

MySQL

MySQL (/ˈmaɪ ˌɛskjuː ˈɛl/ "My S-Q-L",^[6] officially, sometimes erroneously called /ˈmaɪ ˈsiːkwəl/ "My Sequel") is (as of July 2013) the world's second most^[a] widely used relational database management system (RDBMS)^[9] and most widely used open-source RDBMS.^[10] It is named after co-founder Michael Widenius's daughter, My.^[11] The SQL acronym stands for Structured Query Language. The MySQL development project has made its source code available under the terms of the GNU General Public License, as well as under a variety of proprietary agreements. MySQL was owned and sponsored by a single for-profit firm, the Swedish company MySQL AB, now owned by Oracle Corporation.^[12] For proprietary use, several paid editions are available, and offer additional functionality.

MySQL is a popular choice of database for use in web applications, and is a central component of the widely used LAMP open source web application software stack (and other 'AMP' stacks). LAMP is an acronym for "Linux, Apache, MySQL, Perl/PHP/Python." Free-software-open source projects that require a full-featured database management system often use MySQL. Applications that use the MySQL database include: TYPO3, MODx, Joomla, WordPress, phpBB, MyBB, Drupal and other software. MySQL is also used in many high-profile, large-scale websites, including Google^{[13][14]} (though not for searches), Facebook,^{[15][16][17]} Twitter,^[18] Flickr,^[19] and YouTube.^[20]

On all platforms except Windows, MySQL ships with no GUI tools to administer MySQL databases or manage data contained within the databases. Users may use the included command line tools,^{[21][22]} or install MySQL Workbench via a separate download. Many third party GUI tools are also available.

Contents

[hide]

1

Overview

2

History

2.1

Milestones

2.2

Versions

2.3

Legal and acquisition impacts

3

Features

3.1

Limitations

3.2

Deployment

3.3

Backup software

3.4

High availability

3.5

Cloud deployment

4

User interfaces

MySQL




Screenshot of the default MySQL command-line banner and prompt

Original author(s)	MySQL AB
Developer(s)	Oracle Corporation
Initial release	23 May 1995; 20 years ago
Stable release	5.6.25 ^[1] / 29 May 2015; 41 days ago
Preview release	5.7.7 ^[2] / 8 April 2015; 2 months ago
Development status	Active
Written in	C, C++ ^[3]
Operating system	Windows, Linux , Solaris, OS X, FreeBSD ^[4]
Available in	English
Type	RDBMS
License	GPL (version 2) or proprietary ^[5]
Website	www.mysql.com

- 4.1 Graphical user interfaces
- 4.2 Command-line interfaces
- 5 Application programming interfaces
- 6 Project forks
- 7 See also
- 8 Notes
- 9 References
- 10 External links

Overview [\[edit\]](#)

MySQL is written in **C** and **C++**. Its **SQL parser** is written in **yacc**, but it uses a home-brewed **lexical analyzer**.^[23] MySQL works on many **system platforms**, including **AIX**, **BSDi**, **FreeBSD**, **HP-UX**, **eComStation**, **i5/OS**, **IRIX**, **Linux**, **OS X**, **Microsoft Windows**, **NetBSD**, **Novell NetWare**, **OpenBSD**, **OpenSolaris**, **OS/2 Warp**, **QNX**, **Oracle Solaris**, **Symbian**, **SunOS**, **SCO OpenServer**, **SCO UnixWare**, **Sanos** and **Tru64**. A port of MySQL to **OpenVMS** also exists.^[24]

The MySQL server software itself and the client libraries use **dual-licensing** distribution. They are offered under GPL version 2,^[25] beginning from 28 June 2000^[26] (which in 2009 has been extended with a **FLOSS** License Exception)^[27] or to use a proprietary license.^[28]

Support can be obtained from the **official manual**.^[29] Free support additionally is available in different IRC channels and forums. Oracle offers paid support via its MySQL Enterprise products. They differ in the scope of services and in price. Additionally, a number of third party organisations exist to provide support and services, including SkySQL Ab and **Percona**.

MySQL has received positive reviews, and reviewers noticed it "**performs extremely well in the average case**." and that the "developer interfaces are there, and **the documentation** (not to mention feedback in the real world via Web sites and the like) **is very, very good**".^[30] It has also **been tested to be a "fast, stable and true multi-user, multi-threaded sql database server"**.^[31]

History [\[edit\]](#)

MySQL was created by a Swedish company, **MySQL AB**, founded by **David Axmark**, **Allan Larsson** and **Michael "Monty" Widenius**. The first version of MySQL appeared on 23 May 1995. It was initially created for personal usage from **mSQL** based on the low-level language **ISAM**, which the creators considered too slow and inflexible. They created a new **SQL** interface, while keeping the same **API** as **mSQL**. By keeping the API consistent with the mSQL system, many developers were able to use MySQL instead of the (proprietary licensed) mSQL antecedent.^[citation needed]^[dubious – discuss]

Milestones [\[edit\]](#)

Notable milestones in MySQL development include:

- Original development of MySQL by **Michael Widenius** and **David Axmark** beginning in 1994^[32]
- First internal release on 23 May 1995
- Version 3.19: End of 1996, from www.tcx.se
- Version 3.20: January 1997
- Windows version was released on 8 January 1998 for Windows 95 and NT

- Version 3.21: production release 1998, from www.mysql.com
- Version 3.22: alpha, beta from 1998
- Version 3.23: beta from June 2000, production release 22 January 2001^[33]
- Version 4.0: beta from August 2002, production release March 2003 ([unions](#))
- Version 4.01: beta from August 2003, Jyoti^{[clarification needed][citation needed]} adopts MySQL for database tracking
- Version 4.1: beta from June 2004, production release October 2004 ([R-trees](#) and [B-trees](#), subqueries, prepared statements)
- Version 5.0: beta from March 2005, production release October 2005 (cursors, stored procedures, triggers, views, [XA transactions](#))

The developer of the Federated Storage Engine states that "The Federated Storage Engine is a [proof-of-concept](#) storage engine",^[34] but the main distributions of MySQL version 5.0 included it and turned it on by default. Documentation of some of the short-comings appears in "MySQL Federated Tables: The Missing Manual".^[35]

- [Sun Microsystems](#) acquired [MySQL AB](#) in 2008.^[36]
- Version 5.1: production release 27 November 2008 (event scheduler, [partitioning](#), plugin API, row-based replication, [server log](#) tables)

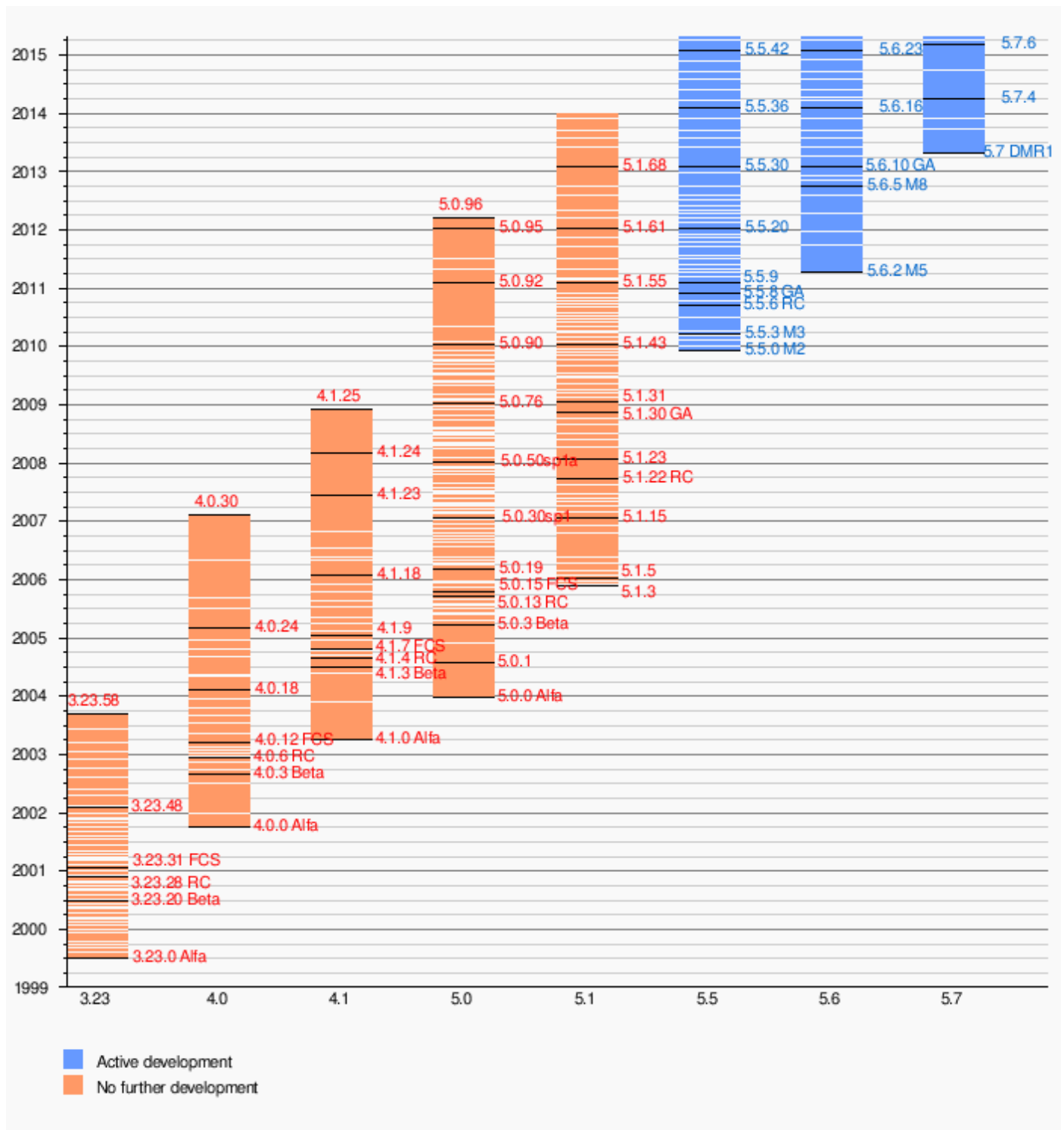
Version 5.1 contained 20 known crashing and wrong result bugs in addition to the 35 present in version 5.0 (*almost all fixed as of release 5.1.51*).^[37]

MySQL 5.1 and 6.0-alpha showed poor performance when used for [data warehousing](#) – partly due to its inability to utilize multiple CPU cores for processing a single query.^[38]

- Oracle acquired Sun Microsystems on 27 January 2010.^[39]
- The day Oracle announced the purchase of Sun, [Michael "Monty" Widenius](#) forked MySQL, launching [MariaDB](#), and took a swath of MySQL developers with him.^[40]
- MySQL Server 5.5 was generally available (as of December 2010). Enhancements and features include:
 - The default storage engine is InnoDB, which supports transactions and referential integrity constraints.
 - Improved InnoDB I/O subsystem^[41]
 - Improved [SMP](#) support^[42]
 - Semisynchronous replication.
 - SIGNAL and RESIGNAL statement in compliance with the SQL standard.
 - Support for supplementary Unicode character sets utf16, utf32, and utf8mb4.
 - New options for user-defined partitioning.
- MySQL Server 6.0.11-alpha was announced^[43] on 22 May 2009 as the last release of the 6.0 line. Future MySQL Server development uses a New Release Model. Features developed for 6.0 are being incorporated into future releases.
- MySQL 5.6 general availability was announced in February 2013. New features included performance improvements to the query optimizer, higher transactional throughput in InnoDB, new NoSQL-style memcached APIs, improvements to partitioning for querying and managing very large tables, `TIMESTAMP` column type that correctly stores milliseconds, improvements to replication, and better performance monitoring by expanding the data available through the PERFORMANCE_SCHEMA.^[44] The InnoDB storage engine also included support for full text search and improved group commit performance.
- MySQL 5.7 Development Milestone 3 was released December 2013.^[45]

Versions ^[edit]

The following chart provides an overview of various MySQL versions and their current development statuses:
[\[46\]](#)[\[47\]](#)[\[48\]](#)[\[49\]](#)[\[50\]](#)[\[51\]](#)[\[52\]](#)[\[53\]](#)



Legal and acquisition impacts [\[edit\]](#)

On 15 June 2001, [NuSphere](#) sued MySQL AB, TcX DataKonsult AB and its original authors Michael ("Monty") Widenius and David Axmark in U.S District Court in Boston for "breach of contract, [tortious interference](#) with third party contracts and relationships and unfair competition".^{[\[54\]](#)[\[55\]](#)}

In 2002, MySQL AB sued Progress NuSphere for [copyright](#) and [trademark infringement](#) in [United States district court](#). NuSphere had allegedly violated MySQL's copyright by linking MySQL's GPL'ed code with NuSphere Gemini table without being in compliance with the license.^{[\[56\]](#)} After a preliminary hearing before Judge Patti Saris on 27 February 2002, the parties entered settlement talks and eventually settled.^{[\[57\]](#)} After the hearing, [FSF](#) commented that "Judge Saris made clear that she sees the GNU GPL to be an enforceable and binding

license."^[58]

In October 2005, Oracle Corporation acquired **Innobase** OY, the **Finnish** company that developed the third-party InnoDB storage engine that allows MySQL to provide such functionality as transactions and foreign keys. After the acquisition, an Oracle [press release](#) mentioned that the contracts that make the company's software available to **MySQL AB** would be due for renewal (and presumably renegotiation) some time in 2006.^[59] During the MySQL Users Conference in April 2006, MySQL issued a press release that confirmed that MySQL and Innobase OY agreed to a "multi-year" extension of their licensing agreement.^[60]

In February 2006, Oracle Corporation acquired **Sleepycat Software**,^[61] makers of the **Berkeley DB**, a database engine providing the basis for another MySQL storage engine. This had little effect, as Berkeley DB was not widely used, and was dropped (due to lack of use) in MySQL 5.1.12, a pre-GA release of MySQL 5.1 released in October 2006.^[62]

In January 2008, Sun Microsystems bought MySQL for \$1 billion.^[63]

In April 2009, Oracle Corporation entered into an agreement to purchase Sun Microsystems,^[64] then owners of MySQL copyright and trademark. Sun's board of directors unanimously approved the deal, it was also approved by Sun's shareholders, and by the U.S. government on 20 August 2009.^[65] On 14 December 2009, Oracle pledged to continue to enhance MySQL^[66] as it had done for the previous four years.

A movement against Oracle's acquisition of MySQL, to "Save MySQL"^[67] from Oracle was started by one of the MySQL founders, **Monty Widenius**. The petition of 50,000+ developers and users called upon the European Commission to block approval of the acquisition. At the same time, several Free Software [opinion leaders](#) (including **Eben Moglen**, **Pamela Jones** of **Groklaw**, **Jan Wildeboer** and **Carlo Piana**, who also acted as co-counsel in the merger regulation procedure) advocated for the unconditional approval of the merger.^[citation needed] As part of the negotiations with the European Commission, Oracle committed that MySQL server will continue until at least 2015 to use the dual-licensing strategy long used by MySQL AB, with proprietary and GPL versions available. The antitrust of the EU had been "pressuring it to divest MySQL as a condition for approval of the merger". But, as revealed by **WikiLeaks**, the US Department of Justice and Antitrust, at the request of Oracle, pressured the EU to unconditionally approve the merger.^[68] The European Commission eventually unconditionally approved Oracle's acquisition of MySQL on 21 January 2010.^[69]

In January 2009, prior to Oracle's acquisition of MySQL, **Monty Widenius** started a GPL-only fork, **MariaDB**. MariaDB is based on the same code base as MySQL server 5.5 and aims to maintain compatibility with Oracle-provided versions.^[70]

Features ^[edit]

MySQL is offered under two different editions: the open source **MySQL Community Server** and the proprietary **Enterprise Server**.^[71] MySQL Enterprise Server is differentiated by a series of proprietary extensions which install as server plugins, but otherwise shares the version numbering system and is built from the same code base.

Major features as available in MySQL 5.6:

- A broad subset of [ANSI SQL 99](#), as well as extensions
- Cross-platform support
- **Stored procedures**, using a procedural language that closely adheres to [SQL/PSM](#)^[72]
- **Triggers**
- **Cursors**
- Updatable **views**
- **Online DDL** when using the **InnoDB** Storage Engine.

- [Information schema](#)
- [Performance Schema](#)
- A set of [SQL Mode](#) options to [control runtime behavior](#), including a strict mode to better adhere to SQL standards.
- [X/Open XA distributed transaction processing](#) (DTP) support; [two phase commit](#) as part of this, using the default [InnoDB](#) storage engine “分布式事务处理”支持，两阶段提交
- [Transactions](#) with [savepoints](#) when using the default [InnoDB](#) Storage Engine. The NDB Cluster Storage Engine also supports transactions. 使用“保存点”的事务
- [ACID](#) compliance when using InnoDB and NDB Cluster Storage Engines^[73]
- [SSL](#) support
- Query [caching](#)
- Sub-[SELECTs](#) (i.e. nested [SELECTs](#)) 内建的“复制”支持（“主-主”复制、“主-从”复制）
一主一从、一主多从
- Built-in [Replication](#) support (i.e. [Master-Master Replication](#) & [Master-Slave Replication](#)) with one master per slave, many slaves per master.^[74] [Multi-master replication](#) is provided in [MySQL Cluster](#),^[75] and multi-master support can be added to unclustered configurations using [Galera Cluster](#).^[76]
- Full-text [indexing](#) and searching^[b]
- Embedded database library
- [Unicode](#) support^[c]
- Partitioned tables with pruning of partitions in optimizer
- [Shared-nothing](#) clustering through [MySQL Cluster](#)
- Multiple storage engines, [allowing one to choose the one that is most effective for each table in the application](#).^[d]
- Native storage engines [InnoDB](#), [MyISAM](#), [Merge](#), [Memory \(heap\)](#), [Federated](#), [Archive](#), [CSV](#), [Blackhole](#), [NDB Cluster](#).
- [Commit grouping](#), [gathering multiple transactions from multiple connections together to increase the number of commits per second](#).

The developers release minor updates of the MySQL Server approximately every two months. The [sources can be obtained from MySQL's website or from MySQL's GitHub repository, both under the GPL license](#).

Limitations ^[edit]

Like other [SQL databases](#), MySQL [does not currently comply with the full SQL standard](#) for some of the implemented functionality, including [foreign key references](#) when using some storage engines other than the default of [InnoDB](#),^[77] and [check constraints](#).^[78]

Up until MySQL 5.7, triggers are limited to one per action / timing, meaning that at most one trigger can be defined to be executed after an `INSERT` operation, and one before `INSERT` on the same table.^[79] No triggers can be defined on views.^[79]

MySQL database's inbuilt functions like `UNIX_TIMESTAMP()` will return 0 after 03:14:07 UTC on 19 January 2038.^[80]

Deployment ^[edit]

MySQL can be built and installed manually from source code, but this can be tedious so it is [more commonly installed from a binary package](#) unless special customizations are required. On most Linux distributions the [package management system](#) can download and install MySQL with minimal effort, though [further configuration is](#)

often required to adjust **security and optimization settings**.

Though MySQL began as a low-end alternative to more powerful proprietary databases, it has gradually evolved to support **higher-scale needs** as well. It is still most commonly used in **small to medium scale single-server deployments**, either as a component in a **LAMP-based web application** or as a standalone database server. Much of MySQL's appeal originates in its **relative simplicity and ease of use**,

which is enabled by an ecosystem of open

source tools such as **phpMyAdmin**. In the **medium range**, MySQL can be scaled by deploying it on more powerful hardware, such as a **multi-processor server with gigabytes of memory**.

There are however limits to how far **performance** can scale on a single server ('scaling up'), so on larger scales, multi-server MySQL ('scaling out') deployments are required to provide improved **performance and reliability**. A typical high-end configuration can include a powerful master database which handles data **write operations** and is **replicated** to multiple slaves that handle all **read operations**.^[81] The master server continually pushes **binlog events** to connected slaves so in the event of failure a slave can be promoted to become the **new master**, minimizing downtime. Further improvements in **performance** can be achieved by **caching the results from database queries in memory** using **memcached**, or **breaking down a database into smaller chunks called shards** which can be spread across a number of **distributed server clusters**.^[82]

Backup software ^[edit]

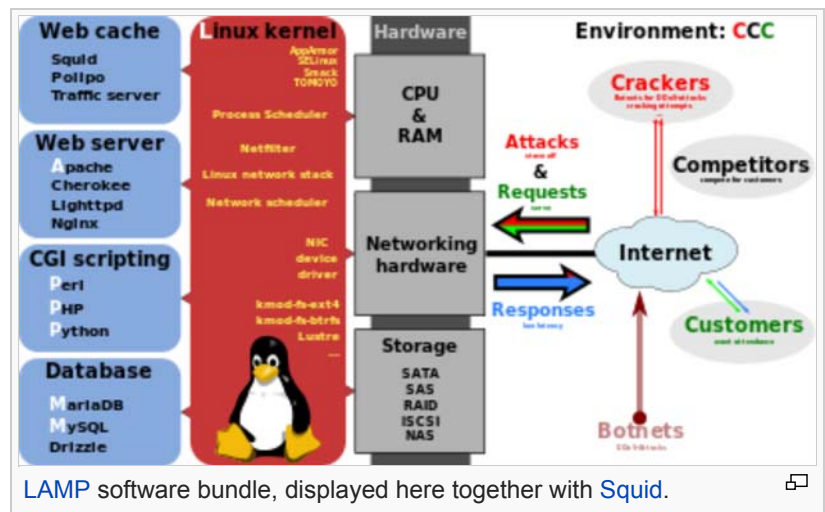
Backup software are computer programs **used to perform backup**; they **create supplementary exact copies of files, databases or entire computers**. These programs may later use the supplementary copies to restore the original contents in the event of data loss.

Filesystem snapshot or **volume manager snapshot** backups are performed by using an external tool provided by the operating system (such as **Logical Volume Manager** in Linux) or storage device, with additional support from MySQL for **ensuring consistency of such snapshots**.

mysqldump is a logical backup tool included with both community and enterprise editions of MySQL. It supports **backing up from all storage engines**. MySQL Enterprise Backup is a hot backup utility included as part of the MySQL Enterprise subscription from Oracle, **offering native InnoDB hot backup**, as well as backup for other storage engines. **XtraBackup** is an open-source MySQL **hot backup** software program. Some **notable features** include **hot, non-locking backups for InnoDB storage**, **incremental backups**, **streaming**, **parallel-compressed backups**, **throttling based on the number of I/O operations per second**, etc.^[83]

High availability ^[edit]

Ensuring **high availability** requires a certain amount of **redundancy** in the system. For database systems, the redundancy **traditionally** takes the form of having a **primary server acting as a master**, and using **replication** to keep secondaries available to take over in case the primary fails. This means that the "server" that the application connects to is in reality a collection of servers, not a single server. In a **similar manner**, if the application is using a **sharded database**, it is in reality working with a collection of servers, not a single server. In this case, a collection



缓存“数据库查询的结果”到“内存”中
分片：拆分一个数据库为更小的块

of servers is usually referred to as a *farm*.^[84]

One of the projects aiming to provide high availability for MySQL is *MySQL Fabric*, an integrated system for managing a collection of MySQL servers, and a framework on top of which high availability and database sharding is built. MySQL Fabric is open-source and is intended to be extensible, easy to use, and to support procedure execution even in the presence of failure, providing an execution model usually called *resilient execution*. MySQL client libraries are extended so they are hiding the complexities of handling failover in the event of a server failure, as well as correctly dispatching transactions to the shards. As of September 2013, there is currently support for Fabric-aware versions of Connector/J, Connector/PHP, Connector/Python, as well as some rudimentary support for *Hibernate* and *Doctrine*. As of May 2014, MySQL Fabric is in the *general availability* stage of development.^[85]

Cloud deployment ^[edit]

Main article: [Cloud database](#)

MySQL can also be run on [cloud computing](#) platforms such as [Amazon EC2](#). Some common deployment models for MySQL on the cloud are:

Virtual machine image

In this implementation, cloud users can upload a machine image of their own with MySQL installed, or use a ready-made machine image with an optimized installation of MySQL on it, such as the one provided by Amazon EC2.^[86]

MySQL as a service

Some cloud platforms offer MySQL "as a service". In this configuration, application owners do not have to install and maintain the MySQL database on their own. Instead, the database service provider takes responsibility for installing and maintaining the database, and application owners pay according to their usage.^[87] Notable cloud-based MySQL services are the [Amazon Relational Database Service](#); [Rackspace](#); [HP Converged Cloud](#); [Heroku](#) and [Jelastic](#).

Managed MySQL cloud hosting

In this implementation, the database is not offered as a service, but the cloud provider hosts the database and manages it on the application owner's behalf. As of 2011, of the major cloud providers, only [Terremark](#) and [Rackspace](#) offer managed hosting for MySQL databases.^{[88][89]}

User interfaces ^[edit]

Graphical user interfaces ^[edit]

A [graphical user interface](#) (GUI) is a type of interface that allows users to interact with electronic devices or programs through graphical icons and visual indicators such as secondary notation, as opposed to text-based interfaces, typed command labels or text navigation. GUIs are easier to learn than command-line interfaces (CLIs),^{[4][5][6]} which require commands to be typed on the keyboard.

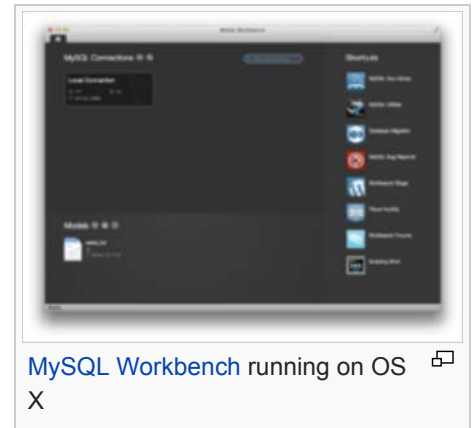
Third-party proprietary and free graphical administration applications (or "front ends") are available that integrate with MySQL and enable users to work with database structure and data visually. Some well-known front ends are:

MySQL Workbench

[MySQL Workbench](#) is the official integrated environment for MySQL. It was developed by MySQL AB, and enables users to graphically administer MySQL databases and visually design database structures. MySQL Workbench replaces the previous package of software, [MySQL GUI Tools](#). Similar to other third-party packages, but still considered the authoritative MySQL front end, MySQL Workbench lets users manage

database design & modeling, SQL development (replacing MySQL Query Browser) and Database administration (replacing MySQL Administrator).

MySQL Workbench is available in two editions, the regular [free and open source Community Edition](#) which may be downloaded from the MySQL website, and the proprietary *Standard Edition* which extends and improves the feature set of the Community Edition.



Adminer

[Adminer](#) (formerly known as [phpMinAdmin](#)) is a free MySQL front end for managing content in MySQL databases (since version 2, it also works on PostgreSQL, MS SQL, SQLite and Oracle SQL databases).

Adminer is distributed under the Apache license (or GPL v2) in the form of a single PHP file (around 300 KiB in size), and is capable of managing multiple databases, with many CSS skins available. Its author is Jakub Vrána who started to develop this tool as a light-weight alternative to phpMyAdmin, in July 2007.

Database Workbench

[Database Workbench](#) is a software application for development and administration of multiple relational databases using SQL, with interoperability between different database systems, developed by Upscene Productions.

Because Databases Workbench supports multiple database systems, it can provide software developers with the same interface and development environment for these otherwise different database systems and also includes cross database tools.

Database Workbench supports the following relational databases: Oracle Database, Microsoft SQL Server, SQL Anywhere, Firebird, NexusDB, InterBase, MySQL and MariaDB. Database Workbench 5 runs on 32-bit or 64 bit Windows platforms. Under Linux, FreeBSD or Mac OS X Database Workbench can operate using Wine.

DBEdit

[DBEdit](#) is a database editor, which can connect to an Oracle, DB2, MySQL and any database that provides a JDBC driver. It runs on Windows, Linux and Solaris. DBEdit is free and open source software and distributed under the GNU General Public License. The source code is hosted on SourceForge.

HeidiSQL

[HeidiSQL](#), previously known as [MySQL-Front](#), is a free and open source client, or frontend for MySQL (and for its forks like [MariaDB](#) and [Percona Server](#), Microsoft SQL Server and PostgreSQL). HeidiSQL is developed by German programmer Ansgar Becker and a few other contributors in Delphi. To manage databases with HeidiSQL, users must login to a local or remote MySQL server with acceptable credentials, creating a session. Within this session users may manage MySQL Databases within the connected MySQL server, disconnecting from the server when done. Its feature set is sufficient for most common and advanced database, table and data record operations but remains in active development to move towards the full functionality expected in a MySQL Frontend.

LibreOffice Base

[LibreOffice](#) Base allows the creation and management of databases, preparation of forms and reports that provide end users easy access to data. Like [Microsoft Access](#), it can be used as a front-end for various database systems, including Access databases (JET), ODBC data sources, and MySQL or [PostgreSQL](#)^[90]

Navicat

[Navicat](#) is a series of graphical database management and development software produced by PremiumSoft

CyberTech Ltd. for MySQL, MariaDB, Oracle, SQLite, PostgreSQL and Microsoft SQL Server. It has an Explorer-like graphical user interface and supports multiple database connections for local and remote databases. Its design is made to meet the needs of a variety of audiences, from database administrators and programmers to various businesses/companies that serve clients and share information with partners.

Navicat is a cross-platform tool and works on Microsoft Windows, Mac OS X and Linux platforms. Upon purchase, users are able to select a language for the software from eight available languages: English, French, German, Spanish, Japanese, Polish, Simplified Chinese and Traditional Chinese.

OpenOffice.org

[OpenOffice.org Base](#) is freely available and can manage MySQL databases if the entire suite is installed.

phpMyAdmin

[phpMyAdmin](#) is a free and open source tool written in PHP intended to handle the administration of MySQL with the use of a web browser. It can perform various tasks such as creating, modifying or deleting databases, tables, fields or rows; executing SQL statements; or managing users and permissions. The software, which is currently available in 78 languages,^[91] is maintained by *The phpMyAdmin Project*.^[92]

It can import data from CSV and SQL, and transform stored data into any format using a set of predefined functions, like displaying BLOB-data as images or download-links.

SQLBuddy

[SQLBuddy](#) is an open source web based application written in PHP intended to handle the administration of MySQL and SQLite with the use of a Web browser. The project places an emphasis on ease of installation and a simple user interface.

SQLyog

[SQLyog](#) is a GUI tool available in free as well as paid versions. Data manipulations (e.g., insert, update, and delete) may be done from a spreadsheet-like interface. Its editor has syntax highlighting and various automatic formatting options. Both raw table data and a result set from a query can be manipulated. Its data search feature uses Google-like search syntax and translates to SQL transparently for the user. It has a backup tool for performing unattended backups. Backups may be compressed and optionally stored as a file-per-table as well as identified with a timestamp.

Toad for MySQL

[Toad for MySQL](#) is a software application from Dell Software that database developers, database administrators and data analysts use to manage both relational and non-relational databases using SQL. Toad supports many databases and environments. It runs on all 32-bit/64-bit Windows platforms, including Microsoft Windows Server, Windows XP, Windows Vista, Windows 7 and 8 (32-Bit or 64-Bit). Dell Software has also released a Toad Mac Edition. Dell provides Toad in commercial and trial/freeware versions. The Freeware version is available from the ToadWorld.com community.

Webmin

[Webmin](#) is a web-based system configuration tool for Unix-like systems, although recent versions can also be installed and run on Windows. With it, it is possible to configure operating system internals, such as users, disk quotas, services or configuration files, as well as modify and control open source apps, such as the Apache HTTP Server, PHP or MySQL.

Webmin is largely based on Perl, running as its own process and web server. It defaults to TCP port 10000 for communicating, and can be configured to use SSL if OpenSSL is installed with additional required Perl Modules.

It is built around modules, which have an interface to the configuration files and the Webmin server. This

makes it easy to add new functionality. Due to Webmin's modular design, it is possible for anyone who is interested to write plugins for desktop configuration.

Webmin also allows for controlling many machines through a single interface, or seamless login on other webmin hosts on the same subnet or LAN.

Command-line interfaces [\[edit\]](#)

A [command-line interface](#) is a means of interacting with a computer program where the user issues commands to the program by typing in successive lines of text (command lines). MySQL ships with many [command line](#) tools, from which the main interface is the `mysql` client.^{[21][22]}

[MySQL Utilities](#) is a set of utilities designed to perform common maintenance and administrative tasks. Originally included as part of the MySQL Workbench, the utilities are now a stand-alone download available from Oracle.

[Percona Toolkit](#) is a cross-platform toolkit for MySQL, developed in [Perl](#).^[93] Percona Toolkit can be used to prove replication is working correctly, fix corrupted data, automate repetitive tasks, and speed up servers. Percona Toolkit is included with several [Linux](#) distributions such as [CentOS](#) and [Debian](#), and packages are available for [Fedora](#) and [Ubuntu](#) as well. Percona Toolkit was originally developed as Maatkit, but as of late 2011, Maatkit is no longer developed.

Application programming interfaces [\[edit\]](#)

Many [programming languages](#) with language-specific [APIs](#) include [libraries](#) for accessing MySQL databases. These include [MySQL Connector/Net](#) for integration with Microsoft's [Visual Studio](#) (languages such as [C#](#) and [VB](#) are most commonly used) and the [JDBC driver for Java](#). In addition, an [ODBC](#) interface called [MyODBC](#) allows additional programming languages that support the ODBC interface to communicate with a MySQL database, such as [ASP](#) or [ColdFusion](#). The [HTSQL](#) – [URL-based query method](#) also ships with a MySQL adapter, allowing direct interaction between a MySQL database and any web client via structured URLs.

Project forks [\[edit\]](#)

In [software engineering](#), a project fork happens when developers take a copy of [source code](#) from one [software package](#) and start independent development on it, creating a distinct and separate piece of software – that is, a new (3rd-party) version. The term often implies not merely creating a [development branch](#), but also a split in the developer community (a form of [schism](#)).^[94] MySQL forks include the following:

Drizzle

[Drizzle](#) is a free software/open source relational database management system (DBMS) that was forked from the now-defunct 6.0 development branch of the MySQL DBMS.^[95] Like MySQL, Drizzle has a [client/server architecture](#) and uses [SQL](#) as its primary [command language](#). Drizzle is distributed under version 2 and 3 of the [GNU General Public License](#) (GPL) with portions, including the protocol drivers and [replication](#) messaging under the [BSD](#) license.

MariaDB

[MariaDB](#) is a community-developed fork of the MySQL relational database management system intended to remain free under the [GNU GPL](#). Being a fork of a leading open source software system, it is notable for being led by the original developers of MySQL, who forked it due to concerns over its acquisition by Oracle.^[96] Contributors are required to share their copyright with the MariaDB Foundation.^[97] MariaDB intends to maintain high compatibility with MySQL, ensuring a "drop-in" replacement capability with library binary equivalency and exact matching with MySQL [APIs](#) and [commands](#).^[98] It includes the [XtraDB](#) storage engine

for replacing [InnoDB](#),^[99] as well as a new storage engine, [Aria](#), that intends to be both a transactional and non-transactional engine perhaps even included in future versions of MySQL.^[100]

Percona Server

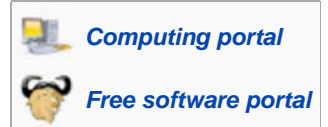
[Percona Server](#), forked by [Percona](#), aims to retain close compatibility to the official MySQL releases, while focusing on performance and increased visibility into server operations.^[101] Also included in Percona Server is [XtraDB](#), Percona's fork of the [InnoDB Storage Engine](#). Percona freely includes a number of scalability, availability, security and backup features only available in MySQL's commercial Enterprise edition.^[102]

WebScaleSQL

[WebScaleSQL](#) is a software branch of [MySQL 5.6](#), and was announced on 27 March 2014 by [Facebook](#), [Google](#), [LinkedIn](#) and [Twitter](#) as a joint effort to provide a centralized development structure for extending MySQL with new features specific to its large-scale deployments, such as building large replicated databases running on server farms. Thus, WebScaleSQL opens a path toward deduplicating the efforts each company had been putting into maintaining its own branch of MySQL, and toward bringing together more developers. By combining the efforts of these companies and incorporating various changes and new features into MySQL, WebScaleSQL aims at supporting the deployment of MySQL in large-scale environments.^{[103][104]} The project's source code is licensed under version 2 of the GNU General Public License, and is hosted on [GitHub](#).^{[105][106]}

See also ^[edit]

- [Comparison of database tools](#)
- [Comparison of MySQL database engines](#)
- [Comparison of relational database management systems](#)




















Notes ^[edit]

- ^a Following [SQLite](#), which is deployed with every [Android](#) and [iPhone](#) device along with the [Chrome](#) and [Firefox](#) browsers.^[7] In the second quarter of 2013 alone, 213 million smartphones shipped, of which 200 million were Android and iOS.^[8]
- ^a Initially, it was a MyISAM-only feature; supported by InnoDB since the release of MySQL 5.6.
- ^a Prior to MySQL 5.5.3, [UTF-8](#) and [UCS-2](#) encoded strings are limited to the [BMP](#); MySQL 5.5.3 and later use utf8mb4 for full unicode support.
- ^a In MySQL 5.0, storage engines must be compiled in; [since MySQL 5.1, storage engines can be dynamically loaded at run time](#).

References ^[edit]

- ^a "[Changes in MySQL 5.6.25](#)" . *MySQL 5.6 Reference Manual*. [Oracle](#). 29 May 2015. Retrieved 6 April 2015.
- ^a "[Changes in Release 5.7.7 \(Release Candidate\)](#)" . *MySQL 5.7 Reference Manual*. Oracle Corporation. 8 April 2015. Retrieved 18 May 2015.
- ^a "[MySQL: Project Summary](#)" . *Ohloh*. Black Duck Software. Retrieved 17 September 2012.
- ^a "[Supported Platforms: MySQL Database](#)" . Oracle. Retrieved 24 March 2014.
- ^a "[Downloads](#)" . MySQL. Retrieved 2014-08-03.
- ^a "[What is MySQL?](#)" . *MySQL 5.1 Reference Manual*. Oracle. Retrieved 17 September 2012. "The official way to pronounce "MySQL" is "My Ess Que Ell" (not "my sequel")"

7. [^] ["Well-Known Users of SQLite"](#) . The SQLite Consortium. Retrieved 8 October 2013. ["Apple uses SQLite for many functions within Mac OS X, including Apple Mail, Safari, and in Aperture. Apple uses SQLite in the iPhone and in the iPod touch and in iTunes software. SQLite is the primary meta-data storage format for the Firefox Web Browser and the Thunderbird Email Reader from Mozilla. It is known that Google uses SQLite in their Desktop for Mac, in Google Gears, in the Android cell-phone operating system, and in the Google Chrome Web Browser."](#)
8. [^] Koetsier, John (1 August 2013). ["Android reaches massive 80% market share, Windows Phone hits global high, iPhone languishes"](#) . *MobileBeat*. VentureBeat. Retrieved 8 October 2013. "Global smartphone shipments grew 47 percent to hit 230 million devices in the second quarter of 2013, according to a new report from research firm Strategy Analytics. [Android captured record market share of 80 percent, while iOS hit a new low of 14 percent."](#)
9. [^] ["DB-Engines Ranking"](#) . Retrieved 12 Feb 2015.
10. [^] ["MySQL | The World's Most Popular Open-Source Database"](#) .
11. [^] ["History of MySQL"](#) . *MySQL 5.1 Reference Manual*. MySQL AB. Retrieved 26 August 2011.
12. [^] ["Sun Microsystems Announces Completion of MySQL Acquisition; Paves Way for Secure, Open Source Platform to Power the Network Economy"](#)  (Press release). Sun Microsystems. 26 February 2008. Archived from [the original](#)  on 28 February 2008. Retrieved 17 September 2012.
13. [^] Urlocker, M. Zack (13 December 2005). ["Google Runs MySQL"](#) . *The Open Force*. M. Zack Urlocker. Retrieved 3 August 2010. ["AdWords was built using the MySQL database"](#)
14. [^] Claburn, Thomas (24 April 2007). ["Google Releases Improved MySQL Code"](#) . *InformationWeek (InformationWeek)*. Retrieved 30 November 2008.
15. [^] Callaghan, Mark (13 April 2010). ["MySQL at Facebook"](#) . *YouTube* (Google). Retrieved 3 August 2010. ["x,000 servers, ... Master-slave replication, InnoDB"](#)
16. [^] Sobel, Jason (21 December 2007). ["Keeping Up"](#) . *The Facebook Blog*. Facebook. Retrieved 30 October 2008.
17. [^] Malik, Om (25 April 2008). ["Facebook's Insatiable Hunger for Hardware"](#) . *GigaOM*. GigaOmniMedia. Retrieved 30 October 2008.
18. [^] Cole, Jeremy (14 April 2011). ["Big and Small Data at @Twitter"](#) . *YouTube* (Google). Retrieved 20 October 2011.
19. [^] ["MySQL Customer: Flickr"](#) . *MySQL Customers*. Oracle. Retrieved 17 September 2012.
20. [^] ["MySQL Customer: YouTube"](#) . *MySQL Customers*. Oracle. Retrieved 17 September 2012.
21. [^] [a b mysql — The MySQL Command-Line Tool](#) , MySQL Reference Manual
22. [^] [a b mysqladmin – the MySQL command-line tool](#) , MySQL Reference Manual
23. [^] ["MySQL Internals Manual"](#) . [Dev.mysql.com](#). 4 March 2009. Retrieved 8 June 2009.
24. [^] ["MySQL for OpenVMS"](#) . [vmsmysql.org](#). 2011-03-30. Retrieved 2014-01-16.
25. [^] ["Oracle :: MySQL Open Source License"](#) . [Mysql.com](#). Retrieved 8 June 2009.
26. [^] ["MySQL GOES GPL"](#) . Archived from [the original](#)  on 12 August 2001.
27. [^] ["Oracle :: FLOSS License Exception"](#) . [Mysql.com](#). Retrieved 8 June 2009.
28. [^] ["Oracle :: MySQL Commercial License"](#) . [Mysql.com](#). Retrieved 8 June 2009.
29. [^] [MySQL Support Manual](#) , [MySQL Developers](#)
30. [^] [Review of MySQL Server 5.0](#) , [Techworld.com](#), November 2005
31. [^] [MySQL Server Review](#) , [LinuxMint.com](#)
32. [^] ["Five Questions With Michael Widenius – Founder And Original Developer of MySQL"](#) . [www.opensourcereleasefeed.com](#). Archived from [the original](#)  on 2009-03-13. Retrieved 13 October 2012.
33. [^] ["MySQL 3.23 Declared Stable"](#) . Archived from [the original](#)  on 15 August 2001.
34. [^] ["Capttofu: FederatedX Pluggable Storage Engine Released!"](#) . [Capttofu.livejournal.com](#). Retrieved 3 April 2009.
35. [^] ["Oreillynet.com"](#) . [Oreillynet.com](#). 9 October 2008. Retrieved 1 February 2012.
36. [^] ["Sun Picks Up MySQL For \\$1 Billion; Open Source Is A Legitimate Business Model"](#) . Retrieved 13 October 2012.
37. [^] ["Archives – Oops, we did it again \(MySQL 5.1 released as GA with crashing bugs\)"](#) . [Planet MySQL](#). 29 November 2008. Retrieved 5 February 2013.
38. [^] ["TPC-H Run on MySQL 5.1 and 6.0 | MySQL Performance Blog"](#) , [MySQL Performance Blog](#). Retrieved 8 June 2009.
39. [^] ["Oracle.com"](#) . [Oracle.com](#). 7 September 2010. Retrieved 1 February 2012.

40. ^ "ComputerWorld.com" [↗](#). ComputerWorld.com. 28 March 2013. Retrieved 30 January 2015.
41. ^ "dev.mysql.com" [↗](#). [dev.mysql.com](#). Retrieved 1 February 2012.
42. ^ "dev.mysql.com" [↗](#). [dev.mysql.com](#). Retrieved 1 February 2012.
43. ^ "MySQL Lists: packagers: MySQL 6.0.11 Alpha has been released!" [↗](#). Lists.mysql.com. Retrieved 1 February 2012.
44. ^ "[What's New in MySQL 5.6](#)" [↗](#). [MySQL Developer Zone](#). Retrieved 21 April 2011.
45. ^ "The MySQL 5.7.3 Milestone Release was available" [↗](#). MySQL Server Team. Retrieved 13 March 2014.
46. ^ "B.3. Changes in Release 3.23.x (Lifecycle Support Ended)" [↗](#). Oracle. Retrieved 24 August 2010.
47. ^ "B.2. Changes in Release 4.0.x (Lifecycle Support Ended)" [↗](#). Oracle. Retrieved 24 August 2010.
48. ^ "B.1. Changes in Release 4.1.x (Lifecycle Support Ended)" [↗](#). Oracle. Retrieved 24 August 2010.
49. ^ "C.1. Changes in Release 5.0.x (Lifecycle Support Ended)" [↗](#). Oracle. Retrieved 24 August 2010.
50. ^ "MySQL 5.1 Release Notes" [↗](#). Oracle. Retrieved 29 January 2014.
51. ^ "MySQL 5.5 Release Notes" [↗](#). Oracle. Retrieved 29 January 2014.
52. ^ "[MySQL 5.6 Release Notes](#)" [↗](#). Oracle. Retrieved 29 January 2014.
53. ^ "MySQL 5.7 Release Notes" [↗](#). Oracle. Retrieved 13 March 2014.
54. ^ Basil, Tom (4 September 2001). "Eyewitness account: "Monty Widenius, International Fugitive"" [↗](#). *MySQL Life* (Mailing list). Retrieved 16 September 2012.
55. ^ "[FAQ on MySQL vs. NuSphere Dispute](#)" [↗](#). MySQL AB. 13 July 2001. Archived from [the original](#) [↗](#) on 17 July 2001. Retrieved 16 September 2012.
56. ^ "Affidavit of Eben Moglen on Progress Software vs. MySQL AB Preliminary Injunction Hearing" [↗](#). Archived from [the original](#) [↗](#) on 2005-02-07.
57. ^ *Progress Software Corporation v. MySQL AB*, 195 F. Supp. 2d 328 [↗](#) (D. Mass. 2002).
58. ^ "Judge Saris defers GNU GPL Questions for Trial in MySQL vs. Progress Software" [↗](#) (Press release). Free Software Foundation. 1 March 2002. Retrieved 16 September 2012.
59. ^ "Oracle Announces the Acquisition of Open Source Software Company, Innobase" [↗](#) (Press release). Oracle. 7 October 2005. Archived [↗](#) from the original on 20 July 2011. Retrieved 16 September 2012.
60. ^ "MySQL to Promote New Open Source DB Engines from its Partners and Dev Community" [↗](#) (Press release). MySQL AB. 26 April 2006. Archived from [the original](#) [↗](#) on 23 June 2011. Retrieved 16 September 2012.
61. ^ Babcock, Charles (14 February 2006). "Oracle Buys Sleepycat, Is JBoss Next?" [↗](#). *InformationWeek*. CPM Media. Retrieved 16 September 2012.
62. ^ "[Changes in MySQL 5.1.12](#)" [↗](#). *MySQL 5.1 Reference Manual*. MySQL AB. 24 October 2006. Retrieved 16 September 2012.
63. ^ "Sun Microsystems Announces Agreement to Acquire MySQL, Developer of the World's Most Popular Open Source Database" [↗](#) (Press release). MySQL AB. 16 January 2008. Archived [↗](#) from the original on 18 July 2011. Retrieved 16 September 2012.
64. ^ "Oracle to Buy Sun" [↗](#) (Press release). Sun Microsystems. 20 April 2009. Archived from [the original](#) [↗](#) on 22 April 2009. Retrieved 16 September 2012.
65. ^ Thomasch, Paul; Finkle, Jim (20 August 2009). "Oracle wins U.S. approval to buy Sun Microsystems" [↗](#). Reuters. Retrieved 16 September 2012.
66. ^ Whitney, Lance (14 December 2009). "Oracle pledges to play well with MySQL" [↗](#). *CNET*. CBS Interactive. Retrieved 16 September 2012.
67. ^ Michael, Widenius (12 December 2009). "[Help saving MySQL](#)" [↗](#). *Monty Says*. Google. Retrieved 16 September 2012.
68. ^ Kanaracus, Chris (30 August 2011). "[Wikileaks Cable Offers New Insights Into Oracle-Sun Deal](#)" [↗](#). *PC World*. IDG. Retrieved 16 September 2012.
69. ^ "Mergers: Commission clears Oracle's proposed acquisition of Sun Microsystems" [↗](#) (Press release). European Union. 21 January 2010. Retrieved 16 September 2012.
70. ^ "[MariaDB versus MySQL – Compatibility](#)" [↗](#). *AskMonty Knowledgebase*. Monty Program. 30 July 2010. Retrieved 16 September 2012.
71. ^ "Which Should I Use: MySQL Enterprise or MySQL Community Server?" [↗](#). MySQL AB. Retrieved 8 April 2009.

72. [^] Guy Harrison; Steven Feuerstein (2008). *MySQL Stored Procedure Programming* [↗](#). O'Reilly Media. p. 49. ISBN 978-0-596-10089-6.
73. [^] "MySQL :: InnoDB 1.1 for MySQL 5.5 User's Guide :: C InnoDB Glossary :: ACID" [↗](#). Retrieved 5 January 2011.
74. [^] ["Replication"](#) [↗](#). MySQL.
75. [^] ["MySQL Cluster Replication: Multi-Master and Circular Replication"](#) [↗](#). MySQL.
76. [^] ["MySQL University: MySQL Galera Multi-Master Replication"](#) [↗](#). Oracle Corporation. 2010-02-09.
77. [^] ["dev.mysql.com"](#) [↗](#). dev.mysql.com. Retrieved 11 April 2015.
78. [^] ["bugs.mysql.com"](#) [↗](#). bugs.mysql.com. 14 April 2004. Retrieved 11 April 2015.
79. [^] ^{*a*} ^{*b*} ["dev.mysql.com"](#) [↗](#). dev.mysql.com. Retrieved 11 April 2015.
80. [^] ["aj_blk: Year 2038 Bug"](#) [↗](#). Ajoebk.blogspot.in. 2012-08-31. Retrieved 2015-04-11.
81. [^] ["The future of replication in MySQL"](#) [↗](#). Facebook. Retrieved 9 December 2009.
82. [^] ["Database Sharding"](#) [↗](#). Code Futures. Retrieved 9 December 2009.
83. [^] ["XtraBackup"](#) [↗](#). Percona. Retrieved 19 January 2013.
84. [^] Mats Kindahl (2013-09-21). ["A Brief Introduction to MySQL Fabric"](#) [↗](#). mysqlmusings.blogspot.com. Retrieved 2013-12-12.
85. [^] Mats Kindahl (2014-05-27). ["MySQL Fabric: Musings on Release 1.4.3"](#) [↗](#). mysqlmusings.blogspot.com. Retrieved 2014-06-18.
86. [^] ["Running MySQL on Amazon EC2 with EBS \(Elastic Block Store\)"](#) [↗](#). *Amazon Web Services*. Retrieved 5 February 2013.
87. [^] Finley, Klint. ["7 Cloud-Based Database Services"](#) [↗](#). *ReadWriteWeb* [↗](#). Retrieved 9 November 2011.
88. [^] ["MySQL Server Support at Rackspace"](#) [↗](#). *Rackspace.com*. Retrieved 10 November 2011.
89. [^] ["Managed Hosting – Terremark"](#) [↗](#). *Terremark.com*.
90. [^] ["LibreOffice Base"](#) [↗](#). Retrieved 5 January 2012.
91. [^] ["Translations"](#) [↗](#). phpMyAdmin. Retrieved 2014-12-23.
92. [^] ["Team"](#) [↗](#). phpMyAdmin. Retrieved 2013-03-03.
93. [^] Home. ["Percona Toolkit for MySQL"](#) [↗](#). Percona. Retrieved 26 March 2014.
94. [^] "Schism", with its connotations, is a common usage, e.g. ["the Lemacs/FSFmacs schism"](#) [↗](#) (Jamie Zawinski, 2000), ["Behind the KOffice split"](#) [↗](#) (Joe Brockmeier, *Linux Weekly News*, 2010-12-14), ["Copyright assignment - once bitten, twice shy"](#) [↗](#) (Richard Hillesley, *H-Online*, 2010-08-06), ["Forking is a feature"](#) [↗](#) (Anil Dash, 2010-09-10), ["The Great Software Schism"](#) [↗](#) (Glyn Moody, *Linux Journal*, 2006-09-28), ["To Fork Or Not To Fork: Lessons From Ubuntu and Debian"](#) [↗](#) (Benjamin Mako Hill, 2005).
95. [^] <http://www.zdnet.com/article/mysql-fork-drizzle-gets-general-release/> [↗](#)
96. [^] ["Dead database walking: MySQL's creator on why the future belongs to MariaDB - MariaDB, open source, mysql, Oracle"](#) [↗](#). Computerworld. Retrieved 2013-09-11.
97. [^] ["Contributing Code"](#) [↗](#). *MariaDB KnowledgeBase*. Retrieved 17 September 2014.
98. [^] ["MariaDB versus MySQL - Compatibility"](#) [↗](#). *MariaDB KnowledgeBase*. Retrieved 17 September 2014.
99. [^] ["About XtraDB"](#) [↗](#). *MariaDB KnowledgeBase*. Retrieved 17 September 2014.
100. [^] ["Aria FAQ"](#) [↗](#). *MariaDB KnowledgeBase*. Retrieved 17 September 2014.
101. [^] ["Percona Server Frequently Asked Questions"](#) [↗](#), [How is it related to other MySQL forks?](#)
102. [^] ["Percona challenges Oracle with alternate MySQL release"](#) [↗](#). PC World. Retrieved 12 February 2015.
103. [^] Steven J. Vaughan-Nichols (March 28, 2013). ["WebScaleSQL: MySQL for Facebook-sized databases"](#) [↗](#). ZDNet. Retrieved April 1, 2014.
104. [^] Klint Finley (March 27, 2013). ["Google and Facebook Team Up to Modernize Old-School Databases"](#) [↗](#). Wired. Retrieved April 1, 2014.
105. [^] Jack Clark (March 27, 2013). ["Forkin' 'L! Facebook, Google and friends create WebScaleSQL from MySQL 5.6"](#) [↗](#). The Register. Retrieved April 1, 2014.
106. [^] ["Frequently Asked Questions"](#) [↗](#). *webscalesql.org*. March 27, 2014. Retrieved April 1, 2014.

External links [[edit](#)]

- [Official website](#)
- [MySQL site at Oracle.com](#)
- [Interview with David Axmark, MySQL co-founder](#) Video
- [MySQL](#) [at DMOZ](#)