



Virtual Developer Day—MySQL
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ORACLE

Welcome to Virtual Developer Day – MySQL!

Keynote: Developer and DBA Guide to What's New in MySQL

Andrew Morgan - MySQL Product Management
@andrewmorgan
www.clusterdb.com

Program Agenda

1:00 PM	Keynote: What's New in MySQL	
	Track 1 MySQL Essentials	Track 2 MySQL Deep Dive
1:30 PM	Session: MySQL Essentials - Learn MySQL Basics in 45 Minutes	Session: New InnoDB Features in MySQL 5.6
2:15 PM	HOL: Getting Started with MySQL	Session: Profiling with MySQL Performance Schema
3:15 PM	Session: MySQL Backup – From Strategy to Implementation	MySQL and Hadoop – Big Data Integration
4:00 PM	HOL: Getting Started with MySQL Replication	Demo: Monitoring in Action: The MySQL Enterprise Monitor
5:00 PM	Event Close	

Session Agenda

- Oracle's Investment in MySQL
- MySQL 5.6 Features Overview
- MySQL Cluster 7.3 Feature Overview
- MySQL in Big Data
- More Resources

Safe Harbor Statement

The following is intended to outline our general product direction. It is intended for information purposes only, and may not be incorporated into any contract. It is not a commitment to deliver any material, code, or functionality, and should not be relied upon in making purchasing decision. The development, release, and timing of any features or functionality described for Oracle's products remains at the sole discretion of Oracle.

World's Most Popular Open Source Database

- Over 15 million estimated installations
- Used by 9 of top 10 web sites in the world
- Embedded by 8 of the top 10 ISVs
- #1 database in the Cloud
- Integrated w/Hadoop in 80% of Big Data platforms
- Facebook: 220K fans, +35% YoY Growth
- Twitter: 35K followers, +67% YoY Growth
- Numerous Awards: Linux Journal, CRN, PHP Architect...

Industry Leaders Rely on MySQL

Logos of various web and enterprise companies:

- eBay
- facebook
- WIKIPEDIA
- Telefonica
- Twitter
- Voyages-sncf.com
- ticketmaster
- YouTube
- Tennet
- SHINSEI BANK
- flickr
- at&t
- Office DEPOT.
- BBC
- INTESA SANPAOLO
- Rikspolisstyrelsen

Web & Enterprise

Logos of various OEM & ISVs:

- Autodesk
- sage
- f5
- AVAYA
- Check Point SOFTWARE TECHNOLOGIES LTD.
- InfoVista
- CISCO
- TECNOTREE
- GE
- McAfee
- EMC²
- Alcatel-Lucent
- Symantec
- ca technologies
- eClinicalWorks

OEM & ISVs

Logos of various cloud service providers:

- amazon web services
- Joyent smart computing
- Google App Engine
- Zimbra
- Atos Worldline
- zendesk LOVE YOUR HELP DESK
- Go Daddy SOFTWARE

Cloud

UNMATCHED INVESTMENT

InnoDB

PERFORMANCE IMPROVEMENTS

REPLICATION

EMBEDDED

CLOUD

WINDOWS

HUNDREDS OF EXPERTS

ORACLE DRIVES MySQL

INNOVATION

STRATEGIC

WORLD-CLASS SUPPORT

MySQL CLUSTER

WEB

NoSQL

LINUX

MySQL ENTERPRISE EDITION

LARGEST MySQL ENGINEERING & SUPPORT ORGANIZATION

DRIVING MySQL INNOVATION

MySQL Enterprise Monitor 2.2
MySQL Cluster 7.1
MySQL Cluster Manager 1.0
MySQL Workbench 5.2
MySQL Database 5.5
MySQL Enterprise Backup 3.5
MySQL Enterprise Monitor 2.3
MySQL Cluster Manager 1.1

All GA!

2010

MySQL Enterprise Backup 3.7
Oracle VM Template for MySQL
Enterprise Edition
MySQL Enterprise Oracle
Certifications
MySQL Windows Installer
MySQL Enterprise Security
MySQL Enterprise Scalability

All GA!

MySQL Database 5.6 DMR*
MySQL Cluster 7.2 DMR

MySQL Labs!

("early and often")

2011

MySQL Cluster 7.2
MySQL Cluster Manager 1.2
MySQL Utilities 1.0.6
MySQL Migration Wizard
MySQL Enterprise Backup 3.8
MySQL Enterprise Audit
MySQL Database 5.6
MySQL Cluster 7.3

All GA!

MySQL 5.7 DMR
MySQL Applier for Hadoop

Available Now!

A BETTER MySQL

2012-13

*Development Milestone Release

Oracle's Investment in MySQL Community

Available to download and use under the GPL

- MySQL Database (Community Edition)
- MySQL Cluster
- MySQL Workbench
- MySQL Migration Wizard
- MySQL Utilities (in Python)
- MySQL Connectors
- MySQL Proxy
- Forums



mysql.com/downloads/

MySQL 5.6: Best Release Ever!

IMPROVED PERFORMANCE AND SCALABILITY

- Scales to 48 CPU Threads
- Up to 230% performance gain over MySQL 5.5

IMPROVED INNODB

- Better transactional throughput and availability

IMPROVED OPTIMIZER

- Better query exec times and diagnostics for query tuning and debugging

IMPROVED REPLICATION

- Higher performance, availability and data integrity

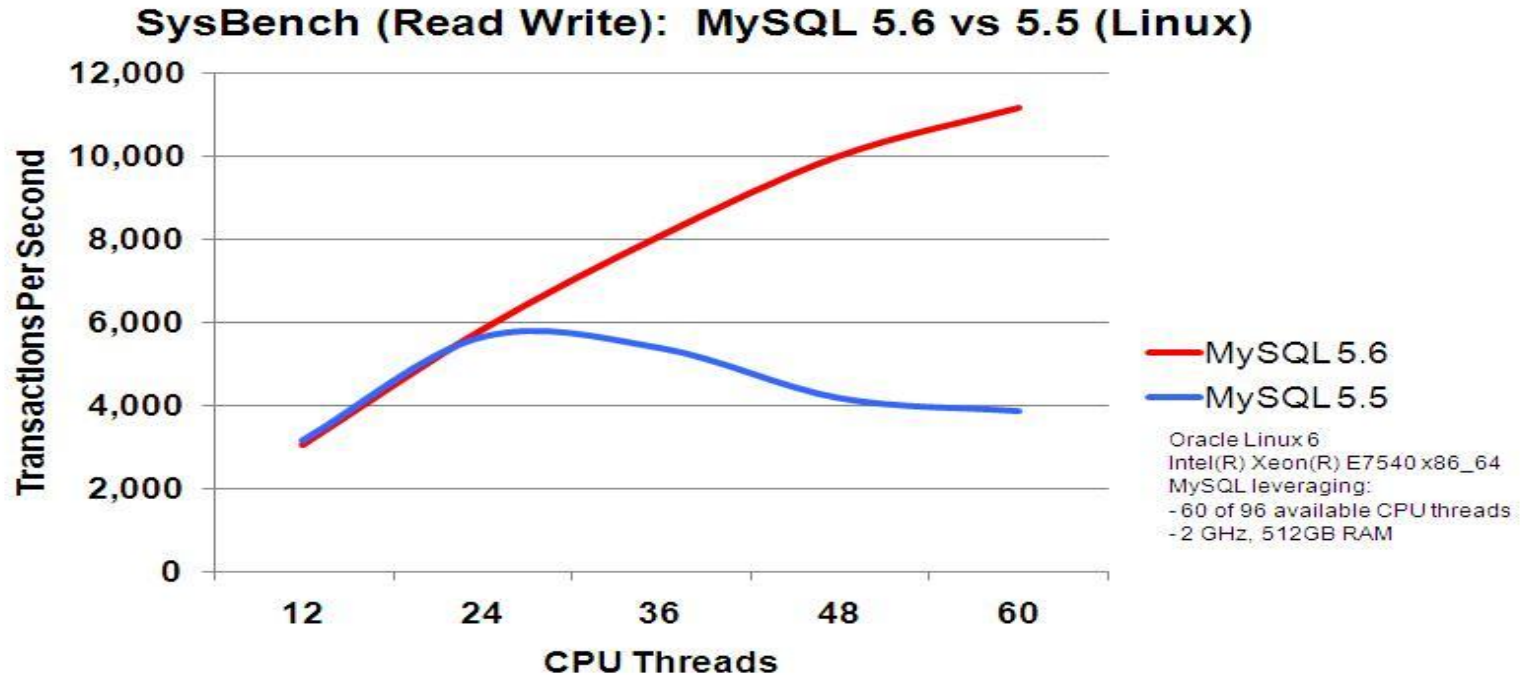
IMPROVED PERFORMANCE SCHEMA

- Better Instrumentation, User/Application level statistics and monitoring

New! NoSQL ACCESS TO INNODB

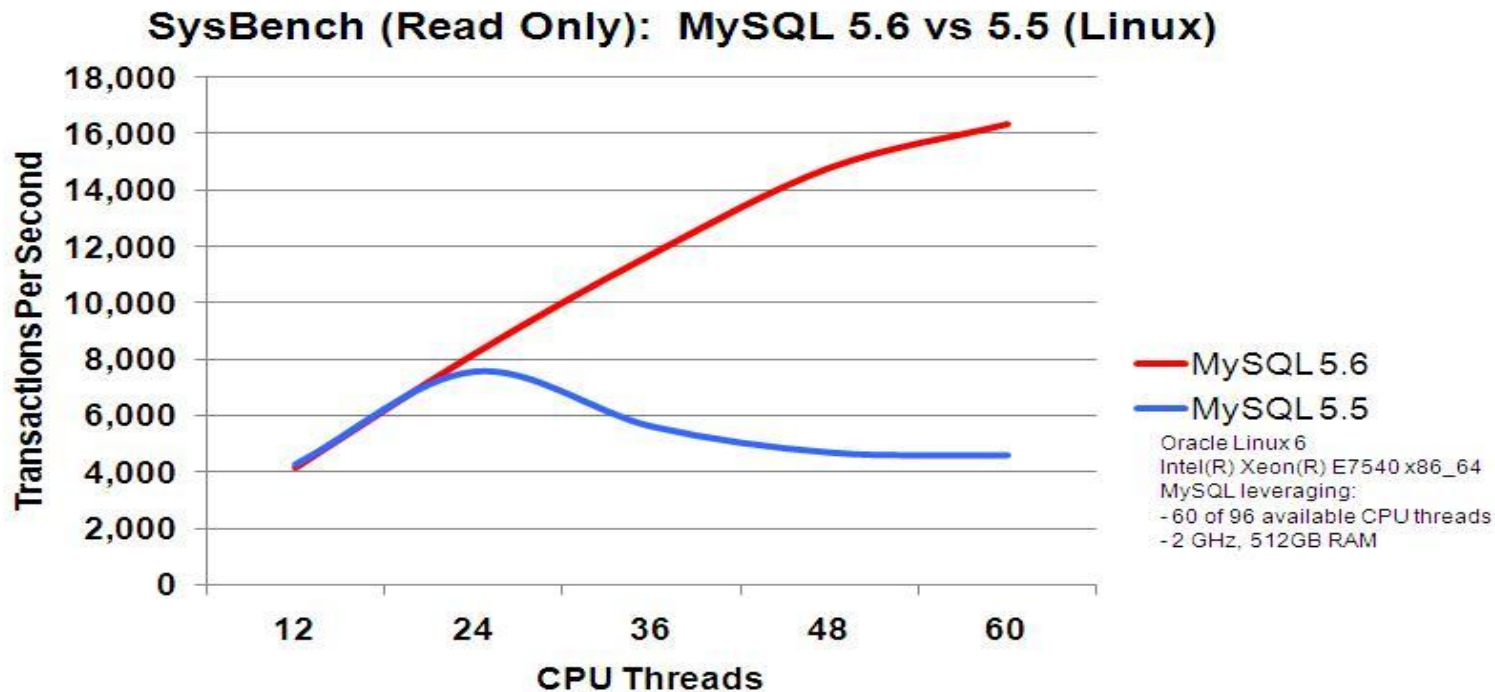
- Fast, Key Value access with full ACID compliance, better developer agility

MySQL 5.6: Scalability



- Users can fully utilize latest generations of hardware and OS
- Scales as data volumes and users grow

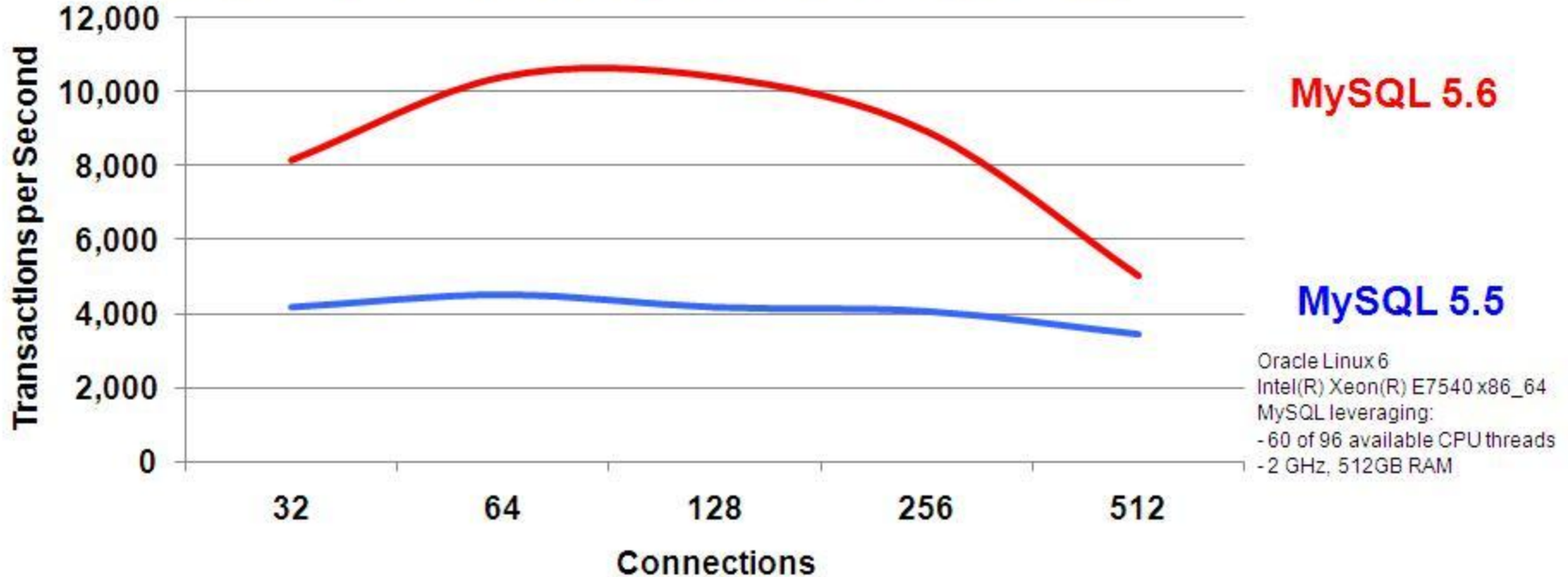
MySQL 5.6: Scalability



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MySQL 5.6 SysBench Benchmarks

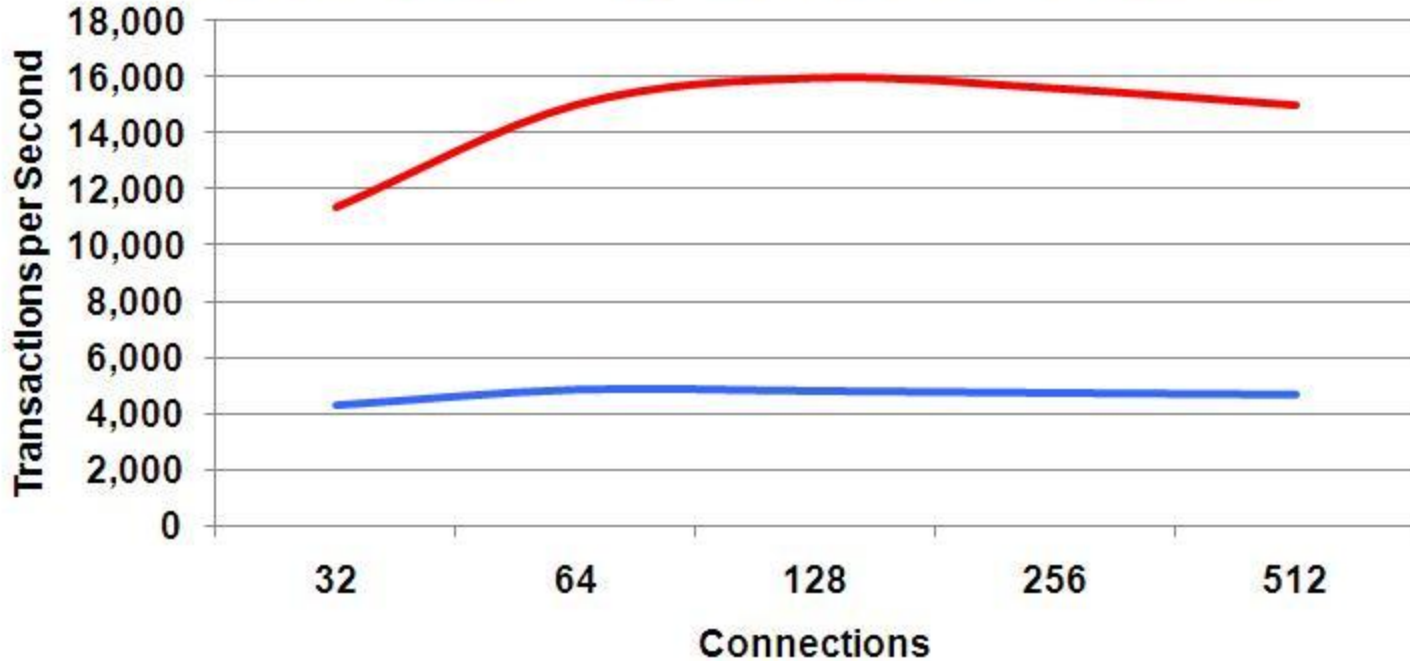
SysBench (Read Write): MySQL 5.6 vs. 5.5 (Linux)



Up to 151% Performance Gain

MySQL 5.6 SysBench Benchmarks

SysBench (Read Only): MySQL 5.6 vs. 5.5 (Linux)



MySQL 5.6

MySQL 5.5

Oracle Linux 6
Intel(R) Xeon(R) E7540 x86_64
MySQL leveraging:
- 60 of 96 available CPU threads
- 2 GHz, 512GB RAM

Up to 234% Performance Gain

MySQL 5.6: InnoDB

BETTER RESOURCE UTILIZATION

- Removal of legacy bottlenecks
- Improved threading/concurrency
- Optimized for Read-Only Workloads
- SSD Optimizations

BETTER AVAILABILITY, FASTER SCALING

- Online DDL Operations
- Transportable Tablespaces
- Dump, Restore/Warm Buffer Pool

DEVELOPER AGILITY

- Full Text Search
- NoSQL, Key-value access to InnoDB

MySQL 5.6: InnoDB

Online DDL Operations

- CREATE INDEX
- DROP INDEX
- Change AUTO_INCREMENT value for a column
- ADD/DROP FOREIGN KEY
- Rename COLUMN
- Change ROW FORMAT, KEY_BLOCK_SIZE for a table
- Change COLUMN NULL, NOT_NULL
- Add, drop, reorder COLUMN

- Adds flexible schemas, online changes, no downtime
- No need to consider NoSQL options

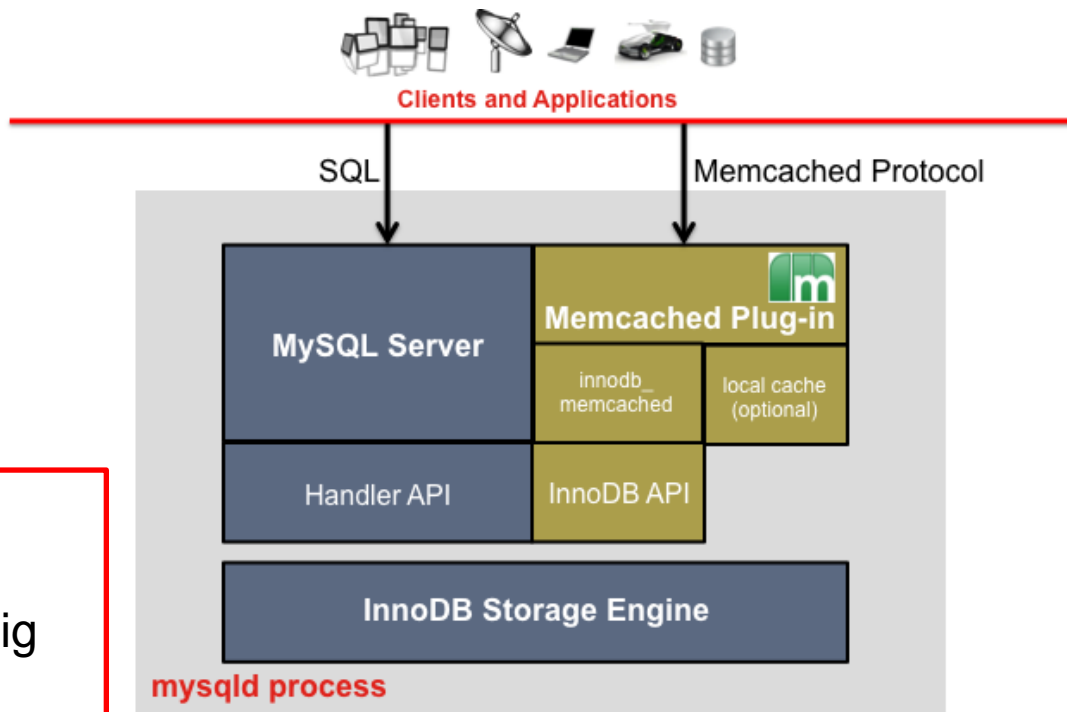
MySQL 5.6: InnoDB

NoSQL Key Value Access to InnoDB

Same app can leverage:

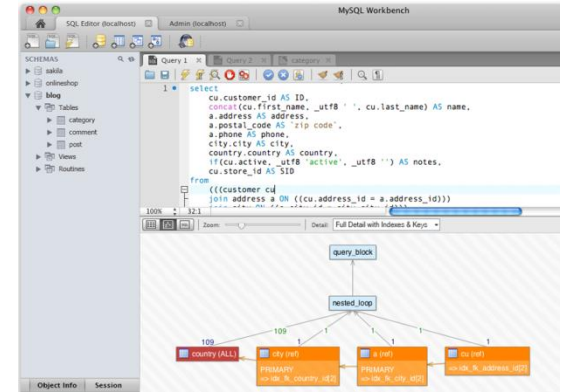
- Key-value access to InnoDB via familiar Memcached API
- SQL for rich queries, JOINS, FKs, etc.
- Fully transactional

- Up to 9x performance boost for updates
- Great for fast data ingestion in Big Data pipeline



MySQL 5.6: Optimizer

- Subquery Optimizations
- File sort optimizations for most web use cases
 - 4x better execution time – 40s to 10s
- Index Condition Pushdown
 - 160x better execution time – 15s to 90ms
- Batched Key Access and Multi Range Read
 - 280x better execution time – 2800s to 10s



- Better complex query execution times ever growing data sets (Big Data!)
- MEM + Query Analyzer key to utilizing full benefits of 5.6 Optimizer
- MySQL Consultative Support provides guidance on configuration

MySQL 5.6: Optimizer

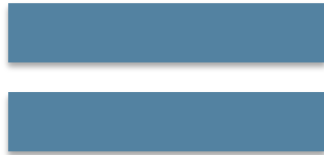
Better Diagnostics

- EXPLAIN
 - INSERT, UPDATE, and DELETE
 - Structured EXPLAIN output (JSON)
- Optimizer Traces

```
SET SESSION OPTIMIZER_TRACE='enabled=on';
SELECT (SELECT 1 FROM t6 WHERE d = c)
AS RESULT FROM t5;
SELECT * FROM information_schema.OPTIMIZER_TRACE;
```

```
"records_estimation": [
  {
    "database": "test",
    "table": "t6",
    "range_analysis": {
      "table_scan": {
        "records": 2,
        "cost": 4.5034
      },
      "potential_range_indices": [
        {
          "index": "d",
          "usable": true,
          "key_parts": [
            "d"
          ]
        }
      ]
    },
    "best_covering_index_scan": {
      "index": "d",
      "cost": 1.4233,
      "chosen": true
    }
  },
]
```

MySQL 5.6: Best Replication Features Ever



PERFORMANCE

- Multi-Threaded Slaves
- Binary Log Group Commit
- Optimized Row-Based Replication

FAILOVER & RECOVERY

- Global Transaction Identifiers
- Replication Failover & Admin Utilities
- Crash Safe Slaves

DATA INTEGRITY

- Replication Event Checksums

DEV/OPS AGILITY

- Time Delayed Replication
- Remote Binlog Backup
- Informational Log Events

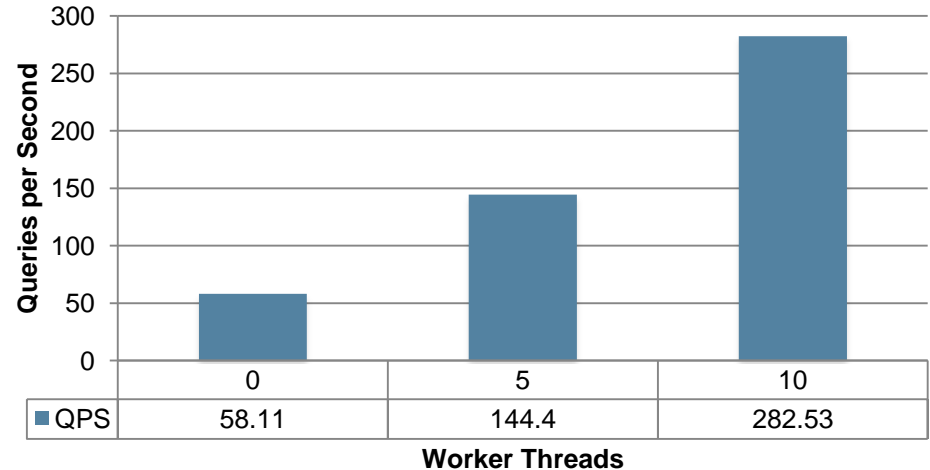
MySQL 5.6: Replication

Multi-Threaded Slaves

- Increases slave throughput, reducing lag
- Applies events to different databases in parallel using concurrent SQL threads
- **5x performance gain**

- Great for systems which isolate application data using databases
 - Cloud, SaaS, Hosting, other multi-tenant deployments

Multi-Threaded Slave Performance

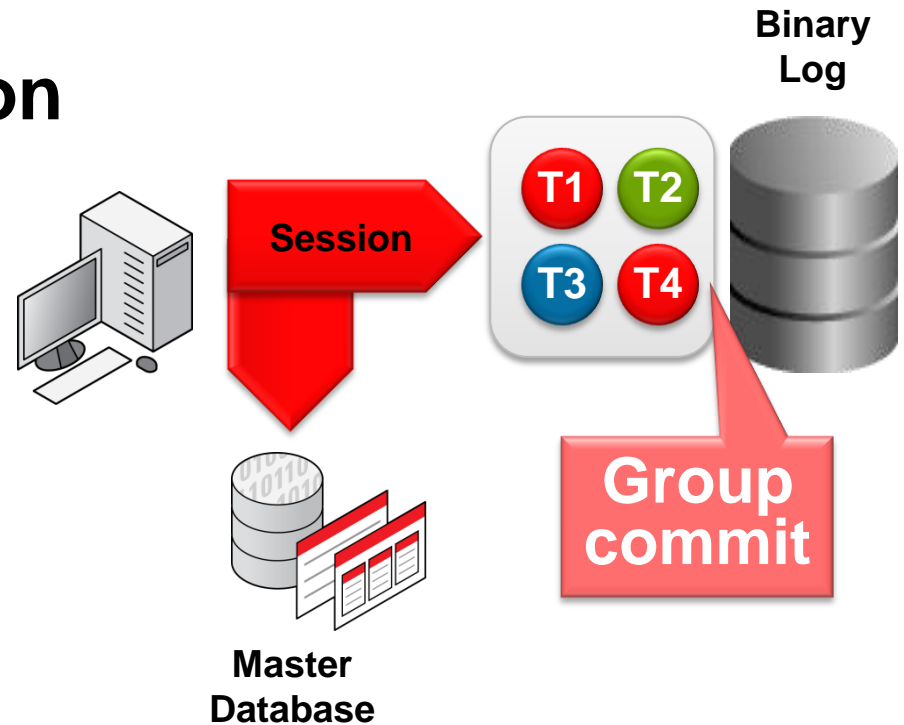


- SysBench, running across 10 x schemas
- Oracle Linux 6.1, Oracle Sun Fire x4150 m2 Server

MySQL 5.6: Replication

Binary Log Group Commit

- Increases replication throughput by increasing performance of the master
- Commits multiple transactions as a group to Binlog on disk
- Finer grained locking; reducing lock wait times

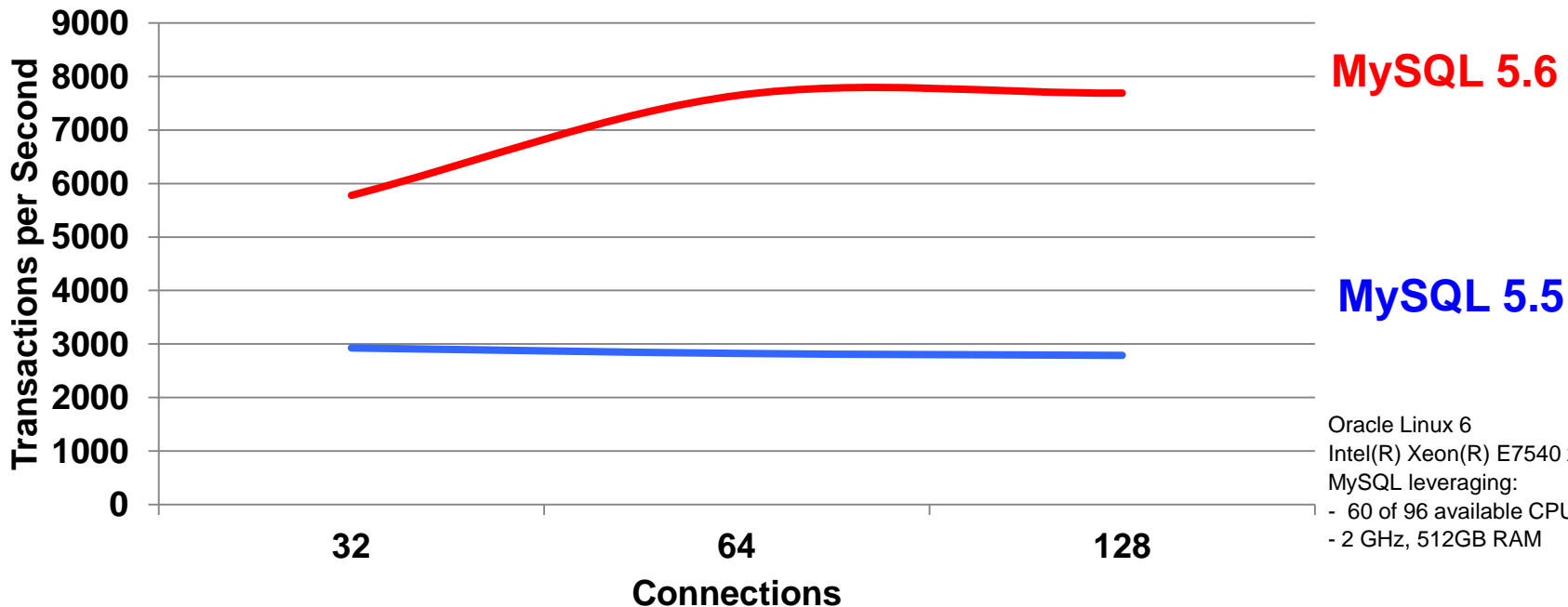


- Better transactional throughput, less slave lag when coupled with MTS
- MySQL Consultative Support provides guidance on configuration

Binary Log Group Commit Performance

Binlog=1

MySQL 5.6 vs. 5.5 - Read Write (Linux)



Oracle Linux 6
Intel(R) Xeon(R) E7540 x86_64
MySQL leveraging:
- 60 of 96 available CPU threads
- 2 GHz, 512GB RAM

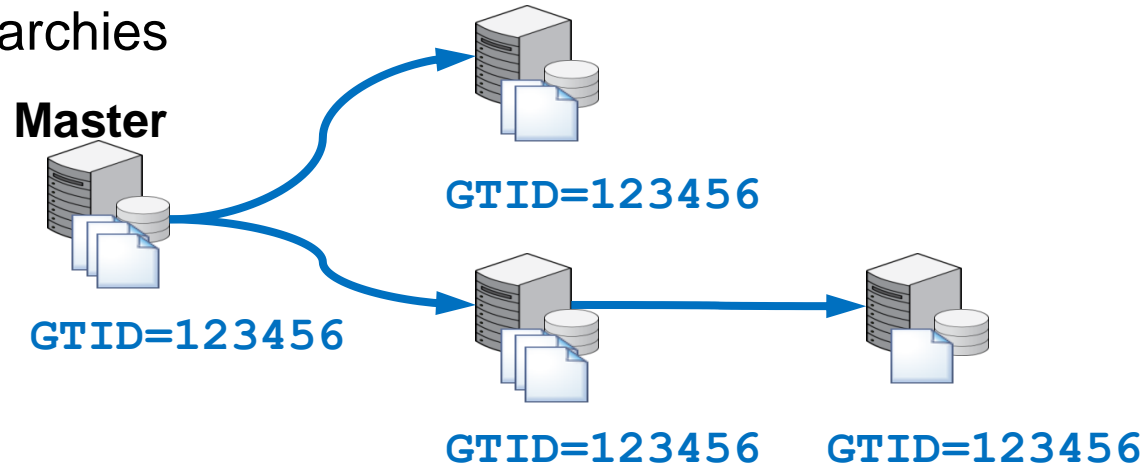
180% Performance Gain

MySQL 5.6: Replication

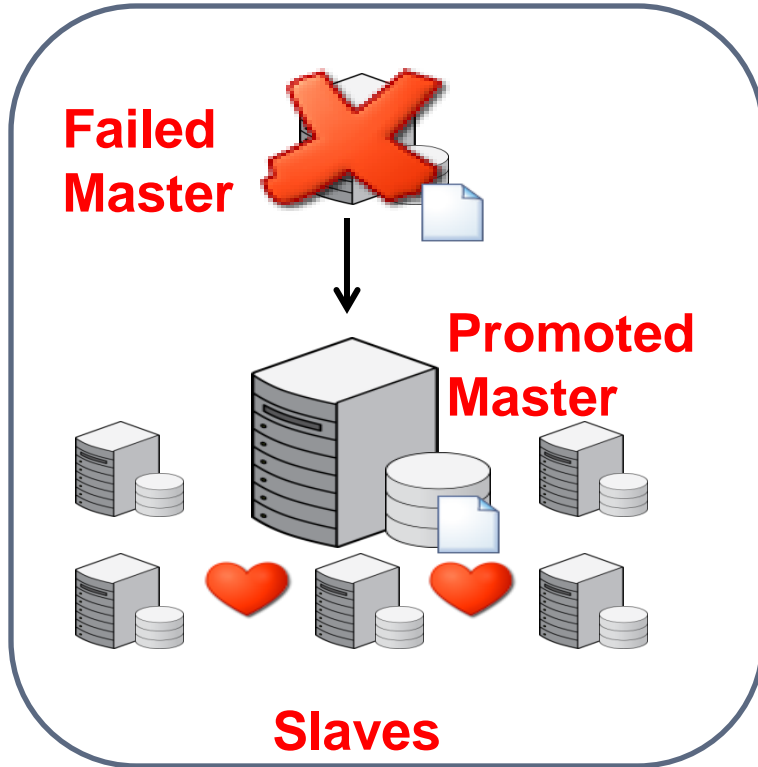
Global Transaction Ids

- Simple to track & compare replication across the cluster
 - Unique identifier for each transaction written to the Binlog
- Automatically start replicating correct events when promoting new master
- Deploy n-tier replication hierarchies

Eliminates the need for *complex*
3rd party solutions



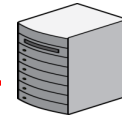
MySQL 5.6: Replication HA Utilities (Python)



- Enabling self-healing replication topologies
- Automated failover & recovery
 - `mysqlfailover` Utility
- Switchover & administration
 - `mysqlrpladmin` Utility



Monitoring



HA Utilities

- Delivers HA within the core MySQL distribution
 - Eliminates the need for 3rd party solutions
 - Allows extensibility to support variety of HA mechanisms

MySQL 5.6: Performance Schema

New Instrumentation

- Statements/Stages
- Table and Index I/O
- Table locks
- Users/Hosts/Accounts
- Network I/O

```
[mysqld]  
performance_schema=on
```

New Features

- Show contents of Host cache
- New Summary tables
- Easier configuration
 - Start up defaults in my.cnf
 - Auto tune
- Reduced overhead
- On by default

Provides user/session level stats on resource usage for Cloud-based consumption/reporting/charge back

MySQL 5.6: Security

Major overhaul of password handling

- Provide alternatives to showing passwords in plain text
- Assess/Enforce password strength policies
- Enforce new password at next login
- Stronger password hashing

Aligns MySQL user security/password policies with Oracle guidelines
and most common industry SOPs

MySQL 5.6: New Default Settings

- Better out-of-the-box performance on modern architectures
- New fixed defaults and auto-tuning based on related parameters, host configuration
- Can be modified after installation (my.cnf or my.ini)
- All new defaults and auto-tuned settings detailed in 5.6 docs

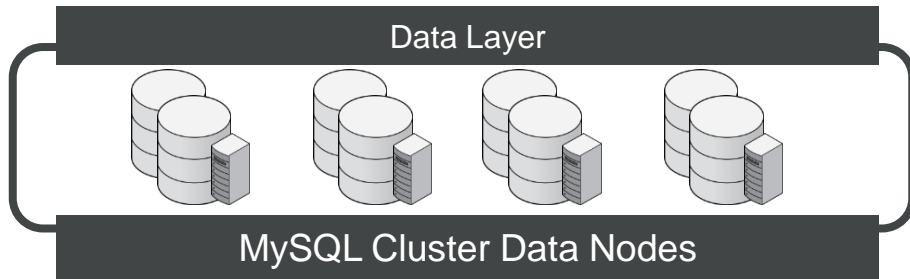
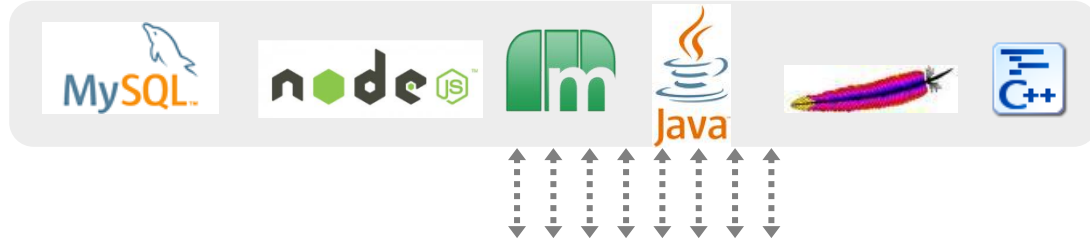
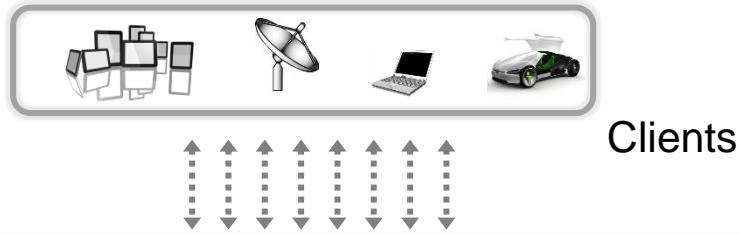
Provides better default performance/scale for most MySQL use cases

MySQL 5.6: Other Important Improvements

- `TIME/TIMESTAMP/DATETIME` - fractional second precision, set defaults
- Better Condition Handling
 - MySQL Diagnostic Area – Statements, conditions
 - **GET DIAGNOSTICS**
- Improved Partitioning
 - Up to 8k partitions/sub-partitions per table
 - Explicit partition selection in queries, DML
 - Import/Export partitions between tables

Improves ease of use for developers

MySQL Cluster Architecture

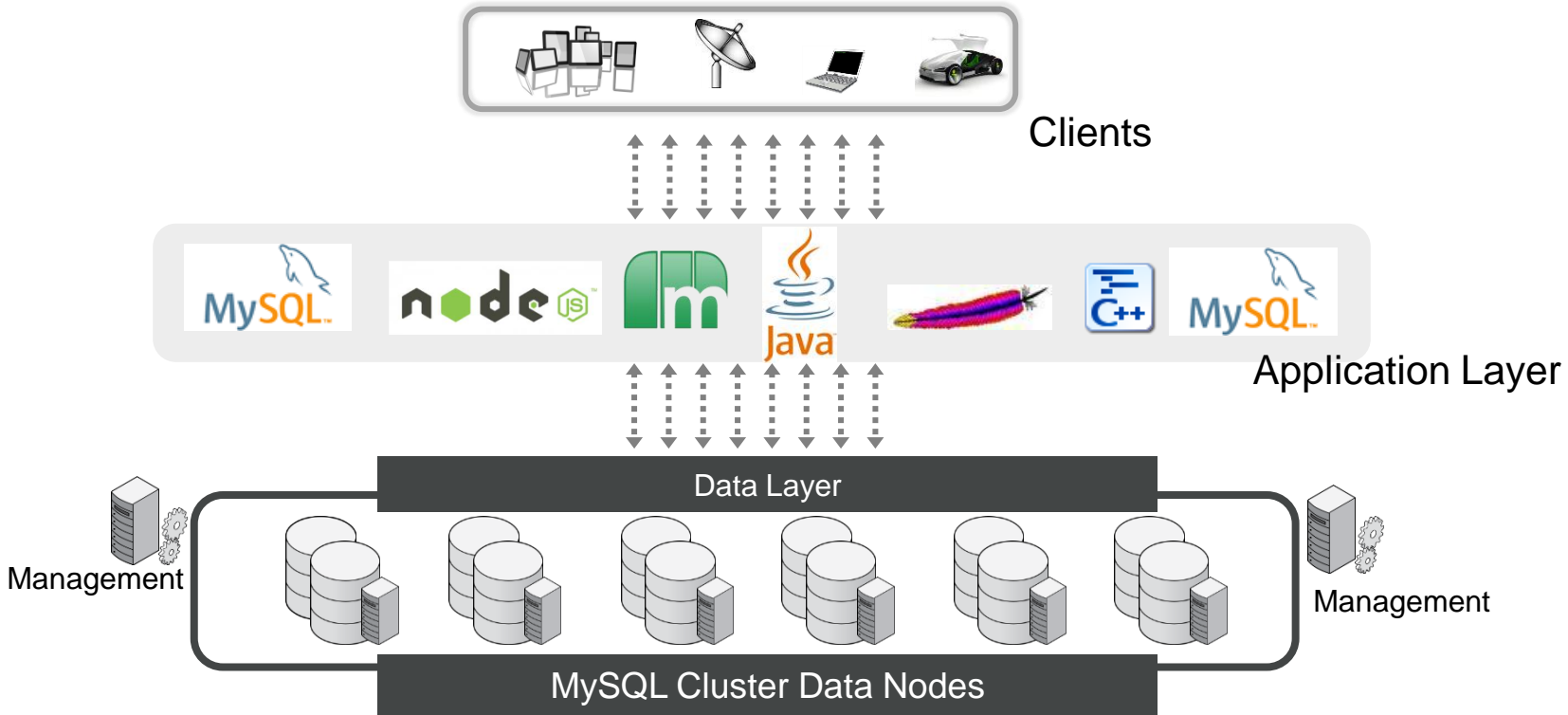


Application Layer

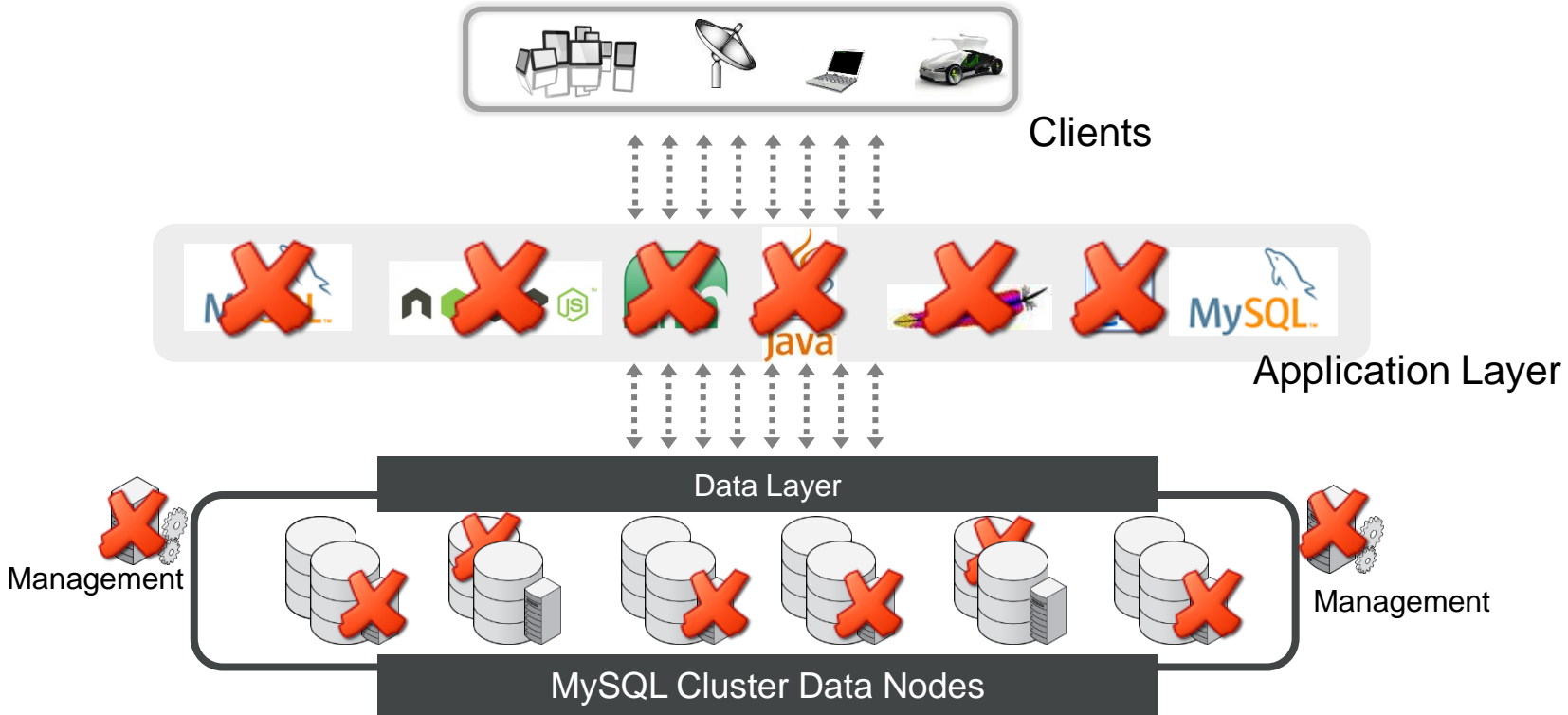


Management

MySQL Cluster Architecture



MySQL Cluster Architecture



Who's Using MySQL Cluster?



MySQL Cluster 7.3

Auto-Sharding, Extreme Performance,
Global Replication

GA Now!

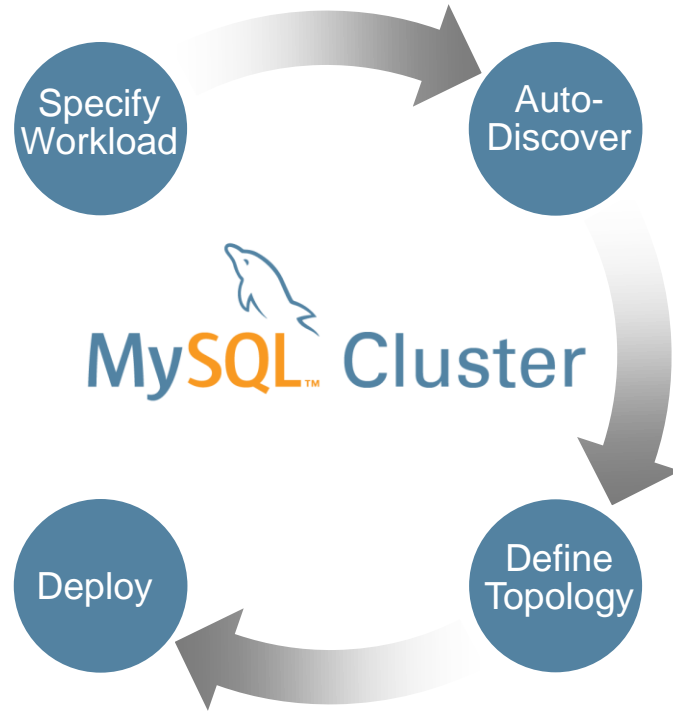
[Learn More »](#)







- Foreign Key Support
- Connection Thread Scalability
- MySQL 5.6
- Auto-Installer
- NoSQL JavaScript for node.js

MySQL Cluster 7.3: **Auto-Installer**

- Fast configuration
- Auto-discovery
- Workload optimized
- Repeatable best practices
- For MySQL Cluster 7.2 + 7.3



Deploy Configuration and start MySQL Cluster

Your MySQL Cluster configuration can be reviewed below. To the left are the processes you have defined, ordered by their startup sequence. Please select a process to view its startup command(s) and configuration file. Note that some processes do not have configuration files. At the bottom of the center panel, there are buttons to *Deploy*, *Start* and *Stop* your cluster. Please note that starting the cluster may take up to several minutes depending on the configuration you have defined. In the process tree, the icons reflect the status of the process as reported by the management daemon:  : *unknown* or if the management daemon does not reply,  : *connected* or *started*,  : *starting* or *shutting down*, and  : *not connected* or *stopped*

MyCluster processes




- Management layer
 - Management node 1
 - Management node 2
- Data layer
 - Multi threaded data node 1
 - Multi threaded data node 2
- SQL layer
 - SQL node 1
 - SQL node 2
 - SQL node 3

Startup command

Host	blue
Path	/var/mysql/mysql-cluster-gpl-7.3.1-linux-x86_64/
Executable	mysql_install_db

Configuration file

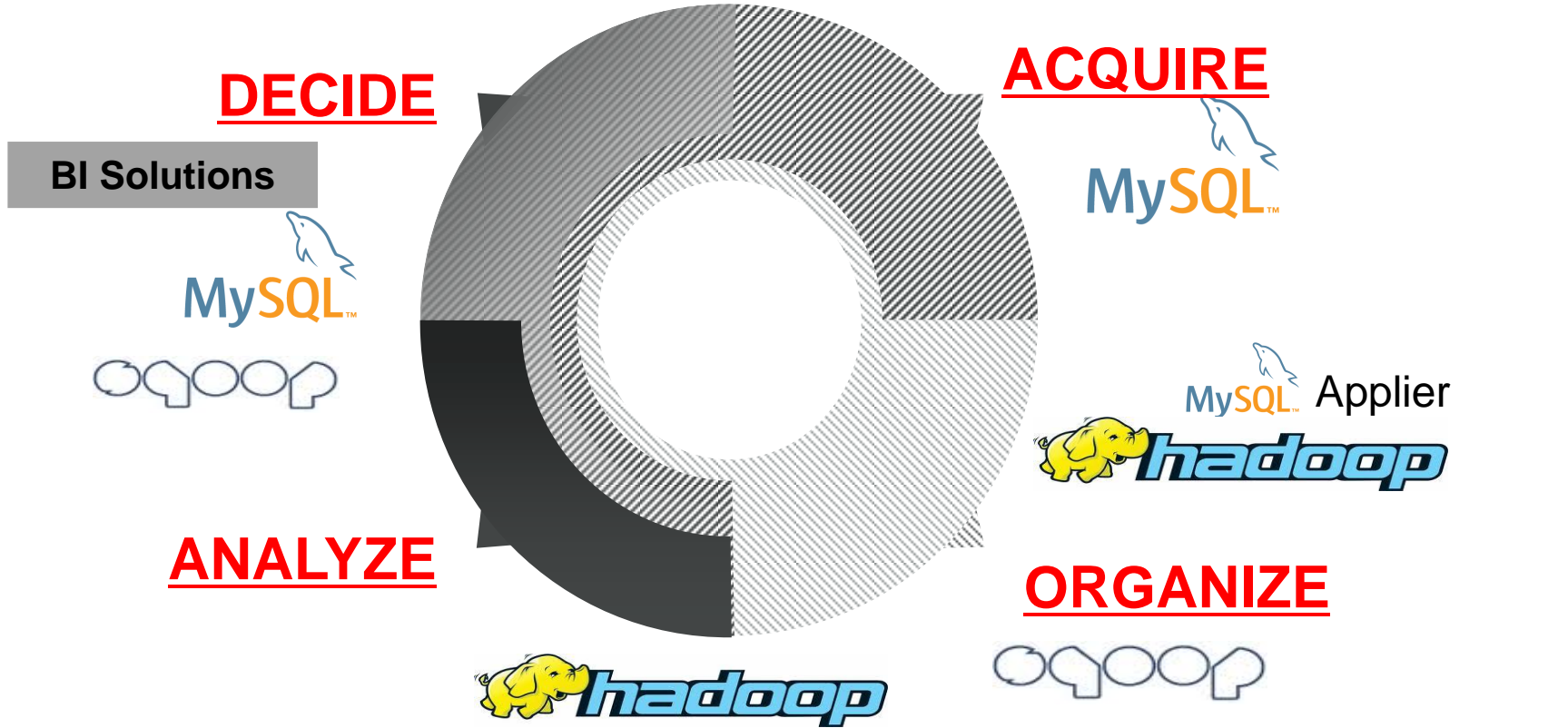
No configuration file for this process

 Deploy cluster  Deploy and start cluster  Stop cluster

ORACLE MAKES MySQL BETTER FOR THE WEB, THE CLOUD & BIG DATA

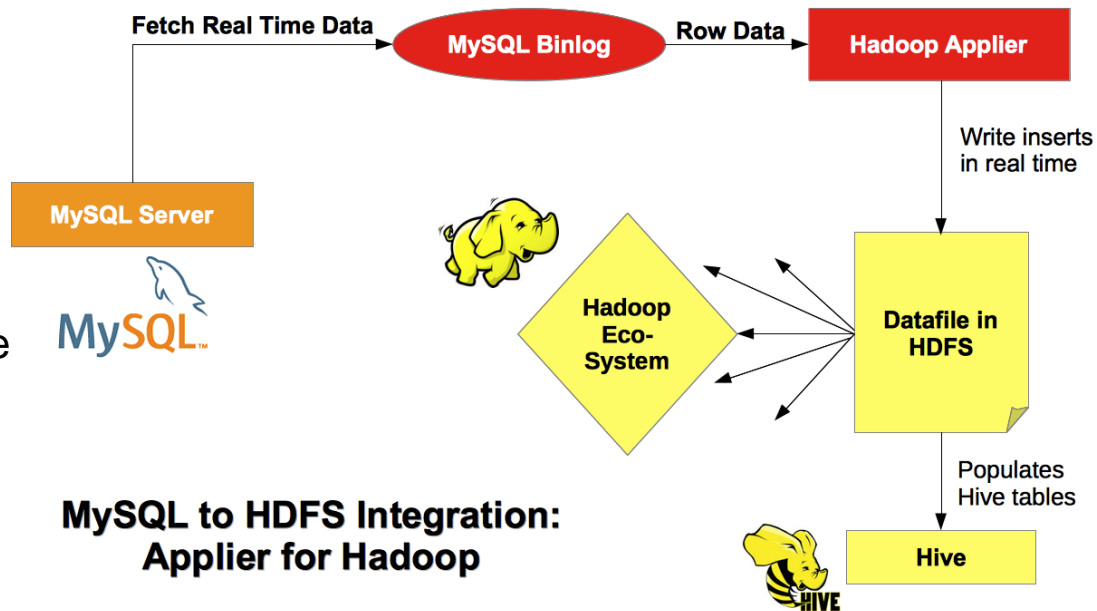
- Performance & Scale-Out
- High Availability, Self-Healing & Data Integrity
- Provisioning, Monitoring & Resource Management
- Developer Agility
- Security

MySQL in the Big Data Lifecycle



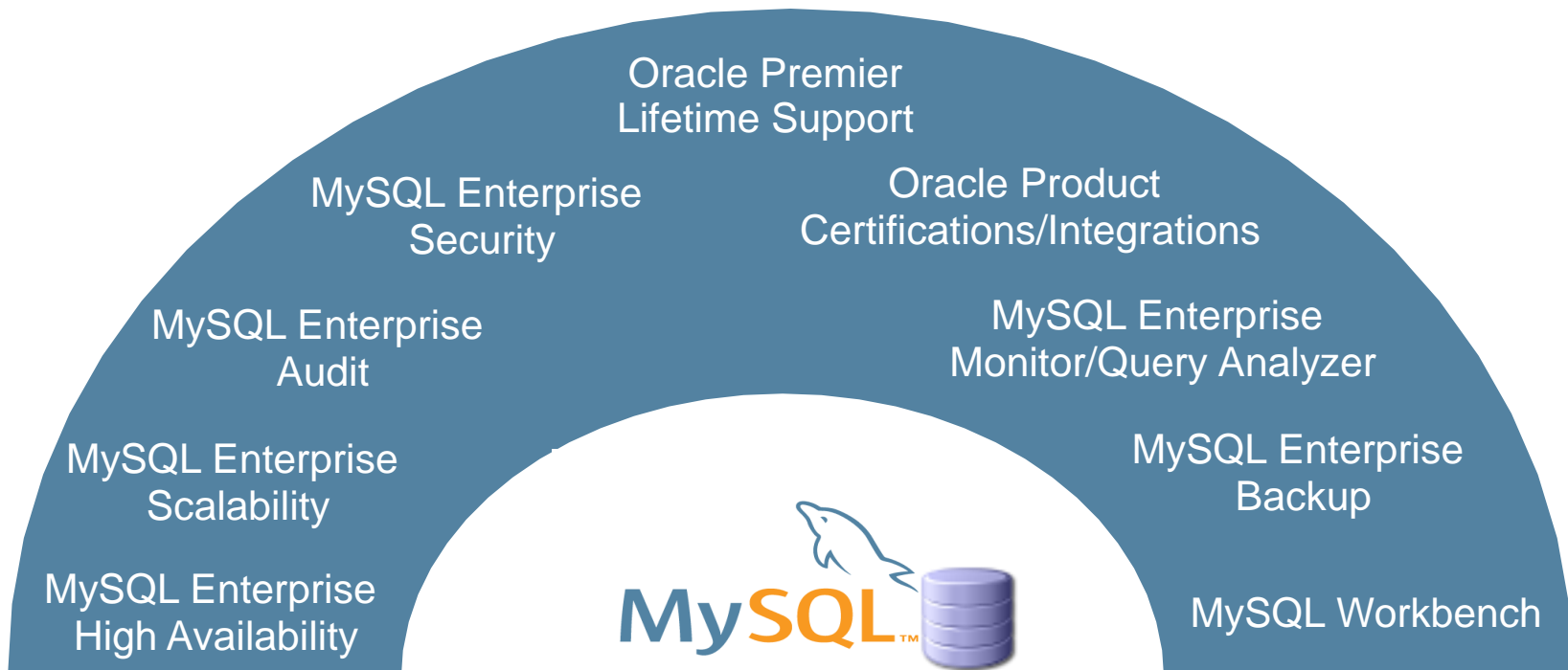
New: MySQL Applier for Hadoop

- Real-time streaming of events from MySQL to Hadoop
 - Supports move towards “Speed of Thought” analytics
- Connects to the binary log, writes events to HDFS via libhdfs library
- Each database table mapped to a Hive data warehouse directory
- Enables eco-system of Hadoop tools to integrate with MySQL data
- See dev.mysql.com for articles
- Available for download now
 - labs.mysql.com



MySQL Enterprise Edition

Highest Levels of Security, Performance and Availability



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- mysql.com
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 - TCO calculator
 - Customer use cases and success stories
- dev.mysql.com
 - Downloads, Documentation
 - Forums
 - PlanetMySQL
- eDelivery.oracle.com
 - Download and evaluate all MySQL products

San Francisco, September 21-23

Additional Day of Tutorials

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- Tutorials
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- Demo Pods
- Receptions

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