What's New in MySQL 5.7?

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Safe Harbor Statement

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Agenda

1. Performance and scalability
2. Optimizer
3. JSON and generated columns support
4. InnoDB improvements
5. Performance schema & SYS schema
6. Security
7. GIS
Performance and scalability
Performance and scalability

- Improved InnoDB scalability
- Improved InnoDB temporary table performance
- Faster online operations
- Faster bulk operations
Point selects

Sources:
http://www.mysql.com/why-mysql/benchmarks/
http://dimitrik.free.fr/blog/archives/2015/10/mysql-performance-yes-we-can-do-more-than-16m-qps-sql-on-mysql-57-ga.html
Connections per second

Sources:
http://www.mysql.com/why-mysql/benchmarks/
Optimizer
Optimizer

- Parser and optimizer refactoring
  - Improves readability, maintainability, stability
  - Cleaner separation of parsing, resolving, optimization and execution phases
  - Allows for faster feature development with less risk

- Improved EXPLAIN
  - Cost numbers in JSON output, displayed in Workbench visual explain
  - EXPLAIN for running thread
Optimizer

- New cost model
- New hint framework
  - Easier to manage
  - More hints
- Support for InnoDB internal temporary tables
- Many smaller, specific optimizations
New cost model

- More accurate cost estimates
  - Better optimizer decisions, faster execution
- Adapt to new hardware developments
  - SSD, larger memory sizes, caching
- More maintainable implementation
  - Avoid hard-coded constants
- Configurable and tunable
  - `mysql.server_cost`, `mysql.engine_cost` tables
New cost model

5 out of 22 queries get a much improved query plan

DBT-3, size factor 10, CPU bound
Query rewrite plugin

- New plugin APIs
  - Hooks before or after parsing

- New post-parse plugin
  - Rewrite queries without changing the application
  - Add hints to pick a different plan
  - Anything else you want to do to your queries

- Improve queries from ORMs, third party apps, etc.

- Eliminates many legacy use cases for proxies
JSON and generated columns
JSON

- Native JSON data type
  - Binary format for more efficient processing and storage
- Built-in JSON functions
  - Store, search and manipulate documents
- JSON comparator
  - Integrate JSON operations within your SQL queries
- Indexing using generated columns
  - InnoDB indexes both stored and virtual generated columns
  - New expression analyzer automatically uses the best functional index available
JSON type tech specs

- utf8mb4 character set
- Optimized for read intensive load
- Parse and validate on insert only
- Dictionary
  - Sorted object attribute names ("keys")
  - Fast access to array cells by index
- Supports all native JSON types
  - Number, string, bool, object, array
- Extended with MySQL types
  - Date, time, datetime, timestamp, etc.
Generated columns

- CREATE TABLE \( t \) (\( i1 \) INT, \( i2 \) INT GENERATED ALWAYS AS (\( i1+1 \)) VIRTUAL);
- Not only for JSON
  - But very useful for functional indexes on JSON documents
- Stored
  - Computed and stored on disk
- Virtual
  - Computed on the fly
- Both stored and virtual generated columns can be indexed
InnoDB improvements
InnoDB improvements

- Native partitioning
  - Transportable tablespace support
- Native full text search
  - Including CJK support
- Transparent page compression
- General tablespace support
  - Store multiple tables in user defined tablespaces
- High priority transactions for MySQL Group Replication
InnoDB improvements

- Improved support for cache preloading
- Configurable fill-factor
- Improved bulk data load performance
- Much faster index creation
- Online buffer pool resizing
- Additional online ALTER TABLE support
  - Enlarge VARCHAR, rename index
InnoDB improvements

• New separate tablespace for temporary tables
  – Optimized for temporary tables
    • No redo logging, no change buffering, less locking
  – Tailored ACID and MVCC semantics for internal temporary tables
  – Light-weight and ultra fast
  – Default for internal temporary tables
Performance schema & SYS schema
Performance schema

● New instrumentation
  – Memory usage
  – Stored routines
    • Functions
    • Procedures
  – Triggers
  – Events
  – And more ...
SYS schema

- Helps you use performance schema data
  - Similar to Oracle's V$ and MS SQL Server's dynamic management views (DMVs)
- Simplifies DBA tasks
  - Monitor server health, user and host statistics
  - Spot, diagnose and tune performance issues
  - IO hot spots, locking, costly SQL statements
  - Schema, table and index statistics
- Integrated with Workbench
Security
Security

- Secure install by default
  - SSL on by default
  - No passwordless root user

- Password rotation policies
  - Global and per user

- Extended proxy user support
  - Deny login for role accounts
  - Allows multiple users to share a single set of managed privileges
GIS
InnoDB spatial indexes

- R-tree indexes
- Transactional
  - Full ACID compliance
- Predicate locking to prevent phantoms
- No longer necessary to use MyISAM for GIS
New GIS engine

- **Boost.Geometry**
  - Replaces the old homegrown GIS engine
    - Removes a number of bugs
    - We're contributing features and bugfixes back to Boost
- Faster feature development
- Stricter and more standard compliant behavior
  - Preparing for future extensions
  - Deprecated confusing and non-standard function aliases
New GIS functionality

- New import/export formats
  - Geohash
  - GeoJSON
    - Using the new JSON datatype
- `ST_Distance_Sphere`
- Other helper functions
- Supporting all geometry types for all functions
  - Including `GeometryCollection`
... and much, much more
Get feature descriptions and design details straight from the developers that wrote the code.

http://mysqlserverteam.com/
Hardware and Software
Engineered to Work Together
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