Database-as-a-Service in Kubernetes with GitOps
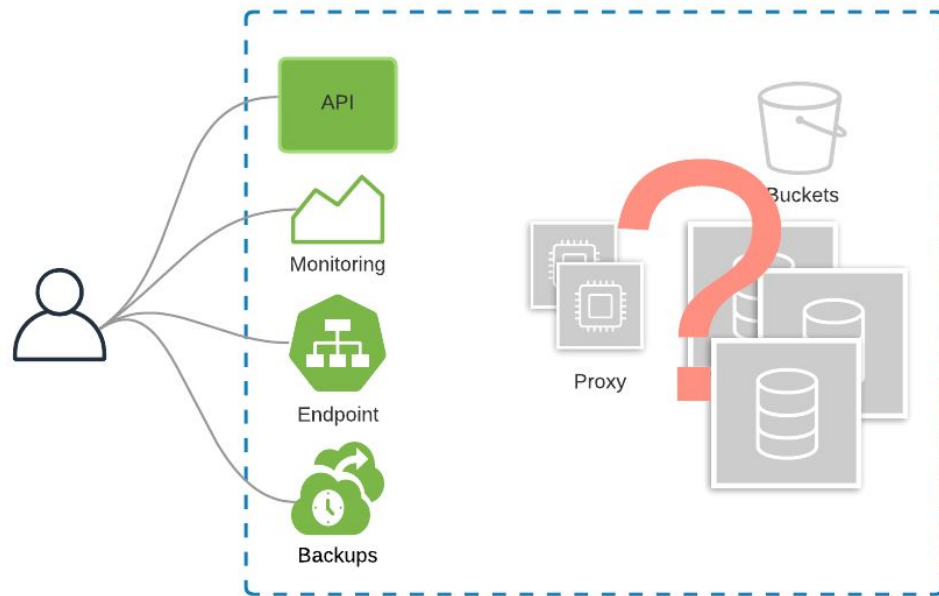
Sergey Pronin, Percona

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Get ready

- **Goals of DBaaS**
- **Databases on K8S**
- **Why DBaaS on K8S**
- **Operators**
- **GitOps**
- **Day1**
- **Day2**
- **Demo**

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Goals of DBaaS

- **Automate deploy**
- **Give me a service**
- **Automate day-2 operations**
  - Updates
  - Scaling
  - Backups
  - DB maintenance
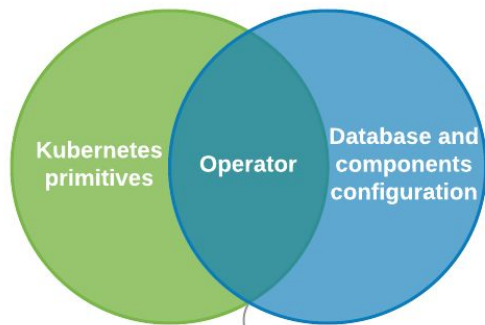
Databases on Kubernetes

- **Three pillars**
  - k8s primitives
  - configuration
  - infrastructure
- **Complexity**
  - Database
  - Components
  - Backups

Configuration

Kubernetes primitives

StatefulSet   StorageClass   Deployment

sc   deploy

pv   pod

```
[client]
port=3306
socket=/tmp/mysql.sock

[mysqld]
port=3306
socket=/tmp/mysql.sock
key_buffer_size=16M
max_allowed_packet=128M
```

Infrastructure

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Operators

Kubernetes primitives | **Operator** | **Database and components configuration**

Custom resource

```
spec:
  pxc:
    size: 3
    image:
percona/pxc:8.0.23
    ...
  proxysql:
    size: 3
    image:
    configuration:
  backup:
    storage:
      ...
```

- Abstract two pillars
- Get the Service, not database nodes
- Simplify and unify deployment
- Day-2 operations are automated

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Why Databases on K8S

Deploying databases manually

Databases with Operators

- **CNCF data ([2020 survey](#))**
  - 91% use k8s, 83% in production
- **Data on Kubernetes data ([2021 report](#))**
  - 70% already run stateful apps on K8S
- **Percona sees demand**
  - How can I run X on k8s?

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Databases on k8s - use cases

The Good

- Something-as-a-Service
- Development and testing
- Kubernetes shop

The Bad

- Mainframe
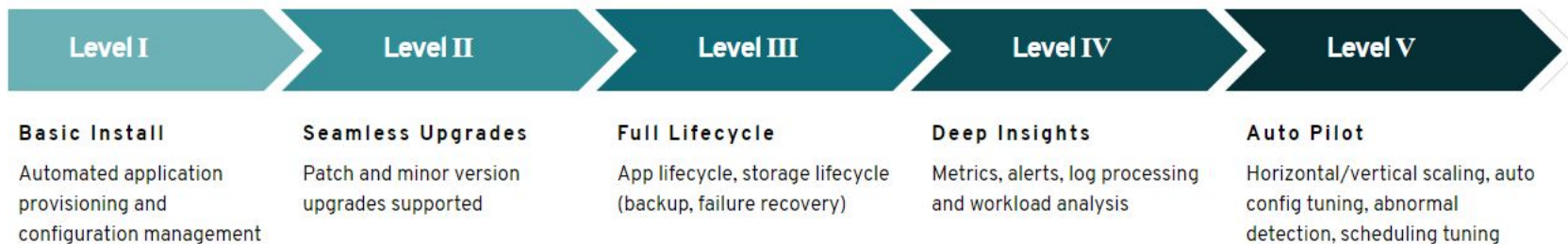- I heard it is good

The Ugly

- Start-up, one app, one DB

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Operators for various DBs

- **MySQL (**Oracle, Bitpoke (former Presslabs), Percona, KubeDB)
- **PostgreSQL (**Zalando, CrunchyData, Percona, KubeDB)
- **MongoDB (**MongoDB (community), Percona, KubeDB)
- **Cassandra (**Datastax)
- **ElasticSearch (**Elastic)
- **ClickHouse (**Altinity)
- **Redis** (Redis Labs)
- **CockroachDB (**Cockroach Labs)
- **YugabyteDB (**Yugabyte)
- **IBM Cloud**
- **MariaDB (**SkySQL)

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Operator Maturity Model

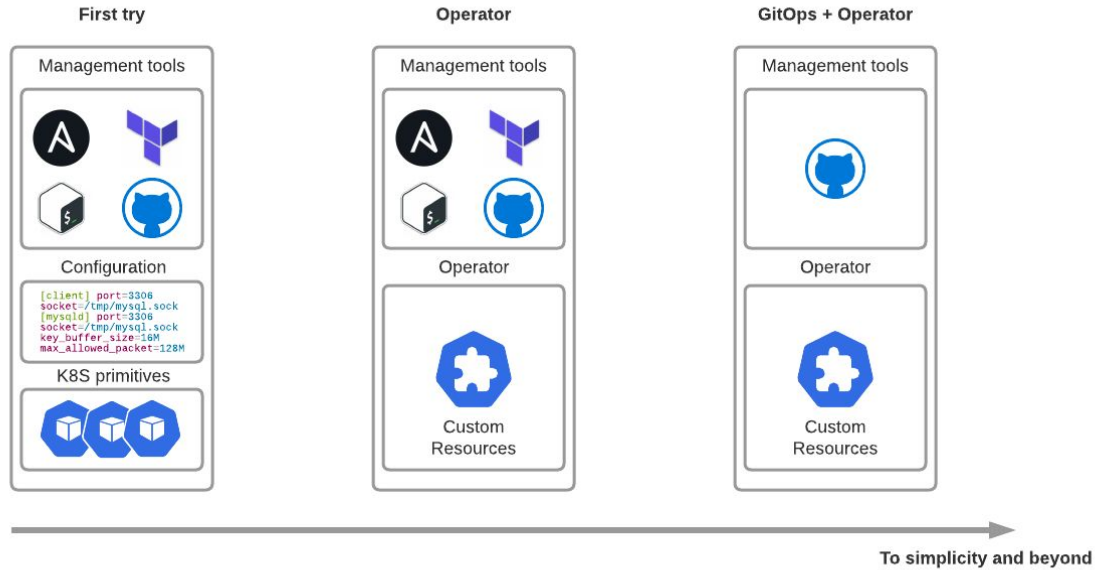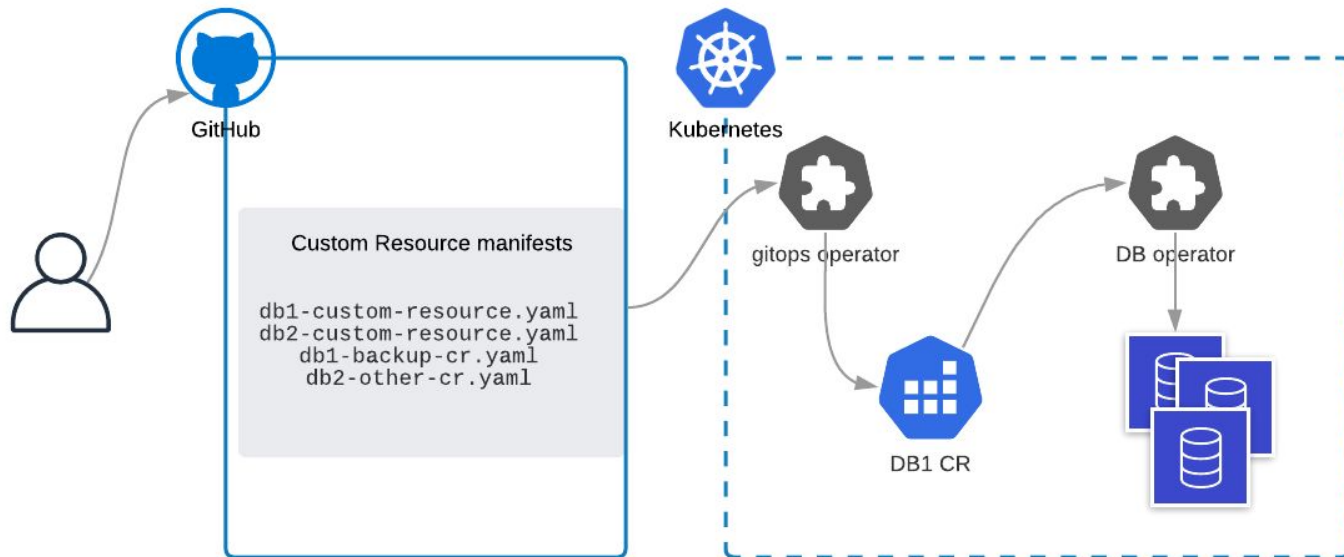| Level I	Level II	Level III	Level IV	Level V
Basic Install	**Seamless Upgrades**	**Full Lifecycle**	**Deep Insights**	**Auto Pilot**
Automated application provisioning and configuration management	Patch and minor version upgrades supported	App lifecycle, storage lifecycle (backup, failure recovery)	Metrics, alerts, log processing and workload analysis	Horizontal/vertical scaling, auto config tuning, abnormal detection, scheduling tuning

Links:

[Operator Framework](#)
[Operator Capability Levels](#)

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Evolution of DBaaS on k8s
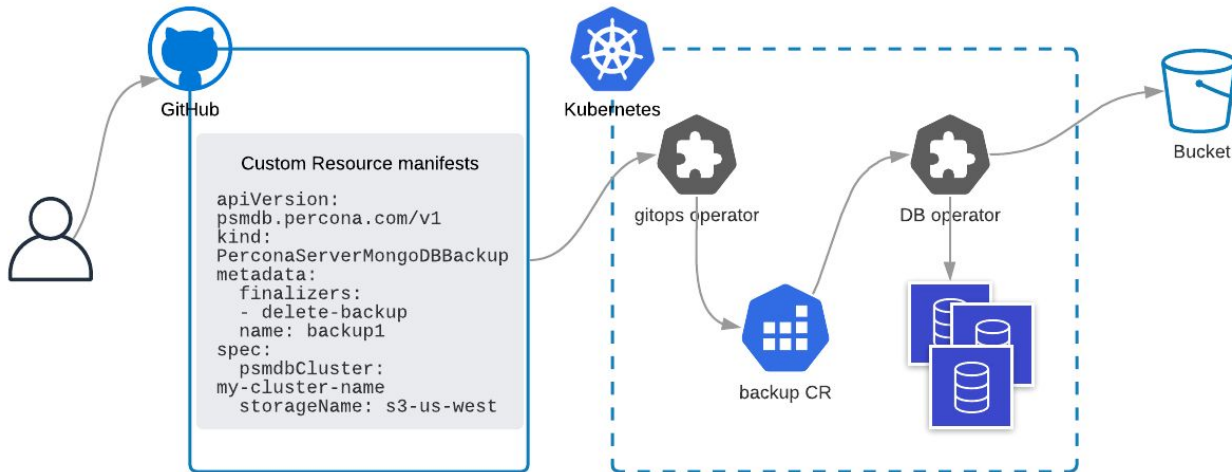
GitOps

Day-1 Operations

- **Usually boils down to Custom Resource manifests**
- **Easy to repeat**
- **CRUD through git**
  - Scaling
  - Updates
  - Other

Day-2 Operations

- **Depends on DB Operator capability**
- **Usuals are backups and restores**
  - Custom Resources

Demo

Let's Connect!

Thank you!

Questions?

- Twitter: @sergeypronin
- sergey.pronin@percona.com

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