DIGITAL CITIES & DIGITAL COUNTIES SURVEY

Best Practice Guide

Produced by:

CENTER FOR DIGITAL GOVERNMENT

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INTRODUCTION

Each year the Center for Digital Government (CDG) conducts the Digital Cities and Digital Counties Surveys to chronicle and rank local governments' use of digital technology to streamline operations and improve service to constituents. These surveys primarily focus on outcomes: the results these cities and counties have been able to achieve by utilizing and finding innovative uses for technology.

In 2012, CDG found cities and counties that are on the "leading edge" of technology adoption without being on the "bleeding edge" of security risk and project failure. Some of these leading-edge players include:

- Louisville and Boston — Each city has become an innovation leader due to CIO and elected officials' strategic leadership, constituent engagement initiatives and business community involvement.
- Ann Arbor, Mich., and Washtenaw County, Mich. — Both have reduced costs and improved operations by sharing services and infrastructure.
- Sussex County, N.J., and Oakland County, Mich. — Both have developed private clouds and offered services to municipalities, overcoming the obstacles to inter-governmental cooperation.

Overall, the surveys found that internal information technology (IT) functions are increasingly seen as engines to help drive economic development and improve the business climate. Additionally, there is widespread adoption of social media sites and tools, with gradual use of social networking to better communicate with constituents.

Still, there are weaknesses which remain ripe for innovation. These include utilizing return on investment (ROI) to make the case for technology improvements, protecting against ever-increasing cyber security threats, preparing for business continuity following disasters, and adopting new Web-based technology for constituent feedback and engagement.

These gaps lead to a number of interesting questions confronting local government leaders today:

- How do some governments become innovative and leading edge?
- How can jurisdictions respond to ever-changing cyber threats?
- How can a city make the case for investment in a new application or better technology?
- Is the best disaster plan to simply send backup tapes off site and hope the "big one" never hits?
- Is that data center remodel or upgrade really necessary, or can the cloud avert it?
- Can counties and cities really collaborate and share services? If so, how do they overcome financial, legal and trust barriers?

In this report, the Center for Digital Government will help address these questions and highlight the cities and counties that are managing to move the needle and innovate.

BACKGROUND

Governments, as stewards of public funds, are often more cautious in the adoption of new technologies than the private sector. Sometimes that caution is justified, as emerging technologies can bring increased risks. This was the case for online bill payments in the 1990s. After private sector companies — especially banks — had worked out the bugs and security issues, governments could rapidly adopt online transactions.

However, in some cases this caution can actually create additional risk or inhibit efficiency. For example, government

agencies have been slow to adopt tablets for field workers. This lack of adoption continues inefficient paper processes and limits the ability to work from the field.

A common thread among this year's Digital Cities Survey and Digital Counties Survey winners is the ability to balance risks and rewards. This places them on the leading edge of innovation and adoption of information technology.

STRATEGIC LEADERSHIP

While innovation is a watchword across the nation, often-times innovative ideas are captured and implemented on a one-off basis, without an overall strategic plan or direction. Leading-edge governments have strategic leadership which ties innovation to their enterprise goals.

What Cities and Counties are Doing

In 2012 some governments created "chief innovation officer" positions, or reworked their information technology depart-ments into information technology and innovation departments. Boston and Philadelphia both have a Mayors' Office for New Urban Mechanics. Louisville created an Office for Innovation focused on both internal services and economic development, and a separate Office of Performance Improvement to lead a culture of continuous improvement within the government.[1]

Two common threads run through these initiatives. First, a commitment by the mayor or chief executive to changing the way business is done in government, and second, a juris-diction-wide strategic plan to which other plans, such as the information technology plan, are intimately linked.

For example, Sacramento's mayor, council and city manager adopted a set of strategic goals and the city's information technology department linked its projects and initiatives to every strategic goal. One leadership goal is to make Sacra-mento a safer place for residents, businesses and visitors. The IT department's corresponding strategies include:

1. Investing in public safety systems such as the Mobile Data Computing upgrade and in-car camera systems
2. Implementing GIS-based routing of vehicles to support cost-effective policing and fire/emergency medical response
3. Using maps integrated with the emergency operations center for flood management

Charles County, Md., is going even further. Its county commission's goals expressly call out work for information technology, including: "Facilitate availability and lobby for equal access to communication services including broadband …" and "Evaluate current departmental technology to improve efficiency." In other words, elected officials are publicly asking their IT professionals to advance the services and quality of life in the jurisdiction.[2]

The mayor and city council in Marana, Ariz., similarly task the IT department to lead parts of its Town Strategic Plan. The plan is composed of five focus areas that contain stra-tegic goals, and IT is the lead organization for specific goals in two of these focus areas: innovation and commerce. The plan proposes that IT lead organizational innovation, as well as lead in the use of innovative technologies and social media to foster communication and engagement of town businesses and constituents.

Best Practices

Ideally the elected officials of county and city governments will have a coherent strategic plan or set of goals, enabling IT resources and initiatives to directly address the elements of this strategic plan and achieve notable results. All of the winners of the Digital Cities and Counties Surveys share this element.

Practically speaking, however, governance models vary sig-nificantly in local government. Many counties have a plethora of elected officials — a council or commission, sheriff, assessor, clerk and so forth — and agendas can conflict with each other.

The same can happen in cities where a separately elected mayor may have conflict between the executive and legislative (city council) branches of government.

However, a majority of cities and counties use the "manager" form of government. The city or county manager can often help resolve these conflicts and guide the CIO in producing a technology strategic plan that supports the goals of elected officials.

And in every case the CIO needs to pull together strategic direction, obtain concurrence of elected officials (often through the budget process) and direct technology resources to achieve objectives.

ECONOMIC DEVELOPMENT

"It's the economy, stupid." That phrase is even more relevant in 2012, after the Great Recession, than it was when James Carville coined it in 1992.[3] Look on the website or in the campaign platform of any mayor or county executive, and you'll see "growing the economy" and "creating jobs" near the top of the priority list. Today, elected officials lust after any job-creating business, but "high-tech" jobs are particularly attractive. Leading-edge elected officials expect the technology of their government to keep pace and to contribute to attracting business.

What Cities and Counties are Doing

Aurora, Colo., adopted the phrase "All for Business." The Aurora city manager tasked employees with improving customer service, streamlining the development process and increasing access to quality information.[4]

Boston's initiative, "Business Relationship Management — The Boston Business Hub," serves as a one-stop shop for business constituents to access research tools and data, as well as connect with business development professionals in the city to answer questions and create a customized permitting and licensing pathway tailored to their particular needs.

Palm Beach County, Fla., launched "PBC Interactive," a Web-based, comprehensive research tool offering real-time data to help facilitate economic development.[5] It was achieved over a period of nine months through a successful collaboration of the IT department, the property appraiser and the Department of Economic Sustainability. The site, built using state-of-the-art GIS[6] technology, contains data that is updated daily with parcel-based business information.

Marana, Ariz., built a one-stop online "business center" that provides access to the town code, forms, permit applications, business licenses, water plan (Marana is committed to returning as much water to its aquifer as it draws out) and everything else necessary to start a business or build in Marana.

Best Practices

A best practice common to all leading cities and counties is integration of disparate systems and applications, often through a Web portal, in support of business and economic development. This allows the city or county to present a single, one-stop "face" to business.

On the surface, this appears simple, but it can be extraordinarily difficult. First, the CIO must identify the goals of the business portal. Will the portal address just licensing of new businesses, or also attracting new businesses? Will it address construction and remodeling permitting as well as business licensing?

Next, the CIO needs to identify all the business processes and underlying technology systems. Such processes could include business licensing, fire code inspections, food handlers' permits or restaurant inspections, construction permitting for remodeling, plumbing and electrical, and many others. Often, simply coordinating and optimizing the business processes will yield either savings or more rapid response or both. Sometimes changes in ordinances or local laws may be required.

Finally, to truly implement the portal, cooperation and collaboration between jurisdictions is usually required. A city will often manage building permits and business licenses, but the county government might conduct food and restaurant inspections and may require a separate business license. Counties often will need to provide all services for unincorporated areas. Separate governmental entities such as fire districts or water or wastewater districts may also be involved. Even state governments may be involved for tax collection and business licenses.

In the end, creation of a business portal will require a great deal of intergovernmental cooperation, governance, business process re-engineering and even shared services.

CONSTITUENT APPS AND ENGAGEMENT

Engaging constituents online is probably the function that advanced most significantly in this year's surveys versus previous years' surveys. Local governments are using a variety of different approaches.

What Cities and Counties are Doing

Constituents interact with government in multiple ways: Some want to do it in person, others by attending a meeting, others by telephone, still others by email or on the Web, and many — unfortunately — don't engage at all.

Salt Lake City typifies how leading cities and counties understand this and offers a wide variety of electronic options:

- Open City Hall (OCH) allows the public to participate in an online discussion of issues and topics. This information is then provided to administrators and elected officials for consideration in the decision-making process.
- Where OCH is targeted at specific topics, SpeakOutSLC lets people post ideas. Others can like/dislike or comment on the ideas. Administrators and elected officials then know what the public really wants to see happen in the city.
- Salt Lake City adopted the Code for America open source application Textizen[7] to help its planning process.
- SLCGov-101 is a set of videos available on YouTube which explains how the city government operates.[8]

Other notable uses of constituent applications and engagement include the Your Voice Vegas online site to improve quality of life in Las Vegas, the AskFairfax online discussion board for interactions with county officials, "Tweets by Beat" in Seattle, the Graffiti Abatement Tool in Riverside, Calif., and Etrakit for mobile permit results in Ann Arbor, Mich.

Most leading-edge cities have launched a mobile app for access to city information and services. These include MetroCall 311 in Louisville, Boston's Citizen Connect and Riverside's 311 Riverside Resident Connect. While this trend is not as prevalent in counties, Boston and the state of Massachusetts recently partnered to expand the Boston app, now deemed Commonwealth Connect, to 138 other cities in the state.
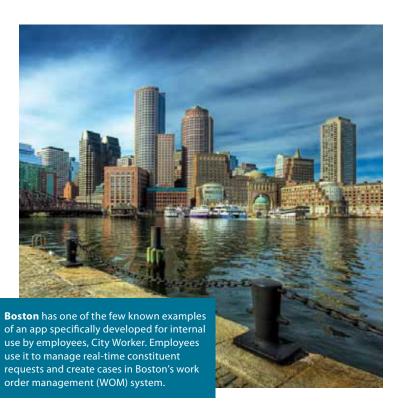
Over 1,000 cities and counties have crime maps online. Larger jurisdictions tend to "roll their own" with customized maps such as Louisville's Crime Map. Sometimes they put the crimes as a layer on a more comprehensive map, such as Seattle's My Neighborhood Map. Other times, agencies collaborate to provide the information, such as Ann Arbor and Washtenaw County's CrimeMapping. Smaller jurisdictions usually send their data to a third-party hosting service.

Most leading-edge governments now offer some form of financial information online. Pre-eminent examples include:

- Fort Worth's "My Property Tax Dollars At Work" allows constituents to enter the appraised value of their home and see whether they have a homestead exemption. The tool then shows how the taxes that they pay are used to support city services. It provides a breakdown of percentages and a dollar amount distributed, and includes a pie chart diagram.
- North Port, Fla., is just one of many examples where cities and counties place their financial information online in an easy-to-consume format. North Port's website shows revenues, expenditures, salaries and even puts its consolidated annual financial report (CAFR) online, all in a searchable format. Ann Arbor's open checkbook, A2OpenBook, is another example of a city posting financial data online.
- Dutchess County, N.Y., posted a budget survey and received feedback from 2,225 constituents — although that took an extensive outreach effort from the county executive and the use of Facebook and Twitter to drive response. The county posted the results online and is using them for budget deliberations.

Constituent services are not just about social media and apps. They also take the form of systems like Washoe County Sheriff's Office state-of-the-art Web visitation solution, iWeb-Visit. Families can now visit with an inmate from home by using a computer with high-speed Internet and a webcam. The sheriff's office charges $9 per video visit and is saving money by reducing staffing to oversee the visitors room.

Boston has one of the few known examples of an app specifically developed for internal use by employees, City Worker. Employees use it to manage real-time constituent requests and create cases in Boston's work order management (WOM) system. This app provides service-oriented departments a tool to address critical constituent needs in a cost-effective, efficient and timely manner, leading to increased constituent confidence in city services.

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Best Practices

Virtually every local government has a Web presence. These Web portals often reflect the original purpose of the Internet: to provide information and content. This original purpose is carried over, now, into the social media and apps world, in that most cities and counties still largely use their social media tools to push information to constituents.

All leading-edge cities and counties are active in adopting social media, especially the use of Facebook, Twitter and blogs. Flickr and Pinterest are used by some. However, it is still rare for government departments to accept service requests via social media.

The use of social media to engage constituents is an area ready for change. With the popularity and authority of government Twitter feeds and Facebook pages established, cities and counties can start using them for rapid feedback regarding problems such as electrical or water outages, or even crimes. Constituents are also ready to use social media to provide feedback on policy issues, if their input is acknowledged and used.

Another initiative which appears to be ripe for further development is mobile apps for city and county workers. Police departments have done this for decades with "on view" reports which police officers initiate when flagged down by a constituent or view a crime in progress. Expanding "on view" to all other city field workers and employees, using a mobile app, is a leading-edge practice which governments should adopt.

Leading-edge governments are also placing financial information online and obtaining constituent feedback on policy and budget. Dutchess County, N.Y., provides a prime example of this practice. CDG recommends:

- Posting detailed budget, revenue and expenditure information on an open data site, which will allow analysis and display of the information by external apps developers and informed constituents, who, in turn, will make it available to the general population
- Placing the county or city's budget information on the Web in traditional formats of PDFs, charts and graphs
- Designing apps and processes for feedback on the budget (these could include the Dutchess County, N.Y., survey example or use of technologies such as Salt Lake City's Open City Hall or SpeakOutSLC); ideally these feedback processes would be used for other policy questions as well, so constituents would know and be comfortable with its use year round, not just during budget season
- Acknowledging input and demonstrating how it was used in the budgetary process

CYBER SECURITY

The year 2012 was marked by a number of frightening cyber incidents. Both South Carolina and Utah had major security breaches which exposed the personal information, including financial and medical data, of hundreds of thousands of constituents. But there were a number of smaller, less publicized incidents where criminals hacked the bank accounts of governments, or defaced websites. And the tide of malware delivered by email or other means is ever increasing as well.

What Cities and Counties are Doing

Chief information security officers (CISOs), when present in a jurisdiction, need to collaborate and share information within their own agency, with neighboring governments and with private sector firms.

Fairfax County, Va., typifies the security practices of leading-edge cities and counties. The County Information Security Office (ISO) uses defense-in-depth principles to increase the availability, accuracy and integrity of information, as well as the ability for stakeholders to share that information.

Like most counties, personally identifiable information (PII), personal health information (PHI), and other internal sensitive and confidential information are governed by federal and state laws and regulations and must be protected. Fairfax County's security program incorporates a diverse set of technical and operation controls. Technical controls include intrusion detection systems, firewalls, complete endpoint protection (anti-virus, malware and firewall), vulnerability assessment and patch management tools, and forensic utilities to assist with investigations. Operational controls include new employee and annual security awareness training, configuration and change management throughout the system lifecycle, policy/standards development and physical security.

In addition to these security controls, many leading-edge cities and counties are embracing the bring-your-own-device (BYOD) trend, and implementing mobile device management (MDM) software which enforces policies such as minimum password requirements and on-device encryption and application management.

Public key infrastructure (PKI) is also used by cities and counties. Some, like Palm Beach County, Fla., are expanding their PKI implementation to embrace two-factor authentication, which is required for access to certain law enforcement data under Criminal Justice Information Services (CJIS) rules.

Marana, Ariz., uses its PKI with RSA Tokens for public safety officers to be able to connect from the field or office to their various applications. This ensures that there is a two-layer process for authentication. Certificates of authority are also used for clients connecting to the Marana wireless network with all mobile devices, including laptops, tablets and smartphones. Access to Marana's wireless network also requires a valid credential set, and authorized hardware with an installed certificate from an Active Directory resource management system. Charles County also uses its certificate authority and Active Directory to issue certificates to servers and desktop computers.

Almost every leading-edge city and county has embraced payment card industry (PCI) compliance to be able to accept credit card payments for services.

Best Practices

All local governments must engage in the following cyber security practices:

- Implementation of robust hardware firewalls, intrusion prevention and intrusion detection systems, maintained daily
- Creation of an active cyber security information awareness program for employees, focused on areas such as password integrity, dangers in websites, use of email and protection of personal information

CDG also strongly recommends the following practices for all governments:

- Protect information, not infrastructure. It is no longer sufficient to try and build a network "fence" around computers and infrastructure. Rather, governments should identify and classify their information and appropriately protect it.
- Collaborate. First, collaborate internally in the government, identifying information security professionals in each technology and business unit. Work together. Next, collaborate with other CISOs in government and the private sector. Seattle's award-winning Public Regional Information Security Event Management (PRISEM) project is one example of such collaboration.[9]
- Scan the Web portal on a regular basis to detect vulnerabilities and other security issues.
- Build an active PCI compliance program to preserve the ability of the government to accept credit cards.
- Conduct an outside third-party security review of any online application, whether Web based or mobile device based, before it is placed into production.
- Add two-factor authentication to applications, devices and individual employee use of technology, especially for criminal justice employees.
- Beyond vulnerability scanning and application review, consider obtaining security services from infrastructure-as-a-service (IaaS) and other cloud providers that have more security resources at their disposal.

RETURN ON INVESTMENT (ROI)

Based on the results of CDG's surveys, cities and counties struggle with conducting cost/benefit analyses and calculating a return on their technology investments. While a number of local governments made such calculations for data center, server and hardware investments, and particularly virtualization, no jurisdiction financially justified investments of time and money in online apps, social media or disaster recovery.

Making the case for further investment in technology is extraordinarily important. Since 2008, economic difficulties have limited the resources of most local governments. But at the same time the capabilities of smartphones, tablets, apps, software and online services have dramatically increased. Innovative use of technology is a force multiplier for virtually every government service from public safety to transportation to social services. Unless CIOs make good return-on-investment, business-based arguments, elected officials may see information technology as a cost to be controlled rather than an enabler of more efficient, effective services.

What Cities and Counties are Doing

Dutchess County, N.Y., issued a bond for its telephone system replacement. The total project cost was $7.8 million, but the county did a detailed ROI analysis, and calculated it would start saving money the second year after implementation compared to operating the current system. Over a 10-year life, the county will save $2.4 million.[10]

All leading cities and counties have heavily virtualized their data center environments. Fairfax County, Va., consolidated its data center environment to take advantage of more efficient servers, reducing its licensing costs by 44 percent. Virtualization and consolidation lowered its SQL server licenses by 60 percent, allowing the county to save $1.8 million and 250 kilowatts of energy ($360,000) annually.

Washoe County, Nev., virtualized 90 percent of its servers, yielding approximate savings of $426,650 in annual energy costs and nearly $2 million in hardware costs over the life of the project. Washoe also installed a new backup/recovery system which includes back up to disk technology. Benefits include reduced backup/restore time, less hardware storage costs through compression and de-duplication, and the ability to securely manage data across many locations. Overall, this project is estimated to save $65,268 over three years.

At Washoe County Libraries, thin clients have been installed on desktop computers to create self-serve kiosks. The kiosks were created in house through a collaborative effort between the Central County Technology Services Unit and library staff, and will save the library $510,000 compared to purchasing kiosks.

Bexar County, Texas, developed an electronic citation entry system in connection with a new court case management system. The courts saw over a 50 percent increase in citations submitted, a reduction of data entry by over 90 percent and a 100 percent reduction in data entry errors. This and the declining economy contributed to the accounts receivables balances for the courts to increase from $60 million to $84 million in less than 18 months. The county also developed a constable warrant postcards system to assist the Constable's Office in collecting past-due fines from outstanding traffic tickets. The postcards identified the specific fines/fees due, and provided information on how to pay, with 112,368 cards mailed initially. Within the first two weeks, approximately $600,000 had been collected or pledged, and as of early 2012, that amount had risen to approximately $2.2 million.

Best Practices

Leading local governments do a cost/benefit analysis for each major technology investment. Benefits might include:
- Hard dollar cost savings, either in hardware or energy, from virtualizing servers
- Reduction in data center and labor costs in moving applications from a hosted to external cloud environment
- Time saved by employees or customers in using an automated process rather than a paper process
- Time and labor saved in data entry
- Faster collection of fines or monies owed, or less time spent in collecting such debts
- Costs saved based on current expenditures, such as telecommunications costs

Invariably, the benefits will also include intangibles such as:
- Economic development, including the creation of jobs
- Constituent goodwill in the use of social media
- Faster response to incidents or more rapid resolution of problems and crimes as a result of higher quality data produced by an automated system

DATA CENTERS, NETWORKS, INTERNAL SERVICES AND CLOUD

Local governments are undertaking a variety of initiatives to improve their internal data center, networking and other services. That said, every visionary local government is considering some sort of cloud service. The service could be software, infrastructure (network) or platform "as a service," that is SaaS, IaaS or PaaS. It could be creating a private cloud and offering services to other governments. Or it could be creating a virtual internal cloud to simplify and improve provisioning and deployment of technology services to internal customer departments.

Seattle has over 500 linear miles of fiber, 50,000+ fiber miles, interconnecting over 20 governmental sites, including the city, King County, the University of Washington, Seattle public schools, the state of Washington, city and county libraries, and others.

What Cities and Counties are Doing

Two major trends are in progress with networking. First, local governments are increasing their use of government-owned fiber optic networks to interconnect sites. Second, where fiber optics are not feasible for geographic or financial reasons, cities and counties are using high-speed wireless networks for interconnection.

Another trend is movement away from external Centrex services and PBX telephone systems to voice-over-Internet-protocol (VoIP) networking. Ann Arbor, Mich., consolidated 14 city phone systems to a single VoIP network, added 82 wireless access points and started to support 100 IP-based video cameras. Cape Coral, Fla., undertook a similar strategy, partnering with Lee County government on fiber networking, deploying high-speed wireless and bringing 70 percent of its city government users onto VoIP.

Oakland County, Mich., has built and expanded an intergovernmental network for over 40 years. The OakNet fiber optic network provides 400+ miles of high-speed broadband Internet and network access throughout Oakland County, and connects directly to Macomb County and the cities of Livonia and Warren. OakNet facilitates cost-effective service delivery to police and fire agencies and local units of the FBI and Michigan State Police. It delivers services to the member agencies of the Oakland County Courts and Law Enforcement Managing Information System (LEMIS), a large law enforcement consortium with 140 police and fire departments in a six-county region.

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King County, the University of Washington, Seattle public schools, the state of Washington, city and county libraries, and others.

Some jurisdictions use fiber obtained from a cable company. Charles County, Md., has a shared fiber institutional network (I-NET) connecting approximately 100 sites, including government buildings, school districts and colleges, sheriff's offices, fire departments, libraries, community centers and court houses.

Riverside, Calif., partnered with a vendor to offer free and low-cost Wi-Fi throughout most of the city for both public and government use. The city has an extensive network of 530 security cameras, with a centralized viewing application, security controls and recording capture stored at the data center. In addition, the police department transmits and stores over 3,000 recordings and 600 Gb of in-police car video each month using the free citywide wireless network.

Most leading counties and cities are experimenting with BYOD, where employees can use their own smartphones and tablets for city business. The most common approach is to use a mobile device management (MDM) solution. In Riverside, all mobile devices are inventoried, managed and encrypted. Policies are deployed and enforced through a central console that allows remote management, including wiping a device in the event that it is lost or stolen. Other MDM features may include creating a separate enterprise data store on the device, and managing which applications may be downloaded and used.

Cities and counties still, by far, prefer to host applications and services themselves, in their own data centers, although shared services between governments are now rapidly expanding.

For agencies using externally hosted services, software-as-a-service (SaaS) is the most popular use (as compared to infrastructure or platform). SaaS is most popular for human resources (job applications), collaboration (document management, SharePoint), public maps (crime reports) and office functions (word processing, spreadsheets).

This past year, Louisville's Metropolitan Technology Services began a move to Drupal and hosting Web services in the cloud. Louisville anticipates savings of 15 percent to 20 percent once the new hosting process is complete and all parts of its site are in the cloud. The savings will come from the city not hosting in its own data center, using an open source CMS system, and accessing many free modules available in the Drupal community.

Best Practices

CDG recommends governments start by inventorying their present technology assets and evaluating their risk posture. For example:

- What is the risk of a major disaster or service interruption in the city or county? Some places have a high risk of hurricanes, severe storms, earthquakes or similar disasters, which warrant a proactive response.
- What data center assets exist and what is their condition? Is the facility a Tier IV data center,[11] hardened against disaster with multiple redundant network connections, backup power and fault tolerant infrastructure? Or is the data center in the basement of a 50-year-old city hall building?
- Are the jurisdiction's networks robust, with fiber optic, copper cable, wireless and microwave links; and redundant electronics and backup power at all key locations?
- Are the mission-critical applications current, patched and kept up to date, or are some so old they're not supported by the manufacturer or cannot run on current servers?

As a result of such an assessment, whenever a government is considering a major system (hardware or software) replacement, it can adequately consider the options and also do an ROI analysis. Again, some examples:

- A jurisdiction with a robust Tier IV data center, with a geographically diverse backup site and a high-speed connection might consider offering IaaS or PaaS to other governments.
- A county with a state-of-the-art public safety computer-aided

dispatch (CAD) system might consider offering that system as SaaS to other nearby cities or 911 centers considering replacement of their software.
- A city with an aging enterprise resource planning (ERP) or other software in an aging data center might consider commercially available SaaS or PaaS solutions.
- A government with few cyber security resources might consider finding a commercial partner of IaaS network security solutions.

DISASTER PREPAREDNESS/ BUSINESS CONTINUITY

The year 2012 was also a year of disasters ranging from snowstorms to hurricanes to drought. All leading jurisdictions are addressing business continuity using a common set of best practices which include:

- Preparation of Continuity of Operations Plans (COOP) which identify critical technology systems by business function. COOPs also identify the required time to restore or recover the system, which in turn dictates the required nature and investment in backup systems or technologies.
- Most leading-edge cities and counties actively update continuity of operations plans (COOP) via an active collaboration between front-line business departments and IT. They then work closely with their Emergency Operations Center functions to test and exercise those plans.
- Backups and backup systems, using disk-to-disk rather than tape backup
- A secondary backup site or data center

What Cities and Counties are Doing

Fairfax County, Va., approaches business continuity by having full backups of all mission-critical systems, both onsite and offsite, and maintaining one or more disaster recovery locations for failover in the event of a local disaster incident. Palm Beach County, Fla.'s, consolidated data center is located at a local Category 5 (hurricane) rated Emergency Operations Center with business continuity services 450 miles away at the Northwest Regional Data Center in Tallahassee.

Most cities and counties surveyed have the same strategy — a primary data center, heavily virtualized, and usually in a

hardened, secure location with backup power. The business continuity strategy is often a secondary data center, sometimes linked by high-speed fiber connectivity. Sometimes it is a "cold" site, with backup tapes only activated during emergencies. Sometimes it is a "warm" site with data and applications actively present. Rarely it is a "hot" site, with actively running major applications which can quickly assume the load of the primary data center during a disaster.

Wauwatosa, Wis., is using the following approach, which was echoed by several other cities and counties in the surveys: Wauwatosa implemented the VMotion facility, which enables applications to not only fail over from one physical server to another within a data center, but allows the entire data center to fail over to the alternate data center in the event of a catastrophic event. The failover capability is tested on a quarterly basis to and from both data centers. Each data center has the processing power to run all applications necessary to support the day-to-day operations of the entire city.

Bexar County, Texas, uses mirroring of disk storage as a business continuity strategy. All data resides on similar enterprise storage servers at each location. The county uses capabilities to provide synchronous updates of both the local and remote copies of all data maintained. The enterprise storage servers are connected via two high-speed fiber optical paths between the county's enterprise data center and a backup location at a city of San Antonio site 10 miles away.

San Diego County and King County are taking somewhat different approaches. San Diego County has outsourced its data center operations to a vendor who maintains them in Oklahoma with an additional hot site in Texas. King County has moved its servers, storage and other data center operations into a Tier 3 privately owned data center, and intends to issue an RFP seeking business continuity services from a commercial vendor.

Best Practices

Business continuity is an area ready for shared services and inter-agency cooperation, as well as cloud technologies.

- Governments should actively consider SaaS for mission-critical applications, to include contract provisions for agency data ownership, system and data backup, and multiple, geographically diverse data centers which host the application.

- Governments should actively consider using either IaaS or PaaS cloud computing services. Such services must be hosted in Tier IV data centers and may include geographically diverse data centers, e.g., two data centers geographically separate, as well as appropriate data security safeguards. The COOP for individual applications will drive this.
- Governments should work together on shared services and shared data centers. These private clouds allow cities and counties to put more resources into both the primary data center, as well as the backup data center at a geographically diverse site. However, governments should compare the costs of hosting their own versus IaaS or PaaS solutions.
- Leading jurisdictions are using their virtualized servers and storage as an integral part of their backup and recovery plan. Often their virtualization vendors offer capabilities and services to use the virtualized storage and operating systems to replicate applications to backup sites and allow rapid restoration after a disaster affecting the primary data center.

BIG DATA AND ANALYTICS

Big data appears to be taking the entire information technology world by storm. Some technology companies such as Google and Facebook are built almost entirely on obtaining data from consumers and businesses, analyzing it, and reselling it to advertisers and others. Many other private companies see mining their deep reservoirs of data as a key competitive advantage. The federal government launched data.gov in 2009, and it now has more than 380,000 datasets. Leading cities and counties have launched their own open data initiatives to make datasets such as crime reports, restaurant inspections, building and business permits, and even 911 calls available online. Placing datasets on the Web, however, is not a widespread practice in cities and counties.

Several activities are related to collecting and using this data. First, a whole "data economy" is emerging as private companies use open government data to develop applications and value-added services ranging from real estate to comparing hospitals to restaurant reviews. Next, leading-edge governments are mining their own data, and cross-correlating datasets from their siloed departments to improve performance and drive efficiency. Finally, many governments have held apps competitions to encourage private developer

use of online datasets. These receive a mixed response, as private developers generally need to monetize their apps, and this can be difficult when the app is written just to use data from a single jurisdiction in that jurisdiction's unique data format.

What Cities and Counties are Doing

Most larger cities and counties surveyed have open data sites, including Louisville, Boston, Riverside, Calif., King County, Wash., Fairfax County, Va., and others.

Leading-edge cities and counties are actively analyzing their data to produce improvements in efficiency and effectiveness. Louisville developed a tool for automated analysis for use by all departments to discover and reduce unplanned overtime, resulting in a $1.2 million reduction in six months against $13.9 million in unplanned overtime for 2011.

Mayor Greg Fischer in Louisville launched the LouieStat initiative to track performance measures in the city government. LouieStat tracks measures such as unscheduled overtime, high sick leave use, missed garbage pickups, average time to book an arrestee into jail and jobs created by economic development.

Even smaller jurisdictions such as Charles County, Md., are implementing such analytics. Charles County uses integrated enterprise financial software. Its CountySTAT project leverages data from that financial system and other county systems to provide comprehensive analytics of department performance indicators. CountySTAT is presented to managers via a digital dashboard.

Best Practices

Placing datasets online is definitely a best practice, and, with a choice of hosting environments, it is not expensive. Agencies report that a significant advantage is simply the cross-pollination of data among their own internal departments. In other words, an economic development office may have trouble getting crime statistics or building permit data, but when both those datasets are placed online, they're not only available to businesses and constituents, but also to other departments in government (including other cities, counties and states).

Standardizing the format of the online data is another important practice, because it makes the data almost immediately usable by private developers and other governments. A few standards such as the Generalized Transit Feed Specification (GTFS) exist.[12] The Local Inspector Value Entry Specification (LIVES) was developed in 2012 by San Francisco, New York City and Yelp to standardize food and restaurant inspection data. Neither standard has been widely adopted.

If a government uses a standardized data format, it makes it much easier for existing apps (restaurant reviews, crime mapping and so forth) to immediately use the data for consumers and businesses.

SHARED SERVICES

The very leading-edge local governments are developing private clouds and related business practices which allow one local government to use services hosted by another. Significant obstacles remain in wider adoption of shared services, but these few leading jurisdictions are showing the way to overcoming these obstacles.

What Cities and Counties are Doing

Historically, shared services are much more prevalent in public safety than in general government. Aurora, Colo.'s, hosting of Coplink for 81 agencies is one example, as is Palm Beach County, Fla.'s, support of a law enforcement exchange (LEX) connecting multiple law enforcement data sources and enabling officers to efficiently query crime information stored in these databases.

Ann Arbor, Mich., and Washtenaw County, Mich.'s, partnership is a leading example of sharing services. The two jurisdictions have driven efficiencies into a shared data center by adopting server virtualization, reducing physical server footprint by 70 percent, partnering on common storage, and archiving and de-duping data. They've also partnered on adopting selective sourcing strategies around cloud offerings for several line-of-business application replacement projects, including human resources and payroll, parking ticket payment, criminal justice and court operations, a hybrid parks and recreation program and activity registration, pension management and public housing management. The two partners are also drawing the Ann Arbor Transportation Authority into this shared services mix.

Sussex County, N.J., has built a private cloud data center with virtualized server clusters and a server cluster supporting virtualized desktops. It uses this environment not just for internal services, but to offer more than 100 municipalities in the county applications and services such as human resources, finance, purchasing, facilities management, health, fleet management and public works. Municipalities can place their own applications such as construction permits and inspections into this data center. The county governs

this shared services environment with a Shared Services Executive Advisory Authority plus inter-local and service-level agreements.

Ann Arbor, Mich., is hosting a fire records management system (RMS) and computer-aided dispatch (CAD) system in its own and Washtenaw County fire departments. This integration provided two major improvements: 1) Incident location information moves immediately from CAD at fire dispatch to the CAD in a fire vehicle, providing automated routing information on the fire mobile computer and removing the need for paper maps in fire apparatus; and 2) Incident information developed during an incident on the CAD is staged for entry in the RMS upon completion of the incident, providing increased accuracy and improving the timeliness of the after-incident reporting in the records management system. This solution is being deployed countywide, hosted by the city of Ann Arbor. Three fire departments have signed up and more departments are moving to the system.

Dutchess County, N.Y., has 12 major shared services in place, including the parcel access online application of the county assessor and the county's Hudson Valley Municipal Purchasing Group online BidNet online service. Additionally, the county's Department of Planning and Development provides planning and zoning expertise to local governments via comprehensive mapping and geographic information systems (GIS) data shared by 30 municipalities with 91,500 unique users.[13,14]

Palm Beach County, Fla., serves as a government cloud for over 40 external entities in the county. In some instances, the county provides co-location and other cases server hosting. The county also provides backup and disaster recovery services.

The city of Wauwatosa, Wis., collaborated with other local municipalities to acquire new property assessment software. The computer-assisted mass appraisal (CAMA) system will be used to improve operations, provide consistent methodology, reduce costs and better customer service. Together, the municipalities drafted a joint RFP.[15] The respective city attorneys and the IT departments contributed and assisted in the evaluation, the selection of the finalist and the drafting of the contracts. This shared experience resulted in a superior product for each municipality. This cooperative approach also resulted in cost savings for all of the municipalities that participated. A significant quantity discount applied and future cost savings will be realized as more municipalities sign contracts with the vendor. For Wauwatosa alone, the savings from this collaborative effort amounted to more than $50,000.

San Diego County is taking a different approach. The city has outsourced its IT operations since 1999 and has reduced its footprint over time from 800 servers to 100 physical servers in 2012. The county is implementing a hybrid cloud strategy, creating IaaS and PaaS within an internal private cloud. The IaaS places commonly used infrastructure components into a reusable and standard architecture that all applications and new services can use without redesign or added costs to the county. PaaS solutions are being built for several key functions: ERP, document and content management, customer relationship management, portals and collaboration.

Oakland County, Mich., formed G2G Cloud Solutions to support technology sharing among governments via the Web. Oakland's G2G Cloud Solutions include online payments and a website publishing suite. The county solved a number of thorny issues in creating its private cloud. A basic inter-local agreement (ILA) is the formal legal mechanism for governments to use the cloud. The ILA requires approval by the county commissioner or city council. Then individual services are added as annexes to the ILA. Oakland also solved financing, fee collection, software licensing and other issues. Over 30 other governments are using the online payment service, including another county (Livingston) with 150 departments and municipalities.

Best Practices

Local governments must actively work together to develop and implement shared services models. The benefits are many. Shared services:

- save money in applications development and data center costs;
- provide improved and less expensive business continuity and backup services; and
- can provide a basis for innovative new approaches to business problems, such as the business portal described above, and the Commonwealth Connect app to be deployed in Massachusetts.

Leading-edge cities and counties are lighting the way to shared services:

- Oakland County, Mich., has developed online payment services which is gaining traction in Michigan and solves the separation of funds issue.
- Sussex County, N.J., has developed a governance board and service-level agreements which entice municipalities to use shared services and make them a partner in the effort.

- Ann Arbor, Mich., and Washtenaw County, Mich., have extensively shared infrastructure and services, demonstrating that city-county cooperation is possible and beneficial.

INNOVATION

Some local governments are able to break the mold and stretch the use of commercially available technology or business process changes into new frontiers for government improvement. As you would expect, these innovations don't necessarily fit a particular pattern.

What Cities and Counties are Doing

Louisville, which is actually a consolidated city/county government, is an extraordinary leader in innovation. The city was not only the No.1 winner in the large city category in the 2012 Digital Cities Survey but was also No.1 in CDG's Best of the Web award program. Louisville competed and obtained an IBM Smarter City grant, a $4.8 million Bloomberg grant and became a 2013 Code for America City. The city's success is due in large part to visionary, strategic leadership. Mayor Greg Fischer has launched a "Vision Louisville" 25-year plan for the city and has hired Ted Smith as chief of innovation and economic development. Beth Niblock has also served as an outstanding leader and CIO.

Boston uses a similar approach. Long-time Mayor Thomas Menino provides strategic leadership, including a Mayor's Office for New Urban Mechanics (MONUM) staffed by Nigel Jacob and Chris Osgood. MONUM promotes innovation in business processes; constituent engagement; technology; and working with businesses, constituents and city employees. MONUM closely collaborates with CIO Bill Oates on technology initiatives, resulting in a wide variety of innovative approaches and applications.

The cities of Fort Worth, Texas, and Wauwatosa, Wis., both harnessed their internal resources to drive innovation. Wauwatosa adopted an internal granting program designed to elicit innovative, cost-saving ideas from employees and departments. The premise is that increased efficiencies produce long-term cost savings and should be rewarded with new funds.

Fort Worth held an "IT Cost Savings Symposium" to solicit ideas from departments and received dozens of suggestions, several of which were implemented in 2012, with others being implemented in the future.

Smartphones and tablets are platforms poised for innovation. Many jurisdictions reported using tablets for their elected officials to use in council and commission meetings. The King County, Wash., Department of Assessment (DOA) took tablets a step further, building and launching an iPad application. The county's iRealProperty application enables employees to spend more time in the field, efficiently plan their route, order tasks during the day, stay connected to the office, provide real-time assessment updates as they are performed and communicate with their colleagues at the touch of an icon. The tablet is dramatically less expensive than the hardware it is replacing. With the combination of Wi-Fi and 3G/4G connectivity, the app allows appraisers to enter data directly into the primary assessment system, take digital photos of the subject property and download these photos directly into assessment systems, video conference with supervisors from the subject properties to ensure the most accurate assessments are completed, use GIS and GPS to locate properties, and rough-sketch building footprints.

Arvada, Colo., implemented speaking software, voice to text, on a limited basis for police reporting. The innovation is promising and could be deployed throughout the department for about $50,000. A great by-product of this is improved morale as police officers spend more time policing and less time typing or doing what they might consider "clerk work."

Long Beach, Calif., is also on the leading edge of a trend among a number of cities and counties — implementing common operating picture software. Activated in August 2012, the Long Beach Common Operating Picture (LBCOP) uses the latest in state-of-the-art video surveillance technology. Housed in the city's Emergency Communications and Operations Center and integrated with the public safety dispatch operation is the command center for almost 400 live video feeds from throughout the community (beaches, parks, business corridors and even private business establishments that volunteer to share their surveillance feeds). This new technology changes the way Long Beach responds to crimes.

Access to live and archived video content, coupled with a host of other law enforcement tools, has resulted in making the Long Beach Police Department more responsive, efficient and productive. Several other cities and counties are implementing such common operating picture systems, which not only improve emergency

response, but also herald better integration of technology systems across siloed departments. Charlotte, N.C., deployed a digital media content management system to manage digital video from fixed cameras, and added a new video operations center to monitor police and transportation cameras. Charlotte also uses wireless cameras for rapid deployment and relocation to handle large-scale events and changing conditions. Riverside, Calif.'s, video application is described in the Networks section on Page 9.

Many cities and counties touted their geographic information systems (GIS) as innovative, however GIS integration with many other applications is becoming more common in local government. On the other hand, the Washoe County, Nev., sheriff's helicopter uses forward-looking infrared radar connected to an augmented reality system that relays information to the helicopter pilot about the terrain. The system includes innovative GIS integration marrying maps with real-time video. A monitor inside the helicopter cockpit displays real-time video (in natural color or thermal infrared). This image is draped with GIS-provided street, address, points-of-interest and orthophotography data.

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Best Practices

These examples illustrate innovations to enhance the delivery of services, all of which flow from visionary leadership with elected officials, chief information officers or both. There's no particular best practice to innovation other than actively collaborating and sharing information and observing what's happening in cities, counties and states across the nation. Participation in CDG's Digital Communities program is designed to help CIOs in this endeavor.

CONCLUSION

As we hear all too often, the pace of change is constantly accelerating. Constituents and businesses are significantly more technologically savvy than ever before. While constituents demand more of their government, governments are in an increasingly competitive environment, fighting to retain jobs and improve economic development in their communities.

What's a CIO to do? Here's how the leading-edge cities and counties in the nation are addressing these issues:
- Seek strategic direction and leadership from mayors, county executives and other elected officials

- Connect the IT agenda and work plan to the priorities that elected officials and constituents care about
- Improve the performance metrics and ROI argument for investments in necessary technology and software improvements
- Collaborate with neighboring jurisdictions by sharing services, applications and infrastructure
- Get help from vendors and partners on consulting, business continuity, cloud services and the host of cyber security threats
- Work incrementally with small wins and innovation, thereby building a record of success and creating the opportunity to do more
- Partner with other jurisdictions and private vendors to provide robust backup plans and business continuity sites which are geographically distant from your jurisdiction and outside the local disaster footprint

CDG plans to help. We'll focus on metrics, ROI and analysis of benefits to help justify important technology projects and improvements. CDG and its sponsors will again support a 2013 survey of counties and cities to discover the successes and innovations and expose the underlying best practices, because, just as the pace of change accelerates, counties and cities are rapidly adjusting to meet those changes head on.

ENDNOTES

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