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# GOPS

# 2017 全球运维大会



北京站

指导单位：



数据中心联盟  
Data Center Alliance



开放运维联盟  
OOPSA Open OPS Alliance

大会时间：7月28-29日

主办单位：



高效运维社区  
Great OPS Community



DevOps 时代



CIO时代  
CIO APP

大会地点：北京朝阳悠唐皇冠假日酒店

# Three steps to clustering your MySQL Environment

## ——MNC、MGC与MIC

周彦伟  
2017.7

# Outline

**1** About me

**2** About MySQL HA

**3** About MySQL Clustering

**4** MNC

**5** MGC

**6** MIC

# About me



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- Renren DB Team (2009-2013)
- Qunar DB Team (2013-2017)
- MySQL Inception (open source)
- 《MySQL运维内参》
- Oracle MySQL ACE Director
- All China MySQL User Group (ACM)
- Open-source Database Fourum (ODF)
  - 2017.8.24-25 Beijing
  - 2017.10.28 Taipei



ID:formysql

# About MySQL HA

## MySQL High-Availability & Scale-Out Solutions



# About MySQL Clustering

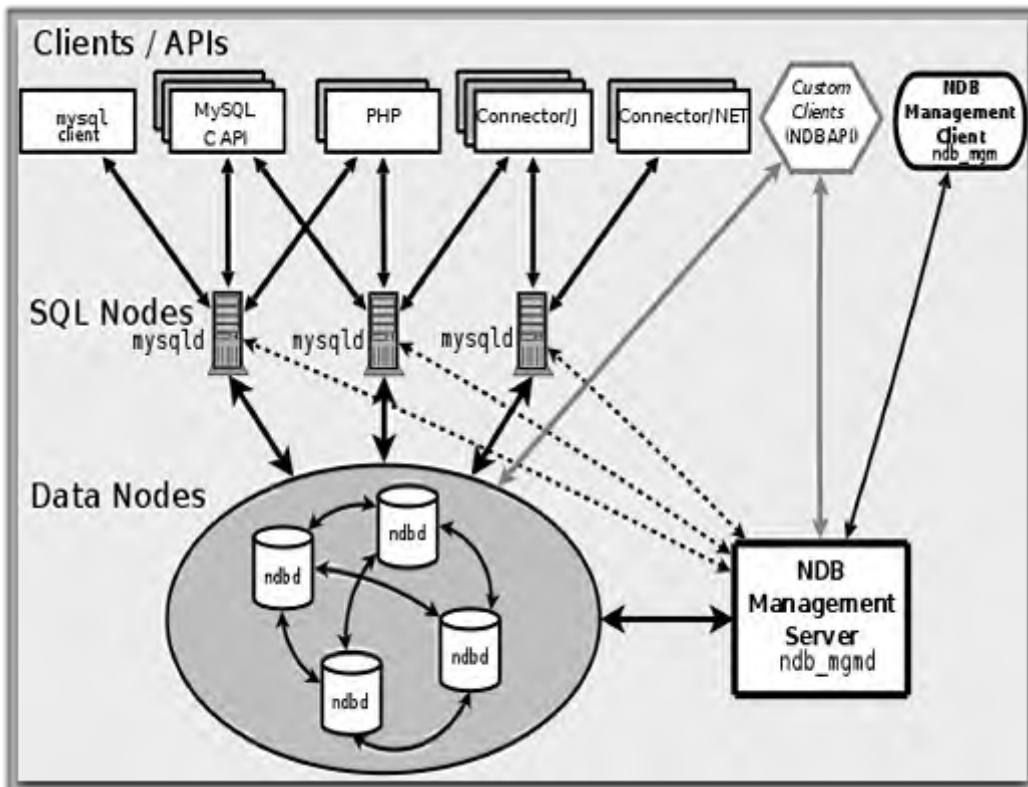


- MNC
  - MySQL NDB Cluster
- MGC
  - MySQL Galera Cluster
    - Percona XtraDB Cluster
    - MariaDB Cluster
- MIC
  - MySQL InnoDB Cluster

# MySQL NDB Cluster(MNC)



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# NDB API — NoSQL



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## SQL

- Industry standard
- Joins & complex queries
- Relational model

## Memcached

- simple to use API
- key/value
- driver for many languages
- ideal as e.g. PHP proxy

## mod\_ndb

- REST/JSON
- HTML
- using Apache

## ClusterJ

- simple to use Java API
- Web & telco
- Object Relational Mapping
- native & fast access to MySQL Cluster

## C++

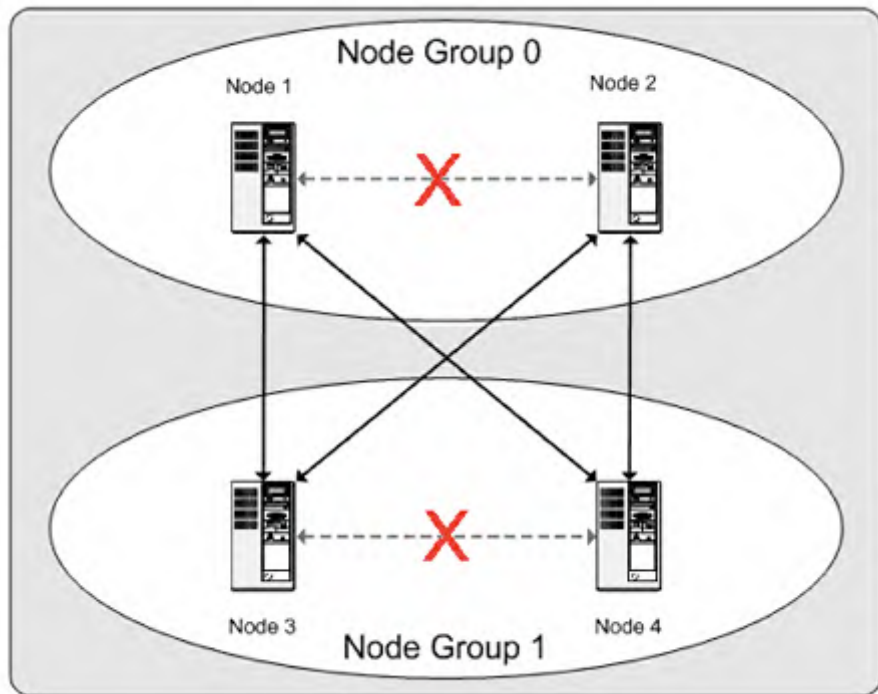
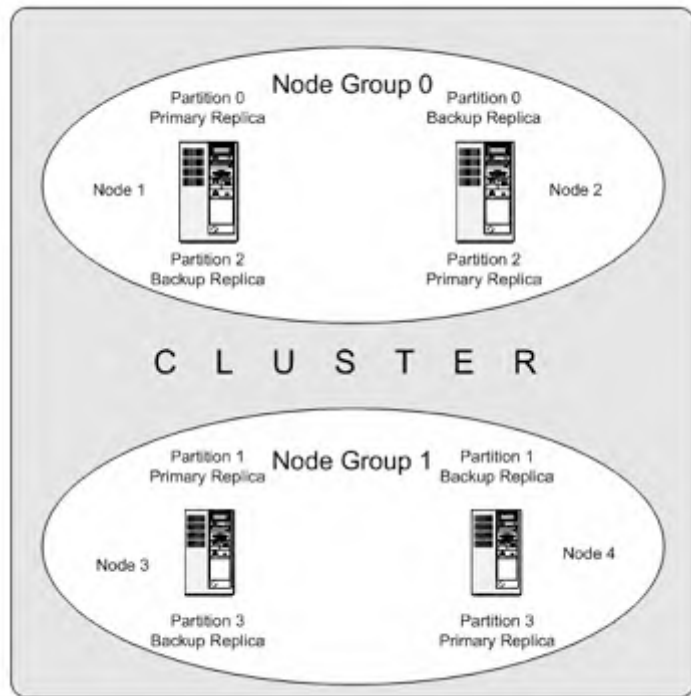
- experienced developer
- ultra low latency / real-time



# Node Groups, Replicas, Partitions



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# MySQL NDB Cluster(MNC)



- Network DataBase
- In-Memory
- Shared-Nothing
- Auto-Sharding
- High-Availability
- Data-Persisnce
- Read/Write  
consistency/scalability

# MNC Components

- SQL Nodes—MySQL Servers
  - SQL Access to data
  - Round-robin app access
  - Geographic Replication
  - Scale out for performance

# MNC Components

- Data Nodes—Ndbd Servers
  - Data storage & management
  - Transparent sharding
  - Synchronous replication
  - Scale out for capacity/performance

# MNC Components

- Management servers
  - Distribute configuration data
  - Control Cluster membership
  - Arbitrator in case of network partitioning

# Management of MNC

- MySQL Cluster Auto-installer
- Client Program
  - ndb\_mgm
- Rolling Restart
- ndbinfo—NDB Cluster Information

# Problems of MNC

- Cluster size
- Network dependence
- Complex SQL Optimazition
- Management & Cost



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# Limitations of NDB Cluster

21.1.6.1 Noncompliance with SQL Syntax in NDB Cluster

21.1.6.2 Limits and Differences of NDB Cluster from Standard MySQL Limits

21.1.6.3 Limits Relating to Transaction Handling in NDB Cluster

21.1.6.4 NDB Cluster Error Handling

21.1.6.5 Limits Associated with Database Objects in NDB Cluster

21.1.6.6 Unsupported or Missing Features in NDB Cluster

21.1.6.7 Limitations Relating to Performance in NDB Cluster

21.1.6.8 Issues Exclusive to NDB Cluster

21.1.6.9 Limitations Relating to NDB Cluster Disk Data Storage

21.1.6.10 Limitations Relating to Multiple NDB Cluster Nodes





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昨夜西风凋碧树  
独上高楼，  
望断天涯路！



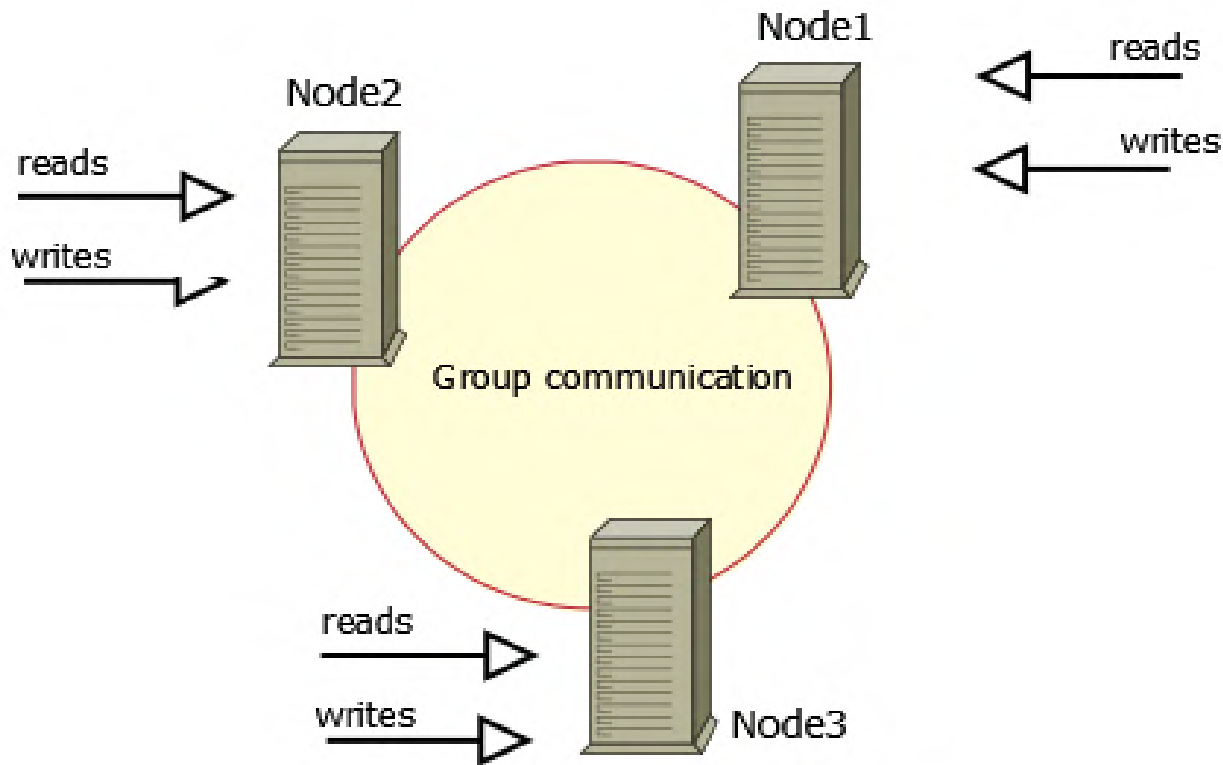
# MySQL Galera Cluster ( MGC )

- True Multi-Master Cluster
- Read and Write to any cluster node
- Synchronous Replication
- True Parallel Replication
- Auto Management

# MySQL Galera Cluster ( MGC )



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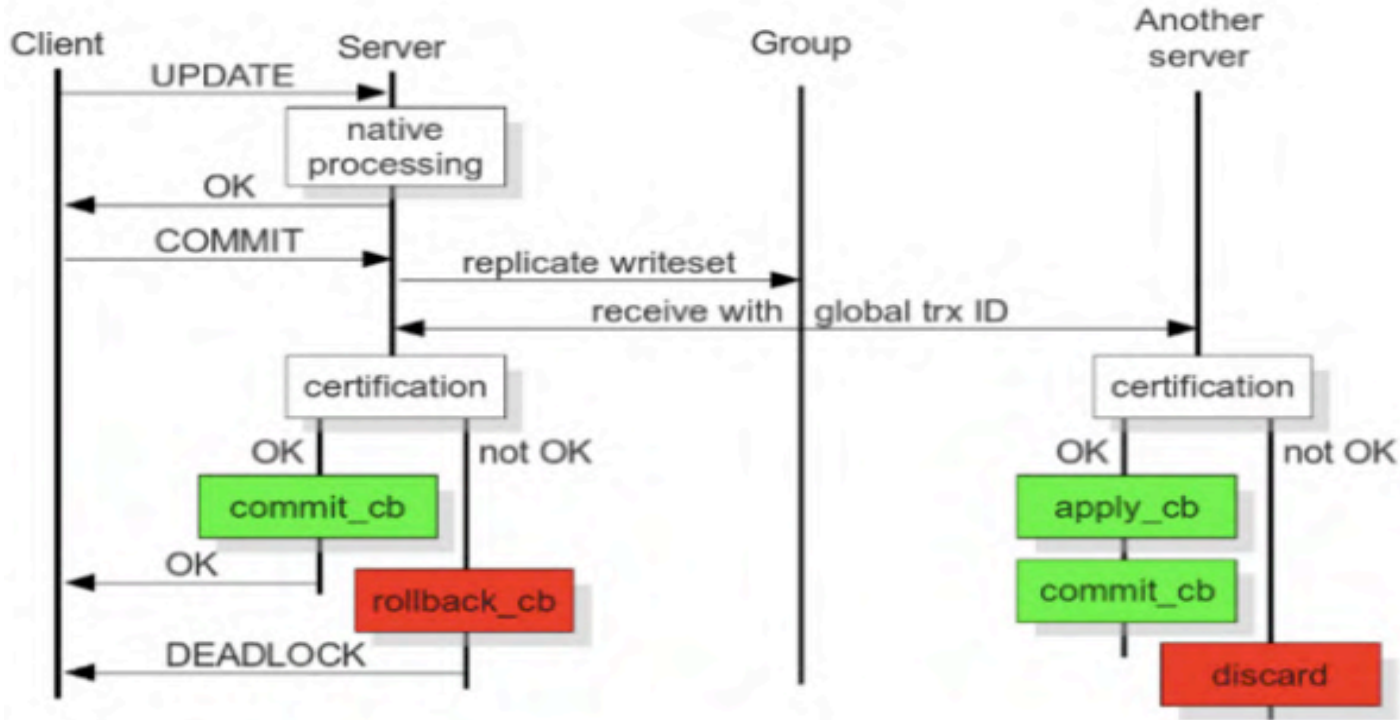


# Certification-Based Replication



- Transactional Database
- Atomic Changes
- Global Ordering
- Group Communication
- Transaction Ordering/GTID

# Certification-Based Replication



# MGC Projects-PXC

- ProxySQL Load Balancer
- Percona Server
- Percona XtraBackup
- Galera Cluster
- Peronca Monitoring and Management



# MGC Projects-MariaDB



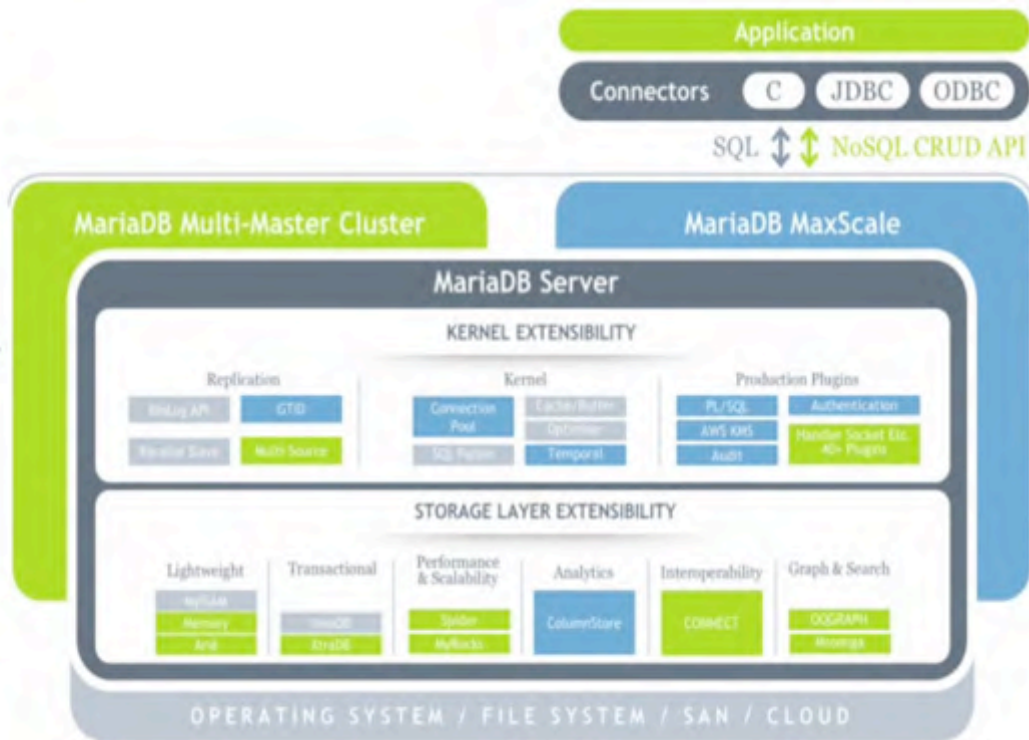
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- Original Core MariaDB
- MariaDB Engineering
- Community Contribution



MariaDB

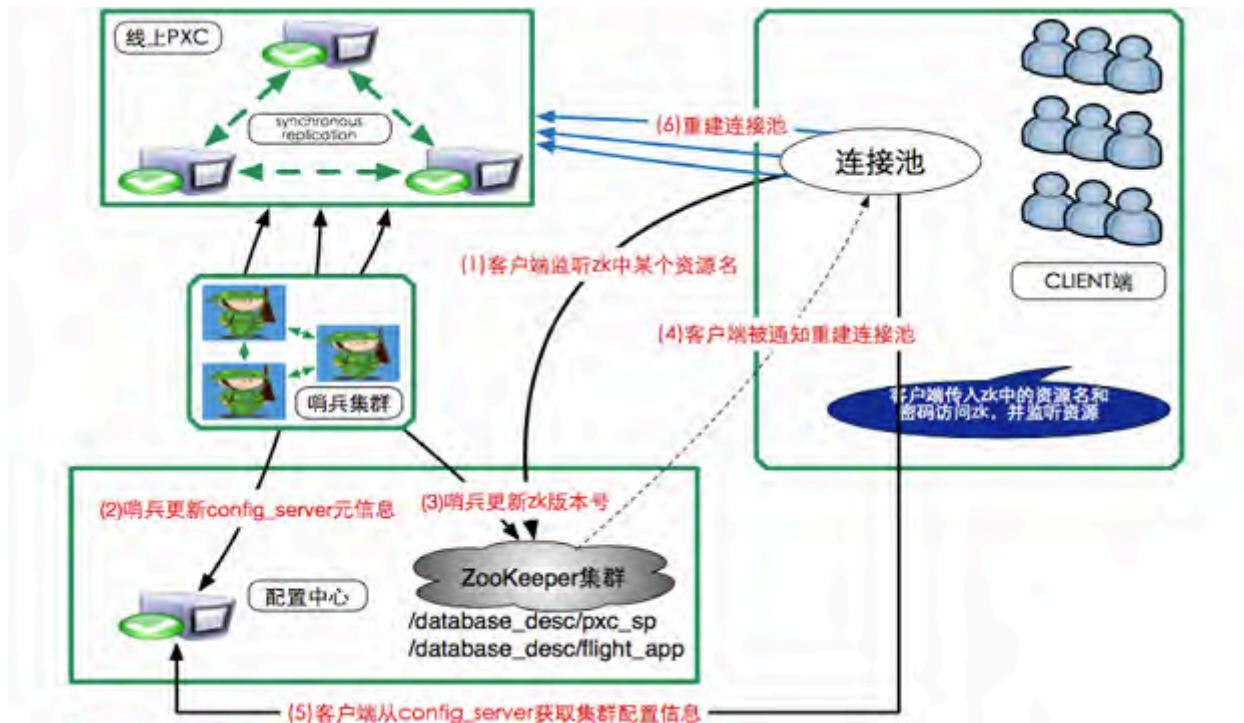
Replicas  
Supporting  
Asynchronous,  
Semi-Sync &  
Synchronous  
replication



# MGC Projects-QunarDB



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# Problems of MGC

- DDL
- Multi-Write
- Flow Control
- Big Transaction
- GCache Size
- Network & Disk



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# 衣带渐宽终不悔为伊消得人憔悴

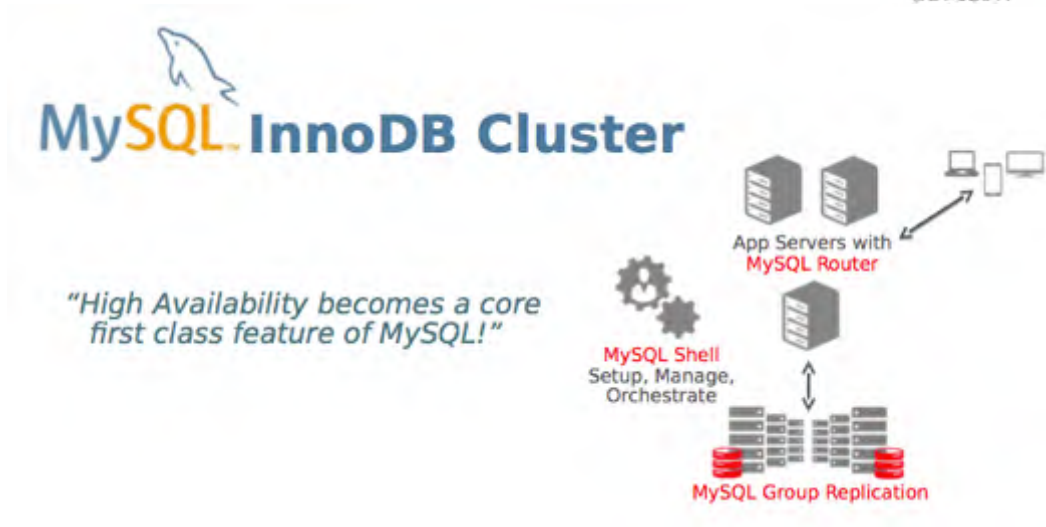


# MySQL InnoDB Cluster(MIC)

- Built into MySQL 5.7+
- InnoDB Storage Engine
- Write consistency
- Read Scalability
- MySQL Document Store

# MIC Components

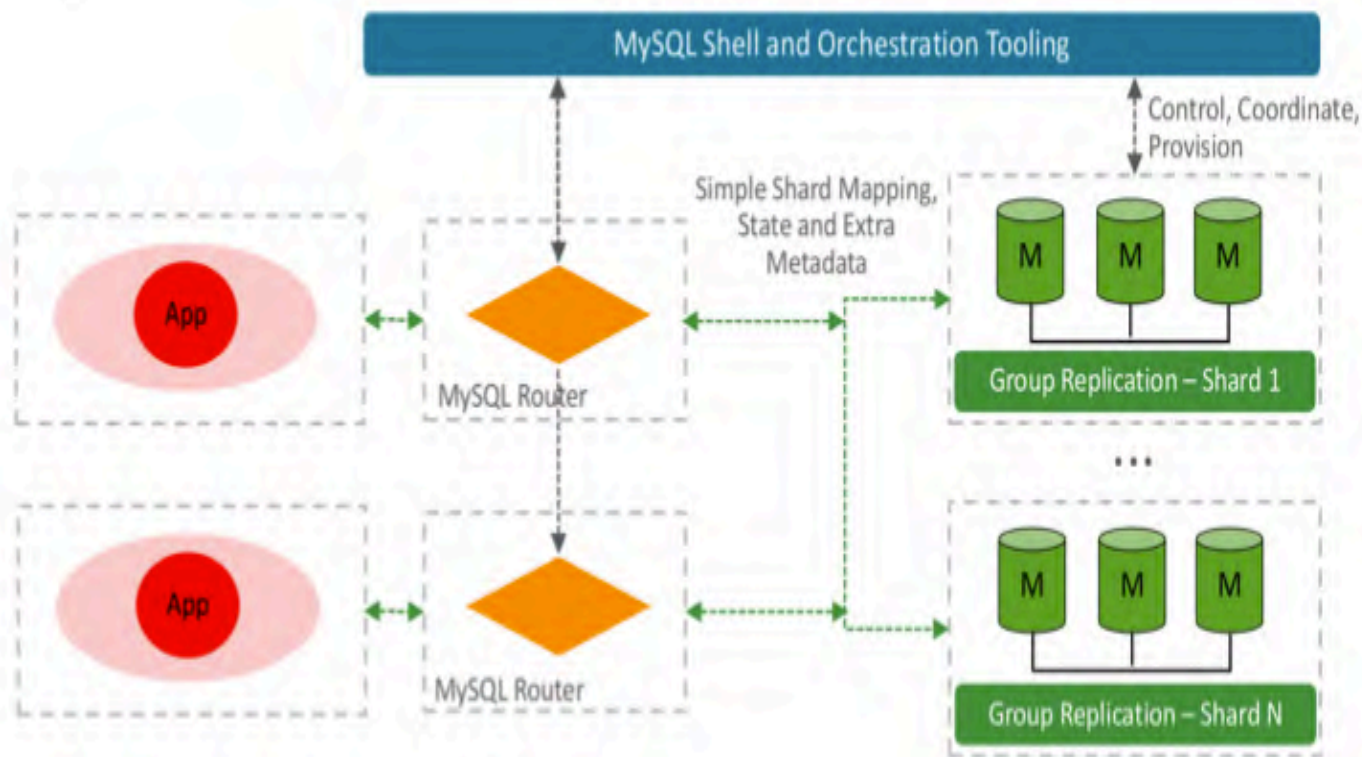
- MySQL Router
- MySQL Shell
- MySQL Group Replication



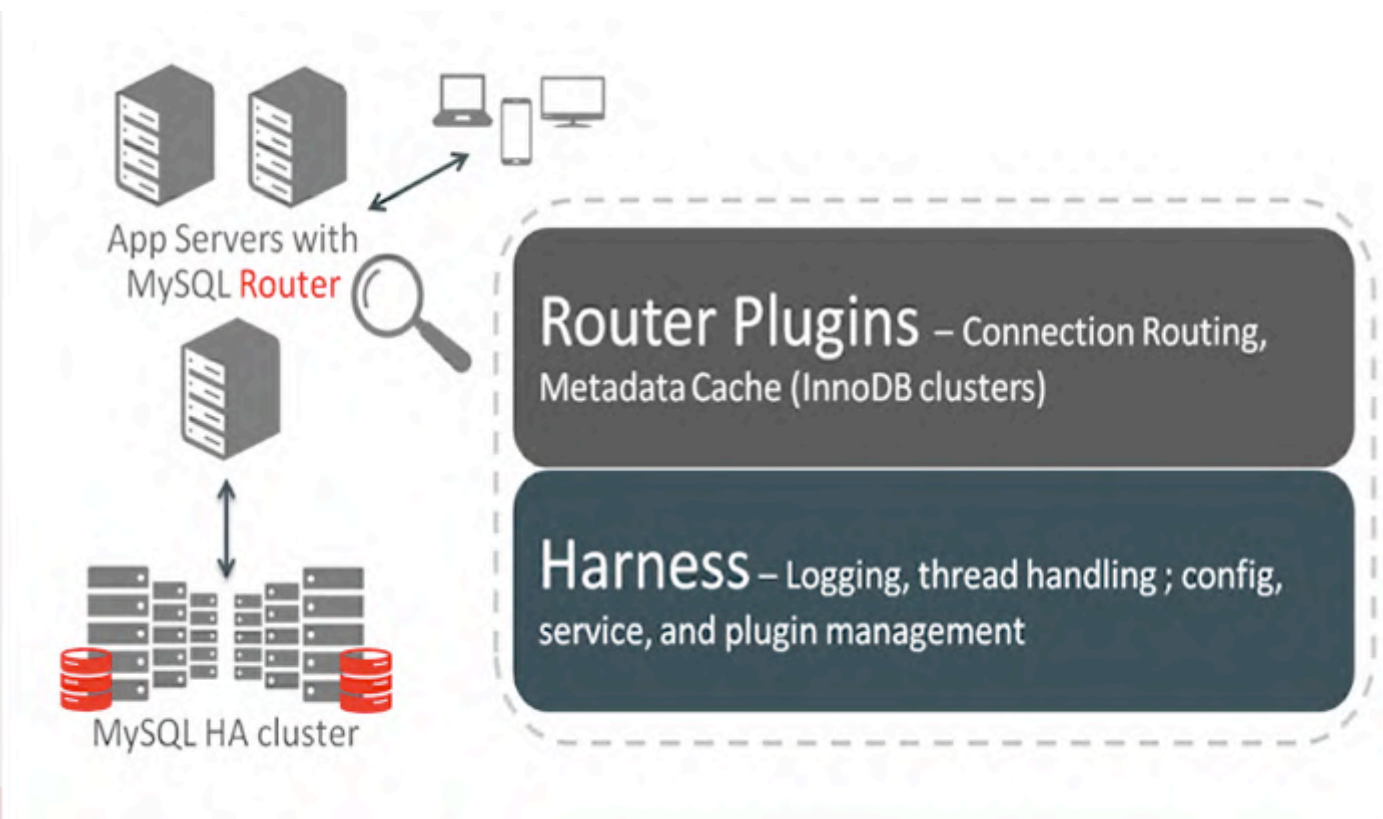
# MIC Architechure



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# MySQL Router

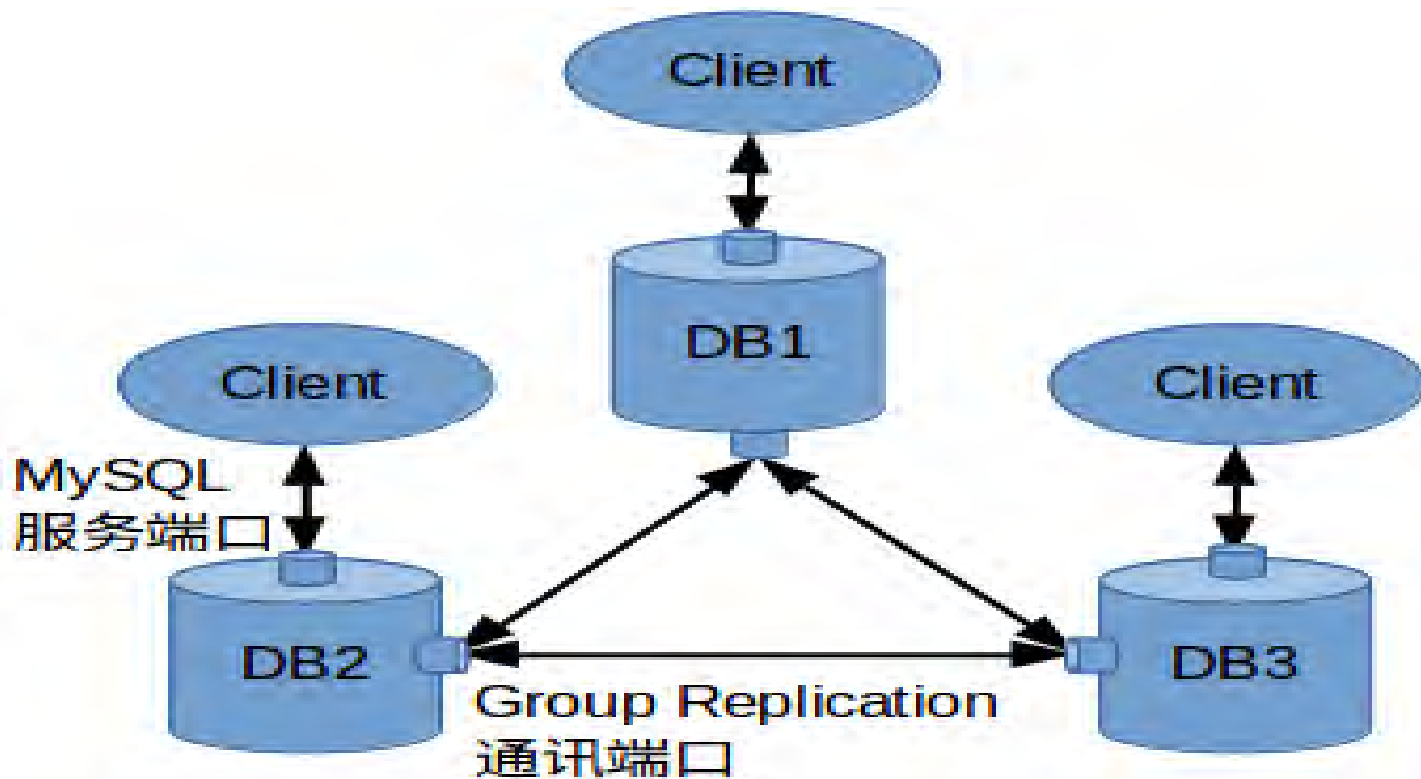


# MySQL Shell



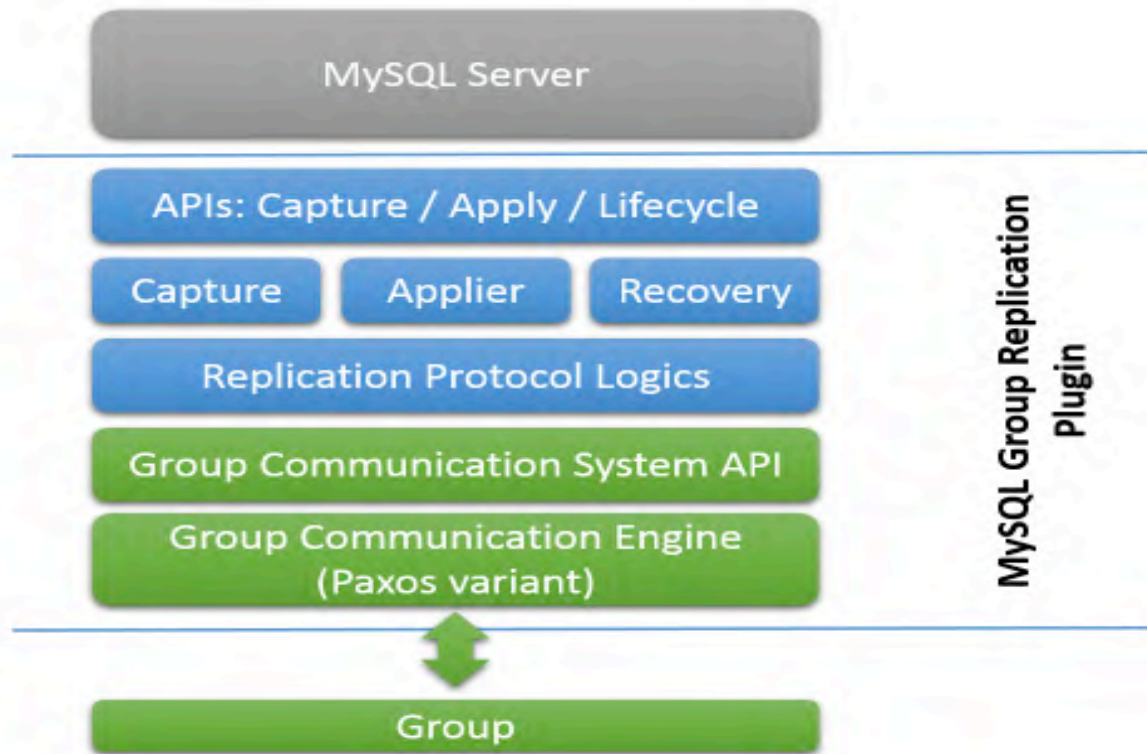
- XProtocol
  - XDevAPI : Relational & Document Data
  - JavaScript
  - Python

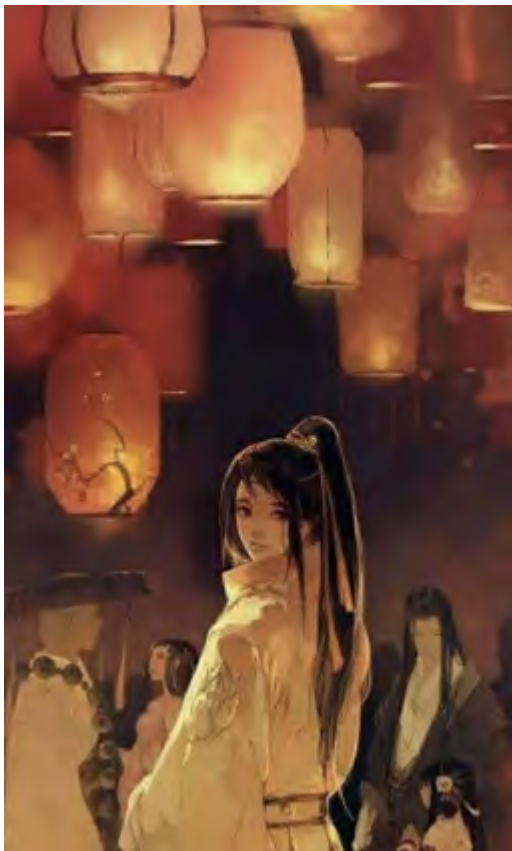
# MySQL Group Replication





# MySQL Group Replication

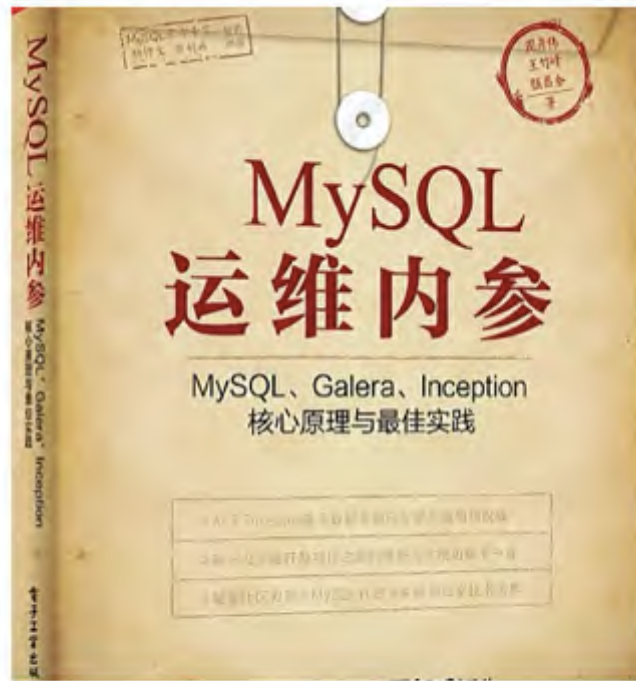




众里寻他千百度，  
蓦然回首，  
那人却在灯火阑珊处  
！

# About My Book

- Internals and experience
  - MySQL
  - InnoDB
  - Galera Internals
  - MySQL Group Replication
  - Inception



长按或扫描二维码  
查看详情

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## 会议

- 8月18日 DevOpsDays 上海
- 全年 DevOps China 巡回沙龙
- 11月17日 DevOps金融上海

## 培训

- EXIN DevOps Master 认证培训
- DevOps 企业内训
- DevOps 公开课
- 互联网运维培训

## 咨询

- 企业DevOps 实践咨询
- 企业运维咨询



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# Thanks

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荣誉出品



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