**INTRODUCTION TO TOOLS**

**3.1 FRONT-END/BACK-END**

**Front-End:** Web Pages using PHP, HTML, JavaScript.

**Back-End:** MYSQL

**3.1.1 Front-End:**

* **HTML:** It is used to generate web page. HTML, an abbreviation of Hypertext Markup Language, is the predominant [markup language](http://en.wikipedia.org/wiki/Markup_language) for [web pages](http://en.wikipedia.org/wiki/Web_page). It provides a means to describe the structure of text-based information in a document - by denoting certain text as headings, paragraphs, lists, and so on.
* **JAVASCRIPT:** It is used for checking User information before sending to JavaScript is a [scripting language](http://en.wikipedia.org/wiki/Scripting_language) most often used for [client-side](http://en.wikipedia.org/wiki/Client-side) web development. It is a [dynamic](http://en.wikipedia.org/wiki/Dynamic_language), [weakly typed](http://en.wikipedia.org/wiki/Weak_typing), [prototype-based](http://en.wikipedia.org/wiki/Prototype-based_programming) language with [first-class functions](http://en.wikipedia.org/wiki/First-class_function).

**3.1.2 Back-End:**

* **PHP:** PHP is a technology that lets you mix regular, static HTML with dynamically-generated HTML. Many Web pages that are built by CGI programs are mostly static, with the dynamic part limited to a few small locations. But most CGI variations, including servlets, make you generate the entire page, even though most of it is always the same.
* **WAMP:** Apache is a [web container](http://en.wikipedia.org/wiki/Web_container), or [application server](http://en.wikipedia.org/wiki/Application_server) developed at the [Apache Software Foundation](http://en.wikipedia.org/wiki/Apache_Software_Foundation) (ASF).It adds tools for configuration and management but can also be configured by editing configuration files that are normally [XML](http://en.wikipedia.org/wiki/XML)-formatted. Apache includes its own internal [HTTP](http://en.wikipedia.org/wiki/Hypertext_Transfer_Protocol) server

**3.2 Why PHP?**

**PHP** is a widely used, general-purpose [scripting language](http://en.wikipedia.org/wiki/Scripting_language) that was originally designed for [web development](http://en.wikipedia.org/wiki/Web_development), to produce [dynamic web pages](http://en.wikipedia.org/wiki/Dynamic_web_page). It can be embedded into [HTML](http://en.wikipedia.org/wiki/HTML) and generally runs on a [web server](http://en.wikipedia.org/wiki/Web_server), which needs to be configured to process PHP code and create [web page](http://en.wikipedia.org/wiki/Web_page) content from it. It can be deployed on most web servers and on almost every [operating system](http://en.wikipedia.org/wiki/Operating_system) and [platform](http://en.wikipedia.org/wiki/Platform_%28computing%29) free of charge. PHP is installed on over 20 million websites and 1 million [web servers](http://en.wikipedia.org/wiki/Web_server).

PHP was originally created by [Rasmus Lerdorf](http://en.wikipedia.org/wiki/Rasmus_Lerdorf) in [1994](http://en.wikipedia.org/wiki/1995) and has been in continuous development ever since. The main implementation of PHP is now produced by **The PHP Group** and serves as the [*de facto* standard](http://en.wikipedia.org/wiki/De_facto_standard) for PHP as there is no [formal specification](http://en.wikipedia.org/wiki/Formal_specification). PHP is [free software](http://en.wikipedia.org/wiki/Free_software) released under the [PHP License](http://en.wikipedia.org/wiki/PHP_License), which is incompatible with the [GNU General Public License](http://en.wikipedia.org/wiki/GNU_General_Public_License) (GPL) because of restrictions on the use of the term *PHP*.

PHP has evolved to include a [command line interface](http://en.wikipedia.org/wiki/Command_line_interface) capability and can also be used in standalone graphical.

**3.2.1 History**

*PHP* originally stood for Personal Home Page. It began in 1994 as a set of Interface binaries written in the [C programming language](http://en.wikipedia.org/wiki/C_programming_language) by the [Danish](http://en.wikipedia.org/wiki/Danish_people)/[Greenlandic](http://en.wikipedia.org/wiki/Greenland) programmer [Rasmus Lerdorf](http://en.wikipedia.org/wiki/Rasmus_Lerdorf). Lerdorf initially created these Personal Home Page Tools to replace a small set of [Perl](http://en.wikipedia.org/wiki/Perl) scripts he had been using to maintain his [personal homepage](http://en.wikipedia.org/wiki/Personal_homepage). The tools were used to perform tasks such as displaying his résumé and recording how much [traffic](http://en.wikipedia.org/wiki/Web_traffic) his page was receiving. He combined these binaries with his Form Interpreter to create PHP/FI, which had more functionality. PHP/FI included a larger implementation for the C programming language and could communicate with [databases](http://en.wikipedia.org/wiki/Database), enabling the building of simple, dynamic [web applications](http://en.wikipedia.org/wiki/Web_application). Lerdorf released PHP publicly on June 8, 1995 to accelerate [bug](http://en.wikipedia.org/wiki/Software_bug) location and improve the code. This release was named PHP version 2 and already had the basic functionality that PHP has today. This included Perl-like variables, form handling, and the ability to embed HTML. The syntax was similar to Perl but was more limited, simpler, and less consistent.

[ZeevSuraski](http://en.wikipedia.org/wiki/Zeev_Suraski) and [Andi Gutmans](http://en.wikipedia.org/wiki/Andi_Gutmans), two developers at the [Technion IIT](http://en.wikipedia.org/wiki/Technion_IIT), rewrote the [parser](http://en.wikipedia.org/wiki/Parser) in 1997 and formed the base of PHP 3, changing the language's name to the [recursive initialism](http://en.wikipedia.org/wiki/Recursive_initialism) *PHP: Hypertext Preprocessor*. The development team officially released PHP/FI 2 in November 1997 after months of [beta](http://en.wikipedia.org/wiki/Development_stage) testing. Afterwards, public testing of PHP 3 began, and the official launch came in June 1998. Suraski and Gutmans then started a new [rewrite](http://en.wikipedia.org/wiki/Rewrite_%28programming%29) of PHP's core, producing the [Zend Engine](http://en.wikipedia.org/wiki/Zend_Engine) in 1999. They also founded [Zend Technologies](http://en.wikipedia.org/wiki/Zend_Technologies) in [Ramat Gan](http://en.wikipedia.org/wiki/Ramat_Gan), Israel.

On May 22, 2000, PHP 4, powered by the Zend Engine 1.0, was released. As of August, 2008 this branch is up to version 4.4.9. PHP 4 is no longer under development nor will any security updates be released. On July 13, 2004, PHP 5

was released, powered by the new Zend Engine II. PHP 5 included new features such as improved support for [object-oriented programming](http://en.wikipedia.org/wiki/Object-oriented_programming), the PHP Data Objects extension (which defines a lightweight and consistent interface for accessing databases), and numerous performance enhancements. In 2008, PHP 5 became the only stable version under development. [Late static binding](http://en.wikipedia.org/wiki/Late_static_binding) has been missing from PHP and has been added in version 5.3. PHP 6 is under development alongside PHP 5. Major changes include the removal of register\_globals[magic quotes](http://en.wikipedia.org/wiki/Magic_quotes), and [safe mode](http://en.wikipedia.org/wiki/Safe_mode). The reason for the removals was that register\_globals had given way to security holes, and magic quotes had an unpredictable nature, and was best avoided. Instead, to escape characters, magic quotes may be substituted with the addslashes () function, or more appropriately an escape mechanism specific to the database vendor itself like mysql\_real\_escape\_string () for [MySQL](http://en.wikipedia.org/wiki/MySQL). Functions that will be removed in PHP 6 have been deprecated in PHP 5.3 and will produce a warning if used.

Many high-profile open-source projects ceased to support PHP 4 in new code as of February 5, 2008, because of the GoPHP5 initiative, provided by a consortium of PHP developers promoting the transition from PHP 4 to PHP 5.

PHP currently does not have native support for [Unicode](http://en.wikipedia.org/wiki/Unicode) or multibyte strings; Unicode support will be included in PHP 6 and will allow strings as well as class, method and function names to contain non-[ASCII](http://en.wikipedia.org/wiki/ASCII) characters.

It runs in both [32-bit](http://en.wikipedia.org/wiki/32-bit) and [64-bit](http://en.wikipedia.org/wiki/64-bit) environments, but on Windows the only official distribution is 32-bit, requiring Windows 32-bit compatibility mode to be enabled while using [IIS](http://en.wikipedia.org/wiki/Internet_Information_Services) in a 64-bit Windows environment. As of PHP 5.3.0, experimental x64 bit versions are available.

**3.2.2 Usage**

PHP is a general-purpose scripting language that is especially suited for [web development](http://en.wikipedia.org/wiki/Web_development). PHP generally runs on a [web server](http://en.wikipedia.org/wiki/Web_server). Any PHP code in a requested file is [executed](http://en.wikipedia.org/wiki/Execution_%28computing%29) by the PHP runtime, usually to create [dynamic web page](http://en.wikipedia.org/wiki/Dynamic_web_page) content. It can also be used for [command-line](http://en.wikipedia.org/wiki/Command-line) scripting and [client-side](http://en.wikipedia.org/wiki/Client-side)[GUI](http://en.wikipedia.org/wiki/Graphical_user_interface) applications. PHP can be deployed on most [web servers](http://en.wikipedia.org/wiki/Web_server), many [operating systems](http://en.wikipedia.org/wiki/Operating_system) and [platforms](http://en.wikipedia.org/wiki/Platform_%28computing%29), and can be used with many [relational database management systems](http://en.wikipedia.org/wiki/Relational_database_management_system). It is available free of charge, and the PHP Group provides the complete source code for users to build, customize and extend for their own use.

PHP primarily acts as a [filter](http://en.wikipedia.org/wiki/Filter_%28software%29), taking input from a file or stream containing text and/or PHP instructions and outputs another stream of data; most commonly the output will be HTML. Since PHP 4, the PHP parser compiles input to produce [byte code](http://en.wikipedia.org/wiki/Bytecode) for processing by the [Zend Engine](http://en.wikipedia.org/wiki/Zend_Engine), giving improved performance over its [interpreter](http://en.wikipedia.org/wiki/Interpreter_%28computing%29) predecessor. Originally designed to create dynamic web pages, PHP now focuses mainly on [server-side scripting](http://en.wikipedia.org/wiki/Server-side_scripting), and it is similar to other server-side scripting languages that provide dynamic content from a web server to a [client](http://en.wikipedia.org/wiki/Client_%28computing%29), such as [Microsoft](http://en.wikipedia.org/wiki/Microsoft)'s [Active Server Pages](http://en.wikipedia.org/wiki/Active_Server_Pages), [Sun Microsystems](http://en.wikipedia.org/wiki/Sun_Microsystems)' [JavaServer Pages](http://en.wikipedia.org/wiki/JavaServer_Pages), and [mod\_perl](http://en.wikipedia.org/wiki/Mod_perl). PHP has also attracted the development of many [frameworks](http://en.wikipedia.org/wiki/Software_framework) that provide building blocks and a design structure to promote [rapid application development](http://en.wikipedia.org/wiki/Rapid_application_development) (RAD). Some of these include [CakePHP](http://en.wikipedia.org/wiki/CakePHP), [Symphony](http://en.wikipedia.org/wiki/Symfony), [CodeIgniter](http://en.wikipedia.org/wiki/CodeIgniter), and [Zend Framework](http://en.wikipedia.org/wiki/Zend_Framework), offering features similar to other [web application frameworks](http://en.wikipedia.org/wiki/List_of_web_application_frameworks).

The [LAMP](http://en.wikipedia.org/wiki/LAMP_%28software_bundle%29) and [WAMP](http://en.wikipedia.org/wiki/WAMP) architectures have become popular in the web industry as a way of deploying web applications. PHP is commonly used as the *P* in this

bundle alongside [Linux](http://en.wikipedia.org/wiki/Linux), [Apache](http://en.wikipedia.org/wiki/Apache_HTTP_Server) and [MySQL](http://en.wikipedia.org/wiki/MySQL), although the *P* may also refer to [Python](http://en.wikipedia.org/wiki/Python_%28programming_language%29) or [Perl](http://en.wikipedia.org/wiki/Perl).

As of April 2007, over 20 million Internet domains were hosted on servers with PHP installed, and mod php was recorded as the most popular Apache module. Significant websites are written in PHP including the user-facing portion of [Facebook](http://en.wikipedia.org/wiki/Facebook), [Wikipedia](http://en.wikipedia.org/wiki/Wikipedia) (Media Wiki), [Yahoo!](http://en.wikipedia.org/wiki/Yahoo%21), [My Yearbook](http://en.wikipedia.org/wiki/MyYearbook), [Digg](http://en.wikipedia.org/wiki/Digg), [Joomla](http://en.wikipedia.org/wiki/Joomla), [WordPress](http://en.wikipedia.org/wiki/WordPress), [YouTube](http://en.wikipedia.org/wiki/YouTube), [Drupal](http://en.wikipedia.org/wiki/Drupal) and [Tagged](http://en.wikipedia.org/wiki/Tagged).

**3.2.3 Speed optimization**

As with many scripting languages, PHP scripts are normally kept as human-readable source code, even on production web servers. In this case, PHP scripts will be [compiled](http://en.wikipedia.org/wiki/Compiler) at runtime by the PHP engine, which increases their execution speed. PHP scripts are able to be compiled before runtime using PHP compilers as with other programming languages such as [C](http://en.wikipedia.org/wiki/C_%28programming_language%29) (the language PHP and its extensions are written in).

Code optimizers aim to reduce the computational complexity of the compiled code by reducing its size and making other changes that can reduce the execution time with the overall goal of improving performance. The nature of the PHP [compiler](http://en.wikipedia.org/wiki/Compiler) is such that there are often opportunities for [code optimization](http://en.wikipedia.org/wiki/Optimization_%28computer_science%29), and an example of a code optimizer is the [Zend Optimizer](http://en.wikipedia.org/wiki/PHP_accelerator) PHP extension.

Another approach for reducing overhead for high load PHP servers is using [PHP accelerators](http://en.wikipedia.org/wiki/PHP_accelerator). These can offer significant performance gains by [catching](http://en.wikipedia.org/wiki/Caching) the compiled form of a PHP script in [shared memory](http://en.wikipedia.org/wiki/Shared_memory) to avoid the overhead of [parsing](http://en.wikipedia.org/wiki/Parsing)

and [compiling](http://en.wikipedia.org/wiki/Compiling) the code every time the script runs. A PHP accelerator will be built into PHP 6.

**3.2.4 Security**

The [National Vulnerability Database](http://en.wikipedia.org/wiki/National_Vulnerability_Database) stores all vulnerabilities found in computer software. The overall proportion of PHP-related vulnerabilities on the database amounted to: 20% in 2004, 28% in 2005, 43% in 2006, 36% in 2007, and 35% in 2008. Most of these PHP-related vulnerabilities can be [exploited](http://en.wikipedia.org/wiki/Exploit_%28computer_security%29) remotely: they allow [hackers](http://en.wikipedia.org/wiki/Hacker_%28computer_security%29) to [steal or destroy](http://en.wikipedia.org/wiki/Computer_crime) data from data sources linked to the webserver (such as an [SQL](http://en.wikipedia.org/wiki/SQL)[database](http://en.wikipedia.org/wiki/Database)), send [spam](http://en.wikipedia.org/wiki/E-mail_spam) or contribute to [DOS attacks](http://en.wikipedia.org/wiki/Denial_of_service) using [malware](http://en.wikipedia.org/wiki/Malware), which itself can be installed on the vulnerable servers.

These vulnerabilities are caused mostly by not following best practice programming rules: technical security flaws of the language itself or of its core libraries are not frequent (23 in 2008, about 1% of the total). Recognizing that programmers cannot be trusted, some languages include [taint checking](http://en.wikipedia.org/wiki/Taint_checking) to detect automatically the lack of [input validation](http://en.wikipedia.org/wiki/Data_validation) which induces many issues.

**3.2.5 Syntax**

[Syntax-highlighted](http://en.wikipedia.org/wiki/Syntax_highlighting) PHP code embedded within [HTML](http://en.wikipedia.org/wiki/HTML)

PHP only parses code within its [delimiters](http://en.wikipedia.org/wiki/Delimiter). Anything outside its delimiters is sent directly to the output and is not processed by PHP. The most common delimiters

are <?php to open and ?> to close PHP sections. <script language="php"> and </script> delimiters are also available, as are the shortened forms <? or <?= (which is used to echo back a [string](http://en.wikipedia.org/wiki/String_%28computer_science%29) or [variable](http://en.wikipedia.org/wiki/Variable_%28programming%29)) and ?> as well as [ASP](http://en.wikipedia.org/wiki/Active_Server_Pages)-style short forms <% or <%= and %>. While short delimiters are used, they make script files less portable as their purpose can be disabled in the [PHP configuration](http://wiki.php.net/rfc/shortags), and so they are discouraged. The purpose of all these delimiters is to separate PHP code from non-PHP code, including HTML.

The first form of delimiters, <?php and ?>, in [XHTML](http://en.wikipedia.org/wiki/XHTML) and other [XML](http://en.wikipedia.org/wiki/XML) documents, creates correctly formed XML 'processing instructions'. This means that the resulting mixture of PHP code and other markup in the server-side file is well-formed XML.

Variables are prefixed with a [dollar symbol](http://en.wikipedia.org/wiki/Dollar_sign) and a [type](http://en.wikipedia.org/wiki/Primitive_type) does not need to be specified in advance. Unlike function and class names, variable names are case sensitive. Both double-quoted ("") and [heredoc](http://en.wikipedia.org/wiki/Heredoc) strings allow the ability to embed a variable's value into the string. PHP treats [newlines](http://en.wikipedia.org/wiki/Newline) as [whitespace](http://en.wikipedia.org/wiki/Whitespace_%28computer_science%29) in the manner of a [free-form language](http://en.wikipedia.org/wiki/Free-form_language) (except when inside string quotes), and statements are terminated by a semicolon. PHP has three types of [comment syntax](http://en.wikipedia.org/wiki/Comparison_of_programming_languages_%28syntax%29): /\* \*/ marks block and inline comments; // as well as # are used for one-line comments. The echo statement is one of several facilities PHP provides to output text (e.g. to a web browser).

In terms of keywords and language syntax, PHP is similar to most high level languages that follow the C style syntax. *If* conditions, *for* and *while* loops, and function returns are similar in syntax to languages such as C, C++, Java and Perl.

**3.2.6 Data types**

PHP stores whole numbers in a platform-dependent range. This range is typically that of 32-bit [signed](http://en.wikipedia.org/wiki/Signed_number_representations) [integers](http://en.wikipedia.org/wiki/Integer_%28computer_science%29). Unsigned integers are converted to signed values in certain situations; this behavior is different from other programming languages. Integer variables can be assigned using decimal (positive and negative), [octal](http://en.wikipedia.org/wiki/Octal), and [hexadecimal](http://en.wikipedia.org/wiki/Hexadecimal) notations. [Floating point](http://en.wikipedia.org/wiki/Floating_point) numbers are also stored in a platform-specific range. They can be specified using [floating point](http://en.wikipedia.org/wiki/Floating_point) notation, or two forms of [scientific notation](http://en.wikipedia.org/wiki/Scientific_notation). PHP has a native [Boolean](http://en.wikipedia.org/wiki/Boolean_datatype) type that is similar to the native Boolean types in [Java](http://en.wikipedia.org/wiki/Java_%28programming_language%29) and [C++](http://en.wikipedia.org/wiki/C%2B%2B). Using the Boolean type conversion rules, non-zero values are interpreted as true and zero as false, as in Perl and C++. The null data type represents a variable that has no value. The only value in the null data type is *NULL*. Variables of the "resource" type represent references to resources from external sources. These are typically created by functions from a particular extension, and can only be processed by functions from the same extension; examples include file, image, and database resources. Arrays can contain elements of any type that PHP can handle, including resources, objects, and even other arrays. Order is preserved in lists of values and in [hashes](http://en.wikipedia.org/wiki/Hash_table) with both keys and values, and the two can be intermingled. PHP also supports [strings](http://en.wikipedia.org/wiki/String_%28computing%29), which can be used with single quotes, double quotes, or [heredoc syntax](http://en.wikipedia.org/wiki/Heredoc).

The Standard PHP Library (SPL) attempts to solve standard problems and implements efficient data access interfaces and classes.

**3.2.7 Functions**

PHP has hundreds of base functions and thousands more via extensions. These functions are well documented on the PHP site, however, the built-in library has a wide variety of naming conventions and inconsistencies. PHP currently has no functions for [thread](http://en.wikipedia.org/wiki/Thread_%28computer_science%29) programming, although it does support multiprocess programming on POSIX systems.

**3.2.8 5.2 and earlier**

Functions are not [first-class functions](http://en.wikipedia.org/wiki/First-class_function) and can only be referenced by their name, directly or dynamically by a variable containing the name of the function. User-defined functions can be created at any time without being prototyped. Functions can be defined inside code blocks, permitting a [run-time decision](http://en.wikipedia.org/wiki/Dynamic_dispatch) as to whether or not a function should be defined. Function calls must use parentheses, with the exception of zero argument class [constructor](http://en.wikipedia.org/wiki/Constructor_%28computer_science%29) functions called with the PHP new operator, where parentheses are optional. PHP supports quasi-[anonymous functions](http://en.wikipedia.org/wiki/Anonymous_function) through the create\_function() function, although they are not true anonymous functions because anonymous functions are nameless, but functions can only be referenced by name, or indirectly through a variable $function name(); in PHP.

**3.2.9 5.3 and newer**

PHP gained support for [closures](http://en.wikipedia.org/wiki/Closure_%28computer_science%29). True [anonymous functions](http://en.wikipedia.org/wiki/Anonymous_function) are supported using the following syntax:

function getAdder($x)

{

return function ($y) use ($x) {

return $x + $y;

};

}

$adder = getAdder(8);

echo $adder(2); // prints "10"

Here, getAdder() function creates a closure using parameter $x (keyword "use" forces getting variable from context), which takes additional argument $y and returns it to the caller. Such a function can be stored, given as the parameter to other functions, etc. For more details see [Lambda functions and closures RFC](http://wiki.php.net/rfc/closures).

**3.2.10 Objects**

Basic [object-oriented programming](http://en.wikipedia.org/wiki/Object-oriented_programming) functionality was added in PHP 3 and improved in PHP 4. Object handling was completely rewritten for PHP 5,

expanding the feature set and enhancing performance. In previous versions of PHP, objects were handled like [primitive types](http://en.wikipedia.org/wiki/Primitive_type). The drawback of this method was that the whole object was copied when a variable was assigned or passed as a parameter to a method. In the new approach, objects are referenced by [handle](http://en.wikipedia.org/wiki/Smart_pointer), and not by value. PHP 5 introduced private and protected [member variables](http://en.wikipedia.org/wiki/Member_variable) and methods, along with [abstract classes](http://en.wikipedia.org/wiki/Abstract_type) and [final classes](http://en.wikipedia.org/wiki/Final_type) as well as [abstract methods](http://en.wikipedia.org/wiki/Abstract_method) and [final methods](http://en.wikipedia.org/wiki/Final_method). It also introduced a standard way of declaring [constructors](http://en.wikipedia.org/wiki/Constructor_%28computer_science%29) and [destructors](http://en.wikipedia.org/wiki/Destructor_%28computer_science%29), similar to that of other object-oriented languages such as [C++](http://en.wikipedia.org/wiki/C%2B%2B), and a standard [exception handling](http://en.wikipedia.org/wiki/Exception_handling) model. Furthermore, PHP 5 added [interfaces](http://en.wikipedia.org/wiki/Interface_%28computer_science%29) and allowed for multiple interfaces to be implemented. There are special interfaces that allow objects to interact with the runtime system. [Objects](http://en.wikipedia.org/wiki/Object_%28computer_science%29) implementing Array Access can be used with [array](http://en.wikipedia.org/wiki/Array_data_type) syntax and [objects](http://en.wikipedia.org/wiki/Object_%28computer_science%29) implementing [Iterator](http://en.wikipedia.org/wiki/Iterator) or [Iterator Aggregate](http://en.wikipedia.org/wiki/IteratorAggregate) can be used with the for each language construct. There is no [virtual table](http://en.wikipedia.org/wiki/Virtual_table) feature in the engine, so [static variables](http://en.wikipedia.org/wiki/Static_variable) are bound with a name instead of a reference at compile time.

If the developer creates a copy of an object using the reserved word *clone*, the Zend engine will check if a \_\_clone() method has been defined or not. If not, it will call a default \_\_clone() which will copy the object's properties. If a \_\_clone() method is defined, then it will be responsible for setting the necessary properties in the created object. For convenience, the engine will supply a function that imports the properties of the source object, so that the programmer can start with a byvalue[replica](http://en.wiktionary.org/wiki/replica) of the source object and only override properties that need to be changed.

**3.3 Resources**

PHP includes [free and open source libraries](http://en.wikipedia.org/wiki/List_of_PHP_libraries) with the core build. PHP is a fundamentally [Internet](http://en.wikipedia.org/wiki/Internet)-aware system with modules built in for accessing [FTP](http://en.wikipedia.org/wiki/File_transfer_protocol) servers, many database servers, embedded SQL libraries such as embedded [PostgreSQL](http://en.wikipedia.org/wiki/PostgreSQL), [MySQL](http://en.wikipedia.org/wiki/MySQL) and [SQLite](http://en.wikipedia.org/wiki/SQLite), [LDAP](http://en.wikipedia.org/wiki/Lightweight_Directory_Access_Protocol) servers, and others. Many functions familiar to C programmers such as those in the [stdio](http://en.wikipedia.org/wiki/Stdio.h) family are available in the standard PHP build. PHP has traditionally used features such as "[magic\_quotes\_gpc](http://en.wikipedia.org/wiki/Magic_quotes)" and "magic\_quotes\_runtime" which attempt to escape apostrophes (') and quotes (") in strings in the assumption that they will be used in databases, to prevent [SQL injection](http://en.wikipedia.org/wiki/SQL_injection) attacks. This leads to confusion over which data is escaped and which is not, and to problems when data is not in fact used as input to a database and when the escaping used is not completely correct. To make code portable between servers which do and do not use magic quotes, developers can preface their code with a script to reverse the effect of magic quotes when it is applied.

PHP allows developers to write [extensions](http://en.wikipedia.org/wiki/Extension_%28computing%29) in [C](http://en.wikipedia.org/wiki/C_%28programming_language%29) to add functionality to the PHP language. These can then be compiled into PHP or loaded dynamically at runtime. Extensions have been written to add support for the [Windows API](http://en.wikipedia.org/wiki/Windows_API), process management on [Unix-like](http://en.wikipedia.org/wiki/Unix-like)[operating systems](http://en.wikipedia.org/wiki/Operating_system), multibyte strings ([Unicode](http://en.wikipedia.org/wiki/Unicode)), [cURL](http://en.wikipedia.org/wiki/CURL), and several popular [compression formats](http://en.wikipedia.org/wiki/Archive_format). Some more unusual features include integration with [Internet Relay Chat](http://en.wikipedia.org/wiki/Internet_Relay_Chat), dynamic generation of images and [Adobe Flash](http://en.wikipedia.org/wiki/Adobe_Flash) content, and even [speech synthesis](http://en.wikipedia.org/wiki/Speech_synthesis). The [PHP Extension Community Library](http://en.wikipedia.org/wiki/PHP_Extension_Community_Library) (PECL) project is a repository for extensions to the PHP language. Zend provides a [certification](http://en.wikipedia.org/wiki/Zend_Certified_Engineer) exam for programmers to become certified PHP developers.

**3.4 MySQL**

**MySQL** is a [relational database management system](http://en.wikipedia.org/wiki/Relational_database_management_system) (RDBMS) which has more than 6 million installations. MySQL stands for "My Structured Query Language". The program runs as a server providing multi-user access to a number of databases.

The project's [source code](http://en.wikipedia.org/wiki/Source_code) is available under terms of the [GNU General Public License](http://en.wikipedia.org/wiki/GNU_General_Public_License), as well as under a variety of [proprietary](http://en.wikipedia.org/wiki/Proprietary_software) agreements. MySQL is owned and sponsored by a single [for-profit](http://en.wikipedia.org/wiki/Business) firm, the [Swedish](http://en.wikipedia.org/wiki/Sweden) company [MySQL AB](http://en.wikipedia.org/wiki/MySQL_AB), now a [subsidiary](http://en.wikipedia.org/wiki/Subsidiary) of [Sun Microsystems](http://en.wikipedia.org/wiki/Sun_Microsystems), which holds the copyright to most of the codebase.

MySQL is commonly used by [free software](http://en.wikipedia.org/wiki/Free_software) projects which require a full-featured database management system, such as [WordPress](http://en.wikipedia.org/wiki/WordPress), [phpBB](http://en.wikipedia.org/wiki/PhpBB) and other software built on the [LAMP](http://en.wikipedia.org/wiki/LAMP_%28software_bundle%29) software stack. It is also used in very high-scale [World Wide Web](http://en.wikipedia.org/wiki/World_Wide_Web) products including [Google](http://en.wikipedia.org/wiki/Google) and [Facebook](http://en.wikipedia.org/wiki/Facebook).

**3.4.1 Uses**

MySQL is used in [web applications](http://en.wikipedia.org/wiki/Web_application) and acts as the database component of the [LAMP](http://en.wikipedia.org/wiki/LAMP_%28software_bundle%29) software stack. Its popularity for use with web applications is closely tied to the popularity of [PHP](http://en.wikipedia.org/wiki/PHP), which is often combined with MySQL. Several high-traffic web sites (including [Flickr](http://en.wikipedia.org/wiki/Flickr), [Facebook](http://en.wikipedia.org/wiki/Facebook), [Wikipedia](http://en.wikipedia.org/wiki/Wikipedia), [Google](http://en.wikipedia.org/wiki/Google) (though not for searches), [Nokia](http://en.wikipedia.org/wiki/Nokia), Auction marts and [YouTube](http://en.wikipedia.org/wiki/YouTube)) use MySQL for data storage and logging of user data.

**3.5 Platforms and Interfaces**

MySQL is written in [C](http://en.wikipedia.org/wiki/C_%28programming_language%29) and [C++](http://en.wikipedia.org/wiki/C%2B%2B). The [SQL](http://en.wikipedia.org/wiki/SQL) parser uses [yacc](http://en.wikipedia.org/wiki/Yacc) and a home-brewed [lexer](http://en.wikipedia.org/wiki/Lex_programming_tool), sql\_lex.cc

MySQL works on many different [system platforms](http://en.wikipedia.org/wiki/System_platform), including [AIX](http://en.wikipedia.org/wiki/AIX_operating_system), [BSDi](http://en.wikipedia.org/wiki/BSD/OS), [FreeBSD](http://en.wikipedia.org/wiki/FreeBSD), [HP-UX](http://en.wikipedia.org/wiki/HP-UX), [i5/OS](http://en.wikipedia.org/wiki/IBM_i5/OS), [Linux](http://en.wikipedia.org/wiki/Linux), [Mac OS X](http://en.wikipedia.org/wiki/Mac_OS_X), [NetBSD](http://en.wikipedia.org/wiki/NetBSD), [Novell NetWare](http://en.wikipedia.org/wiki/Novell_NetWare), [OpenBSD](http://en.wikipedia.org/wiki/OpenBSD), [OpenSolaris](http://en.wikipedia.org/wiki/OpenSolaris), [eComStation](http://en.wikipedia.org/wiki/EComStation), [OS/2](http://en.wikipedia.org/wiki/OS/2) Warp, [QNX](http://en.wikipedia.org/wiki/QNX), [IRIX](http://en.wikipedia.org/wiki/IRIX), [Solaris](http://en.wikipedia.org/wiki/Solaris_%28operating_system%29), [Symbian](http://en.wikipedia.org/wiki/Symbian), [SunOS](http://en.wikipedia.org/wiki/SunOS), [SCO OpenServer](http://en.wikipedia.org/wiki/SCO_OpenServer), SCO [UnixWare](http://en.wikipedia.org/wiki/UnixWare), [Sanos](http://en.wikipedia.org/wiki/Sanos), [Tru64](http://en.wikipedia.org/wiki/Tru64) and [Microsoft Windows](http://en.wikipedia.org/wiki/Microsoft_Windows). A port of MySQL to [OpenVMS](http://en.wikipedia.org/wiki/OpenVMS) is also available.

[Libraries](http://en.wikipedia.org/wiki/Library_%28computing%29) for accessing MySQL databases are available in all major [programming languages](http://en.wikipedia.org/wiki/Programming_language) with language-specific [APIs](http://en.wikipedia.org/wiki/Application_programming_interface). In addition, an [ODBC](http://en.wikipedia.org/wiki/ODBC) interface called [MyODBC](http://en.wikipedia.org/wiki/MyODBC) allows additional programming languages that support the ODBC interface to communicate with a MySQL database, such as [ASP](http://en.wikipedia.org/wiki/Active_Server_Pages) or [ColdFusion](http://en.wikipedia.org/wiki/Adobe_ColdFusion). The MySQL server and official libraries are mostly implemented in [ANSI C](http://en.wikipedia.org/wiki/ANSI_C)/[ANSI C++](http://en.wikipedia.org/wiki/ANSI_C%2B%2B).

To administer MySQL databases one can use the included [command-line](http://en.wikipedia.org/wiki/Command_line) tool (commands: MySQL and mysqladmin).

Also downloadable from the MySQL site are [GUI](http://en.wikipedia.org/wiki/Graphical_user_interface) administration tools: [*MySQL Administrator*](http://en.wikipedia.org/wiki/MySQL_GUI_Tools), [*MySQL Migration Toolkit*](http://en.wikipedia.org/wiki/MySQL_GUI_Tools) and [*MySQL Query Browser*](http://en.wikipedia.org/wiki/MySQL_GUI_Tools). The GUI tools are now included in one package called [*MySQL GUI Tools*](http://en.wikipedia.org/wiki/MySQL_GUI_Tools).

In addition to the above-mentioned tools developed by MySQL AB, there are several other commercial and [non-commercial](http://en.wikipedia.org/wiki/Non-commercial) tools available. Examples include [Navicat](http://en.wikipedia.org/wiki/Navicat) Free Lite Edition or [SQLyog](http://en.wikipedia.org/wiki/SQLyog) Community Edition, they are free desktop

based GUI tools, and [phpMyAdmin](http://en.wikipedia.org/wiki/PhpMyAdmin), a free [Web](http://en.wikipedia.org/wiki/World_Wide_Web)-based administration interface implemented in [PHP](http://en.wikipedia.org/wiki/PHP).

**3.5.1 Features**

As of April 2009[[update]](http://en.wikipedia.org/w/index.php?title=MySQL&action=edit), MySQL offers MySQL 5.1 in two different variants: the MySQL Community Server and [Enterprise Server](http://en.wikipedia.org/wiki/MySQL_Enterprise). They have a common code base and include the following features:

* A broad subset of [ANSI SQL 99](http://en.wikipedia.org/wiki/SQL:1999), as well as extensions
* Cross-platform support
* [Stored procedures](http://en.wikipedia.org/wiki/Stored_procedure)
* [Triggers](http://en.wikipedia.org/wiki/Database_trigger)
* [Cursors](http://en.wikipedia.org/wiki/Cursor_%28databases%29)
* Updatable [Views](http://en.wikipedia.org/wiki/View_%28database%29)
* True [Varchar](http://en.wikipedia.org/wiki/Varchar) support
* INFORMATION\_SCHEMA
* Strict mode
* [X/Open XA](http://en.wikipedia.org/wiki/X/Open_XA)[distributed transaction processing](http://en.wikipedia.org/wiki/Distributed_transaction_processing) (DTP) support; [two phase commit](http://en.wikipedia.org/wiki/Two-phase-commit_protocol) as part of this, using Oracle's [InnoDB](http://en.wikipedia.org/wiki/InnoDB) engine
* Independent [storage engines](http://en.wikipedia.org/wiki/Storage_engine) ([MyISAM](http://en.wikipedia.org/wiki/MyISAM) for read speed, InnoDB for transactions and [referential integrity](http://en.wikipedia.org/wiki/Referential_integrity), [MySQL Archive](http://en.wikipedia.org/wiki/MySQL_Archive) for storing historical data in little space)
* Transactions with the InnoDB, BDB and Cluster storage engines; savepoints with Inn
* [SSL](http://en.wikipedia.org/wiki/Secure_Sockets_Layer) support
* Query [caching](http://en.wikipedia.org/wiki/Caching)
* Sub-[SELECTs](http://en.wikipedia.org/wiki/Select_%28SQL%29) (i.e. nested SELECTs)
* Replication with one master per slave, many slaves per master, no automatic support for multiple masters per slave.
* Full-text [indexing](http://en.wikipedia.org/wiki/Indexing) and searching using MyISAM engine
* Embedded database library
* Partial [Unicode](http://en.wikipedia.org/wiki/Unicode) support ([UTF-8](http://en.wikipedia.org/wiki/UTF-8) sequences longer than 3 bytes are not supported; [UCS-2](http://en.wikipedia.org/wiki/UTF-16/UCS-2) encoded strings are also limited to the [BMP](http://en.wikipedia.org/wiki/Basic_Multilingual_Plane))
* Partial [ACID](http://en.wikipedia.org/wiki/ACID) compliance (only full compliance when using the non-default storage engines InnoDB, [BDB](http://en.wikipedia.org/wiki/Berkeley_DB) and Cluster)
* [Shared-nothing](http://en.wikipedia.org/wiki/Shared-nothing) clustering through [MySQL Cluster](http://en.wikipedia.org/wiki/MySQL_Cluster)

The MySQL Enterprise Server is released once per month and the sources can be obtained either from MySQL's customer-only Enterprise site or from MySQL's [Bazaar](http://en.wikipedia.org/wiki/Bazaar_%28software%29) repository, both under the GPL license. The MySQL Community Server is published on an unspecified schedule under the GPL and contains all bug fixes that were shipped with the last MySQL Enterprise Server release. Binaries are no longer provided by MySQL for every release of the Community Server.

* Replication support (i.e. Master-Master Replication & Master-Slave Replication)

**3.5.2 Distinguishing features**

The following features are implemented by MySQL but not by some other [RDBMS](http://en.wikipedia.org/wiki/RDBMS) software:

* Multiple storage engines, allowing one to choose the one that is most effective for each table in the application (in MySQL 5.0, storage engines must be compiled in; in MySQL 5.1, storage engines can be dynamically loaded at [run time](http://en.wikipedia.org/wiki/Run_time_%28computing%29)):
  + Partner-developed storage engines ([InnoDB](http://en.wikipedia.org/wiki/InnoDB), [solidDB](http://en.wikipedia.org/wiki/SolidDB), NitroEDB, [Infobright](http://en.wikipedia.org/wiki/Infobright) (formerly Brighthouse), [Infobright (Open Source)](http://www.infobright.org))
  + Community-developed storage engines ([memcached](http://en.wikipedia.org/wiki/Memcached), [httpd](http://en.wikipedia.org/wiki/Web_server), PBXT)
  + Custom storage engines

**3.5.3 Server compilation type**

There are 3 types of MySQL Server Compilations for Enterprise and Community users:

* Standard: The MySQL-Standard binaries are recommended for most users, and include the InnoDB storage engine.
* Max: (not [MaxDB](http://en.wikipedia.org/wiki/MaxDB), which is a cooperation with [SAP AG](http://en.wikipedia.org/wiki/SAP_AG)) is mysqld-max Extended MySQL Server. The MySQL-Max binaries include additional features that may not have been as extensively tested or are not required for general usage.
* The MySQL-Debug binaries have been compiled with extra debug information, and are not intended for [production use](http://en.wikipedia.org/w/index.php?title=Production_use&action=edit&redlink=1), because the included debugging code may cause reduced performance.

Beginning with MySQL 5.1, MySQL AB has stopped providing these different package variants. There will only be one MySQL server package, which includes a mysqld binary with all functionality and storage engines enabled. Instead of providing a separate debug package, a server binary with extended debugging information is also included in the standard package.

**3.5.4 History**

Milestones in MySQL development include:

* MySQL was originally developed by [Michael Widenius](http://en.wikipedia.org/wiki/Michael_Widenius) and [David Axmark](http://en.wikipedia.org/wiki/David_Axmark) beginning in 1994
* MySQL was first released internally on 23 May 1995
* Windows version was released on 8 January 1998 for Windows 95 and NT
* Version 3.23: beta from June 2000, production release January 2001
* Version 4.0: beta from August 2002, production release March 2003 ([unions](http://en.wikipedia.org/wiki/Union_%28SQL%29))
* Version 4.01: beta from August 2003, Jyoti adopts MySQL for database tracking
* Version 4.1: beta from June 2004, production release October 2004 ([R-trees](http://en.wikipedia.org/wiki/R-tree) and [B-trees](http://en.wikipedia.org/wiki/B-tree), subqueries, [prepared statements](http://en.wikipedia.org/w/index.php?title=Prepared_statement&action=edit&redlink=1))
* Version 5.0: beta from March 2005, production release October 2005 ([cursors](http://en.wikipedia.org/wiki/Cursor_%28databases%29), [stored procedures](http://en.wikipedia.org/wiki/Stored_procedure), [triggers](http://en.wikipedia.org/wiki/Database_trigger), [views](http://en.wikipedia.org/wiki/View_%28database%29), [XA transactions](http://en.wikipedia.org/wiki/Database_transaction))
* Sun Microsystems acquired [MySQL AB](http://en.wikipedia.org/wiki/MySQL_AB) on 26 February 2000
* Version 5.1: production release 27 November 2008 (event scheduler, [partitioning](http://en.wikipedia.org/wiki/Partition_%28database%29), plugin API, row-based replication, [server log](http://en.wikipedia.org/wiki/Server_log) tables)

**3.5.5 Future Releases**

The MySQL 6 roadmap outlines support for:

* [Referential integrity](http://en.wikipedia.org/wiki/Referential_integrity) and [Foreign key](http://en.wikipedia.org/wiki/Foreign_key) support for all storage engines is targeted for release in MySQL 6.1 (although it has been present since version 3.23.44 for [InnoDB](http://en.wikipedia.org/wiki/InnoDB)).
* Support for supplementary [Unicode](http://en.wikipedia.org/wiki/Unicode) characters, beyond the 65,536 characters of the [Basic Multilingual Plane](http://en.wikipedia.org/wiki/Basic_Multilingual_Plane) (BMP) is announced for MySQL 6.0.
* A new storage engine is also in the works, called [Falcon](http://en.wikipedia.org/wiki/Falcon_%28storage_engine%29). A preview of Falcon is available on MySQL's website.

Support for [parallelization](http://en.wikipedia.org/wiki/Parallel_computing) is also part of the roadmap for future versions.

**3.5.6 Support and licensing**

Via MySQL Enterprise MySQL AB offers support itself, including a [24/7](http://en.wikipedia.org/wiki/24/7) service with 30-minute response time, the support team has [direct access](http://en.wikipedia.org/wiki/Direct_access) to the developers as necessary to handle problems. In addition it hosts forums and [mailing lists](http://en.wikipedia.org/wiki/Mailing_list), employees and other users are often available in several [IRC channels](http://en.wikipedia.org/wiki/Internet_Relay_Chat) providing assistance

Buyers of MySQL Enterprise have access to binaries and software that is certified for their particular operating system, and access to monthly binary updates with the latest bug fixes. Several levels of Enterprise membership are available, with varying response times and features ranging from how to and emergency support through server [performance tuning](http://en.wikipedia.org/wiki/Performance_tuning) and [system architecture](http://en.wikipedia.org/wiki/Systems_architecture) advice. The MySQL [Network Monitoring](http://en.wikipedia.org/wiki/Network_monitoring) and Advisory Service monitoring tool for [database servers](http://en.wikipedia.org/wiki/Database_server) is available only to MySQL Enterprise customers.

MySQL Server is available as [free software](http://en.wikipedia.org/wiki/Free_software) under the [GNU General Public License](http://en.wikipedia.org/wiki/GNU_General_Public_License) (GPL), and the [MySQL Enterprise](http://en.wikipedia.org/wiki/MySQL_Enterprise) subscriptions include a GPL version of the server, with a traditional [proprietary](http://en.wikipedia.org/wiki/Proprietary_software) version available on request at no additional cost for cases where the intended use is incompatible with the GPL.

Both the MySQL server software itself and the client libraries are distributed under a [dual-licensing](http://en.wikipedia.org/wiki/Dual_license) format. Users may choose the GPL, which MySQL has extended with a [FLOSS](http://en.wikipedia.org/wiki/Alternative_terms_for_free_software) License Exception. It allows Software licensed under other [OSI](http://en.wikipedia.org/wiki/Open_Source_Initiative)-compliant [Open Source licenses](http://en.wikipedia.org/wiki/Open-source_license), which are not compatible to the GPL, to link against the MySQL client libraries.

Customers that do not wish to be bound to the terms of the GPL may choose to purchase a proprietary license.

[Like many open-source programs](http://en.wikipedia.org/wiki/List_of_trademarked_open_source_software), the name "MySQL" is [trademarked](http://en.wikipedia.org/wiki/Trademark) and may only be used [with the trademark holder's permission](http://www.mysql.com/company/legal/trademark.html).

MySQL recently (2008) released version 5.1 with 20 known crashing and wrong result bugs in addition to the 35 present in version 5.0. Critical bugs sometimes

do not get fixed for long periods of time. An example was a critical bug which was reported in 2003 and eventually patched six years later in an alpha release.

MySQL shows poor performance when used for [data warehousing](http://en.wikipedia.org/wiki/Data_warehousing); this is partly due to inability to utilize multiple CPU cores for processing a single query.

MySQL does not offer a single table type ("storage engine") offering all features; the two most common types, [MyISAM](http://en.wikipedia.org/wiki/MyISAM) and [InnoDB](http://en.wikipedia.org/wiki/InnoDB), do not completely overlap in their feature sets.

Previous versions of MySQL did not support many standard SQL features, with the manual claiming that they were unnecessary or would hurt performance. Even now, MySQL has many limitations that other RDBMS software (e.g. [PostgreSQL](http://en.wikipedia.org/wiki/PostgreSQL)) do not, such as the inability to refer to a temporary table twice in one query and extremely poor sub select performance.

The developer of the Federated Storage Engine states that "The Federated Storage Engine is a [proof-of-concept](http://en.wikipedia.org/wiki/Proof_of_concept) storage engine", though it was included and turned on by default in the main distributions of MySQL version 5.0. Some of the short-comings are documented in the ["MySQL Federated Tables: The Missing Manual"](http://www.oreillynet.com/pub/a/databases/2006/08/10/mysql-federated-tables.html).

**3.5.7 Competition**

In October 2005, [Oracle Corporation](http://en.wikipedia.org/wiki/Oracle_Corporation) acquired Innobase OY, the [Finnish](http://en.wikipedia.org/wiki/Finland) company that developed the [InnoDB](http://en.wikipedia.org/wiki/InnoDB) storage engine that allows MySQL to provide such functionality as transactions and [foreign keys](http://en.wikipedia.org/wiki/Foreign_key). A [press release](http://en.wikipedia.org/wiki/News_release) by

Oracle that was issued after the acquisition, mentioned that the contracts that make the company's software available to [MySQL AB](http://en.wikipedia.org/wiki/MySQL_AB) would be due for renewal (and presumably renegotiation) sometime in 2006. During the MySQL Users Conference in April 2006, MySQL issued a press release which confirmed that MySQL and Innobase OY agreed to a "multi-year" extension of their licensing agreement. In February 2006, Oracle Corporation acquired [Sleepycat Software](http://en.wikipedia.org/wiki/Sleepycat_Software), makers of the [Berkeley DB](http://en.wikipedia.org/wiki/Berkeley_DB), a database engine onto which another MySQL storage engine was built.