High-availability with Galera Cluster for MySQL

FromDual Company Meeting
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www.fromdual.com

About FromDual GmbH

- FromDual provides neutral and independent:
  - Consulting for MySQL, Galera Cluster, MariaDB and Percona Server
  - Support for all MySQL and Galera Cluster
  - Remote-DBA Services for all MySQL
  - MySQL Training
- Open Source Business Alliance (OSBA)
- Member of SOUG, DOAG, /ch/open

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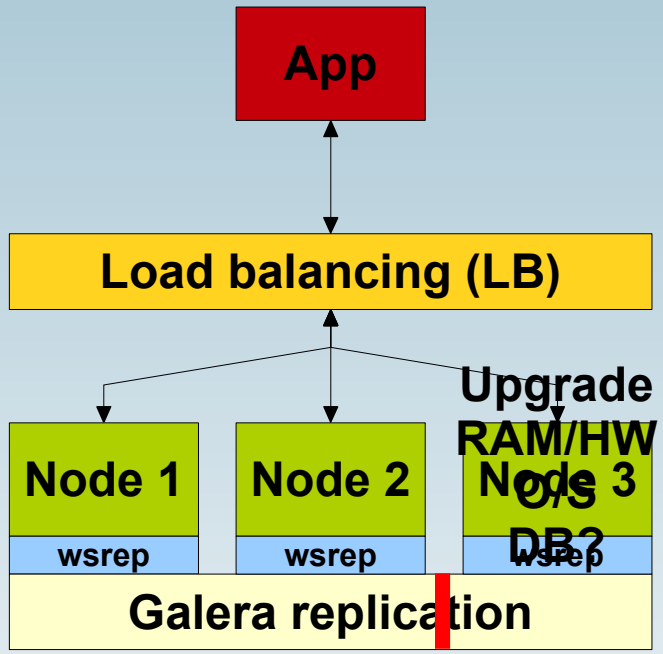
High-Availability :-(

- Who loves night-shifts?
- Who loves weekend-work?
- Who does regular upgrade (DB, kernel, etc.)?
- Who does regular reboots (after kernel upgrade)?

- Why are you not doing it in your office hours?

The Galera Cluster for MySQL

Maintenance time...



Advantages / Disadvantages

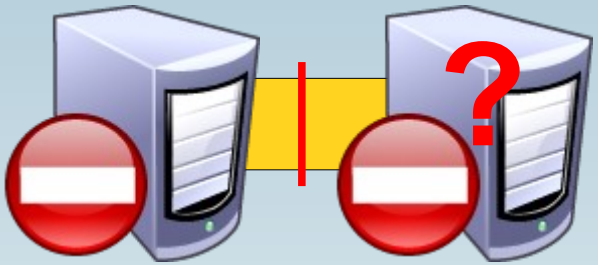
- Based on InnoDB SE
- Synchronous replication → No lost transaction
- Active-active multi-master Cluster

  → Read and write to any cluster node (no r/w split any more!)
- Read scalability and higher write throughput (Flash-Cache?)
- Automatic node membership control
- Rolling Restart (Upgrade of Hardware, O/S, DB release, etc.)
- True parallel replication, on row level

  → No slave lag
- A bit more complicated than normal MySQL, but similar complexity as M/S Replication!
- No original MySQL binaries → Codership MySQL binaries
- Be aware of Hot Spots on rows: Higher probability of deadlocks

Quorum and split-brain

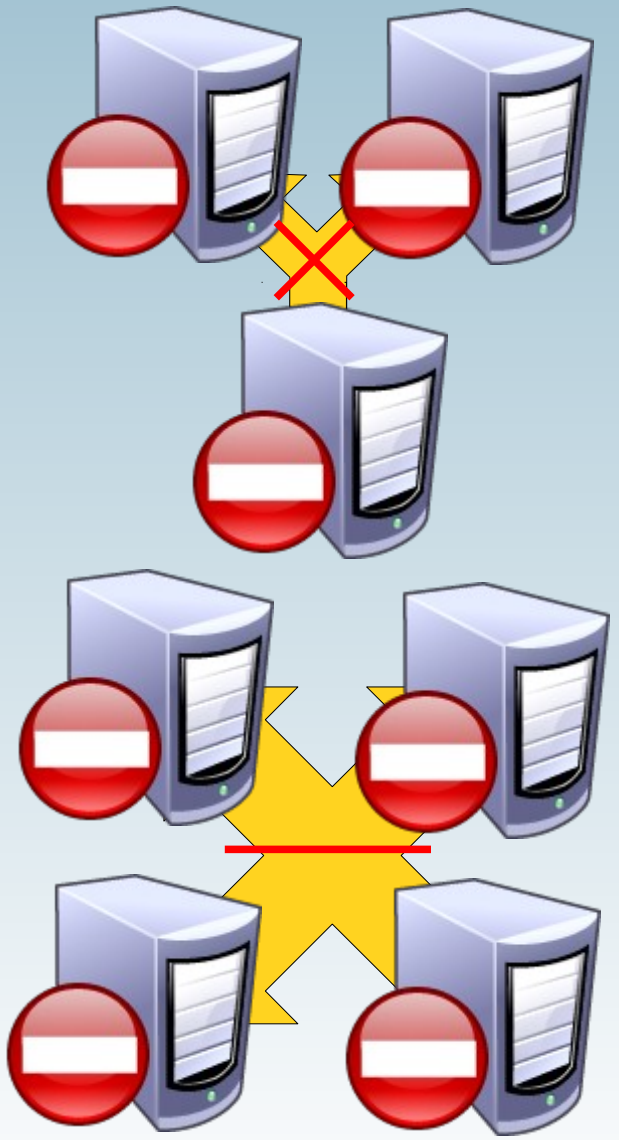
- What is the problem?
- Split-brain → bad!



- Galera is a pessimistic Cluster → good!
- Quorum: `FLOOR(n/2+1)`

  → more than half! → 3-node Cluster (or 2+1)

Quorum



Installation and Configuration

Installation

- Galera Cluster consists of:
  - A patched Codership MySQL (`mysqld`)
    - Or MariaDB Galera Cluster
    - Or Percona XtraDB Cluster
  - The Galera Plugin (`libgalera_smm.so`)
- Ways of installation
  - Packets (RPM, DEB)
  - Binary tar-ball
  - Patch MySQL source and compile both
- Download http://galeracluster.com/downloads/

MySQL Configuration

my.cnf

```
[mysqld]

default_storage_engine          = InnoDB
binlog_format                   = row

innodb_autoinc_lock_mode        = 2   # parallel applying

innodb_flush_log_at_trx_commit = 0   # performance only!

query_cache_size                = 0   # Galera 3 → experimental
query_cache_type                = 0   # Mutex! Consistency!
```

Galera Configuration

my.cnf (conf.d/wsrep.cnf)

```
[mysqld]

# wsrep_provider                  = none
wsrep_provider                  = …/lib/plugin/libgalera_smm.so

# wsrep_cluster_address           = "gcomm://"
wsrep_cluster_address           = "gcomm://ip_node2,ip_node3"

wsrep_cluster_name              = 'Galera Cluster'
wsrep_node_name                 = 'Node A'

wsrep_sst_method                = mysqldump
wsrep_sst_auth                  = sst:secret
```

Operations

Initial Cluster start

- Start very 1st node with:

```
wsrep_cluster_address = "gcomm://"
```

or

```
mysqld_safe --wsrep-cluster-address="gcomm://"
```

  - → this tells the node to be the first one!
- All other nodes normal:

```
service mysqld start
```

Rolling Restart

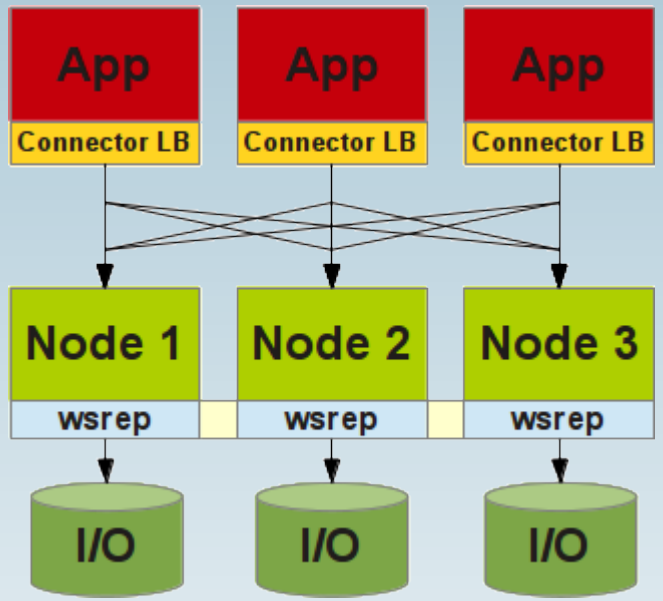
- Scenario:
  - Hardware-, O/S-, DB- and Galera-Upgrade
  - MySQL configuration change
  - During full operation!!! (99.999% HA, 5x9 HA)

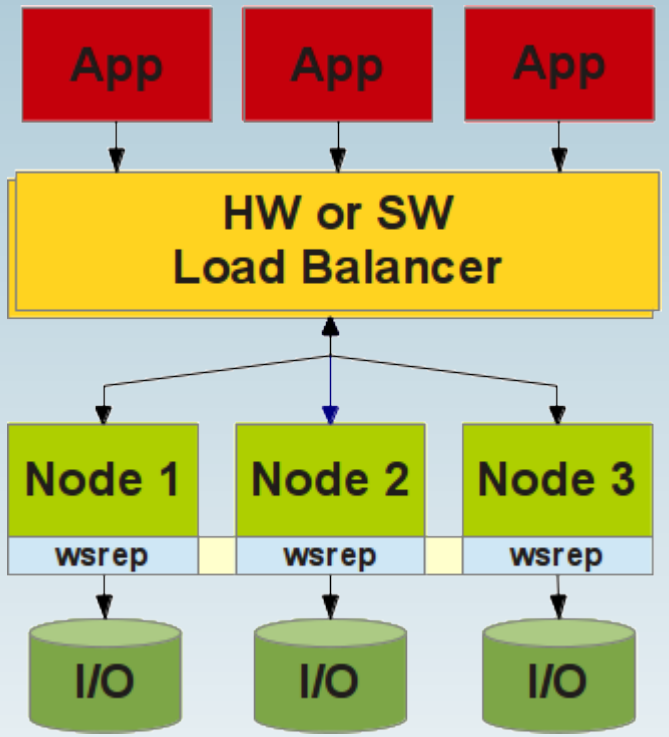
- → Rolling Restart
  - Start one node after the other in a cycle
  - New features or settings are used after Rolling Restart is completed

Load Balancing

- Connectors
  - Connector/J
  - PHP: MySQLnd replication and load balancing plug-in
- SW Load Balancer
  - GLB, LVS/IPVS/Ldirector, HAProxy
- HW Load Balancer

Location of Load Balancing





Online Schema Upgrade (OSU)

- Schema Upgrade = DDL run against the DB
  - Change DB structure
  - Non transactional
- 2 Methods:
  - Total Order Isolation (TOI) (default)
  - Rolling Schema Upgrade (RSU)
- `wsrep_osu_method = {TOI|RSU}`

Online Schema Upgrade

- Total Order Isolation (TOI) (default)
  - Part of the database is locked for the duration of the DDL.
  - + Simple, predictable and guaranteed data consistency.
  - - Locking operation
  - Good for fast DDL operations
- Rolling Schema Upgrade (RSU)
  - DDL will be only processed locally at the node.
  - Node is desynchronized for the duration of the DDL processing.
  - After DDL completion, delayed write sets are applied (similar to IST).
  - DDL should be manually executed at each node.
  - + only blocking one node at a time
  - - potentially unsafe and may fail if new and old schema are incompatible
  - Good for slow DDL operations

We want you!

- Database enthusiast for support / remote-DBA / consulting

Q & A

Questions ?

Discussion?

We have time for some face-to-face talks...

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