

The IBM On Demand and Linux Value Proposition to the Public Sector

WHITE PAPER

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EXECUTIVE OVERVIEW

The federal government's affinity for open source software seems somewhat preordained. If not for the vision and contribution of agencies such as the National Security Agency (NSA), National Aeronautics and Space Administration (NASA), National Center for Supercomputing Applications (NCSA), and Defense Advanced Research Projects Agency (DARPA), most open source software programs would not have reached their current state of maturity.

Other public sector organizations in the United States and around the world have implemented and continue to implement Linux and other open source solutions to meet their needs. Three of these organizations are featured in case studies in this document: a city in Colorado; a county in Wales, United Kingdom; and the Italian federal senate. They show the ubiquity of On Demand and Linux usage around the world.

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Key Government IT Market Drivers

Before delving into the particulars of On Demand and Linux, we need to understand the key issues that drive government information technology (IT) spending today:

- **Government budgets are tightly constrained.** There is substantial pressure from the Office of Management and Budget (OMB) to reduce costs and consolidate IT systems. Events such as the wars in Iraq and Afghanistan and natural disasters such as Hurricanes Katrina and Rita have consumed government resources and made all government spending, including IT budgets, extremely tight.
- **Demands are increasing for improved government services.** Constituents are demanding better-performing and more reliable online interactions, effective handling of security threats, and better collaborative environments.
- **Accountability for compliance and efficiency is increasing.** Agencies must track and report on how they are complying with a variety of laws and government reporting structures, including those aimed at streamlining costs. Secure, reliable data sources are needed if these reports are to be reliable.
- **Emphasis on security continues, but with a requirement for improved accessibility.** A system can be made so secure that it fails to share data in a timely manner with those who need it most. A system is most valuable when it is both secure and quickly accessible to the right people.
- **Innovative buying models are being developed.** From packaged solutions to new pricing structures that reach across multiple levels of government, costs are being driven down while new higher expectations for performance are being set.

OPINION

IBM continues to be a major solution provider in the public sector marketplace. IBM's strategies relating to open source, Linux, and On Demand systems have been well-received among public sector organizations, and IBM should continue to have a strong government presence. IBM has integrated Linux as a key element in its On Demand computing infrastructure. Few industry sectors are as well-positioned as the public sector to benefit from Linux On Demand solutions.

Government organizations face business and technical decisions about the strategic use and alignment of IT at a time when infrastructure must be transformed to generate new services, improve efficiency, and safeguard the security and integrity of systems and data. Government executives confront serious challenges around the strategic use of IT, and Linux and On Demand solutions are already contributing to this transformation.

Government agencies and private sector companies are collaborating to make Linux even more secure. Building on the work done by the NSA, Trusted Computer Solutions Inc. (TCS) is working to establish the main pieces of Linux as a trusted operating system. This development is being done in conjunction with IBM and Red Hat.

Government organizational challenges vary, but two challenges are common and critical. The first hurdle is reducing the cost base of legacy IT while creating a connected organization. The second challenge is to securely expand access to end users through innovation, information visibility, and new services. Unlocking, exposing, and integrating information are critical, and the service oriented architecture (SOA) is the key.

To innovate and grow the public sector organization, the next generation of IT architecture must also link the processes of government agencies with those of other agencies and the private sector — citizens, suppliers, and partners. We already see a shift beginning from agencies simply providing data to the orientation of dynamic delivery of service and information. That's the essence of an On Demand strategy. Linux, as a popular vehicle for On Demand, delivers both savings through its efficiency and a way to migrate to an integrated organization.

Most government executives by nature are conservative. A few lead with technology, and the rest follow once they see demonstrable results and a clear path to implementation. The public sector is adopting open source in small steps. Both Linux and On Demand offer proven advantages when chosen with the proper care and understanding of how they fit within an organization.

The three case studies in this document illustrate how government organizations are leveraging On Demand, Linux, and IBM offerings to reach their goals. These case studies show the ability of Linux, On Demand, and the IBM support infrastructure to meet diverse needs.

The variety of public sector organizations is impressive. While the needs of town, cities, states, provinces, and federal government can be differentiated, some challenges and opportunities are similar. IDC's research indicates that IBM and its partners offer solutions applicable to most of these organizations.

Trusted Linux is a trusted operating system that is the response to the needs of and demands by government agencies for a secure, mainstream operating system to address system access and other security concerns. This response by open source technology providers heeds the government's call by using Linux as the platform for delivering a highly secure operating system to the marketplace. The value of Trusted Linux is that it provides the foundation to allow:

- Access to secure information across different domains — system to system, agency to agency
- Information sharing between different security levels without compromising protected data
- Transfer of information across domains using the security protocols required.

IBM On Demand and Linux Vision

IBM's On Demand approach is a structured go-to-market strategy developed with the public sector in mind, including local, state, and federal governments. The strategy positions IBM to assist the public sector in its pursuit of improved productivity, efficiency, security, and alignment of its resources with organizational strategies for constituency services.

With Linux integrated into its solution portfolio, IBM, for the first time in its history, can run a common operating system and deliver application portability across four architecturally diverse platforms. Even more important, Linux factors heavily into IBM's strategy to provide solutions and services that empower customers to flexibly configure, provision, and manage IT resources in response to specific government business needs and market opportunity. This strategy is an important part of IBM's stated On Demand vision, including its ongoing development of integration and infrastructure management tools.

IN THIS WHITE PAPER

This Government Insights White Paper reviews the trends in the public sector and examines IBM's On Demand and Linux offerings for the government sector. It describes their current utilization with specific examples, forecasts the future situation for this market, and lists the challenges and opportunities that IBM faces. The analysis considers the position and value proposition Linux offers and how they apply to IBM Systems architectures and IBM's extensive middleware offerings. It also examines how the value proposition is perceived by public sector customers.

INTRODUCTION

A combination of economic, geopolitical, strategic business, and technological influences is changing the relationships between IT and its users and between IT organizations and their suppliers. At the core of these changes are new IT architectures based on Internet standards and the new business relationships between the service users and providers leveraging these new architectures.

Many public sector IT service providers are migrating toward this next generation of system architectures that marks three broad business and technology influences: the industry's heritage, the drivers for change in government, and technology developments. Where these three paths cross, forces will produce a sea change on how IT solutions and systems are developed, sourced, acquired, and owned.

On the supplier side, the competitive struggle of hardware vendors for differentiation based on performance, operating system, or loyal following is interesting, but still evolving. Open source software is pushing the open standards stack ever higher, introducing commodities into areas that had been vendor differentiated just a short while ago. Instead of a barrier,

current technology is an affordable enabler and easily allows a much improved, common, and affordable platform. Meanwhile, IT organizations face several often-conflicting challenges: containing costs, managing increasing complexity, and dealing with rapidly changing demands. The chief information officer (CIO) of a government agency is responsible for two basic objectives: reducing operating costs by making the organization more efficient and increasing the opportunities for improved service by enabling improved organizational agility. The two are not mutually exclusive, but when budgets get tight, the costs of operating, maintaining, and adapting systems take priority and can squeeze the budget available for new software initiatives. Still, the drivers of integration, cost containment, and business agility make a strong case for an SOA that can be assembled and reassembled as organizational demands require.

What does Linux have to do with these sets of developments? For starters, the demand for return on investment (ROI), leveragability, and support for SOA can sometimes favor Linux. Numbers of government organizations are very interested in achieving these attributes. Linux provides flexibility for the future in a heterogeneous IT environment. In fact, some of the largest agencies in the world are now running elements of their mission-critical Internet infrastructures on Linux server farms.

WHAT IS IBM'S ON DEMAND INITIATIVE?

IBM Systems Hardware Support for an On Demand Operating Environment

IBM's stated goal is to design its systems around the core principles of collaboration, openness, and virtualization. IBM's hardware portfolio includes an array of discrete offerings. This portfolio was recently renamed and placed under the banner of IBM Systems (see Table 1) to reflect an enhanced focus on integration and collaborative processing.

TABLE 1

IBM Systems

"Old" Name	"New" Name
IBM eServer xSeries	IBM System x
IBM eServer BladeCenter	IBM BladeCenter
IBM eServer pSeries	IBM System p
IBM eServer iSeries	IBM System i
IBM eServer zSeries	IBM System z
IBM TotalStorage	IBM System Storage

Source: IDC, 2006

Additional information on the IBM Systems agenda can be found at www.ibm.com/systems/why.

On Demand is a comprehensive initiative that is central to IBM's business and technical strategies. As defined by IBM, On Demand has three key elements:

- Business transformation
- On Demand operating environment
- Flexible financial delivery options

IBM categorizes On Demand businesses as "enterprises whose business processes — integrated end-to-end across the company and with key partners, suppliers, and customers — can respond with flexibility and speed to any customer demand, service opportunity, or external threat."

The "Business" Value of On Demand in Government

IBM's On Demand initiative is both a business story and a technology story. The business story is one of business transformation. Its core goal is to empower businesses to become flexible, responsive organizations that can react to changes in market opportunities and shifts in customer behavior when and where they present themselves.

The corollary to the public sector is similar. Empowering an agency to become more flexible and responsive to react to the dynamics of its constituency is not that different from the private sector industry situation.

For example, technologies that are integrated with an information framework to aggregate data from thousands of contacts from multiple sources will enable higher levels of responsiveness and the ability to analyze performance and acquire knowledge that can lead to more effective and more profitable public service. Examples of technology that enhances the citizen experience and the ability to "serve and protect" are growing in both numbers and sophistication.

Meeting these "business" requirements is the intent of the technologies that constitute On Demand.

Linux Addresses the Needs of On Demand Public Sector Organizations

Enabling the public sector to more fully utilize the resources of its investments provides direct benefits. Dynamic provisioning gives agencies the ability to dynamically reassign existing system resources or deploy additional resources to applications or operating environment installations that require more capacity. However, dynamic provisioning capabilities are only one aspect of the operational benefit that On Demand can provide to customers.

IDC notes that the comprehensive implementation of Linux as a native operating system aboard all IBM Systems — System x, BladeCenter, System p, System i, and System z — makes it possible for Linux to connect today's Web-based applications with the existing application logic and databases that generally have been in place aboard these platforms for years. IBM's adoption of Linux is an integral component of its plan to create a comprehensive set of technologies to extend the business value of its server platforms, and it is one of many factors showing how IBM has embraced the movement to solutions based on open standards.

The emergence of the blades form factor has been a key technology driver of change in IT deployment within the public sector. Blade computing technology allows higher-density computing power, lower overall power consumption, and integration with networking and security options. IBM has implemented blade servers with the IBM BladeCenter, enabling a more complete "capacity On Demand" availability model. BladeCenter enables easier scale-out provisioning for an On Demand environment, which should appeal to many government organizations.

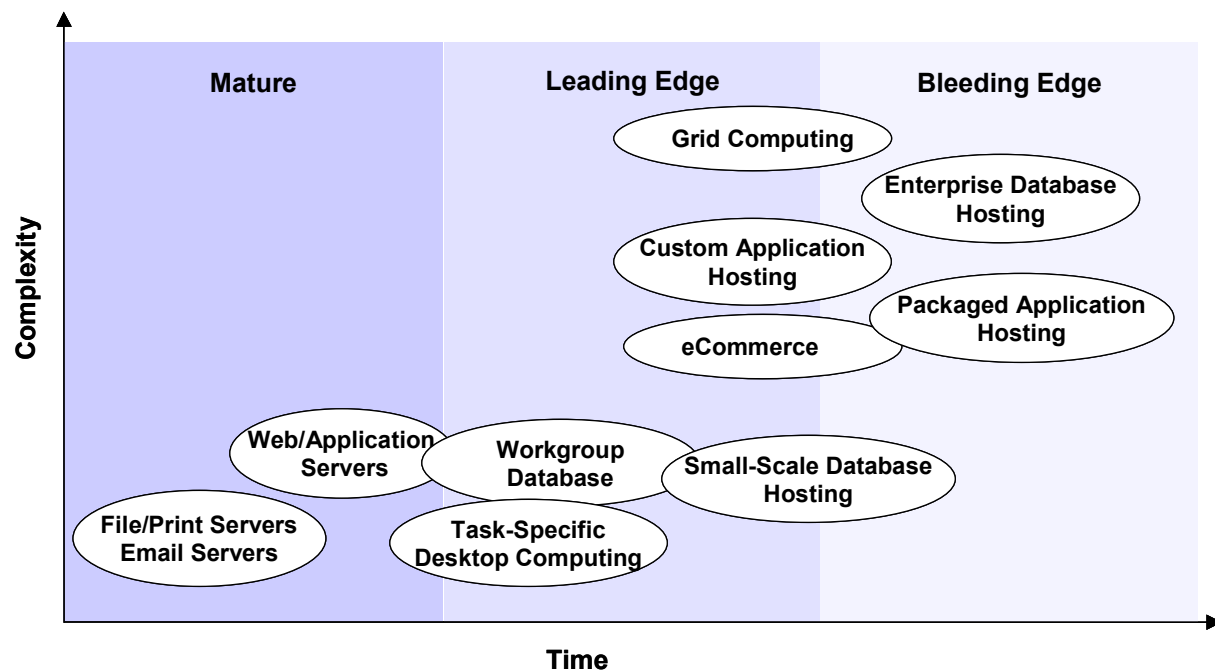
Linux Adoption in Government

The increasing adoption of Linux in the public sector (see Figure 1) is a shining example of the successful use of open source. Use of Linux is mature in low-impact workloads such as Web infrastructure support, email servers, and IT infrastructure. These types of workloads are typically "stateless," meaning that failure of any one server will not suspend data processing. Rather, incoming instructions will be redirected by workload balancing software to an operational server. This has been a low-risk way to test Linux within an organization, and Linux has passed the test.

On the leading edge are the applications, typically custom, that require heavy transaction processing, often on expensive Unix/RISC-based hardware. Because of the design of the Linux kernel, and especially the most recent 64-bit version of Linux, quick database searches and heavy computing can be very efficient using clustering and workload-balancing of small Linux servers. These same properties also aid in making Linux a major competitor in supporting grid computing. Grid computing harnesses the processing power of many smaller commodity servers, such as those based on Intel's x86 processor family and those based on AMD's Opteron microprocessor. In past years, grid computing has moved from bleeding edge to leading edge in the public sector. Finally, bleeding-edge applications are slowly moving to Linux, depending mostly on the pace and enthusiasm of vendors to port their applications to it.

FIGURE 1

Linux Adoption in the Public Sector



Source: IDC, 2006

Linux in Government: Integrating a Multichannel World

Agencies are adopting open source code in incremental steps. The Linux operating system is the most commonly used element of all the open source software that is available today. Enough Linux and open source success stories, including more than a handful from public sector, now exist that agencies are developing open source policies internally and moving beyond low-end applications, such as print servers and application development. In 2004 and 2005, we began to see a broader variety of critical business applications running on Linux.

Government Datacenters Are Increasingly Willing to Move Applications to Linux

At the federal level, the U.S. Census Bureau has recently enabled a series of Linux blade servers and is moving toward using the system as a shared utility pool for application processing. The U.S. Geological Survey also runs multiple databases on Linux, feeding into applications that run on a variety of platforms, including Linux. And within the U.S. Department of Defense (DoD), dozens of highly customized applications run on Linux, including some that are at the front lines of battle.

For example, in the public sector, the multichannel world (e.g., field office platform/citizen call center, Internet, self-service kiosk) is now beginning to venture out of pilot-project status with Linux moving into the real world. We expect to see both large and medium-sized public sector organizations rolling out and signing off on Linux-based implementations across hundreds, and ultimately thousands, of locations. These implementations can include both Linux-based servers and desktops.

Government organizations expect to realize a shopping basket of business benefits from ambitious Linux-based implementations. Execution excellence will no doubt determine the successful implementations. We expect that a number of public sector organizations worldwide will use Linux in ways that make an important contribution to their budget efficiency. Agencies curious about, or even contemplating, the role of Linux in their organizations should step back and look at the strategic drivers for their group and IT. In many cases, Linux is a viable alternative environment to support these strategic drivers.

Linux in Government: Leading an Open Source Migration

For the public sector, the impact of open source software has been increasing. The limited use of Apache Hypertext Transfer Protocol (HTTP) Web server software, PHP: Hypertext Preprocessor for fast application development, and the Linux OS running a few smaller-scale custom applications is changing. Major public sector organizations such as the Department of Defense are using open source applications for mission-critical applications.

IBM is positioning Linux to support a number of public sector solution areas, including:

- Workload consolidation
- High-performance computing solutions (clusters)
- Government business intelligence (BI)
- Large-scale datacenters
- Point-of-service (POS) kiosks and devices for the public sector
- Supply chain management and planning for the military
- Purchasing and procurement for government acquisition managers
- Content management for government information

The state of Utah is moving into a new era of centralized IT management and large-scale system consolidation and virtualization of services. It's using IBM hardware and Linux in many of its installations. By redefining and upgrading network services, Utah has saved about \$7 million on a budget of over \$50 million. The state also has consolidated multiple email servers down to just one cluster of servers, which serves all state employees.

- Transportation
- Logistics planning
- Government field office infrastructure
- Warehouse management
- Office operations

The cost-conscious public sector sees open source as a way to redeploy old hardware while avoiding lock-in with specific vendors and license fees.

While open source applications are available for both desktop and server deployment, most applications within government have focused on the use of Linux and open source software on the server side. A few organizations are installing desktop Linux systems, with sporadic deployment in situations where Microsoft Office applications are less prevalent.

Linux in the Public Sector: Moving to Mission-Critical Applications

Civil servants around the world rely on the movement of information. Organizations that can create, move, or act on information faster have an advantage, especially if they are security-related organizations. Public sector IT shops are therefore always looking at how technology can provide information faster to help them improve organizational efficiencies. The public sector has been on the leading edge of Linux and open source usage. The public sector and universities working under government grants lead this effort. They were spurred by the need to maintain a technology edge while reducing the cost of that technology. The public sector continues to be in the vanguard of implementing Linux in new places, including moving mission-critical applications to the Linux operating system.

Early Linux implementations often focused on replacing proprietary Unix client/server applications with Linux-based commodity servers. A number of these applications were high-volume and low-processing requirements that were considered ideal for Linux. Firms that moved these high-volume, low-complexity applications from Unix onto Linux reported a short-term return on investment consisting mostly of decreased hardware expenses.

The public sector and its contractor infrastructure also rely on technology for analytical tools that inform agencies and other information-hungry users about such things as security risks, payment processing, licensing and grant applications, and field data collection. Because of the size and number of iterations that many of these calculations require, computations often had to wait until the end of the day. Results were produced several hours later and sometimes not until after the start of the following day or even the following week or month. This limited the value-added tools that public sector organizations needed in order to provide timely and top-level service to their citizens.

A limited number of large organizations are either using or examining the possible use of Linux to construct new, grid-computing architectures. By using current networking technologies and virtualization tools, grid computing has significantly decreased the completion time of the many highly iterative calculations that are required by agencies.

As more successes are reported, we expect more agencies to implement Linux-based grids for their more analytical and processor-intense systems. Agencies that have grids will soon start to expand them, not just in size (by adding more servers and CPUs) but also by having more applications reside on the grid. A large percentage of these grids will be based on Linux.

Linux in Government: Dynamic Solutions for Organizations in Transition

The public sector is coming under escalating pressures. With changing demographics, increasingly complex security and privacy requirements, organizational realignments, and, in many cases, an aging and inefficient technological infrastructure, many public sector organizations are facing a sea change in their current modes of operation.

High-performing public sector operations have some common characteristics:

- A differentiating value proposition via new service offerings, increased and more personal interactions, and quicker reactions to the dynamics of our world
- Operational excellence through an increased focus on productivity and cost controls
- Financial controls that are timely, appropriate for internal and external requirements, and quickly adapted to the demand for change
- Proper alignment and balance of the preceding three characteristics to meet organizational demands

Several publications have written about reacting to the pressures of change. Government organizations have always handled this pressure, but today's world places additional strain, not only by the increased number of changes required but also by the pressure to make the change in a reduced time frame. The pressure to change, the pressure to change quickly, and the pressure to be productive and efficient all combine to produce a need for new approaches. One approach has been to expand the technology foundation of the IT infrastructure. A growing number of organizations are including Linux and On Demand from IBM in their technology foundations.

Public sector use of Linux parallels its use in other segments of industry: first replacing Unix client/server applications, then moving toward enhancing the support infrastructure and using Linux in more mission-critical applications as it gains "industrial strength."

A datacenter manager working for Miami-Dade County offered the following advice with regard to consolidating systems on new platforms: "You need to be well-socialized within your organization. You have to have your stakeholders on board to make it work." He said that government IT managers also need to work with a good system architect right from the start to build a reliable and expandable services structure.

IBM promotes a phased approach: gain insight into the core processes or building blocks, develop an architecture around key processes, and then invest in the processes that can provide the best return. IBM Global Services takes this phased approach, which is both holistic and focused on components. By addressing the strategic vision and tactical implementations, On Demand has proven that it can provide value to a number of organizations.

Linux and On Demand continue to be important parts of IBM's offerings to the government market. Solutions tailored to individual agencies address core needs such as administration and finance, social services' delivery, internal and internal agency collaboration and connectivity, e-government citizen access, consolidated and shared resources, public safety, records management, regulatory compliance and licensing, court systems, taxation processes, infrastructure maintenance and repair, and postal services.

Beyond these core needs, IBM is working with its partners to assist their efforts to serve the public sector around the world. An example of this type of cooperation is the IBM collaboration on Linux for highly secure government environments. The work under way will make Linux a trusted operating system. The debut of Linux as a trusted operating system will move open source trusted OS solutions into mainstream and cost-effective solutions for government users. The NSA was the main catalyst behind this development, and IBM, Red Hat, and Trusted Computer Solutions are working together to put Trusted Linux on the fast track. The value of Trusted Linux is that it provides access to secure information across different domains, information sharing between different security levels without compromising protected data, and transfer of information across domains using required security protocols. Implementation results may vary by organization, but federal, state, and local government IT managers may find this open source offering a friendly and affordable solution for their secure system needs.

IBM INFRASTRUCTURE FOR GOVERNMENT

IBM is not a newcomer to the public sector marketplace and brings a wealth of experience and expertise to the table. In addition, it has an enviable infrastructure to support its efforts:

- Industry Solution Labs in the United States and Switzerland provide industry-specific demonstrations, presentations, and insights from IBM research scientists and industry specialists.
- IBM Center for The Business of Government in Washington, D.C., is dedicated to providing cutting-edge knowledge to government leaders around the world. By stimulating research and facilitating discussion around new approaches, the center encourages improvements and effectiveness across the public sector — central and federal, state and province, and local government. Additional information can be found at www.businessofgovernment.org. IBM categories of government coverage include:

- Cross-government
- Customs, ports, and border management
- Defense: network-centric operations
- Postal
- Finance and taxation
- Safety and security
- Social services and social security
- The Institute for Business Value, part of the IBM Global Business Services division, has a worldwide presence, drawing on consultants in nine countries to identify issues of global interest and to develop practical recommendations with local relevance. The IBM Institute for Business Value (www.ibm.com/iibv) provides strategic insights and recommendations that address critical business challenges and capitalize on new opportunities. IBM works in collaboration with industry experts, leading-edge clients, and its own field practitioners to provide practical recommendations built on a foundation of fundamental research. IBM's research helps senior executives:
 - Anticipate changes in their industries
 - Prioritize strategic and operational alternatives for action
 - Formulate road maps for change initiatives
 - Determine the best metrics for measuring success
 - Quantify the expected return on their investments
- Global Solution Centers in the United States and France offer workshops, design, prototyping, and demonstrations around On Demand, contact center architecture, and the array of products and services that IBM offers to meet ebusiness requirements.
- Linux Centers of Competency in New York and London offer Linux education, porting facilities, and a demonstration environment to customers, ISVs, and business partners.
- Centers for IBM e-Business Innovation in the United States, Canada, Germany, Spain, Italy, Australia, and Japan provide access to communities of expertise on business strategy, marketing, interactive design, application development, and systems integration. These communities consist of IBM personnel and IBM's extensive partner network. The centers feature line-of-sight product solutions to meet today's needs and over-the-horizon views into the future that include digital video surveillance, wearable computers, mobile workforce enablement, smart cards, digital media, and digital asset management.

CHALLENGES/OPPORTUNITIES

IBM's commitment to Linux is not without its challenges. Elements of its initiative take the company into niche opportunities that may be far enough outside the Linux mainstream that IBM may find itself fighting an uphill battle for market and mindshare. Some possible challenges include:

- **Non-x86 platform solutions.** While IBM's System x and BladeCenter products clearly have the mainstream Linux-on-Intel market well-covered, Linux solutions on IBM System p, System i, and System z platforms are less mainstream. J2EE-based applications deployed aboard these platforms will likely be less problematic, but Linux applications accessing native APIs require at least a recompile and potentially a more comprehensive porting operation to function properly. IBM's Chiphopper program (IBM Systems Application Advantage for Linux) is available to simplify and accelerate this process for ISVs and developers.
- **32-bit versus 64-bit environments.** A corollary to the non-Intel platform issue is the gap between 32- and 64-bit environments. Intel platforms have traditionally been primarily 32-bit solutions, while System p, System i, and System z solutions are 64-bit platforms that offer 32-bit compatibility. This gap, however, is closing due to the availability of dual-core 64-bit x86 processors from both Intel and AMD.
- **Continued support from ISVs.** For IBM's strategy to continue to succeed and expand, the company requires continued support from vendors of infrastructure software and applications. In particular, System z and System i platforms would present a more attractive option to ISV solution providers currently targeting System x (and other x86/x86-extended platforms) if the complete portfolio of key Linux infrastructure software products were available on the high-end systems.
- **Bringing ISVs to Linux and grid.** ISVs have been rather slow in implementing Linux and grid solutions. Most do not want to use sparse resources on projects that may have only a limited return. The majority of ISVs that have implemented Linux and grid solutions have done so at the request of a client, with the client offering resource support. To spur on ISVs, IBM will have to not just solicit ISVs but also help port their applications to Linux and grid enable them as well.

CONCLUSION

IBM's strategy for integrating Linux and its IBM Systems hardware into its grid-enabled On Demand infrastructure is bold and comprehensive. It offers a tremendous potential value for existing customers, including those in the public sector. The value proposition has the potential to be strong for both noncustomers and customers who wish to use one of these platforms for consolidation purposes.

Ultimately, IBM has even more riding on the success of this initiative. The long-term health of IBM's non-Intel platforms depends in no small way on Linux for the applications that may well make up the next-generation deployments.

We believe that IBM has done a good job building out the software stack aboard its platform portfolio, but the next challenge remains significant: to drive more ISV support on System z, System i, and System p platforms. We believe that IBM has the resources to continue to drive this issue toward resolution, and we expect to see IBM move methodically toward this goal over the next year or two.

CASE STUDIES

Case Study Methodology

IDC conducted telephone interviews with a selection of IBM public sector customers from around the world. These customers were identified by IBM. IDC developed a standard interview guide to facilitate the exploration of the customers' views and their real-world experiences.

Overview of the Case Studies: City of Fort Collins, Colorado; Powys County, Wales; and the Italian Senate

Although the city of Fort Collins in the United States, the county of Powys in Wales, and the Senato della Repubblica in Italy are all part of the public sector market, they are widely different in terms of the constituencies that they serve and the needs that they must meet. Yet these public sector organizations have found common ground in their long-term migrations to Linux-based servers. All highlight the cost savings and operational efficiencies that governments can achieve by making such a switch. Along the way, they have made significant use of IBM On Demand technologies.

The midsize city of Fort Collins, Colorado, has built a reputation to envy when it comes to IT management and service to its citizens. In 2004, the city took top honors in the Center for Digital Government's Best of the Web competition (besting larger city portal sites such as New York City, Chicago, and New Orleans). User friendliness and breadth of available information (over 1 million document pages) were the deciding factors. And with over 80% of the city's residents online, Fort Collins' site, **www.fcgov.com**, has become the preferred place for conducting most government-to-citizen interactions, according to a city-sponsored survey.

Fort Collins is also an interesting case study in how Linux systems can be used to cut IT costs and boost reliability. System managers have replaced a number of different platforms with Linux-based platforms, enjoying a significant savings along the way.

Powys County, on the other hand, has built its reputation on reaching out to a far-flung population. It's a large and very rural area within Wales, covering about 2,000 square miles, with a population of 129,300. (That averages to just one person for every 10 acres.) But it's also a recognized leader in its realm, winning a UK Linux Award in 2005 for its cost-effective and sustainable IT solutions for schools.

In federal government, the Senato della Repubblica is meeting the challenges to become even more integrated, evolve its existing applications and infrastructure, and protect its systems with enhanced security. Meeting these needs in a cost-efficient manner led the Senato to an IBM implementation.

Local Government IT on the Linux Forefront

In Powys, the IT department has a long-term interest in open source solutions. The county first started using Linux in 1995 and has steadily moved in that direction ever since. The county now maintains 150 servers that run Linux. It provides Internet and intranet Web services for both schools and government offices, email services, DNS, LDAP directory functions, database services, and a variety of "network appliance" roles. The county government itself includes 73 elected officials and 7,000 staffers who handle everything from financial management to roads, to schools, to waste management.

The Fort Collins IT department oversees all computer information systems, telecommunications, and cable and video production. The IT department also manages systems for 1,500 employees (1,200 desktop systems) plus all online interactions for over 126,000 local citizens.

City and County Web Services

Fort Collins' Web portal receives 3 to 4 million hits each month. Several Web applications were created for the **fcgov.com** site. They range from a West Nile virus reporting and notification system to "virtual town hall" areas with notices of proposed laws and sections for citizen comments and questions. The portal also provides ecommerce Web access to city documents and building permits. It operates several Linux servers, including a large IBM server that will soon host additional applications.

Powys County uses its Linux servers to deliver secure Web-based applications for activities such as downloading and submitting license applications, accepting citizen tax and license payments, and applying for government contracts. The county uses IBM technologies not only on the server side but also for remote desktop management and for software deployment to remote machines.

Federal Legislator Services

The Senato della Repubblica serves the needs of legislators, their staffs, and specialized commissions. It provides support for these dynamic needs in a context of increased complexity, a demand for cost-efficiency, growing concerns about security, and a growing set of access technologies.

Emerging Issues and Current IT Challenges in the Local Government Sector

IT managers for Fort Collins, Powys County, and the Senato della Repubblica indicated that the following issues have significantly impacted their operations and their budgeting decisions.

- **Increased demand for online citizen access to government services and documents.** In the case of Fort Collins, this need has been met for most information. Next year the city will launch a transaction processing gateway so that most fees for licensing or special purchases can be made via the city government portal. Powys installed a powerful open source content management system to meet the demand for access to government information. The Italian senators and their staffs are outside their offices and must maintain a lifeline to the information needed to meet citizens' needs.
- **Significant budget cuts to many departments, including the IT department.** Fort Collins Senior Web Architect Jim Thome said that budget cuts can sometimes be a blessing in disguise because they prompt IT managers to think of ways to trim the total long-term costs of ownership for their systems.
- **Consolidation of infrastructure.** This issue is related to the first two points. To maximize ROI while avoiding "server proliferation," many cities are consolidating servers, eliminating redundant applications, moving toward open systems, and streamlining software licenses. When servers are consolidated and moved to Linux, Fort Collins saves 60% to 70% on the total cost of ownership (TCO) of the servers. The Senato della Repubblica has seen applications that required a half-dozen servers to be consolidated down to one server with the associated savings in hardware, software, and system management.
- **Migration from silo-style standalone systems to integrated systems.** These systems are capable of sharing data across multiple platforms, which ultimately helps reduce data entry and ensures consistency of data for all government offices.
- **Security and data access.** As the number of Web-based applications increases, government managers find an associated need for better data access, security, integrity of data and systems, and privacy (citizens). There is also a strong need for disaster recovery plans. Most government IT managers consider disaster recovery a top priority, according to IDC research. Thome of the Fort Collins IT department said, "Don't ever launch an application and then worry about security. Security comes first. Everything else is second."

- **Reducing complexity.** There is a growing issue with government IT system complexity due to the diversity of platforms, software, and networks. Many governments have a need for self-monitoring and self-managing systems, which are self-healing based on a configurable set of rules. They also need an On Demand computing infrastructure with reliable, scalable availability. Ultimately this streamlining helps improve worker productivity. For example, the Powys County Council worked with IBM and IBM Business Partner Elyzium to implement a remote systems management solution that reduced staffing and travel costs.
- **Availability of a skilled workforce.** Questions have been raised in some government sectors about the shrinking numbers of available experts available for hire combined with the organizational demands to do more with less. But government IT departments that have standardized on modern, well-supported solutions seem to find this to be a moot point.
- **Mobility solutions.** The growing number of distributed/mobile/remote users is a problem for many cities. Today, only about 5% of Fort Collins' workforce uses laptop computers. But in other cities, mobility solutions and security have become key issues. With the rise of metropolitan area mesh networks and a mobile workforce (e.g., city inspectors who spend much of the time in the field), the need to grant access to applications from outside the firewall increases the need for strong authentication tools, such as tokens. Such access also helps increase worker productivity.

In summary, the top four IT issues between these three public sector organizations are:

- The desire to handle the complexities of upgrading, integrating, and enhancing legacy applications and infrastructure
- The need to increase productivity
- The ability to handle complexity of integration and operations while ultimately reducing that complexity
- Pressure to control IT system costs

These issues are the key drivers of future application and infrastructure development. Thome said that his office is committed to creating a more open and standards-based architecture that has a Web component for all future IT projects. Future applications will share common data formats and data models that will greatly reduce reliance on custom-developed legacy applications and facilitate vendor independence when developing new solutions.

One of the public sector IT executives interviewed said he specifically sought a partner who understands that open source solutions are credible for government IT shops. He chose IBM, he said, because of the company's understanding and experience in implementing open source solutions.

City of Fort Collins

Why the City of Fort Collins Web-based Solutions Run on an IBM Platform

According to Fort Collins Senior Web Architect Jim Thome, the city views IBM's On Demand offering as a way to acquire a Linux solution that suits its specific business process.

The Fort Collins IT department has been slowly migrating multiple Web servers away from older Unix servers. Three years ago nearly all servers were Unix. Now about 75% of the city's Web/database/name servers are running Linux.

Fort Collins' largest server is an IBM eServer/xSeries 346, which will serve as the staging server for the city's public Web site, as well as the Web host for several business-critical Web applications. It runs SUSE Enterprise Linux with Zend Core for Oracle.

Other technologies include:

- MySQL for content management
- Oracle database for ecommerce and storage of customer/citizen information
- WebSphere for the city's JD Edwards ERP package, which is currently supported through Oracle
- Zend Core for Oracle, a technology stack that supports business processes via PHP for mission-critical Web applications
- A document management system called SIRE, supported by SIRE Technologies (formerly AlphaCorp), that stores public records (It has an associated Web-based view called CityDocs, which was written by Thome.)
- An existing storage area network (SAN) (In the near future, Fort Collins will add more servers to use that storage.)

IBM-Linux solutions are being used for two areas of the IT architecture:

- Improvement of system management and access to city services
- Future reduction in the total number of servers

Three key issues drove the city's Linux system migration project:

- The cost of Linux servers and operating system licenses
- Ease of use in getting the machines running (compared with other Linux systems) and keeping them running (This includes a limited need for reporting and monitoring for each machine.)
- Need to reduce costs (Thome estimates between \$120,000 and \$150,000 in savings thus far.)

Fort Collins has realized the following benefits:

- Ability to reduce some major pain points (It is now easier for the city to ensure data quality and availability.)
- Powerful new application called CityDocs, which allows internal and external users to search across multiple archives of city documents, from inspection reports to subdivision plats, ordinances, and more

Fort Collins has realized the following savings:

- Since all RFPs and bid submissions were moved online, annual printing and mailing costs were reduced by approximately \$8,000.

Powys County

Why the Powys County Web-based Applications and System Management Solutions Run on an IBM Platform

According to IT Policy and Planning Manager Nick Talbott, Powys County considers IBM's On Demand offering a way to trim overall system software costs while boosting employee and student service levels, specifically when it comes to managing servers and desktop systems in the 200-plus sites on the county network.

The county network has approximately 5,000 desktop computers and approximately 200 servers running a variety of software applications. The IBM solution allows the council's IT staff to remotely manage, monitor, and service the IT infrastructure from a centralized location.

The system includes:

- **IBM Tivoli intelligent management software and the IBM Red Hat Enterprise Linux V2.1 operating system** allow support technicians to centrally perform routine maintenance activities and monitor systems disruptions and repairs. IBM helped design the solution architecture and helped implement the solution, which includes:
 - IBM Tivoli Configuration Manager V4.2.1
 - IBM Tivoli Remote Control V3.8
 - IBM Tivoli Enterprise Console V3.9
 - IBM Tivoli NetView V7.1.4 software
- **Slackware Linux** is the main Linux implementation on most county machines.
- **MySQL database server** is used to support Web applications. Connection is via JDBC, ODBC, or native applications for Windows and Linux clients.

- **Samba and the Mars NetWare emulator** provide file and print sharing services for desktop systems. This gives Windows clients point-and-click access to files on servers.
- **Exim mail server** is an open source mail system from the University of Cambridge in the United Kingdom.
- **OpenLDAP directory server** is used for maintaining school email directories, synchronizing information from over 100 separately administered school email systems.
- **TYPO3 content management system** is used as the platform for the county's public Web sites and intranet.

Powys County Benefits and Savings

IT managers selected the IBM solution to achieve "optimized service delivery costs and improved service levels." By enabling remote problem diagnosis and resolution, it will also help the council improve the speed and quality of its service delivery while reducing its operational costs.

The Linux and Open Source Benefit

Together, these two municipalities show the benefits that can be gained by focusing on open source solutions. In Fort Collins' case, there is a significant long-term migration toward Linux service. In Powys County's case, there is a larger commitment to multiple open source solutions and to remotely support all machines across the county. IBM has proven to be a key partner for both, as they continue to meet the challenges of On Demand government business.

Senato della Repubblica

The Senato della Repubblica is one of the two chambers of the Italian parliament. It includes 315 senators that exercise legislative power with the Camera dei Deputati, which has 630 members. Besides 315 elected senators, the Senato has life-appointed senators, of which there are currently five; former presidents of the republic are by law part of this group.

The Senato is elected every five years by citizens above 25 years of age, and its members must be at least 40 years old.

The organization of the Senato encompasses the main assembly, the president, the council of the president, 14 commissions, and all administrative offices.

The IT Department

The IT department has a staff of 65 supplemented by consultants who are hired on a contract basis for specific projects. The department is led by Doctor Michele Pandolfelli.

Emerging Issues and Current IT Challenges in the Government Sector

Various issues have emerged either specifically in the government sector or from the overall marketplace. The top 3 issues that the IT department of the Senato faces at the moment are:

- The need to handle complex integration and operations
- The need to upgrade and enhance legacy applications and infrastructure
- The need to provide higher levels of security and integrity

The need to handle complex integration and the need to upgrade existing applications and infrastructure will be key drivers of future development; in fact, the Senato aims at progressively creating a more open architecture based on common data format and data models that reduce reliance on custom-developed legacy applications and enable vendor independence when developing new solutions.

IBM On Demand and Why the Senato Chose IBM Solutions

The Senato IT department has some knowledge of the IBM On Demand offering and identifies it as "the set of methodologies, processes and instruments that support efficiently the dynamic demand for IT services." The Senato's IT staff reckons that it is at a pilot stage in using On Demand methodologies and at the moment is not aware of other vendors with similar value propositions.

How Does the Senato Use IBM On Demand Linux Solutions, and What Are the Achieved Benefits?

The Senato has a complex infrastructure that includes a variety of hardware and software components:

- IBM xSeries 445 servers
- EMC storage devices
- Red Hat Linux operating system for servers
- Microsoft operating systems for clients
- VMware virtualization software
- WebSphere for some integration middleware tasks
- IBM Lotus as the main engine for email and groupware
- Some Tivoli components for very specific functionalities

IBM-Linux solutions are used for two areas of the IT architecture:

- A combination of Linux and Apache is used for the new Senato Web site, which was launched approximately one year ago. This architecture will be used to develop a key project: the implementation of internal portals to provide senators with specific functionalities and information from the intranet or through mobile access.
- IBM xSeries 445, Linux, and VMware virtualization software are being used for a server consolidation project. The server consolidation project has three key objectives:
 - Reduction of the number of machines by 70%
 - Improvement of system management — for instance, through streamlined patch management
 - Improvement of security

The launch of the server consolidation project was driven by three key issues:

- The need to optimize internal system management processes
- The need to standardize the solution on an open standard platform that enables vendor-independent developments
- The need to reduce costs

Two years into the project, the Senato's IT department is seeing the first benefits of the server consolidation initiative in terms of lower total cost of ownership/productivity — the new architecture enables one machine to manage the workload that was previously handled by six or seven servers — and manageability of the system.

Notwithstanding the benefits that the Senato is experiencing, there was a drawback in the implementation. The IBM-Linux server consolidation solution turned out to be difficult to integrate with crucial security applications, such as the authentication systems. The Senato's IT department is currently working with IBM — also by applying some additional Tivoli technologies — to ensure integration between IBM Directory Services, Domino, and Microsoft Active Directory. The Senato's IT department would have recommended a more integrated approach from the beginning in the project definition and assessment phase to avoid major changes when end users are already getting into the system — "You don't want things to change when they are already in the hands of the senators. You know they are not yet very sophisticated IT users," said Franco Guelfi, chief information officer.

APPENDIX

How Linux Enables IBM's On Demand Vision

IBM's strategy of supporting each of its discrete IBM Systems platforms has long been positioned as a strength, while competitors have maintained that this strategy represents a weakness. IDC believes there is truth in both perspectives.

Combining Linux with IBM's endorsement of J2EE as the platform for next-generation applications and the support for SOA — led by IBM's WebSphere product line — offers customers extraordinary flexibility for application development, deployment, and runtime execution. IBM's On Demand intentions go beyond an operating system strategy. IBM's vision calls for the integration not only of application environments but also across users, data, and workspaces.

The Role of Linux

Linux clearly plays a starring role in IBM's play to build an On Demand vision. The availability of Linux as a native operating system aboard all of its IBM Systems platforms offers a number of benefits:

- **Deployability and manageability by existing platforms.** Linux environments can be deployed and managed with resource allocation provided by either the hypervisor layer or a combination of the hypervisor and the host operating system on System z, System i, and System p. Aboard System x and BladeCenter systems, other management software tools provided by IBM perform the deployment and management.
- **Ability to participate in clusters and external grids.** The presence of Linux as a native environment aboard IBM's platforms allows those platforms to increasingly participate in external clusters and grids that may include systems other than IBM hardware but that support Linux operating environments.
- **Enabler of next-generation applications.** With few college graduates entering the job market with strong programming skills in RPG, COBOL, and other legacy languages, it becomes increasingly important to offer environments that support modern applications without major rewrites.
- **Standardization of tools and utilities to support each environment.** With a common operating system environment such as Linux, the development of related technologies such as middleware, transaction processors, and management tools can be more common across each environment. While it is unlikely that such products would become completely identical, maintaining different versions for Linux on multiple platforms is far less challenging than maintaining technologies that run natively aboard z/OS and OS/390, OS/400, AIX, and Windows.

- **A common interface to the outside world.** Another key benefit of using Linux as the common denominator on IBM's platforms is its ability to support applications developed not for IBM, but for Linux aboard IBM's platforms. No longer will ISVs be forced to become experts on multiple operating systems to reach customers of that platform. Instead, supporting a Linux solution potentially extends an ISV's reach to IBM's entire customer base.

IBM's Software Strategy for Linux

IBM has embraced Linux as if it were one of its internally developed operating system products. IBM's software portfolio is designed to help customers implement an On Demand operating environment. As a result, products originating from DB2, Lotus, Rational, Tivoli, and WebSphere, which includes the developer tools group, are all available for Linux. For customers, this means that the entire IBM software stack is available for and fully supported on Linux.

The strategy to grow the Linux "ecosystem" begins with IBM's partner programs and its tool offerings. The company has a multipronged strategy to reach all levels of the market. At the top tier, IBM is focusing on the largest ISV partners. Vendors in this category get direct assistance from IBM with the placing of their solutions into user organizations. At the next level, IBM is working with ISV partners to deliver the applications that customers need aboard Linux systems. At the third tier, IBM works with corporate Linux developers to integrate and utilize IBM's infrastructure software products in their internal development.

Future Outlook

Linux is reaching maturity in the public and private sectors. No longer are just the leading-edge organizations using it. Organizations are taking Linux out of the lab and putting it out front in mission-critical applications. Even smaller local governments have implemented or are testing Linux in R&D settings. Any organization that wants to decrease technology expenses is using it somewhere in its operation. Leading-edge public sector organizations are now using Linux for the underlying operating systems for grid computing and application hosting. We expect both of these areas will grow over the next several years.

IDC's projections call for paid new Linux server operating environment license shipments to show a 2004–2009 compound annual growth rate (CAGR) of 18.4%. In parallel with this increase, the shift toward "enterprise" Linux distributions will have a positive effect on the average selling prices of Linux server operating environments and will help drive Linux operating system revenue generation upward.

By 2009, IDC projects that there will be 1.7 million paid new Linux server operating environments being shipped each year, versus the current rate of .873 million per year.

Another trend that will continue to accelerate Linux deployments is the focus of large systems vendors, including IBM, HP, and Sun, on its promotion. IBM, in particular, has a vested interest in seeing Linux prosper: Linux solves challenges that IBM must resolve to ensure the long-term health of its business. IBM and other large players are critical to the survival and growth of Linux, given their enormous marketing resources. Independent Linux vendors such as Red Hat have comparatively limited reach.

IDC expects the pool of IT professionals with Linux skills to increase substantially during the forecast period. Professionals in Unix environments can easily make the transition to Linux, which is built on a similar — but not identical — kernel. In addition, Linux usage is widespread on college campuses. The increasing availability of Linux skills will help to drive down deployment and maintenance costs and, therefore, alleviate concerns around long-term TCO and support issues.

IBM's position within the Linux market is multifaceted. The company is competing for a piece of the commodity 32-bit Intel x86 and AMD x86-compatible markets while it vies for the higher margin and larger footprint of Linux on 64-bit—extended x86 processors from AMD and Intel within the IBM Systems family. At the high end, IBM has delivered powerful and scalable 64-bit Linux solutions built on System p and System i systems on the POWER processors, as well as aboard System z hardware.

We believe IBM is well-positioned to capitalize on the larger system configurations. Furthermore, given IBM's large ISV partner community and its ability to motivate that community to support the company's platforms, it is reasonable to believe that the availability of applications, particularly those specific to verticals of significant interest to IBM's Linux initiative (including government, retail, and financial services), will increase at a healthy pace.

The On Demand Operating Environment

The goals for On Demand are business flexibility and IT simplification. To build out IBM's vision for an On Demand operating environment requires an orchestrated collection of hardware systems, software enablers (including operating system software), virtual machine and hypervisor technology, and application environments designed for deployment both on the host operating systems and aboard J2EE environments. These elements are all connected by a service oriented architecture.

The Components of the On Demand Operating Environment

IBM has incorporated three key themes into its concept and implementation of an On Demand operating environment: use of open industry standards; integration of people, processes, and information; and infrastructure management.

- **Open industry standards.** IBM has embraced both de facto and formal standards, including many of those used to construct Web services, such as J2EE, XML, Simple Object Access Protocol (SOAP), and Apache. The company has actively participated in community processes for Linux and other industry initiatives.
- **Integration: people, processes, and information.** IBM's strategy cites three key elements that need integration to achieve its On Demand vision. The company describes the role of Linux as an enabling technology that helps to tie together people, processes, and information in a seamless manner.
- **Infrastructure management.** IBM's infrastructure management aims to reduce the complexity and to simplify the management of an IT infrastructure while aligning it with business goals. IBM describes infrastructure management as a set of capabilities: availability, security, optimization, provisioning, infrastructure orchestration, business service management, and resource virtualization. These capabilities can ensure the most efficient utilization of IT resources; provide business continuity through reliability, availability, privacy, and security; and enable organizations to quickly and more efficiently execute core business processes.

IBM's Software and Systems Portfolio for Linux

The IBM software and systems portfolio for Linux illustrates just how seriously the company views the Linux opportunity. IBM's aim with its software portfolio on Linux is to provide an open and comprehensive platform enabling the easy integration, deployment, development, and management of applications across heterogeneous server and storage environments that will result in lower costs and higher performance.

IBM has full product support for Linux on the IBM Systems server and storage line of hardware. These systems are designed to improve the customer's ability to use an integrated, On Demand approach to collaboration and virtualization. For more detailed information on IBM Systems, visit www.ibm.com/systems.

With the emergence of Linux, IBM quickly moved to extend its broad software portfolio with Linux support. Software supported on Linux includes:

- DB2 Information Management family for data management
- WebSphere for Web serving and applications
- Lotus email and collaborative solutions
- Tivoli product family for end-to-end infrastructure and systems management
- Rational Software for application development

The built-in self-management, self-optimization, and other autonomic computing capabilities extend the On Demand value of these software products in a Linux environment. For more information about IBM software products and Linux, visit www.ibm.com/software/linux.

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