not affected)

## Deprecation, Rename and Removal

- K8SPSMDB-596: The `spec.mongod` section is removed from the Custom Resource configuration. Starting from now, mongod options should be passed to Replica Sets using `spec.replsets.[].configuration` key, except the following 3 options:
  - `mongod.security.encryptionKeySecret` key was left in a deprecated state in favor of the new `spec.secrets.encryptionKey` option
  - `mongod.storage.wiredTiger.engineConfig.cacheSizeRatio` and `mongod.storage.inMemory.engineConfig.inMemorySizeRatio` options are now only available from the `replsets.storage` section

Before the upgrade, please ensure that you have moved all custom MongoDB parameters to proper places!

- K8SPSMDB-228: The `spec.psmdbCluster` option in the example on-demand backup configuration file `backup/backup.yaml` was renamed to `spec.clusterName` (`psmdbCluster` will be valid till 1.15 version)

## Supported Platforms

The following platforms were tested and are officially supported by the Operator 1.12.0:

- OpenShift 4.7 - 4.10

- Google Kubernetes Engine (GKE) 1.19 - 1.22
- Amazon Elastic Container Service for Kubernetes (EKS) 1.19 - 1.22
- Minikube 1.23

This list only includes the platforms that the Percona Operators are specifically tested on as part of the release process. Other Kubernetes flavors and versions depend on the backward compatibility offered by Kubernetes itself.

# Percona Distribution for MongoDB Operator 1.11.0

- **Date**

  December 21, 2021

- **Installation**

  For installation please refer to the documentation page

## Release Highlights

- In addition to S3-compatible storage, you can now configure backups to use Microsoft Azure Blob storage. This feature makes the Operator fully compatible with Azure Cloud.
- Custom sidecar containers allow users to customize Percona Distribution for MongoDB and other Operator components without changing the container images. In this release, we enable even more customization, by allowing users to mount volumes into the sidecar containers.

## New Features

- K8SPSMDB-513: Add support of Microsoft Azure Blob storage for backups

## Improvements

- K8SPSMDB-422: It is now possible to set annotations to backup cron jobs (Thanks to Aliaksandr Karavai for contribution)
- K8SPSMDB-534: mongos readiness probe now avoids running listDatabases command for all databases in the cluster to avoid unneeded delays on clusters with an extremely large amount of databases
- K8SPSMDB-527: Timeout parameters for liveness and readiness probes can be customized to avoid false-positives for heavy-loaded clusters
- K8SPSMDB-520: Mount volumes into sidecar containers to enable customization
- K8SPSMDB-463: Update backup status as error if it's not started for a long time
- K8SPSMDB-388: New `backup.pitr.oplogSpanMin` option controls how often oplogs are uploaded to the cloud storage

## Bugs Fixed

- K8SPSMDB-603: Fixed a bug where the Operator checked the presence of CPU limit and not memory limit when deciding whether to set the size of cache memory for WiredTiger
- K8SPSMDB-511 and K8SPSMDB-558: Fixed a bug where Operator changed NodePort port every 20 seconds for a Replica Set service (Thanks to Rajshekar Reddy for reporting this issue)
- K8SPSMDB-608: Fix a bug that resulted in printing the password of backup user the in backup agent logs (Thanks to Antoine Ozenne for reporting this issue)
- K8SPSMDB-592: Fixed a bug where helm chart was incorrectly setting the `serviceAnnotations` and `loadBalancerSourceRanges` for mongos exposure
- K8SPSMDB-568: Fixed a bug where upgrading to MongoDB 5.0 failed when using the `upgradeOptions:apply` option

## Supported Platforms

The following platforms were tested and are officially supported by the Operator 1.11.0:

- OpenShift 4.7 - 4.9
- Google Kubernetes Engine (GKE) 1.19 - 1.22
- Amazon Elastic Container Service for Kubernetes (EKS) 1.18 - 1.22
- Minikube 1.22

This list only includes the platforms that the Percona Operators are specifically tested on as part of the release process. Other Kubernetes flavors and versions depend on the backward compatibility offered by Kubernetes itself.

# Percona Distribution for MongoDB Operator 1.10.0

- **Date**

  September 30, 2021

- **Installation**

  For installation please refer to the documentation page

## Release Highlights

- Starting from this release, the Operator implements as a technical preview the possibility to include non-voting replica set members into the cluster, which do not participate in the primary election process. This feature enables users to deploy non-voting members with the Operator through a Custom Resource object without manual configuration.
- The technical preview of the cross-site replication feature allows users to add external replica set nodes into the cluster managed by the Operator, including scenarios when one of the clusters is outside of the Kubernetes environment. External nodes can be run by another Operator or can be regular MongoDB deployment. The feature is intended for the following use cases:
  - provide migrations of your regular MongoDB database to the Percona Server for MongoDB cluster under the Operator control, or carry on backward migration,
  - deploy cross-regional clusters for Disaster Recovery.

## New Features

- K8SPSMDB-479: Allow users to add non-voting members to MongoDB replica, needed to have more than 7 nodes or to create a node in the edge location
- K8SPSMDB-265: Cross region replication feature simplifies the migrations and enables Disaster Recovery capabilities for MongoDB on Kubernetes

## Improvements

- K8SPSMDB-537: PMM container should not cause the crash of the whole database Pod if pmm-agent is not working properly

- K8SPSMDB-517: Users can now run Percona Server for MongoDB 5 with the Operator. Version 5 support is added as a technical preview and is not recommended for Production.
- K8SPSMDB-490: Add validation for the Custom Resource name so that cluster name and replica set name do not exceed 51 characters in total

## Bugs Fixed

- K8SPSMDB-504: Fixed a race condition that could prevent the cluster with LoadBalancer-exposed replica set members from becoming ready
- K8SPSMDB-470: Fix a bug where ServiceAnnotation and LoadBalancerSourceRanges fields didn't propagate to Kubernetes service (Thanks to Aliaksandr Karavai for reporting this issue)
- K8SPSMDB-531: Fix compatibility issues between Percona Kubernetes Operator for MongoDB and Calico (Thanks to Mykola Kruliv for reporting this issue)
- K8SPSMDB-514: Fix a bug where backup cronJob created by the Operator did not include resources limits and requests, which prevented it to run in the namespaces with resource quotas (Thanks to George Asenov for reporting this issue)
- K8SPSMDB-512: Fix a bug where configuring getLastErrorModes in the replica set causes the Operator to fail to reconcile (Thanks to Adam Watson for contribution)
- K8SPSMDB-553: Fix a bug where wrong S3 credentials caused backup to keep running despite the actual failure
- K8SPSMDB-496: Fix a bug where Pods did not restart if custom MongoDB config was updated with a secret or a configmap

## Supported Platforms

The following platforms were tested and are officially supported by the Operator 1.10.0:

- OpenShift 4.6 - 4.8
- Google Kubernetes Engine (GKE) 1.17 - 1.21
- Amazon Elastic Container Service for Kubernetes (EKS) 1.16 - 1.21
- Minikube 1.22

This list only includes the platforms that the Percona Operators are specifically tested on as part of the release process. Other Kubernetes flavors and versions depend on the backward compatibility offered by Kubernetes itself.

# Percona Distribution for MongoDB Operator 1.9.0

- **Date**

  June 29, 2021

- **Installation**

  For installation please refer to the documentation page

## Release Highlights

- Starting from this release, the Operator changes its official name to **Percona Distribution for MongoDB Operator**. This new name emphasizes graduate changes which incorporated a collection of Percona's solutions to run and operate MongoDB Server, available separately as Percona Distribution for MongoDB.
- It is now possible to restore backups from S3-compatible storage to a new Kubernetes-based environment with no existing Backup Custom Resources
- You can now customize Percona Server for MongoDB by storing custom configuration for Replica Set, mongos, and Config Server instances in ConfigMaps or in Secrets

## New Features

- K8SPSMDB-276: Restore backups to a new Kubernetes-based environment with no existing Backup Custom Resource
- K8SPSMDB-444, K8SPSMDB-445: Allow storing custom configuration in ConfigMaps and Secrets

## Improvements

- K8SPSMDB-365: Unblock backups even if just a single Replica Set node is available by setting `allowUnsafeConfigurations` flag to true
- K8SPSMDB-453: It is now possible to see the overall progress of the provisioning of MongoDB cluster resources and dependent components in Custom Resource status
-

K8SPSMDB-451, K8SPSMDB-398: MongoDB cluster resource statuses in Custom Resource output (e.g. returned by `kubectl get psmdb` command) have been improved and now provide more precise reporting

- K8SPSMDB-425: Remove `mongos.expose.enabled` option from Custom Resource and always expose mongos (with the ClusterIP exposeType by default)
- K8SPSMDB-421: Secret object containing system users passwords is now deleted along with the Cluster if delete-psmdb-pvc finalizer is enabled
- K8SPSMDB-411: Added options to specify custom memory and CPU requirements for Arbiter instances
- K8SPSMDB-329: Reduced the number of various etcd and k8s object updates from the operator to minimize the pressure on the Kubernetes cluster

## Bugs Fixed

- K8SPSMDB-437: Fixed a bug where Labels were not set on Persistent Volume Claim objects when set on the respective Pods
- K8SPSMDB-435: Fixed a bug that prevented adding custom Labels to mongos Pods
- K8SPSMDB-423: Fixed a bug where unpause of a cluster did not work when `replsets.expose = LoadBalancer` because of provisioning new Load Balancers with different names (Thanks to Aliaksandr Karavai for reporting this issue)
- K8SPSMDB-494: When upgrading MongoDB clusters with Smart Update, the statuses reported in Custom Resource are now reflecting the real state
- K8SPSMDB-489: Fixed a bug where the status of successful backups could be set to error in case of a cluster crash
- K8SPSMDB-462: Fixed a bug where psmdb-backup object could not be deleted if the backup was not successful
- K8SPSMDB-456: Fixed a bug where Smart Update was not upgrading a MongoDB deployment with a replica set consisting of one node
- K8SPSMDB-455: Fixed a bug that prevented major version downgrade to a specific version number when `upgradeOptions.setFCV` Custom Resource option was not updated to the new version
- K8SPSMDB-485: Fixed TLS documentation that referenced incorrect Secrets names from the cr.yaml configuration file

## Deprecation and Removal

-

We are simplifying the way the user can customize MongoDB components such as mongod and mongos. It is now possible to set custom configuration through ConfigMaps and Secrets Kubernetes resources. The following options will be deprecated in Percona Distribution for MongoDB Operator v1.9.0+, and completely removed in v1.12.0+:

- `sharding.mongos.auditLog.\*`
- `mongod.security.redactClientLogData`
- `mongod.security.\*`
- `mongod.setParameter.\*`
- `mongod.storage.\*`
- `mongod.operationProfiling.mode`
- `mongod.auditLog.\*`

- The mongos.expose.enabled option has been completely removed from the Custom Resource as it was causing confusion for the users

# Percona Kubernetes Operator for Percona Server for MongoDB 1.8.0

- **Date**

  May 6, 2021

- **Installation**

  Installing Percona Kubernetes Operator for Percona Server for MongoDB

## Release Highlights

- The support for Point-in-time recovery added in this release. Users can now recover to a specific date and time from operations logs stored on S3
- It is now possible to perform a major version upgrade for MongoDB (for example, upgrade 4.2 version to 4.4) with no manual steps

## New Features

- K8SPSMDB-387: Add support for point-in-time recovery to recover to a specific date and time
- K8SPSMDB-284: Add support for automated major version MongoDB upgrades

## Improvements

- K8SPSMDB-436: The imagePullPolicy option in the `deploy/cr.yaml` configuration file now is applied to init container as well
- K8SPSMDB-400: Simplify secret change logic to avoid Pod restarts when user changes the credentials
- K8SPSMDB-381: Get credentials directly from Secrets instead of the environment variables when initializing the Replica Set
- K8SPSMDB-352: Restrict running run less than 5 Pods of Replica Sets with enabled arbiter unless the `allowUnsafeConfigurations` option is set to true
- K8SPSMDB-332: Restrict running less than 3 Pods of Config Servers unless the `allowUnsafeConfigurations` option is set to true
- K8SPSMDB-331: Restrict running less than 3 mongos Pods unless the `allowUnsafeConfigurations` option is set to true

## Bugs Fixed

- K8SPSMDB-384: Fix a bug due to which mongos Pods were failing readiness probes for some period of time during the cluster initialization
- K8SPSMDB-434: Fix a bug due to which nil pointer dereference error was occurring when switching the `sharding.enabled` option from false to true (thanks to srteam2020 for contributing)
- K8SPSMDB-430: Fix a bug due to which a stale apiserver could trigger undesired StatefulSet and PVC deletion when recreating the cluster with the same name (thanks to srteam2020 for contributing)
- K8SPSMDB-428: Fix a bug which caused mongos to fail in case of the empty name field in configsvrReplSet section of the Custom Resource
- K8SPSMDB-418: Fix a bug due to which `serviceAnnotations` changes in the `deploy/cr.yaml` file were not applied to the running cluster
- K8SPSMDB-364: Fix a bug where liveness probe of a mongo container was always failing if the userAdmin password contained special characters
- K8SPSMDB-43: Fix a bug due to which renaming Replica Set in the Custom Resource caused creating new Replica Set without deleting the old one

# Percona Kubernetes Operator for Percona Server for MongoDB 1.7.0

- **Date**

  March 8, 2021

- **Installation**

  Installing Percona Kubernetes Operator for Percona Server for MongoDB

## Release Highlights

- This release brings full support for the Percona Server for MongoDB Sharding. Sharding allows you to scale databases horizontally, distributing data across multiple MongoDB Pods, and so it is extremely useful for large data sets. By default of the `deploy/cr.yaml` configuration file contains only one replica set, but when you turn sharding on, you can add more replica sets with different names to the `replsets` section.
- It is now possible to clean up Persistent Volume Claims automatically after the cluster deletion event. This feature is off by default. Particularly it is useful to avoid leftovers in testing environments, where the cluster can be re-created and deleted many times. Support for custom sidecar containers. The Operator makes it possible now to deploy additional (*sidecar*) containers to the Pod. This feature can be useful to run debugging tools or some specific monitoring solutions, etc. The sidecar container can be added to replsets, sharding.configsvrReplSet, and sharding.mongos sections of the `deploy/cr.yaml` configuration file.

## New Features

- K8SPSMDB-121: Add support for sharding to scale MongoDB cluster horizontally
- K8SPSMDB-294: Support for custom sidecar container to extend the Operator capabilities
- K8SPSMDB-260: Persistent Volume Claims can now be automatically removed after MongoDB cluster deletion

## Improvements

- K8SPSMDB-335: Operator can now automatically remove old backups from S3 if retention period is set
-

K8SPSMDB-330: Add support for runtimeClassName Kubernetes feature for selecting the container runtime

- K8SPSMDB-306: It is now possible to explicitly set the version of MongoDB for newly provisioned clusters. Before that, all new clusters were started with the latest MongoDB version if Version Service was enabled
- K8SPSMDB-370: Fix confusing log messages about no backup / restore found which were caused by Percona Backup for MongoDB waiting for the backup metadata
- K8SPSMDB-342: MongoDB container liveness probe will now use TLS to follow best practices and remove noisy log messages from mongod log

## Bugs Fixed

- K8SPSMDB-346: Fix a bug which prevented adding/removing labels to Pods without downtime
- K8SPSMDB-366: Fix a bug which prevented enabling Percona Monitoring and Management (PMM) due to incorrect request for the recommended PMM Client image version to the Version Service
- K8SPSMDB-402: running multiple replica sets without sharding enabled should be prohibited
- K8SPSMDB-382: Fix a bug which caused mongos process to fail when using `allowUnsafeConfigurations=true`
- K8SPSMDB-362: Fix a bug due to which changing secrets in a single-shard mode caused mongos Pods to fail

# Percona Kubernetes Operator for Percona Server for MongoDB 1.6.0

- **Date**

  December 22, 2020

- **Installation**

  Installing Percona Kubernetes Operator for Percona Server for MongoDB

## New Features

- K8SPSMDB-273: Add support for `mongos` service to expose a single shard of a MongoDB cluster through one entry point instead of provisioning a load-balancer per replica set node. In the following release, we will add support for multiple shards.
- K8SPSMDB-282: Official support for Percona Monitoring and Management (PMM) v.2

> **Note**
>
> Monitoring with PMM v.1 configured according to the unofficial instruction will not work after the upgrade. Please switch to PMM v.2.

## Improvements

- K8SPSMDB-258: Add support for Percona Server for MongoDB version 4.4
- K8SPSMDB-319: Show Endpoint in the `kubectl get psmdb` command output to connect to a MongoDB cluster easily
- K8SPSMDB-257: Store the Operator version as a `crVersion` field in the `deploy/cr.yaml` configuration file
- K8SPSMDB-266: Use plain-text passwords instead of base64-encoded ones when creating System Users secrets for simplicity

## Bugs Fixed

-

K8SPSMDB-268: Fix a bug affecting the support of TLS certificates issued by cert-manager, due to which proper rights were not set for the role-based access control, and Kubernetes versions newer than 1.15 required other certificate issuing sources

- K8SPSMDB-261: Fix a bug due to which cluster pause/resume functionality didn't work in previous releases
- K8SPSMDB-292: Fix a bug due to which not all clusters managed by the Operator were upgraded by the automatic update

## Removal

- The MMAPv1 storage engine is no longer supported for all MongoDB versions starting from this version of the Operator. MMAPv1 was already deprecated by MongoDB for a long time. WiredTiger is the default storage engine since MongoDB 3.2, and MMAPv1 was completely removed in MongoDB 4.2.

**Note**

Upgrade of the Operator from 1.5.0 to 1.6.0 will fail if MMAPv1 is used, but MongoDB cluster will continue to run. It is recommended to migrate your clusters to WiredTiger engine before the upgrade.

# Percona Kubernetes Operator for Percona Server for MongoDB 1.5.0

- **Date**

  September 7, 2020

- **Installation**

  Installing Percona Kubernetes Operator for Percona Server for MongoDB

## New Features

- K8SPSMDB-233: Automatic management of system users for MongoDB on password rotation via Secret
- K8SPSMDB-226: Official Helm chart for the Operator
- K8SPSMDB-199: Support multiple PSMDB minor versions by the Operator
- K8SPSMDB-198: Fully Automate Minor Version Updates (Smart Update)

## Improvements

- K8SPSMDB-192: The ability to set the mongod cursorTimeoutMillis parameter in YAML (Thanks to user xprt64 for the contribution)
- K8SPSMDB-234: OpenShift 4.5 support
- K8SPSMDB-197: Additional certificate SANs useful for reverse DNS lookups (Thanks to user phin1x for the contribution)
- K8SPSMDB-190: Direct API quering with “curl” instead of using “kubectl” tool in scheduled backup jobs (Thanks to user phin1x for the contribution)
- K8SPSMDB-133: A special Percona Server for MongoDB debug image which avoids restarting on fail and contains additional tools useful for debugging
- CLOUD-556: Kubernetes 1.17 / Google Kubernetes Engine 1.17 support

## Bugs Fixed

- K8SPSMDB-213: Installation instruction not reflecting recent changes in git tags (Thanks to user geraintj for reporting this issue)

- K8SPSMDB-210: Backup documentation not reflecting changes in Percona Backup for MongoDB
- K8SPSMDB-180: Replset and cluster having “ready” status set before mongo initialization and replicasets configuration finished
- K8SPSMDB-179: The “error” cluster status instead of the “initializing” one during the replset initialization
- CLOUD-531: Wrong usage of `strings.TrimLeft` when processing apiVersion

# Percona Kubernetes Operator for Percona Server for MongoDB 1.4.0

- **Date**

  March 31, 2020

- **Installation**

  Installing Percona Kubernetes Operator for PSMDB

## New Features

- K8SPSMDB-89: Amazon Elastic Container Service for Kubernetes (EKS) was added to the list of the officially supported platforms
- K8SPSMDB-113: Percona Server for MongoDB 4.2 is now supported
- OpenShift Container Platform 4.3 is now supported

## Improvements

- K8SPSMDB-79: The health check algorithm improvements have increased the overall stability of the Operator
- K8SPSMDB-176: The Operator was updated to use Percona Backup for MongoDB version 1.2
- K8SPSMDB-153: Now the user can adjust securityContext, replacing the automatically generated securityContext with the customized one
- K8SPSMDB-175: Operator now updates observedGeneration status message to allow better monitoring of the cluster rollout or backups/restore process

## Bugs Fixed

- K8SPSMDB-182: Setting the `updateStrategy: OnDelete` didn't work if was not specified from scratch in CR
- K8SPSMDB-174: The inability to update or delete existing CRD was possible because of too large records in etcd, resulting in "request is too large" errors. Only 20 last status changes are now stored in etcd to avoid this problem.

Help us improve our software quality by reporting any bugs you encounter using our bug tracking system.

# Percona Kubernetes Operator for Percona Server for MongoDB 1.3.0

Percona announces the *Percona Kubernetes Operator for Percona Server for MongoDB* 1.3.0 release on December 11, 2019. This release is now the current GA release in the 1.3 series. Install the Kubernetes Operator for Percona Server for MongoDB by following the instructions.

The Operator simplifies the deployment and management of the Percona Server for MongoDB in Kubernetes-based environments. It extends the Kubernetes API with a new custom resource for deploying, configuring and managing the application through the whole life cycle.

The Operator source code is available in our Github repository. All of Percona's software is open-source and free.

## New Features and Improvements

- CLOUD-415: Non-default cluster domain can now be specified with the new `ClusterServiceDNSSuffix` Operator option.
- CLOUD-395: The Percona Server for MongoDB images size decrease by 42% was achieved by removing unnecessary dependencies and modules to reduce the cluster deployment time.
- CLOUD-390: Helm chart for Percona Monitoring and Management (PMM) 2.0 have been provided.

Percona Server for MongoDB is an enhanced, open source and highly-scalable database that is a fully-compatible, drop-in replacement for MongoDB Community Edition. It supports MongoDB protocols and drivers. Percona Server for MongoDB extends MongoDB Community Edition functionality by including the Percona Memory Engine, as well as several enterprise-grade features. It requires no changes to MongoDB applications or code.

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# Percona Kubernetes Operator for Percona Server for MongoDB 1.2.0

Percona announces the *Percona Kubernetes Operator for Percona Server for MongoDB* 1.2.0 release on September 20, 2019. This release is now the current GA release in the 1.2 series. Install the Kubernetes Operator for Percona Server for MongoDB by following the instructions.

The Operator simplifies the deployment and management of the Percona Server for MongoDB in Kubernetes-based environments. It extends the Kubernetes API with a new custom resource for deploying, configuring and managing the application through the whole life cycle.

The Operator source code is available in our Github repository. All of Percona's software is open-source and free.

## New Features and Improvements

- A Service Broker was implemented for the Operator, allowing a user to deploy Percona XtraDB Cluster on the OpenShift Platform, configuring it with a standard GUI, following the Open Service Broker API.
- Now the Operator supports Percona Monitoring and Management 2, which means being able to detect and register to PMM Server of both 1.x and 2.0 versions.
- Data-at-rest encryption is now enabled by default unless `EnableEncryption=false` is explicitly specified in the `deploy/cr.yaml` configuration file.
- Now it is possible to set the `schedulerName` option in the operator parameters. This allows using storage which depends on a custom scheduler, or a cloud provider which optimizes scheduling to run workloads in a cost-effective way.
- The resource constraint values were refined for all containers to eliminate the possibility of an out of memory error.

## Fixed Bugs

- Oscillations of the cluster status between "initializing" and "ready" took place after an update.
- The Operator was removing other cron jobs in case of the enabled backups without defined tasks (contributed by Marcel Heers).

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# Percona Kubernetes Operator for Percona Server for MongoDB 1.1.0

Percona announces the general availability of *Percona Kubernetes Operator for Percona Server for MongoDB* 1.1.0 on July 15, 2019. This release is now the current GA release in the 1.1 series. Install the Kubernetes Operator for Percona Server for MongoDB by following the instructions. Please see the GA release announcement.

The Operator simplifies the deployment and management of the Percona Server for MongoDB in Kubernetes-based environments. It extends the Kubernetes API with a new custom resource for deploying, configuring and managing the application through the whole life cycle.

The Operator source code is available in our Github repository. All of Percona's software is open-source and free.

## New Features and Improvements

- Now the Percona Kubernetes Operator allows upgrading Percona Server for MongoDB to newer versions, either in semi-automatic or in manual mode.
- Also, two modes are implemented for updating the Percona Server for MongoDB `mongod.conf` configuration file: in *automatic configuration update* mode Percona Server for MongoDB Pods are immediately re-created to populate changed options from the Operator YAML file, while in *manual mode* changes are held until Percona Server for MongoDB Pods are re-created manually.
- Percona Server for MongoDB data-at-rest encryption is now supported by the Operator to ensure that encrypted data files cannot be decrypted by anyone except those with the decryption key.
- A separate service account is now used by the Operator's containers which need special privileges, and all other Pods run on default service account with limited permissions.
- User secrets are now generated automatically if don't exist: this feature especially helps reduce work in repeated development environment testing and reduces the chance of accidentally pushing predefined development passwords to production environments.
- The Operator is now able to generate TLS certificates itself which removes the need in manual certificate generation.
- The list of officially supported platforms now includes the Minikube, which provides an easy way to test the Operator locally on your own machine before deploying it on a cloud.
- Also, Google Kubernetes Engine 1.14 and OpenShift Platform 4.1 are now supported.

Percona Server for MongoDB is an enhanced, open source and highly-scalable database that is a fully-compatible, drop-in replacement for MongoDB Community Edition. It supports MongoDB protocols and drivers. Percona Server for MongoDB extends MongoDB Community Edition functionality by including the Percona Memory Engine, as well as several enterprise-grade features. It requires no changes to MongoDB applications or code.

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# Percona Kubernetes Operator for Percona Server for MongoDB 1.0.0

Percona announces the general availability of *Percona Kubernetes Operator for Percona Server for MongoDB* 1.0.0 on May 29, 2019. This release is now the current GA release in the 1.0 series. Install the Kubernetes Operator for Percona Server for MongoDB by following the instructions. Please see the GA release announcement. All of Percona's software is open-source and free.

The Percona Kubernetes Operator for Percona Server for MongoDB automates the lifecycle of your Percona Server for MongoDB environment. The Operator can be used to create a Percona Server for MongoDB replica set, or scale an existing replica set.

The Operator creates a Percona Server for MongoDB replica set with the needed settings and provides a consistent Percona Server for MongoDB instance. The Percona Kubernetes Operators are based on best practices for configuration and setup of the Percona Server for MongoDB.

The Kubernetes Operators provide a consistent way to package, deploy, manage, and perform a backup and a restore for a Kubernetes application. Operators deliver automation advantages in cloud-native applications and may save time while providing a consistent environment.

The advantages are the following:

- Deploy a Percona Server for MongoDB environment with no single point of failure and environment can span multiple availability zones (AZs).
- Deployment takes about six minutes with the default configuration.
- Modify the Percona Server for MongoDB size parameter to add or remove Percona Server for MongoDB replica set members
- Integrate with Percona Monitoring and Management (PMM) to seamlessly monitor your Percona Server for MongoDB
- Automate backups or perform on-demand backups as needed with support for performing an automatic restore
- Supports using Cloud storage with S3-compatible APIs for backups
- Automate the recovery from failure of a Percona Server for MongoDB replica set member
- TLS is enabled by default for replication and client traffic using Cert-Manager
- Access private registries to enhance security
- Supports advanced Kubernetes features such as pod disruption budgets, node selector, constraints, tolerations, priority classes, and affinity/anti-affinity
- You can use either PersistentVolumeClaims or local storage with hostPath to store your database

- Supports a replica set Arbiter member
- Supports Percona Server for MongoDB versions 3.6 and 4.0

## Installation

Installation is performed by following the documentation installation instructions for Kubernetes and OpenShift.

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