Open Source Database Technologies

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INTRODUCTION

The free or open source software (OSS) movement, pioneered by Richard Stallman in 1983, is gaining mainstream acceptance and challenging the established order of the commercial software world. The movement is taking root in various aspects of software development, namely operating systems (Linux), Web servers (Apache), databases (MySQL), and scripting languages (PHP) to mention but a few. The basic tenet of the movement is that the underlying code of any open source software should be freely viewable, modifiable, or redistributable by any interested party, as enunciated under the copyleft concept (Stallman, 2002) This is in sharp contrast to the proprietary software (closed source), in which the code is controlled under the copyright laws.

In the contemporary software landscape, the open source movement can no longer be overlooked by any major players in the industry, as the movement portends a paradigm shift and is forcing a major rethinking of strategy in the software business. For instance, companies like Oracle, Microsoft, and IBM now offer the lightweight versions of their proprietary flagship products to small—to-medium businesses at no cost for product trial (Samuelson, 2006). These developments are signs of the success of the OSS movement. Reasons abound for the success of the OSS, viz. the collective effort of many volunteer programmers, flexible and quick release rate, code availability, and security. On the other hand, one of the main disadvantages of OSS is the limited technical support, as it may be difficult to find an expert to help an organization with system setup or maintenance. Due to the extensive nature of OSS, this article will only focus on the database aspects.

A database is one of the critical components of the application stack for an organization or a business. Increasingly, open-source databases (OSDBs) such as MYSQL, PostgreSQL, MaxDB, Firebird, and In-gress are coming up against the big three commercial proprietary databases: Oracle, SQL server, and IBM DB (McKendrick, 2006; Paulson, 2004; Shankland, 2004). Big companies like Yahoo and Dell are now embracing OSDBs for enterprise-wide applications. According to the Independent Oracle Users Group (IOUG) survey, 37% of enterprise database sites are running at least one of the major brands of open source databases (McKendrik, 2006). The survey further finds that the OSDBs are mostly used for single function systems, followed by custom home-grown applications and Web sites. But critics maintain that these OSDBs are used for nonmission critical purposes, because IT organizations still have concerns about support, security, and management tools (Harris, 2004; Zhao & Elbaum, 2003).

Undoubtedly, the OSDB initiative plays a major role in the IT world, but the expressed concerns about its adoption are the internal IT operations issue of every company. Some companies have successfully integrated OSDBs by using in-house expertise and support. It is therefore incumbent on every company to determine the cost-effectiveness of OSDB adoption before embracing such systems. Furthermore, MySQL database is currently equipped with several features that facilitate the integration with other information systems such as legacy systems and existing software applications. Notably, MySQL converts and imports other databases using a migration toolkit or workbench. This is a powerful framework that supports the migration of several systems with proven methodology.

However, open source databases are forging ahead with attractive business strategies such as the blending of the roles of a database administrator and a developer. Currently, two business models are evolving in the OSDBs space, namely the MYSQl and PostgreSQl models (Maguire, 2003; McKendrik, 2006). The MySQL model is based on a dual-licensing approach, whereby a single firm releases, maintains, and supports

the code, while the PostgreSQl model has a community (regulated by experts) entrusted with code release and maintenance. Furthermore, there are more than 30 approved open source licenses, with GNU General Public License (GPL) being the most common (Rosen, 2004). The GNU GPL is copylefted, in that any redistributor of a free software cannot restrict the redistribution or modification of that software. For a detailed treatise on OSS licensing, interested readers are referred to the open source initiative Web site. Due to the large number of OSDBs in the market, this article will further shrink the focus to only the MySQL database and its use with PHP in generating dynamic Web content.

BACKGROUND

The history of MySQL started about three decades ago, when a Swedish firm TcX launched a screen builder-reporting application. Currently, MySQL dominates the OSDBs market with over 6 million installations and with characteristics such as easy administration, performance, stability, robustness, and compactness (LeClaire, 2006; McKendrick, 2006). To underline the popularity of the MySQL database, companies like Dell now package it for distribution with other components of the LAMP (Linux, Apache, MySQL, PHP/Python/Perl) stack. With significant cost savings, businesses deploy it to power high-volume Web sites, critical enterprise applications, and other software packages. A well documented case of MySQL use is Yahoo Finance (Zawodny, 2002). According to Zawodny (2002), MySQL database is cost-effective, easy-to-use, and reliable. It handled high-volume 260 million record tables just as well as the small, low-volume ones. The report further noted key MySQL features such as replication strength, and the ready-to-use APIs and libraries that have helped Yahoo manage its demanding applications smoothly.

MySQL is a multithreaded, server-based relational database management system. As server-based, it can be shared by multiple users, as opposed to desktop databases like Microsoft Access and FileMaker Pro that are designed as standalone for a single user. It runs on multiple platforms such as Unix and Windows and can be procured under the GNU GPL or nonGPL commercial license from its manufacturer, MySQLAB. As the most commonly used open source database for small-to-medium businesses, large shared databases, and Web sites, almost all virtual hosting companies provide MySQL. Its low cost and frequent use for Web-based systems has attracted attention of the academia, government, businesses, nonprofit organizations, and developing countries alike. Furthermore, users can choose from MySQL's flexible storage engines that include MYLSAM, memory, merge, cluster, InnoDB, and the other two new archive and federated storage engines.

Because MySQL is a server-based database, its content needs to be extracted and made visible or visualized to the user through a client or browser. It is therefore logical to discuss MySQL with a popular open-source scripting language (PHP) that helps to generate its content on the Web. There are other languages used in this endeavor, but PHP has a significant edge that makes it popular to use with MySQL as a Web-based interface.

Hypertext pre-processor (PHP) is a simple language to learn with rich features for generating dynamic Web content. It is a server-side, cross-platform, HTML embedded scripting language that is compatible with different databases, including MySQL. Its database tier support is excellent, with more than 15 libraries available to interact with almost all popular database servers (Williams & Lane, 2004). There are many reasons why PHP is an excellent choice for Web scripting: flexible integration with HTML, fast execution of scripts, capability for complex projects, platform portability, and its open-source community effort (Welling & Thomson, 2001). PHP's dynamic nature supports Web-centric tasks and services, and it has been instrumental in the paradigm shift in software development, especially the shift to service-oriented architecture (SOA). PHP supports overloading capabilities and strong string or text processing, a feature that is essential in Web development. It has rich libraries for multimedia programming, such as Ming, GD, ImageMagick, PDF, and FDF (Sweat, Kent & Slenc, 2003). Furthermore, PHP supports MySQL with libraries that improve SQL queries. For instance, PHP allows a MySQL query to be prepared once, and be executed many times, which substantially improves speed if a query is often used (Williams & Lane, 2004). Thus, PHP with its Web centric approach has fared well in turning MySQL into a Web database system.

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