Going through era of IoT with MySQL 5.7

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MySQL

MySQL 5.7 Is Now Generally Available!

Performance & Scalability

- 3 X Faster than MySQL 5.6
- Enhanced InnoDB: faster online & bulk load operations
- Replication Improvements (incl. multi-source, multi-threaded slaves...)
- New Optimizer Cost Model: greater user control & better query performance

Manageability

- Performance Schema Improvements
- MySQL SYS Schema
- Improved Security: safer initialization, setup & management
- NEW! JSON Support

And many more new features and enhancements... http://mysqlserverteam.com/the-mysql-5-7-8-release-candidate-is-available/

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MySQL 5.7: Innovation & Quality

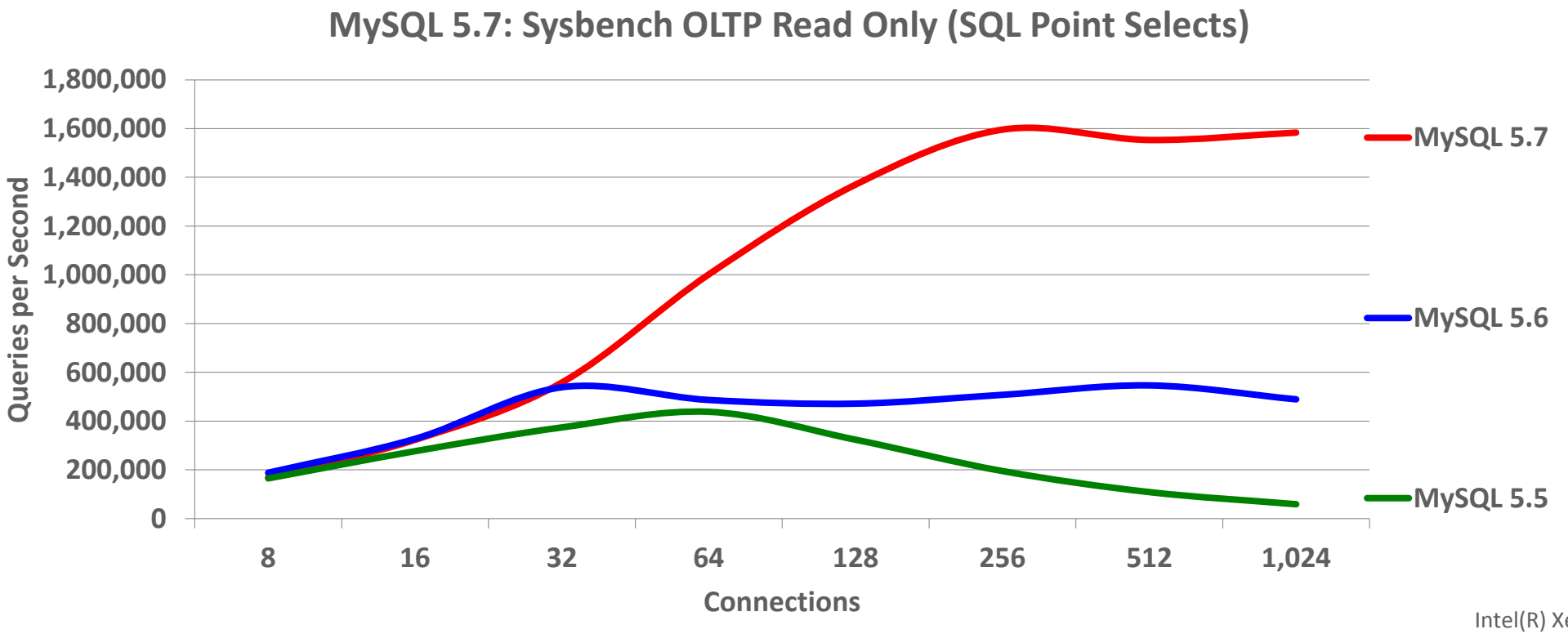
- Worklogs Implemented in 5.7: 365
- New MTR Tests for 5.7: 1083
- Total Bugs Fixed in 5.7: 2812
- Total Bugs Fixed since 5.5: 10708
  - Since MySQL 5.5 GA Dec 15, 2010

MySQL 5.7 Sysbench Benchmark: SQL Point Selects

3x Faster than MySQL 5.6

4x Faster than MySQL 5.5

1,600,000 QPS

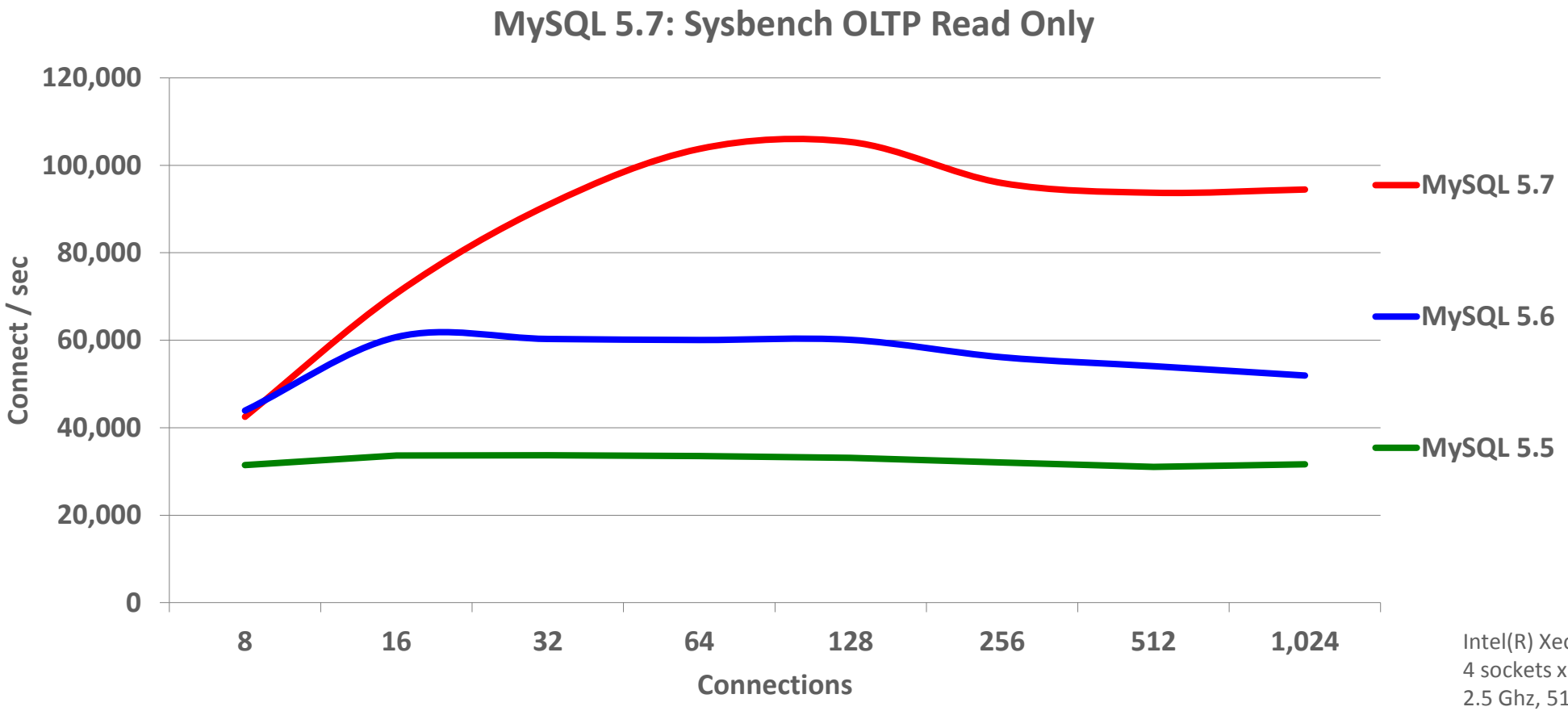


Intel(R) Xeon(R) CPU E7-8890 v3
4 sockets x 18 cores-HT (144 CPU threads)
2.5 Ghz, 512GB RAM
Linux kernel 3.16

MySQL 5.7 Sysbench Benchmark: Connection Requests

82% Faster than MySQL 5.6

100K Connect / Sec



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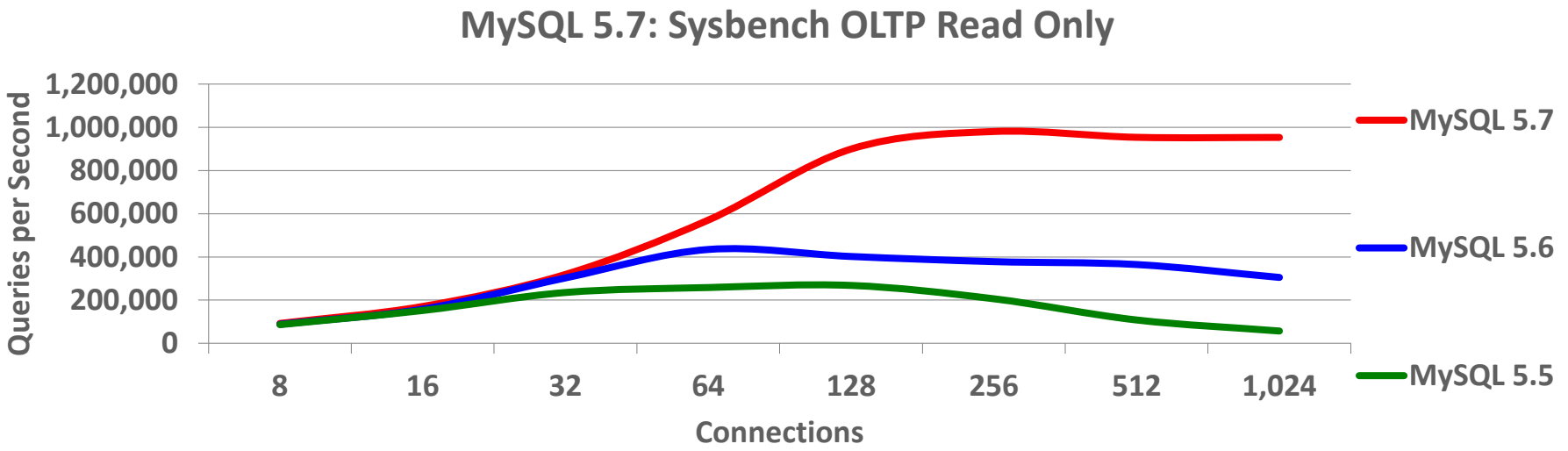
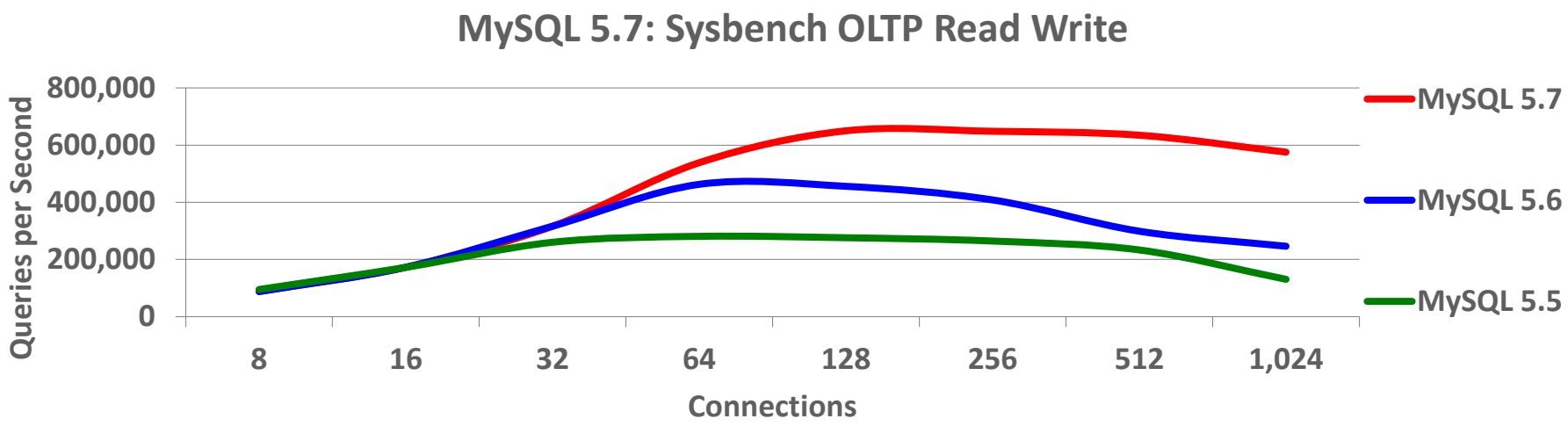
MySQL 5.7 Sysbench Benchmark: OLTP Read Only

~ 1,000,000 QPS



3x Faster than MySQL 5.6
6x Faster than MySQL 5.5



1.5x Faster than MySQL 5.6
3x Faster than MySQL 5.5

Intel(R) Xeon(R) CPU E7-8890 v3
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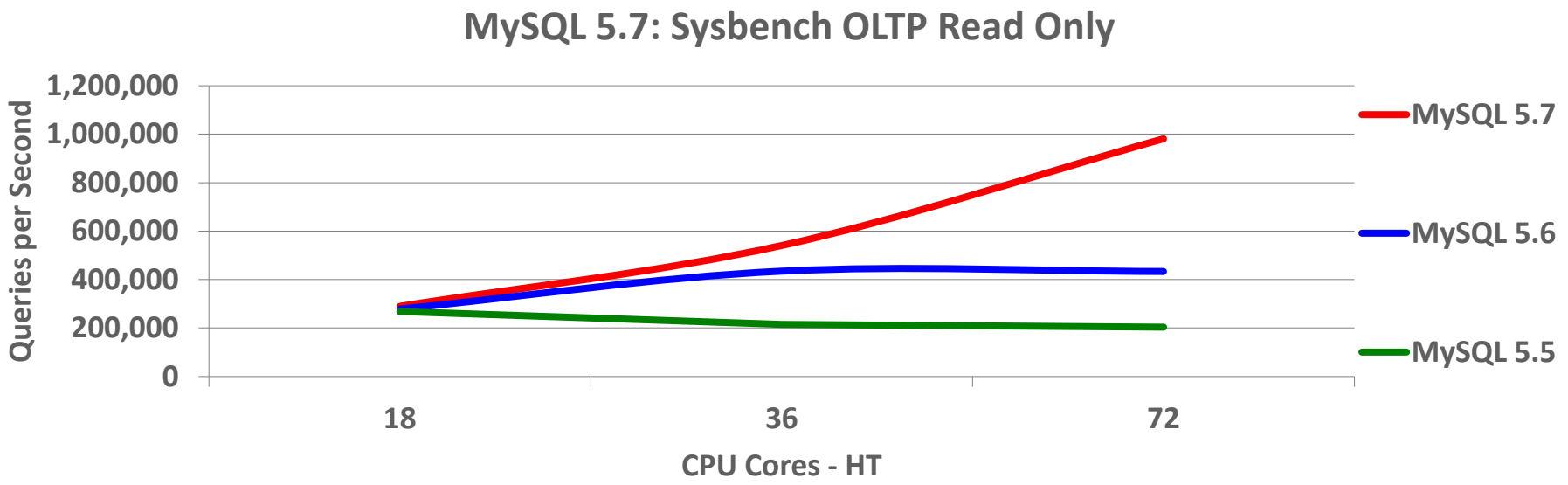
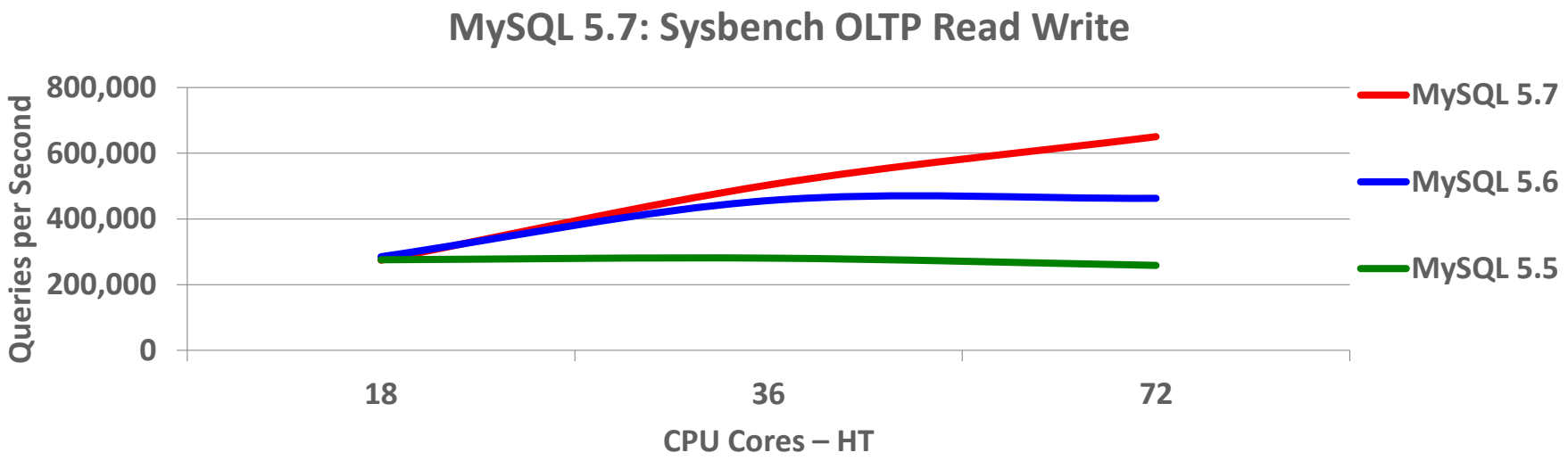
MySQL 5.7 Sysbench Benchmark: OLTP





MySQL Scales Beyond 72 CPU Cores-HT

Intel(R) Xeon(R) CPU E7-8890 v3
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144 CPU threads)
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MySQL 5.7: Optimizer Improvements

- Optimizer and Parser refactoring
  - Improves readability, maintainability and stability
  - Cleanly separate the parsing, optimizing, and execution stages
  - Allows for easier feature additions, with lessened risk
- New hint framework
  - Easier to manage
  - With support for additional new hints
- Improved JSON EXPLAIN
- EXPLAIN for running thread

- New Cost based Optimizer
- Generated Columns
- Support for InnoDB based internal temp tables
- Better ONLY_FULL_GROUP_BY mode
- Better support for InnoDB & GIS
- Many specific new optimizations

Queries execute faster, while using less CPU and disk space!

MySQL 5.7: Query Rewrite Plugin

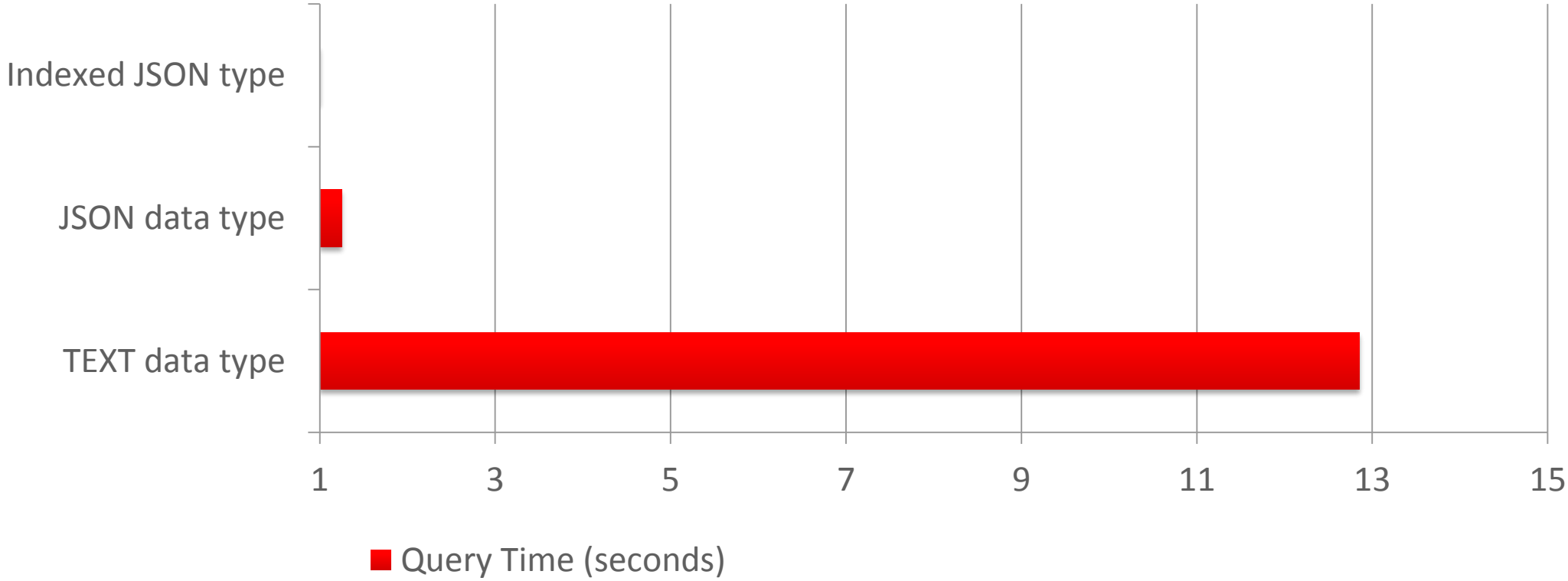
- New pre and post parse query rewrite APIs
  - Users can write their own plug-ins
- Provides a post-parse query plugin
  - Rewrite problematic queries without the need to make application changes
  - Add hints
  - Modify join order
  - Many more …
- Improve problematic queries from ORMs, third party apps, etc
- Eliminates many legacy use cases for proxies

MySQL 5.7: JSON

- Native JSON data type
  - Native internal binary format for efficient processing & storage
- Built-in JSON functions
  - Allowing you to efficiently store, search, update, and manipulate Documents
- JSON Comparator
  - Allows for easy integration of Document data within your SQL queries
- Indexing of Documents using Generated Columns
  - InnoDB supports indexes on both stored and virtual Generated Columns
  - New expression analyzer automatically uses the best “functional” index available
- New inline syntax for easy SQL integration

MySQL 5.7: Searching JSON Documents

200x Improvement

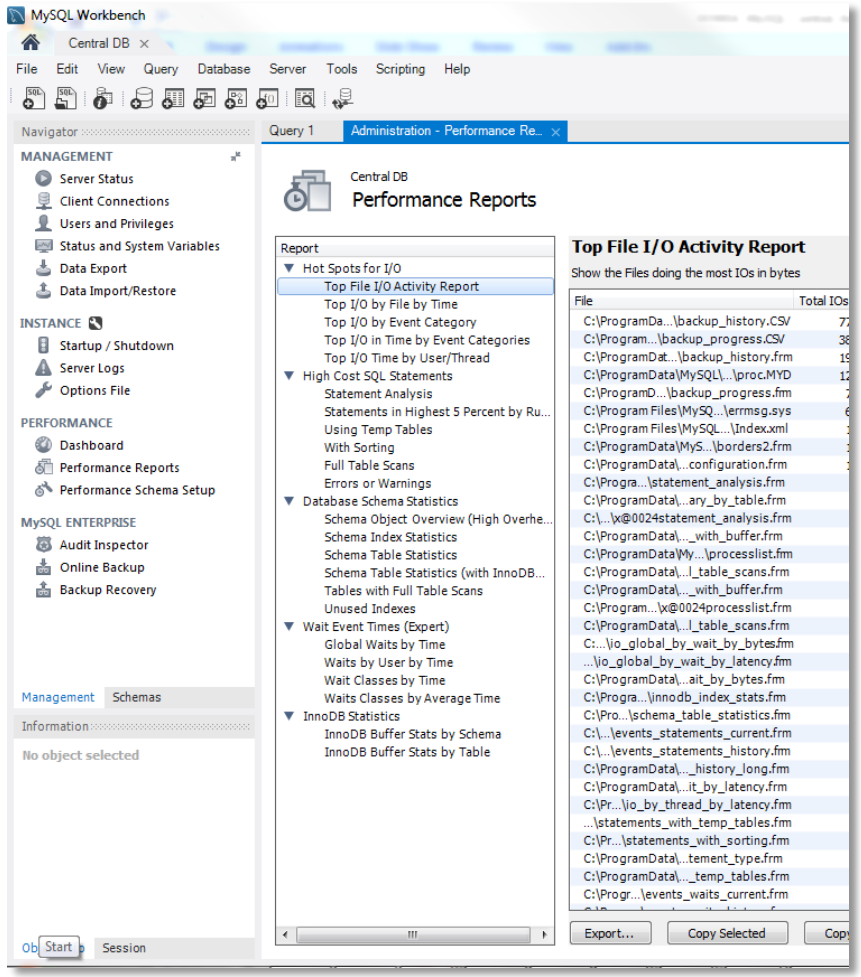


Using 206K JSON documents containing City lot parcels from SF OpenData.
Indexed JSON performance Improves query from 12.85 seconds to 0.06 seconds.

MySQL 5.7: SYS Schema

Helper objects for DBAs, Developers and Operations staff

- Helps simplify DBA / Ops tasks
  - Monitor server health, user, host statistics
  - Spot, diagnose, and tune performance issues
- Easy to understand views with insights into
  - IO hot spots, Locking, Costly SQL statements
  - Schema, table and index statistics
- SYS is similar to
  - Oracle V$ catalog views
  - Microsoft SQL DMVs (Dynamic Mgmnt Views)



MySQL 5.7: InnoDB Improvements

- Native Partitioning
  - Eliminates previous limitations
  - Eliminates resource usage problems
  - Transportable tablespace support
- Native Full-Text Search
  - Including full CJK support!
- Native Spatial Indexes
- Transparent page compression
- Support for 32K and 64K pages
  - Use with transparent page compression for very high compression ratios
- General TABLESPACE support
  - Store multiple tables in user defined shared tablespaces
- Support for MySQL Group Replication
  - High priority transactions
- Improved support for cache preloading
  - Load your hottest data loaded at startup
- Improvements in storage footprint
  - Configurable innodb-fill-factor
  - Configurable merge_threshold per table
- Improved bulk-data load performance

MySQL 5.7: InnoDB – Always Online

- Resize the InnoDB Buffer Pool online
  - Allows DBAs to tune the buffer size without any downtime
  - Adapt in real-time to changes in database usage patterns
- Separate UNDO tablespace
  - With automatic online truncation
- Additional Online ALTER TABLE support
  - Enlarge VARCHAR, Rename Index
- Dynamic configuration
  - Making existing settings dynamically configurable
  - As a design principle for new features & settings

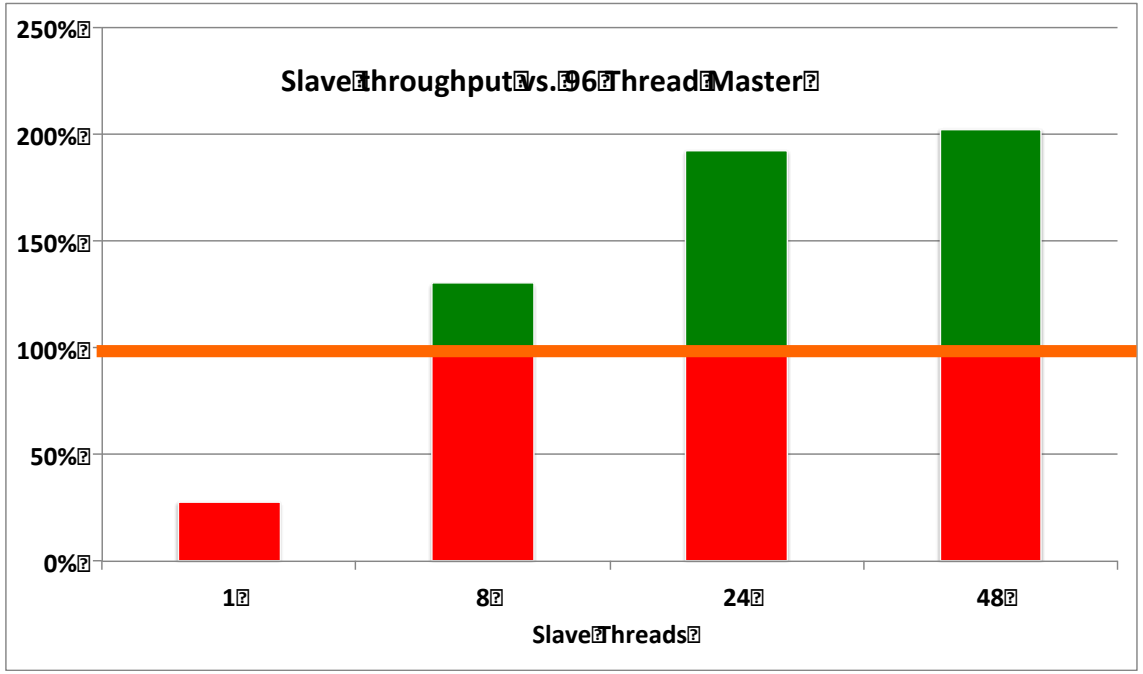
MySQL 5.7: InnoDB Bulk Load for Index Creation

- Much faster INDEX creation and bulk loads
- Sorted index builds, done from the bottom-up
  - Improves speed by increasing locality and decreasing node splitting
- Pages are compressed only when full
- New innodb_fill_factor option controls free space left in each page
- Performance results show
  - 2-3x performance improvement for ADD/CREATE INDEX operations
    - Up to 500x improvement with larger `--innodb_sort_buffer_size values`
  - 2-5% improvement for standard INSERT operations

MySQL 5.7: Replication Improvements

- GTID enhancements
  - On-line, phased deployment of GTIDs
  - Binary logging on slave now optional
- Enhanced Semi-synchronous replication
  - Write guaranteed to be received by slave before being observed by clients of the master
  - Option to wait on Acks from multiple slaves
- Multi-Source Replication
  - Consolidate updates from multiple Masters into one Slave
- Dynamic slave filters

- **8-10x** Faster slave throughput
  - Often removes slave as a bottleneck; keep pace with master with 8+ slave threads
  - Option to preserve Commit order
  - Automatic slave transaction retries



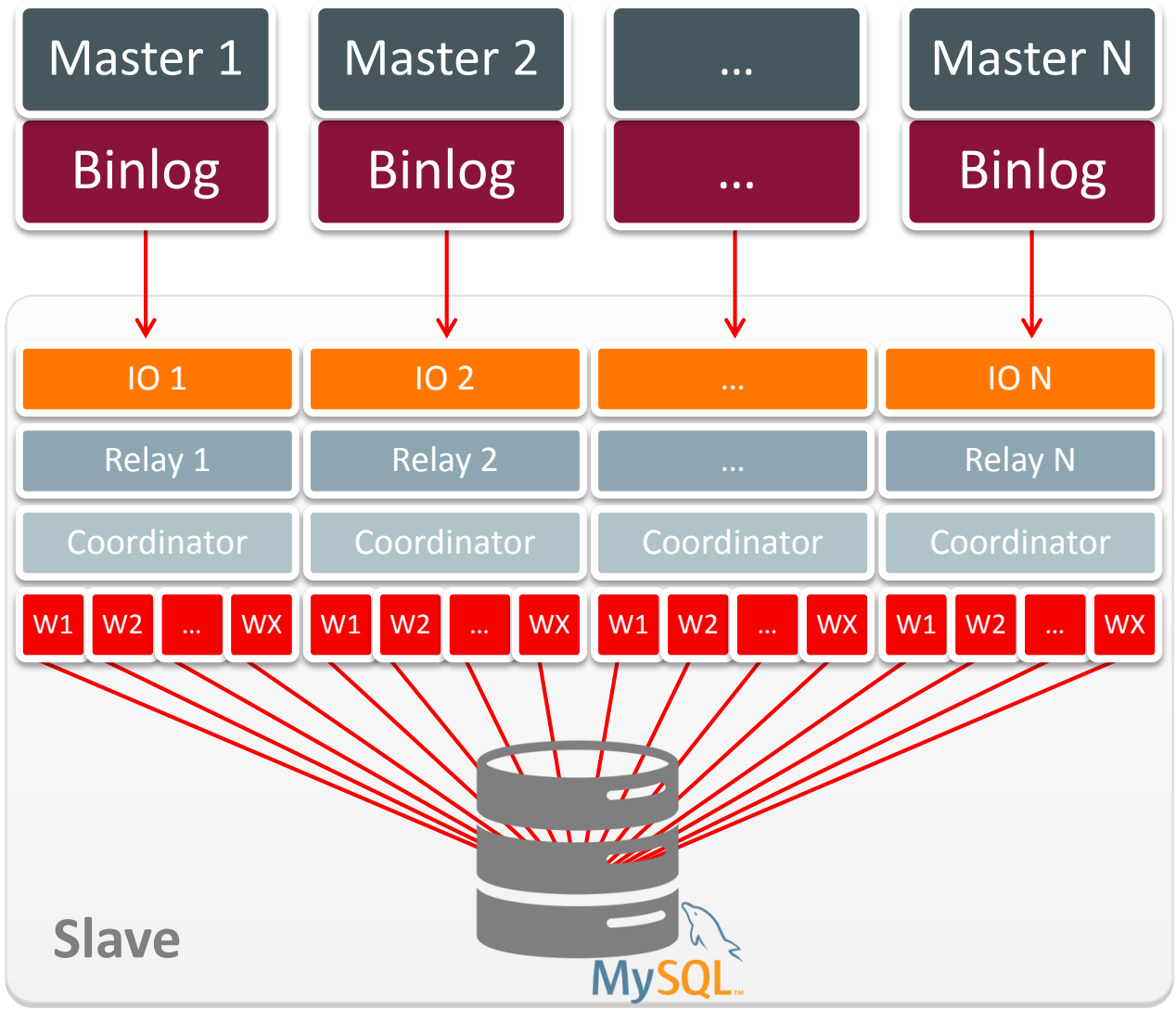
MySQL 5.7: Enabling GTIDs

Phased, On-line Introduction

- Server reports any incompatible operations
- All servers generate GTIDs but don't depend on them
- Allow all legacy events to work through all servers
- All Servers generate and expect GTIDs only
- Full benefits of GTIDs available

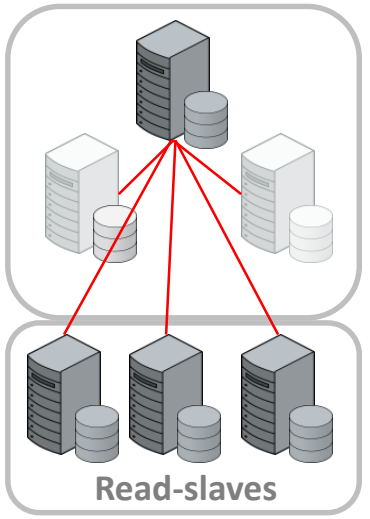
MySQL 5.7: Replication Improvements

- Multi-Source Replication
  - Consolidate updates from multiple Masters into one Slave
    - Consolidated view of all shards
    - More flexible topologies
    - Centralized point for backups
  - Compatible with Semi-Sync Replication & enhanced MTS
- Performance Schema tables for monitoring slave
- Online Operations: Dynamic Replication Filters, switch master



MySQL 5.7: High Availability Improvements

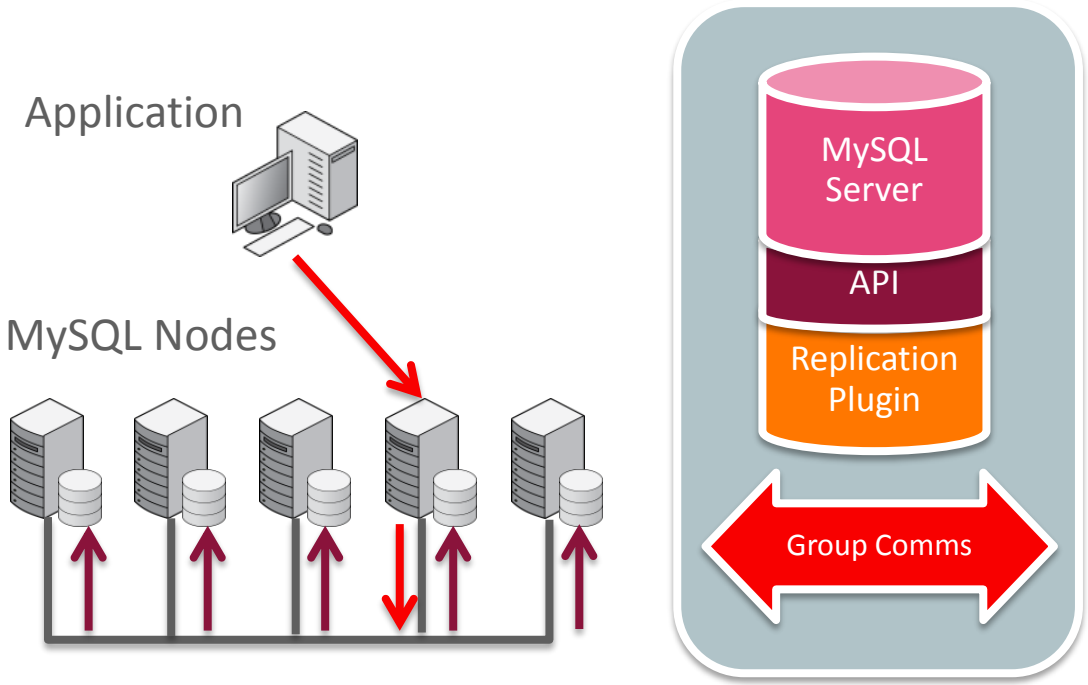
- Support for tracking session transaction state
  - This offers better support for load balancing across nodes
- Server Version Tokens
  - This offers better support for caching in distributed systems
- New data migration tool : `mysqlpump`
  - Improves data migration and sharding operations between nodes
- Improved Replication options in HA groups
  - Improved slave performance with clock based parallelization
  - Loss-less Semi-Sync Replication plugin supporting multi-node acks
  - Synchronous replication (Group Replication plugin now in Labs)



HA group

MySQL Group Replication

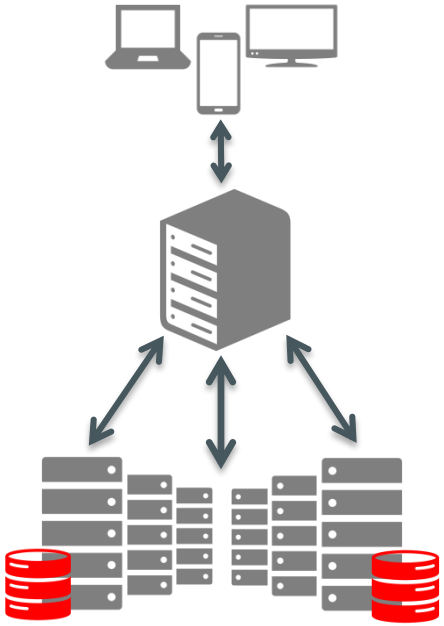
labs.mysql.com



- Active/Active Update Anywhere
  - Conflict detection and resolution (transaction rollback)
  - Optimistic State Machine Replication
- Automatic group membership management and failure detection
  - No need for server fail-over
  - Elastic scale out/in
  - No single point of failure
  - Automatic reconfiguration
- Well integrated
  - InnoDB
  - GTID-based replication
  - PERFORMANCE_SCHEMA

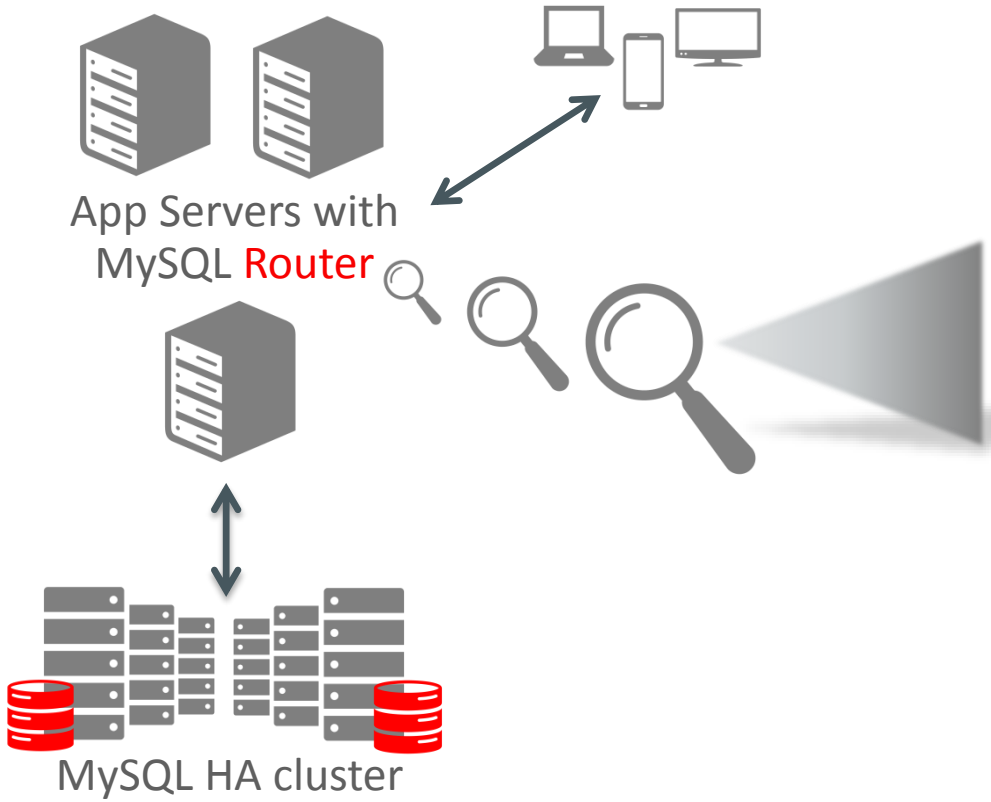
MySQL Router

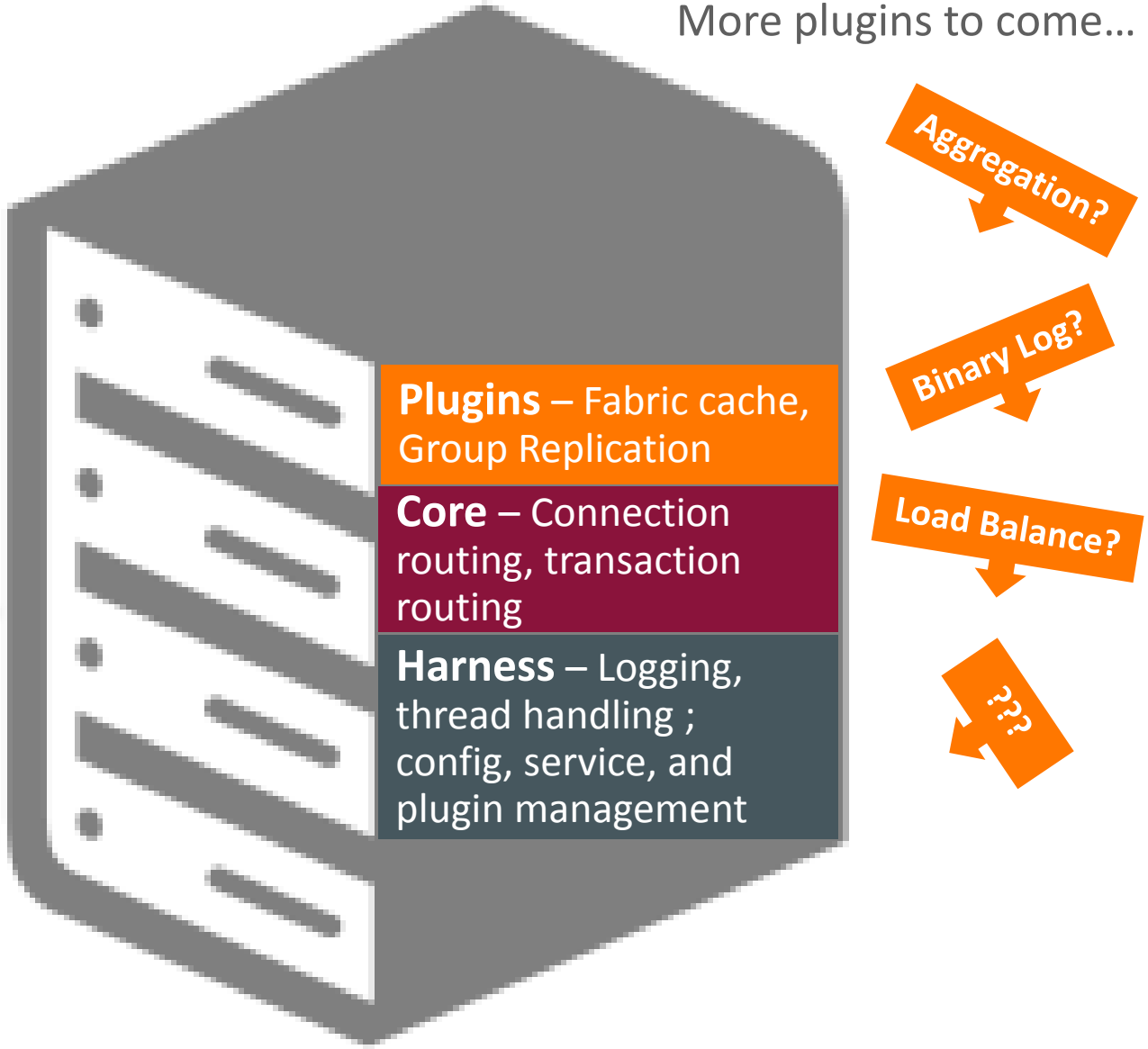
- Connection and Transaction routing
- Transparently improve your MySQL apps
  - Transparent MySQL Fabric support
    - Transparent HA
    - Transparent Sharding
  - Transparent support for MySQL Group Replication clusters
  - Transparent support for custom clusters and HA setups
- Easily extendable using plugin APIs
- Many new plugins to come – Aggregation, Binary Log, Load Balancing, …
  - What would you most like to see?



MySQL Router

Extensible Architecture





More plugins to come…

Aggregation?

Binary Log?

Load Balance?

???

MySQL Repos

- Distributions
  - Oracle, Red Hat, CentOS
  - Fedora
  - Ubuntu, Debian
  - SUSE
- Official MySQL Docker Image from Oracle
- Coming Soon
  - Preconfigured Containers
  - Improved support for popular DevOps deployment tools

https://dev.mysql.com/downloads/repo

MySQL on GitHub

- Git for MySQL Engineering
  - Fast, flexible and great for a distributed team
  - Great tooling
  - Large and vibrant community
- GitHub for MySQL Community
  - Easy and fast code availability to the community and to downstream projects
  - New Pull Requests

https://github.com/mysql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