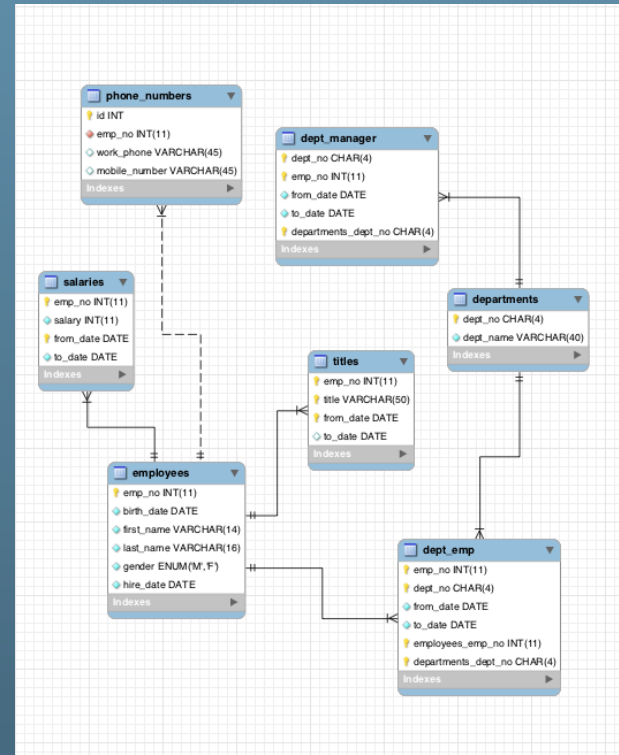




MySQL Essentials

Learning the Basics

Craig Sylvester
MySQL Principal Sales Consultant



Agenda

- What is MySQL?
- Installing and Configuring MySQL
- Application/Architecture Considerations
- Developing MySQL Applications
- MySQL on Windows
- MySQL Enterprise Edition



What is MySQL?

**SOFTWARE.
HARDWARE.
COMPLETE.**

My Experience with MySQL Is.....?

- ✓ I've never seen / used MySQL – but really looking forward to learning more ...
- ✓ Downloaded and played around with it but nothing serious ...
- Have developed some websites / applications... they seem to work well most of the time ...
- DBA team at Facebook keeps bugging me to help ...

MySQL is Everywhere

Multiple Platforms



Multiple Languages



C / C++ / C#

A low-angle photograph of a construction site. Several large cranes are visible against a clear blue sky. In the foreground, a blue crane arm extends from the left. In the background, a tall building is under construction, featuring a concrete facade with a grid of windows and a yellow crane on top. A red banner is overlaid on the image, containing the title text.

Installing & Configuring MySQL

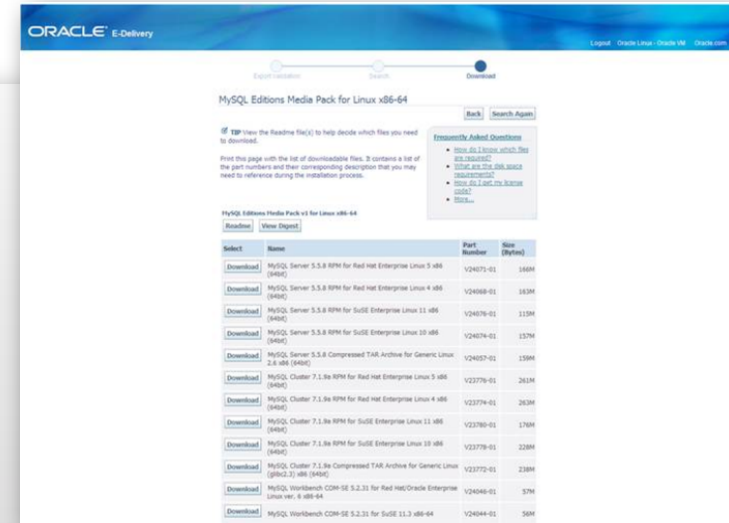
**SOFTWARE.
HARDWARE.
COMPLETE.**

MySQL Software

Where to Download?

MySQL Enterprise

- Oracle E-Delivery (edelivery.oracle.com)
 - Commercial-licensed servers and add-ons
 - Enterprise Monitor
 - Enterprise Backup
 - Cluster Manager
- My Oracle Support (support.oracle.com)
 - Latest patch levels for commercial-licensed software

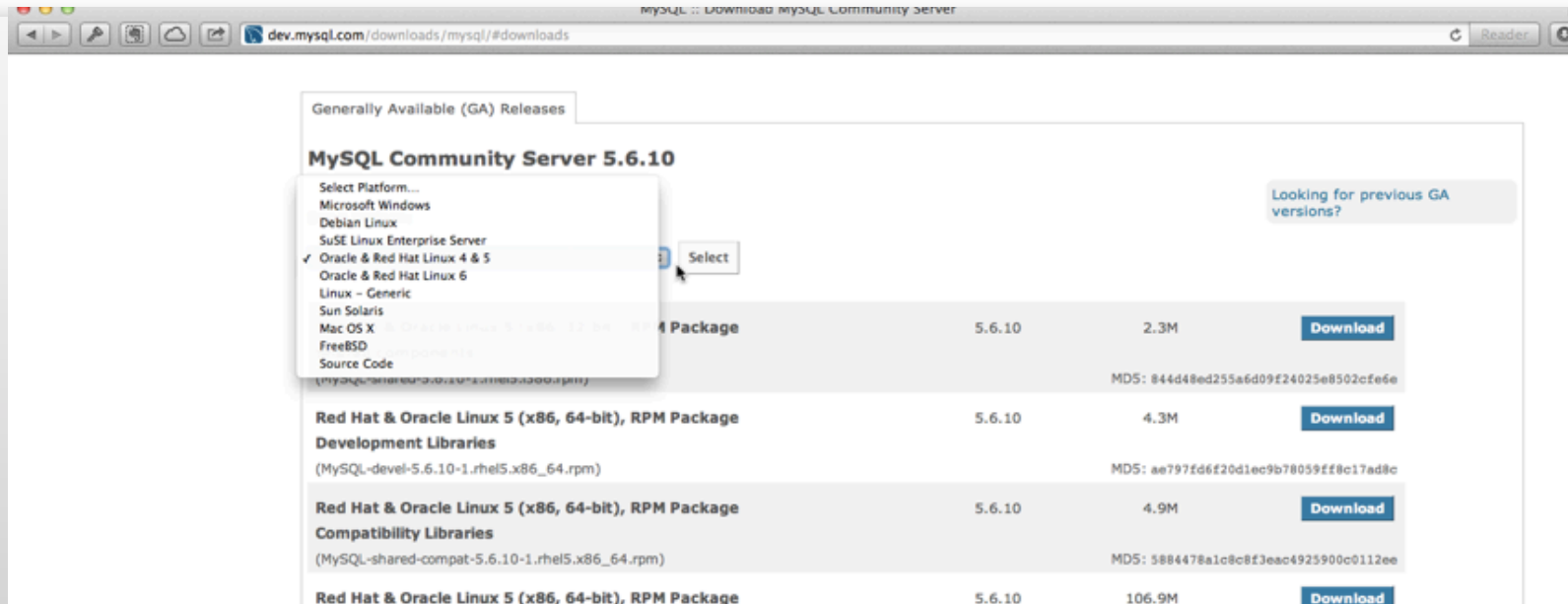


MySQL Community

- MySQL Developer (dev.mysql.com)
 - GPL Binaries and Source Code
 - Documentation
- MySQL Labs (labs.mysql.com)
 - Experimental or preview releases



MySQL Software Installation Packages



The screenshot shows the MySQL Community Server download page. A dropdown menu is open, listing various operating systems: Microsoft Windows, Debian Linux, SuSE Linux Enterprise Server, Oracle & Red Hat Linux 4 & 5 (selected), Oracle & Red Hat Linux 6, Linux - Generic, Sun Solaris, Mac OS X, FreeBSD, and Source Code. The main content area displays a table of available packages for MySQL Community Server 5.6.10.

Package Name	Version	Size	Action
Red Hat & Oracle Linux 5 (x86, 64-bit), RPM Package	5.6.10	2.3M	Download
Red Hat & Oracle Linux 5 (x86, 64-bit), RPM Package Development Libraries (MySQL-devel-5.6.10-1.rhel5.x86_64.rpm)	5.6.10	4.3M	Download
Red Hat & Oracle Linux 5 (x86, 64-bit), RPM Package Compatibility Libraries (MySQL-shared-compat-5.6.10-1.rhel5.x86_64.rpm)	5.6.10	4.9M	Download
Red Hat & Oracle Linux 5 (x86, 64-bit), RPM Package	5.6.10	106.9M	Download

Linux/Unix

- RPM
- Compressed TAR
- Distribution repository

Windows

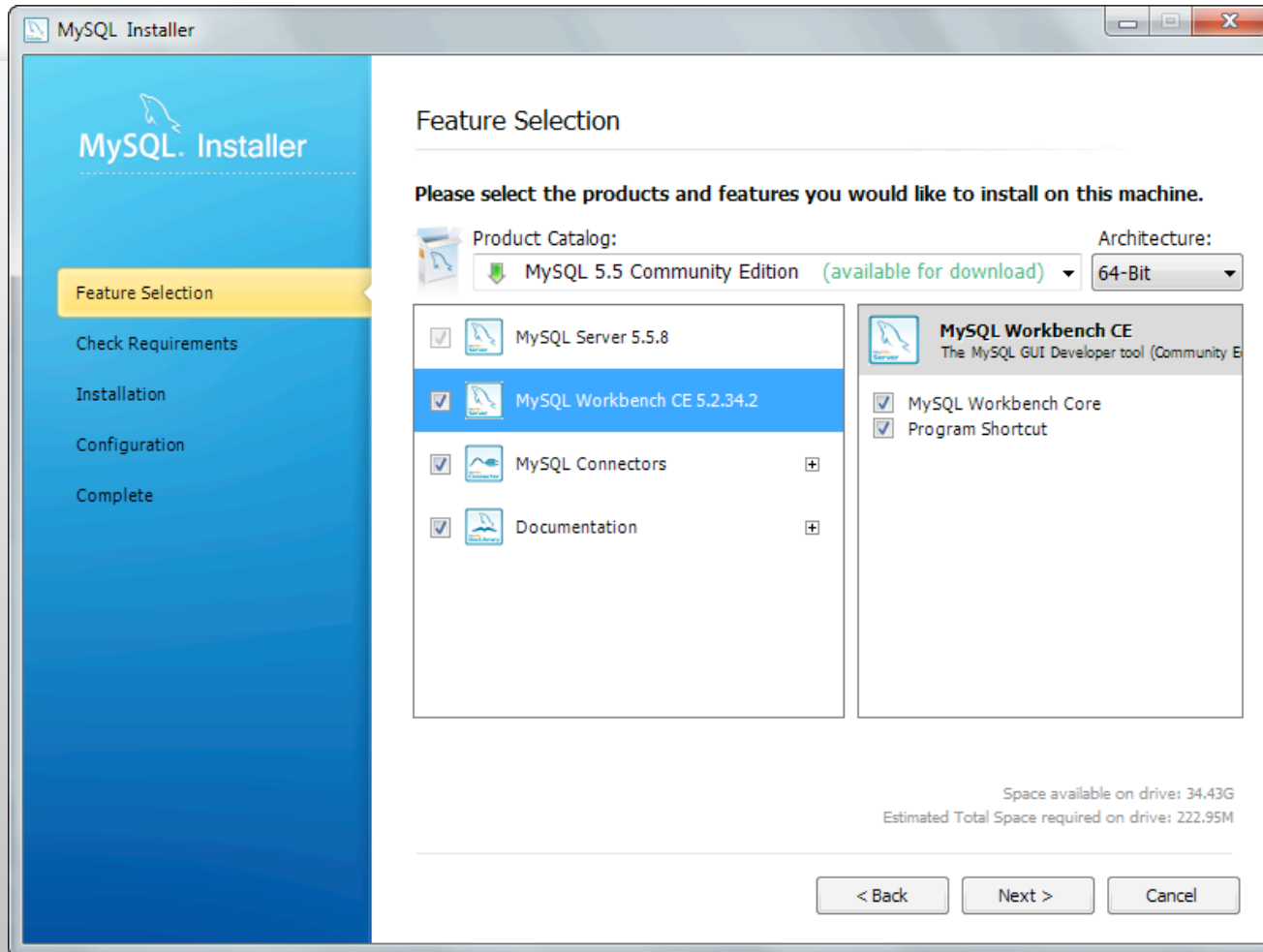
- MySQL Installer
- ZIP

The MySQL 15 Minutes Rule



“Download, install and start using MySQL in 15 minutes.”

Windows Installer



Full install in 3 minutes!



MySQL Configuration

Overview

- Highly configurable
- Command line options
- Configuration files
 - Plain-text, INI-like files with groups
 - Several configuration files (/etc, \$HOME, ...)
 - The last value takes precedence
- `<exe> [--verbose] --help` – order of loading files
- SQL interface to get or change configuration parameters

MySQL Configuration

Post Installation

- Where are the configuration files
 - my.cnf : /etc, /etc/mysql, /usr/local/mysql/
 - my.ini : C:\Program Files\MySQL\MySQL 5.6\
- Default configuration may need to be tweaked ...
 - Performance, ...
 - SQL_MODE
 - AUTOCOMMIT
 - ...

MySQL Configuration

Post Installation

- Secure the installation
 - Do not run `mysqld` as 'root' (OS superuser or admin)
 - Have separate directories (configuration, data, binary logs, ...)
 - Change MySQL server's 'root' password
 - Remove default/anonymous accounts
 - In short:
 - Run `mysql_secure_installation` script on Linux/Unix
 - Use Configuration Wizard on Windows (default)

MySQL Configuration

Client Programs

mysql	Mysql command line/shell for SQL statements
mysqladmin	Performing administrative operations. You can use it to check the server's configuration and current status, to create and drop databases, and more
mysqldump	Used to export a database(s) for backup or transfer to another server. The dump contains SQL statements to create tables, populate it with data, or both. Can also generate files in CSV, delimited text, or XML format.
mysqlimport	Command-line interface to the LOAD DATA INFILE SQL statement..
mysqlshow	Shows databases exist, their tables, or a table's columns or indexes.
mysqlslap	A diagnostic program designed to emulate client load for a MySQL server and to report the timing of each stage. It works as if multiple clients are accessing the server.

<http://dev.mysql.com/doc/refman/5.6/en/programs-client.html>

A low-angle photograph of a construction site. In the foreground, a large blue tower crane is partially visible. In the background, a tall building is under construction, featuring a section with glass panels and a section with a perforated metal facade. A yellow tower crane is positioned on top of the building. The sky is a clear, pale blue.

*Application / Architecture
Considerations*

**SOFTWARE.
HARDWARE.
COMPLETE.**

MySQL Server Architecture

Pluggable Storage Engines



Connectors
Native C API, JDBC, ODBC, .Net, PHP, Ruby, Python, VB, Perl

Connection Pool
Authentication – Thread Reuse – Connection Limits – Check Memory – Caches

SQL Interface
DDL, DML, Stored Procedures, Views, Triggers, Etc..

Parser
Query Translation, Object Privileges

Optimizer
Access Paths, Statistics

Caches
Global & Engine Specific

Enterprise Management Services and Utilities

- Backup & Recovery
- Security
- Replication
- Cluster
- Partitioning
- Workbench
- Information_Schema
- Performance_Schema

Pluggable Storage Engines
Memory, Index and Storage Management

InnoDB

NDB/Cluster

MyISAM

Etc...

Partners

Community

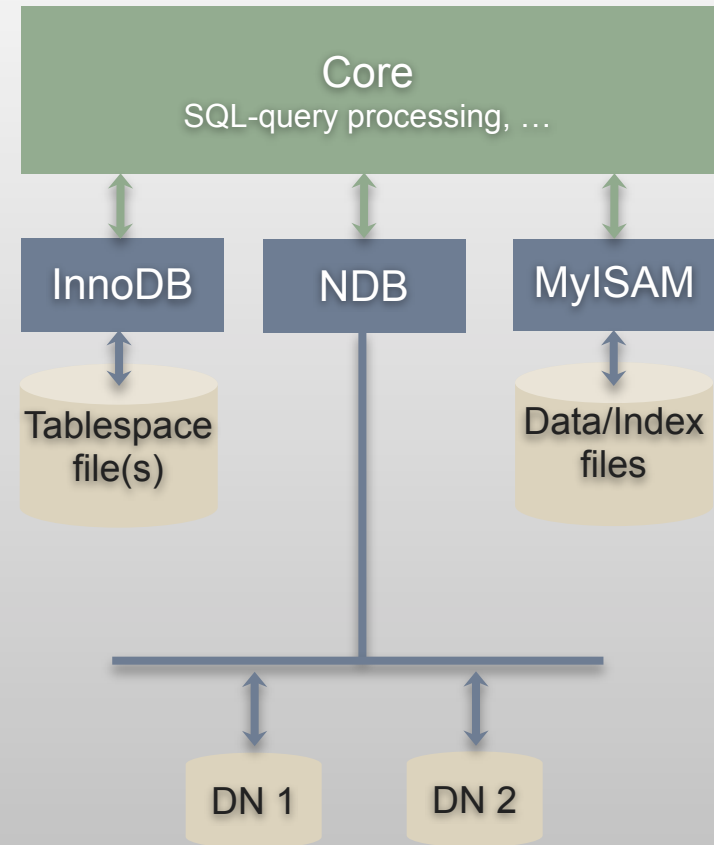
More..

Filesystems, Files and Logs
Redo, Undo, Data, Index
Binary, Error, Query, Slow, Audit

MySQL Server Components

Storage Engines

- Defines data storage and retrieval
- Defined per regular table
- Most known Storage Engines:
 - InnoDB (default since 5.5)
 - fully transactional, MVCC, FKs
 - MyISAM (default prior to 5.5)
 - NON-transactional, simple
 - NDB/Cluster
 - shared nothing, HA engine with transactional support
 - multi-master support



MySQL Concepts

Database

- Database or Schema
- Current database (per connection)
- Database – a set of files in “the data directory”
- System database (mysql)
- Virtual databases:
 - INFORMATION_SCHEMA
 - PERFORMANCE_SCHEMA

MySQL Concepts

SQL_MODE

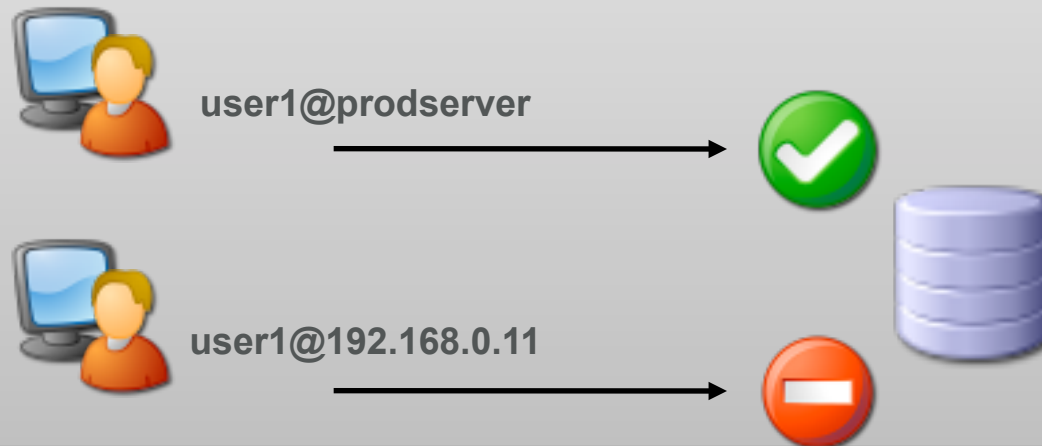
- Very important variable
- Affects data consistency!
- It might be remembered ...
 - ... or it might be not
- Thus: set it once for all in configuration file
- Recommended value is 'TRADITIONAL':
 - Equates to : STRICT_TRANS_TABLES, STRICT_ALL_TABLES, NO_ZERO_IN_DATE, NO_ZERO_DATE, ERROR_FOR_DIVISION_BY_ZERO, TRADITIONAL, NO_AUTO_CREATE_USER, NO_ENGINE_SUBSTITUTION
 - Additional options to consider
 - IGNORE_SPACE, ANSI_QUOTES

<http://dev.mysql.com/doc/refman/5.6/en/server-sql-mode.html>

MySQL Concepts

User authentication

- MySQL authenticates “username@hostname”
 - MySQL user ≠ Unix (or Windows) user
 - Anonymous users supported (empty username field)
 - Hostname can be wildcarded
 - “%” = any host
 - %.mydomain.com or 192.168.1.%
- For example: user1 below is two separate accounts



MySQL Concepts

User authentication - Useful functions

■ SELECT USER()

- User name and host name provided by the client

■ SELECT

CURRENT_USER()

- User name and host name as authenticated by server

```
craig (world)> select user,host from mysql.user;
+-----+-----+
| user      | host      |
+-----+-----+
| craig     | %         |
| employee  | %         |
| employee_admin | %         |
| root      | 127.0.0.1 |
| root      | ::1       |
| agent     | localhost |
| root      | localhost |
+-----+-----+
7 rows in set (0.00 sec)

craig (world)> select user(), current_user();
+-----+-----+
| user()      | current_user() |
+-----+-----+
| craig@localhost | craig@%         |
+-----+-----+
1 row in set (0.00 sec)

craig (world)>
```

MySQL Server Components

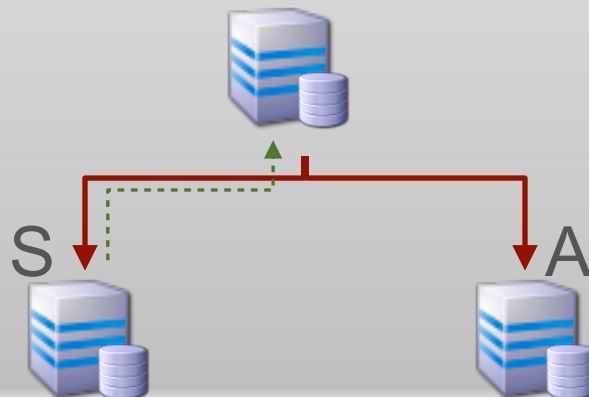
Partitioning

- Horizontal partitioning (distribute rows, not columns)
- Partitioning types:
 - List
 - Range
 - Key/Hash
 - Columns
 - List
 - Range
- Sub-partitions are supported

MySQL Server Components

Replication

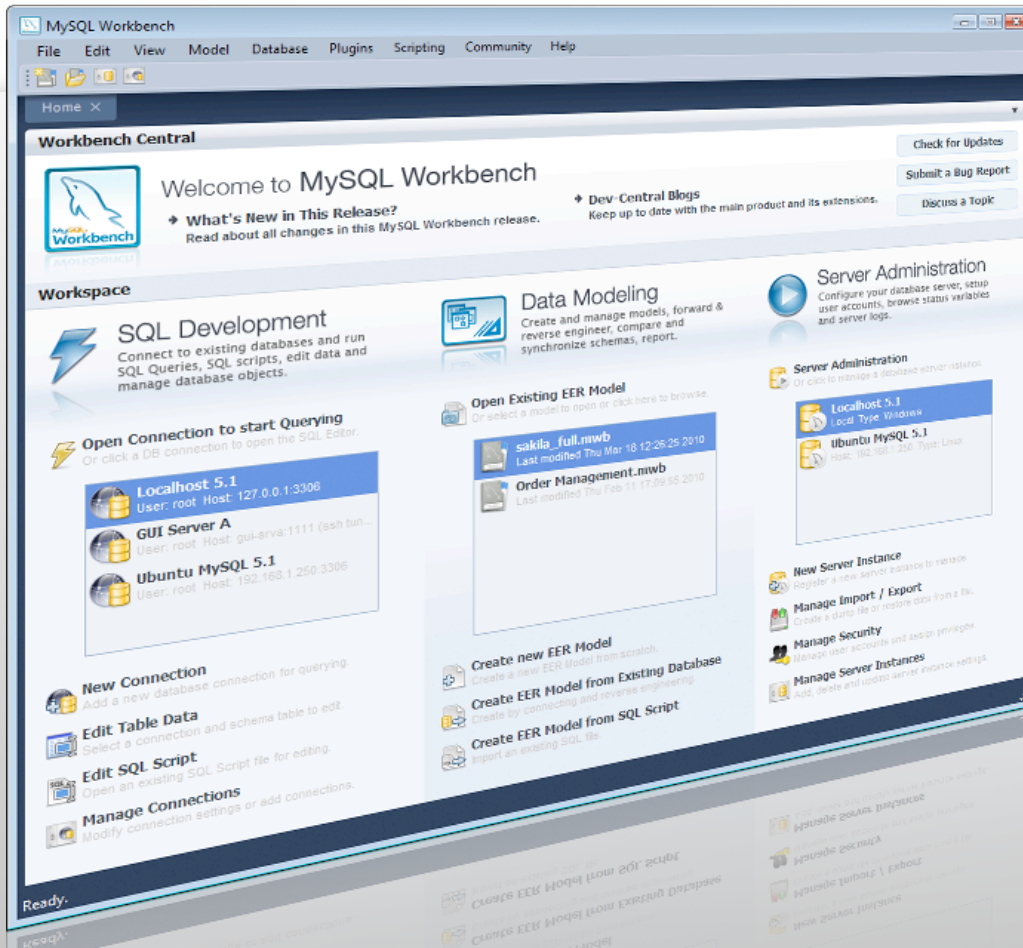
- One-way, master and slaves
- Asynchronous or Semi-synchronous replication
- Replication formats:
 - Statement-based replication (SBR): propagate SQL statements
 - Row-based replication (RBR): propagate row changes
 - Mixed: SBR or RBR depending on the statement



Developing MySQL Applications

**SOFTWARE.
HARDWARE.
COMPLETE.**

MySQL Workbench



SQL Development
Connect to existing databases and run SQL Queries, SQL scripts, edit data and manage database objects.



Data Modeling
Create and manage models, forward & reverse engineer, compare and synchronize schemas, report.



Server Administration
Configure your database server, setup user accounts, browse status variables and server logs.

MySQL - Standard-based Drivers

Broad Language Support

Oracle Developed

- ADO.NET - Connector/NET
- ODBC - Connector/ODBC
- JDBC - Connector/J
- Python - Connector/Python
- C/C++
 - Connector/C++
 - Connector/C
 - C API - mysqlclient

Community Developed

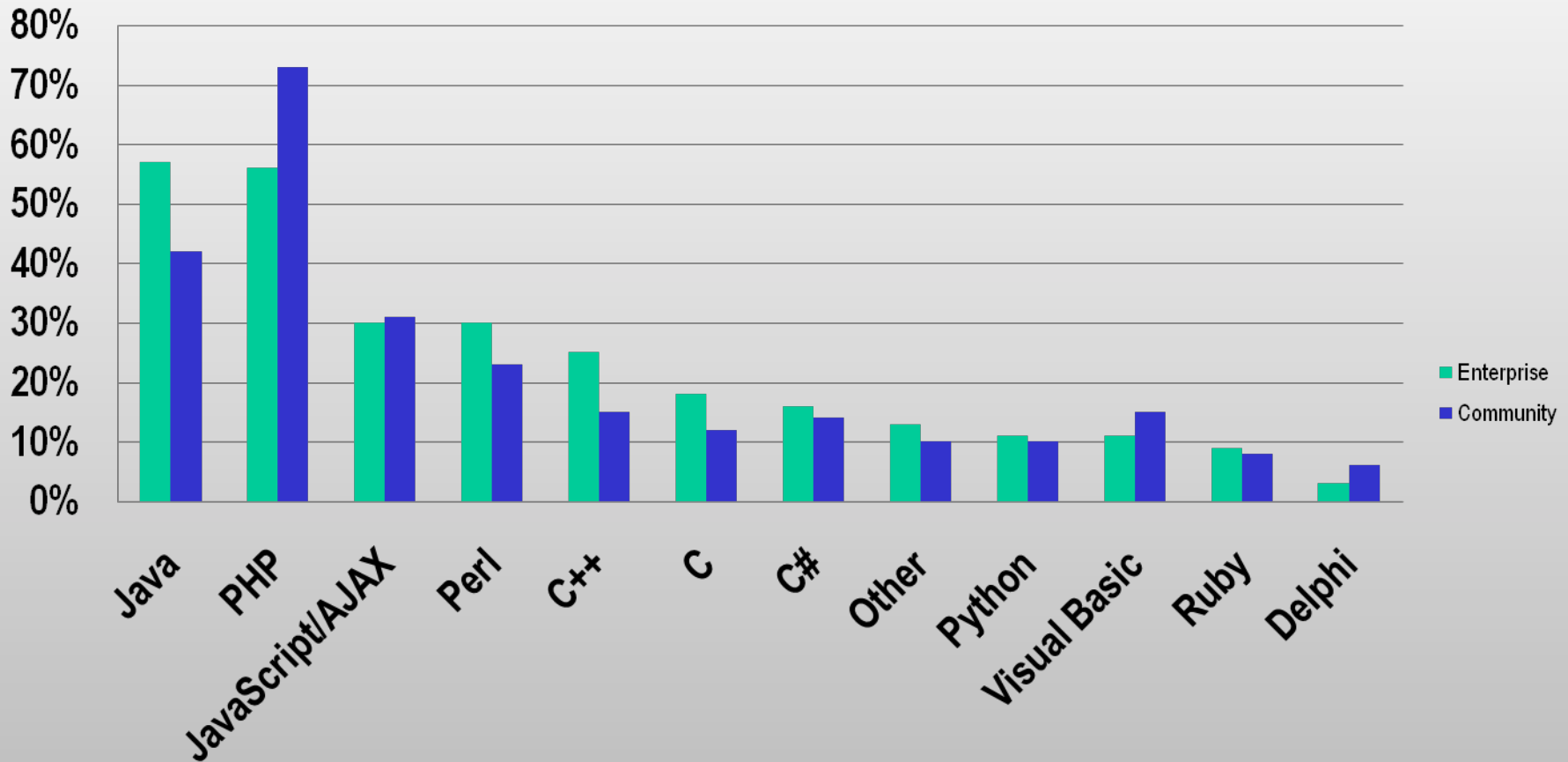
- Perl - DBD::mysql
- Python - MySQLdb
- Ruby - DBD::MYSQL
- C/C++ - MySQL++
- PHP
 - mysql_i, ext/mysql_i
 - PDO_MYSQL
 - PHP_MYSQLND

<http://www.mysql.com/products/connector/>

MySQL User Survey

Top Languages

Which languages do you use to develop your MySQL Applications?





MySQL on Windows

**SOFTWARE.
HARDWARE.
COMPLETE.**

MySQL on Windows

Did you know?

#1 Platform for MySQL ...

- ◆ Development
- ◆ Deployment for Community Edition Users

MySQL on Windows

Why?

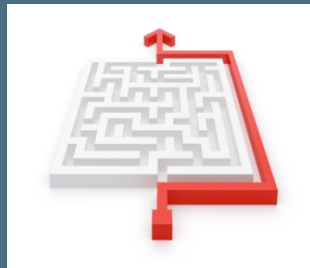
Lower
TCO



Performance
and
Scalability



Ease of Use
and
Administration



Cross-Platform
Flexibility



MySQL on Windows

Connector/NET Resources

Visual Studio integration

<http://dev.mysql.com/doc/refman/5.6/en/connector-net-visual-studio.html>

Connector/Net is available for download at:

<http://www.mysql.com/downloads/connector/net/>

Exploring MySQL in the Microsoft .NET Environment

<http://dev.mysql.com/tech-resources/articles/dotnet/index.html>

Using MySQL With .NET/C#/Visual Basic/Powershell

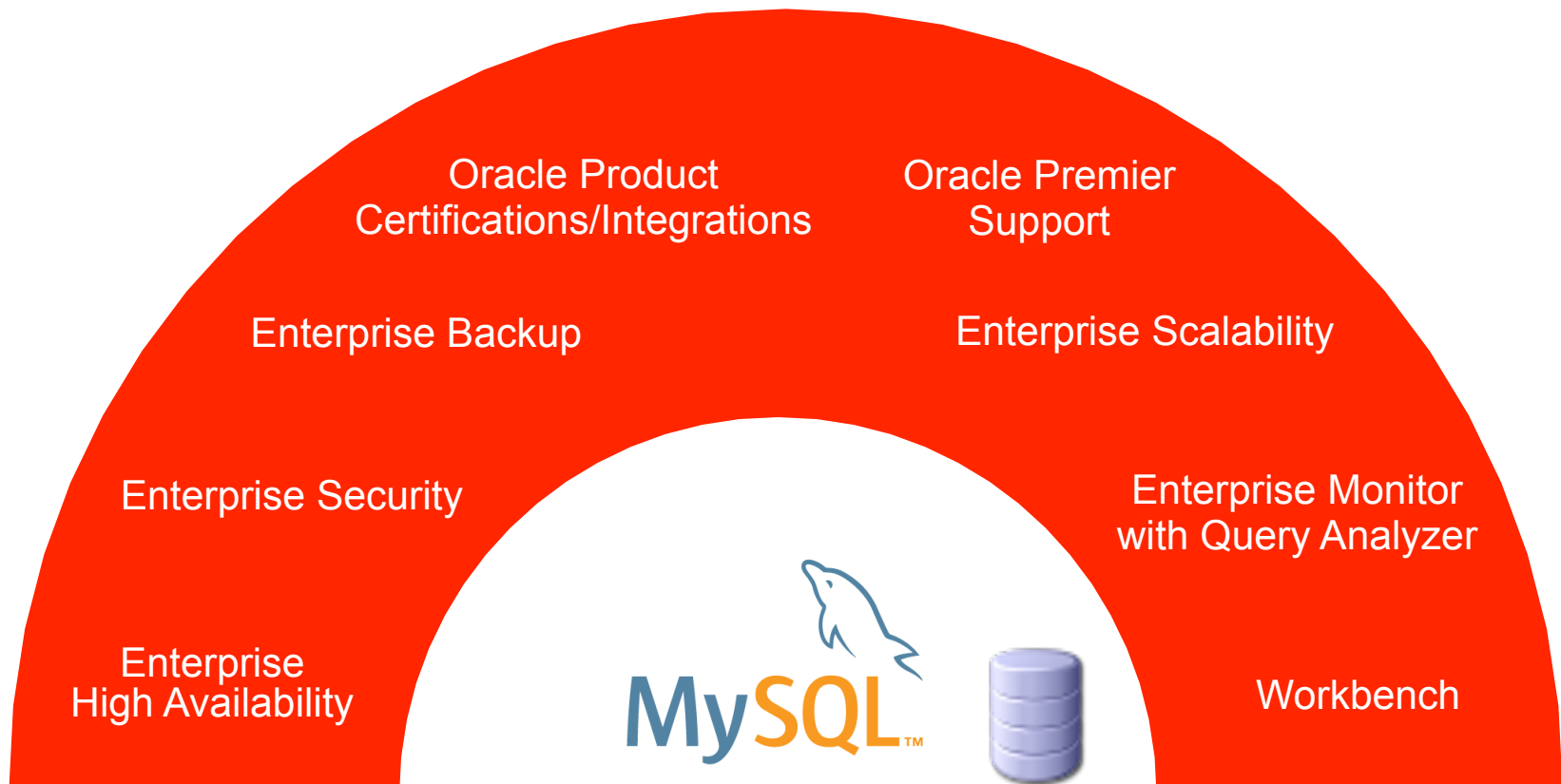
<http://dev.mysql.com/usingmysql/dotnet/>



MySQL Enterprise Edition

**SOFTWARE.
HARDWARE.
COMPLETE.**

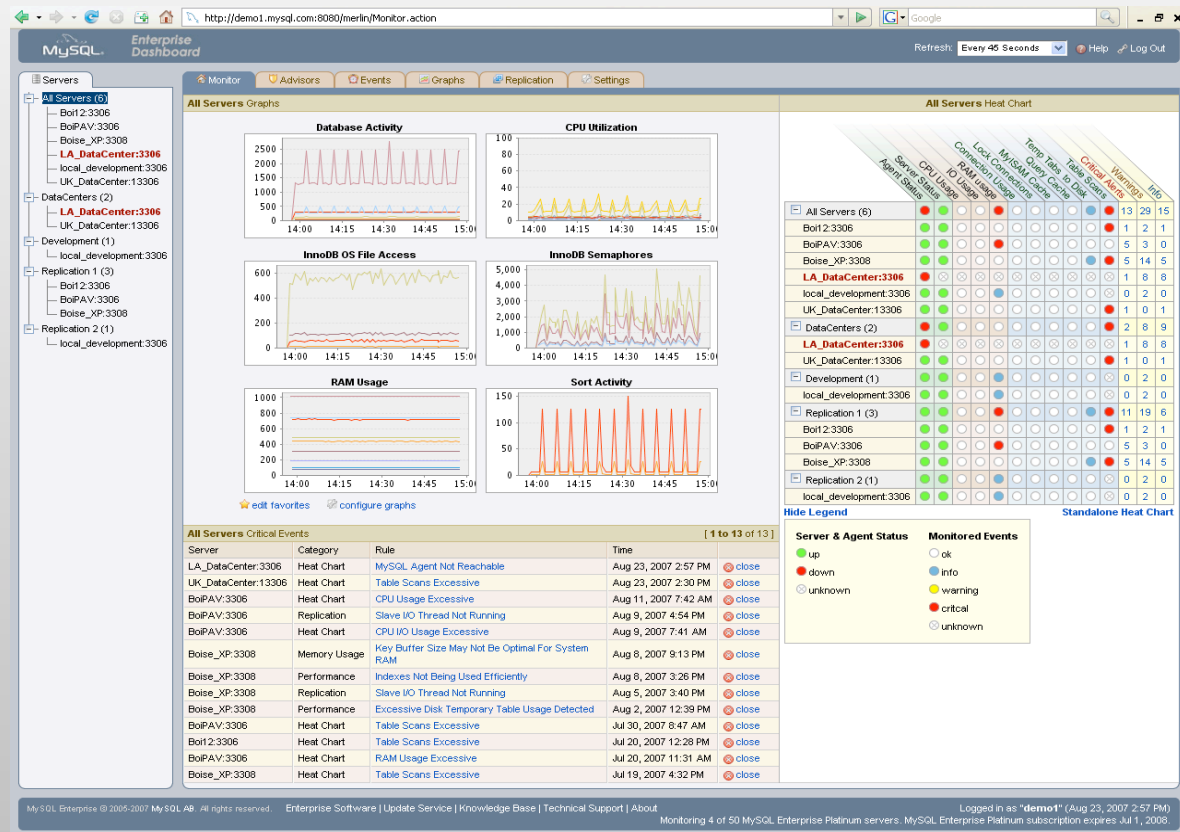
MySQL Enterprise Edition



MySQL Enterprise Edition

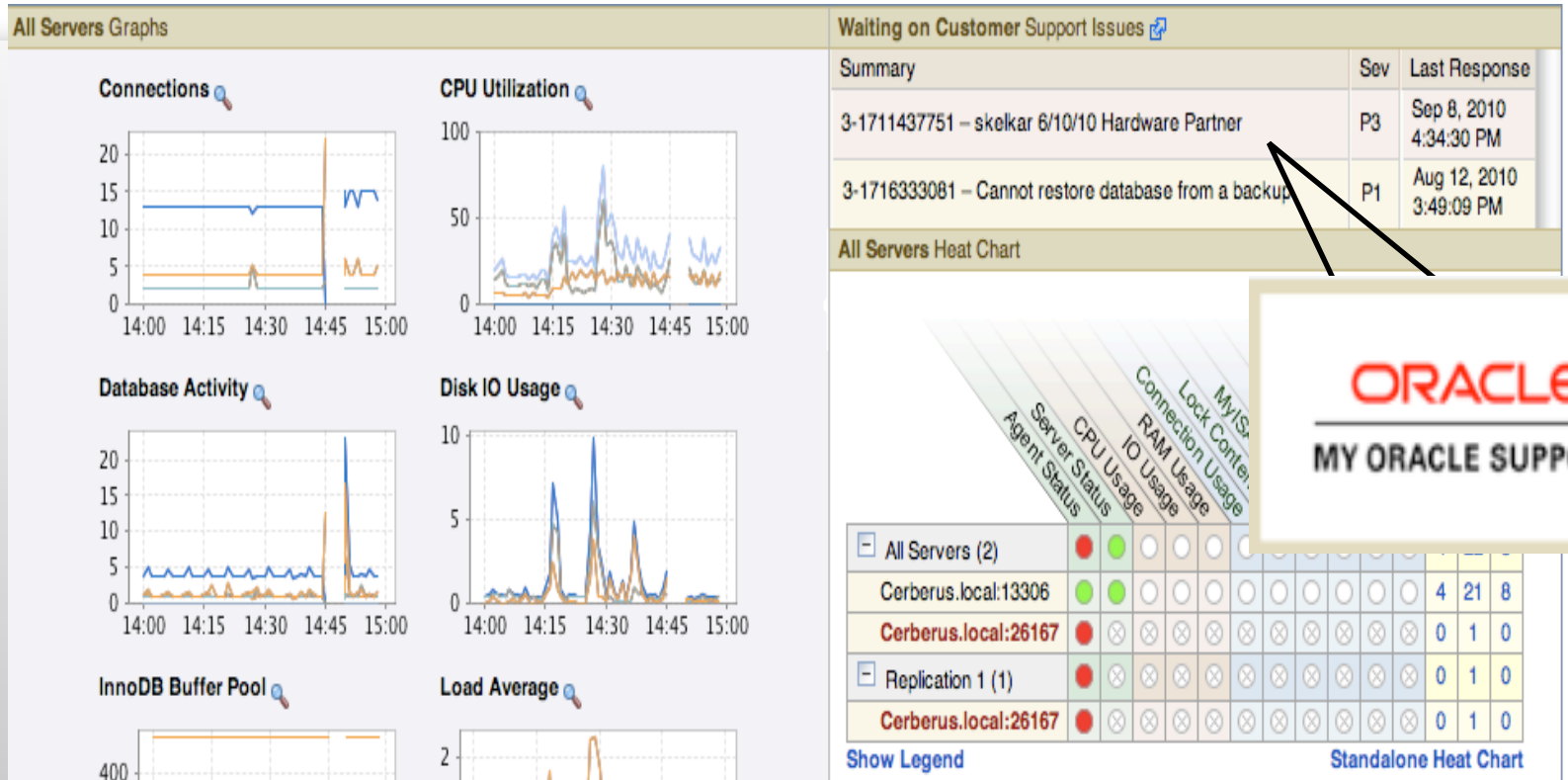
Enterprise Monitor

- Consolidated view
- Enterprise Support
 - SNMP
 - LDAP
 - Customizable
- Query Analysis with Correlation Graphs



MySQL Enterprise Monitor

My Oracle Support Integration



- Collect MySQL diagnostics and upload to MySQL Support
- Track MOS SRs from Enterprise Dashboard

MySQL Enterprise Edition

Enterprise Backup

- Online Backup for InnoDB
- Full, Incremental, Partial Backups
 - Compression
 - Scriptable Interface
 - Streaming (Single File)
- Recovery Options
 - Point in Time
 - Full
 - Partial
- Metadata on status, progress, history
- Unlimited Database Size
- Cross-Platform
 - Windows, Linux, Unix
- Certified with Oracle Secure Backup



MySQL Enterprise Edition

Commercial Extensions

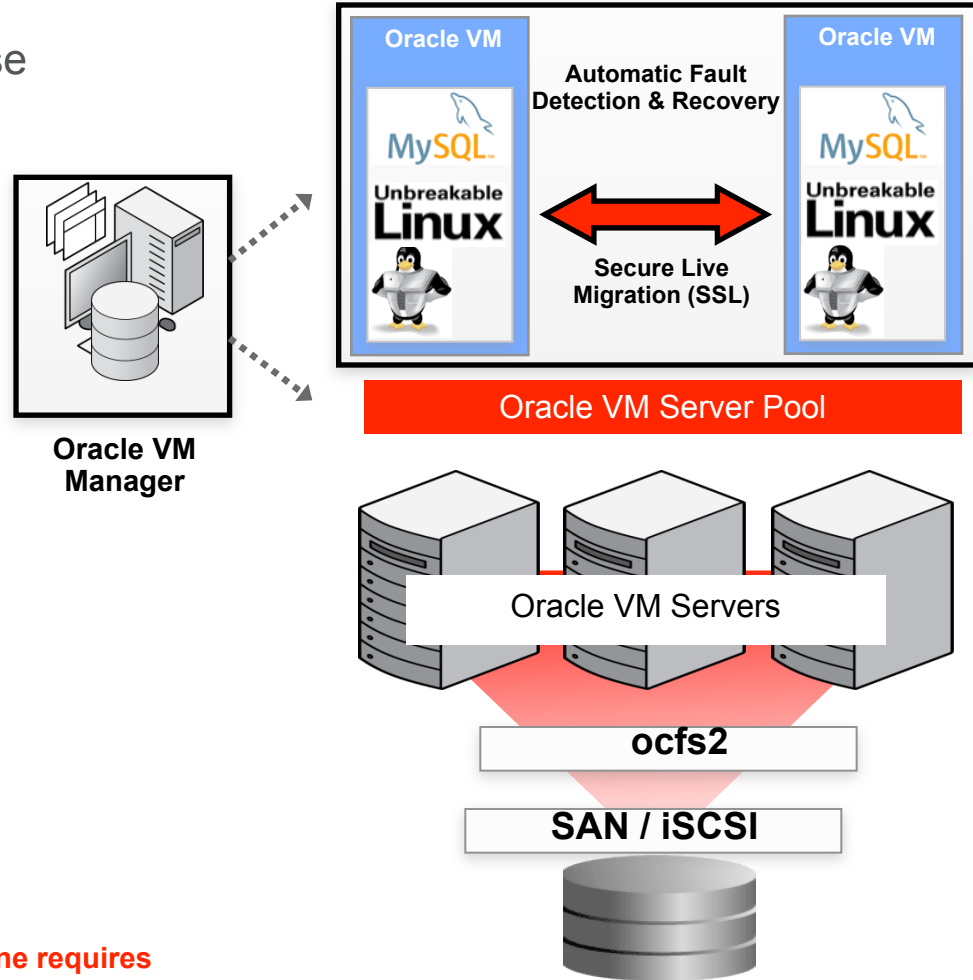
<i>Security</i> Authentication	<ul style="list-style-type: none">• Support for SSO environments• Linux: PAM (Pluggable Authentication Modules)• Windows: AD, Native Windows Auth• Pluggable Authentication API
<i>Security</i> Audit	<ul style="list-style-type: none">• Policies for logins and/or query activity• Dynamically enable/disable audit stream• Automatic log rotation based on size• Auditing API
<i>Scalability</i> Thread Pool	<ul style="list-style-type: none">• Improves sustained performance and scale as user connections increase• Thread Pooling API

MySQL Enterprise Edition

HA - OVM Template for MySQL

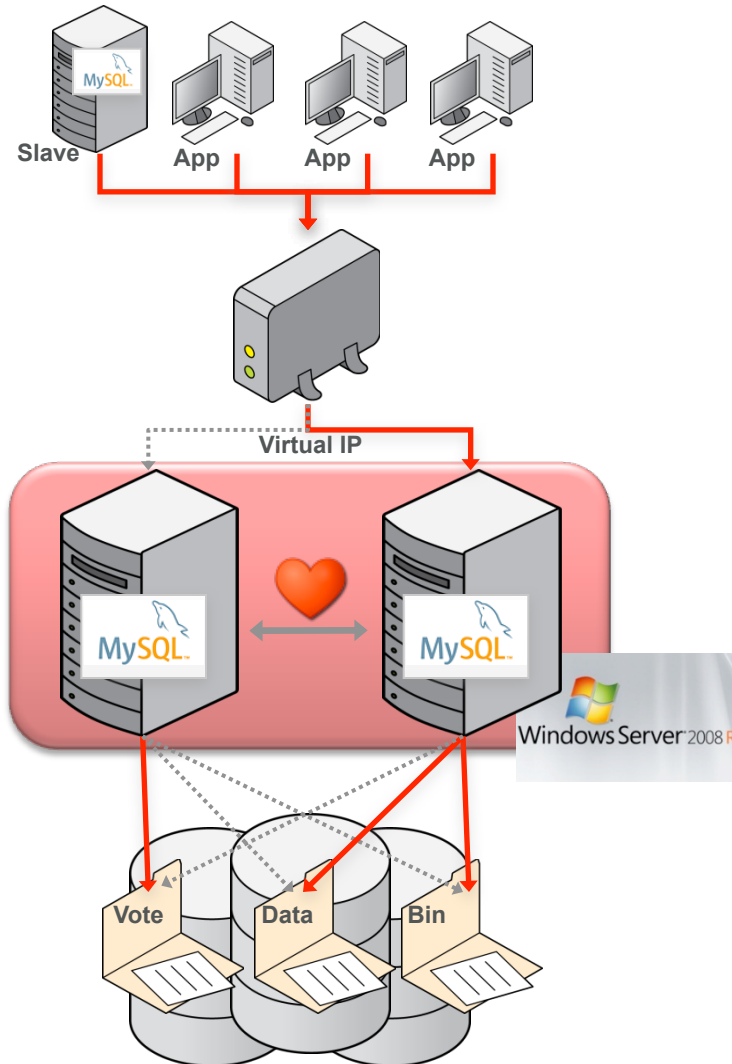
- Oracle Linux with the Unbreakable Enterprise Kernel
 - Oracle VM
 - Oracle VM Manager
 - Oracle Cluster File System 2 (OCFS2)
 - MySQL Database (Enterprise Edition)
-
- Pre-Installed & Pre-Configured
 - Full Integration & QA Testing
 - Single Point of Support**

** Technical support for Oracle Linux and Oracle Virtual Machine requires Unbreakable Linux Network subscription..



MySQL Enterprise Edition

HA - Windows Server Failover Clustering



Technical support for Windows Server Failover Clustering must be sourced from Microsoft.

Summary

Oracle is driving MySQL Innovation

Build your Applications with MySQL using
the technology you like most

Rely on MySQL Enterprise Edition For Web &
Departmental Applications Across Your
Organization

The preceding 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 decisions.

The development, release, and timing of any features or functionality described for Oracle's products remains at the sole discretion of Oracle.



Thank you!

