

# Open Source and Proprietary approaches in Municipal Information Technology.

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## Abstract

Two cities (Garden Grove, CA, and Largo, FL) that use mostly Open Source Software (OSS) in their municipal IT were compared with nine other cities that use proprietary software (PS). It describes how these cities implement their IT and how the 2 OSS cities in particular use it to decrease their immediate and long-term costs.

The conclusion is **not** that implementing OSS will save a city millions of dollars, although it may in the long term. Both OSS-using cities spend among the least of the 11 cities reviewed, but there are mitigating circumstances for some of the other cities using proprietary software – they may have a very large user base, they may support a large number of remote sites, they may support some operations that the OSS-using cities do not. However, Microsoft's "Get the Facts" campaign strongly implies that the use of a Microsoft-based system is cheaper than a Linux/OSS-based one, and there was no evidence to support this. On the contrary, in cases where Microsoft and PS was used, the cost was higher than for Linux/OSS in all but one case. This was true both on absolute and relative scales. The one case in which a proprietary-based system was arguably less costly than the Linux/OSS case was Redondo Beach, which uses Novell and HP-based software rather than Microsoft products. Surprisingly, all cities that use Microsoft products in their back-end require notably more servers to provide acceptable service than do the 2 OSS-using cities, in one case by a factor of 10.

Unexpectedly, Largo (which uses predominantly Linux thin clients and the Open Office suite) did not have lower costs than Garden Grove (which uses Microsoft fat clients and Microsoft Office) when it came to IT costs. This may be partially explained by the fact that Garden Grove uses more OSS application in its IT backend while Largo uses more proprietary applications (although they run on Linux). Garden Grove has taken a more active approach to using OSS in building it's own OSS solutions to many problems. Buying your own software rather than building it is the conventional wisdom, but Garden Grove has demonstrated that building it also works if the functional units are large and robust enough and the funding time frame is long enough.

## Introduction

There has been a lot of chatter recently about how this or that model of software infrastructure is cheaper. Microsoft has one view, RedHat another, IBM presents a different view, Sun still a fourth. Obviously these companies are trying to convince the IT community that their way is the best way. By attempting to measure things like Total Cost of Ownership (TCO)<sup>1</sup>, Return on Investment (ROI)<sup>2</sup>, and administration overhead, they are predicting *a priori*, what model will be cheaper in the long run, often making unrealistic assumptions that provide the support for their marketing and implementation approaches.

To some, the easy-to-use tools that come with Microsoft and the undeniable breadth of applications are worth the additional cost of licensing proprietary software (and tracking those licenses). To others, the massive service organizations behind IBM and Sun are strong arguments for drinking their Koolaid (or Java). And to others, the freedom from service and licensing costs as well as the apparent robustness and simplicity makes Do It Yourself IT (DIYIT – pronounced like the last 2 syllables of 'idiot')<sup>3</sup> and Open Source Software (OSS)<sup>4</sup> a very attractive alternative. The methodology of determining TCO and ROI, and all the other parameters of 'what makes IT cheap' are extremely sensitive to assumptions and selective analysis<sup>5</sup>. I'm not going to try to dismiss others' analysis of this problem.

I'm going to take yet another approach. Instead of trying to predict costs and benefits, I'm going to **measure** the costs, and try to analyze the risks, benefits, and downsides to using OSS. For this article, I will analyze the municipal budgets of 2 cities that use predominantly DIYIT/OSS models for their IT needs and 9 cities (6 in California, 3 in Florida) that use predominantly proprietary SW, using both DIYIT and outsourcing models. I will try to determine what the results mean in the larger area of municipal IT, and whether it has any implications for IT in general. The information for the stanzas below was gathered via interviews with the source if a person is named, from anonymous sources that did not want to be named for this article, or from publicly available information from budget documents and job postings.

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1 [http://search390.techtarget.com/sDefinition/0,,sid10\\_gci342316,00.html](http://search390.techtarget.com/sDefinition/0,,sid10_gci342316,00.html)

[http://encyclopedia.thefreedictionary.com/Total cost of ownership](http://encyclopedia.thefreedictionary.com/Total+cost+of+ownership)

2 <http://www.computerworld.com/news/1999/story/0,11280,36069,00.html>

[http://www.rms.net/lc\\_faq\\_other\\_roi.htm](http://www.rms.net/lc_faq_other_roi.htm)

3 <http://www.itconversations.com/shows/detail150.html> (audio)

<http://garage.docsearls.com/>

<http://www.searls.com/doc/oscon2003/> (presentation)

4 <http://www.opensource.org/>

5 <http://www.bitpipe.com/tlist/Return-On-Investment.html>

## **Garden Grove**

Garden Grove, California is a city of about 165,000, with a median family income of \$49,697<sup>6</sup>. It was the first city reported to use Linux and OSS for its municipal IT system some 9 years ago, a long enough time that it now has a good public track record. Although it has been described elsewhere<sup>7</sup>, it's worth a short review to show how Garden Grove came to Linux and OSS for what it says about the importance of leadership, and ability to disregard conventional wisdom.

Garden Grove was not looking for an Open Source solution when it was forced to re-examine its IT structure in 1991 as a result of cost constraints. It was looking for better price:performance than it was getting from using a \$400,000 Data General minicomputer to host its PICK database and serial line terminals, which was costing it \$94,000/yr in lease and support costs. The three alternatives that IT Director Robert Shingledecker identified were:

- Novell Netware, which was cheaper (though still expensive), but so complex that 2 Novell Certified Engineers couldn't get a test installation configured acceptably in 3 weeks.
- the newly released Microsoft NT which was significantly cheaper and easier to configure than Netware but which had horrible performance, networking, and scalability issues.
- SCO Unix, which was the best fit with their Unix background, and was used for a time, eventually supplemented with Samba, the free Windows networking server.

Schingledecker, a self-confessed geek, had also been playing around with some of the new unix-like operating systems, including Coherent, Minix, and a new arrival, Linux. After trying and discarding Minix and Coherent as too limited for the kind of operation that he was supporting, he tried the new Slackware distribution of Linux. His trial of Linux left him with feeling that he had stepped into a parallel IT universe, where the basic laws of IT no longer applied. Here was an operating system that ran on the cheapest hardware, ran faster and more reliably than the most expensive alternative, gave him the all the utilities and cross-platform support he needed, and most astonishingly, was FREE! It was unbelievable. They soon migrated away from SCO to Linux, which gave them higher performance, easier server configuration, much easier networking, no licensing issues, and free development tools.

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6 Population data from the city web site or failing that, from the 2000 Census.  
Income data from the 2000 Census.

7 <http://www.linuxjournal.com/article.php?sid=0218>  
<http://www.shingledecker.org/gghistory/index.html>  
<http://www.linuxworld.com/story/34260.htm?DE=1>  
<http://ch.ci.garden-grove.ca.us/internet/gbet/OpenSource.html> (excellent)

Shortly afterwards, PICK started to support Linux as a server platform, which allowed them to run their entire server infrastructure with Linux. After considerable testing, he took a large breath, considered the career suicide he could be undertaking, and then replaced the \$400,000 minicomputer with two 100MHz Pentiums running Linux. Of course, people immediately began calling - something was wrong - database queries were returning too quickly, so the DB queries must be silently failing. It turned out that, nope - it was just that the performance was so much faster on the (~100 fold cheaper) Linux platform. Since then, Garden Grove converted the commandline PICK interface to a web-based GUI so that everyone on the municipal network can have access to the database.

Garden Grove, now led by Charles Kalil (present at the initial Linux conversion) is slowly migrating the PICK database (now called D3, from Raining Data) to the free PostgreSQL database<sup>8</sup> and is integrating it into web-pages using the free scripting language tcl<sup>9</sup> and UnixODBC<sup>10</sup> for database interoperability.

Their municipal imaging and document storage system has been developed using entirely OSS components, including the aforementioned tcl and its graphical user interface tk toolkit, the image manipulation utilities a2ps, ps2pdf, netpbm, ImageMagick, and GOCR.

Other OSS packages being used to good effect in Garden Grove are:

- the widely used apache web server<sup>11</sup>, along with many packages that extend its abilities such as OpenSSL<sup>12</sup> for encrypting transactions, and htdig for searching web contents.
- Zope<sup>13</sup>, the Python-based content management system to host a new city web site.
- the Network File System (NFS),
- Samba, the OSS implementation of Microsoft's CIFS networking protocol that allows Windows file and print services to run on Linux.

Garden Grove's email is handled by HP's Openmail product running on Linux as well as sendmail, Mutt, and a commercial spam agent CanitPro (itself based on the OSS Spamassassin and MIMEDefang). OpenMail has been discontinued and Kalil is looking for an acceptable

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8 I am not going to note any home sites unless they are difficult to find via google.  
For example, PostgreSQL is found at <http://www.postgresql.org>

9 <http://www.scriptics.com/>

10 <http://www.unixodbc.org>

11 <http://www.apache.org>

12 <http://www.openssl.org>

13 <http://www.zope.org>

groupware product to replace it.

Garden Grove uses 11 production servers running RedHat Linux, 8 running WindowsNT or Windows2000, and 2 running DEC Unix for the Emergency dispatch system. They recently started a project to provide wireless data services to the Police using 10 Linux PCs configured as encrypting routers to provide a higher level of security than was available via the wireless standards. This alone saved them more than \$50k over the commercial equivalent.

However, Garden Grove still uses Windows on their ~550 desktops, with most of the applications running locally, using file and print services via Samba. However, even with the use of Windows, they they have been able to increase their efficiency tremendously by using the OSS Virtual Network Computing<sup>14</sup> software to remote-manage the PC clients (as I manage my Mum's Mac in Nova Scotia from California).

Internally, the 8 person IT group uses both Linux and Windows desktops and is continuously evaluating situations where Linux can be used as a replacement on the desktop. It's not that various Linux desktops are inferior - Kalil says the opposite is true - but as in most places, it is the breadth of Windows applications that is keeping Windows on the desktop for now.

Over the last 4 years, Garden Grove has had an annual IT budget of \$1.08M, an average of 1.85%  $\pm$  0.053% (SEM) of the City's General Fund. Remember that number - 1.85%.

### **Irvine**

My hometown of Irvine has a population of ~172,000, and a median family income of \$85,624. The official color is beige, the official house exterior is stucco, and it has some of the best and emptiest bike lanes in California. The City Hall web site is reasonably well designed, runs on MS Windows & IIS, and the city IT infrastructure is entirely proprietary. There is only a single full time employee (FTE) who makes the whole thing run. Actually, she oversees the outsourcing of the entire IT system to Affiliated Computer Services<sup>15</sup>, which employs an additional 18 people to manage the IT system for Irvine, which it has done since 1994 when the system ran on a minicomputer with serial line terminals. Today it requires ~95 servers running Windows 2000 (70%) and Server 2003 (30%) to provide the IT services to the ~600 PCs at City Hall and another ~150 PCs offsite at Public Safety. All the PCs run versions of Windows. There are a few Macs used in design, but

14 <http://www.realvnc.com/>

15 <http://www.acs-inc.com>

IT doesn't support them. Almost all municipal databases are MS SQL Server<sup>16</sup>, with a few still in Access. The Financial system is run on a Unix system which is due to be replaced by a Windows system in the near future. ACS provides computer security using Cisco hardware and software and also configures that equipment to provide the required level of network security. Irvine does not support wireless services yet. My impression of the system, from interviews and as a consumer of its products is that it's reasonably well-run.

However, Irvine's average outlay for IT services over the last 4 years has been \$4.7M  $\pm$  \$0.45M (SEM) contributing 4.61%  $\pm$  0.43% of Irvine's General Fund.

### **Redondo Beach**

Located about 20 miles southwest of Los Angeles, Redondo Beach has a population of ~64,000, with a median family income of \$80,543. The IT department of 7 FTEs supports 530 users (~350 peak simultaneous) in 12 remote sites and runs Windows and Netware servers for most services. However, a good part of the city's vital services runs on HP-UX. The Emergency Dispatch system, the Public Library system the Finance and Payroll systems all run on HP-UX. The latter 2 are custom written in PI-Open, which explains the dearth of other proprietary databases. They are planning to move from this system to one from another vendor, in the near future. The IT dept is also responsible for the telecommunications system.

They have dabbled with Linux as a proxy server, and run apache on Netware, both of which have worked well. However, they use predominantly proprietary software products, being a self-described Novell shop. Besides the Netware directory, print, and file services, also use ZenWorks, Groupwise, BorderManager. They are watching Novell's transition to Linux and OSS carefully and may well move with them if it makes business sense; otherwise they will have to switch to an entirely Windows system within 4 years.

Of the total 24 servers, 8 run Netware, 2 run HP-UX and the rest Windows2000. This imbalance between Netware servers (which do most of the work) and Windows servers (which run specific applications) is explained by the common vendor requirement to run a single application per server. For example, a simple scheduling system requires four Windows2000 servers to run the separate components - one each for the database system, the e-connect server, the IVR server and a payment processing server.

The IT dept had a history with VAXen and Prime minicomputers, so

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<sup>16</sup> <http://www.microsoft.com/sql/default.asp>

they were aware of the advantages of centralization, even in moving to a client-server environment. Despite being warned off Novell during their transition, they stuck with it and have been able to leverage Netware's Directory Services and the remote administration capabilities of ZenWorks to dramatically decrease the number of servers relative to other cities. For example, just 2 technicians handle all the desktop issues for the 400 desktops and laptops and 90 printers.

After an under-funded attempt at implementing a GIS system several years ago, Redondo Beach is again looking at bringing in a GIS system, but it will require at least one additional FTE.

Like all the cities that I was able to query, they would also be amenable to co-development of municipal applications or core technologies if the city approved it and it made business sense.

The Redondo Beach General Fund for Fiscal Year 2002-03 was \$50,764,030 and for 04-05, the General fund was \$51,766,950. Since the IT budget is \$1.6M, IT composes 3.09% of the General Fund.

### **Oceanside**

Oceanside, California is adjacent to the Camp Pendleton Marine base midway between Los Angeles and San Diego. With a population of ~170,000, it is about the same size as Irvine and Garden Grove, and has a median family income of \$52,232 about the same as Garden Grove, although it is more than double the area (41.6 mi<sup>2</sup> vs 18mi<sup>2</sup>). Partly because of the sprawl, the IT staff of 20 is responsible for 42 locations and 4 data centers. It also services double the number of desktops (1400) that Garden Grove uses with more than 300 servers. The servers break down to 50 running Server2003, 75 running WindowsNT, and 175 running Windows2000. Oceanside runs Oracle and SQL server on their servers, with a 3rd party Financials package, supported and customized by 3 programmers who also do web development. The Desktops are all Windows fat clients, although they do use some thin clients for internal services.

Oceanside's General Fund for 03-04 was ~\$81M; for 04-05 it is \$89M. The corresponding IT budgets for 03-04 was \$6M, decreasing to \$5.2M for 04-05, for a percentage of 7.37% in 03-04 decreasing to 5.83% in 04-05.

### **Ontario**

Ontario is a city of ~160,000 30 miles east of Los Angeles in the heart of the LA Basin. The median family income is \$44,031. The IT dept

consists of 19 FTEs and 4 interns, but despite repeated calls and emails, I could not contact anyone to give a further breakdown as to the scope of their system. From the Web site, I determined that Ontario uses mostly proprietary software, using Oracle, SQL Server, Sybase, and Access for databases, Visual Basic for most programming. The city web site uses a Content Management System based on ColdFusion for its web site, supplemented with Macromedia tools such as DreamWeaver, Flash, and Fusion. It also provides an ARCVIEW GIS system running on 3 Sun workstations, which is used for planning, zoning, and in locating registered sex offenders.

Ontario's general fund for the year 04-05 was \$117,543,962, while the IT budget was \$5,956,894 for an IT consumption of 5.07%. For the 4 years, the percentage is 4.85% +/- 0.245, about 3 times Garden Grove's.

### **Carlsbad**

Carlsbad, California is coastal city of 93,000 located just south of Oceanside, with a median family income of \$77,151. Notably, at least to my son, Legoland USA is in Carlsbad.

Carlsbad has about 1000 full and part-time employees of which the IT department makes up 16 FTEs. Another 2 FTEs work directly for the Police dept on their dispatch system and the Fire dept dispatch system is organized through a separate Joint Authority. Carlsbad also has a GIS system, supported by 2 additional FTEs, but they are funded separately from the IT system. The IT dept does support all voice and data telecommunications.

Carlsbad's IT supports 800-900 clients on 2 networks, a public one of ~200 clients and an internal staff network composing the rest. Like Oceanside to the north, Carlsbad supports a number of distributed sites, though with a single data center. Of the 28 distributed sites, 10 of them are large enough to warrant at least one server.

Carlsbad runs a slightly more heterogeneous site than most. It runs Novell, Windows and HP-UX servers, with standard Windows fat clients on the Desktop. They use Citrix to service a few remote, bandwidth-constrained sites. The city web site runs Apache on Solaris, although it is a hosted offsite and the city does not support the machine. Email, file, and print services are hosted by Netware. Most of the Web, small database, and specialized applications are hosted on separate blade servers running Windows2000, to conform with vendor requirements for separate servers. The Library and Financial applications are hosted on HP-UX, using Oracle and Informix, respectively. In total there are about 100 servers, of which 30 are the Win2k blade servers, ~15 run Netware, 4 run HP-UX, and the rest are networked Win2K servers. There is a single Linux machine running a specialized authentication



and data transmission application, which was set up by a Linux-phile employee. Networking and security are mostly implemented with Cisco machinery. There is limited 802.11 connectivity in the IT dept, but it is not widely available.

HP and Novell are two important vendors for Carlsbad and while HP has increased support for Linux recently, it is Novell's Linux strategy that interests Carlsbad. Since they currently like and use a number of back-end Novell applications, a conversion to Linux-hosted back-ends would be of interest, as long as it was economical and resulted in an overall simplification of their infrastructure. They have also looked at OpenOffice, but a move to include more OSS will more likely be on the back-end, invisible to end-users.

Carlsbad would also be willing to participate in co-development of core technologies if it fit with their needs, but have not been active in doing so at this point, as their core technologies are mostly proprietary.

Carlsbad has a 04-05 General Fund of \$96.1M and an 04-05 IT budget of \$5,010,367 for a percentage of 5.214%, down from almost 6% the year before. Over the past 4 years, Carlsbad has spent 5.23%  $\pm$  0.56% of their General Fund on IT.

### **Newport Beach**

Newport Beach, California is a coastal city just to the west of Irvine which has a population of about 70,000, with a median family income of \$111,166, the highest of this survey. There are approximately 800 full time employees in the city.

The IT department serves about 300 users and is Windows-based on the desktop, mostly with standard Windows fat clients, although there are a few Citrix thin clients. The IT back-end is split among 16 Windows servers of various flavors and 4 HP-UX minicomputers running the enterprise databases (using Oracle and Informix) that are increasingly being made available to a wider audience of users via web interfaces. The department also supports telecommunications, a city-wide GIS which is accessible via the web, as well as supporting high data rate wireless communication across the city including a 7 Mb/s radio link to their ISP. Newport Beach does develop some applications in-house, but only with the source code from their proprietary vendor, or for the city web site. MIS Manager Paul Malkemus says that they've considered doing co-development with other municipalities, but have never done a complete project although they have shared parts of projects. On other fronts, they are typical Windows site, running the standard Windows Office suite with Exchange as the standard groupware package.

Despite the relative wealth of Newport Beach, the relatively expensive HP backend and the number of responsibilities, NB has a 05-

06 IT budget of \$2.47M, compared to a General Fund of \$91.1M for an IT percentage of only 2.7%. This number is a bit higher than average, as the 7 year mean is  $2.39\% \pm 0.070\%$ .

## *Moving to Florida*

### **Largo**

Largo is a city of about 70,000 with a median family income of \$41,523, located in Pinellas County, on the Gulf coast of Florida. In the late '90s, Largo had been using both proprietary Unix and a DEC VAX as the basis for their IT and was looking for a more cost-effective strategy for providing IT to the city. Like almost all cities considering this kind of move, they reviewed the conventional wisdom of IT, the networked PC running Windows. Unlike almost all other cities, Largo was more worried by the instability of this new technology and the incipient support issues than its initial lower cost. Since they were already familiar with the Unix environment, and the low cost of their previous green-screen terminals, they looked for an alternative that was Unix-compatible. They found the modern thin client, essentially a naked display device, albeit a fully networked, GUI-capable one. Since the display device has few or no moving parts, and cannot store data or configuration changes locally, there are few things to go wrong with it, and fewer reasons for a support person to visit it. Additionally, since the files that describe the user's desktop and the data files are stored (and backed up) centrally, employees can access their complete working environment from a thin client located anywhere, including from home if necessary. This approach also simplified Largo's compliance with Florida law which has strict laws about where government information can be kept.

Thus, even before Linux appeared on the horizon, they were already using thin clients as a part of the infrastructure. The current It Manager Harold Schomaker came to Largo in 2001, after the conversion to thin clients was in progress. His decision was "Yes I like it, let's expand it". The advent of Linux just made things cheaper, by allowing Largo to largely replace a proprietary (SCO) Unix with Linux running on generic PC hardware. By 2002, Largo was supporting their network of ~400 simultaneous users (of ~800 total) on only 2 servers, each one of which could have supported the whole load. Note that these servers hosted only login and desktop services, not the entire application load which was spread over several other servers. Currently, Largo's IT system runs on ~25 servers, running a combination of Red Hat Linux, Suse Linux, AIX (for the police dispatch system), SCO Unix, and WinNT & Win2K. According to their current

budget and planning documents, with more users requiring more resources, and the original servers coming up to the end of their life-cycle, they will be replaced with more and beefier ones.

Largo has a number of remaining Windows applications that are not available on the Linux platform. Largo has addressed this need by using the Microsoft approach to thin clients - the Windows Terminal or Citrix Metaframe server. This approach uses the same display devices as the Linux applications, so rather than providing a fat client on each desk for each set of applications, a small pool of fat servers provides the applications for a large number of thin clients (only one of which is required to provide *both* Windows and Linux applications to the end user).

There were transition issues. Four VAX applications had to be replaced with proprietary software (albeit that ran on Linux) and much data had to be migrated to formats compatible with Linux. Schomaker says that Largo has no problem with buying proprietary applications, especially for supplying the business logic, and in fact prefer this for the indemnification it provides. However, finding such applications was fairly time-consuming since there were few such applications on the market at the time. Similarly, they were very concerned with the SCO lawsuit against IBM<sup>17</sup> (regarding the intellectual property SCO said was flowing to Linux from Unix), especially since Largo was a poster child for Linux, and Schomaker followed the lawsuit carefully.

While they much prefer to buy than build infrastructure, Largo does interact with other Florida IT departments via the Florida Local Government Information Systems Association<sup>18</sup> (Schomaker is an officer) to share ideas to decrease costs. Since Largo is a OSS success story, Schomaker gets about 2-3 phone calls a month to discuss his approach, but although his approach is relatively straightforward and cheap, there is usually a generally a reluctance to try to duplicate Largo's efficiency. Existing contracts, management resistance, ignorance or misunderstanding of the new technology, lack of choice of replacement applications, data migration, and risk concerns all contribute to a reluctance to implement the kind of IT structure that Largo enjoys. Schomaker also noted that he is also paying attention to the Government Open Code Collaborative (GOCC)<sup>19</sup>, a collection of state and local governments to encourage the sharing of wisdom and OSS code developed for and by government.

Largo is one of the few cities that use non-Microsoft groupware, using

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17 <http://www.caldera.com/ibmlawsuit>, <http://www.groklaw.net>

18 <http://www.flgisa.org>

19 <http://www.govtech.net/?pg=news/news&id=90695>, <http://www.gocc.gov>

Novell's Groupwise 4.1 on Unix for calendaring and the Suse Open Xchange mail server<sup>20</sup>. On the client side, they use the well-regarded Ximian Evolution client. Novell bought Suse and Ximian recently so integrated Novell solutions will certainly be considered in the future., especially as calendar functions are being added to Evolution. The city has also moved from WordPerfect 8 for Unix to the OpenOffice.org suite recently which reduced the number of licenses significantly, but also called for a fair amount of retraining. Macro incompatibility wasn't an issue as they didn't use many. Schomaker estimates that Largo saves at least \$500,000 per year on licenses by using OSS.

The efficiency of the thin clients and robustness of the Linux servers results in a much smaller staff - Largo has only 11 IT staff, including the Director. These savings result in a comparatively low budget for the IT dept - \$1.57M  $\pm$  0.125M over the last 5 years for an enviable price:performance ratio, 3.07%  $\pm$  0.034% of the General Fund over the last 3 years.

### **Boca Raton**

Boca Raton is a city of ~75,000, located in Palm Beach County on the east coast of Florida with a median family income of \$60,248, considerably higher than Largo. The IT infrastructure is entirely proprietary, based on running most of its applications and databases on an IBM AS/400 midrange computer that serves ~900 desktops and 25 GPRS-equipped laptops (all Windows fat clients), which is about the same sized user base as Largo's. The IT dept also supports telecommunications and a copy center with a small part of its budget. Boca Raton has an IT staff of 21 split about equally to support the PC Network and the AS/400 functions. Boca Raton also has a proprietary GIS, but it is funded separately. Walt Scrivens, IT Director of the city reports that Boca Raton uses no Open Source software and it has no plans to. A substantial difference between Boca Raton and Largo can also be seen in the IT budget. Over the past 5 years it has averaged \$5.73M +/- \$221,721 in IT costs for a combined average of 7.37% +/- 0.43% of the General Fund.

### **Daytona Beach**

Daytona Beach is a city of about 65,000, median family income of \$33,500, located on the east coast of Florida in Volusia County. It is largely based on Windows as an infrastructure, with an IT staff of 17 to support 1250 employees. Like many other IT departments, it also has responsibilities for telecommunications and has recently instituted a changeover to Voice Over IP on its gigabit ethernet. It also was forced

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<sup>20</sup> recently open-sourced: <http://linuxtoday.com/news/2004080200926NWSVLL>

to address the problem of document archiving to comply with Florida's public information access laws and went with a commercial vendor to provide these services rather than write them in-house. It would have been interesting to see if Garden Grove's document-archiving system would have been a good fit. Over the past 3 years Daytona Beach has an annual IT budget of about \$2.31M +/- \$0.129M for a combined average of 4.46% +/- 0.18% of their General Fund.

## **DISCUSSION**

The central point of this review is that OSS solutions for municipal IT can be implemented and sustain budgets that are as low or lower than those using proprietary software. The 2 OSS models presented are as cost-effective or more so than any of the other proprietary models described (and I would be interested in additional data points that both support and rebuff this interim conclusion).

This is not a statistically valid sampling (due to the low number of OSS cities), but it does try to compare the approaches that Garden Grove and Largo took to use OSS successfully for their IT infrastructure. Contrary to some studies that claim that infrastructures based on Microsoft's approach are cheaper (compared to conversion to Linux-based systems and over the long run), the IT budgets for these OSS-using cities are not greater than the population- and income-matched cities that use proprietary software. On the contrary - their budgets range from slightly less to about  $\frac{1}{4}$  of those of the cities using proprietary software. The OSS approach even yields costs well below those in for-profit businesses where the pressure to control costs should be more intense than in government. (Businesses are estimated to spend an average of  $\sim 3.6\%$  of revenue on IT according to David, Schuff, & St. Louis), which may be comparable to a city's Basic Services. If it was comparable to what is usually called City's Enterprise Fund, municipalities would be even more efficient than Businesses (Garden Grove, for example would spend 0.72% of its Enterprise Fund on IT.)

It might be unsurprising that Free Software costs less than proprietary software - after all, it's *Free*. However as Microsoft makes abundantly clear in its advertisements, the cost of software is only a minor part of TCO. The much larger cost comes from user support, patching software, dealing with malware and unstable systems.

### **IT Staff**

With the exception of Redondo Beach, the number of IT staff of Largo and Garden Grove was less than those that used substantially proprietary software, which runs counter to conventional wisdom. A central point highlighted in the Microsoft "Get the Facts" documents is that conversion to Linux will cause personnel costs to skyrocket because Linux-proficient staff cost much more than Windows-proficient staff (and implies an equivalence of reliability). While I did not directly measure personnel costs, I did count IT staff and here again, reality seems slightly different than Microsoft's version of it. The 2 OSS cities had the smallest staffs of the cities covered, except for Redondo Beach, which uses mostly Novell, not Microsoft.

### **Desktop Management**

You might think that proprietary software would be more robust and easy to manage, but that is not borne out by the data. However, it may be that the real causes of instability are with the supporting Operating System rather than the applications. Support issues themselves were not a substantial problem for the OSS cities. Long institutional familiarity with Unix and OSS obviously helps decrease the support problems, but it was notable that support issues were very low on the list of priority problems for both Garden Grove and Largo. Both Garden Grove and Redondo Beach used remote desktop software (VNC and Novell's ZenWorks, respectively) to substantially reduce the trips that support people had to make. Since Largo uses thin clients, remote desktop management is essentially built into the system.

### **Number of Servers**

The number of servers required to provide support to a set of users was lower with Linux, sometimes dramatically. In fact, this was a trend with all sites that used anything EXCEPT Windows. Sites that used Novell, HP-UX, or even AS/400 tended to use fewer servers than did sites that used only Windows servers. In some cases this imbalance was by a factor of 5 and even 10, although note the number of remote sites supported above). Originally, Largo supported all their thin clients with 2 Linux servers (and claimed that only a single one was needed). Currently, Largo uses a total of 25 servers for all its services. Garden Grove uses a total of 11 Linux, 8 Windows and 2 DEC machines to provide service. Of the 2 pure Windows sites, Irvine uses ~95 servers to provide service to about the same number of users as Garden Grove and Oceanside uses 300, *greater than ten times more*. Carlsbad also uses Win2K predominantly and has about 100 servers, 80% of which run win2K. However, note that Carlsbad and Oceanside have a substantial number of external sites and this undoubtedly contributes to the number of servers.

Another explanation offered by the interviewees for the high number of Windows servers is that many vendors of Windows-based applications insist or strongly recommend that their applications run alone on a dedicated server to avoid memory competition or conflicts. This contributes to the rapid multiplication of servers, each one running one application or even multiple servers running the same application to provide adequate response time. This is typically not the case with Linux-based servers which run a variety of applications without conflict. This weakness may be improved with Windows Server 2003, but a quick scan of online reviews indicates that it has some ways to go before it comes close to the stability and robustness of Linux or BSD derivatives (often characterized as even more stable than Linux).

From the above points, if it takes more people to run the system and it takes more hardware to run the system and the software is more costly, it is no surprise that overall, it is considerably more expensive to run the system. As can be seen from Table 1, Garden Grove and Largo spend about 2%-3% of their municipal budget on IT, while those based on proprietary software spend about 3%-6% of their budget on IT.

If software cost, support, robustness, and scalability are the problems that Microsoft mentions in its "Get the Facts" campaign as reasons to avoid Linux and OSS, this should not be the case - the costs should be reversed. While there are clearly problems with my analysis, there are also clearly problems with Microsoft's.

## **Barriers to the Use of Open Source Software**

Using well-known OSS applications as a substantial part of your back-end IT infrastructure would appear to be eminently reasonable. Why pay for proprietary software if the free alternative is widely used, better debugged, arguably better supported, has more useful add-ons, is more secure, and scales better?

As it turns out there are a number of very good answers to that rhetorical question.

Inertia is, of course a major one and a very strong argument to stay the course. If your IT system is working well, and your budget is stable, unless you have a strong desire for pain, there really is no reason to change. This is the primary reason Microsoft is correct in its assertion that switching from a working Microsoft infrastructure to a

Linux-based infrastructure is bound to be very expensive. Any time you force a massive change in infrastructure, it's going to be expensive and time-consuming – witness the problems Munich is undergoing in its conversion to OSS.<sup>21</sup>

In the real world however, these 2 requirements are not guaranteed. IT is almost always being asked to do more, usually with less. OSS expertise allows you to do that, and in doing so, makes you more valuable to a wide variety of prospective employers.

In many cases, it is not that OSS alternatives are inferior or lacking; they are not used because the IT personnel are uninformed about their availability, have been prevented from using them, or the IT infrastructure is such that only proprietary applications can be used due to the idea that software must be backed and supported by a legally responsible entity.

Given the low frequency that software vendors are successfully sued for product liability or anything else, this seems to be a case of misguided optimism at best. Since it takes an entity the size of a state or federal gov't to take on Microsoft, the 'liability' of proprietary SW vendors is at best questionable, given the 'click through' licensing that obliges you to hold the vendor blameless if anything goes wrong.

Recently, with the SCO suite against IBM<sup>22</sup>, the argument was made that you need your software supplier to provide indemnity against legal action. This latter point is a frequent and effective part of the FUD (Fear, Uncertainty, Doubt) campaign against Linux and OSS. At least some cities are avoiding Linux for this reason and even Largo is watching that case with more than casual interest. For related reasons, Munich briefly halted its widely announced transition to Linux until the European Union clarified its position on software patents. Microsoft DOES provide unlimited indemnity with its products, so that is one reason to stay with it. Microsoft CEO Steve Ballmer has recently made noises that a further reason not to use Linux is that it violates several patents<sup>23</sup>, according to a study from Open Source Risk Management (which is looking to sell indemnity protection to Linux users). Novell, HP, and RedHat already provide such indemnification, although other Linux vendors do not. For a city on a tight budget, this is certainly a not a trivial consideration.

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21 [http://www.theregister.co.uk/2005/09/06/linux\\_migration/](http://www.theregister.co.uk/2005/09/06/linux_migration/)

22 [http://en.wikipedia.org/wiki/SCO\\_v.\\_IBM](http://en.wikipedia.org/wiki/SCO_v._IBM)

23 [http://news.com.com/Ballmer+attacks+Linux+on+patent+front/2100-7344\\_3-5457879.html](http://news.com.com/Ballmer+attacks+Linux+on+patent+front/2100-7344_3-5457879.html)



## How to use more OSS in Municipal IT

Obviously the best way to keep from going down the proprietary road is to never start down it, but that is an unrealistic goal - with almost every PC coming preloaded with Windows, it takes an enormous force of will not to start down that slippery Microsoft slope or to try to climb off it once you're on it. There are tales of success but they are rare and are almost always triggered by catastrophic events<sup>24</sup>. Even for groups who are committed to converting to OSS, it can be difficult to do so because of the demands that they face to do more with less on a daily basis in addition to planning and implementing OSS migration.

In order to succeed with an OSS plan, there needs to be a different mind-set in the IT population. The IT department needs to be committed to and especially interested in the process. This sounds trite and obvious, but if they are not interested in the process, then there is little incentive to figure out how things work, how to make pieces work together, and how to further the process. This was especially evident in the Garden Grove transition. The head of the dept was a committed geek (in the best sense of the word) who needed to get things done reasonably fast, and done fast with a minimum of money. In this case, OSS showed yet another advantage - the ability to 'load and go'. Because it is free, a government employee is (usually) free of the need to hold a lengthy Request for Proposals (RFP) for the software<sup>25</sup>.

As the US Census department noted<sup>26</sup>, it saved a huge amount of time to be able to download the various software packages, try them and then make a decision based on the results of their trial, without a lengthy RFP process. Especially in time-critical environments (granted, not often the case in municipal governments), this can be a large advantage, but even at regular deployment speeds, it can be a large time and personnel saving to be able to avoid developing a complex specification and then evaluating numerous submissions to come to a defensible judgment.

Conversion to OSS doesn't have to be done at once. You don't even have to do it using Linux or BSD. There are a large number of OSS packages that run quite happily on the Windows platform including Windows environments that emulate the Unix environment, including

24 A well-known example is that of the Ernie Ball company, which converted to OSS when it was sued by Microsoft over license miscounts - [http://news.com.com/2008-1082\\_3-5065859.html?tag=lh](http://news.com.com/2008-1082_3-5065859.html?tag=lh)

25 Note that the California Performance Review (<http://www.report.cpr.ca.gov/cprprt/issrec/stops/it/so10.htm>) states no preference for OSS, just that the selected SW should be the best for the price.

26 At the O'Reilly Open Source Conference [http://perl.oreilly.com/pub/a/oreilly/perl/news/census\\_0101.html](http://perl.oreilly.com/pub/a/oreilly/perl/news/census_0101.html)

free Cygwin<sup>27</sup> environment and commercial vmware<sup>28</sup>. With these, you can run the Linux version of many OSS packages on a Windows server. As well, applications written in Java have the potential to run equally well on Windows or Linux. And theoretically, Microsoft's .NET applications will run just as well on Linux running the free Mono framework (if Microsoft doesn't bring out the legal long guns to blow Mono to monomers)

Once a company has decided that it's worth investigating, and a competent technical lead has been identified, the best way is to start incrementally with server infrastructure, slowly replacing proprietary systems with OSS equivalents, gaining experience with the Operating System and OSS approaches so that further replacements also go smoothly. This approach is logical because servers typically emit well-defined data in response to well-defined requests and there has been tremendous work in this area from other domains. Web, database, mail, fax, file and print servers, firewalls, spam filters, source code versioning systems have all been used and debugged considerably in the OSS domain. The transition from using a proprietary version to an OSS version can be nearly invisible to the user (for example, replacing a Windows file and print system with a Samba server). This same approach can also be used to replace expensive commercial routing equipment with Linux PCs loaded with multiple ethernet cards, as Garden Grove has done. As long as the performance is comparable, the end-users are completely unaware of a change.

As noted above, most municipal IT departments have found is that they can reduce, sometimes dramatically, the number of servers when they switch from Windows to almost anything else (see Table 1). And if they can also run OSS services on these servers to get the same performance, they reduce their outlay on licenses, as well as on hardware and hardware support.

Once your IT population is comfortable with a basic system, you can replace the next system and the next. Once the back-end has been largely transitioned to OSS (often without the end users being aware of the change), you can either stop there (as Garden Grove has done), or start experimenting with the Desktop in various ways, starting with the IT group internally, and moving out from there in gradations, depending on your environment and comfort level. The Desktop has a very different ecology and changing it will depend on how much power the IT department wields over the user groups. Typically, if the user groups are 'knowledge workers' - highly specialized, highly educated,

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<sup>27</sup> <http://www.cygwin.com/>

<sup>28</sup> <http://www.vmware.com>

highly paid, and highly opinionated - a forced change will simply not work. For example University professors are a notably recalcitrant group. However, a workgroup of users with a set of specific tasks that demand a restricted set of applications is a better bet to succeed with a top-down mandated change in their desktop. Call Centers, purchasing departments, Help Desks, trading desks, etc can all benefit from a standardized Desktop. This doesn't mean that the Desktop can't be personalized, but it does imply that there is a centralized imposition of order.

- There is a shadow hanging over this for those who are thinking of trying to convert. Once MS releases Longhorn, with its new applications and licensing, it will be even harder to effect a transition. It will be even harder if MS finally implements their WinFS, which will replace the standard filesystem with an object database so that it will become even harder to separate your data from their systems.

- There is an tipping point coming that MS and other proprietary vendors have to be worried about. If even small groups of municipalities band together to design and build the chunks of common infrastructure that all cities and states need (and there are a limited number of pieces that are needed) then very soon there will really be little demand for the proprietary civil software industry.

This is a pretty good overview of linux vs windows:

<http://www.techworld.com/files/whitepapers/twlinvwinv2.pdf>

In most of the research and polling that has taken place so far, very few have indicated that OSS tools and packages are technically inferior to their proprietary counterparts. If anything, most are deemed technically superior or equivalent, and 'greenfield' implementations using OSS would tend to be easier and more economical than using proprietary SW. The problem is that there are almost no cases in which this will be the case. Almost all current IT infrastructures will be largely based on proprietary software that has, as one of its goals, buyer lock-in; the product seeks to make it difficult for a user to switch to another product. While there is some proprietary software that is designed to 'play well with others' by publishing well-defined Application Programming Interface (API) information, most are not, assuring customer loyalty through incompatible, undocumented formats. OSS software is usually designed along the principles of SW re-use and modularity so that functionality from other projects can be incorporated more easily.(standing on the shoulders of giants has its advantages).

Transitioning end-users to OSS is a multi-stage process. Some OSS packages such as Mozilla/Firefox, OpenOffice.org, are available in native form for Windows, enabling users to try OSS applications without changing the underlying operating system. In some cases, this alone can be a significant saving due to lower licensing costs and better malware resistance. In some cases, further migration may be prevented due to the lack of a particular application or the complexity that providing an alternative application requires. In other cases, once users get used to the core applications on the familiar platform, moving to a client system is not as hard as it might seem. There are some (probably apocryphal) stories of users not realizing that the platform has changed until they go searching for Solitaire.

So how does one rationalize using some OSS with the real world requirements for some Microsoft Windows software that is not available for Linux?

One way that is cheaper, more reliable, and easier to manage than even replacing Windows with Linux is to use thin clients - bitmapped display terminals with no moving parts (usually) that can be used with both Linux and Windows applications at the same time, allowing the required mix of Windows and Linux-based applications to run simultaneously while transitioning from Microsoft to Linux. The Microsoft applications run via Windows Terminal Services or Citrix and the Linux applications run via Xwindows. Besides this advantage of a single workstation being able to run both OSS and Windows applications in native mode, the thin client approach has the well-characterized advantage of being cheaper, easier to administer, and simplifies backup and security. It's also possible to use older PCs as thin clients for very low-cost terminals.

The problem for using the thin client model for municipal IT is not technical, but psychological. It runs counter to the most popular computing models which are really extensions of the home computing environment. This model assumes the user needs a stand-alone PC that connects to a remote server for some services, but almost all of the applications run on the local PC. However, in many large organizations almost all of the important processing happens on the server, with the PC acting as a very expensive display terminal, more in line with the Web model of utility computing. Using a Windows PC for this purpose is vast overkill – it is built as a small server, with its own enormously powerful CPU, lots of memory, multiple disk drives, and often multimedia devices, all of which adds up to a display device that is more powerful by an order of magnitude than it really needs to be, while introducing multiple points of failure, increased security risks,

much harder administration, and increased difficulties in protecting the data. To be sure, more of the system value is concentrated on the server, but that single point is easier to protect and in all well-designed operations, there are redundant servers providing failover support.

The real challenge then is not so much in facing a cataclysmic change in application availability, but in the change in mindset and abilities that are required to change the infrastructure and the ways in which it demands that the IT staff deal with it.

Garden Grove did not have problems recruiting or retaining people who were experienced in the type of approach that I describe. From his POV, Kalil indicated that universities are starting to turn out people who have the necessary skills and attitudes to work with OSS. It may be that he is lucky and that Garden Grove has an exceptional work environment, but he has not had a problem with retention, although that may change as more companies start to hire OSS-competent IT staff.

### **Build or Buy aka Do It Yourself IT**

Both Largo and Garden Grove have used a small group of talented and technically savvy people to implement an IT system that is highly optimized for their requirements. This runs counter to the currently accepted and seemingly logical idea that it is always cheaper to buy an infrastructure component than to build it. If this is the case, how can OSS be a net plus, as the OSS approach implies that you are building, not buying?

Well, it's pretty simple - no system, commercial or free, comes exactly the way you want. They all have to be configured to serve the exact needs of the organization, hence all those control panels, wizards, and configuration files. And of course, you have to supply the content. The key is that when you use OSS these days, you are NOT developing from scratch. OSS now often comes in roughly the same chunks of functionality that much commercial software does. With those OSS chunks, it is only slightly more challenging to, for example, put together an email system with spam filtering and integrated fax server, than to install and configure a commercial one. As well, the OSS version may well be more scalable, resistant to collapse, attack, viruses and other malware than the commercial one<sup>29</sup>, leading to manpower savings over the long run because you have to baby it less.

Many of the popular OSS projects are now full blown, mid-level

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<sup>29</sup>[http://www.dwheeler.com/oss\\_fs\\_why.html](http://www.dwheeler.com/oss_fs_why.html)

enterprise systems, with associated commercial support, such as Apache and its associated modules, MySQL, PostgreSQL, Compiere, Zope/Plone, etc.

Where there are large chunks of functionality that are not (or not quite) available as OSS, the choice to build or buy becomes quite relevant, depending on the constraints. Garden Grove had a proprietary document archiving system that they needed to replace and finally decided (perhaps foolishly) to write it themselves. While the entire system was not available in finished form, large chunks of the functionality were, and they were able to knit the whole together with the **tcl** scripting language to the point where it is now a production system. They are considering the best way to make this functionality available to other municipalities as OSS<sup>30</sup>. An OSS municipal imaging and archiving system makes for one less piece of software that has to be bought by other cities. The much discussed conversion of Munich's infrastructure to OSS will certainly provide more large chunks of functionality in support of municipal IT, especially for well-integrated groupware. The Government Open Code Collaborative<sup>31</sup> is a recent addition to the code repositories for government-related projects. While it has only a few projects currently listed, it has only been in operation a few months and there are a number of other OSS projects that are useful to governments but are not specifically related to them (for example, Compiere (Enterprise Resource Planning & Customer Relationship Management<sup>32</sup>), Double Choco Latte (web-based project management<sup>33</sup>), the governmentforge Leopard project , apache and the apache project modules. MySQL, Firebird, Inprise, and PostgreSQL are excellent databases. CVS and Subversion are now better repository tools in many respects than their commercial counterparts. The Linux kernel team keeps the kernel versions, branches, and modules under version control with git, another OSS version control system.

Can this OSS component model support all aspects of Municipal IT? Not currently, although there are progressively fewer parts of it that are absent in the OSS world. The greater challenge is to start the process of evaluating the software and using it where it makes sense.

### **Are there reasons NOT to use OSS?**

The answer to this question depends on your own situation. Your IT implementation and your happiness with it sharply depends on the

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30 contact Charles Kalil [charlesk@ci.garden-grove.ca.us](mailto:charlesk@ci.garden-grove.ca.us)

31 <http://www.gocc.gov/>

32 <http://www.compiere.org>

33 <http://dcl.sf.net>

expertise of your staff. If you've outsourced all your application development and IT to a Linux house that suddenly goes broke, and you have no in-house expertise to back it up, you're SOL. And you should be fired. This was the case with Combe Inc., recently of a Microsoft 'Get the Facts' advert. (It might be alternatively be titled 'How to hide your incompetence by being a cover boy for how MS saved your butt'. For a company to bet on a technology that they don't understand is the worst kind of silliness.

In order to move from a substantially proprietary infrastructure to one that includes substantial OSS components, there are several obstacles to overcome. Management/staff/user resistance, user/staff retraining, long-term contracts, lack of applications, performance issues, unfamiliar development tools, perceived lack of competent personnel, integration issues, lack of vendor support, data migration, can all make it difficult to transition from PS to OSS. These are some of the reasons that make switching from a Windows environment to one based on OSS is so expensive. *OF COURSE* it's going to be more expensive to completely re-engineer your IT infrastructure than to upgrade to another version of Windows - no sane person would dispute that. The debate among many companies is not if, but *when* the long term benefits of such a transition are worth initiating. Strangely enough, this is actually the underlying theme of some of the documents that are currently on MS's 'Get the Facts' Web site<sup>34</sup>. Such docs clearly note the high cost of immediately switching to an OSS strategy, but also make the point that almost all the firms they interviewed had a Linux/OSS strategy and were going to transition to it as soon as it made business sense. Rather than being supportive of a continued or expanding MS hegemony, these documents seem to herald the end of Microsoft's dominance, at least on the server side. A recent one from TechWorld<sup>35</sup> is as balanced an account as I've seen recently, with their judgment being:

*All of which seems to bring us to the conclusion: "Run a Windows server if Linux can't run the programs you want, on the server you want to use, in the authentication infrastructure you want. " If you don't absolutely have to run Windows [for one of the reasons noted in the report] then unless the training requirements are extravagant, Linux will usually be the better value choice.*

Note that bit about the programs that you need to run. There are some applications that simply do not exist for Linux and if they are a

<sup>34</sup> <http://download.microsoft.com/download/7/d/0/7d059de9-1557-415c-8332-920db6f89e44/FRSTRossCosts0404.pdf>

<http://download.microsoft.com/download/6/b/7/6b7c5fa1-fcc9-434e-b1e6-5025b7f97786/YankeePart1.pdf>

<sup>35</sup> <http://www.techworld.com/files/whitepapers/twlinvwinv2.pdf>

critical part of your infrastructure, you will need to run Windows to provide it. If you need to run a specialized financial application, chances are that it will not be available for Linux (however, see emulators below). On the other hand, there are more applications that are being re-written for Linux or are being written *de novo* for Linux. For example, Redondo Beach, CA is researching a GIS for the city. While they are leaning strongly towards ESRI's ArcView, there are a number of Open Source GIS systems available<sup>36</sup>, some of which, such as GRASS<sup>37</sup>) are quite user-friendly and feature-rich.

## **Transition Costs**

No matter how attractive the alternative, there is a high transition cost to converting from one type of infrastructure to another. This conversion cost is the main one now being mentioned as preventing the conversion from Windows to Linux and the major reason why Microsoft can say with absolute certainty that a continued Windows system is cheaper than any Linux conversion solution. In the short term, Windows is cheaper because ANY conversion will cost more, not because Linux is inherently more expensive to run in the long term, something that many such studies fail to mention (or mention in fine print). Incidentally, there are fewer and fewer studies that claim Microsoft is actually cheaper to run in the long term and most of the ones that do have been shown to be paid for by Microsoft or the result of catastrophic planning.

For a total conversion, it is not simply the cost of re-training your employees to use a new application - it is the porting or re-writing of scads of software, from spreadsheet macros to full applications, database schemas, and possibly changing e-business infrastructure - not a thing to take lightly. But this is a cost that you don't have to absorb immediately, nor should you.

### Assumptions & Disclaimers.

This is not a valid statistical sample, and it will be difficult to provide such a sample for a while as the number of cities that use a mostly OSS model are extremely small. However, it provides a baseline set of numbers that I encourage people to expand, correct, and amplify upon as more information becomes available. The methodology for sampling is that I took the 2 cities that used OSS as anchor points and tried to sample cities that were matched in geographical, population, and income level. I was not able to perfectly match these (Boca Raton

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<sup>36</sup> <http://opensourcegis.org/>

<sup>37</sup> <http://grass.itc.it/>



and Irvine have a much higher income level than Largo or Garden Grove, for example).

I personally interviewed Charles Kalil of Garden Grove, Jan Canevari of Irvine, and Robert ShingleDecker for this article and a number of people related to this topic.

It also does not cover cities that attempted to use or convert to OSS and failed for various reasons.

Finally, I did not measure usability from the point of view of the city employees, so it could be possible that the OSS cities managed to implement a cheap, but ineffective IT structure. However, this seems to be unlikely.

For this analysis, I will use the basic cost of the city government as the baseline (usually termed **General Purpose Fund** or **General Fund**, not the 'Total' or Enterprise' budget. I think the actual figures will come out about the same comparatively but the smaller number more closely approximates the 'cost of the government' as opposed to including more varied and optional things such things as municipal utilities, golf courses and libraries. However, many times a **Basic Services Budget** is also mentioned and this is probably closer to the real cost of city government. The actual budget of the IT department is also noted for comparison.

A Note on municipal budgets. These are among the worst-presented, hardest to decipher, least transparent documents that I've ever had opportunity to read. Most are PDF documents that are scanned images of the actual docs, so that while the information is (usually) visible, it can't be searched, and sometimes it is actually presented turned sideways to make reading it even harder on screen. The scanning also makes these documents gigantic (multiple MB for a couple of pages), so that without a broadband connection, they are essentially unavailable to review.

Of the >20 budgets that I've reviewed the best by far is that of Austin, Texas, which is also a PDF, but has an accurate TOC, is searchable and is a model of clarity (even tho it is very long).