Using Free, Open-Source Software in Local Governments: Streamlined Internal Computing for Better Performance and Record Keeping

An ICMA Report

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Introduction

This report was composed for employees of local governments, with the intention of showcasing how and why some local governments in the United States have switched some or all internal software policies to rely on free and/or open-source software. There have been a few pioneers in the application of these types of software among local governments, but the industry has moved much further in that direction over the past few years. As a result, it is likely that local governments are not achieving optimal performance with the software they currently have and could start using free, open-source software solutions instead, saving money while getting the job done more quickly and efficiently. This is not merely a tool for local governments; as a recent study reports, the highest levels of U.S. government are also making use of these tools.

> Historically, Open Source technologies had been discouraged within the Department of Defense…. [Currently,] Open Source is used extensively in security applications, and research uses Open Source for the exchange of ideas and shedding of costs. Since Open Source had been discouraged within the department, why then was it being used at all? First, but not always foremost, is cost. Second, many Open Source solutions are highly responsive. [Third,] security of the proprietary software was often a concern, since only one major software firm—the respective vendor/developer—provided only after-the-fact security patches.[1]

With this type of recommendation being implemented at the highest levels of security in the U.S. federal government, the utility and cost-saving capabilities of free and open-source software at the local level begin to become clear. The possibilities presented by open-source software emanating from a bigger and better pool of programmers working to improve it are also manifest: In England, Birmingham's local government's expensive proprietary software-based blog crashed when too many citizens used it. As one newspaper posed,

Nobody seems to have stood up in a meeting and said "You know, there's lots of very good open source content management systems (CMS) out there—there's one called WordPress, which is free and eminently customizable." This is peculiar, as WordPress was available (and as solid as any CMS) in 2005 [the time of the problems], runs on MySQL and PHP …and there are lots of programmers around with MySQL and PHP skills.[2]

Those initial examples aside, it is first necessary to give a definition of what open-source software refers to, as different local governments use different approaches to their technology standards. One of the most prevalent definitions of open source used by the industry is found on the website of the Open Source Initiative. It explains that the source code that makes the program run must be freely available for enthusiasts to improve as they like.

> The program must include source code, and must allow distribution in source code as well as compiled form. Where some form of a product is not distributed with source code, there must be a well-publicized means of obtaining the source code for no more than a reasonable reproduction cost preferably, downloading via the Internet without charge. The source code must be the preferred form in which a programmer would modify the program. Deliberately obfuscated source code is not allowed. Intermediate forms such as the output of a preprocessor or translator are not allowed.[3]

Including the source code makes the program is free for anyone to use or modify. The beauty of the system, as its years of existence have demonstrated, is that it is almost completely decentralized, and yet the changes that meet with most approval are kept, whereas those that do not work are edited out by other members in the community. Free software does not have to be open source in terms of licensing, but in many ways is a derivative of the same conditions that started the open-source movement.

Given that vital criteria, a simple example will suffice to illustrate the biggest strength of free and

open-source software. A problem with proprietary, costly software is that the software provider allows only its small group of internal employees to make changes to the software, meaning that if a group of users experiences problems, there is no guarantee that requesting a change will make it happen. There is also the possibility that the software provider will provide the requested features or changes, but as an "upgrade or new edition, and thus charge more money for something that should not have been a problem to start.

Open-source software, however, can be changed by anyone who is having a problem and knows how to program, so the chance of the issue being solved quickly magnitude is much higher. Free software is a different entity in this case, but it would not be as successful as it has been if it were not stable and useful. An August 2009 report from Public Sector Forums showed that the top three reasons people say a local government should switch to open-source software are lower cost (75 percent of respondents), lack of supplier dependency (47 percent), and better functionality (40 percent).[4]

About this report

This report examines six case studies of local governments that have implemented several aspects of free or open-source software:

- Washington, D.C.
- Los Angeles, California
- San Francisco, California
- Portland, Oregon
- Largo, Florida
- Northglenn, Colorado.

Each of these governments has different software needs, but their shared use of this type of software helps demonstrate its value in a variety of circumstances. This change can be effective, whether a local government changes some or all of its software from proprietary to open source. As argued in *Government Technology,* "Federal IT savings could reach $3.7 billion from open source. These cost savings can't be ignored, especially when taxpayer dollars are footing the bill."[5] If this is the estimate for the U.S. federal government, local governments could experience similar or greater savings. Open source offers the opportunity to reuse supposedly outdated computer hardware, as the president of the Open Source Software Initiative, John Weathersby, says:

Government entities, primarily state and more specifically municipal [and] local government entities, are more prone to repurpose old hardware as their budgets are not as robust as federal budgets (within limits, of course). One of the greatest strengths of open source software is that it is generally more flexible in that is does not require the latest, greatest, newest and most expensive hardware to run effectively. In addition, open source solutions tend to be developed and deployed with open standards in mind. This is an important element in enabling software to be and remain compatible on a variety of hardware(s) and platforms.[6]

By offering case studies and a resource section, this report provides a brief rationale and instructions for getting a local government started with open source.

Case studies

Washington, D.C.

Population: 600,000 (5.3 million in metropolitan area)
Website: www.dc.gov/index.asp

In 2008, many changes were being planned for the software model in the Washington, D.C. municipal government. The city's intranet for its employees—the collection of websites used internally for the purposes of coordination and increased productivity—was outdated and essentially nonfunctional, given the problems involved. As such, Chief Technology Officer Vivek Kundra planned on taking the technology infrastructure in a different direction. He did this for two reasons. First, a closed-source solution would have cost D.C. taxpayers about $4 million, which Kundra thought to be exorbitant; and second, Kundra believed that open-source technology is the future of enterprise.[7] He chose something untested within local governments in the United States: Google Apps and their functionality to run websites for any enterprise's intranet.

A vibrant new approach to city intranet

Rather than paying $4 million for proprietary software that would eventually become obsolete, Kundra chose to go with the lower licensing fees of Google, coming out to about $475,000 annually for use by 38,000 municipal employees. This change has been very useful: Instead of being vendor-reliant to provide changes to the software's functionality for intranet applications, such as displaying internal job openings, using Google Apps means there is an open platform on which users can easily erect new programs and

interfaces.[8] D.C. has moved to using three products from Google: Google Enterprise, which includes personal websites, e-mail, and the Google Applications suite of productivity tools; Google search appliances, which are used to index and search the city's intranet; and Google Earth.[9] By mixing these technologies, the municipality's employees are well-prepared to address any situation via their intranet, which substantially reduces the load on the telephone and cellular services in the area in the event of an emergency.

As an example of how useful this slow migration has been, consider the process of preparing a city budget in 2008. Kundra explained, "We did our budget planning with a group of 60 people using Google Docs." If they had been using Microsoft Word, "we would've ended up with about 60 documents, and we would've had to compile them together."[10]

For any local government, the possibility for the existence of a single proposed budget document/spreadsheet that all employees can edit at the same time sounds like a miracle, but it is just one aspect of this new software that has benefited Washington, D.C. The possibilities of simultaneous editing can also apply to regular documents and all other aspects of Google Apps—opening a new realm of possibilities for quick turnaround in group projects that was never before possible.

Engaging the D.C. citizenry: Apps for Democracy

Based on the open-source ideals that steered him toward Google Apps, Kundra also devised an innovative program called Apps for Democracy. The program was simple in its vision and had a relatively low price tag.

The first edition of Apps for Democracy yielded 47 web, iPhone, and Facebook apps in 30 days—a $2,300,000 value to the city at a cost of $50,000. Our mission …is twofold: to engage the populace of Washington, D.C., to ask for their input into the problems and ideas they have that can be addressed with technology and then build the best community platform for submitting 311 service requests to the city.[11]

This might seem like an overblown estimate of the value of the products created, but some amazing pieces of free and open-source software were the result, including dcBIKES (mapping software designed to help determine the best places for bike racks and new bicycle lanes) and PARKiTDC (an application that helps determine pricing, crime rates, and construction for those trying to park their vehicles). These two applications, along with almost fifty others, are available free of charge. Many of them are open source, meaning that any other local government can hold a similar contest and ask its citizens to modify the code to work for their municipality. Having these features created for such a low cost has additional benefits: By making this information easily and freely available, the government gave citizens who were previously disinclined to work with local government to improve their community an incentive to do so.

Los Angeles, California

Population: 4 million (15 million in metropolitan area)
Website: www.lacity.org/index.htm

In August 2009, the city of Los Angeles, California, began to consider the possibility of switching its proprietary software applications to a cheaper, more efficient, and more effective solution. The chief information officer (CIO) at the time, Randi Levin, delivered her opinion to the city council:

The ability to get whatever information the city needs, whenever they need it, on whatever device they need it on will fundamentally change the way the city works and enhance productivity greatly…. In a fiscal crisis it is difficult to find technology solutions that will save money without regarding a significant capital outlay to achieve those objectives.[12]

The biggest fear for the city council was security, since much of the software was to be based on servers at Google rather than in-house in Los Angeles. Although some of the fears were justified, Levin explained that those concerns were mitigated

because basic Google Apps had better security than the contemporary level of information technology (IT) security for the city. Also, Google was working to improve the level of security for aspects of the municipal government such as the police force, which requested additional security guarantees. These security concerns about the servers being at Google are part of the model of cloud computing, and it has been nicknamed the "government cloud" for all levels of government considering this approach.

Entering the "government cloud"

Cloud computing has captured the imaginations of computer users and industry leaders worldwide. Cloud computing refers to the idea of having the actual software in use installed and operated from a central computing center (usually owned by a private, third-party company), and users of the software must access it on their Internet browsers to use it. This model means that the users' organizations will not need to spend capital on more expensive, modernized computer hardware or software. They can derive many more years of use out of the computers they currently have, because the majority of the software is run on the company's server. The user will need only a computer good enough to have a decent connection to the Internet, which has been the industry standard of computer replacement policies for years. The U.S. federal government was exploring cloud computing as early as 2008: "Cloud computing can also enhance operational efficiencies and improve the performance of a technology infrastructure, as end users are accessing technologies and software hosted elsewhere."[13]

A special deal with Google

By entering the contract with Google in October 2009, the city of Los Angeles became the second major U.S. city, after Washington, D.C., to adopt the cloud-computing model. Although there are nearly 30,000 employees of the Los Angeles municipal government, only 17,000 completely switched to Google Apps at first; the remainder, who are members of the police department and the city attorney's office, only switched to Google Mail (commonly known as Gmail).[14] The estimated initial savings made possible by this contract are attractive: Estimates on the low end are approximately $13.8 million, and if this estimate is expanded to cover all included archiving, automated electronic discovery, and video conferencing capabilities that Google Apps has, it could make the savings reach nearly $50 million for the city.[15]

As a further financial incentive, the contract between Los Angeles and Google is being written to allow it to spread to other cities in California and thus give rebates to all involved. Upon reaching 100,000 individual users working in any municipality in the state, Los Angeles will receive $1.2 million in rebates from Google.[16] This type of contract could be replicated by other local governments across the country, regardless of size or technical specification.

After implementation in March 2010, the Los Angeles CIO admitted that the switch to all Google services, meaning both Google Apps and Gmail, was an accident; the city had intended to emulate the new practices of Washington, D.C., but D.C. had implemented only Google Apps. She comments on the —savings represented by the change:

> The move will save more than $5 million in hard costs and $20 million more through increased productivity…. In all, everyone's trying to figure out that age-old question of doing more with less, and people are realizing that running [computer] infrastructure [in-house], particularly, is becoming much more of a commodity—and there are others who can do it better, faster, and cheaper.[17]

San Francisco, California

Population: 800,000 (4 million in metropolitan area)
Website: www.sfgov.org/index.asp

While Washington, D.C., and Los Angeles have made efforts to incorporate specific free and open-source software solutions into their municipal information technology infrastructure, San Francisco was the first major city to implement an overall open-source

policy. Rather than allowing for the option of just open-source software or just using open-source software in one aspect,

> San Francisco's new policy requires city departments to consider open-source software equally with commercial products when purchasing new software. The opportunities with open source are tremendous: lower costs, greater agility, better reliability, improved security, and increased innovation.[18]

With this in mind, it is important to note that any department in the city will have the opportunity to consider open-source software alternatives only when purchasing and implementing new software entirely—not when older proprietary software needs to be replaced or upgraded.[19]

Policy for an "open San Francisco"

Given the progressive nature of this policy, it stands to reason that there have been many changes in software. The list is lengthy, but a short survey[20] shows the numerous possibilities that this forward-looking, cost-saving policy offers:

- *Mozilla Firefox:* A free and open-source Internet browser that is the successor to Netscape Navigator of the 1990s. It offers a more stable, versatile, and effective option for Web browsing than does Microsoft Internet Explorer. (www.mozilla.com/en-US)
- *Firebug:* An open-source piece of debugging software that works from within Firefox. It is one of the highest-quality examples of free debugging software for websites. (getfirebug.com)
- *ColorZilla:* Another piece of open-source software that works within Firefox. It allows for the fine-tuning of colors and visual effects on a government's website. (www.colorzilla.com/firefox)
- *PercentMobile:* A free service for measuring data about mobile devices being used within the workforce of a municipality, which in turn can help inform decisions about how to plan the next round of purchases. (percentmobile.com)
- *WordPress:* A premier free and open-source content management system for putting government information online. San Francisco uses this basic service as well as a large variety of free plug-ins made by other parties, allowing for a close degree of control and customization. (wordpress.org)
- *GIMP:* Free and open-source photo-editing software for organizations that need more sophisticated options than Microsoft Paint but do not want the fees or features of Adobe Photoshop. (www.gimp.org)

Cloud computing from a different perspective

San Francisco implements the cloud-computing model in a different way than Washington, D.C., and Los Angeles do. Rather than using Google Apps as the software, which is run on servers owned and operated by Google, San Francisco works with an organization called 3tera (www.3tera.com). This organization provides the cloud-computing infrastructure for the municipal government, which means that programs are hosted and run on 3tera's servers for the city. The specific pieces of software being used are chosen by San Francisco using the aforementioned IT policy and are installed on the infrastructure provided by 3tera.

This implementation model has different strengths and weaknesses than the models of San Francisco and D.C. Los Angeles has all upkeep and software issues handled directly by Google and therefore does not need to get involved unless the city wants to develop additional applications. San Francisco, however, has a much greater degree of control over which programs it wants to use on the cloud and in what manner. This also means it has a higher chance of software problems, which requires more IT staff trained to address them.

Portland, Oregon

Population: 580,000 (2.2 million in metropolitan area)
Website: www.portlandonline.com

Portland, Oregon, has approached the open-source movement in a different way. Beyond using open-source software as a cost-saving measure for its municipal government, Portland has sought to influence its entire governmental procedure with an open-source mindset. This was codified in a resolution passed by its city council in September 2009:

> Resolution no. 36735: Mobilize and expand the regional technology community of software, hardware and service professionals by promoting open and transparent government, open data, and partnership opportunities between public, private, and non-profit sectors, academia, and labor.[21]

The list of intentions is derived from the community's longstanding interest in open-source software and ideals, but now the resolution's ideals are directly driving local government policy.

A comprehensive open-source policy

Two key points in the list of clauses in the resolution best describe how this policy differs from that of San

Crowdsourcing, a derivative of the open-source movement, has been implemented in a few cities besides Portland. In Pittsburgh, Pennsylvania, there has been a strong movement toward crowd sourcing issues with transportation systems and urban planning. The city is working on the second version of its system, which it calls The CitiWiki Project (www.pghwiki.org), and it encourages citizens to post useful information about which areas need transportation infrastructure upgrades and repairs, all for free and on an as-interested basis. This translates into the areas with the most problems being the most important, as they end up having the most posted comments.

Another city using crowdsourcing is New Haven, Connecticut: It is making use of commercial software called SeeClickFix (seeclickfix.com/citizens). Similar to the in-house solutions of Pittsburgh, this software has produced significant results. According to its cofounder,

We've seen people report and be informed about water quality from their reservoirs. (*O'Reilly Radar*)

> We have thousands of potholes fixed across the country, thousands of pieces of graffiti repaired, streetlights turned on, catch basins cleared, all of that basic, broken windows kind of stuff. We've seen neighborhood groups form based around issues reported on the site. We've seen people get new streetlights for their neighborhood, pedestrian improvements in many different cities, and all-terrain vehicles taken off of city streets. We've seen university shuttle buses slow down their speeds by 15 miles per hour across the board.

All of these outcomes come from a simple piece of software and have involved heavy citizen input and participation. Another company has released software called CitizenSpigit (www.spigit.com/products/e_index.html). It seeks to crowdsource various aspects of reporting problems within a local government while providing social media platforms for citizens and government employees to interact. The first municipality to use this software was Manor, Texas.

Sources: James Turner, "Citizens as public sensors," *O'Reilly Radar,* April 12, 2010, radar.oreilly.com/2010/04/crowdsourcing-the-dpw.html (accessed July 12, 2010); Luke Fretwell, "Spigit launches CitizenSpigit, Government Crowdsourcing, Engagement Platform," *Gov2.0,* May 27, 2010, govfresh.com/2010/05/spigit-launches-citizenspigit-government-crowdsourcing-engagement-platform (accessed July 12, 2010).

Francisco and the executive decisions of Vivek Kundra in Washington, D.C. Besides the shared interest in using open-source software for local government employees, there is a focus on changing something as mundane as file types. The resolution holds:

> Publishing structured standardized data in machine-readable formats creates new opportunities for information from different sources to be combined and visualized in new and unexpected ways, for niche markets to be indentified and developed, and for citizens to browse, interpret, and draw attention to trends or issues with greater efficiency.[22]

As implied, this aspect of the resolution is seeking to open source all data generated and collected by the Portland government, but the city council also mandates that data is made available in electronic formats to increase the ease of distribution to all involved

citizens. This is based on a principle related to open source called *crowdsourcing,* which holds that more eyes looking at a problem will yield better solutions in a shorter period of time.

This open-source policy in Portland has multiple aspects designed to crowdsource aspects of improving local governance. The entire initiative in Portland is dependent on the ability of its citizens to access the data; therefore, the resolution includes a section that mandates specific ways of making data available:

> The adoption of open standards improves transparency, access to public information, and improved coordination and efficiencies among bureaus and partner organizations across the public, nonprofit, and private sectors.[23]

The data are mandated to be saved in open-source file formats. Instead of saving a spreadsheet in the Microsoft Excel format, which is proprietary and

not in compliance with the International Standards Organization (ISO), Portland's employees would save it as an ISO-compliant Open Document Spreadsheet. The process is easier for both private citizens and professional organizations to participate in. There are numerous free productivity suites available for citizens to access the information in an open format, removing the common issue of incompatible file formats between professional organizations.

Encouraging citizen involvement in open source

Given that the government of Portland is working to make itself more open and transparent, it stands to reason that the city would want additional open-source resources made available to its citizens and scholars. As such, the Portland local government has been directed to work with Travel Portland and regional partners to promote Portland as a host city for leading Open Source Software conferences and related technology events, such as LinuxCon and Innotech.[24]

This directive has many implementations. A recent example of a successful open-source event involving the Portland local government is the Open Source Bridge, a conference about the possibilities of open-source citizenship—getting citizens directly involved in improving transparent government.[25] One of the founders of Open Source Bridge, Audrey Eschright says open-source citizenship is a complex idea:

> It seems important to bridge the kinds of roles we have in open source, user/contributor/owner/institution, getting down to something more fundamental. What else are people who interact in this multidirectional way? Perhaps we're citizens. Not residents—we do more than live here. We are, like citizens of a country, engaged in the practice of an interlocking set of rights and responsibilities.[26]

In this explanation, Eschright describes a type of engagement and participation in governance that many local governments desire of their citizens. It is based heavily on the use of open-source software and is operating on the basis of open-source ideals.

Largo, Florida

Population: 75,000
Website: www.largo.com

A long-standing and highly involved user of open-source software is Largo, Florida. Harold A. Schomaker, the IT manager and CIO of Largo, has said:

> Largo spends a total of 1.3 percent of its gross budget on IT. This includes hardware, software, salaries, and incidental expenses…. [T]he typical small city spends over 3 percent of its budget on IT, with some approaching 4 percent.[27]

These are not insignificant savings. They are demonstrated by looking at savings from the city of Garden Grove, California: In its first year of using Linux servers and solutions, it saved $380,552; thereafter, it experienced $70,465 in approximate annual savings.[28]

There is a multi-tiered method to achieving this level of savings. In a similar vein, Garden Grove saves $7,000 annually by doing its records and imaging backup on-site, using a Linux server.[29] The industry standard for replacing desktop computers is currently after 3 to 4 years of use, at which point they become obsolete. Largo has circumvented this issue, making its computers last 10 years before needing to be replaced. More incredibly, the computers it does use are often low-cost and require no maintenance; the IT department never has to spend time updating software on a desktop computer in the city's intranet. This is possible due to client computing, the predecessor of the aforementioned cloud computing by several decades. As such, one member of Largo's IT department estimated in as early as 2002 that using Linux "saves the city at least $1 million a year in hardware, software licensing, maintenance, and staff costs."[30]

This nearly universal reliance on open-source software removes a common problem for IT professionals: worrying about not having the proper number of software licenses on hand during audits. This auditing process can be very time-consuming, and wastes time better spent providing vital IT services for a local government. In Largo, the vast majority of software in use is open source and Linux-based, but machines that are compliant with Microsoft products are run for the few employees who require such programs.

Schomaker said he could lose his job if Largo were fined for missing licenses, so the city spends more money than needed to have extra licenses on hand.[31] By seeking to have as much software as possible be free and open source, Largo saves additional money on direct costs of licenses and protects itself from potential legal issues. Along these lines, one of the best free and open-source alternatives to the Microsoft Office productivity suite is OpenOffice.org. Its website explains:

> OpenOffice.org 3 can be downloaded and used entirely free of any licence [sic] fees. OpenOffice.org 3 is released under the LGPL licence [sic]. This means you

may use it for any purpose—domestic, commercial, educational, public administration. You may install it on as many computers as you like. You may make copies and give them away to family, friends, students, employees—anyone you like.[32]

This is a far cry from worrying about license audits. Largo makes extensive use of OpenOffice.org.

Centralized hubs: Linux-based thin-client computing

It is necessary to explain what client computing is to understand how Largo can provide such stable and effective computing services at low costs to the city's employees. Rather than operating full-fledged desktop PCs, Largo makes use of Linux *thin clients,* so named because they lack moving parts (like fans), have no internal hard drive space, and are therefore less expensive. The IT department runs multiple centralized Linux servers, which run all programs used by any employee.

When an employee is logged on to a thin client, he sees the program being run on his own machine, but the computing resources are provided almost entirely by the centralized machine. These client machines run almost silently: Since virtually none of the processing is done directly on the client machine, the video card and central processing unit are much less powerful, therefore reducing the amount of heat produced and making passive cooling (without noisy fans) a viable solution.

Schomaker adds to this model, summarizing the system as one in which any employee can sit down at any computer and, using the graphical interface to log in like on Windows or a Mac, be able to run any Mac, Windows, Linux, or Unix program from the central servers on their own machines. For strong security, the IT department closely regulates all peripherals that are being used, which means that using a CD or USB drive or installing any new software has to be directly approved by IT, making for an airtight layer of internal security.[33] This may sound overly restrictive, but it makes sense within the thin-client model of computing: If all data is stored on a central machine and that same central machine runs all programs, there is no need to transfer data or add programs for individual users.

This hardware setup is paired with the client method of running the software. Since all programs and applications are run on the central servers, nothing is saved on an individual machine, which means that there are virtually no technical problems at any given time.[34] If all machines are interchangeable, experiencing an unlikely technical issue doesn't mean

a several-day turnaround for repairs; it means getting a spare computer set up for that user and getting him logged back in within 5 minutes. Logging in is done via the terminal (for Windows users of the early 1990s, this would be called the command prompt), which is a text-only window that allows flexibility and usability within Linux for more advanced users while also being viable for less advanced users. Dave Richards, while working in IT for Largo, said:

> There is a 48 percent reduction in cost on the Microsoft Windows platform by moving it from an unmanaged PC environment to a centralized design with thin clients. Half the cost, and no change in functionality. Imagine then what the savings would be if companies had the option to move to thin clients *and* Linux at the same. A major part of the cost …is licenses and software products. Imagine going into companies and telling them that they could save 60 to 70 percent on computing costs. Really, trying to shake off Microsoft Windows from their personal computers just isn't enough to warrant a change for most people. It doesn't offer the major cost reductions that are found with a complete and stable redesign. Centralized computing using thin clients really works. There shouldn't be so few of us implementing and being the voice.[35]

That means that this approach is viable for people who are not entirely sold on the idea of Linux for local governments, but the estimated 48 percent savings on the client-computing model simply does not compare to the almost 70 percent projected savings of the client-computing model using Linux. It is important to note that local governments can go the opposite way with Linux as well; using full desktop versions of a free or cheap Linux distribution on all of their computers will still save a significant amount of money from licensing fees. *Government Computer News* recently reviewed several Linux options. Many variations, or distributions, of Linux are available, and the study analyzed four best options for local governments.[36]

Northglenn, Colorado

Population: 34,000
Website: www.northglenn.org

Northglenn, Colorado, is a relative newcomer to using open-source solutions but has strongly committed to this change and therefore reaped benefits from this decision. In 2003, the city decided that it would make strong efforts toward open sourcing its software solutions and, toward this end, hired an IT department head, a network administrator, and an open-source software developer.[37] In describing the reasons the city decided to switch, IT department head Bob Lehr said:

> The first and most fundamental [motivation] is that it largely eliminates the costs of acquisition. Note that licensing costs are just a part of that. There is also the manpower behind software license research (e.g., Which version of this product should we license? Do we need per-CPU licensing? Was that per-core or per-socket? Enterprise or Server? How many CALs are required? etc.) and license management (storage, tracking, retrieval) that is entirely avoided with open source. And, for many government agencies, the bureaucratic process of procurement can be long, complex, and not pleasant to navigate. Open-source software, being freely available for download, jumps over all those hoops and make acquisition painless and free.[38]

The cost-saving argument was compelling enough to cause Northglenn nto head in a new direction. As the results accumulated, they made two vital realizations: that they could provide better and safer stewardship of public information by using open source while using fewer public funds, and that they could easily combine open-source and closed-source software solutions to best pursue their IT projects.

In addition to this main line of reasoning for adopting open source, Northglenn has several other reasons for striving to use open-source solutions. While it is well-established that replacing proprietary software with open-source software will lower costs significantly, it is also possible to add additional services with open source at almost no cost. Northglenn encodes and hosts video footage of its city council meetings on its website, costing next to nothing while making governance much more transparent to citizens. Another unexpected reason Northglenn gives for using open source is that it is rewarding work:

> People who work with open-source software do it because they like it. Usually they get into the practice because it is fun and rewarding for them. They are often

very competent and highly motivated, and would love to make their hobby into a paying job. They enjoy making things work and learning new things, and seek a job that would allow them to continue those practices.[39]

These are ideal IT employees. The IT department from Northglenn presents a comparative archetype of employees forced to work with a closed-source server system (where even if they are highly creative, competent, and motivated, they cannot edit the closed-source code themselves):

> Contrast an open-source implementation position with a "defined skill set," where the first diagnostic action is to reboot the server and the second is to call the vendor and wait in a telephone hold queue. It is easy to understand why open-source jobs are prized.[40]

Last, entering into the usage of some open-source software enables a local government IT department to be well-positioned and trained to implement future open-source innovations over time. This is punctuated by the fact that previously exorbitant proprietary programs for functions such as Web content management systems, document imaging and management systems, intranet portals, and voice-over-Internet-protocols are now cheaply or sometimes freely added, and this will be easier with a staff trained and interested in open-source software and policies.[41]

Pairing closed- and open-source to provide for all computing needs

The list of open-source software and solutions implemented by Northglenn is lengthy. It has Linux-based servers, open-source fax services, and OpenOffice on some computers as its office productivity suite, and it added open-source flat-panel touch screens for councilors in the city chamber to vote and work with. The presence of open-source software is unmistakably an

integral part of the foundation of its IT infrastructure.[42] However, Lehr explains that this vital foundation of open-source software is only part of the IT operations:

> During this period the city's IT department also deployed many closed-source proprietary software products when no credible open-source alternative could be found. These products included a municipal court system, a new financial system, a police record-management system, and a rec-center software package, among others.[43]

Northglenn has pursued the ideal IT solution for each specific need it had, resulting in a hybrid approach to computing: It has long-term employees and policies that work for open sourcing the IT department, yet it also recognizes that some closed-source products fulfill specific needs best.

Get involved in open source!

After reading the case studies and reasons for getting started with open source, visit the ICMA's Knowledge Network, which itself is an open-source exercise. We provide a forum for local government leaders and other interested parties to candidly discuss what does and does not work in local governance. We have contacted many of the individual IT experts mentioned in this report and IT leaders in other U.S. local governments, and they have agreed to make a free profile on our Knowledge Network, meaning that you can ask them questions directly while discussing the possibilities offered by open-source software with other local government leaders around the nation.

Making open-source software solutions work for your government

Having examined six local governments in the United States and their comparative use of free and open-source technologies, as well as cloud computing and client computing, there are several immediate facts worth commenting on. First and foremost, there are multiple ways to implement free or open-source software solutions for the needs of a local government. This flexibility is not necessarily intuitive, nor is it mainstream yet; municipal governments will often consider the cost of custom-tailored software for enormous sums of money. But adhering to the norms of the majority instead of achieving massive savings and better computing performance does not seem viable any longer, given the budget difficulties faced by all governments, local or otherwise.

Interested in learning more and hearing from the experts in this field? Join the Knowledge Network discussion about Local Governments and Open Source!

icma.org/osgroup

Is your local government already involved in using open source? We would love to know about it. Check out our wiki and make some edits.

icma.org/oswiki

This potential variability in application translates into another strength: Many local governments using different options will provide easily accessible data for which software solutions work best in specific kinds of local governments, meaning that future municipalities making the change will be even better informed. Plus, free and open-source options are often easy to learn, with almost no learning curve involved. Schomaker, director of IT in Largo, was proud to announce that the graphical user interface system of their system was so similar to the industry standard of Windows that there were negligible differences between their use of Linux and other offices using Windows.[44]

In 2009, the World Congress on Engineering and Computer Science featured one of the first statistical examinations of U.S. local governments making use of open-source software. The study set out to determine if cities are capable of fully using open-source software solutions at the present time. The approach was based on three criteria: (1) the capability of a municipality to achieve comprehensive open-source use, (2) the discipline to stay with the new IT methods, and (3) the cultural affinity of the municipality as a workplace for open-source software.[45] One observations that can explain the lack of prevalence of open-source software in local government to date is that "it is more likely [that] an organization will continue to use a software product once deployed and established than to abandon the product."[46] The report ends by concluding:

While a majority of cities in the study show some characteristics that indicate the adoption of OSS [open-source software] is possible, and indeed on a trivial level (with a few notable exceptions) some cities are using OSS, still most cities still lack key characteristics in the three domains [capability, discipline, cultural affinity] to enable a successful comprehensive adoption of OSS.[47]

In essence, the report demonstrates that doing an entire switch to open-source software solutions is not viable for most local governments. But this is not a problem, given the first strength discussed in this section: Flexibility is built into open-source software, so it is entirely reasonable to only implement open-source software incrementally. Both this report and Dave Richards of Largo contend that making use of open-source software in a local government setting can happen in stages, with additional savings made possible by taking further steps toward open source. It is reasonable and viable to try it out in stages in terms of comfort, as well—if a local government's employees find that they don't like a certain aspect, there are other free or low-cost open-source options available to try.

A third strength, and in an entirely different paradigm than the software business community, using open-source software means that a local government is part of a software community, rather than just another paying client. All distributions of Linux that are viable for local government use have a user-operated online forum attached, where issues are brought up for public discussion.[48] This means that anything from trouble getting started with Linux initially to advanced discussion of working through software bugs for future versions happen in the same open and free-to-access environment. Even though traditional capitalism disallows for the possibility of people providing free advice to others consistently, these forums disprove those notions. Linux Forum provides general advice for using the Linux operating system, while more specific forums like (e.g., openSUSE Forum, the Ubuntu Forums) provide advice for, by, and about Ubuntu users the world over. This means that there is nothing stopping your local government from making the switch to some or all open-source solutions. The instructions for its use are online, this software is often free or at least low-cost, and it is not proprietary, so you can use as much or as little open-source software as you want to start with.

Starting points and tools

Internet browsers

It is easy to make the switch from Microsoft's Internet Explorer or Apple's Safari to a free, open-source Internet browser that is more stable and secure and also offers more options for customization.

- *Mozilla Firefox:* www.mozilla.com/en-US/firefox/personal.html
- *Google Chrome:* www.google.com/chrome
- *Opera:* www.opera.com

Word processing/application suites

Although Microsoft Word and its attendant .doc or .xls file types are perceived to be the standard for document files, in reality, the International Standards Organization (ISO) has approved the Open Document Format, which uses Open Document Text (.odt) for textual documents and Open Document Spreadsheet (.ods) for spreadsheets. Some widely used applications for this are as follows:

- *OpenOffice.org:* A suite of programs you download and install on your computer for free. It functions almost exactly like Microsoft Office but is free and has better stability. (www.openoffice.org)
- *Google Documents:* A suite of applications available online through Google that is free to use and has a strong focus on enabling real-time collaboration on documents and spreadsheets. It allows you to save your documents in Open Document Format whenever you want to take them with you offline. (docs.google.com/demo/?hl = en)

PDF readers

There are many lightweight and performance-focused options available for PDF readers that are worth taking a look at.

- *Foxit Reader:* The halfway step between open-source software and commercial software. A freeware version of its PDF reader, as well as the option to purchase additional features as desired (e.g., the ability to edit PDFs), is available. (www.foxitsoftware.com)
- *Evince:* A free and open-source PDF reader. It was originally intended for use only on the Linux operating system but is now available on Windows as well. (live.gnome.org/Evince/Downloads)

Content management systems

For local governments that have started a blog or are considering it, the various free and open-source content management systems available should be high on their list of potential software solutions.

- *Joomla!:* www.joomla.org
- *WordPress:* wordpress.org
- *Alfresco:* www.alfresco.com

Geographic information systems

Many municipalities and other local governments need the ability to track situations accurately using global positioning systems (GPS) and then make the data available online. This is often called geographic information systems (GIS), and there are a slew of expensive proprietary options that quickly become obsolete and have annual costs. Instead, local governments can consider these options:

- *OpenLayers:* Enables a city to post onto its website a free map of any size and update it easily. (openlayers.org)
- *OpenStreetMap:* An open-source version of what Google Maps aspires to provide, but with a Wikipedia-esque approach. Anyone can edit the map based on their localized knowledge. (www.openstreetmap.org)
- *World Wind:* An open-source method of seeing a satellite map of any area, similar to the proprietary Google Earth. It was created by NASA. (worldwind.arc.nasa.gov/java)
- *GeoServer:* Designed to encourage interoperability between users. Local governments in close proximity or within the same county could benefit from this. (geoserver.org/display/GEOS/Welcome)
- *Quantum GIS:* An open-source method of composing maps for a variety of uses. (www.qgis.org)

Survey software

If your local government is looking for a quick and easy way to gather statistical evidence from your constituents, there are several excellent options available, many of which are free and offer a professional version with additional features for those who need them.

- *LimeSurvey* (www.limesurvey.org)
- *SurveyMonkey* (www.surveymonkey.com)

Project management

For local governments that need more collaboration-friendly software than Google Document option or those that use Microsoft Project, there are several open-source options that are well regarded in the open-source community.

- *DotProject:* Read more about this software at sourceforge.net/projects/dotproject/files.
- *OpenProj:* You can read about the software at openproj.org/openproj and download the most current version for Windows (or whatever operating system your machine is using) at sourceforge.net/projects/openproj/files.

Media players

In today's computing world, there are far too many types of video files in use, many of which are proprietary attempts at "winning the market." As a result, Windows Media Player and Apple's QuickTime don't have the capability to play all types of files. Alternatives include:

- *VLC Media Player:* A widely acclaimed open-source solution whose motto—"It plays everything!"—is true. (www.videolan.org/vlc)
- *Media Player Classic:* An option designed for absolute simplicity, ease of use, and maximum functionality. (sourceforge.net/projects/guliverkli)

Crowdsourcing applications

For cities interested in crowdsourcing aspects of their local governance, there are several commercial options available, meaning that they are not free (although they allow for a sort of open-sourcing of problems in a community). That said, if enough local governments demonstrate interest in a program that allows citizens to report problems (e.g., potholes, graffiti) or examine data to find trends that other individuals might not see, the nature of the open-source community is such that the desired program will likely be created and consistently improved.

- *SeeClickFix:* This program prides itself on making all citizens into sensors for the municipal government, so that anyone who notices a problem (e.g., with public works) can easily report it online for members of the government to work on quickly. (seeclickfix.com/citizens)
- *CitizenSpigit:* This software is based on the premise that problem reporting is only part of the equation. It also includes the ability for citizens interested in similar areas to form discussion groups and then pass on their findings to the government (local, state, or federal). (www.spigit.com/products/e_index.html)

- *The CitiWiki:* This site built by Pittsburgh is an in-house method of crowdsourcing. (www.pghwiki.org)

Open source cloud computing

Released right before the publication of this report, a partnership between NASA and a company called Rackspace has resulted in the public release of open source cloud computing software called OpenStack.

- *OpenStack:* This is a piece of software for local governments with a dedicated staff of IT professionals, as it will allow them to create their own cloud computing environment completely in-house. (www.openstack.org/)

Other specific applications

- *OpenGeo:* If you're looking for a GIS, there is a free trial from Open Geo. (opengeo.org)

- *FixCity and Bike Racks:* Although at the time of this report being written it is still being tested, FixCity has released a pilot program that is open source and seeks to let citizens vote and input data on where bike racks really need to be installed. It then maps and collates the data and prepares official requests to the Department of Transportation. (fixcity.org)

- *Apps for Democracy:* As referenced in the case study of Washington, D.C., this page offers all of the programs and applications written free of charge to all interested parties. This means that your local government could link to this page and ask local citizens to rework the applications for your municipality. (www.appsfordemocracy.org)

Operating systems[49]

- *Xandros Desktop Pro 4* (Linux-based): www.xandros.com

- *Novell SUSE Linux 11* (Linux-based): www.novell.com

- *openSUSE Linux 11.2* (Linux-based): www.opensuse.org/en

- *RedHat Enterprise Linux 5* (Linux-based): www.redhat.com

- *Ubuntu 10.04* (Linux-based): www.ubuntu.com

- *OpenSolaris* (Unix-based): hub.opensolaris.org/bin/view/Main

Linux forums

- *Linux forums:* Individuals who have generic questions regarding the Linux operating system need look no further than the Linux Forums. (www.linuxforums.org)

- *Ubuntu forums:* Some of the best response times for questions regarding an operating system can be found on the Ubuntu Forums, which have thousands of users at all levels of proficiency. (ubuntuforums.org)

- *openSUSE forums:* This is a free distribution of Linux and has a widely populated forum about using the operating system. (forums.opensuse.org)

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