2020-03-MySQL企业版研讨会参加者

善用 MySQL 支持企业级应用-近况报告

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议程

- MySQL 8.0
- MySQL企业版支持您的关键业务
- 让 My Oracle Support 为您扶上马送一程

DB-Engines 2020

Database Ranking

DB-ENGINES

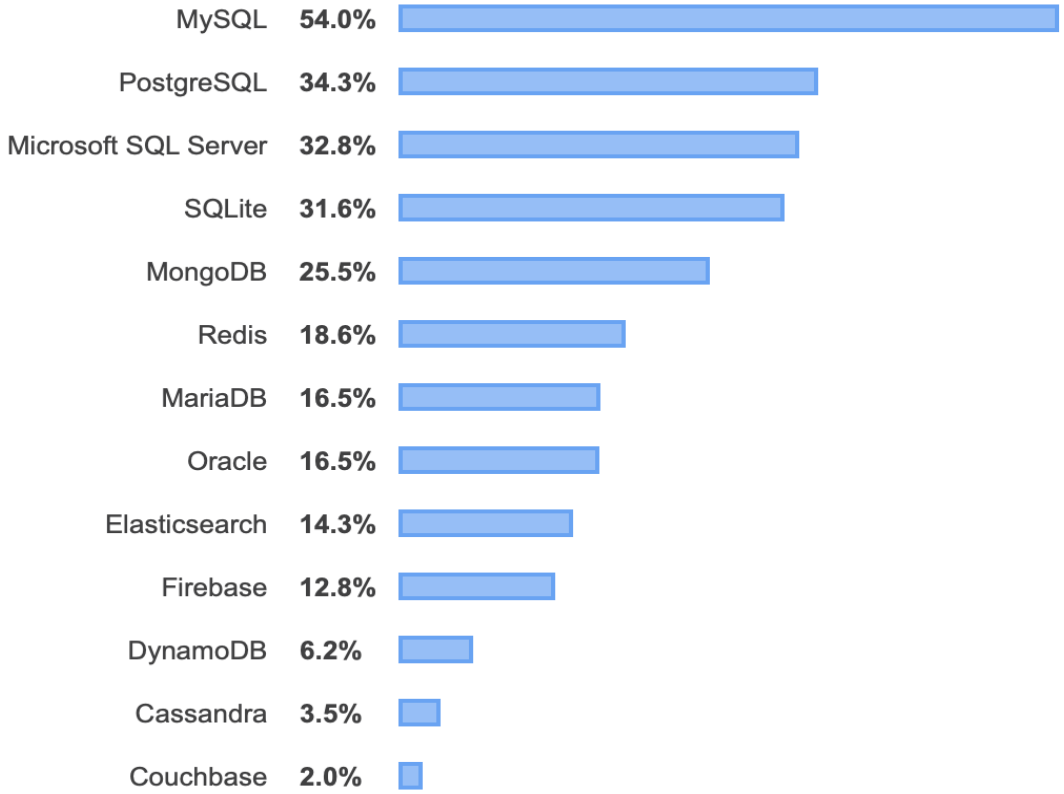
354 systems in ranking, March 2020

Rank Mar 2020	Rank Feb 2020	Rank Mar 2019	DBMS	Database Model	Score Mar 2020	Score Feb 2020	Score Mar 2019
1.	1.	1.	Oracle	Relational, Multi-model	1340.64	-4.11	+61.50
2.	2.	2.	MySQL	Relational, Multi-model	1259.73	-7.92	+61.48
3.	3.	3.	Microsoft SQL Server	Relational, Multi-model	1097.86	+4.11	+50.01
4.	4.	4.	PostgreSQL	Relational, Multi-model	513.92	+6.98	+44.11
5.	5.	5.	MongoDB	Document, Multi-model	437.61	+4.28	+36.27
6.	6.	6.	IBM Db2	Relational, Multi-model	162.56	-2.99	-14.64
7.	7.	↑ 9.	Elasticsearch	Search engine, Multi-model	149.17	-2.98	+6.38
8.	8.	8.	Redis	Key-value, Multi-model	147.58	-3.84	+1.46
9.	9.	↓ 7.	Microsoft Access	Relational	125.14	-2.92	-21.07
10.	10.	10.	SQLite	Relational	121.95	-1.41	-2.93

MySQL is the 2nd most popular database,
the most popular opensource database

MySQL Developer Popularity

Stack Overflow Developer Survey 2019



MySQL is most popular database with developers

MySQL 8.0

MySQL 8.0 Highlights

Performance

Reliability

MySQL Document Store

SQL Functions

MySQL Security

MySQL GIS

MySQL 8.0 Highlights

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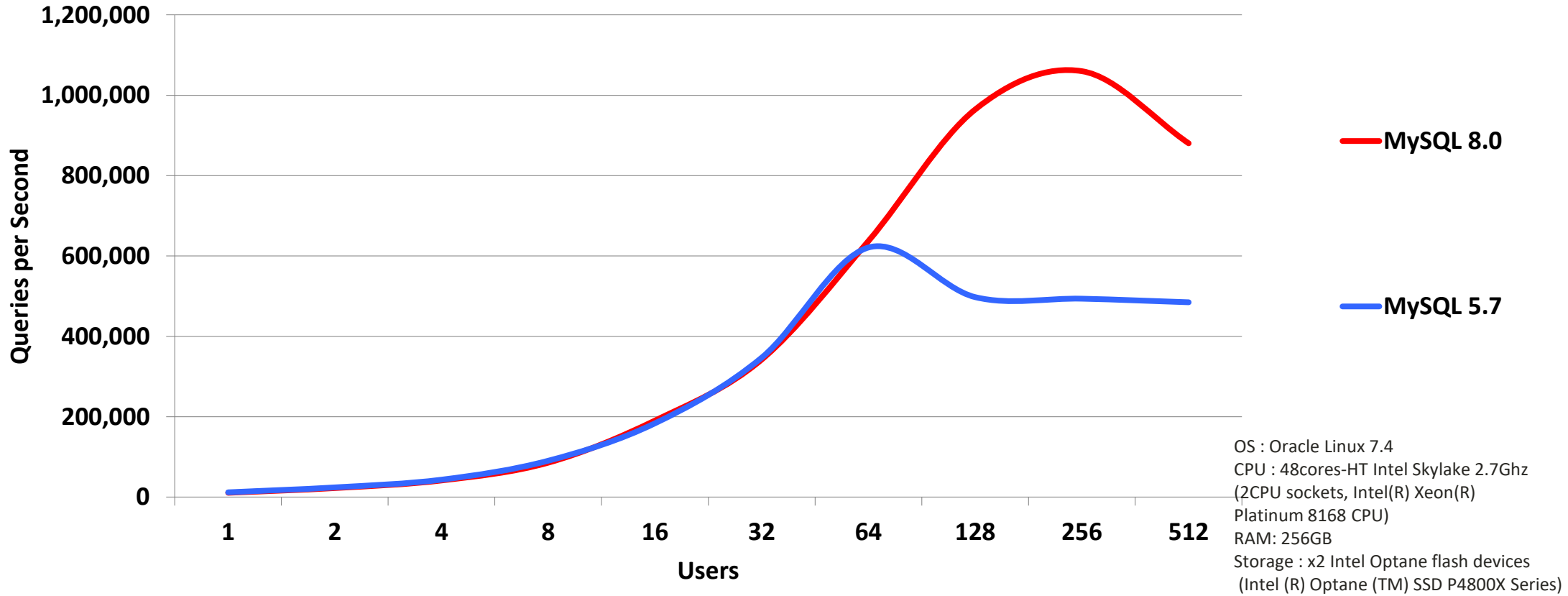
MySQL 8.0 持续增强性能:

SysBench IO Bound Read Only (Point Selects)

比MySQL 5.7快两倍



OS : Oracle Linux 7.4
CPU : 48cores-HT Intel Skylake 2.7Ghz (2CPU sockets, Intel(R) Xeon(R) Platinum 8168 CPU)
RAM: 256GB
Storage : x2 Intel Optane flash devices (Intel (R) Optane (TM) SSD P4800X Series)

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可靠性

DevOps 需要其系统持续运行或至少在可回复的状态

- 元数据存于InnoDB
  - 由文件移到 久经验证的事务型存储引擎
  - 系统表由 MyISAM 移到 InnoDB
- 讯息只有一个来源
  - 一个共通的数据字典
- 原子化, 崩溃安全的DDL
  - `CREATE/DROP USER <u1, u2, u3>, DROP TABLE <t1, t2, t3>,...`

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SQL

Relational Tables

Foreign Keys

NoSQL

JSON Documents

Schemaless JSON Collections

X Dev API

SQL

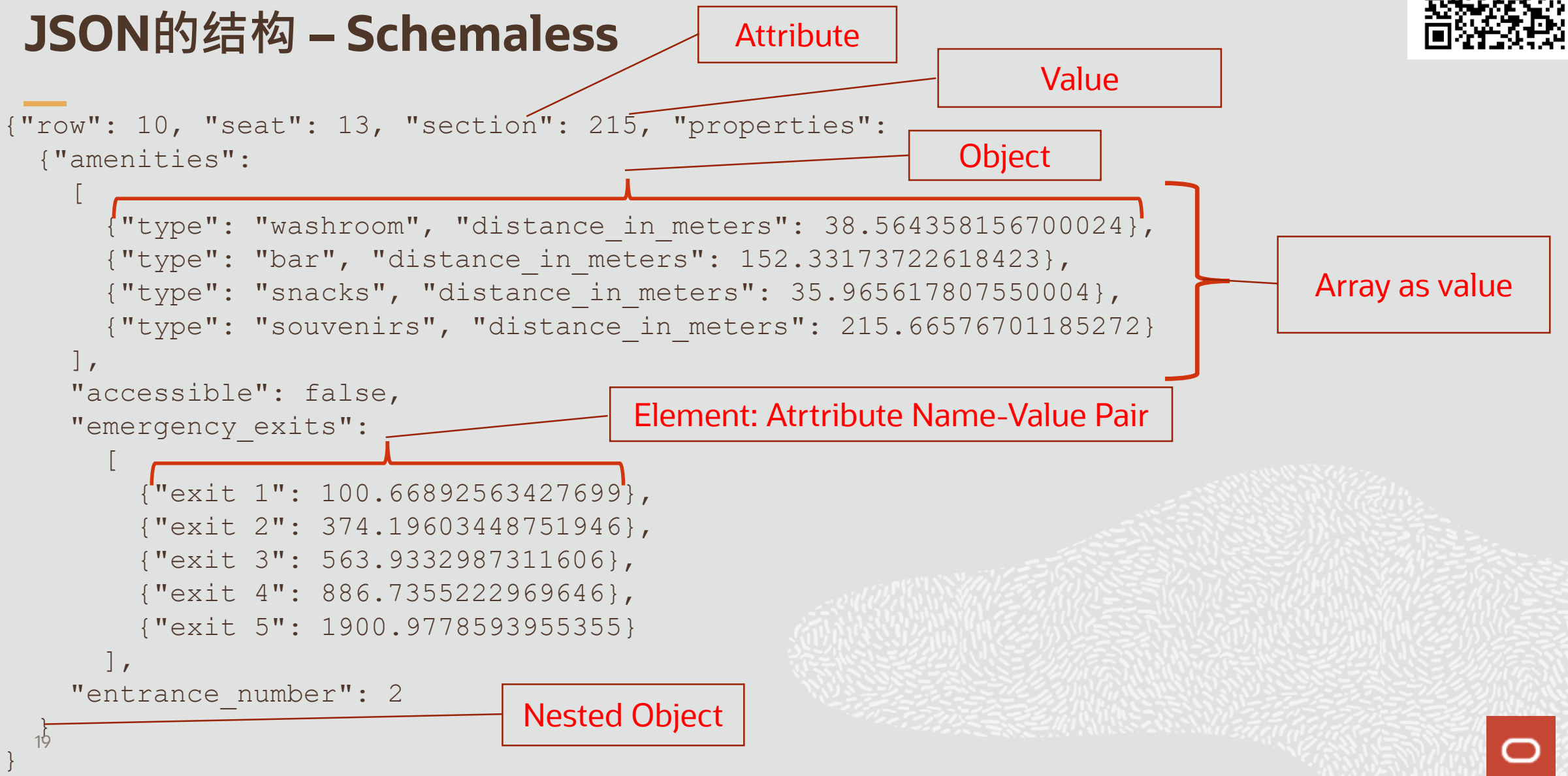
CRUD

MySQL 8.0: Document Store

NoSQL + SQL = MySQL

- **的文件导向数据存储**
  - 通过 SQL和新的X DevAPI NoSQL 接口完全支持JSON文件
- **用一套技术做Schema-less 和schema 为基础的数据**
  - 一起用文件的COLLECTION关系型表
- **Rapid Prototyping 和简单的CRUD APIs**
  - 新进 APIs 用“method chaining” 和异步运行 (例如 promises, callbacks, 等.)
- **对许多不同的语言和架构都有Connector**
  - Node.JS, Java, NET, C++/C, PHP, Python

JSON的结构 – Schemaless




```
{"row": 10, "seat": 13, "section": 215, "properties":
  {"amenities":
    [
      {"type": "washroom", "distance_in_meters": 38.564358156700024},
      {"type": "bar", "distance_in_meters": 152.33173722618423},
      {"type": "snacks", "distance_in_meters": 35.965617807550004},
      {"type": "souvenirs", "distance_in_meters": 215.66576701185272}
    ],
    "accessible": false,
    "emergency_exits":
      [
        {"exit 1": 100.66892563427699},
        {"exit 2": 374.19603448751946},
        {"exit 3": 563.9332987311606},
        {"exit 4": 886.7355222969646},
        {"exit 5": 1900.9778593955355}
      ],
    "entrance_number": 2
  }
}
```

MySQL Document Store – 因应到处都有Javascript

Backend: M(ySQL)EAN范例请参考: https://github.com/alastori/MySQL-Express.js-AngularJS-Node.js-Example
和 http://insidemysql.com/develop-by-example-document-store-working-with-express-js-angularjs-and-node-js/

+ express

Frontend:

MySQL Shell和XDevAPI操作JSON文件

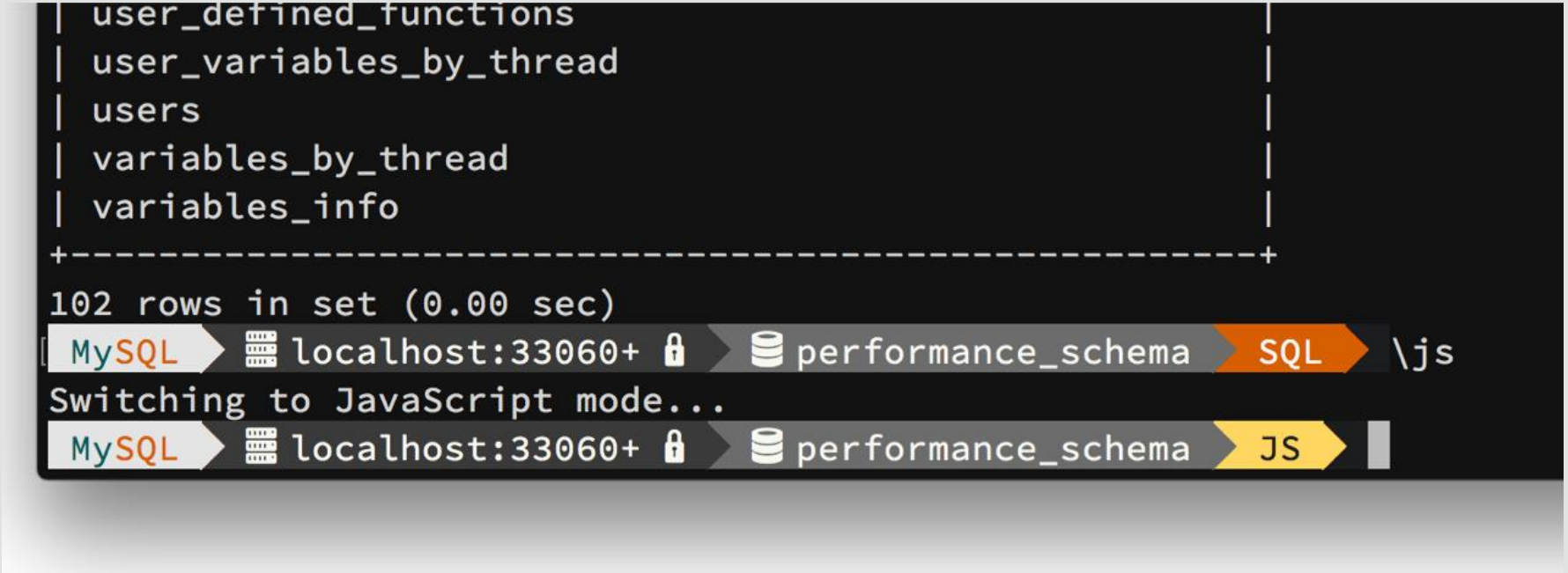
可客制化提示符号
- 包括内容和对话讯息

支持客制化字型和颜色

指令行历史持久化

自动完成 / 内容辅助

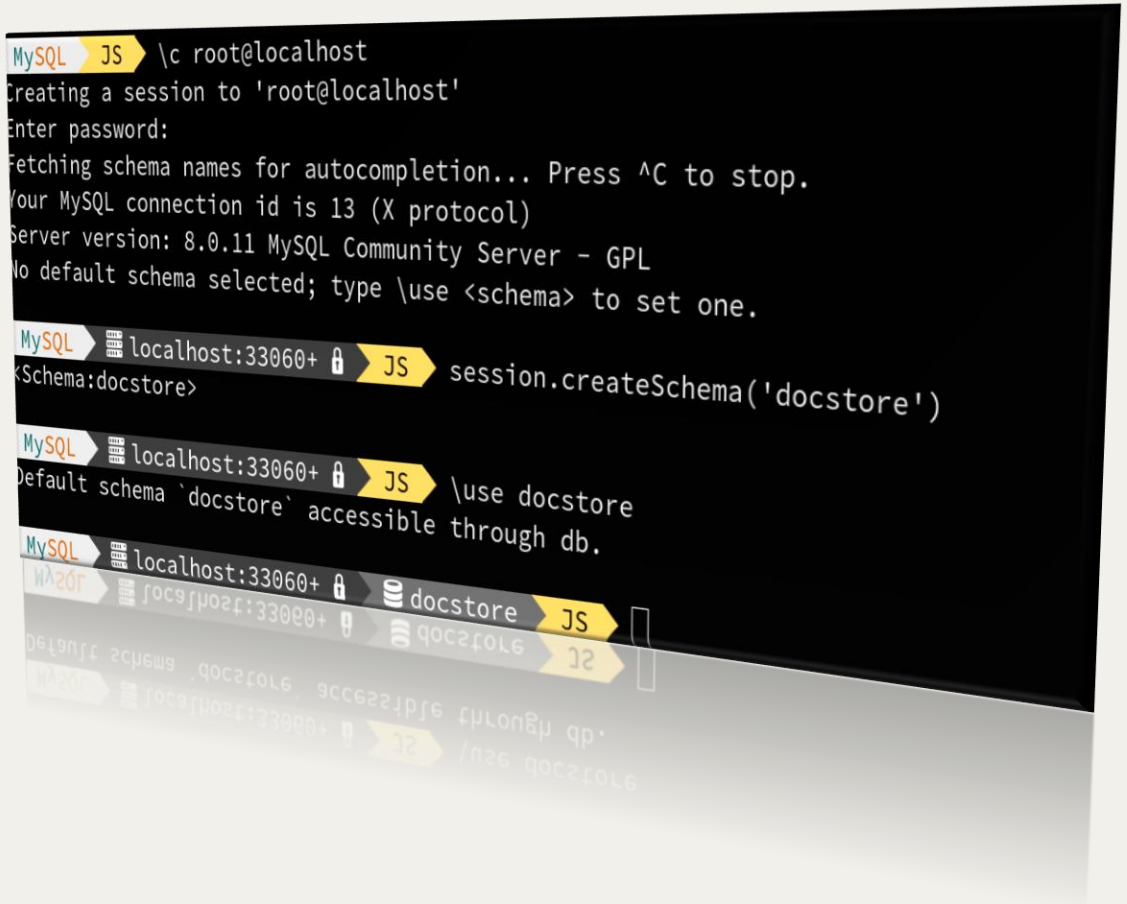
支援全Unicode



MySQL 8.0: Shell

几分钟内就能开始用

- **Rapid prototyping 的能力**
  - 用JavaScript 和Python
- **完整支持 SQL 和X DevAPI**
  - 用内建的 auto-completion
- **支持InnoDB Cluster**
  - 在几分钟内完成高可用的设定
- **DevOps 工具**
  - 设计时就考虑对DevOps的支持



MySQL 8.0 Highlights

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MySQL Security

MySQL GIS

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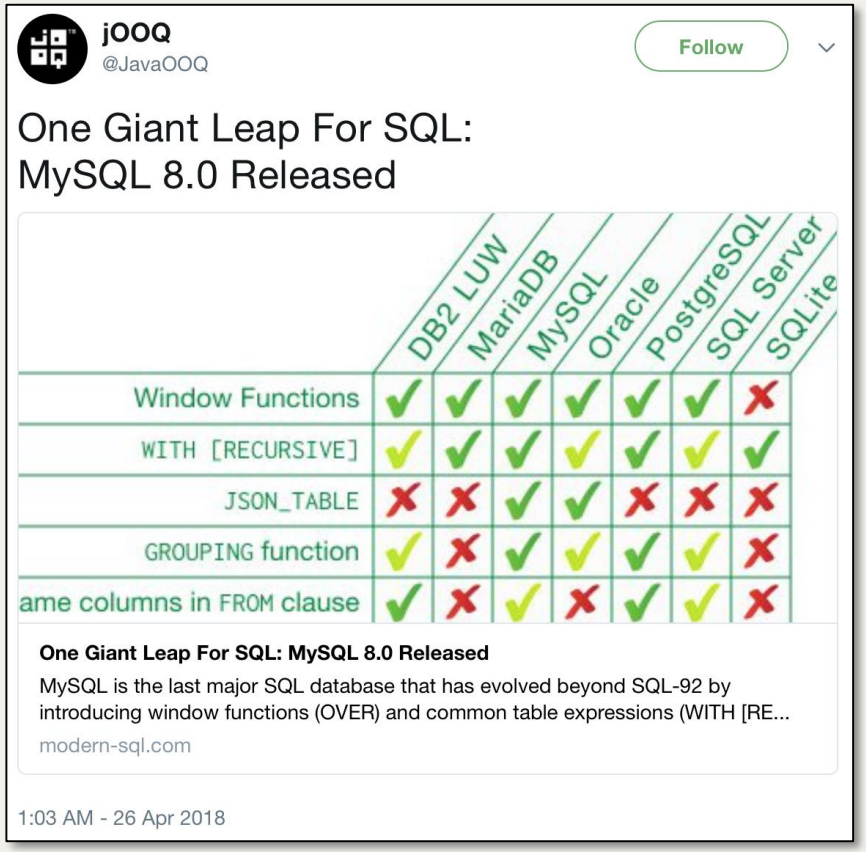
MySQL 8.0: 对SQL支持的大跃进



"This is a landmark release as MySQL eventually evolved beyond SQL-92 and the purely relational dogma. Among a few other standard SQL features, MySQL now supports window functions (over) and common table expressions (with). Without a doubt, these are the two most important post-SQL-92 features."

https://modern-sql.com/blog/2018-04/mysql-8.0

MySQL 8.0: CTEs 和 Window Functions

- **Common Table Expression (WITH clause)**
  - Non-recursive
  - Recursive
  - Used for hierarchy traversal
- **Window Functions**
  - Aggregation, ranking, analytics
  - Used for analytics and reporting

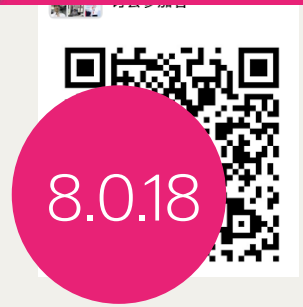
```
WITH cte1 AS (SELECT a, b FROM table1),
cte2 AS (SELECT c, d FROM table2)
SELECT b, d FROM cte1
JOIN cte2 WHERE cte1.a = cte2.c;
```

```
SELECT year, country, product, profit,
 SUM(profit) OVER() AS total_profit,
 SUM(profit) OVER(PARTITION BY country) AS country_profit
FROM sales
ORDER BY country, year, product, profit;
```

MySQL 8.0: Hash Join

- 用于大的结果集远比**nested loop**快
- 尽可能在内存中
- 必要时用磁盘
- 用于**inner equi-joins**
  - 可扩大到 outer, semi 和anti joins
- 在执行计划中取代**Block Nested Loop**
- 以**Hint**强迫用 **hash join**或**nested loop**

MySQL 8.0: EXPLAIN ANALYZE



- **衡量和执行查询**
  - 估计的成本
  - 实际执行统计
    - 传回第一笔的时间
    - 传回所有行的时间
    - 传回的行数
    - 做了多少圈回
- **在 EXPLAIN时也可用新的树结构做输出格式**

MySQL 8.0: EXPLAIN ANALYZE

8.0.18

```
EXPLAIN FORMAT=TREE
SELECT first_name, last_name, SUM(amount) AS total
FROM staff INNER JOIN payment
  ON staff.staff_id = payment.staff_id
     AND
     payment_date LIKE '2005-08%'
GROUP BY first_name, last_name;

-> Table scan on <temporary>
    -> Aggregate using temporary table
        -> Nested loop inner join  (cost=1757.30 rows=1787)
            -> Table scan on staff  (cost=3.20 rows=2)
            -> Filter: (payment.payment_date like '2005-08%')  (cost=117.43 rows=894)
                -> Index lookup on payment using idx_fk_staff_id (staff_id=staff.staff_id)  (cost=117.43 rows=8043)
```

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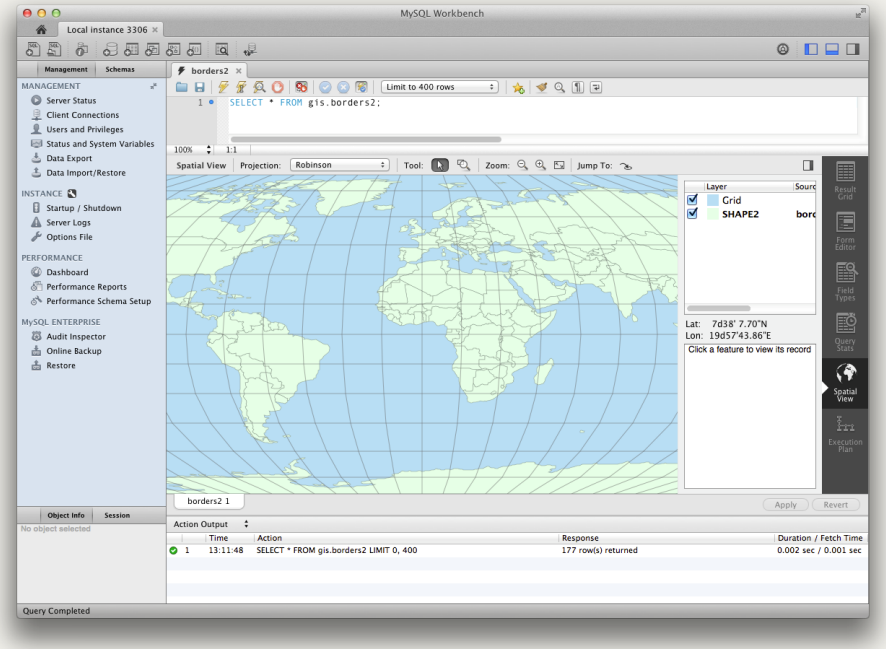
MySQL 8.0: GIS

简单

- 完全内建且立即可用
- 不需额外的配置或安装

强大

- 完整支持各种地理系统
  - Projected – 平面/跨两个维度
  - Geographic – 球面
- 详尽 -
  - 来自EPSG Dataset 9.2预设的SRS 5107
    - 4628 projected
    - 479 geographic



GIS: Geography

SRID 感知的空间索引

CREATE TABLE t1 (g **GEOMETRY SRID 4326** NOT NULL, **SPATIAL INDEX (g)**);

SRID 感知的空间函式

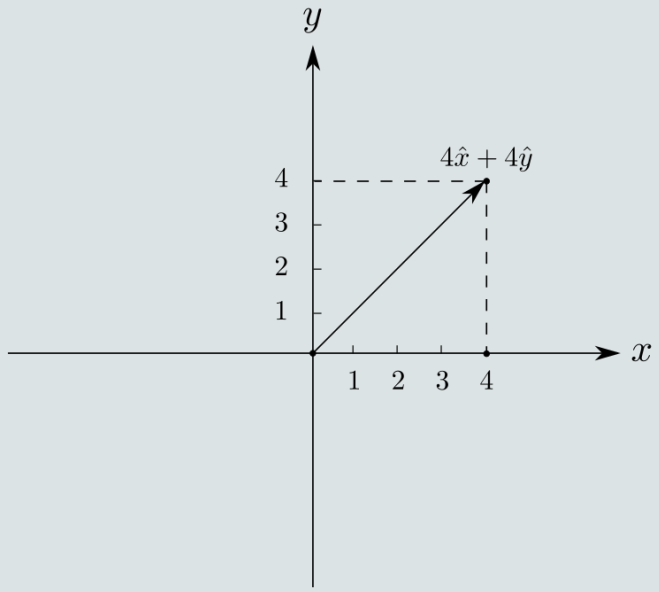
ST_Distance(), ST_Length(),...

ST_Within(), ST_Intersects(), ST_Contains(),...

GeoHash(), GeoJSON()

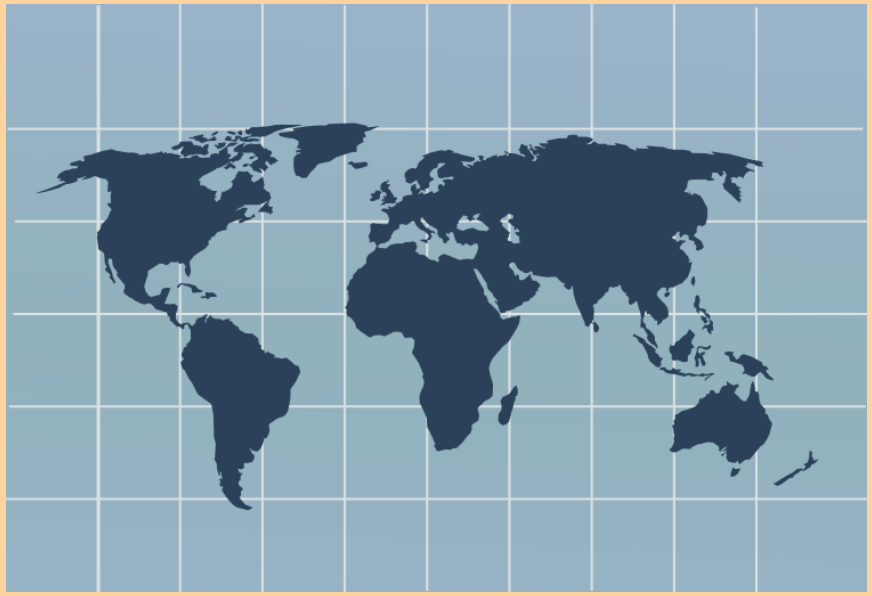
Spatial Reference Systems

5.7



SRID 0

8.0



Projected SRS

Geographic SRS

Cartesian SRS

Spatial Indexes

- 在spatial 数据加R-tree索引
  - 依SRID为Cartesian 或 geographic
    - Geographic R-trees 只在InnoDB可用
- 自动为优化器所采用
  - 由spatial 关系所触发(ST_Within, etc.)
  - Cost based decision making

示范

- 在台北101二百公尺以内的建筑物有那些?

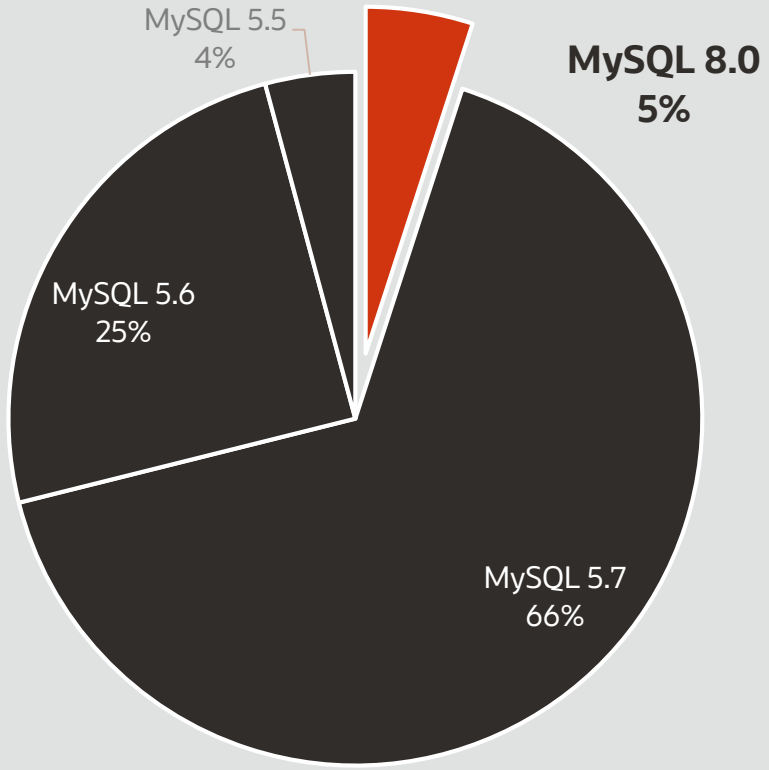
```
show create table taiwangis.gis_osm_buildings_a_free_o\G
select @tp101pt := point1 from taiwangis.gis_osm_buildings_a_free_o where name = '台北101' limit 1;
SELECT ogr_fid,name ,osm_id, code, fclass,type, st_distance(point1, @tp101pt) distance
from taiwangis.gis_osm_buildings_a_free_o
where name is not null and st_distance(point1, @tp101pt) < 200;
```

- 通过北京的轨道系统有那些?

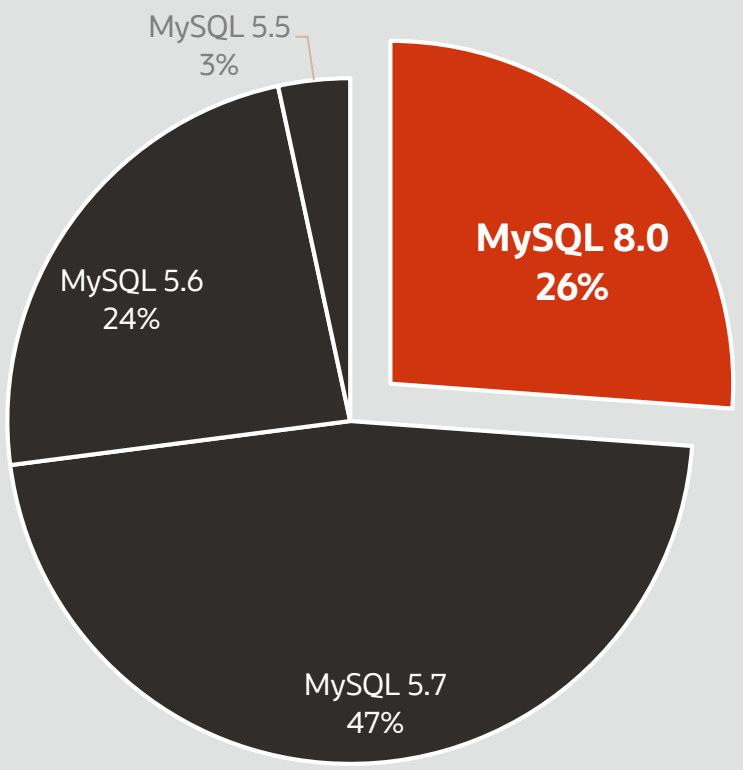
```
select @bjshape := shape from chinagis.gadm36_chn_2 where name_1 = 'Beijing';
select distinct name from chinagis.gis_osm_railways_free_1
where st_intersects(shape, @bjshape) and name is not null order by name limit 40\G"
```

MySQL 8.0: 快速被采纳

April 2018 (8.0 GA)



August 2019



Demo - Upgrade

MySQL 8.0: Upgrade Checker

- 快速易用的MySQL Shell Utility
  - JavaScript
  - Python
- 依严重程度分类问题
  - No Issues
  - 有潜在的问题
  - 在升级前一定要改正的错误
- 改正的建议
  - Schema, Configuration
  - Data on Server, etc.

```
-js> util.checkForServerUpgrade("root@localhost:3306")
ySQL server at localhost:3306 will now be checked for compatibility iss
pgrade to MySQL 8.0...
 version: 5.7.19 - MySQL Community Server (GPL)

age of db objects with names conflicting with reserved keywords in 8.0
sues found

age of utf8mb3 charset
ng: The following objects use the utf8mb3 character set. It is recommen
nvert them to use utf8mb4 instead, for improved Unicode support.

e_schema.city.name - column's default character set: utf8
e_schema.city.country_code - column's default character set: utf8

age of use ZEROFILL/display length type attributes
e: The following table columns specify a ZEROFILL/display length attrib
ase be aware that they will be ignored in MySQL 8.0

big_table.ORDINAL_POSITION - bigint(21) unsigned
```

MySQL 企业版

MySQL 企业版

Demo - QUA

先进的功能

- 扩充性
- 高可用
- 登入认证
- 审计
- 加密和TDE
- 防火墙
- 数据屏蔽和脱敏

管理工具

- 监看
- 备份
- 开发
- 管理
- 迁移

支持

- 技术支持’
- 咨询服务
- Oracle认证

MySQL企业版

- MySQL Enterprise **Masking**
  - De-identify, Anonymize Sensitive Data
- MySQL Enterprise **TDE**
  - AES 256 encryption, Key Management
- MySQL Enterprise **Authentication**
  - External Authentication Modules
- MySQL Enterprise **Encryption**
  - Public/Private Key Cryptography, Asymmetric Encryption
- MySQL Enterprise **Firewall**
  - Block SQL Injection Attacks, Intrusion Detection
- MySQL Enterprise **Audit**
  - User Activity Auditing, Regulatory Compliance

- MySQL Enterprise **Monitor**
  - Monitor Changes in Database Configurations, Users Permissions, Database Schema, Passwords
- MySQL Enterprise **Backup**
  - Securing Backups, AES 256 encryption

Demo - Backup

My Oracle Support
為您扶上馬送一程

Oracle MySQL 優質服務

- 最大工程和支援队伍
- 背后有 MySQL 的研发队伍做后盾
- 全球性, 29 种语言
- 热修复和维护性发行
- 24x7x365
- 不限服务次数
- 顾问咨询服务
- 全球每个角落都覆盖了

MySQL Consultative Support

协助您正确的设计、配置、和调优 MySQL

- 远端问题解决
- 复制评估
- 分区评估
- 资料架构设计评估
- 查询命令评估
- 效能调优
- 客户代码评估:
  - Client APIs
  - User Defined Functions
  - Server Extensions
  - Stored Routines
- 安装支持

MySQL EE on Oracle Cloud Market Place

- https://cloudmarketplace.oracle.com/marketplace/en_US/listing/6743

MySQL Enterprise Edition

Get App

MySQL is the world's most popular open source database

Oracle Cloud Infrastructure | Other , Big Data , Application Development

Contact Listing Provider

★★★★★ (0)

Overview | Ratings (0) | Provider

App by MySQL

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感谢您,请您指教

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MySQL GBU, Oracle LLC

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