

MySQL on Kubernetes

Sami Ahlroos

Senior Support Engineer

FOSDEM 2020

01.02.2020



Introduction

Sami Ahlroos

- Senior support engineer at Percona
- Been working with Open Source technologies since around 1995



Table of contents

- What's the point?
- Getting started
- Backup, restore
- Scaling up, scaling down
- Monitoring

What's the point?

Why would I want a database in Kubernetes?

The point

- Applications are already there

The point

- Applications are already there
- Resource allocation / utilization

The point

- Applications are already there
- Resource allocation / utilization
- Scaling up and down

The point

- Applications are already there
- Resource allocation / utilization
- Scaling up and down
- Kubernetes is really good at automation

Getting started

How could we get started running MySQL in Kubernetes?

Getting started

Percona Kubernetes Operator for Percona XtraDB Cluster

- Free
- Open source (Apache 2.0)
- Get it on GitHub:
 - <https://github.com/percona/percona-xtradb-cluster-operator>

Getting started

Percona Xtra-- what?

- Percona XtraDB Cluster (PXC)
- Free and open source
- Percona Server for MySQL (5.7) + Galera replication

Getting started

Requirements

- Kubernetes cluster
 - *Google Kubernetes Engine*
 - *OpenShift*
 - *Minikube*

Getting started

Installation

- Clone from GitHub
- Deploy couple of YAML files

Getting started

```
Samis-MBP-2:percona-xtradb-cluster-operator sami$ kubectl apply -f deploy/bundle.yaml
customresourcedefinition.apiextensions.k8s.io/perconaxtradbclusters.pxc.percona.com created
customresourcedefinition.apiextensions.k8s.io/perconaxtradbclusterbackups.pxc.percona.com created
customresourcedefinition.apiextensions.k8s.io/perconaxtradbclusterrestores.pxc.percona.com created
customresourcedefinition.apiextensions.k8s.io/perconaxtradbbackups.pxc.percona.com created
role.rbac.authorization.k8s.io/percona-xtradb-cluster-operator created
serviceaccount/percona-xtradb-cluster-operator created
rolebinding.rbac.authorization.k8s.io/service-account-percona-xtradb-cluster-operator created
deployment.apps/percona-xtradb-cluster-operator created
Samis-MBP-2:percona-xtradb-cluster-operator sami$
```

Getting started

```
Samis-MBP-2:percona-xtradb-cluster-operator sami$ kubectl apply -f deploy/cr.yaml  
perconaxtradbcluster.pxc.percona.com/cluster1 created  
Samis-MBP-2:percona-xtradb-cluster-operator sami$ █
```

Getting started

```
apiVersion: pxc.percona.com/v1-2-0
kind: PerconaXtraDBCluster
metadata:
  name: cluster1
spec:
  pxc:
    size: 3
    image: percona/percona-xtradb-cluster-operator:1.2.0-pxc
    configuration: |
      [mysqld]
      wsrep_debug=ON
      wsrep_provider_options="gcache.size=1G; gcache.recover=yes"
  resources:
    requests:
      memory: 1G
      cpu: 600m
    limits:
      memory: 1G
      cpu: "1"
  nodeSelector:
    disktype: ssd
  volumeSpec:
    emptyDir: {}
    hostPath:
      path: /data
      type: Directory
  persistentVolumeClaim:
    storageClassName: standard
    accessModes: [ "ReadWriteOnce" ]
    resources:
      requests:
        storage: 6Gi
    accessModes: [ "ReadWriteOnce" ]
    volumeMode: Filesystem
    accessModes: [ "ReadWriteOnce" ]
    resources:
      requests:
        storage: 6Gi
```


Getting started

```
Samis-MBP-2:percona-xtradb-cluster-operator sami$ kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
cluster1-proxysql-0                 3/3    Running   7           35m
cluster1-proxysql-1                 3/3    Running   3           34m
cluster1-proxysql-2                 0/3    Pending   0           26m
cluster1-pxc-0                       1/1    Running   0           2m39s
cluster1-pxc-1                       1/1    Running   0           110s
cluster1-pxc-2                       1/1    Running   0           63s
percona-xtradb-cluster-operator-74bcbd9df5-bf8jr 1/1    Running   2           38m
Samis-MBP-2:percona-xtradb-cluster-operator sami$
```

Getting started

```
Samis-MBP-2:percona-xtradb-cluster-operator sami$ kubectl get services
NAME                                TYPE           CLUSTER-IP      EXTERNAL-IP      PORT(S)          AGE
cluster1-proxysql                   ClusterIP      10.110.157.107  <none>           3306/TCP         91m
cluster1-proxysql-unready           ClusterIP      None            <none>           3306/TCP,6032/TCP 91m
cluster1-pxc                        ClusterIP      None            <none>           3306/TCP         91m
cluster1-pxc-unready                ClusterIP      None            <none>           3306/TCP         91m
kubernetes                          ClusterIP      10.96.0.1       <none>           443/TCP          104m
Samis-MBP-2:percona-xtradb-cluster-operator sami$
```

Getting started

```
bash-4.2$ mysql -h cluster1-proxysql -uroot -pKVrqzDVaeQVyCrSQ
mysql: [Warning] Using a password on the command line interface can be insecure.
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 310
Server version: 5.7.26 (ProxySQL)

Copyright (c) 2009-2019 Percona LLC and/or its affiliates
Copyright (c) 2000, 2019, Oracle and/or its affiliates. All rights reserved.

Oracle is a registered trademark of Oracle Corporation and/or its
affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> create database test1;
Query OK, 1 row affected (0.07 sec)

mysql> use test1;
Database changed
mysql> create table a(id int primary key);
Query OK, 0 rows affected (0.07 sec)

mysql> insert into a values(1);
Query OK, 1 row affected (0.00 sec)

mysql> █
```

Backups

Backing up and restoring

Backup destinations

- S3 compatible storage
- Kubernetes persistent volume

Scheduled backups

```
storage: s3
schedule:
  - name: "sat-night-backup"
    schedule: "0 0 * * 6"
    keep: 3
    storageName: s3-us-west
  - name: "daily-backup"
    schedule: "0 0 * * *"
    keep: 3
    storageName: fs-pvc
```

On-demand backup

```
apiVersion: pxc.percona.com/v1
kind: PerconaXtraDBClusterBackup
metadata:
  name: backup1
spec:
  pxcCluster: cluster1
  storageName: fs-pvc
```

Restoring backups

```
Samis-MBP-2:percona-xtradb-cluster-operator sami$ kubectl get pxc-backups
```

NAME	CLUSTER	STORAGE	DESTINATION	STATUS	COMPLETED	AGE
backup1	cluster1	fs-pvc	pvc/cluster1-xb-backup1	Succeeded	13m	6h7m
cron-cluster1-20200130080957-q4iq8	cluster1	fs-pvc	pvc/cluster1-xb-cron-cluster1-20200130080957-q4iq8	Succeeded	12m	6h10m

Restoring backups

```
Samis-MBP-2:percona-xtradb-cluster-operator sami$ deploy/backup/copy-backup.sh backup1 ~/tmp/cluster1/
pvc/cluster1-xb-backup1
pod/backup-access created
Starting pod...[done]

Downloading started
tar: Removing leading '/' from member names
Downloading finished
pod "backup-access" deleted

You can recover data locally with following commands:
$ service mysqld stop
$ rm -rf /var/lib/mysql/*
$ cat /Users/sami/tmp/cluster1//xtrabackup.stream | xbstream -x -C /var/lib/mysql
$ xtrabackup --prepare --target-dir=/var/lib/mysql
$ chown -R mysql:mysql /var/lib/mysql
$ service mysqld start

Samis-MBP-2:percona-xtradb-cluster-operator sami$ █
```

Scaling up, scaling down

Scaling

```
Samis-MacBook-Pro-2:percona-xtradb-cluster-operator sami$ kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
cluster1-proxysql-0                 3/3     Running   3           25h
cluster1-proxysql-1                 3/3     Running   3           25h
cluster1-proxysql-2                 3/3     Running   3           25h
cluster1-pxc-0                       1/1     Running   0           2m51s
cluster1-pxc-1                       1/1     Running   0           101s
cluster1-pxc-2                       1/1     Running   0           47s
cluster1-xb-cron-cluster1-20200131000026-14tsy-jzt9g  0/1     Completed 0           17h
daily-backup-1580428800-82lmn       0/1     Completed 0           17h
percona-xtradb-cluster-operator-74bcbd9df5-prj28     1/1     Running   1           25h
Samis-MacBook-Pro-2:percona-xtradb-cluster-operator sami$
```

Scaling

```
pxc:  
  size: 5  
  image: percona/percona-xtradb-cluster-operator:1.2.0-pxc
```

Scaling

```
Samis-MacBook-Pro-2:percona-xtradb-cluster-operator sami$ kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
cluster1-proxysql-0                 3/3    Running   3           25h
cluster1-proxysql-1                 3/3    Running   3           25h
cluster1-proxysql-2                 3/3    Running   3           25h
cluster1-pxc-0                       1/1    Running   0           7m11s
cluster1-pxc-1                       1/1    Running   0           6m1s
cluster1-pxc-2                       1/1    Running   0           5m7s
cluster1-pxc-3                       1/1    Running   0           85s
cluster1-pxc-4                       1/1    Running   0           52s
cluster1-xb-cron-cluster1-20200131000026-14tsy-jzt9g  0/1    Completed 0           17h
daily-backup-1580428800-82lmn       0/1    Completed 0           17h
percona-xtradb-cluster-operator-74bcbd9df5-prj28     1/1    Running   1           25h
Samis-MacBook-Pro-2:percona-xtradb-cluster-operator sami$
```

Scaling

```
Samis-MacBook-Pro-2:percona-xtradb-cluster-operator sami$ kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
cluster1-proxysql-0                 3/3    Running   3          25h
cluster1-proxysql-1                 3/3    Running   3          25h
cluster1-proxysql-2                 3/3    Running   3          25h
cluster1-pxc-0                       1/1    Running   0          26m
cluster1-pxc-1                       1/1    Running   0          25m
cluster1-pxc-2                       1/1    Running   0          24m
cluster1-pxc-3                       1/1    Terminating 0          20m
cluster1-xb-cron-cluster1-20200131000026-14tsy-jzt9g 0/1    Completed 0          17h
daily-backup-1580428800-82lmm       0/1    Completed 0          17h
percona-xtradb-cluster-operator-74bcbd9df5-prj28     1/1    Running   1          25h
Samis-MacBook-Pro-2:percona-xtradb-cluster-operator sami$
```

Monitoring the cluster

Percona Monitoring and Management

- Free, open source
- Grafana, Prometheus, ClickHouse
- Helm chart for installing PMM Server in Kubernetes

Monitoring

pmm:

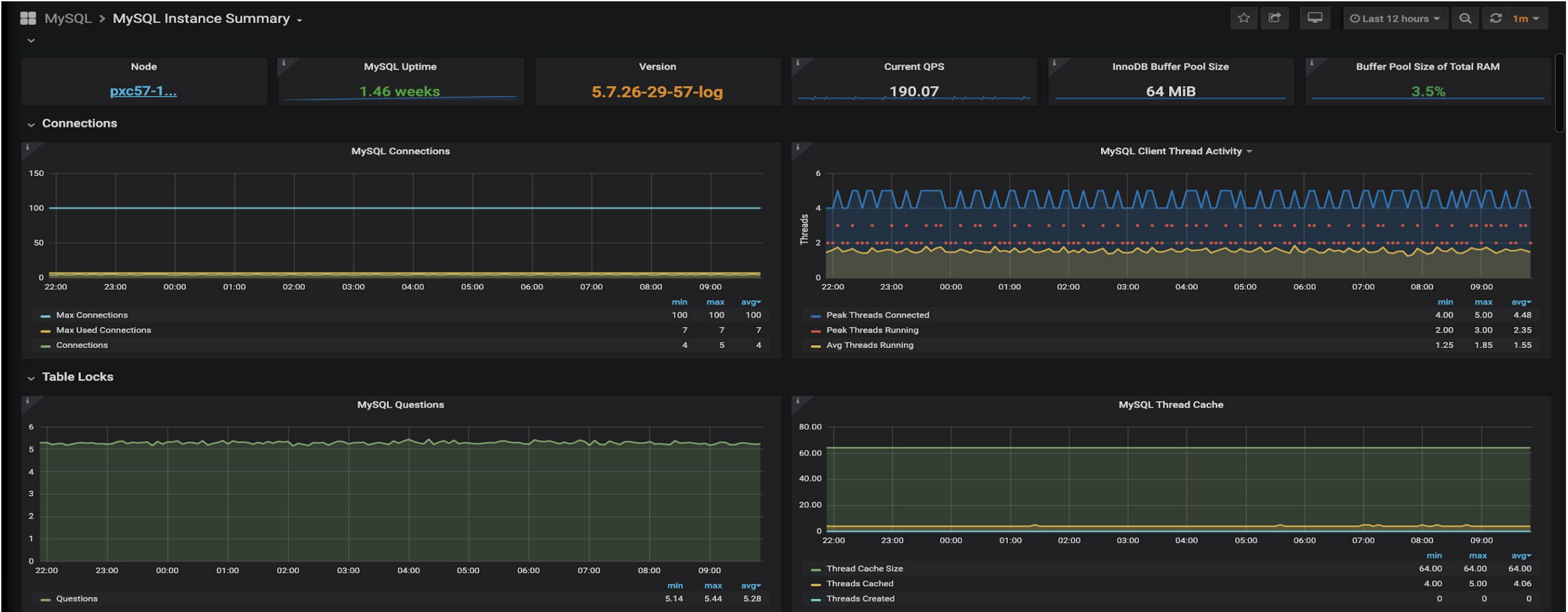
enabled: true

image: percona/percona-xtradb-cluster-operator:1.2.0-pmm

serverHost: monitoring-service

serverUser: pmm

Monitoring



Useful links

■ PXC Operator on GitHub

- <https://github.com/percona/percona-xtradb-cluster-operator>

■ PXC Operator documentation

- <https://www.percona.com/doc/kubernetes-operator-for-pxc/index.html>

■ Percona Monitoring and Management (PMM)

- <https://www.percona.com/doc/percona-monitoring-and-management/index.html>

■ Minikube

- <https://github.com/kubernetes/minikube>

OPEN SOURCE DATABASE CONFERENCE



**PERCONA
LIVE**

2020

**MAY 18 20
AUSTIN, TEXAS**

Percona Live is the one and only event where all of the open source database solution companies come together with the community

***MySQL, Mongo, Postgres, Elastic, Redis and more
Percona Live brings them to you.***

- 3 Days
- Hands-on tutorials,
- Breakout sessions,
- Keynote addresses,
- Expo Hall
- Networking
- Lots of Fun!

Use **PRESENTER** for 20% off! Register now at perconalive.com



**Champions of Unbiased
Open Source Database Solutions**