EFFICIENT GOVERNMENT
Building a Launching Pad for Digital Transformation
State and local governments are navigating a fourth industrial revolution. This revolution is “characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres” and is bringing about changes that “herald the transformation of entire systems of production, management, and governance.”1

Adding to the impact of this revolution is the astounding rate at which it is happening. Because of this, organizations need a modern IT infrastructure that allows them to dynamically respond and quickly deliver new products, services and information.

“What makes IT modernization different today compared to earlier years is the pace of change,” says Dennis John, CIO for the city of Arlington, Texas. “It is now very important to make decisions that are strategic and have a longer-term impact.”2

Although it can be difficult due to siloed legacy systems, staffing shortages and tight budgets, government leaders can accelerate the path to IT modernization. With the right approach, organizations can create an efficient and future-ready launching pad to agilely, cost-effectively and securely meet the needs of constituents, employees and internal customers; accommodate increasing data volumes; and comply with regulatory requirements.

**IT TRENDS AND DRIVERS OF THE DIGITAL REVOLUTION**

Within government organizations, the following trends and drivers are at the forefront of this revolution:

- **Rising expectations** — With the consumerization of technology, government organizations need to keep pace with employee and citizen demands for sophisticated, convenient, user-centric services — in spite of tight budgets, funding uncertainties and siloed legacy systems.

- **Cloud and as-a-service adoption** — According to the Center for Digital Government’s 2016 Digital Cities Survey, 91 percent of responding cities have nearly one-third of their applications and systems in the cloud. Adoption is increasing as cloud service providers create offerings specifically designed to meet public sector needs and compliance requirements. Cloud-based applications, platforms and infrastructure offer rapid service deployment, cost savings, scalability and other efficiencies.

- **Mobility** — Ninety-five percent of U.S. Americans now own a cell phone, 77 percent own a smartphone and approximately 50 percent own a tablet.3 Citizens and workers expect their government agencies to support mobile device applications so they can access information, conduct transactions and do business anywhere, anytime. In response, state and local governments are creating apps and employing responsive web design. Increasingly, they are using GIS data to provide location-relevant citizen services and deploy their workforce to the field more efficiently.

- **Big data and analytics** — A wealth of structured (e.g., databases, forms) and unstructured (e.g., video files, photographs, emails and files) data resides within government organizations. In addition, the Internet of Things (IoT) generates real-time data about power consumption, traffic patterns, pollution levels and more. State and local governments that can harness this data will be poised to provide services and create efficiencies (through automation and artificial intelligence) that were unheard of just a few years ago. The Center for Digital Government’s 2016 Digital Cities Survey found 73 percent of cities included IoT in their strategic planning.

- **Low-cost bandwidth** — Bandwidth is a significant recurring cost for organizations. But vendor competition and lower costs for the underlying hardware that supports connectivity have made it more affordable. This lower cost helps drive modernization as government agencies find it more cost effective to use cloud services, high-speed storage and other solutions that require the rapid transfer of large volumes of data.
Data protection and compliance — Security and compliance remain one of the top priorities for government IT leaders, as the public sector is a prime target of cybercriminals. Cloud services, mobile initiatives and other innovations add complexity and risk if not managed properly. However, new applications make it easier to protect mobile devices and other endpoints. In addition, accreditation by the Federal Risk and Authorization Management Program (FedRAMP), Criminal Justice Information Services (CJIS) and other compliance programs can help identify cloud services that are suitable for government use.

THE FAST PATH TO IT MODERNIZATION
According to Gartner, “By 2020, more than seven billion people and businesses, and close to 35 billion devices, will be connected to the internet.” By the same year, there will also be more than 5,200 GB of data per person on the planet.

To create a launching pad for growth and innovation amid this dynamic environment, state and local governments need modernized data centers that can keep pace with change and exponential increases in data volume. They also need to derive insights — in real time — from the data across their enterprise. These components form the foundation for a smart, future-ready system that allows organizations to better serve their constituents while reducing costs and complexity.

The future-ready data center. The fundamental function of a data center is to store, process and distribute data throughout the government organization. However, yesterday’s data center was not designed for the needs and technologies of today. Modern data centers must provide a flexible infrastructure to support traditional functionality, as well as workload automation, virtualization, cloud services, the IoT and other innovations.

By upgrading their data centers, organizations can:

- Accommodate the ever-increasing speed and volume of data

STRATEGY AND GOVERNANCE ARE KEY TO IT MODERNIZATION IN ARLINGTON, TEXAS
The City of Arlington, Texas, calls itself “The American Dream City.” Without IT modernization, that would be a hard name to live up to. In serving nearly 370,000 residents, as well as the global and local companies that do business there, the city’s greatest IT modernization challenge is investing its limited resources in solutions that give the greatest return to the enterprise.

To create a path to modernization, the city has emphasized strategy and governance. “It’s very easy to purchase the newest solution. What’s difficult is to incorporate all solutions into an enterprise architecture without strategy and governance,” says Arlington CIO Dennis John.

Arlington employs a high-level strategy for procuring network, communication, storage, compute and application solutions. The strategy is reviewed annually as new technology enters the marketplace. In addition, the city relies on a governance process to oversee all requests for new projects. The process aligns the executive team with the technology strategy and the city budget process to make decisions based on enterprise objectives. In the near future, an IT governance structure will document standards, processes and procedures for everything the IT department does. Doing so will help the department manage solutions and reduce risk.

To extract value from the ever-increasing volumes of data that it’s accumulating, the city has also worked with a third party to develop a Data Strategic Plan. The plan helps leaders understand what the city’s data environment consists of and provides a roadmap of next steps to put that data to work.

By using its strategy and governance processes to make the right decisions on infrastructure, the city can easily respond to new technologies as they become available. “I believe our greatest success has been our flexibility and capability to implement solutions to provide value to the city,” says John.

The city’s latest smart cities engagement is a good example. Arlington has been able to easily deploy smart vehicle infrastructure to better track traffic patterns at the individual car level and make decisions about roadway infrastructure. Using its modernized IT infrastructure for further innovation, the city will be well positioned to remain “The American Dream City” as well as a smart city of the future.
Agilely respond to citizen and line-of-business demands for new services

Flexibly adopt cloud services as needed and integrate these services with on-premises applications

Enable citizens, employees and partners to interact with applications from desktops and laptops as well as phones, tablets and other mobile devices

Connect with IoT devices and other sensors to help build smart cities

A modern IT infrastructure makes sense from a financial standpoint, too. According to Gartner, operations and maintenance account for almost 75 percent of IT expenses. Large, aging, complex infrastructures increase the cost of server maintenance, storage, utilities and software. By converging infrastructure, consolidating servers and storage, and implementing cloud services, enterprises can generate cost savings while supporting more users and more services.

The following components are central to data center modernization:

- **Converged infrastructure (CI)** — According to a recent survey, 92 percent of private sector organizations with more than 5,000 employees had already implemented some form of CI, or were considering implementing it. Converged infrastructure gives organizations the flexibility, availability, scalability and high performance they need to drive transformation. It simplifies resource management and increases efficiency by breaking down silos and combining and standardizing server, storage and network resources across the enterprise into a single unified solution. Using CI, state and local governments can more efficiently meet demand for new services and capabilities. CI also allows organizations to select the right deployment model (e.g., on-premises, cloud or hybrid).

- **Server consolidation** — According to a McKinsey report, most public-sector servers within data centers are only about 20 to 30 percent utilized on average per day, compared with 70 to 80 percent in best-practice companies. By optimizing storage and server usage, organizations can reduce the number of physical servers needed. Many state and local agencies have already undertaken consolidation and optimization efforts to meet federal mandates, control costs and reduce complexity within their organizations.

By consolidating servers, the city of Virginia Beach, Virginia, reduced its data center footprint from 29 racks to four. In doing so, it expects to save approximately $675,000.
annually on maintenance, labor, and power and cooling costs — while also avoiding a $1.2 million upgrade to legacy storage systems.\textsuperscript{13}

- **Data protection** — Cloud services, mobile devices, the IoT and other innovations require new approaches to secure data. The right data protection solution promotes IT modernization by ensuring data is secure and available to authorized entities regardless of where it exists in the extended enterprise. It includes identity and access management (IAM), encryption, disaster recovery, monitoring, endpoint and infrastructure protection, and more. As organizations adopt cloud services, they must be especially vigilant about their cloud service providers’ (CSPs) security practices, service level agreements (SLAs), and history of service levels and cyberattacks. In addition, they need to address shadow IT (i.e., the unsanctioned use of applications and services).

Data that opens new doors. With the right technology and processes, state and local governments can use open data (machine-readable public data), big data and data analytics to unlock a treasure trove of actionable information. Using this data, they can develop innovative services, make better decisions, optimize workflows, personalize citizen services and predict future needs.

State and local governments that can collect and analyze real-time data from mobile devices and the IoT are going even further, building smart cities that address some of the most pressing issues of urban growth. According to the United Nations, more than 80 percent of the North American population will live in cities by 2050.\textsuperscript{14} To meet the needs of this growing population, governments are leveraging data from connected devices for data-driven decision-making and intelligent automation. Using real-time data around traffic, air quality, power consumption, public safety and public infrastructure, cities can save money, improve resource management; reduce crime; and keep citizens happier, healthier and more productive.

To take advantage of these opportunities, government organizations need innovative ways to harness structured and unstructured data coming from disparate systems. Whether IT leaders are planning smart city projects or working to optimize operations and services, the following approaches can help propel their data initiatives:

- **Data lakes** — Data lakes allow state and local governments to tap into the potential of unstructured data from the IoT, mobile devices, data centers and the cloud by bringing together multiple data streams for collection, analysis and storage on a common platform. This platform enables analysts to make decisions based on the entirety of data versus a small sample. Using a single pool of information on which to efficiently perform analytics, organizations can get the real-time information they need to make data-driven decisions. In addition, data lakes allow organizations to make use of unstructured data even as data volumes grow exponentially. A properly deployed data lake can scale easily to accommodate petabytes (i.e., 1,000 terabytes) of data. Data lakes also create significant efficiencies and cost savings. In a Forrester Research study, a data lake provided a return on investment (ROI) of up to 250 percent over a three-year period. The top benefits driving this ROI were storage cost optimization, storage management efficiencies and added business value.\textsuperscript{15}

- **Research infrastructure** — Advanced data analysis often requires multiple supercomputers working in parallel to execute complex mathematical formulas. Most organizations do not have the high-performance computing (HPC) capacity needed to efficiently, reliably and quickly perform these analytics. In many cases, it would not be fiscally appropriate for a single
department or agency to invest in such capacity; however, organizations may be able to pool resources to create a cross-agency HPC platform. Another option is to partner with higher education. Because research and data analysis are often core activities within higher education, many universities and colleges have infrastructure and compute capabilities and talent that exceed most government organizations’ resources. Organizations may need to revise policies to facilitate such partnerships with not only higher education, but also the private sector.

TAKING THE LEAP FORWARD
Infrastructure modernization opens the door to new opportunities, allowing organizations to agilely deliver new citizen services; store, analyze and share information more easily; accommodate growth quickly and cost-effectively; simplify management; and reduce total cost of ownership. With the approaches presented in this paper and the right technology, organizations can close the gap between outdated legacy systems and a future-ready infrastructure that acts as a catapult for change and innovation.

When embarking on an IT modernization initiative, organizations can start with the following best practices to ensure success:

- **Develop a strategic plan based on vision, goals, operational needs and existing resources.** Many organizations make the mistake of defining their strategy before defining their operational and business goals. Identify customers and stakeholders and clarify their needs. Develop a common vision and list goals and objectives for realizing that vision; conduct a gap analysis of technology and staff resources; decide how much you want to manage in house; and then create a strategy and road map for achieving your goals.

  “IT modernization is an ongoing effort of consideration with each project or maintenance effort, with each purchase and with each interaction with our customers,” says Arlington CIO John. “Every IT initiative we undertake needs to be viewed from the perspective of how it will mature, change and potentially reach end-of-life in the next three to five years.”

- **Establish governance processes.** These processes help ensure IT purchases not only align with enterprise strategy and objectives, but also are compatible with other purchases and existing legacy systems. “Our role as a governance team is not to decide which solutions are good — since every one of the proposals has great merit — our role is to select the solutions that are right for the enterprise and provide the best long-term benefit to the organization for the investment,” says John.

- **Obtain buy-in from funders.** It’s important to involve governing bodies and funders. Doing so gives them a stake in the plan and helps ensure their support over time. Be sure the plan is clear and transparent. Also consider the political environment and have a strategy for working with newly elected or appointed officials.

- **Obtain buy-in from citizens and employees.** Citizens and employees are tech savvy and have high expectations about the type and quality of services that government should provide. Share your vision, goals and plan with internal and external customers; solicit and incorporate input where appropriate; and publish a modernization road map for the next 3 to 5 years.

QUESTIONS TO CONSIDER
- What are our objectives and priorities for a smart city?
- In gauging success with big data initiatives, what key performance indicators should we measure and how?
- How do we manage, control and preserve digital assets – especially those that may be subject to legal discovery?
- Does IT or another entity have responsibility for the data coming from various sources?
- What policies do we need to change to leverage partnerships with higher education, local businesses and private sector industries?
**Incorporate security holistically.** Security should be an integral part of the infrastructure model regardless of whether the organization is using cloud, on-premises or hybrid services. Conduct a cybersecurity gap analysis, especially if you’re opening the organization to cloud services, mobile applications and the IoT.

**Re-examine business continuity.** Be sure cloud service provider(s) or other third-party providers (including another government agency or government services broker) can meet the organization’s requirements for data loss, recovery, availability and security. Consider the provider’s SLAs as well as its actual service record. Be sure it has a solid grasp of the compliance, auditing and reporting requirements imposed on your organization, and that it can meet those requirements.

**Prepare for big data.** Determine how to manage, control and preserve digital assets. Identify resources and potential partnerships within higher education for data analysis and HPC environments.

**Change the culture.** Despite centralization and consolidation, many city and state agencies still work in silos. Establish policies and governance that break down silos and promote transparency and data sharing.

**Partner with the right vendor.** Look for a partner with the depth and breadth of experience to support modernization in a government setting. Make sure they can offer enterprise-wide solutions that address not only the cloud, hybrid environments, the IoT and mobile devices, but also security and big data. Ask about integration with cloud services and other vendors’ offerings. Consider the vendor’s history of creating real-world solutions that work with existing systems. Finally, be sure the vendor has the financial stability required to provide services and remain a partner in innovation over time.

*This piece was developed and written by the Center for Digital Government Content Studio, with information and input from Dell EMC.*

**ENDNOTES**

2. CDG interview with Dennis John conducted in July 2017.
7. CDG interview with Dennis John conducted in July 2017.
8. CDG interview with Dennis John conducted in July 2017.
17. CDG interview with Dennis John conducted in July 2017.
The Center for Digital Government, a division of e.Republic, is a national research and advisory institute on information technology policies and best practices in state and local government. The Center conducts e.Republic’s annual Digital Cities and Counties Surveys; the biennial Digital States Survey; and a wide range of custom research projects. www.centerdigitalgov.com

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