



# Guide to Open Source Software in Government

Open Source and MySQL @ Work in Applications



*A MySQL<sup>®</sup> Business White Paper*

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## Executive Summary

In the last ten years there has been a sea-change in how local, state and federal government organizations operate. Not only is there a drive to make information more readily accessible through web-based applications that provide information to constituents, but also an increased need for interoperability across applications that may span multiple departments or agencies. In recent years, there is also a heightened awareness regarding the need to ensure that systems are secure and that private information is protected. Under any circumstances, these changes would present significant obstacles; but the challenges are further compounded by cutbacks in spending.

*"It's clear that cost of government is not sustainable in its present form. We need to think outside the box, which includes not just open source, but state collaboration around potential uses of software in the public domain."*

**Peter Quinn, CIO**  
**Commonwealth of Massachusetts**

Open source technology, though not new to government, is playing an increasingly important role in helping develop the next generation of highly scalable information applications. Many such applications are built on the LAMP open source software stack (Linux, Apache, MySQL, PHP / Python / Perl) which provides the main infrastructure for cost-effective application development and deployment.

Key elements of open source software that make it attractive to government include:

- **Greater interoperability:** Open source software is typically based on open standards making it easier to share information than with proprietary systems.
- **Eliminates lock-in:** Open source provides flexibility by eliminating platform and vendor lock-in.
- **Higher level of security:** Studies have shown open source software to be more reliable and more secure than closed-source equivalents. When patches are required, they are typically available in a matter of hours, rather than days or months.
- **Lower Total Cost of Ownership (TCO):** Studies have shown that the improved reliability and productivity of open source software combined with reduced hardware and software expenses can result in up to 90% lower TCO compared to traditional closed source software.

MySQL provides an attractive foundation for government applications because of its unique strengths:

- **High Performance:** MySQL's unique multiple storage engine architecture enables it to post some of the highest performance as reported by third-party benchmark tests.
- **Highly Reliable and Secure:** MySQL has been used by government agencies such as NASA with no downtime in more than three years.
- **Easy to Use and Deploy:** MySQL provides a full complement of graphical tools making it easy for developers and DBAs to get started in just 15 minutes.
- **Cost-Effective Scale-Out:** MySQL is ideally suited to high-volume web and data warehouse applications that require a cost-effective horizontal scale-out approach running on commodity hardware and software. For example, the Los Alamos Nuclear Laboratory has developed applications with more than 7 terabytes of data.
- **MySQL Network:** MySQL provides a full range of production support, certified binaries and automatic updates that make it easy for organizations to leverage open source.

In this white paper, we review some of the reasons why open source software is ideally suited to government. We also provide examples of where open source software in general, and the MySQL open source database in particular, have enabled government organizations to develop and deploy highly scalable applications at a fraction of the total cost of traditional, closed source software.

## Open Source in Government

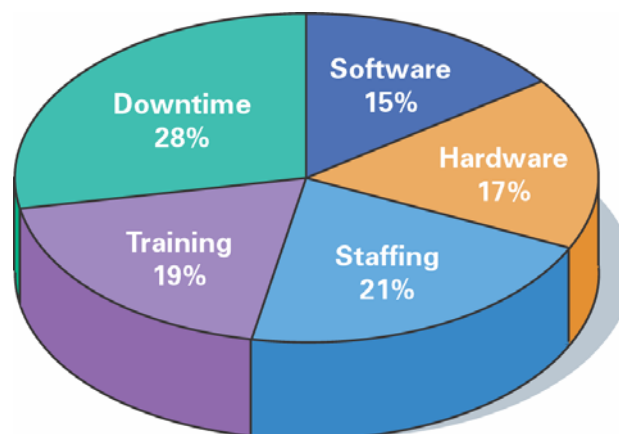
In recent years, open source software has become widely adopted at all levels of government including local, state and federal agencies. Historically, government agencies, research groups and educational institutions have been not only primary beneficiaries of open source technology, but also contributors to many open source technologies.

According to the research firm IDC Corp., US federal, state, and local governments combined spend upwards of \$34 billion a year on software alone. And, according to the Gartner Group, in Europe, where numerous bills and resolutions have been introduced to encourage the adoption of open source software, local, state and federal governments are estimated to spend more than \$8 billion on software each year.

Open source software can help governments deliver more information resources at a lower cost than traditional closed source, proprietary software, just as it has done in the commercial world. Studies by Meta Group<sup>1</sup>, IDC<sup>2</sup> and Forrester Research<sup>3</sup> have shown how open source software has enabled companies to lower their Total Cost of Ownership (TCO) by as much as 90% due to the reduced license and maintenance expense as well as the improved efficiency, reliability and security of open source software.

To be truly efficient, a product must not only have lower up front license costs, but also slash the running costs that make up the total cost of ownership. IDC found that software cost is only 15% of the total cost of deploying an Oracle 8i Database application — the hardware was 17%, staffing 21% and training 19%. A full 28% of the total cost of Oracle database deployment is attributed to system downtime.

### TCO Breakdown of Database Software



<sup>1</sup> META Group, "The End of Database Licensing?" Garry. March 2005.

<sup>2</sup> IDC, "Maximizing the Business Value of Enterprise Database Applications on a Unix Platform." 2002.

<sup>3</sup> Forrester Inc. "Your Open Source Strategy". Schadler, Rustein, Lambert, Tseng, Whitely. September 2003.

Although few would propose that all government software should be open source, there is clearly an opportunity for its further adoption in government. Although the reasons for adopting open source software in government are varied, a primary reason is that many government agencies want to avoid being locked-in to a single source proprietary solution. One of the primary virtues of open source software is that it eliminates platform and vendor lock-in giving the customer far more flexibility and control. Not only does open source eliminate the constant “upgrade treadmill” and associated maintenance costs, but also can help reduce hardware upgrades often required for the latest versions of software. This results in a lower cost of providing information to their constituencies. With open source software, agencies can guarantee citizens’ easy access to information.

Using an open source platform also makes it easy to achieve interoperability by adopting open standards that do not require expensive proprietary technologies. This makes it easier for agencies to collaborate among themselves and with commercial solution providers. There are also cases where the use of open source technology can be a significant point of local or national pride and part of an overall policy to encourage the development of local IT talent and expertise.

Here are just a few examples of how open source is being used at various levels of Government to improve access to information and provide greater flexibility at a much lower cost.

- **US Census Bureau** built their FedStats web portal using the open source LAMP stack (Linux, Apache, MySQL, PHP). The site includes a display of the U.S.'s leading financial and economic indicators at a glance. Users can use the site's linking and searching capabilities to track economic and population trends, health care costs, aviation safety, foreign trade and more. Users can access data from over 200,000 documents and from more than 70 federal agencies quickly and seamlessly. Its use of open source software won the Census Bureau's Director's Award for Innovation.
- **NASA Jet Propulsion Laboratory** used eight open source software components to develop the Mars Rover Science Activity Planner, a software system designed to control and communicate with the Rovers as they drive around the surface of Mars. All critical functionality including activity plans, energy calculations and resource usage are done with open source software including the Castor data-binding framework, Java Expression Parser and MySQL database. Open source turned out to be the most economical solution for NASA enabling them to give taxpayers more bang for the buck.
- **Los Alamos National Laboratories** built its “library without walls” application using the MySQL open source database to create a robust, secure distributed database containing more than 55 million scientific journal articles encompassing more than 7 terabytes of data.
- **Brisbane City Council** in Australia developed a traffic signaling system for an arterial road based on Red Hat Cluster with MySQL.
- **The City of Munich** in Germany is migrating 14,000 desktops to a Linux platform, with OpenOffice as the office suite and Mozilla as the internet browser. It cited the improved security, flexibility and cost savings as key reasons in migrating away from proprietary systems and applications.
- **The Brazilian government** announced it could save around \$120 million a year by migrating to open source software. According to Sergio Amadeu da Silveira, head of the ITI (National Information Technology Institute), the government is currently paying around \$500 for every workstation to Microsoft regarding license fees. Through numerous open source projects, the government tries to

*“MySQL’s reputation for speed has proved itself in handling links among over 1.5 billions of rows of data.”*

**Mariella Di Giacomo**  
**Los Alamos National Laboratory**

bridge the technology divide among the Brazilian population. One successful initiative entitled Recycling Goal aims to provide computer technologies to people living in the underdeveloped outskirts of Sao Paulo.

- **The People's Republic of China** plans to install at least 200 million copies of an Open Source-based desktop solution throughout the country, following an agreement between Sun Microsystems and the China Standard Software Co. Ltd.
- **France's civil service minister** Renaud Dutreil told Reuters that he wants to use open source software providers to re-supply some of its almost one million state computers, under a government cost-cutting drive designed to trim a bulging public deficit. He said, "My estimate is that we can cut the state software bill at least in half."

Government agencies are not just consumers of open source software, they have also been known to contribute to open source projects and have started sharing their own application source code to foster inter-governmental collaboration.

- **NASA** published its World Wind planetary visualization application using an open source model. This not only made the software more popular (over 6,000,000 downloads to date) but also resulted in several significant enhancements from users.
- **The State of Rhode Island** released the code to an application called RSSonate (pronounced "resonate") an open source application that takes SQL statements and produces a formatted RSS syndication feed that enables organizations to automatically update subscribers in real-time. RSSonate is made available through the recently formed Government Open Code Collaborative [www.gocc.gov](http://www.gocc.gov).
- **The NSA** has developed Security-Enhanced Linux (SELinux), a prototype Linux kernel and of utilities with enhanced security functionality providing mandatory access controls that reduces the risk of security vulnerabilities from flawed or malicious programs.
- **The Peruvian government** has introduced a bill requiring that all software in government applications must be open source. There are three reasons for this stated in the bill: 1) to ensure citizens' access to data; 2) to guarantee the long-term usability of data; and 3) to improve security. The Peruvian government is also leveraging open source software as a means to create jobs local IT jobs.

*"Government attitudes are spurring interest in open source as an alternative to today's leading commercial software... Public-sector agencies may derive further economic benefits from the adoption of open-source development 'share and reuse' best practices."* **Nikos Drakos**  
**Open-Source Software Running for Public Office, Gartner**

Two dozen other countries are also looking at having legislation that would encourage the adoption of open source software.

## Government IT Challenges

While there are many similarities between Government IT issues and those found in traditional corporate IT environments, there are also special considerations that arise. These include areas such as Access to information; Interoperability; Confidentiality and Security; and Budget Efficiency.

### Access to Information

One of the fundamental roles of government is to provide easy access to public information to their constituents, whether it is to individual citizens, businesses or other government departments or offices. Increasingly, government applications are built on a web-based architecture to facilitate standards-based self-service applications. The advantage of web-based applications is that they are not only easy to use, but also based on open standards. The information can be accessed without becoming dependent on proprietary tools or platforms.

While avoiding lock-in is important in many IT environments, it is particularly critical for government applications where providing direct access to information is often a core part of their charter. By using open source software government agencies can reduce the dependency on a single vendor or platform. So if a supplier uses open source software to deliver its solution, there can be less dependency if there is ever the need to change suppliers.

### Interoperability

Closely related to the idea of providing access to information is the need for interoperability of applications. Many government applications must integrate and interoperate with existing applications and systems, pulling information from a myriad of different sources. Typically this could include a broad range of legacy applications such as client/server applications, mainframe systems and proprietary or home-grown applications developed over the years. Standards-based open source software can provide an improved level of interoperability that enables applications to work together, even when they span government departments or agencies. By using open source technology, it becomes much easier for agencies to adopt common models for building applications since there is no inherent platform lock-in or need for additional software licensing fees in order to ensure interoperability. Unlike closed source applications and platforms, open source software is often portable to a dozen or more different operating systems or platforms.

Several recent intra-governmental initiatives such as Government Open Code Collaborative ([www.gocc.gov](http://www.gocc.gov)) and Component Organization & Registration Environment ([www.core.gov](http://www.core.gov)) have been established to help foster interoperability of government applications using open source code as well as to encourage the interchange of open source code, ideas and best practices. These initiatives are described in more detail in the Resources section at the end of this white paper.

### Confidentiality & Security

While government applications must provide easy access to data and interoperate with other systems, there is also a need to ensure confidentiality and security of government applications. Many government applications safeguard data, whether it is for electoral purposes, health and social services, government funding initiatives, military applications or national defense.

*“MySQL is the world’s most popular FOSS database. It is fast, full-functioned, and precise enough to be used in both heavy load and mission critical applications.”*

**MITRE Report to US Defense Information Systems Agency (DISA)**

*“The public sector has been, and probably still is, the largest benefactor of open-source software development through research and development (R&D) and university funding.”*

**Nikos Drakos**  
**Open-Source Software Running for Public Office**  
**Gartner**

Open source software has proven to have a greater degree of security than closed source solutions. Because the source code is widely available, it tends to ensure that vulnerabilities are quickly corrected rather than exploited. Indeed, many government applications within security agencies have long depended on the improved security of open source software such as Linux and Apache to avoid the weaknesses and security vulnerabilities associated with the Microsoft Windows environment.

*“The view of the MoD (UK Ministry of Defence) Defence Academy is that a server infrastructure based on Open Source software is inherently more secure than one based on proprietary software.”*

**Open Source Software Trials in Government: Final Report**  
**Office of Government Commerce UK**  
**2005**

When patches are required, whether in response to a bug fix or a newly discovered security vulnerability, the open source community has been very quick to resolve these, typically in a matter of hours, as compared to days or weeks sometimes required to get upgrades from a closed source software vendor.

### **Budget Efficiency**

Government IT departments, like their commercial counterparts, are under constant budgetary pressure to “do more with less.” In many cases there are demands for new applications without commensurate budget for additional hardware or software. In these cases, budget that is allocated to closed source software comes directly at the expense of budget for hardware or staffing. Many government departments have started using open source software for the very pragmatic reason that most commercial software was overpriced.

*“More often than not, the strongest deciding factors for choosing FOSS products were capability and reliability, with cost being an important but secondary factor.”*

**MITRE Report for US Defense**  
**Information Systems Agency (DISA)**

Since open source software typically does not suffer from the “feature bloat” common to commercial software that is upgraded every year with new features to justify maintenance expenses, it tends to run more efficiently in less memory and with less hardware resources. This is one reason that Linux and the whole LAMP stack (Linux, Apache, MySQL, PHP / Perl / Python) have become very popular at the departmental level. New applications can be built quickly using existing resources, without costly software or hardware upgrades.

While it is true that using open source software can eliminate the expense associated with traditional software license fees and maintenance, in most cases the cost savings are only one advantage of using open source software. The more important considerations are that open source software better enables government to meet its primary objectives of providing information to its constituencies in an easily accessible manner.

## **Open Source Challenges and How to Overcome Them**

Although there is already very significant use of open source technology within government, there are also issues to be considered. Not all open source software provides the same quality or support; as with any technology purchase, it is important to determine the exact requirements to ensure a fit.

In this section, we identify the concerns and provide

*“The most striking difference between our experiences developing with commercial and open source components was the open source developers’ responsiveness. When we contacted open source developers about a problem in their component, they responded immediately with workaround suggestions and kept us informed as they worked to correct the issue. In one case, they diagnosed the problem, fixed it, and released a corrected version in less than a day.”*

**Jeffrey S. Norris**  
**NASA Jet Propulsion Laboratory**

recommendations on how to best deal with them. When first getting started with open source

- **Support:** When selecting open source technology, be sure to understand what kind of support or assistance is available. Is there a vendor behind the technology? Do they offer 24x7 and emergency support? Are there means of getting training, consulting and certification? These are all important considerations to ensure that you are successful in adopting the technology.

- **Security and Reliability:** While much open source software has proven to be more reliable and secure than comparable closed source software, quality can obviously vary greatly from product to product. You should investigate whether there are objective third-party tests that can validate the quality of the product.

*"Coverity's analysis of MySQL found results that are at least four times better than is typical with commercial software."*

**Seth Hallem, CEO**  
**Coverity**

Also, consider whether the software is certified by a vendor to ensure that it is tested for your particular operating environment. For example, companies such as Coverity, Klocwork and Reasoning have done independent quality tests of major open source technologies including Linux, Apache, and MySQL which show that these particular products have 1/6<sup>th</sup> or fewer the number of defects compared to equivalent closed source products.

- **Ease of deployment:** In the early days of open source technology, developers had to be prepared to piece together all the right parts and compile the source code for their own platform, a process that could be quite tricky with dozens or even hundreds of different packages and dependencies. However, in recent years, open source software now typically comes with easy-to-use graphical installation and management tools. These tools not only save time and improve productivity, but also make the software accessible to a much broader audience.
- **Performance & scalability:** Many government applications, especially those that are part of public portals, can have very demanding volumes of transactions and users. It is important in these cases not to sacrifice performance by using a low-cost solution that ultimately does not scale. Fortunately, the open source LAMP stack (Linux, Apache, MySQL, PHP / Perl / Python) has been shown to scale to extremely high levels in a cost-effective fashion. You may wish to review third-party performance benchmarks to ensure that your system will scale to meet the demands that will be placed on it and to size the required hardware.
- **Best practices skills development:** If you are new to open source technology you may wish to invest in the appropriate level of skills development for your staff. This may include the use of training, certification or consulting services. A good architectural review with experienced open source experts can ensure to ensure that design decisions are sound and follow best practices thereby eliminating risks due to lack of prior exposure to the new technology. If there are pockets of expertise in your organization that are already using open source technology, get them involved in the early stages to help bootstrap the development process.
- **Size of community:** When selecting open source software, you will want to assess the size of the open source community behind the software and whether it is growing significantly or not. Software which is widely used typically has several benefits including greater stability, well-known best practices, a large talent pool to draw upon, as well as third-party products, services, web sites and publications. A large and active community helps ensure that the software continues to evolve and that enhancements as well as security or bug fixes happen rapidly.
- **Compatible third-party products:** In government IT, no technology exists in isolation. Software, in particular, needs to integrate and interoperate with existing applications and systems. In years past, selecting open source software sometimes meant forsaking compatibility

with existing closed source software. Today that is not the case. There are many third-party products, both open source and closed source, that co-exist with and provide interoperability with leading open source packages, particularly with the more popular systems. However, if there is a critical application or piece of infrastructure that is vital to your organization, you should verify this beforehand. If the support is not there to begin with, determine what effort would be required, to make it work. Since most open source software is extensible and based on open standards, there may be a way to make the systems work together even if it has not been tested by the third-party vendor.

- **IP licensing:** Approximately 80% of open source projects on SourceForge use the GPL (Gnu Public License) license and many others use the BSD (Berkeley Software Distribution) license or a variation of either of these. You will want to make sure your department or agency has reviewed these licenses and is comfortable with any common variations. Although there have been few incidents of proprietary source code inadvertently being released as open source, there have been enough concerns raised by SCO, you should verify the legal status of any open source software you are using. Is it supported by the authors of the code? Do they own all the copyrights to the code? Do they provide indemnification of that code?
- **References:** If you are using a new open source technology for the first time, it may be a good idea to check if there are references or case studies from other government users. Ideally, these would have a usage model similar to your own and be willing to provide some input into how to best work with the software. Increasingly, government agencies are sharing best practice techniques in working with open source technology. There are numerous case studies and research reports listed in the Reference section of this paper.

By being aware of the potential challenges of open source software and having to plan to overcome, government agencies can reap the many rewards of going with an open source approach. In fact, some governments are now recommending the adoption of open source equally with or even over proprietary applications.

*"It is recommended that state departments actively research and evaluate open source code alternatives prior to considering use of the traditional procurement model for software."*

[Explore Open Source Alternatives  
California Performance Review](#)

## Case Study: US Census Bureau FedStats Application

Most Americans are aware that every 10 years, the United States Census Bureau conducts a massive Census of the 105 million U.S. households to collect updated national demographic information. The Census data determines critical population information such as size, growth and geographic densities, as well as other vital statistics. What many people don't know is that the U.S. Census Bureau also creates and manages web sites that serve as highly-accessible resources for anyone looking for just about any kind of national or local statistic.

The Census Bureau's web development team has relied on an open source LAMP stack (Linux, Apache, MySQL and PHP/Perl) to develop several highly-acclaimed and very successful web sites. In fact, one of the MySQL-run sites won the prestigious Census Bureau's Director's Award for Innovation. The Census Bureau's web development team, led by Rachael LaPorte Taylor, senior technology architect for FedStats.gov at the Census Bureau, and Lisa Nyman, senior Internet technology architect, has begun serving as informal open-source consultants to the entire organization of over 5,000 employees.

The Census Bureau has a site license for the Oracle RDBMS, but LaPorte Taylor notes that, "We chose to use the MySQL database server because of its ease of installation, maintainability, configuration and speed. I've been using open source software since I got into the business, which was in '92," she continued.

FedStats ([www.fedstats.gov](http://www.fedstats.gov)) is a MySQL-powered portal to statistics produced by the Federal government. Features include a display of the U.S.'s leading financial and economic indicators at a glance. Users can use the site's powerful linking and searching capabilities to track:

- Economic and population trends
- Health care costs
- Aviation safety
- Foreign trade
- . . . and more

With the ultra-fast MySQL database at the back end, users can access data from over 200,000 documents and from more than 70 federal agencies quickly and seamlessly.

MapStats, a feature of FedStats, is a dynamic MySQL-based application that delivers statistical profiles of states, counties and other local regions. Like FedStats, it transparently aggregates data from many different sources within and outside the U.S. Census. A popular site for many government agencies, MapStats has almost 70,000 records and relies heavily on the performance of the MySQL database to serve up statistics quickly and accurately.



The Census Bureau's MySQL-based QuickFacts is an award-winning, user-friendly web site that provides state and county profiles with the latest Census statistics about people, business and geography. Visited by many students and others unaccustomed to using Census data, QuickFacts serves an average of 120,000 pages per day. The U.S. Census Bureau's open source-developed web sites have served as models of success for this government agency. "We've had a lot more traffic to our office because of our success with MySQL," said LaPorte Taylor. "We are now helping other departments within our agency develop applications with open source software, and we have future plans for more MySQL-based applications."

## Case Study: NASA's Acquisition Internet Service

The NASA Acquisition Internet Service (NAIS) (<http://nais.nasa.gov/>) is responsible for providing the public with information regarding contract opportunities with the space agency. NAIS has grown from a modest set of static web sites displaying contract data into a sophisticated application with back-end databases of solicitations and vendor proposals for the entire NASA procurement community. It handles all acquisitions valued at more than \$25,000 and has thousands of internal and external users receiving more than 300,000 page views each month.

The NAIS application saves NASA and its partners roughly \$4 million annually by making the procurement process more efficient. The NAIS application is now being adopted by the U.S. FedBizOpps program (<http://www.eps.gov/>) as a means for providing access to contracting opportunities for the entire U.S. Government.

Dwight Clark, an IT Specialist and Systems Analyst at NASA says that when their previous closed source database vendor decided to restructure its license program, NASA was faced with fees that would cost "more than twice their total annual budget" – for a simple upgrade. The NAIS team settled upon what they considered to be the most robust database product available: MySQL.

*"Our tests showed MySQL could perform NAIS functions faster."*

**John Sudderth**  
Senior Computer Scientist  
Computer Science Corporation

The NAIS team identified several reasons for the switch to open source:

- **Performance:** NASA noticed an improvement in performance of 28% by migrating to MySQL.
- **Improved Reliability.** "We've been up and running for 3 years now without any data loss or downtime. That's just incredible," said John Sudderth, Senior Computer Scientist of Computer Science Corporation, who was the lead developer on the conversion project.
- **Compatibility:** MySQL was able to easily interface with SQL-compliant applications through ODBC. "To switch to MySQL we only had to install the MySQL database driver module and change the connect call to the database interface module. Once this was done, we literally had to change one line of code out of 15,000 lines to begin using MySQL in our first application," said Sudderth.
- **Support:** NASA was able to get support directly from MySQL AB when they needed it as well as from the open source community. NASA found that the support from MySQL AB was "very helpful and responsive when needed" and it cost only a fraction of what they had previously paid, according to the NAIS director Jim Bradford.
- **Lower Cost:** Because MySQL is open source, there were no upfront license fees or ongoing maintenance costs.

NASA's story is not uncommon. Many government agencies discover MySQL when looking for more cost-effective licensing deal, but end up reaping savings across a broad range of areas.

## Managing Growing Data Capacity

More than ever before, government IT organizations face the challenge of accomplishing more with less. Budgetary constraints are forcing organizations to evaluate alternatives to traditional high-cost proprietary solutions. Government must find a cost-effective way to increase capacity such as growth in web site traffic and growth in government data.

There are two ways to accommodate this growth:

- **Scaling out** (or Horizontal Scaling). This means distributing the computing and data workload among multiple commodity servers by load balancing, with the ability to add or subtract servers to increase or decrease capacity. By distributing the workload, processing resources are spread among multiple low-cost servers, which improve both performance and the availability of the overall service at a dramatically lower cost.
- **Scaling up** (or Vertical Scaling). This refers to running an application on a single large SMP server and having the ability to add hardware processors and memory to increase overall system performance and scalability. Scale-up implies fewer, more expensive servers than with scale-out. The big issue here is that because of the 'forklift' upgrade approach, you have too much high-cost hardware which is often under-utilized.

Most government agencies are selecting the scale-out approach because the scale-up model is not a cost-effective solution to address performance and scalability issues associated with database growth. Scaling up requires expensive and sophisticated hardware and operating systems to deliver scalability and availability to business applications.

*"IDC expects the deployment of industry-standard servers and a scale-out approach to continue to grow the presence of scale-out computing in enterprise customer environments."*

IDC

Scale-out using MySQL enables organizations to cost-effectively solve database capacity issues that result from increased traffic and transaction volumes. In particular, scale-out with MySQL provides organizations the following advantages:

- **Easily and cost-effectively add capacity** to your database infrastructure.
- **Reduced Hardware costs** - adding several smaller systems is typically far less expensive than upgrading a mainframe-class system.
- **Reduce Software costs** – scaling out with MySQL is far less expensive than with using a proprietary closed source database.
- **Improve response time and availability** – Scale-out improves the performance and availability of your system. Users experience fewer interruptions in accessing data.
- **Increased flexibility** – Right-size the initial purchase of commodity hardware and software and have the flexibility to incrementally add capacity as needed.
- **Reduce the risk of performance degradation** typical of SMP machines that near their capacity limits.
- **Improve scalability** using MySQL Replication to distribute large workloads to individual server nodes for execution.
- **Improved Performance** using a pluggable storage engine architecture. Purpose built storage engines enable organizations to optimize MySQL for their type of applications such as read-only vs. transactional.

## Conclusion

Open source technology has become an increasingly important foundation for government to develop the next generation of highly scalable information applications. Its high interoperability, no platform lock-in, high level of security, and low total cost of ownership make open source software and, in most cases, the LAMP stack ideally suited for government use.

Through open source technology, government is finding it easier to provide access to information, interoperability across applications and agencies, high security, and budget efficiency.

## About MySQL Network

For organizations deploying scale-out architectures, MySQL offers MySQL Network. MySQL enables these organizations to achieve the highest levels of reliability, security and uptime at an affordable price. MySQL Network is a simple, cost-effective way to maximize all the benefits available from MySQL to successfully deploy business-critical applications. It combines a comprehensive set of software and services including certified software, software updates, production support, customized alerts, and a technical Knowledge Base. Multiple tiers give you the flexibility to choose the appropriate level of service to match your requirements. For more information visit: <http://www.mysql.com/network>

### Partial List of Government Offices Using MySQL

ADEME  
Australian Sports Commission  
Brisbane City Council  
City of New York  
CNES (Centre National d'Etudes Spatiales)  
CNRS (Centre National de la Recherche Scientifique)  
Department of Defense  
Department of Homeland Security  
Deutsch Post  
Government Open Code Collaborative (GOCC)  
IRSN (Institut de Radioprotection et de Surete Nucleaire)  
NASA  
NASA Jet Propulsion Lab (JPL)  
RATP  
State of Illinois  
State of Michigan  
State of Minnesota  
State of New York  
State of Parana  
State of Rhode Island  
US Census Bureau

## Resources

### White Papers

***A Guide to Lower Database TCO***, MySQL AB

<http://www.mysql.com/tco>

A Computerworld article, "MySQL Breaks Into the Data Center", revealed how MySQL has become the world's most popular open source database and why corporations intent on lowering their cost of operations are using it to further commoditize their IT infrastructure. In this white paper we'll show you how. You'll also learn how organizations such as Cox Communications, NASA, Sabre Holdings and Yahoo! have improved database reliability, performance and TCO using MySQL.

***Guide to Developing an Enterprise Open Source Strategy***, MySQL AB

<http://www.mysql.com/lamp>

To meet the service levels demanded by your users, your database-based application needs to deliver high performance and scalability. In addition, it requires complete data availability, which includes fault tolerance, service uptime, and throughput. In short, performance and service uptime are the two most important criteria to ensure an application operates at expected levels.

### Analyst Reports

***Your Open Source Strategy***, Forrester: Schadler, September 2003,

<http://www.mysql.com/it-resources/analyst-reports/forrester-open-source-databases.php>

Enterprises are intrigued by open source software --- but stymied by myths of cost, support, and risk. Smart firms will master these myths to get the open software stack they want.

***Open-Source Software Running for Public Office***, Nikos Drakos, Andrea Di Maio, Gartner, April 2003

<http://www.gartner.com/DisplayDocument?id=392799>

Government attitudes are spurring interest in open source as an alternative to today's leading commercial software. Case studies and analyses demonstrate the risks and benefits of open software in the public sector.

***The End of Database Licensing?*** Meta Group, April, 2005,

<http://www.mysql.com/it-resources/analyst-reports/meta-group-db-licensing.php>

As the competition for open source heats up, it is the support (e.g., technical, implementation, ISV) that will decide how soon adoption takes place and show will win. MySQL Network is an innovative support offering that threatens traditional commercial software licensing models. MySQL Network is an offering that should increase the velocity of MySQL within the enterprise market and mark the "beginning of the end" for software licensing fees as a separately charged line item.

## **Case Studies**

**MySQL: Lessons Learned on a Digital Library, IEEE Software**, May / June 2005

<http://csdl.computer.org/comp/mags/so/2005/03/s3010.pdf>

The Los Alamos National Laboratory Research Library's recent project to develop a comprehensive database of scientific journal articles and citation information was its most ambitious project ever. The project converted bibliographic metadata from several data sources into a common format and enhanced the data with links between each of more than 55 million articles as well as 600 million individual references. The project also provided search capabilities and browser access to the data.

***Developing An Open Source Option for NASA Software***, Patrick J. Moran, NASA Ames Research Center, April 2003

<http://www.nas.nasa.gov/News/Techreports/2003/2003.html>

This paper presents arguments in favor of developing an Open Source option for NASA software; in particular how Open Source is compatible with NASA's mission. It also addresses some of the related issues for NASA with respect to Open Source including a thorough review of open source licenses.

***Mission-Critical Development with Open Source Software: Lessons Learned***, Jeffrey S. Norris, Jet Propulsion Laboratory, IEEE Software, January / February 2004

<http://csdl2.computer.org/persagen/DLAbsToc.jsp?resourcePath=/dl/mags/so/&toc=comp/mags/so/2004/01/s1toc.xml&DOI=10.1109/MS.2004.1259211>

Mission operators at NASA's Jet Propulsion Laboratory use Science Activity Planners (SAP) to analyze data acquired by rovers and direct their activities. In designing the SAP for the Mars Exploration Rovers project, developers relied heavily on open source components. They found that using open source software components not only helped keep the project within budget but also resulted in a more robust and flexible tool. When considering an open source component, prospective users should evaluate the project for several characteristics: maturity, longevity, and flexibility.

***Major Range Control Center Relies on Open Source Database***, MySQL AB

<http://www.mysql.com/it-resources/case-studies/mysql-rocc-casestudy.php>

The Range Operation Control Center (ROCC) at one of the major US missile and space test ranges collects real-time data from radar sensors to track and predict the path of space objects including asteroids and meteoroids. To make these vital real-time predictions, the ROCC built a real-time data warehousing application that relies on the performance and reliability of MySQL.

***Los Alamos National Labs Relies on MySQL to Scale with 7 Terabytes of Data***, MySQL AB

<http://www.mysql.com/it-resources/case-studies/mysql-losalamos-casestudy.php>

MySQL is the high-performance database that enabled Los Alamos Labs to deliver SearchPlus, a robust, scalable and secure distributed database containing more than 55 million scientific journal articles. Using SearchPlus, scientists and researchers can search over 7 terabytes of data for articles and authors more efficiently. MySQL has proven itself to be the ideal solution for SearchPlus by combining high-performance, superior reliability, scalability, security and replication.

***Local County Government Turns to MySQL to Help Support its Citizens***, MySQL AB,

<http://www.mysql.com/it-resources/case-studies/mysql-pcit-casestudy.php>

The Information Technologies department of Pottawattamie County, Iowa is employing the open source LAMP software stack -- Linux, Apache, MySQL, Perl/PHP -- to improve the reliability and functionality of

their local government applications. They have standardized on MySQL for all their new database systems development, replacing legacy Informix and Microsoft SQL Server applications.

### **Articles & Research Reports**

**Myths of Open Source**, CIO Magazine, March 1, 2004

<http://www.cio.com/archive/030104/open.html>

Is open source right for every organization? In the end, argues Andy Mulholland, chief technology officer for Cap Gemini Ernst & Young, it's a question of attitude. "The arguments for and against open-source software often get very trivialized," he says. "It's not a technology issue; it's a business issue to do with externalization." This article provides a comprehensive review of many of the common myths and misperceptions about open source software.

**Use of Free and Open-Source Software in the U.S. Department of Defense**, MITRE Corporation, prepared for Defense Information Systems Agency (DISA), January 2003

[http://www.egovos.org/rawmedia\\_repository/588347ad\\_c97c\\_48b9\\_a63d\\_821cb0e8422d?/document.pdf](http://www.egovos.org/rawmedia_repository/588347ad_c97c_48b9_a63d_821cb0e8422d?/document.pdf)

The main conclusion of the analysis was that FOSS software plays a more critical role in the DoD than has generally been recognized. FOSS applications are most important in four broad areas: Infrastructure Support, Software Development, Security, and Research. One unexpected result was the degree to which Security depends on FOSS. Includes an extensive review of 'Generally Accepted as Safe' open source software and a comprehensive review of open source licenses.

**Open Source Software Trials in Government: Final report**, UK Office of Government Commerce, October 2004

<http://www.ogc.gov.uk/index.asp?docid=2190>

In September 2003 the Office of Government Commerce (OGC) announced that they would be coordinating "Proof of Concept" trials of Open Source Software (OSS) in a range of public bodies. This report, published by OGC in October 2004, summarizes the key findings from those activities and, to supplement the reports from the trials, also takes into account information obtained from other public sector activity in OSS planning and deployment in the UK and elsewhere in Europe.

**Why Open Source Software / Free Software (OSS/FS)? Look at the Numbers!**, Wheeler,

[http://www.dwheeler.com/oss\\_fs\\_why.html](http://www.dwheeler.com/oss_fs_why.html)

This paper provides quantitative data that show using open source software can be a superior approach to using their proprietary competition according to various measures. Also includes a section on Open Source in Government citing several case studies and research reports.

**Government initiatives regarding open source and their successes and failures**, Lindsay Bentz et al, Open Source Development and Documentation Project (OSDDP), October 2004

<http://osddp.org/node/186>

This paper provides information regarding various government open source initiatives, such as in Munich, India, Japan, South Korea, China, and Brazil.

## **Online Resources**

### ***IDABC - Open Source Observatory***

<http://europa.eu.int/idabc/en/chapter/452>

A section of the IDABC (Interoperable Delivery of European eGovernment Services to public Administrations, Businesses and Citizen) website is dedicated to open source software and is intended to encourage the spread and use of best practices in Europe. The site introduces the concepts of open source and presents news, reports, case studies for those interested in adopting open source software.

### ***CORE.gov – Component Organization & Registration Environment***

[www.core.gov](http://www.core.gov)

CORE.GOV, the Component Organization and Registration Environment is a government source for business process and technical components. The goal is to support cross-agency collaboration, transformation and government-wide improvement. CORE.GOV is the place to search for and locate a specific component that meets your needs, or to find components you can customize to meet your unique requirements. You can also recommend components for inclusion in CORE.GOV. Using the CollabNet SourceCast tool, CORE.GOV is a robust collaborative environment that organizes and maps the components in a variety of ways to make them easy to identify, discuss and develop.

### ***Government Open Code Collaborative***

[www.gocc.gov](http://www.gocc.gov)

The Government Open Code Collaborative is a voluntary collaboration between public sector entities and non-profit academic institutions created for the purpose of encouraging the sharing, at no cost, of computer code developed for and by government entities where the redistribution of this code is allowed. Please consult the documentation for more information.

### ***Open Source Software Institute***

<http://oss-institute.org/>

The Open Source Software Institute (OSSI) is a non-profit organization comprised of corporate, government and academic representatives whose mission is to promote the development and implementation of open-source software solutions within U.S. federal, state and municipal government agencies and academic entities.

### ***Center of Open Source & Government***

[www.egovos.org/](http://www.egovos.org/)

The center of open source & government is an independent group that works with governments around the world on open source policy & strategy. The web site provides a range of resources, white papers and case studies on open source software.

### ***Open Source Development & Documentation Project***

<http://osddp.org/>

Purdue University's Open Source Development and Documentation Project (OSDDP) seeks to assist with the development of open source projects in the global community by promoting greater awareness of open source applications, their uses, and their possibilities in education, government, business, and the non-profit sector.