Introduction of MariaDB

26th September 2017

GOTO Satoru
Customer Solutions Engineer
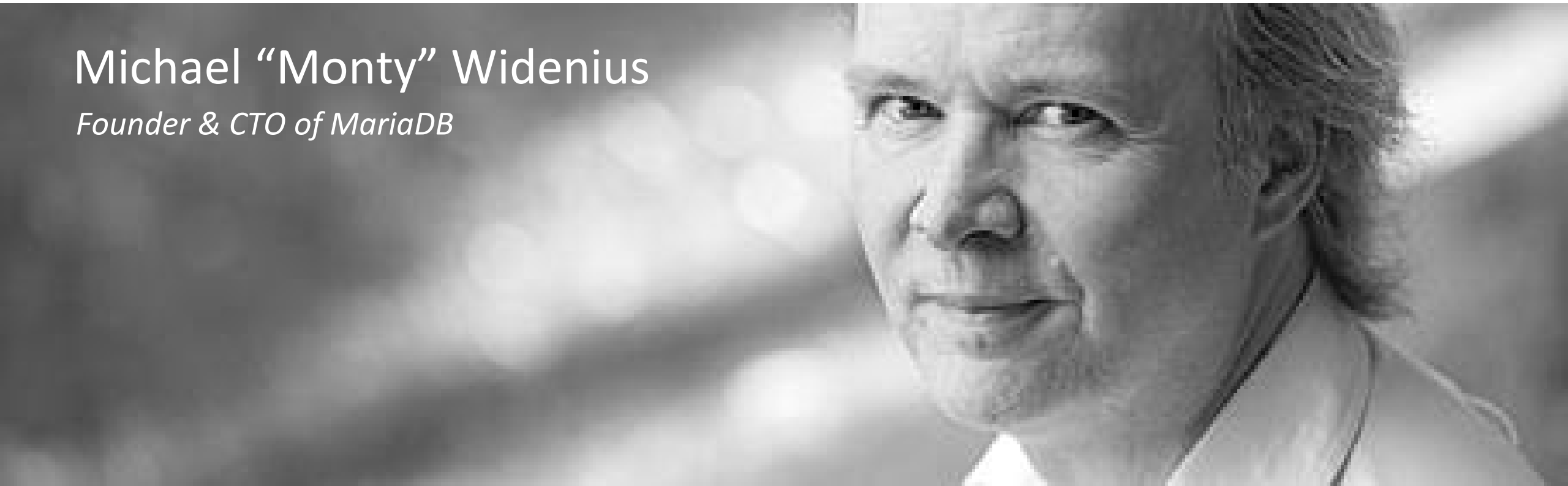
What is MariaDB ?

The Soul of Open Source

> " MariaDB was created to preserve openness and community, so that we can push ahead faster with the capabilities for tomorrow's applications. "

Michael "Monty" Widenius

Founder & CTO of MariaDB

History of
MySQL & MariaDB

1981	Unireg (base of MySQL code)
1994	Added SQL interface and renamed it MySQL
1995	**MySQL released** under dual licensing
2005	Oracle acquired InnoDB
2008	Sun acquired MySQL AB for 1 billion USD
2009	Monty & others left Sun in Feb 2009 to work on Maria engine in Monty Program Ab
2009	Oracle acquired Sun
2012	**MariaDB foundation** was created
2013	MariaDB started replacing MySQL in most Linux distributions
2013	Monty Program Ab merged with SkySQL
2014	SkySQL Ab renamed to **MariaDB Corporation**

MariaDB

History of MariaDB

Feb 2010   MariaDB 5.1
Nov 2010   MariaDB 5.2
Apr 2012   MariaDB 5.3
Feb 2012   MariaDB 5.5

Mar 2014 MariaDB 10.0
Oct 2015   MariaDB 10.1
May 2017   MariaDB 10.2.6 GA
Aug 2017   MariaDB 10.3.1 alpha

https://downloads.mariadb.org/mariadb/+releases/
https://github.com/MariaDB/server/releases

MariaDB vs. MySQL

MariaDB vs. MySQL
More Storage Engines

- **ColumnStore**   column oriented engine for Data warehousing(DWH)
- **Spider**   in 10.0 and later
- **MyRocks**   with great compression, in 10.2
- **Aria**   MyISAM replacement with better caching
- FederatedX   drop-in replacement for Federated
- OQGRAPH   new in 5.2 - Open Query GRAPH
- SphinxSE   new in 5.2
- TokuDB   in 5.5 and later -
- CONNECT   in 10.0 and later
- SEQUENCE   in 10.0 and later
- Cassandra   in 10.0

https://mariadb.com/kb/en/library/mariadb-vs-mysql-features/

MariaDB

MariaDB vs. MySQL
Performance Improvements

- Query Optimizer enhancements

- Faster and safer replication

- Character set conversions

- **Thread Pool**
  - allows 200,000+ connections and with a notable speed improvement when using many connections
  - w/ MySQL only available with Enterprise version

https://mariadb.com/kb/en/library/mariadb-vs-mysql-features/

MariaDB vs. MySQL
Extensions & New Features

- **Window functions**   new in 10.2
- DECIMAL from 30 to 38   new in 10.2
- **Recursive CTE**   new in 10.2 (Common Table Expressions)
- CHECK CONSTRAINT   new in 10.2
- DEFAULT   new in 10.2, for BLOB and TEXT
- Added catchall for list partitions   new in 10.2
- EXECUTE IMMEDIATE   new in 10.2 (Oracle-style)
- JSON functions   new in 10.2
- ms Precision in Processlist
- Table Elimination
- Virtual Columns   new in 5.2

MariaDB vs. MySQL
Extensions & New Features

- Extended User Statistics   new in 5.2
- KILL all queries for a user   new in 5.3
- KILL QUERY ID   terminates the query by query_id, leaving the connection intact — new in 10.0.5
- Pluggable Authentication   new in 5.2
- Enhancements to INFORMATION SCHEMA.PLUGINS table — new in 5.2
- Group commit for the binary log   new in 5.3
- Added --rewrite-db mysqlbinlog option to change the used database — new in 5.2
- Progress reporting for ALTER TABLE and LOAD DATA INFILE — new in 5.3
- Faster joins and subqueries   new in 5.3
- HandlerSocket and faster HANDLER calls   new in 5.3
- Dynamic Columns support   new in 5.3
- GIS Functionality   new in 5.3

MariaDB

MariaDB vs. MySQL
Extensions & New Features

- Multi-source replication   new in 10.0
- GTID   new in 10.0, Global Transaction ID
- SHOW EXPLAIN   new in 10.0, gives the EXPLAIN query plan
- Roles   new in 10.0
- PCRE   new in 10.0, **P**erl **C**ompatible **R**egular **E**xpressions
- DELETE … RETURNING   new in 10.0

https://mariadb.com/kb/en/library/mariadb-vs-mysql-features/

MariaDB vs. MySQL
Truly Open Source

- All code in MariaDB : released under GPL, LGPL or BSD

- MariaDB client libraries (for C, for Java (JDBC), for Windows (ODBC) are released under **LGPL**
  - allows link with closed source software
  - MySQL client libraries are released under GPL that does not allow linking with closed source software

- MariaDB includes test cases for all fixed bugs.
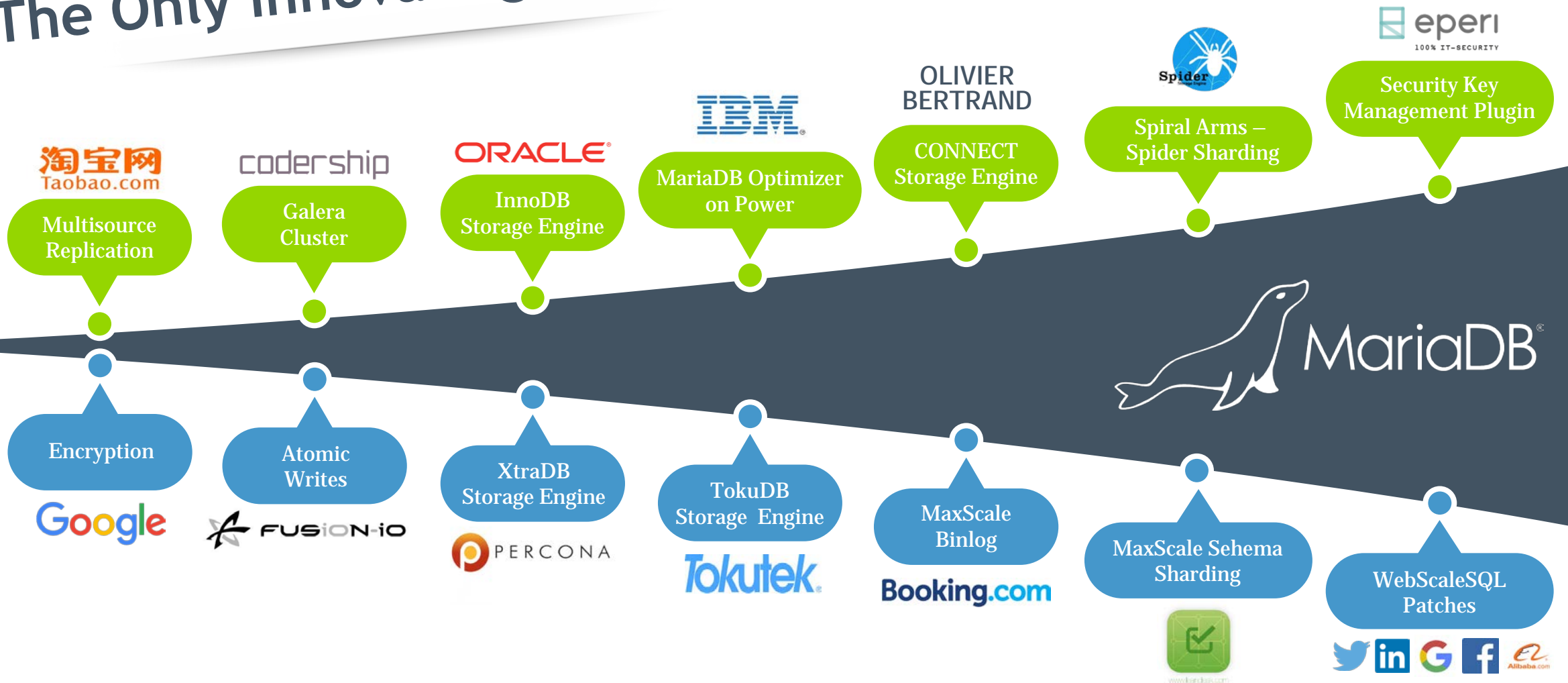 - Oracle doesn't provide test cases for new bugs fixed in MySQL 5.5
  - All bugs / development plans are public
    - https://jira.mariadb.org/
    - https://github.com/MariaDB

"

By 2018, more than 70% of new in-house applications will be developed on an ODBMS, and 50% of existing commercial RDBMS instances will have been converted or will be in process.

Gartner | STRATEGIC PLANNING ASSUMPTION

MariaDB®

The Only Innovating Community

Multisource Replication — 淘宝网 Taobao.com

Galera Cluster — codership

InnoDB Storage Engine — ORACLE

MariaDB Optimizer on Power — IBM

CONNECT Storage Engine — OLIVIER BERTRAND

Spiral Arms – Spider Sharding — Spider

Security Key Management Plugin — eperi 100% IT-SECURITY

Encryption — Google

Atomic Writes — FUSiON-iO

XtraDB Storage Engine — PERCONA

TokuDB Storage Engine — Tokutek

MaxScale Binlog — Booking.com

MaxScale Sehema Sharding

WebScaleSQL Patches

MariaDB

We're building a database that is
easy to use, easy to extend, and easy to deploy:

on premise, in the cloud, or hybrid, operational or analytical
– and with the languages and frameworks you prefer.

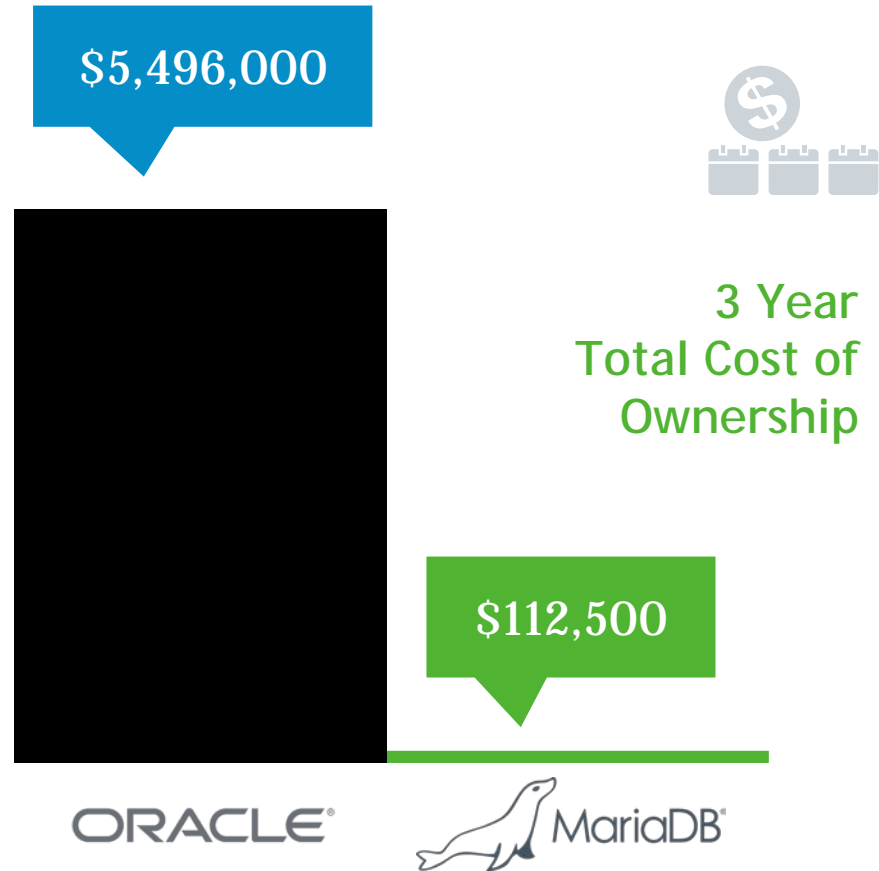15

MariaDB

Why consider MariaDB?

Reduced Costs

Annual Subscriptions

Cloud Infrastructure

Modern Hardware

MariaDB
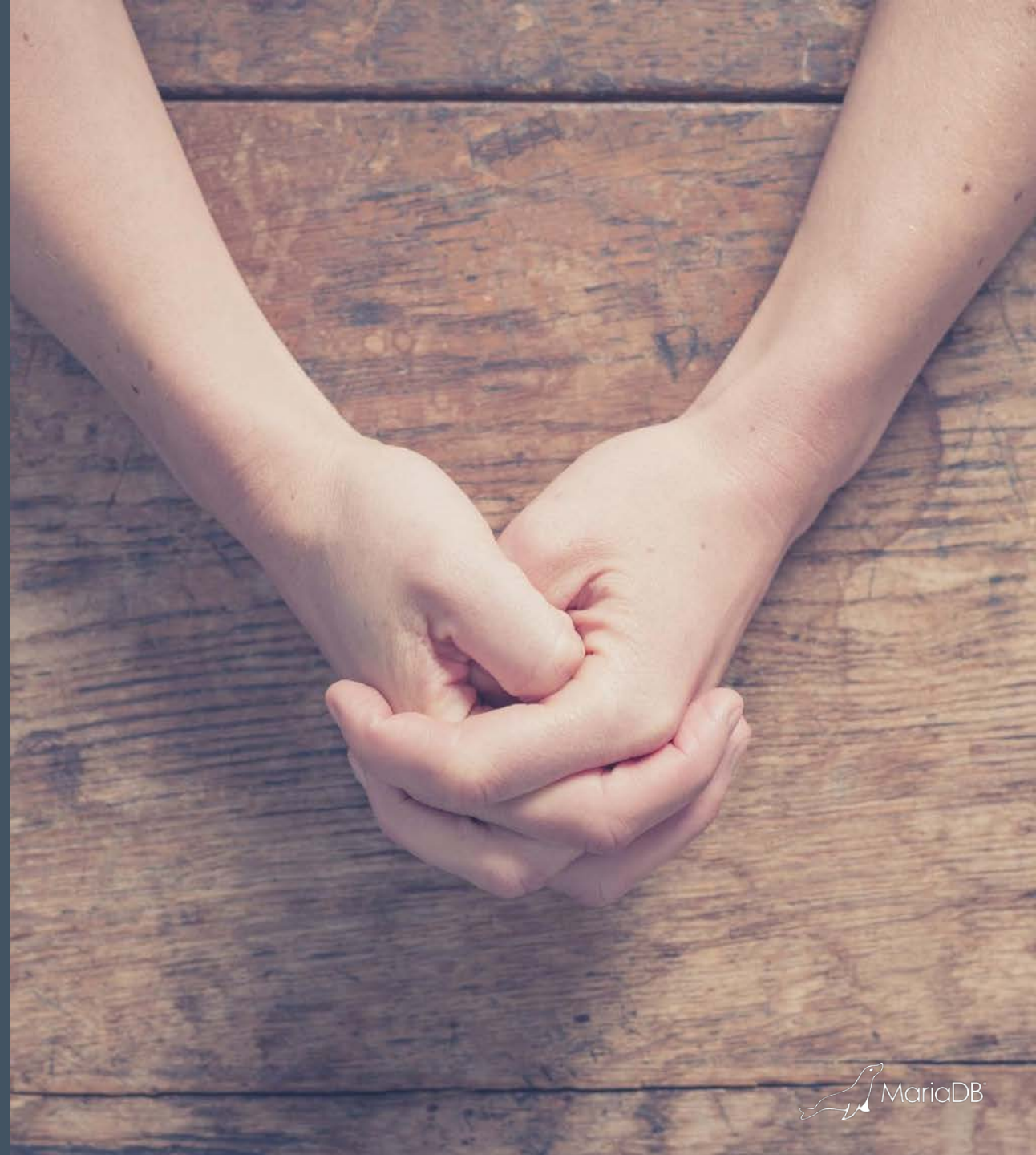
Economics of Inevitable Change

$5,496,000

3 Year
Total Cost of
Ownership

$112,500

ORACLE®   MariaDB®

On premise…
- Oracle costs **80x** more
- Organizations can save **$9 million**

In the cloud…
- On AWS, Oracle costs **145x** more
- On Oracle Cloud, it costs **69x** more

Default Database on Leading Linux Distros, Available on Leading Cloud Platforms

MariaDB Going Mainstream

OpenStack user survey April 2017

Which databases are used for OpenStack components?

MariaDB Galera Cluster moved from fourth to first place on this list, up 7 points, while MongoDB slipped 6 points. MySQL with Galera also dropped significantly, down 8 points. This follows a longer-term trend over time where deployments are moving away from MySQL (down 22% over past 18 months) to MariaDB and others. IBM DB2 was noted among other databases used.
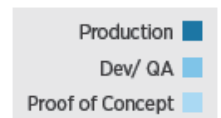

	0%	10%	20%	30%
MariaDB Galera Cluster	24%	6%	31%	
MariaDB	14%	7%	4% 25%	
MySQL	12%	3% 5% 20%		
MongoDB	11%	4% 18%		
MySQL with Galera	8%	9%		
PostgreSQL	5% 3% 9%			
Percona XtraDB Cluster	7% 8%			
Percona Server	2% 3%			
MySQL with DRBD	1%			

Figure 5.7 n=478

Production
Dev/ QA
Proof of Concept

20
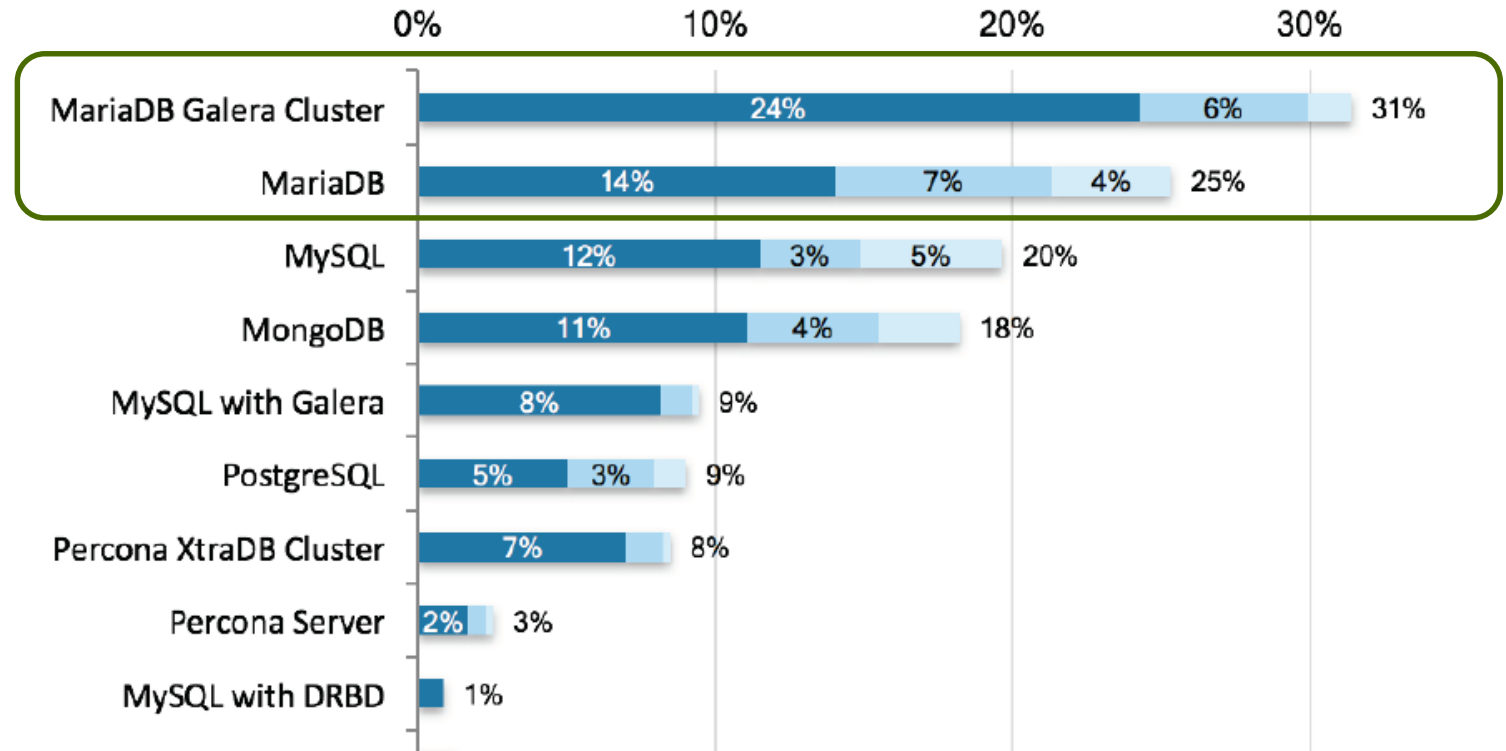
MariaDB Going Mainstream

Distribution	Estimated Reach	MariaDB Default since
CentOS	10 million	2013
RHEL	5.3 million	2013
openSUSE	28 million	2015
Fedora	13.4 million	2015
Debian	1.5 million	2017
Ubuntu	25 million	Expected to follow Debian
BSD, Mageia, macOS etc	1 million	Mostly all default MariaDB

MariaDB Going Mainstream

DB-Engines Ranking
RDBMS
Sep 2017

db-engines.com/en/ranking

137 systems in ranking, September 2017

Rank			DBMS	Database Model	Score		
Sep 2017	Aug 2017	Sep 2016			Sep 2017	Aug 2017	Sep 2016
1.	1.	1.	Oracle ➕ 🛒	Relational DBMS	1359.09	-8.78	-66.47
2.	2.	2.	MySQL ➕ 🛒	Relational DBMS	1312.61	-27.69	-41.41
3.	3.	3.	Microsoft SQL Server ➕ 🛒	Relational DBMS	1212.54	-12.93	+0.99
4.	4.	4.	PostgreSQL ➕ 🛒	Relational DBMS	372.36	+2.60	+56.01
5.	5.	5.	DB2 ➕	Relational DBMS	198.34	+0.87	+17.15
6.	6.	6.	Microsoft Access	Relational DBMS	128.81	+1.78	+5.50
7.	7.	7.	SQLite	Relational DBMS	112.04	+1.19	+3.41
8.	8.	8.	Teradata	Relational DBMS	80.91	+1.67	+7.84
9.	9.	9.	SAP Adaptive Server	Relational DBMS	66.75	-0.16	-2.41
10.	10.	10.	FileMaker	Relational DBMS	61.00	+1.35	+5.64
11.	11.	⬆13.	MariaDB ➕	Relational DBMS	55.47	+0.78	+16.94
12.	⬆13.	⬇11.	Hive ➕	Relational DBMS	48.62	+1.31	-0.21
13.	⬇12.	⬇12.	SAP HANA ➕	Relational DBMS	48.33	+0.36	+4.91
14.	14.	14.	Informix	Relational DBMS	27.84	+0.41	-0.35
15.	⬆16.	15.	Vertica ➕	Relational DBMS	22.01	+0.20	+0.95
16.	⬇15.	⬆17.	Microsoft Azure SQL Database	Relational DBMS	21.60	-0.31	+2.18
17.	17.	⬇16.	Netezza	Relational DBMS	19.40	-0.17	-0.41
18.	18.	18.	Firebird	Relational DBMS	17.86	-0.20	+2.28
19.	19.	⬆22.	Impala	Relational DBMS	13.56	+0.51	+4.34
20.	20.	⬇19.	Amazon Redshift ➕	Relational DBMS	13.04	+0.21	+2.21

MariaDB Going Mainstream

DB-Engines
Ranking of RDBMS
Sep 2017

db-engines.com/en/ranking

DB-Engines Ranking of Relational DBMS

- Oracle
- MySQL
- Microsoft SQL Server
- PostgreSQL
- DB2
- Microsoft Access
- SQLite
- Teradata
- SAP Adaptive Server
- FileMaker
- MariaDB
- Hive
- SAP HANA
- Informix
- Vertica
- Microsoft Azure SQL Database
- Netezza
- Firebird
- Impala
- Amazon Redshift
- Google BigQuery
- Greenplum
- Oracle Essbase
- Spark SQL
- dBASE
- Interbase

June 2014
● DB2: 198.029

Score (logarithmic scale)

© September 2017, DB-Engines.com

2013 2014 2015 2016 2017

▲ 1/6 ▼

MariaDB

12 Million Users in 45 Countries Trust Critical Business Data to MariaDB

Travel
amadeus — Your technology partner
BOOKING.COM — online hotel reservations
Jetair
AIRFRANCE Regional
Club Med
softvoyage
BlaBlaCar

Retail & Ecommerce
Toys Я us
GROUPE LACTALIS
QVC
buch.de — einfach|schnell
Verkkokauppa.com — PROBABLY ALWAYS CHEAPER
SALOMON
THE HOME DEPOT
otto group
PIXmania.com

Financial Services
PAYBOX SERVICES
First American Title
Swedbank
NH
Crédit Mutuel — LA banque à qui parler
Virgin money

Gvmt & Education
LE GOUVERNEMENT DU GRAND-DUCHÉ DE LUXEMBOURG
LA POSTE
NEW YORK UNIVERSITY
LOCKHEED MARTIN
HARVARD
POLICE NATIONALE
Deutscher Bundestag
NC S

Telecom
vodafone
elisa
Virgin mobile
mobilcom debitel
SK telecom
bandwidth
Gamma
swisscom
Alcatel·Lucent
JUNIPER NETWORKS
orange

Technology & Internet
SAMSUNG
SIEMENS
Canon
MCAD
ST STMicroelectronics
1&1
Nimbuzz!
hp

Media & Social
EA
XING
FT FINANCIAL TIMES
Constant Contact — Connect. Inform. Grow.
TALK
Disney
ZeniMax MEDIA INC.
craigslist
tumblr.
WIKIPEDIA — The Free Encyclopedia

24

The database market is changing.
It is time for a new leader.

Proprietary

Expensive Licenses

Closed Development

Platform Lock-in

Yesterday's Interest

Resistance to Change

Open Source

Low-cost Subscriptions

Community Innovation

Infrastructure independent

Today's Excitement

Continuous Evolution

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What will this new leader provide?

Enterprise Reliability

High Availability (Replication / Failover)

Disaster Recovery (Backup & Restore)

Performance (Thread Pool)

Scalability (Partitioning and Sharding)

Security (Firewall and Encryption)

Open Source Innovation

Open Development (Tests and Roadmaps)

Community **Collaboration** (New Features)

Extensible Architecture (Custom Plugins)

Flexible Modeling (Dynamic Columns & JSON)

Streaming Integration (CDC and Kafka)

MariaDB

MariaDB Technology
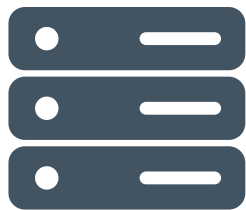
SERVER

Enterprise-grade secure, highly available and scalable relational database with a modern, extensible architecture
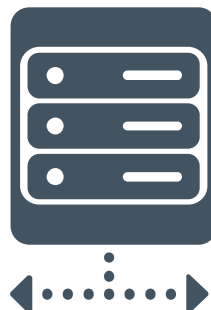
MAXSCALE

Next-generation database **proxy** that manages security, scalability and high availability in scale-out deployments
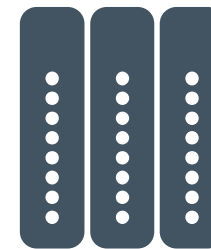
COLUMNSTORE

Columnar storage engine for massively parallel distributed query execution and data loading

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Extensible Architecture

Legend:
- ● Original Core
- ● MariaDB Engineering
- ● Community Contribution

Applications

Connectors | C | JDBC | ODBC

SQL ↕ ↕ NoSQL CRUD API

MariaDB Multi-Master Cluster

MariaDB MaxScale

MariaDB Server

KERNEL EXTENSIBILITY

Replication

BinLog API	GTID
Parallel Slave	Multi-Source

Kernel

Connection Pool	Cache/Buffer
	Optimiser
SQL Parser	Temporal

Production Plugins

PL/SQL	Authentication
AWS KMS	Handler Socket
Audit	40+ Plugins

STORAGE LAYER EXTENSIBILITY

Lightweight	Transactional	Performance & Scalability	Analytics	Interoperability	Graph & Search
MyISAM	InnoDB	Spider	ColumnStore	CONNECT	OQGRAPH
Memory	XtraDB	MyRocks			Mroonga

OPERATING SYSTEM / FILE SYSTEM / SAN / CLOUD

MariaDB
Replicas Supporting Asynchronous, Semi-Sync & Synchronous replication
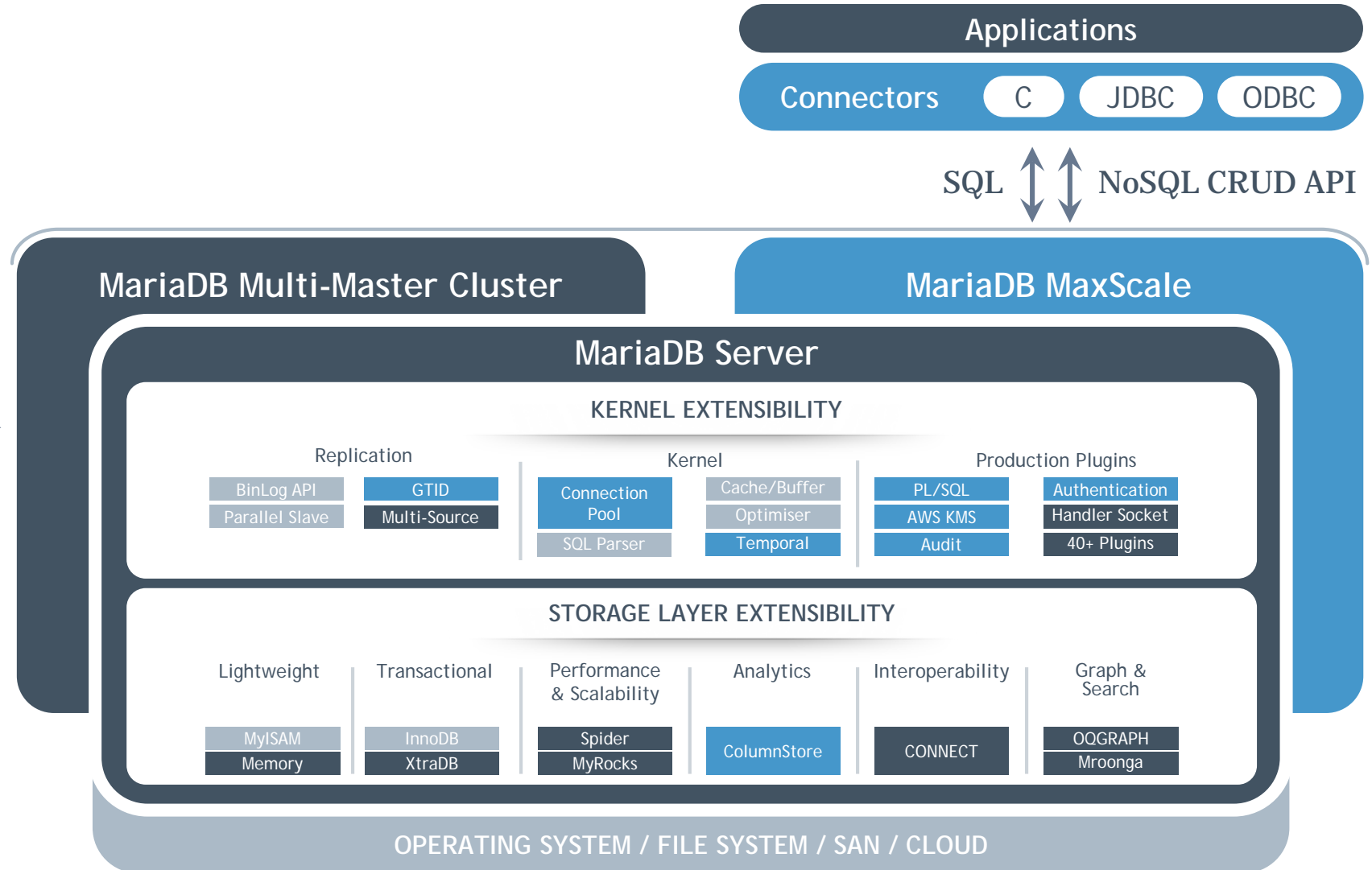
MariaDB Storage Engines

MariaDB Storage Engines
General Purpose

- XtraDB :   best choice in many cases until MariaDB 10.1
  - performance-enhanced fork of InnoDB and is MariaDB's default engine until MariaDB 10.1

- **InnoDB** :   general transactional engine, default MariaDB **10.2**

- **MyISAM** :   small footprint and allows for easy copying between systems
  - MySQL's oldest storage engine

- **Aria** :   MariaDB's modern improvement on MyISAM

https://mariadb.com/kb/en/library/choosing-the-right-storage-engine/

MariaDB Storage Engines
Scaling, Partitioning

- Galera Cluster : synchronous multi-master cluster. **only InnoDB supported**

- **TokuDB** is a transactional storage engine which is optimized for workloads that do not fit in memory, and provides a **good compression ratio**

- **Spider** uses partitioning to provide data **sharding** through multiple servers
  - https://www.slideshare.net/Kentoku/mariadb-103spider

- **ColumnStore** utilizes a massively parallel **distributed** data architecture and is designed for big data scaling to process petabytes of data
  - https://www.slideshare.net/InsightTechnology/dbtstky2017-c37-mariadb

MariaDB Storage Engines
Compression / Archive

- **MyRocks** : enables greater compression than InnoDB, as well as less write amplification giving better endurance of flash storage(SSD) and improving overall throughput. Developed at **Facebook**
  - https://enterprisezine.jp/dbonline/detail/9450

- TokuDB : transactional storage engine which is optimized for workloads that do not fit in memory, and provides a good compression ratio

- Archive : best used for archiving

Storage Engines
Connecting to other data sources

- **CONNECT** : allows access to different kinds of text files and remote resources as if they were regular MariaDB tables

- CSV : read and append to files stored in CSV format.
    - since MariaDB 10.0, CONNECT is a better choice and is more flexibly able to read and write such files
- FederatedX : uses libmysql to talk to the data source, the data source being a remote RDBMS.
    - Currently, since FederatedX only uses libmysql, it can only talk to another MySQL RDBMS.
- CassandraSE : allowing access to an older version of Apache Cassandra NoSQL DBMS.
    - It was relatively experimental, and is no longer being actively developed

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Storage Engines
Full Text Search

- SphinxSE :   proxy to run statements on a remote Sphinx DB server

- **Mroonga** :   fast CJK-ready full text search

  - http://mroonga.org/ja/blog/2016/07/21/mariadb-community-event-in-tokyo.html

  - https://www.slideshare.net/kou/dbtechshowcasetokyo2017

Storage Engines
Cache, read-only

- MEMORY : does not write data on-disk (all rows are lost on crash) and is best-used for **read-only caches** of data from other tables, or for temporary work areas.
  - With the default XtraDB and other storage engines having good caching, there is less need for this engine than in the past.

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Evolution of MariaDB Server

10.1 (GA)

Multi-master Replication (Galera)

Data-at-Rest Encryption

Password Validation

Page Compression

Facebook Defragmentation

Spatial References (GIS)

10.2 (GA)

MyRocks

Flashback (Point in Time Rollback)

Common Table Expressions

Window Functions

Check Constraints

JSON & GeoJSON Functions

Mult-Trigger Support

Delayed Replication

Binary Log Compression

Per User Resource Limits

Virtual Column Indexes

10.3 (DEV)

Sequences & PL/SQL

System Versioned Tables

 As Of (Point in Time Querying)

User-defined Aggregate Functions

Intersect & Except

Hidden Columns

MariaDB MaxScale

MariaDB MaxScale is a next-generation database proxy that manages security, scalability and high availability in a scale out deployment.

Security

Secure **database firewall** to prevent cyber attacks like SQL injection and DDoS
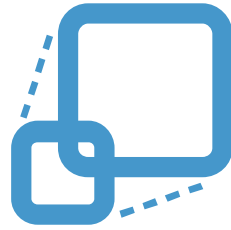
Scalability

Manage your scaled-out infrastructure **without changing application code**

High Availability

Ensure uptime with no single point of failure and **minimize downtime** during upgrade
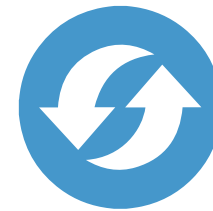
Data Streaming

Stream transactional data to data lake for **real-time analytics**

MariaDB ColumnStore(AX)

High performance columnar storage engine that supports a wide variety of analytical use cases in highly scalable distributed environments

Better Price Performance	Easier Enterprise Analytics	Faster, More Efficient Queries
Power of SQL and Freedom of Open Source to Big Data Analytics	Single Interface for OLTP and analytics Easy to Manage and Scale	Parallel query processing for distributed environments

MariaDB ColumnStore Architecture

Application

BI Tool

SQL Client

Custom
Big Data App

**MariaDB SQL
Front End**

User Module (UM)

**Distributed
Query Engine**

Performance
Module (PM)

**Data
Storage**

Columnar Distributed Data Storage

Local Storage | SAN | EBS | GlusterFS
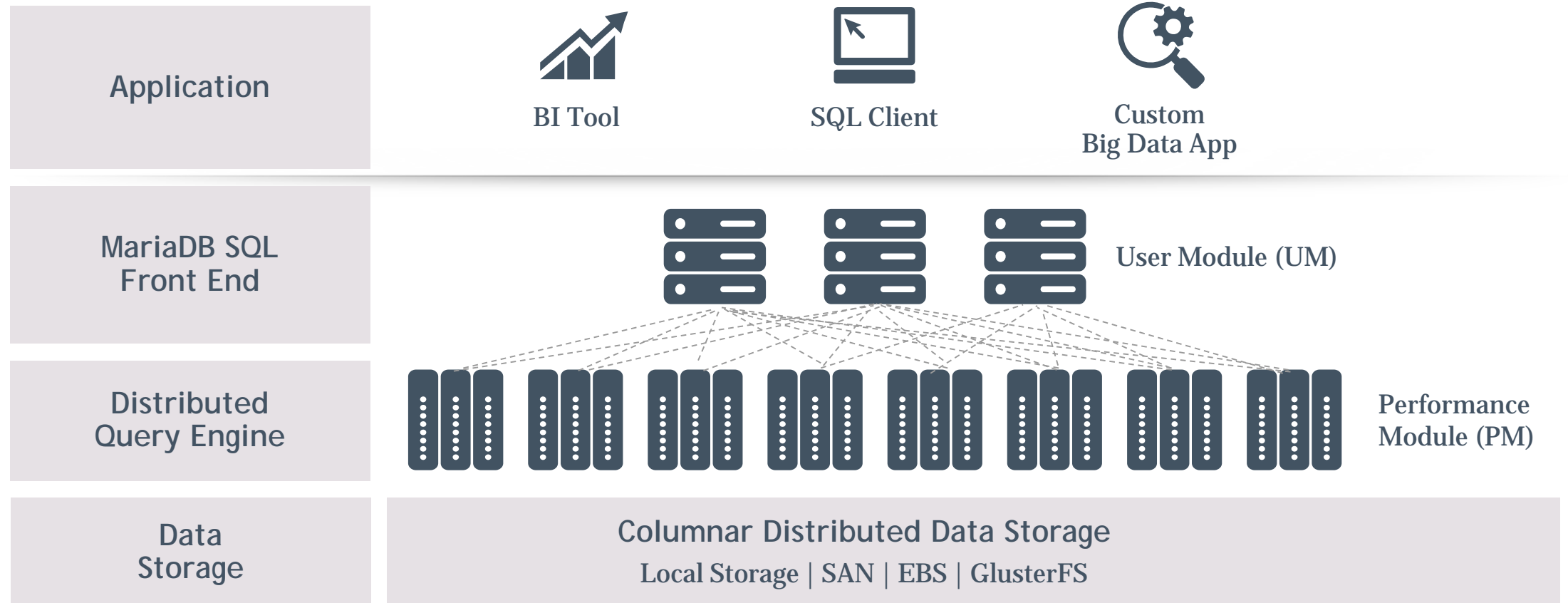
Services and Support

Put our Expertise to Work for You

Remote DBA

Migration Practice

Technical Support

Enterprise Architect

MariaDB®

Consulting

Training
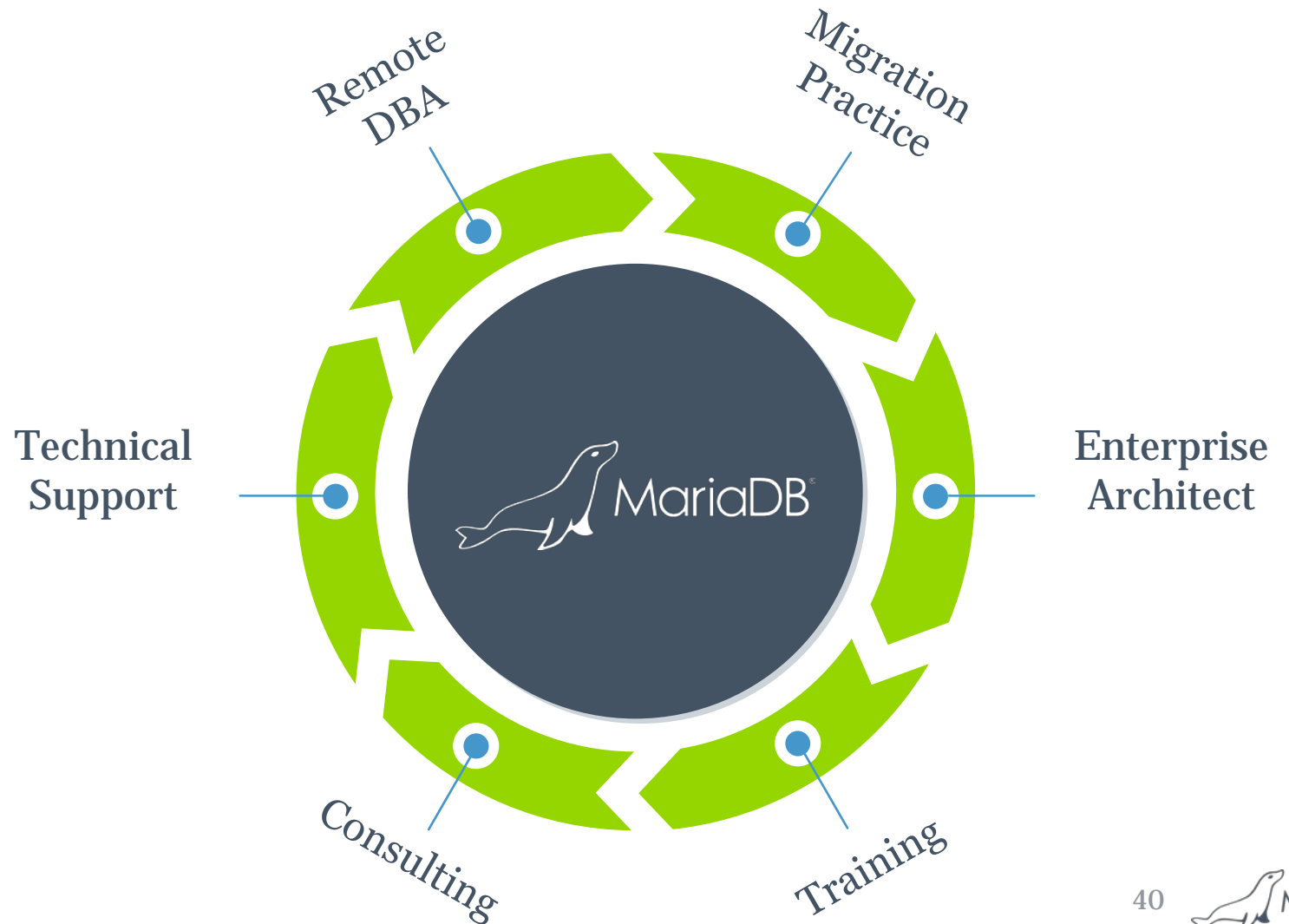
MariaDB TX 2.0

Transaction Platform

MariaDB Services

- Remote Administration
- Enterprise Architecture
- Migration Management
- Technical Support

MariaDB Connectors

MariaDB MaxScale (Proxy)

| Security | Routing |
| Failover | Sharding | Streaming | Caching |

MariaDB Server	MariaDB Server	MariaDB Server
Pluggable Storage	Pluggable Storage	Pluggable Storage
Replication	Replication	Replication

MariaDB Cluster

MariaDB Tools

- MariaDB Admin
- MariaDB Monitor
- MariaDB Backup
- MariaDB Notifications

MariaDB

MariaDB TX 2.0

Transaction Platform

Software

licensing
and support for
databases, the
database proxies and
database connectors

Services

credits for remote
administration,
enterprise architecture,
migration planning
services and more

Tools

tools for
administration,
monitoring, backup
and replication
management

Customer and Use Cases

Paybox by Verifone
- Multi-terabyte DB
- 80M transactions / month

BlaBlaCar
- 250 servers, 600G + 1.5T archive
- 10M travelers/quarter
- 4M transactions/ month

WIKIPEDIA The Free Encyclopedia
- ~14TB in MariaDB
  production clusters

believe digital
- 50+ Node Cluster
- Multi-billion rows
- 600 Million reads/second

ZeniMax MEDIA INC.
- Over 150 servers
- 150-200k queries / sec on the MariaDB Cluster

Sprint
- 3 to 10 TB
- Over billion rows, most tables
  100's of millions of rows

sas
- 70 million rows per day
- 4 billion impressions per month

BOOKING.COM online hotel reservations
- Over 5 TB in Pay Per click application

bandwidth
- 6TB and millions of CDR's

Get Started with MariaDB

1

Download
https://mariadb.com/downloads

2

Read the Technical overviews
https://mariadb.com/resources/datasheets-guides

3

Search the Knowledge Base
https://mariadb.com/kb

4

Watch a Webinar
https://mariadb.com/resources/webinars

Upcoming events

MariaDB® FOUNDATION

Supporting continuity and open c

About MariaDB ∨   **Download**   **Learn**   **Get Invo**

Blog

13-17 November, 2017

Home / Conferences/Events / Community / Development / 2017-2 Developers Unconference and Related Events, Shenzhen

2017-2 Developers Unconference and Related Events, Shenzhen

2017-08-02 | Written by Ian Gilfillan   💬 4 Comments

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MariaDB®

M|18

FEB 26-27, 2018

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Latest news

What is new in ColumnStore 1.1 ?

Data Engine	• Columnar Engine based on MariaDB 10.2

Streaming	• Native Data API for ColumnStore files: C++: LGPL
	• Data Adapters
	   ○ Avro, JSON - BSL
	   ○ Streaming Change Data Capture via MaxScale & Kafka - BSL
	• Streaming Insert via MaxScale - BSL

HA	• Built-in Data Redundancy: Integrated **GlusterFS** for Data HA
Analytics	• User defined distributed aggregate and Window functions
Data Types	• Text, BLOB
Ease of Use	• Backup, restore tool - BSL
Performance	• Improved string handling / memory utilization • General performance improvements
Security	• Audit Plugin Integration
Certification	• Tableau

Now Beta testing !

https://mariadb.com/downloads/mariadb-tx