

**ENGINEERED
FOR INNOVATION**



ORACLE®

The State of The Dolphin

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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 decisions.

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

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

More Product Releases Than Ever Before

Driving MySQL Innovation

• MySQL Workbench 5.2

GA!

• MySQL Enterprise Monitor 2.2

• MySQL Cluster 7.1

• MySQL Cluster Manager 1.0

All GA!

- MySQL Database 5.5
- MySQL Enterprise Backup 3.5
- MySQL Enterprise Monitor 2.3
- MySQL Cluster Manager 1.1

All GA!

- MySQL Enterprise Backup 3.6
- Oracle VM Template for MySQL Enterprise Edition

GA!

MySQL Database 5.6

MySQL Cluster 7.2

DMR*

and MySQL Labs!

("early and often")

A Better MySQL

***Development Milestone Release**

Q2 CY2010

Q3 CY2010

Q4 CY2010

Q1 CY2011

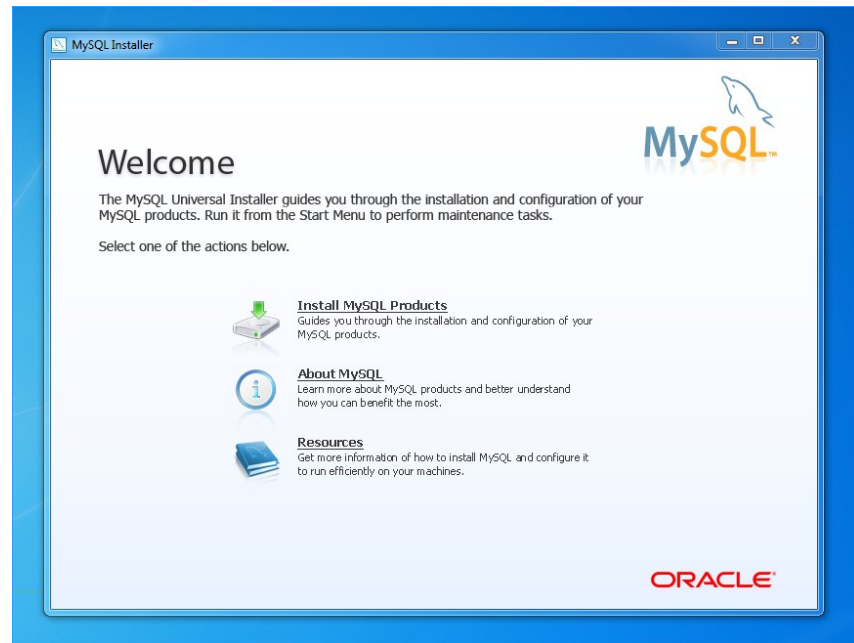
Q2-4 CY2011



What's New!?

MySQL Installer For Windows

- Native MS Windows UI
- Oracle Universal Installer feature set
- All MySQL products in ONE single package
- Tight integration, download on demand, update features

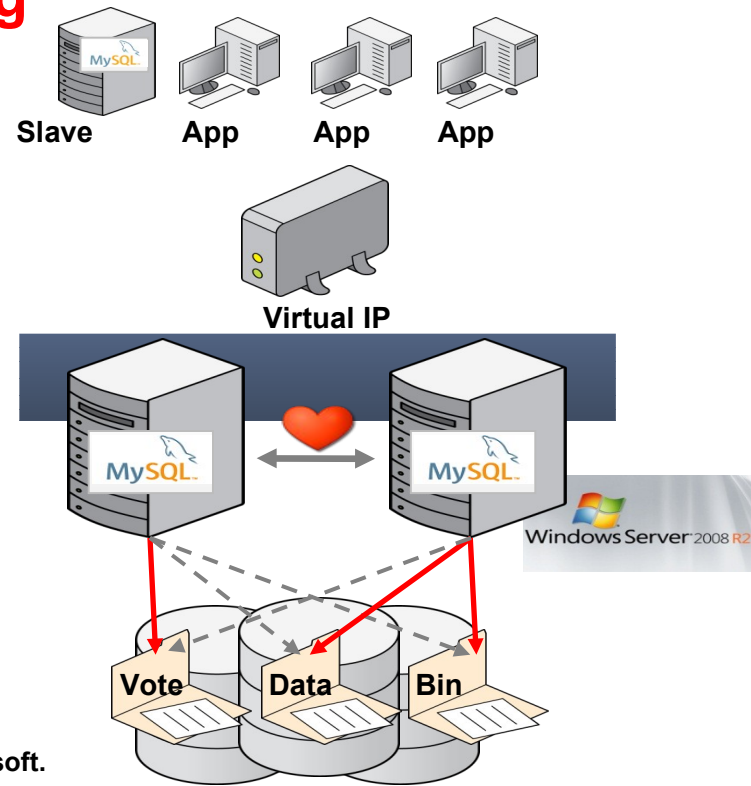


dev.mysql.com/downloads/installer/

MySQL Enterprise High Availability

Windows Server Failover Clustering

- Windows Server 2008 R2, MySQL 5.5**
- Failover:
 - Planned maintenance
 - MySQL service failure
 - Connectivity, Host failures
- Cluster managed through MS Failover Cluster Management snap-in GUI
- No new software/scripts required



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

MySQL on Windows, Priorities

Faster & Easier

- Windows Performance & Scalability optimizations
 - Additional Performance Enhancements
- Windows Eco-system Support
 - Visual Studio. MS Office Integration
 - Entity Framework
 - Windows Administration Tooling
 - Connector Enhancements
 - SQL Server Migration

**Windows: #1 Development
Platform for MySQL**

➤ **MySQL 5.6: DMR* 2**



➤ **MySQL Cluster 7.2: DMR 2**



➤ **MySQL Enterprise Oracle Certifications**



*DMR: Development Milestone Release

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MySQL 5.6: DMR 2

MySQL 5.6: A Better MySQL.

- MySQL 5.6 builds on MySQL 5.5 by improving:
 - Optimizer for better Performance, Scalability
 - Performance Schema for better instrumentation
 - InnoDB for better transactional throughput
 - Replication for higher availability, data integrity
 - “NotOnlySQL” options for better flexibility

**ORACLE DRIVES MySQL
INNOVATION**

MySQL 5.6.3 - Optimizer

- File sort optimizations with small limit
- Index Condition Pushdown
- Batched Key Access
- Postponed Materialization
- EXPLAIN for Insert, Update, and Delete
- Persistent Optimizer Statistics
- Optimizer Traces

MySQL 5.6.3 – Optimizer

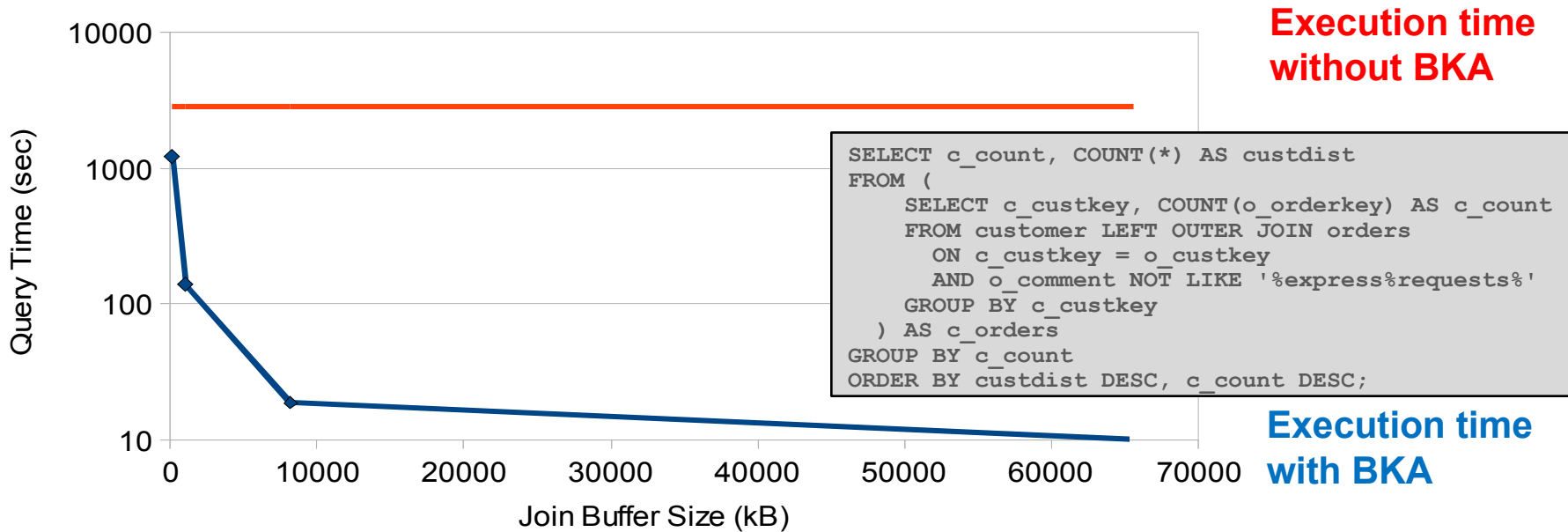
Persistent Optimizer Statistics (InnoDB)

- More Accurate Statistics
- More Stable Statistics
- Run ANALYZE
- `mysql.innodb_table_stats` and `mysql.innodb_index_stats`
- Can be manually updated

MySQL 5.6.3 – Optimizer

Batch Key Access (BKA)

Improves performance of disk-bound join queries
DBT3 (Scale 1), Query 13



MySQL 5.6.3 - Replication

- Better Data Integrity
 - Crash-Safe Slaves, Replication Checksums, Crash-Safe Binlog
- Better Performance
 - Multi-threaded Slaves
 - Reduced Binlog size for RBR
- Extra flexibility
 - Time-delayed replication
- Simpler troubleshooting
 - Row-based repl. logging of original query
- Enhanced Monitoring/Management

MySQL Server - Under Development

Early Access Features



- InnoDB
 - InnoDB - smaller 4k, 8k page sizes
 - InnoDB - Full-text Search
- Replication
 - Global Transaction IDs
 - Binlog API
 - Binlog Group Commit
- “NotOnlySQL” options for accessing InnoDB data

Try them now:

labs.mysql.com

MySQL 5.6.3 – Other Enhancements

- Ipv6 improvements
- Support Unicode for Windows command client
- Import/export tables to/from partitioned tables
- Explicit partition selection
- GIS/MyISAM: Precise spatial operations

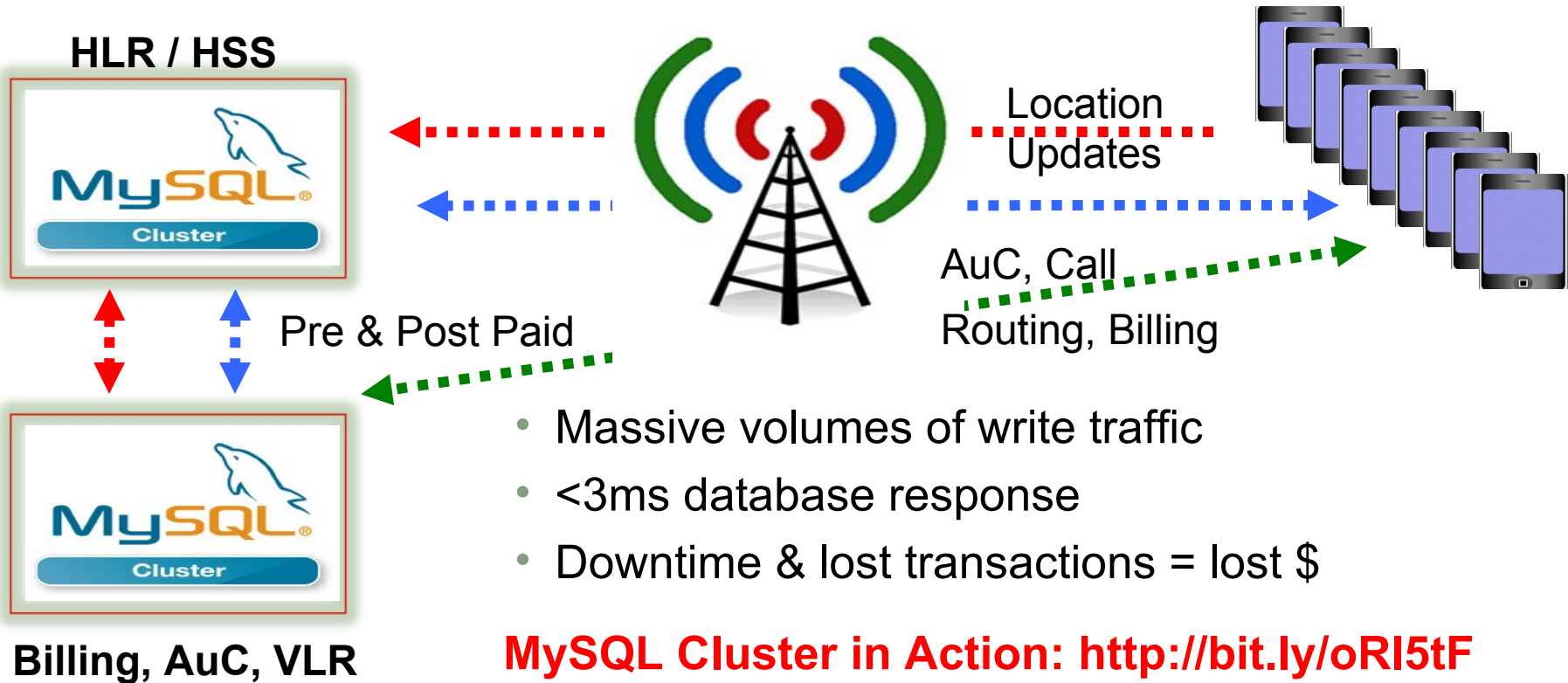
Get it now:

dev.mysql.com/downloads/



MySQL Cluster: DMR 2

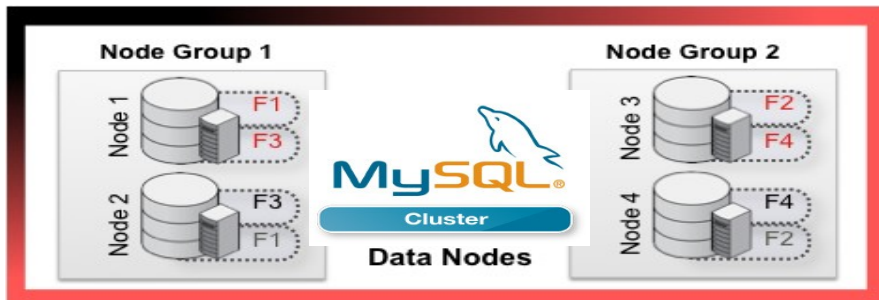
Use-Cases: Cellular Network



Use Cases: Flight Control



- US Navy aircraft carriers
- Consolidated flight operations management system
 - Maintenance records
 - Fuel loads
 - Weather conditions
 - Flight deck plans
- Requirements
 - No Single Points of Failure
 - Complete redundancy
 - Small footprint, harsh environment
- 4 x MySQL Cluster nodes, Linux and Windows



Use-Cases: eCommerce



Shopatron



- Integrated Service Provider platform
 - eCommerce
 - Payment processing
 - Fulfillment
- Supports 1k+ manufacturers & 18k retail partners
- Requirements
 - Scaling, On-Demand
 - HA: failures & on-line upgrades
 - High batch & real time loads
 - Low TCO: capex and opex

<http://mysql.com/customers/view/?id=1080>



ACID Compliant Relational Database

- SQL & NoSQL interfaces

Write-Scalable & Real-Time

- Distributed, multi-master, auto-sharding, optimized in-memory structures & indices

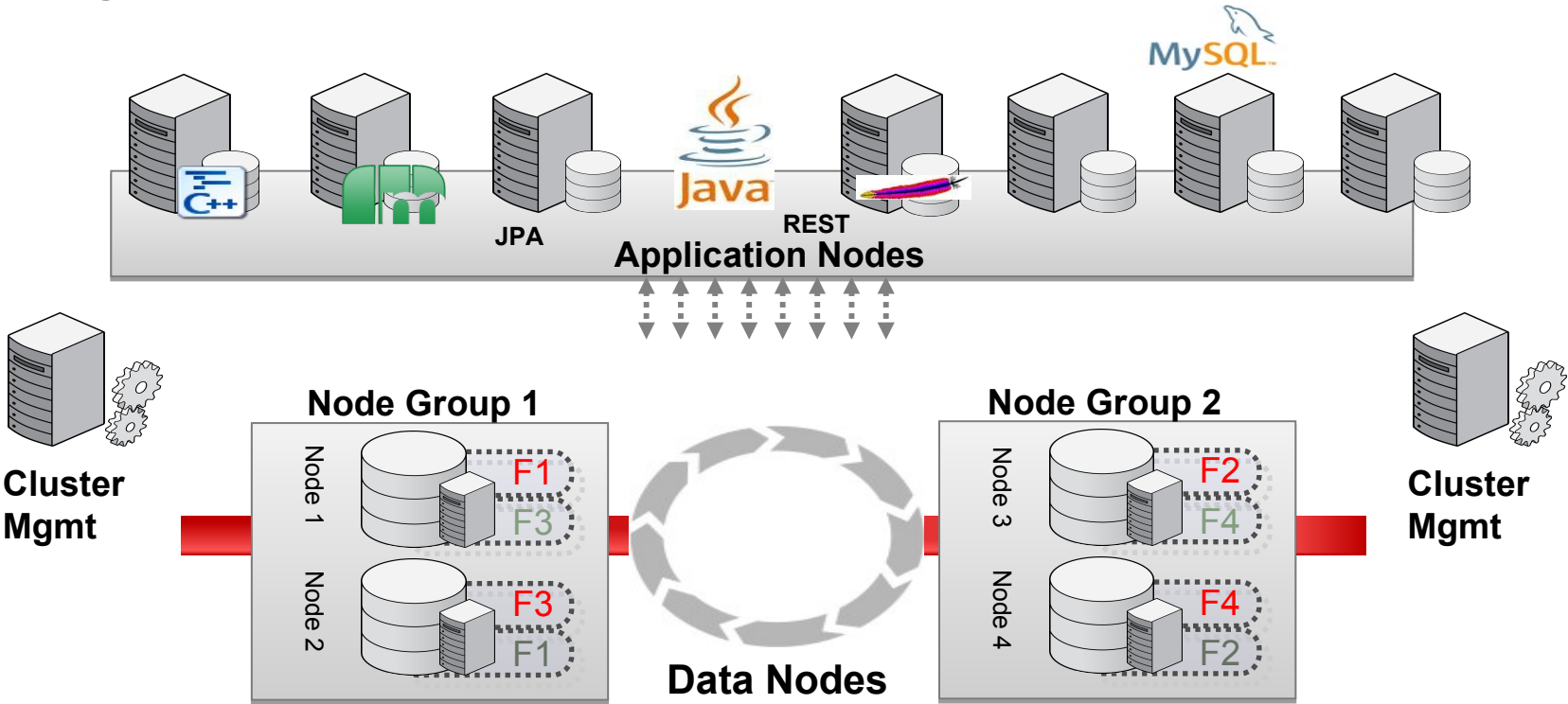
99.999% Availability

- Shared-nothing, integrated clustering & sub-second recovery, local & geographic replication, on-line operations

Low Barriers to Entry

- Open-source, elastic, multiple APIs, management tools, commodity hardware

MySQL Cluster Architecture



MySQL Cluster 7.2: DMR 2

Enabling Next Generation Web Services

- 70x Higher Complex Query Performance:
Adaptive Query Localization
- Native memcached API
- MySQL 5.5 Server Integration

Enhancing Cross Data Center Scaling

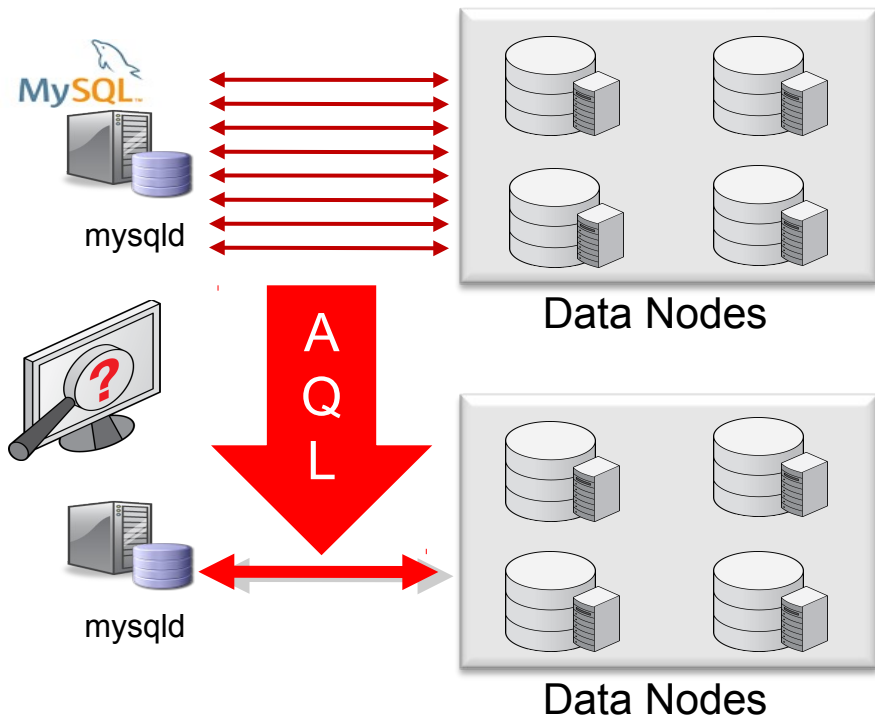
- Multi-Site Clustering
- Simplified Active / Active Replication

Simplifying Provisioning & Administration

- Consolidated Privileges

Adaptive Query Localization

Scaling Distributed Joins



**70x
More
Performance**

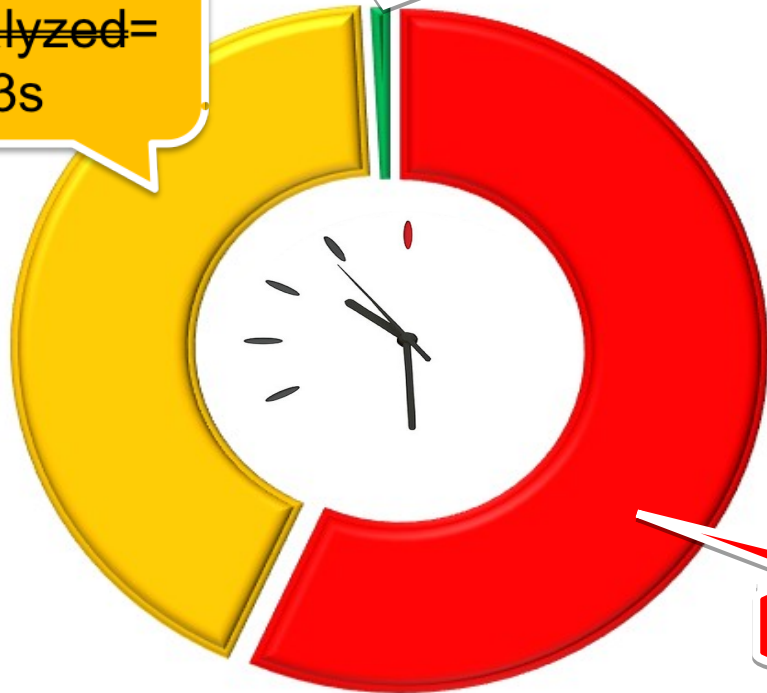
- Perform Complex Queries across Shards
 - JOINS pushed down to data nodes
 - Executed in parallel
 - Returns single result set to MySQL
- Opens Up New Use-Cases
 - Real-time analytics
 - Recommendations engines
 - Analyze click-streams

DON'T COMPROMISE FUNCTIONALITY TO SCALE-OUT !!

MySQL Cluster 7.2 70x Speedup! (DMR)

7.2
~~analyzed=~~
65.3s

7.2 = 1.26s



7.1 = 87.23s

- 70x Speedup for real customer JOIN across 11 tables
- Must Analyze tables for best results

```
mysql> ANALYZE  
TABLE <tab-name>;
```

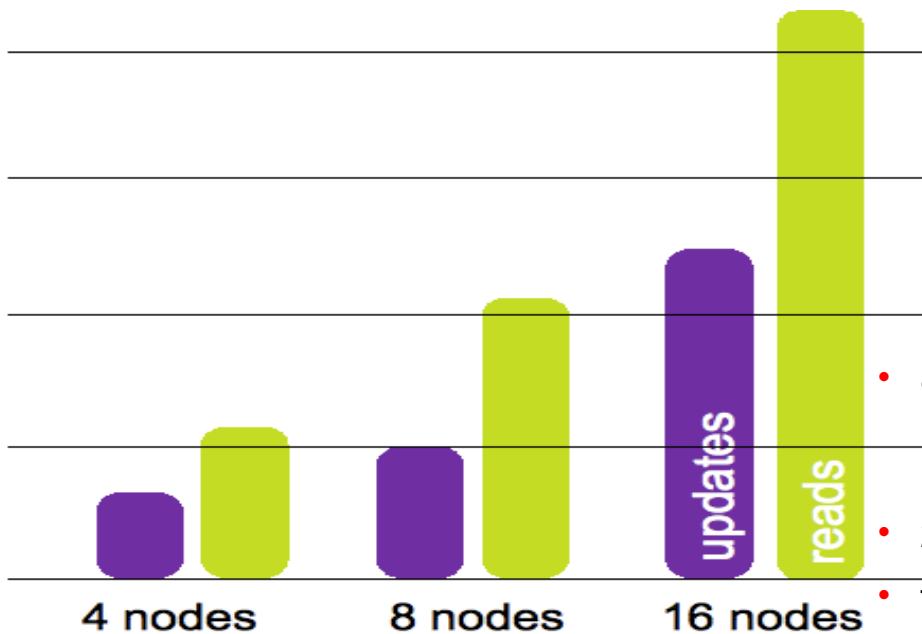
Scale-Out on Commodity Hardware

4M ops/s

3M ops/s

2M ops/s

1M ops/s

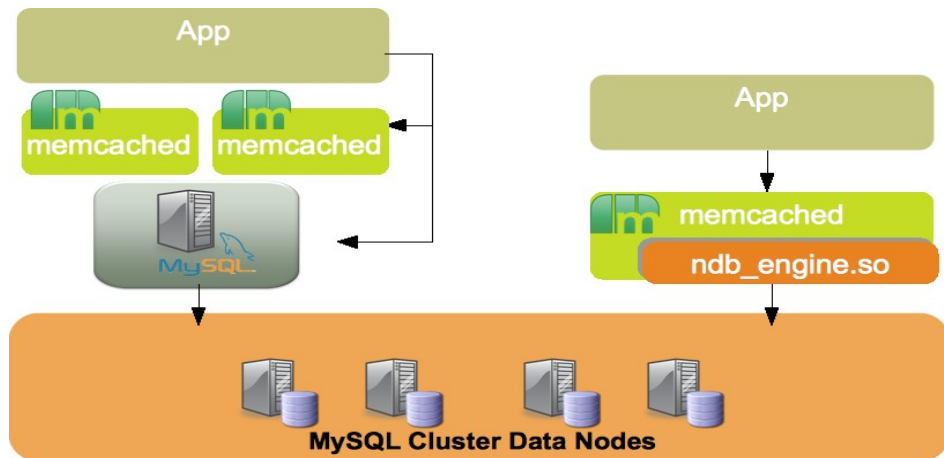


**4.3M
QPS**

- 8 Intel servers
 - Dual-6-core CPUs @2.93 GHz
 - 24GB RAM
- 2 Data Nodes per server
- flexAsync benchmark
 - 16 parallel threads, each issuing 256 simultaneous transactions
 - Read / Write 100KB attribute
 - Access via NDB API

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Memcached Key-Value API



**New
NoSQL
Access**

- Persistent, Scalable, HA Back-End to memcached
 - No application changes: re-uses standard memcached clients & libraries
 - Faster Cloud Deployments/Integration
- Consolidate Caching & Database Tiers
 - Eliminate cache invalidation
 - Simpler re-use of data across services
 - Improved service levels
- Flexible Deployment
 - Schema or Schema-less storage

API Flexibility:

SQL & NoSQL Combined



Clients



NDB API



Data Nodes

Mix
&
Match

- **SQL:** Complex, relational queries
- **HTTP / memcached:** Key-Value web services
- **Java:** Enterprise Apps
- **NDB API:** Real-time services

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Product Goals



MySQL Database Goals

- Re-factored architecture
 - Pluggable feature set
 - Deprecate legacy “baggage”
 - Real data dictionary (remove .frm files)
- Better Cloud, Hosting, SaaS features
 - Auto-sharding, load balancing, automatic failover
 - Online operations
 - Multi-tenancy, schema/catalogs, resource control, “elastic resources”
- Windows platform
 - Continue improvements



MySQL Cluster Goals

- **Ease of Use**
 - Tools for simplified configuration, provisioning & management
- **Enhanced API Support**
 - New NoSQL Interfaces
 - Richer SQL Functionality
- **Performance & Capacity Increases**
 - Optimizations for latest hardware developments
- **Wider Deployment Options**
 - Virtualization
 - Cloud



MySQL Enterprise Edition Goals

- MySQL Enterprise Security
 - MySQL Database Auditing extension
 - Oracle Product Certifications
 - Oracle Database Firewall
 - Oracle Audit Vault
- MySQL Enterprise Monitor
 - Evolve into management
 - Instance, Backup, Replication\HA
 - Integration with Oracle Enterprise Manager



MySQL Enterprise Edition Goals

- MySQL Enterprise Backup
 - Performance – parallel backups, skip empty pages, PK only options
 - Efficiency, Ease of use
 - Better PIT recovery
 - Better master/slave synch on restore
 - Cloning of complete prod, test, QA environments
- MySQL Workbench SE
 - Schema/data migration from SQL Server
 - ER Model Repository
 - Code generation – PHP, Python

ORACLE DRIVES MySQL INNOVATION

LARGEST TEAM OF MySQL EXPERTS

**LARGEST MySQL ENGINEERING & SUPPORT
ORGANIZATION**

UNMATCHED INVESTMENT

Q&A