



Introduction to MySQL

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ORACLE

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Major milestones in history



- 2001 MySQL 3.23 GA
- 2004 MySQL 4.0 InnoDB new SE
- 2005 MySQL 5.0 GA and Oracle acquired Innobase OY
- 2008 SUN acquired MySQL AB for \$1 Billion
- 2010 Oracle acquires SUN
- 2010 MySQL 5.5 GA “InnoDB default”
- 2013 MySQL 5.6 GA “Best release ever”

Open Source LAMP Stack

Operating System		L
Application Server		A
Database		M
Scripting	  	P

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: 175K fans, +35% YoY Growth
- Twitter: 28K followers, +67% YoY Growth
- Numerous Awards: Linux Journal, CRN, PHP Architect...

Industry Leaders Rely on MySQL

Web & Enterprise

OEM & ISVs

Cloud



MySQL Powers The Web



Over 500 million Tweets/day. 143,200 Tweets/sec in Aug 2013

facebook

“Many petabytes” of data. 11.2 Million Row changes & 2.5 billion rows read /sec handled in MySQL

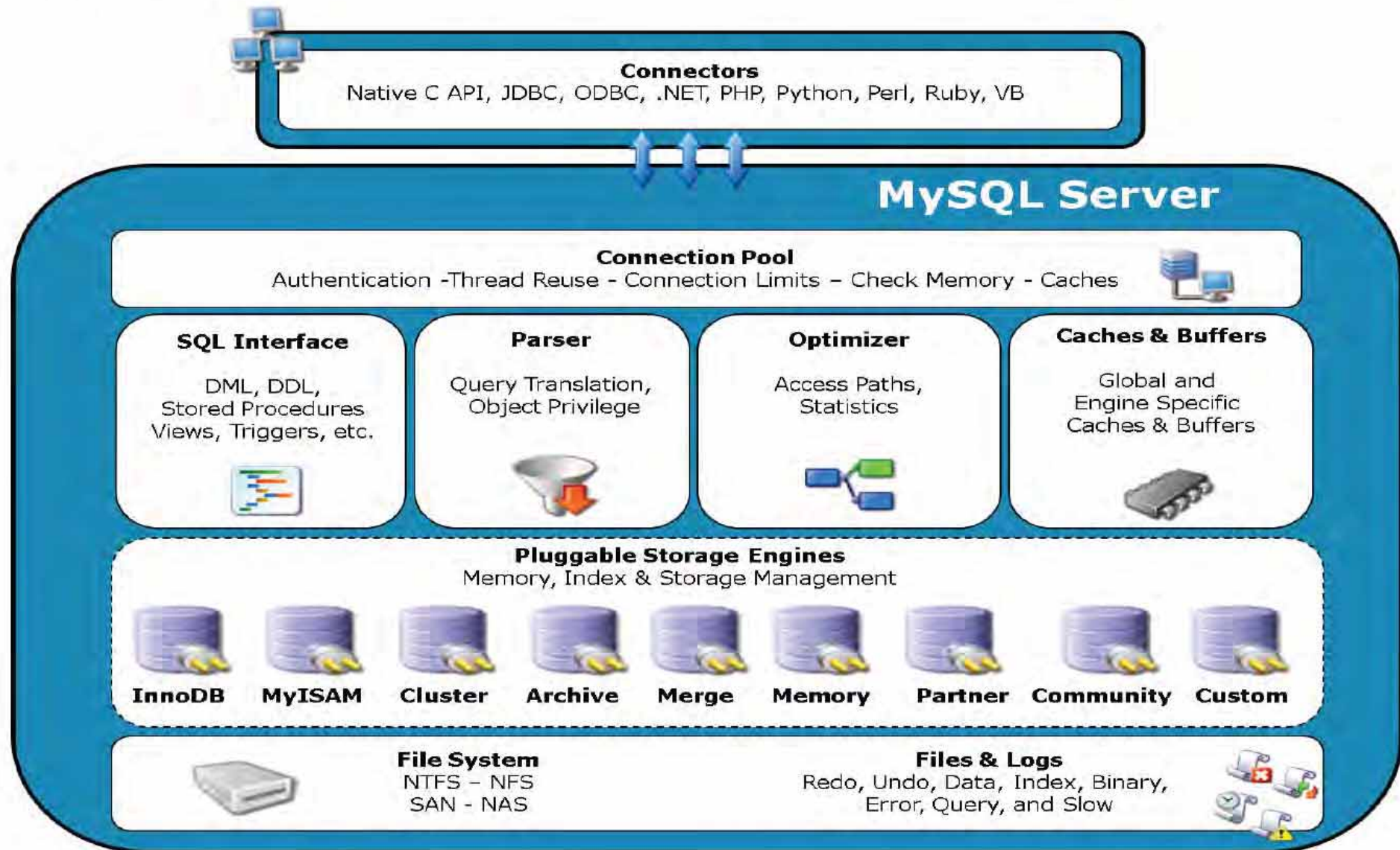
You Tube

6 billion hours of video watched each month

PayPal

Globally-distributed database with 100 terabytes of user-related data based on MySQL Cluster

MySQL Architecture



MyISAM

- **Default Storage Engine** before MySQL 5.5
- **Table** level locking
- **Small** footprint on disk
- **Read Only** during backups
- **GIS** and **FTS** indexing



InnoDB

- **Default Storage Engine** since MySQL 5.5
- **ACID** compliant transactions, MVCC
- **Row** level locking
- **Clustered** primary key index
- **Foreign** keys and native partitioning
- **Online** backup and DDL operations
- **SQL** and NoSQL access to data



INNOBASE

MySQL Cluster aka NDB

- **Clustered** database
- **ACID** compliant
- **Row** level locking
- **Shards** data automatically, transparent for application
- **Foreign** keys and and native partitioning
- **Online** backup and DDL operations
- **SQL** and NoSQL access to data
- **Max 2TB**



MySQL 5.5

- InnoDB default SE
- InnoDB multiple BP, splitting and removing mutexes
- InnoDB 10X improvement in InnoDB recovery speed
- Replication semi-synchronous replication
- Replication heartbeat
- Partitioning on more data types and more partition functions
- Performance Schema released



MySQL 5.6 GA “Best release ever”

- **InnoDB** scales up to 48 (60) cores
- **InnoDB** NoSQL access using memcached API
- **Optimizer** improvements for sub-queries
- **Optimizer Explain** on all type of statements
- **Replication** safer and more robust
- **Replication** multi threaded slaves
- **Partition pruning** in DML

MySQL 5.7 **DM**

- **InnoDB** for better transactional throughput, availability, IO
- **Security** with new encryption functions
- **Replication** for better scalability and availability
- **Fabric** for high availability and sharding
- **Performance Schema** for new and improved performance metrics
- **Optimizer** for better EXPLAINing, parsing, query performance
- **GIS** with native InnoDB spatial indexes and Boost.Geometry integration



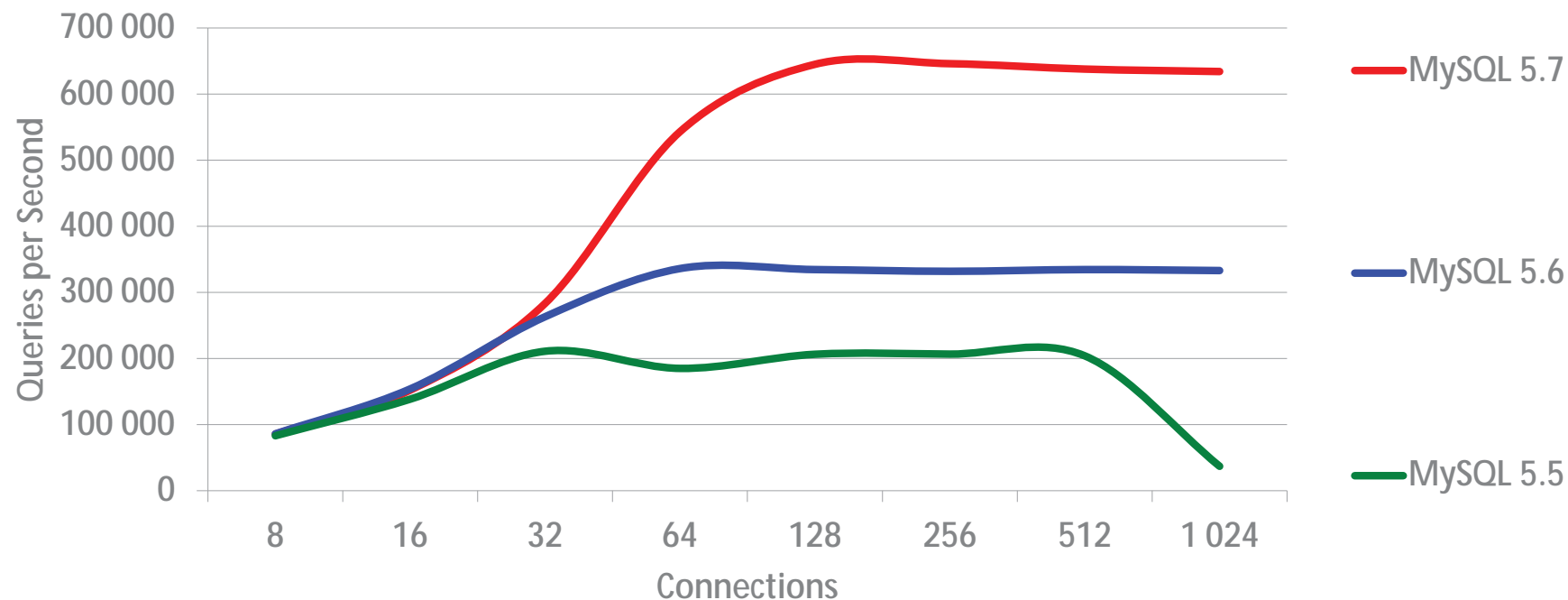
Available Now! dev.mysql.com/downloads/mysql/

MySQL 5.7: Sysbench Benchmark

2x Faster than MySQL 5.6
3x Faster than MySQL 5.5

645,000 QPS

MySQL 5.7: Sysbench Read Only (Point Select)

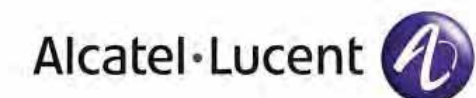


Intel(R) Xeon(R) CPU E7-4860 x86_64
4 sockets x 10 cores-HT (80 CPU threads)
2.3 GHz, 512 GB RAM
Oracle Linux 6.5

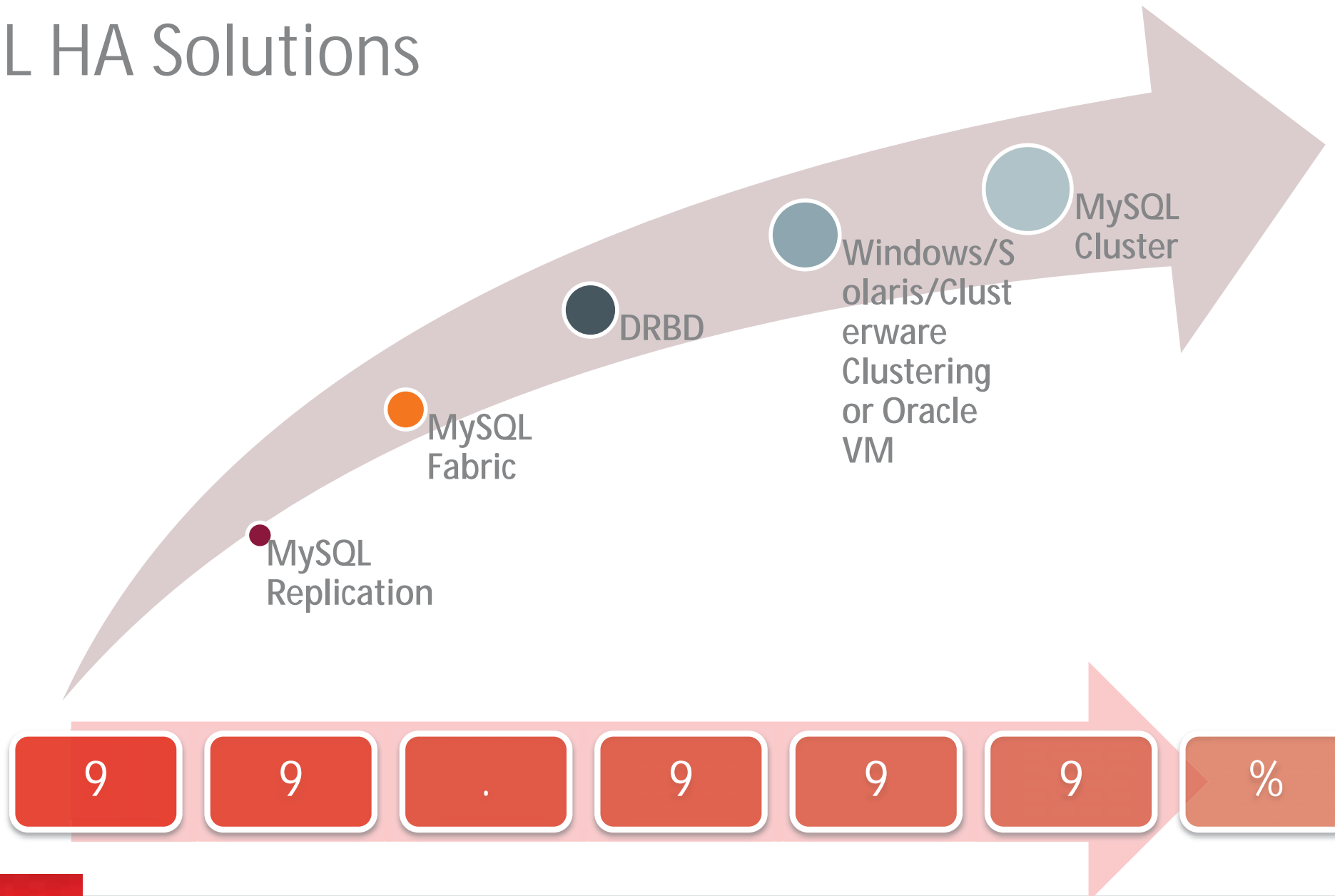
MySQL Future

Focus on Web, Cloud, Embedded

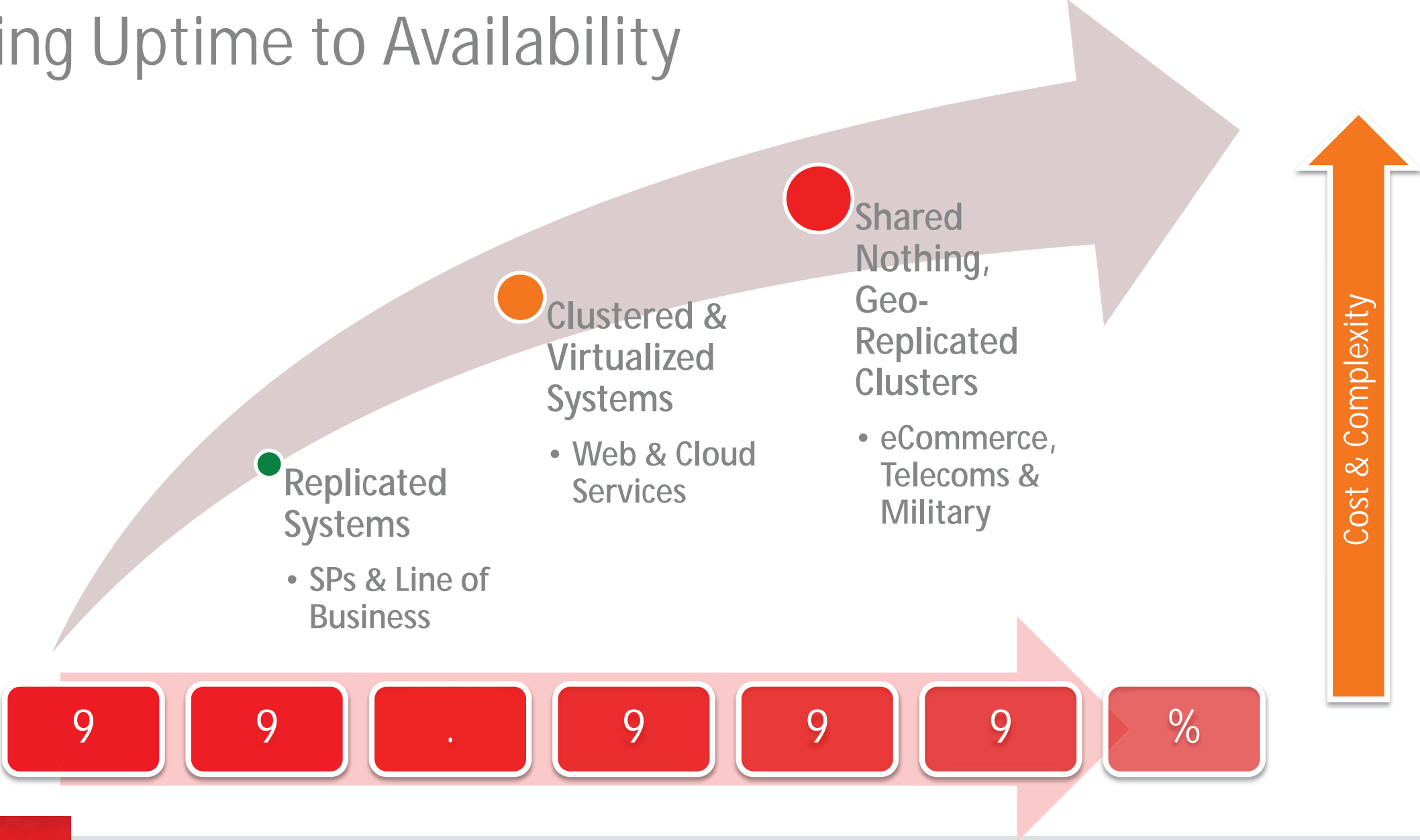
- Architecture Improvements
 - Improved Modularity
 - Refactoring Optimizer, Parser, Runtime
- Web Scale Performance & Scalability
 - Optimizer Cost Model
 - InnoDB & Replication Improvements
- Management & Security
 - Data Dictionary
 - MySQL Enterprise Encryption
 - Oracle Enterprise Manager for MySQL



MySQL HA Solutions

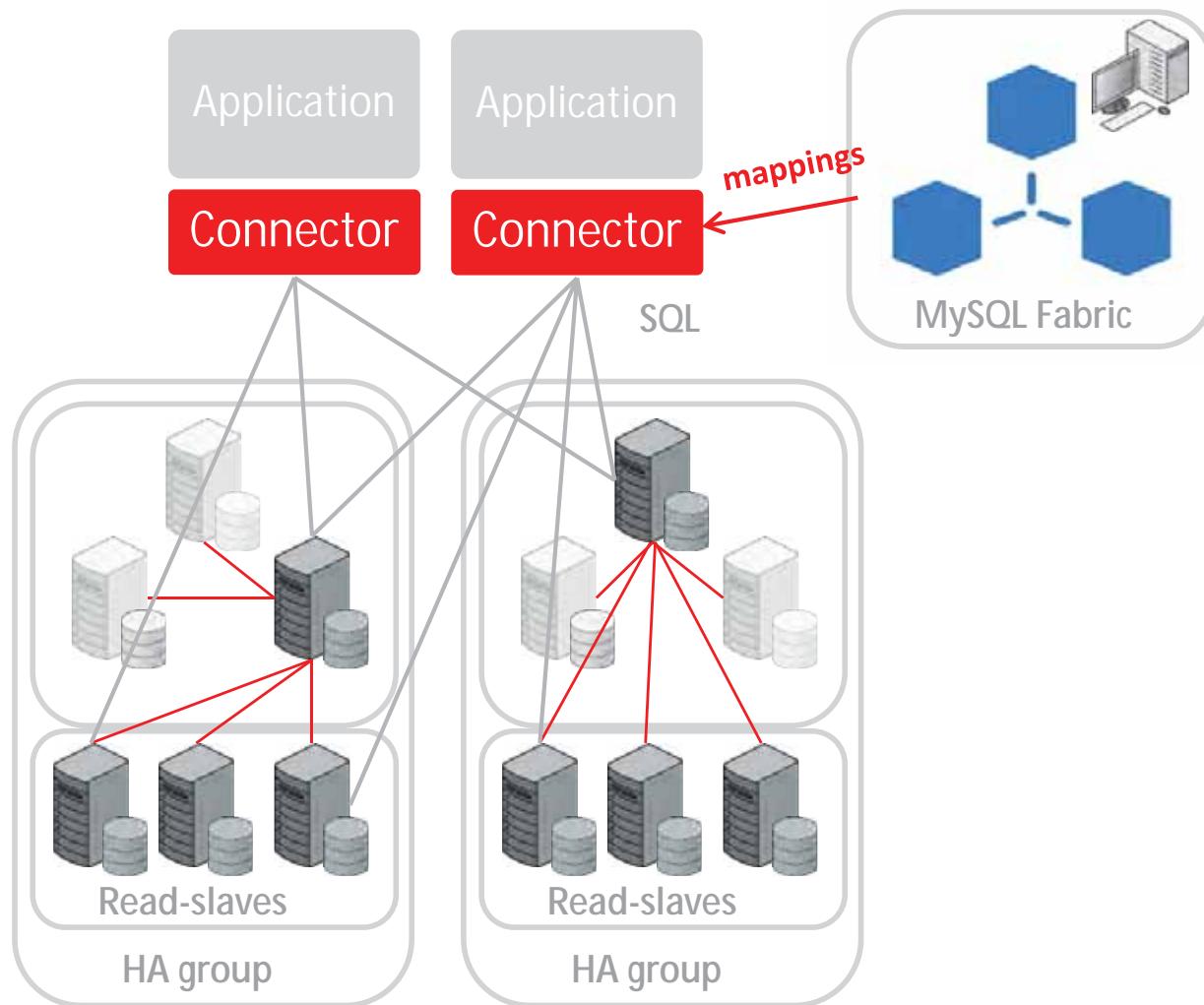


Mapping Uptime to Availability



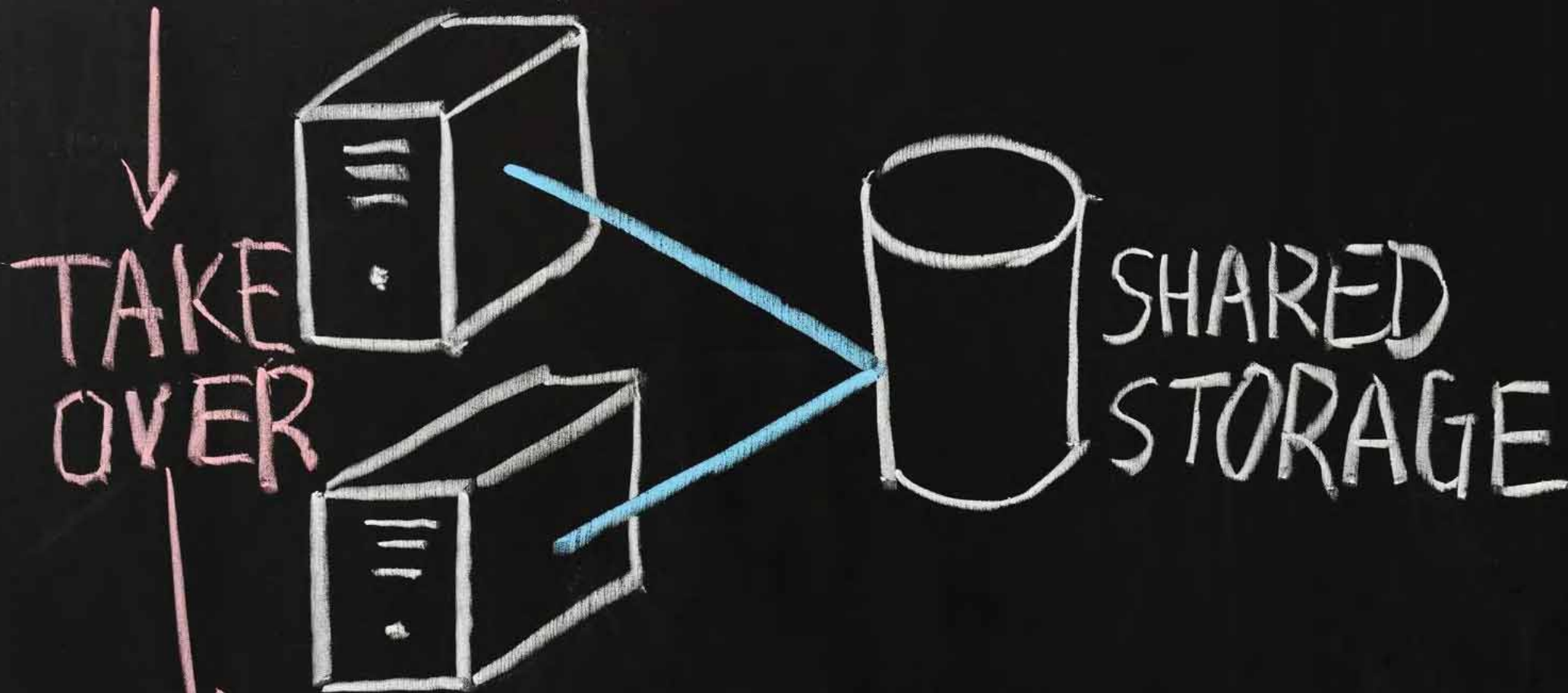
MySQL Fabric 1.5

High Availability + Sharding-Based Scale-out



- High Availability
 - Server monitoring with auto-promotion and transparent application failover
- Optionally scale-out through sharding
 - Application provides shard key
 - Range or Hash
 - Tools for resharding
 - Global updates & tables
- Fabric-aware connectors rather than proxy: Python, Java, PHP, .NET, C (labs)
 - Lower latency, bottleneck-free
- Server provisioning using OpenStack etc.

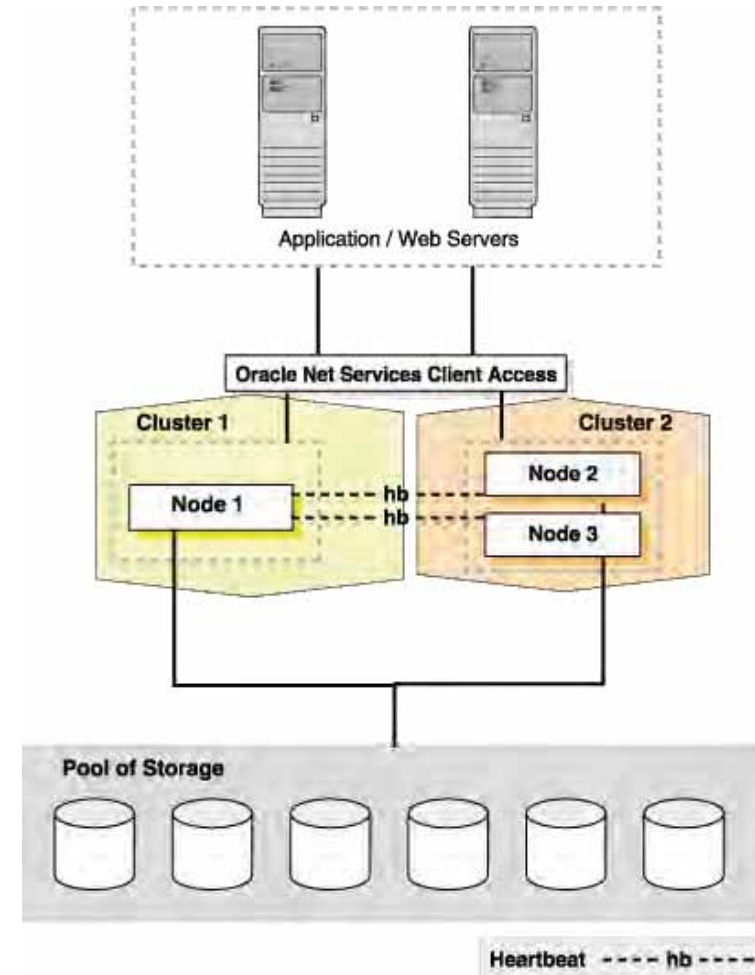
X ACTIVE



O PASSIVE

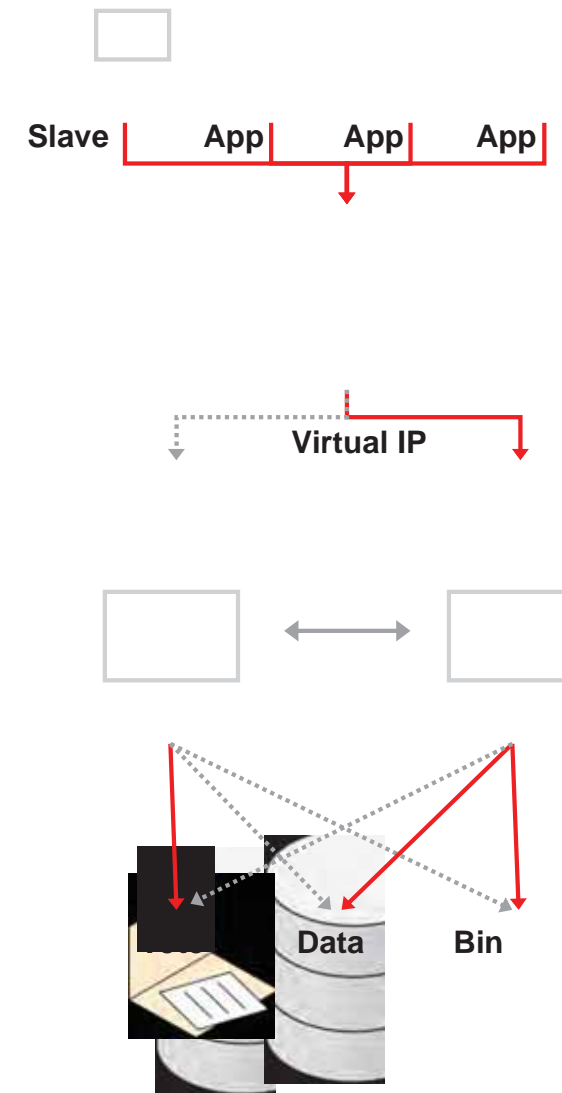
MySQL on Oracle Clusterware

- Oracle Clusterware unifies servers in a server farm to form a cluster
 - At the core of Oracle RAC
- Oracle Cluster 12c includes MySQL Server 5.6 agent
- Planned migration and failover of MySQL database
 - Hidden from the application



Windows Server Failover Clustering

- Native Windows HA clustering with MySQL
- Quorum (3rd vote), data (InnoDB + schema) & binaries (optional) stored in shared storage (iSCSI & FCAL)
- Loss of service = couple of seconds + InnoDB recovery time
- Cluster managed through MS Failover Cluster Management snap-in GUI



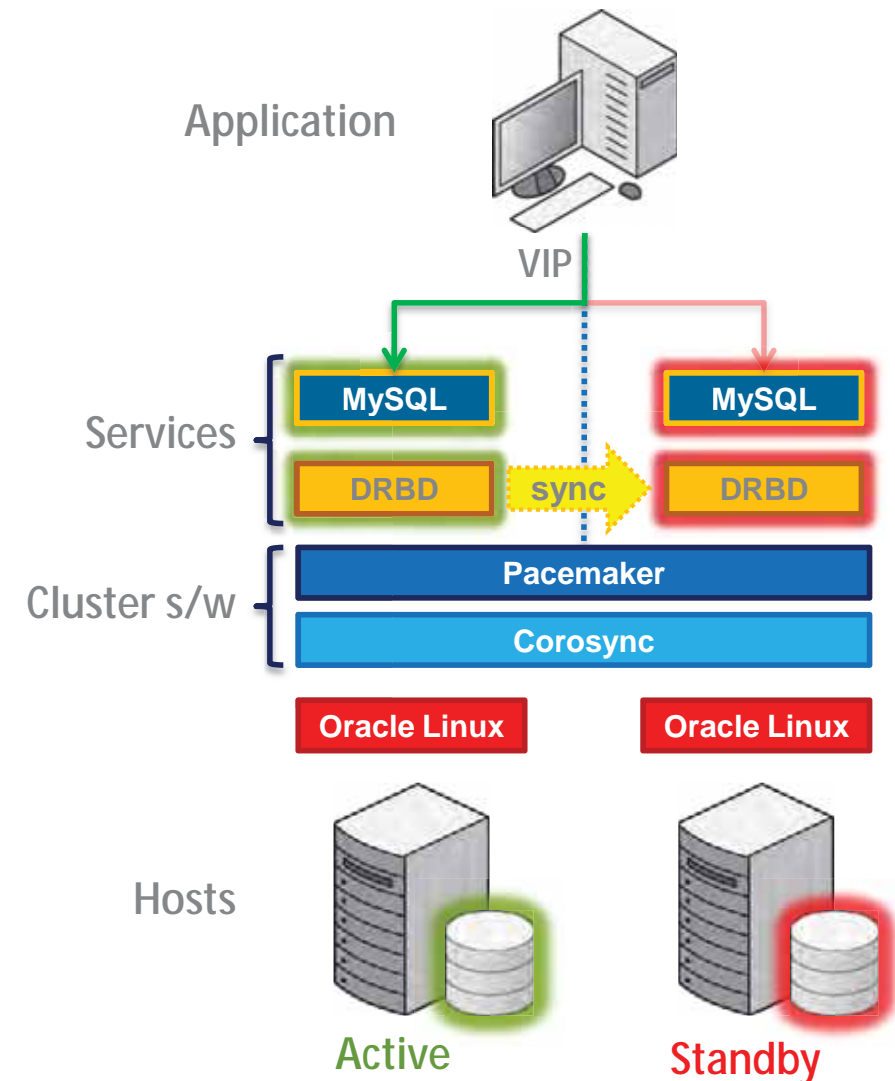
Oracle Solaris Clustering

- Kernel based heartbeating and monitoring
- SPARC and x86. Solaris Virtualization-aware
- MySQL agent included with Oracle Solaris Cluster
- Learn more:
<http://www.oracle.com/technetwork/server-storage/solaris-cluster/overview/index.html>



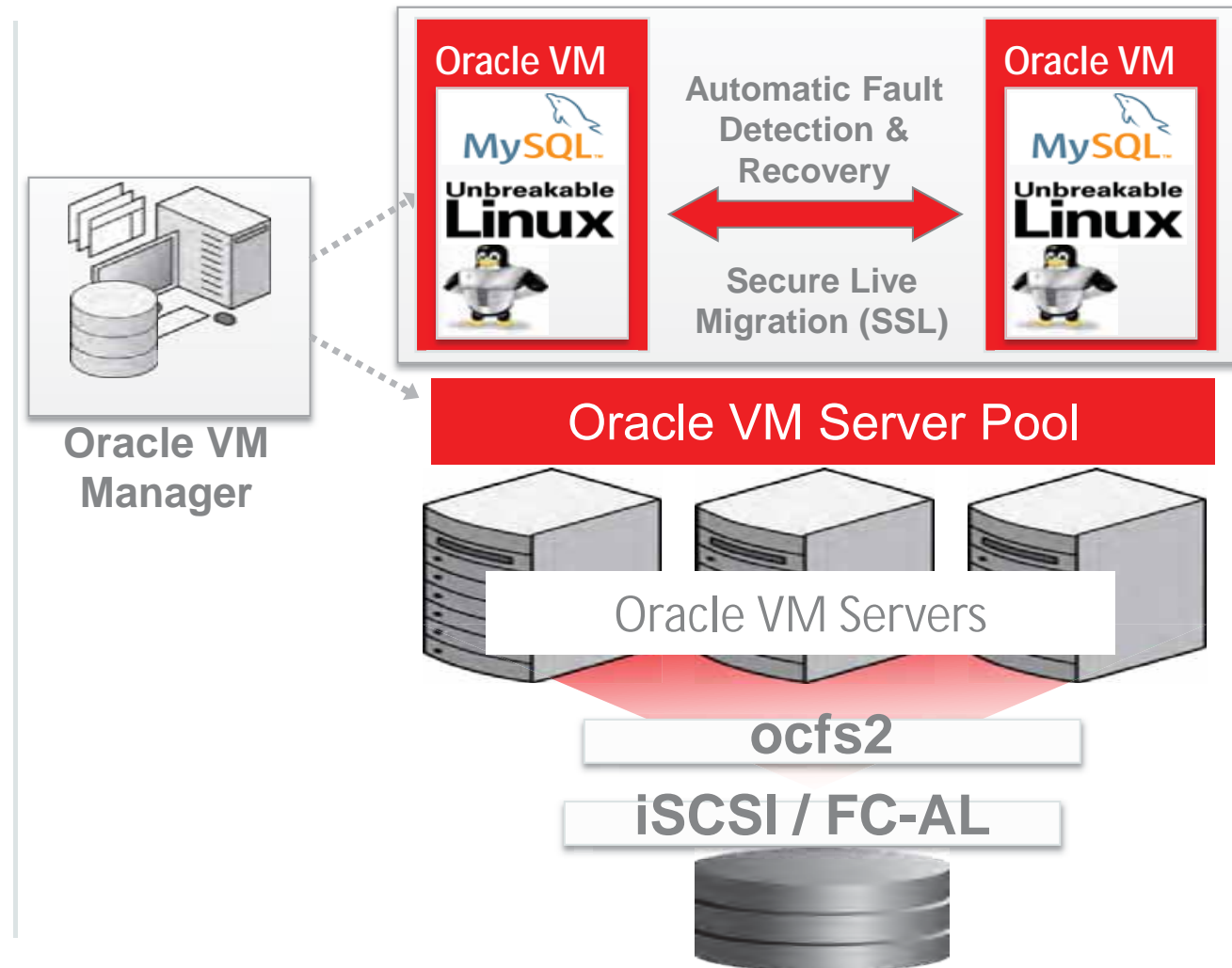
Oracle Linux and DRBD Stack

- Based on distributed storage
 - NOT physical shared storage
- Synchronous replication at block device level eliminates risk of data loss
- Open source, mature & proven
- Certified and supported by Oracle



Oracle VM Template for MySQL

- Pre-Installed & Pre-Configured
- Full Integration & QA Testing
- Single Point of Support



MySQL Cluster Overview

HIGH SCALE, READS + WRITES

- Auto-Sharding, Multi-Master
- ACID Compliant, OLTP + Real-Time Analytics

99.999% AVAILABILITY

- Shared nothing, no Single Point of Failure
- Self Healing + On-Line Operations

REAL-TIME

- In-Memory Optimization + Disk-Data
- Predictable Low-Latency, Bounded Access Time

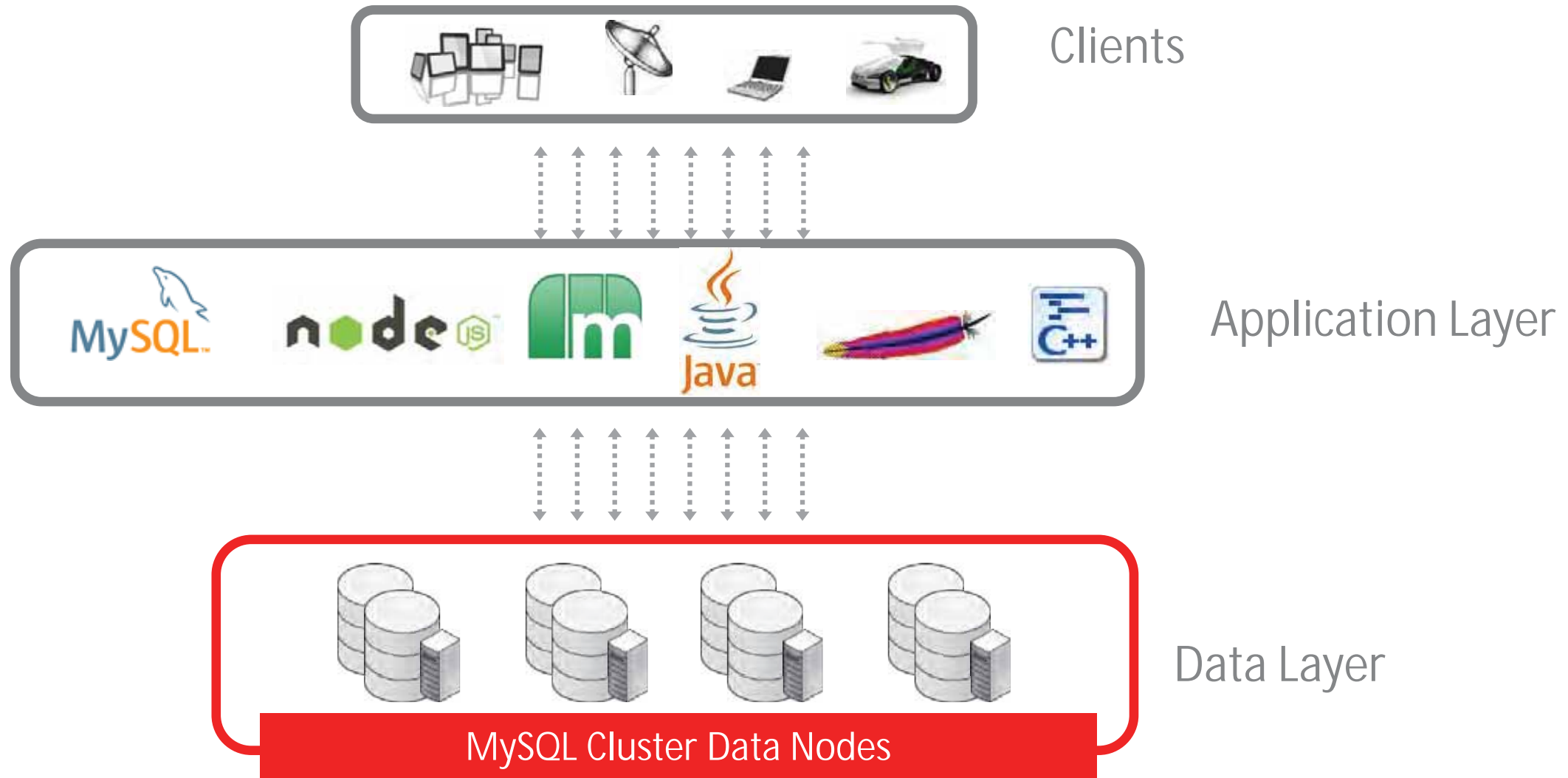
SQL + NoSQL

- Key/Value + Complex, Relational Queries
- SQL + Memcached + JavaScript + Java + HTTP/REST & C++

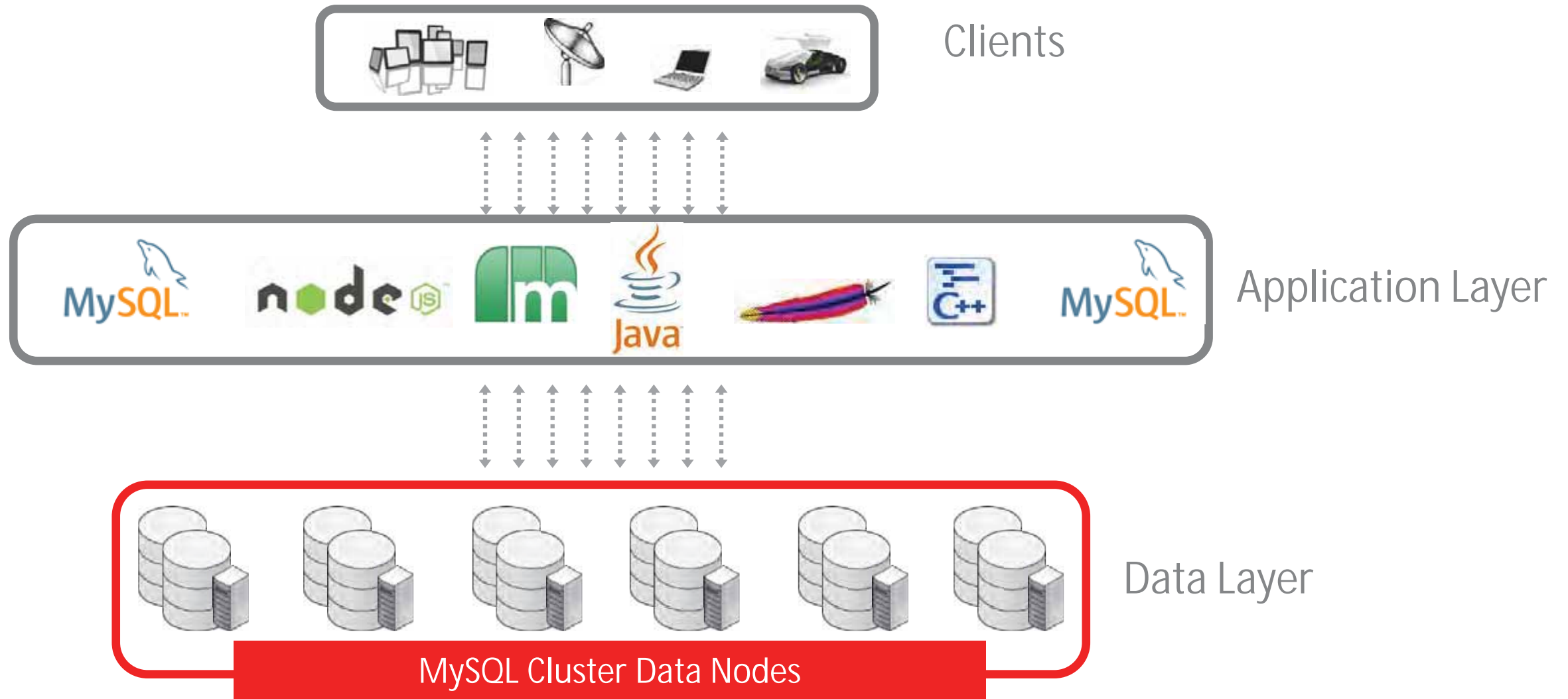
LOW TCO

- Open Source + Commercial Editions
- Commodity hardware + Management, Monitoring Tools

MySQL Cluster Architecture



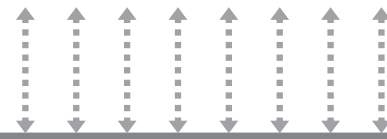
MySQL Cluster Scaling



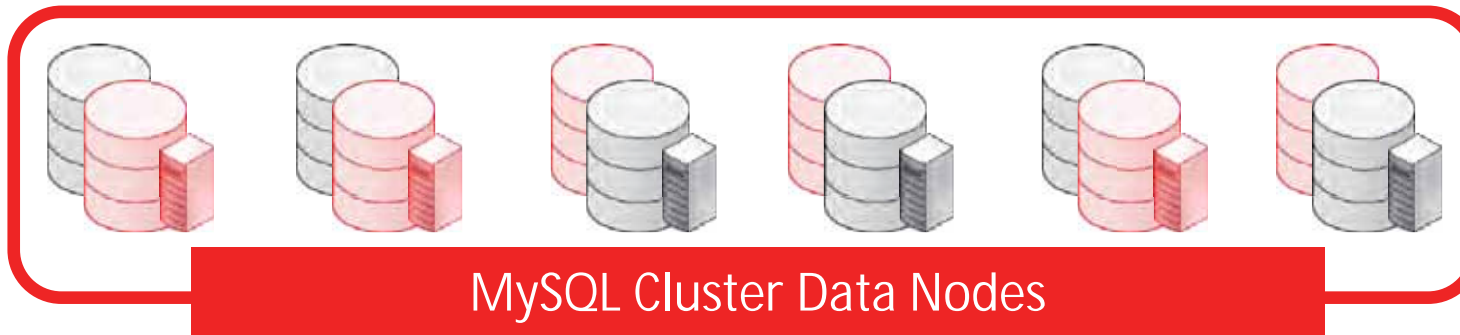
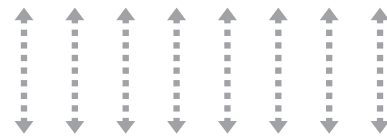
MySQL Cluster HA



Clients



Application Layer



Data Layer

Who's Using MySQL Cluster?



Oracle MySQL HA & Scaling Solutions

	MySQL Replication	MySQL Fabric	Oracle VM Template	Oracle Clusterware	Solaris Cluster	Windows Cluster	DRBD	MySQL Cluster
App Auto-Failover	✗	✓	✓	✓	✓	✓	✓	✓
Data Layer Auto-Failover	✗	✓	✓	✓	✓	✓	✓	✓
Zero Data Loss	MySQL 5.7	MySQL 5.7	✓	✓	✓	✓	✓	✓
Platform Support	All	All	Linux	Linux	Solaris	Windows	Linux	All
Clustering Mode	Master + Slaves	Master + Slaves	Active/Passive	Active/Passive	Active/Passive	Active/Passive	Active/Passive	Multi-Master
Failover Time	N/A	Secs	Secs +	Secs +	Secs +	Secs +	Secs +	< 1 Sec
Scale-out	Reads	✓	✗	✗	✗	✗	✗	✓
Cross-shard operations	N/A	✗	N/A	N/A	N/A	N/A	N/A	✓
Transparent routing	✗	For HA	✓	✓	✓	✓	✓	✓
Shared Nothing	✓	✓	✗	✗	✗	✗	✓	✓
Storage Engine	InnoDB+	InnoDB+	InnoDB+	InnoDB+	InnoDB+	InnoDB+	InnoDB+	NDB
Single Vendor Support	✓	✓	✓	✓	✓	✗	✓	✓

Best Choice for Next Generation Web & Cloud Applications

Strong MySQL Momentum



World's Most Popular Open Source Database



Leading Open Source Database for Web Applications



#1 Open Source Database in the Cloud



Integrated with Hadoop in Big Data Platforms

Getting Started

MySQL Enterprise Edition

- <http://www.mysql.com/news-and-events/web-seminars/why-relying-on-mysql-enterprise-edition/>
- <http://www.mysql.com/news-and-events/web-seminars/the-mysql-sys-schema/>

MySQL Security and Upgrading to 5.6

- <http://www.mysql.com/news-and-events/web-seminars/mysql-security-whats-new-in-mysql-5-7-best-practices/>
- <http://www.mysql.com/news-and-events/web-seminars/upgrading-to-mysql-5-6-best-practices/>

MySQL Availability

- <http://www.mysql.com/why-mysql/white-papers/#en-22-16>
- <http://www.mysql.com/news-and-events/on-demand-webinars/#en-20-16>

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MySQL Central
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Sept. 28–Oct. 2, 2014
San Francisco

Thank You!

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