ORACLE DevLive | Level Up | MySQL Summit

Introduction to MySQL Operator for Kubernetes

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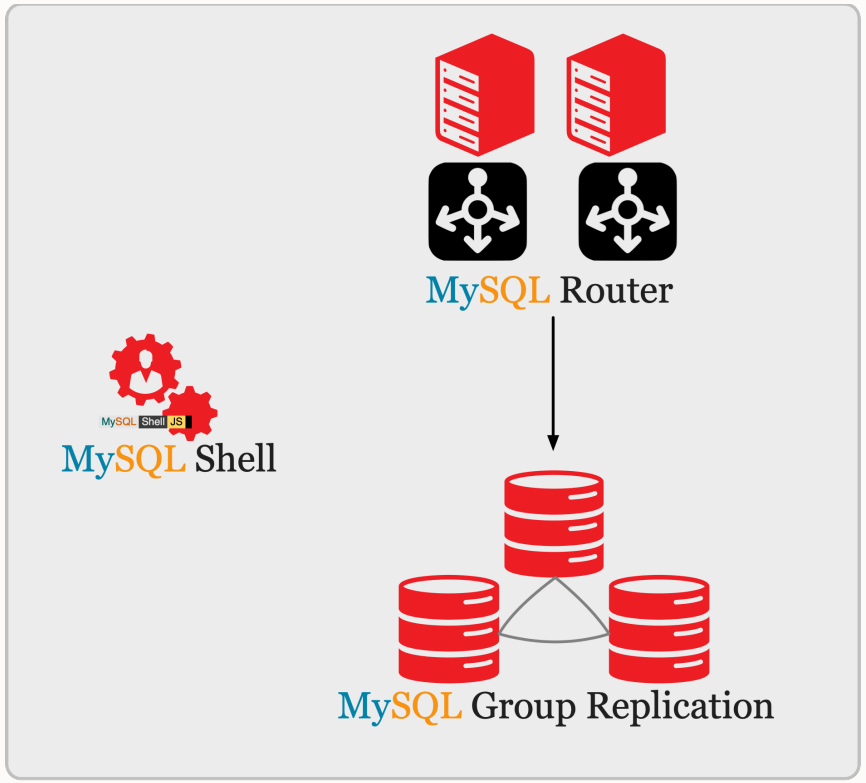
MySQL InnoDB Cluster

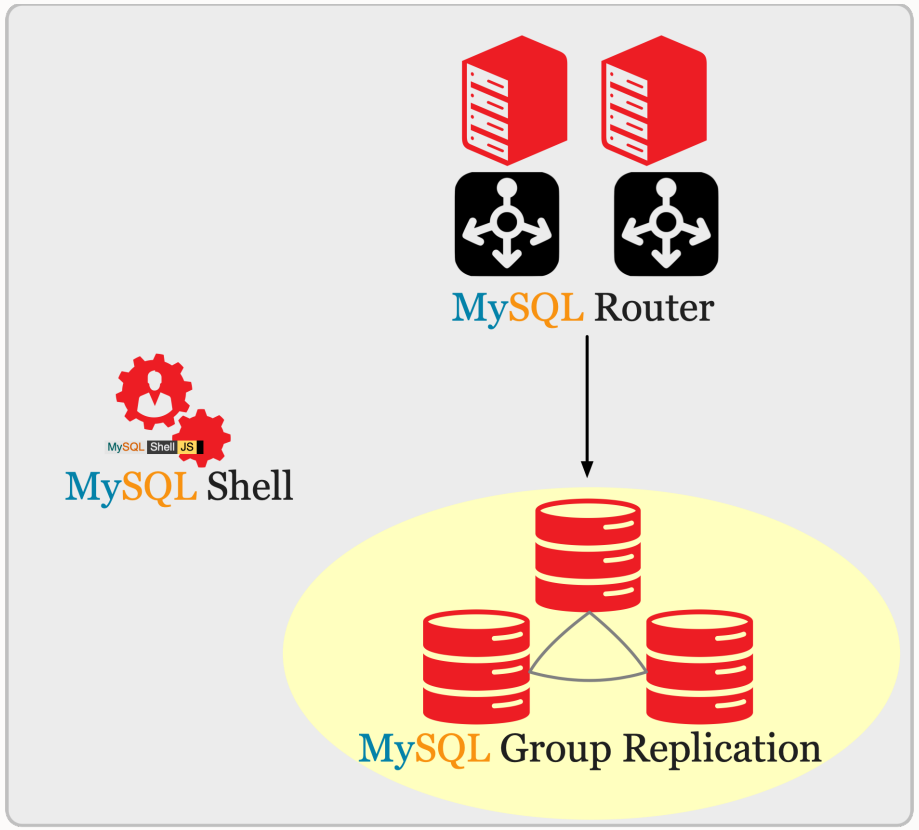
"A single product — MySQL — with high availability and scaling features baked in; providing an integrated end-to-end solution that is easy to use."



Components

- MySQL Server
- MySQL Group Replication
- MySQL Shell
- MySQL Router

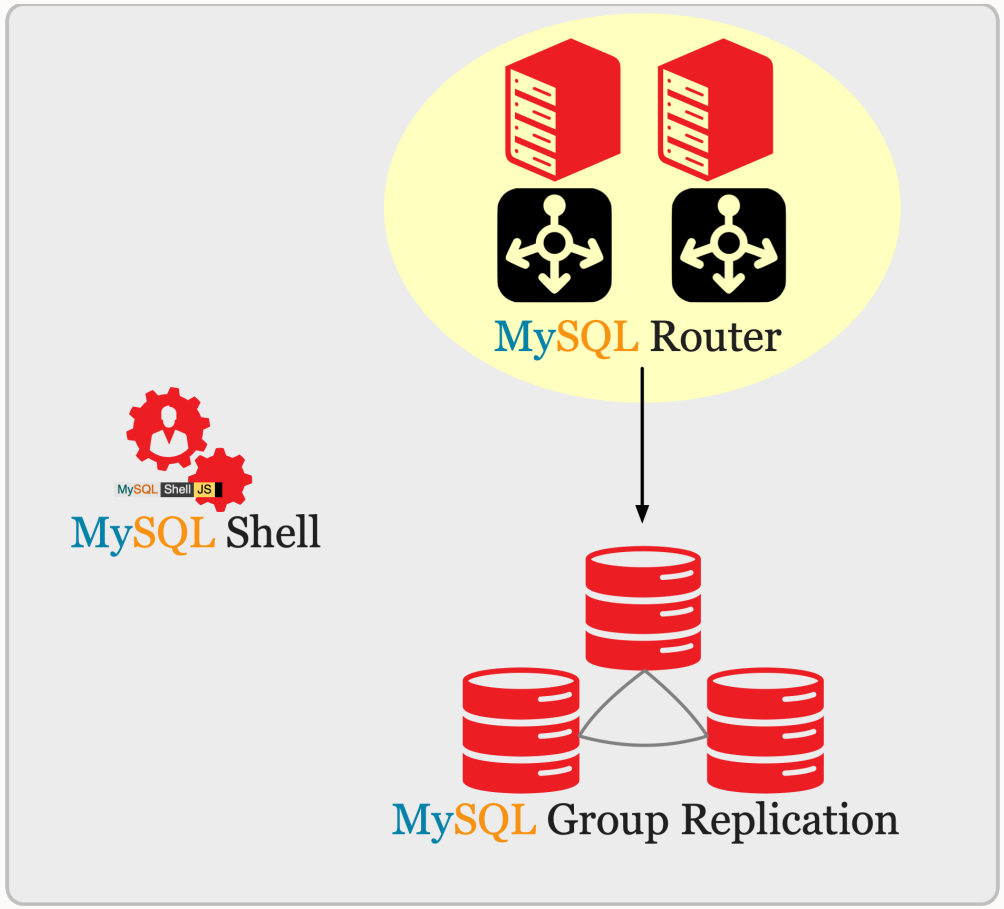
MySQL Group Replication



Highly Available Distributed MySQL DB

- Fault tolerance
- Automatic failover
- Active/Active update anywhere (limits apply)
  Automatic membership management
  - Adding/removing members
  - Network partitions, failures
- Conflict detection and resolution
- Prevent data loss

MySQL Router

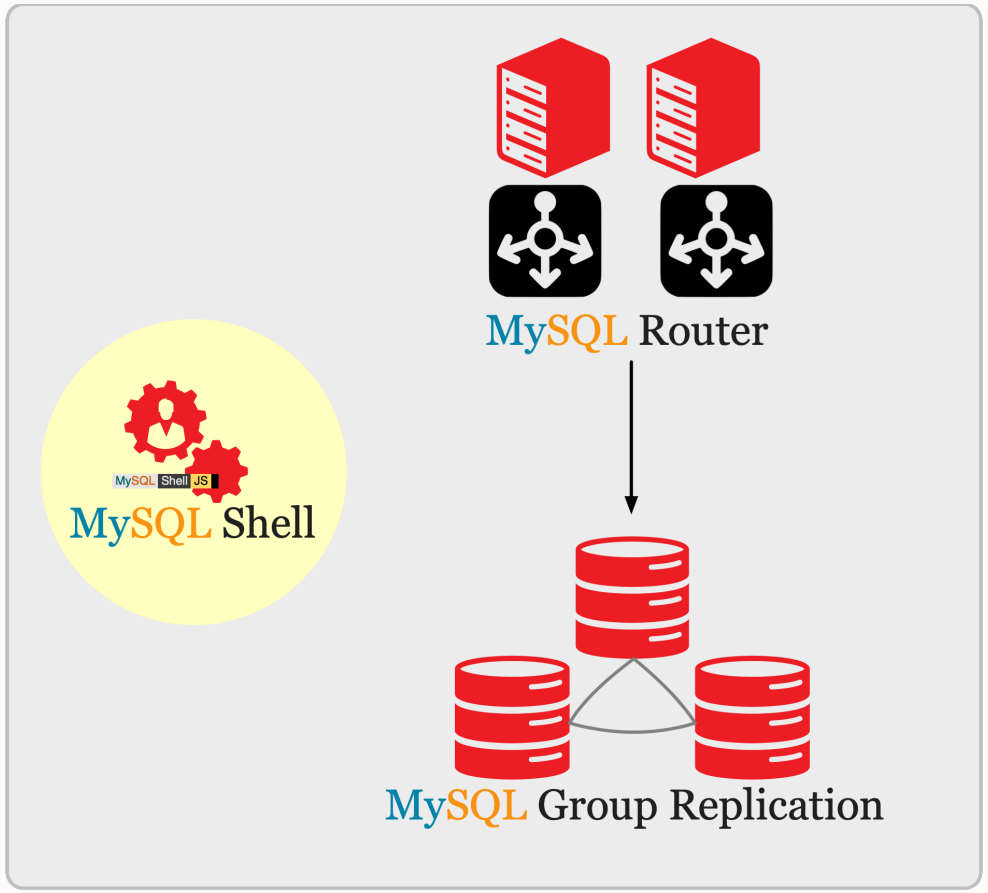


Transparent Access to Database Arch.

"provide transparent routing between your application and back-end MySQL Servers"

- Transparent client connection routing
  - Load balancing
  - Application connection failover
  - Little to no configuration needed
- Stateless design offers easy HA client routing
  - Router as part of the application stack
- Integration into InnoDB Cluster & InnoDB ReplicaSet
- 2 TCP Prots: **`PRIMARY`** and **`NON-PRIMARY`** traffic

MySQL Shell



Database Administration Interface

"MySQL Shell provides the developer and DBA with a single intuitive, flexible, and powerful interface for all MySQL related tasks!"

- Multi-Language: JavaScript, Python, and SQL
- Naturally scriptable
- Supports Document and Relational models
- Exposes full Development and Admin API
- Classic MySQL protocol and X protocol

Kubernetes

A portable, extensible, open-source platform for managing containerized workloads and services, that facilitates both declarative configuration and automation.

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Kubernetes Operator

Method of automatically deploying and managing a service.

Goals of an operator:

- Deployment
- Configuration
- Self-healing
- Backup & Restore
- Observability
- Using Kubernetes custom resources

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Both Kubernetes Operator
& MySQL InnoDB Cluster
share a common goal to make it easier to deploy, automate and manage a service.

MySQL Operator for Kubernetes

New MySQL Operator for Kubernetes

- Developed by MySQL team @ Oracle
  - same team that develops MySQL InnoDB Cluster
- Integrated with MySQL InnoDB Cluster
  - Coordinated development between both projects
- MySQL Operator for Kubernetes
  - K8s Operator leverages MySQL InnoDB Cluster to deploy the declared architecture
    - Keeps cluster healthy
    - Replaces instances when another fails
    - Recovers complete cluster goes offline
    - Can recover in certain quorum majority loss situations
  - Backup & Recovery

MySQL Group Replication - Use Cases

Consistency: No Data Loss (RPO=0)

- in event of failure of (primary) member
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  Automatic Network Partition handling

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Read Scaleout

- Add/Remove members as needed
- Replication Lag handling with Flow
- Control Congurable Consistency Levels
  - Eventual
  - Full Consistency -- no stale reads

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MySQL 8.0

Simplifying automation and container deployment

- MySQL InnoDB Cluster
- MySQL Shell dump/load
- **`CLONE` plugin**
- **`SET PERSIST`**
- **`RESTART`**
- **`performance_schema.error_log`**
- …

Connectors supporting DNS-SRV

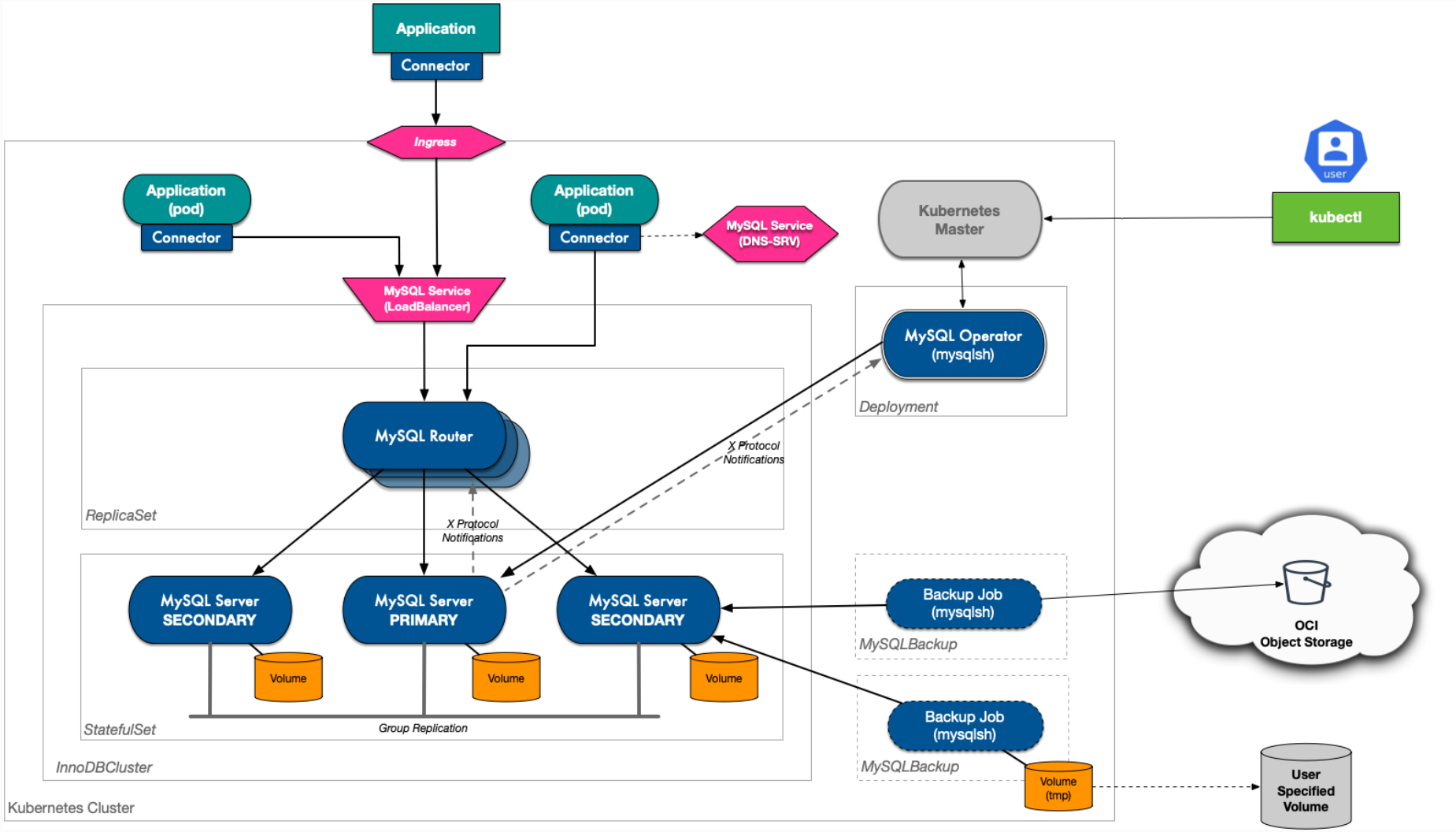
- 8.0.19
- DNS Service record - RFC 2782
  "defining the location, i.e., the hostname and port number, of servers for specified services"
- Available in:
  - Connector/NET
  - Connector/ODBC
  - Connector/J
  - Connector/Node.js
  - Connector/Python
  - Connector/C++

MySQL 8.0 Container Images

Improvements in 8.0.24+ aimed to make containers work better in kubernetes environments:

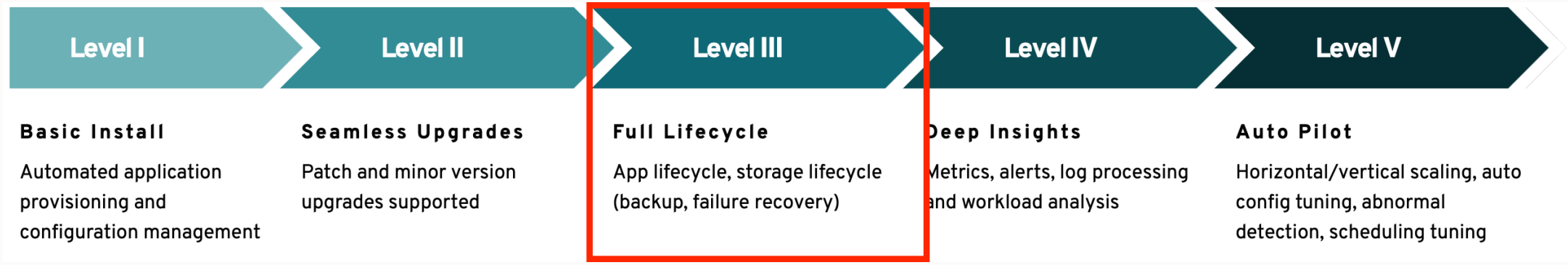
- Refactoring of to better support various flavors of Kubernetes
  - e.g: Supporting random user ID
  - **`RESTART`** capability
  - **`CLONE`** support
- MySQL Router Container GA
- Community & Commercial versions available on https://container-registry.oracle.com

MySQL Operator for Kubernetes



MySQL Operator for Kubernetes - Features

Level III Maturity Operator



- Automated deployment and management of
  - MySQL Server
  - MySQL Router
- Self-healing
- Backup & Restore to/from
  - AWS S3
  - OCI Object Storage
- Scaleup/Scaledown of Routers & Servers
- Rolling upgrades with minimal downtime
- Configuration Management
- Deploy from InnoDB CLONE
- Private container registries
- CNCF cert-manager support
- Community Edition, Open Source License (UPL)
- Enterprise Edition
  - Data Masking
  - Encryption Functions
  - Keyring Functions
- Fully supported by Oracle