Welcome to Virtual Developer Day – MySQL!

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

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## Program Agenda

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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

Web & Enterprise

OEM & ISVs

Cloud
UNMATCHED INVESTMENT

HUNDREDS OF EXPERTS

LARGEST MySQL ENGINEERING & SUPPORT ORGANIZATION

MySQL CLUSTER

MySQL ENTERPRISE EDITION

PERFORMANCE IMPROVEMENTS

REPLICATION

EMBEDDED

CLOUD

WINDOWS

HUNDREDS OF EXPERTS

WEB

InnoDB

STRATEGIC

World-Class Support

NoSQL

LINUX

MySQL

ORACLE DRIVES MySQL INNOVATION
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!

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

- Users can fully utilize latest generations of hardware and OS
- Scales as data volumes and users grow
MySQL 5.6 SysBench Benchmarks

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

Up to 151% Performance Gain

Oracle Linux 6
Intel® Xeon® E7540 x86_64
MySQL leveraging:
- 60 of 96 available CPU threads
- 2 GHz, 512GB RAM
MySQL 5.6 SysBench Benchmarks

Up to 234% Performance Gain

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

```json
"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

<table>
<thead>
<tr>
<th>Worker Threads</th>
<th>QPS</th>
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<tbody>
<tr>
<td>0</td>
<td>58.11</td>
</tr>
<tr>
<td>5</td>
<td>144.4</td>
</tr>
<tr>
<td>10</td>
<td>282.53</td>
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Worker Threads
- 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)

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

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
- 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

[mysqlld] 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 performanceSCALE 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

Clients

Application Layer

MySQL Cluster Data Nodes

Data Layer

Management

MySQL Cluster Data Nodes

MySQL

node.js

Java

C++

Clients
MySQL Cluster Architecture

MySQL Cluster Data Nodes

Data Layer

Application Layer

Clients

Management

MySQL Cluster Data Nodes

Management
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.
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

1. ACQUIRE
   - MySQL

2. ORGANIZE
   - MySQL
   - Hadoop

3. ANALYZE
   - MySQL
   - Hadoop

4. DECIDE
   - BI Solutions
   - MySQL
   - Hadoop
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

Oracle Premier Lifetime Support
Oracle Product Certifications/Integrations
MySQL Enterprise Security
MySQL Enterprise Monitor/Query Analyzer
MySQL Enterprise Audit
MySQL Enterprise Backup
MySQL Enterprise Scalability
MySQL Enterprise Workbench
MySQL Enterprise High Availability
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- mysql.com
  - MySQL Products and Editions
  - New 5.6, Replication and HA White papers
  - 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
Oracle.com/mysqlconnect

MySQL Connect

Early Bird Discount:
Register Now and Save US$500!

Keynotes
Conferences Sessions
Birds-of-a-feather sessions
Tutorials
Hands-on Labs
Exhibition Hall
Demo Pods
Receptions
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