High-Performance Networks Power the Move to Modern Government

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It's a transformative time in government information technology. Public sector organizations are moving to the cloud. At the same time, seemingly everything that can be virtualized is quickly heading in that direction. Immersive Web applications are enabling next-generation services, including innovative mobile apps that give agency staff members and constituents anytime access to valuable resources. Video seems to be everywhere, with one research firm estimating that video streaming accounts for more than 53 percent of all downstream traffic in North America.[1]

What if all of this exciting change — inside and outside of government — rested on a single foundation that could make or break almost any project? And what if that critical foundation was routinely overlooked in IT planning? Unfortunately, it does and it is.

That critical resource is a high-performance wide area network (WAN), and it acts as the essential, if sometimes underappreciated link that connects people inside and outside government to data in the cloud, allows doctors and patients to collaborate via telemedicine, enables desktop virtualization to deliver attractive cost savings to agencies and underpins a host of other game-changing benefits.

In this white paper from the Center for Digital Government (CDG), we break down what every IT leader needs to know about today's networking to ensure project success. The days are over when IT managers could order a switch or network service a few weeks before the go-live date of a new application. When so much hinges on the network, technology leaders must carefully consider this vital component early and often in the IT management process. The bottom line: To support current initiatives and enable emerging services, governments at all levels must take a strategic view of their networking infrastructure.

Why the Network Matters

Networks enable new video services. Public officials in the city of Atlanta recently received another reminder about why a reliable and high-performing network infrastructure is essential to their goal to continuously improve how they deliver services to constituents and employees. In January 2014, a winter storm disrupted the city and caused massive traffic jams on main arteries. But throughout the snow and ice storm, the city's core, high-speed network continued to operate, keeping communication flowing while officials confronted the emergency.

The network is essential at other times, as well. For example, the city's Video Integration Center is where staff members monitor all city-deployed surveillance cameras, including those used by the Atlanta Police Department to oversee traffic conditions, active crime scenes and public emergencies, such as reports of school shootings. "Having a reliable network infrastructure is essential for making all camera feeds accessible on demand or in real time," says Noel M.A. Small, director of telecommunications and network operations for the city's Department of Information Technology.[2] "Not having a reliable infrastructure would adversely affect response time to incidents and reduce the level of security our constituents deserve."

Does your IT network need to be improved or upgraded?

Yes 56%
No 26%
Don't know 11%
Other 7%
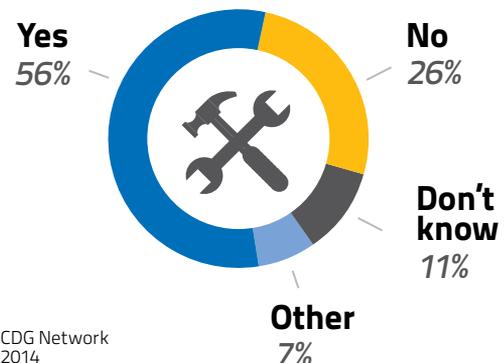
Source: CDG Network Survey, 2014

Atlanta isn't unique in its reliance on a robust network infrastructure. In an exclusive new survey conducted by CDG, 40 percent of CIOs and other senior IT managers and practitioners in state and local government said their networks currently or will soon provide live feeds and real-time information through video monitoring. In addition to traffic and crime monitoring, networked video streams are important in a variety of other ways. Examples include video booking capabilities that bring together suspects and judges when face-to-face meetings aren't practical, 24/7 oversight of critical infrastructure to guard against natural or terrorist threats, and videoconferencing that allows remote employees to collaborate within straining travel budgets.

Networks support internal IT efficiencies. Networks also support internal IT innovations that boost efficiency and reduce costs, such as data center consolidations that enable IT managers to virtualize servers, desktops and applications to deliver needed services using fewer physical resources. The right internal network infrastructure enhances security by allowing users to bypass the public Internet when sending sensitive data in favor of dedicated Ethernet connections.

Networks are the pipeline to the cloud. For similar reasons, public sector IT managers are turning to private networks when connecting users and applications to cloud solutions. These pipelines come with sophisticated controls for enforcing access rights and managing data that aren't available with the wide-open Internet. Reliable cloud connections are becoming crucial for today's government IT operations. For example, 46 percent of the executives responding to the CDG survey said their IT network already has a public, private or a hybrid cloud component. In addition, when addressing the shortcomings of their network infrastructure, nearly a quarter of the senior executives cited the lack of built-in flexibility as a challenge, such as a cloud network to alleviate IT network stress. The apparent take-away from this statistic is that a solid number of managers have this option on their IT to-do lists.

Networks connect government to its citizens. The role of modern networks isn't limited to internal government operations. Increasingly, these pipelines are helping agencies and citizens forge closer connections and enabling government to deliver valuable new services to constituents. They provide lifelines to emergency 911 communications, as well as

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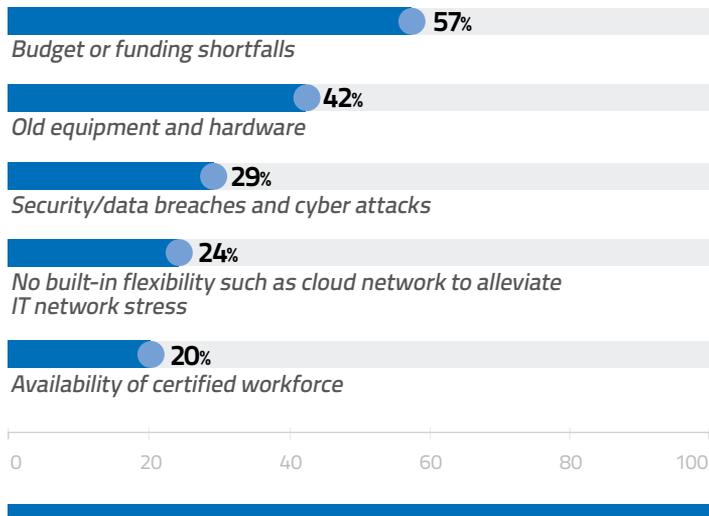
– *Noel M.A. Small, Director of Telecommunications and Network Operations, Atlanta Department of Information Technology*

non-emergency 311 calls that enable agencies to disseminate information or receive feedback from citizens about broken street lights, graffiti, potholes, requests for shelter or a host of other types of alerts.

Networks promote business development. Government officials also recognize the crucial role modern, high-speed network infrastructures play in promoting business development in local areas. Nearly three-quarters of the senior executives in the CDG survey said the IT network was important to economic development initiatives. Having a state-of-the-art network helps attract and retain corporate citizens.

For example, the city of San Mateo, Calif., upgraded its broadband network to link local businesses in its downtown area to high-speed Internet and telecommunications services.[3] Known as the Digital Downtown, this resource gives high-tech startups, medical offices and hundreds of other businesses access to a robust optical fiber backbone with download and upload speeds of up to 100 megabits per second (Mbps) and 10Mbps, respectively.

What are your top network challenges?

57%	Budget or funding shortfalls
42%	Old equipment and hardware
29%	Security/data breaches and cyber attacks
24%	No built-in flexibility such as cloud network to alleviate IT network stress
20%	Availability of certified workforce

0   20   40   60   80   100

Source: CDG Network Survey, 2014

Similarly, the Cambridge Innovation Center in Massachusetts provides office space to technology and life science companies in a city that has long been at the forefront of high-tech innovation. The approximately 500 tenant companies that lease office space receive enterprise-class network services, including a 300Mbps Ethernet dedicated Internet connection that can scale capacity volumes to meet the fluctuating needs of its tenants.[4] As a result, at any hour of the day end users can organize videoconferences — accessing online storage servers, sharing documents online and using hosted office applications.

Network Painpoints

Secure, high-speed networks may offer many benefits to modern IT environments in the public sector, but there's a flipside to the rising status of networks: Managers and technology practitioners find themselves in an ongoing struggle to keep up with bandwidth and reliability demands while simultaneously addressing budget realities.

Bandwidth. Not surprisingly, higher data volumes are driving demand for network services. Thirty-two percent of survey respondents said mobile and stationary devices are placing the highest demand on IT networks, followed closely by video traffic.

Additionally, while application virtualization and data center consolidation increase efficiencies and reduce costs, they require a strong network foundation to succeed. Nineteen percent of respondents said virtualization was driving the highest demand for network resources, while 15 percent said data center consolidation was the culprit.

But regardless of the specific cause, the message is clear: Bandwidth demands are on a trajectory to increase, likely considerably. The capacity available today will likely fall short in the near future as new applications and services arrive. This requires a forward-looking approach to network planning. As one survey participant noted, "Network managers need to pass the ball to be where the receiver is running to, not where he is now."

Reliability and continuity. IT officials see networks as a way to provide more and better services to constituents. However, to do this effectively, reliability of the network is key. When ranking the highest priorities for their network environments, survey respondents overwhelmingly agreed that consistent availability was by far the most important.

However, that goal is becoming increasingly difficult to achieve in an era of ubiquitous mobility. Survey respondents were nearly unanimous in their view that the complexities of maintaining mobility and wireless capabilities during a disaster or security threat has become increasingly important for continuity planning. And while a solid majority of the respondents — 69 percent — said their organization has a robust business continuity plan in place, less than half reported that the plan has been fully tested in the past year. As new services, such as mobile applications, constantly evolve, network contingency plans require frequent updates and testing to ensure they're still effective.

Modernization. For most organizations, the evolution of networks is a moving target. Fifty-six percent of survey respondents said their networks needed to be improved or upgraded, largely to replace old equipment and hardware. Interestingly, 67 percent of respondents said their IT networks had been upgraded within the past year — a testament to how fast technology is evolving.

The city of Atlanta is part of the modernization movement. "The city will be upgrading approximately 78 percent of its core infrastructure for [voice over IP telephone] deployment throughout the city," Small says. "This city will attempt to consolidate all its disparate phone systems to one common system."

Six Important Considerations When Choosing Ethernet Services

With agency networks taking on more importance than ever to power today's IT initiatives, it's essential for IT managers to choose the right technology. With time division multiplexing (TDM), SONET and frame-relay options each suffering from their own drawbacks, Ethernet is becoming the growing choice for modern networks. Part of the appeal of Ethernet services is a variety of options that can help government IT managers find the best solution for their needs. To make the right choices, weigh these important areas.

1 Ethernet ports (aka user-to-network interfaces or UNIs) connect agency networks to service providers. UNIs may be electrical and fiber-optic connections, with standard Ethernet speeds ranging from 10Mbps for the former to 100Gbps for the latter.
   Consider: Multi-rate ports, such as 10/100/1,000Mbps electrical interfaces, simplify migrations to higher speeds as bandwidth needs increase over time.

2 In addition, Ethernet services provide two basic types of deployment options: point-to-point (site-to-site) or multipoint (any-to-any). Point-to-point is the most widely deployed Ethernet service choice, but agencies that expect to interconnect a large number of sites should investigate multipoint connectivity.
   Consider: This option enables additional sites to be more easily added to the WAN. Multipoint connectivity also allows for simple traffic prioritization and can effectively support IP telephony (VoIP) and data traffic over the same WAN. Work with the service provider to determine the size port that will be used to provision your circuit. The rule of thumb in this case: bigger is better. Organizations that buy a 20Mbps circuit that's provisioned on a 1Gbps port will have capacity that's ready to scale as needs grow — without adding new cards in agency networking equipment or contracting for a new circuit.

3 Standardized Ethernet solutions typically include port-based Ethernet services, which are the simplest form of Ethernet service and require little coordination between agencies and service providers.
   Consider: There is low coordination overhead because the service makes no differentiation of Ethernet traffic entering the UNI from the customer's attaching equipment. Basically, it provides a bits in, bits out service for a specific amount of subscribed bandwidth.

4 Alternately, VLAN-aware Ethernet services enable agencies to support multiple Ethernet virtual connections (EVCs) on the same port. This saves organizations the cost of purchasing additional ports from the service provider.
   Consider: With VLAN-aware services, IT managers can add additional EVCs in the future as long as there is sufficient bandwidth available on the Ethernet UNI.

5 Advanced service components include classes of service or CoS options to address unique service performance requirements for various applications.
   Consider: The ability to designate individual requirements lets network administrations who may want to differentiate VoIP traffic from the data traffic used to interact with customers for some applications, such as a call center using VoIP. This represents another reason why bigger circuits are preferable.

6 Another advance component is service performance metrics, which defines the performance parameters of the Ethernet service.
   Consider: Terminology varies between service providers. For example, the terms "packet" or "frame" can be used interchangeably. The same may be true for "jitter" and "delay variation" or "latency" and "delay." It is also important to understand how latency is measured to compare apples-to-apples between service providers. Questions to ask are: Is latency the time a packet takes on a round-trip or one-way? Is it measured only in the core of the network or all the way down to the agency's premises? Measuring all the way to the premises is much more accurate because the alternative measurement only yields an average rate across all circuits in the network, not specifically for the individual agency.

But while modernization is a high priority for many public sector organizations, the upgrade path is strewn with obstacles, including some venerable challenges, according to respondents to the CDG survey. Fifty-seven percent identified budget or funding shortfalls as a major stumbling block, while 20 percent cited a lack of readily available, certified technical workers.

Developing a Strategic Plan

Senior IT managers are struggling with a delicate balancing act. They must meet growing demand for new services with fast, reliable and secure network technologies. But at the same time budget constraints and other difficulties require executives to optimize their technology investments to achieve the highest performance paybacks at more economical costs. Here are four key considerations that can help IT leaders achieve these results.

1. Make sure network goals and requirements are integrated within the organization's overall strategic plan. Atlanta's Small calls this a network system lifecycle strategy that defines the high-level impact of proposed network upgrades. "Not having a network system lifecycle strategy [in the past] prevented the timely optimization activities necessary to ensure a secure and highly available network," he says. "Our pending network optimization plan will enable one common network to be shared by the world's busiest airport, the water department and our City Hall administrative offices."

In addition, government IT managers may find that after creating an optimization plan and securing funding for an upgrade, it may smooth the path for subsequent enhancements as additional opportunities arise.

2. Assess current network resources to identify performance gaps and reliability shortcomings, as well as what it will take to address them. An important step in the assessment process is to outreach to department heads and end users. Feedback from these stakeholders will give network managers a clearer picture of real-world application performance and system downtime. This will help leaders understand the most critical upgrade goals — higher performance, better availability, enhanced security, improved agility or a combination of needs.

3. Evaluate network technology options to find the best fit. Thanks to their proven reliability and familiarity to managers of local area networks (LANs), Ethernet services are now a leading choice for today's WANs. In fact, technology analyst firm International Data Corporation (IDC) says adoption rates for Ethernet services are soaring, propelled by superior cost effectiveness, high-bandwidth scalability, ease of implementation and overall flexibility.[5] "Today, enterprises are increasingly utilizing 100Mb, Gigabit, 10 Gigabit and even some 40 Gigabit Ethernet services for their domestic and international WAN networking," says Nav Chander, IDC research manager, United States Enterprise Communication Services, in a statement.[6] "We are also seeing a lot of U.S. enterprises upgrading their Ethernet bandwidth and adding more applications and business locations on net because of the economics and faster time-to-service compared to the alternatives. Together, these trends will enable enterprises to converge their communication platform requirements with Ethernet."[7]

IDC forecasts that total revenues for Ethernet services in the U.S. will rise from $6.2 billion in 2013 to $10.1 billion in 2016. In recent years, Ethernet services for WANs have evolved beyond their roots as a LAN networking technology by expanding bandwidth, virtual connectivity and service-performance capabilities. The WAN services have also become more standardized than in the past, thanks to the efforts of the Metro Ethernet Forum, an industry consortium. As a result, Ethernet services can now deliver higher performance and cost savings compared to expensive private line services. In addition, Ethernet services offer improved flexibility and scalability. Reduced complexity is another plus — agencies can use the well-established Ethernet technology platform for connecting both their LANs and WANs. (For technical details about Ethernet services, see sidebar "Six Important Considerations When Choosing Ethernet Services" on page 5.)

Benefits like these help explain why 43 percent of the respondents to the CDG survey said their organizations now outsource all or portions of their network to a private vendor. In fact, 22 percent of this group rely on a service provider for more than a quarter of their network services.

4. Find the right network service provider. While there's a lot to like about Ethernet services, government network administrators still must find the right service provider to ensure long-term success. Look for vendors that can draw on a solid track record in the public sector to assure they

know how to address the unique financial and reliability requirements of government. Also, service providers should demonstrate a history of innovation so agency networks keep pace with the latest advances in performance and security. A provider with a widespread geographic presence is a must for government organizations that need to connect field offices and other remote locations. To match the right service for each individual application, IT managers should look for providers with a full portfolio of services, ranging from Ethernet private line and Ethernet virtual private line to Ethernet network service and Ethernet dedicated Internet. For optimum flexibility, each service should be available with a 10Mbps, 100Mbps, 1Gbps or 10Gbps Ethernet port in bandwidth increments from 1Mbps to 10Gbps.

Other service provider must-haves include dedicated project managers for each government account, proactive monitoring of network performance all the way to the client location and 24-hour enterprise support resources.

A Foundation for the Future

IT operations are undergoing fundamental transformation thanks to a growing adoption of cloud computing, wide-ranging mobile applications, extensive virtualization within data centers and other trends. The potential payoff is clear — technology innovation today and tomorrow promise new and better services for constituents and government employees. The common thread that connects all these changes is they all require a high-performing, reliable and secure network infrastructure to make them successful.

But agency IT managers face a venerable dilemma: How do you evolve and modernize essential networking resources while addressing the realities of today's tight budgets? Fortunately,

How much of your network is outsourced to a private vendor?

56% *Less than 25%*

15% *26% - 50%*

4% *51% - 75%*

2% *76% - 99%*

2% *100%*

18% *I don't know*

3% *None*
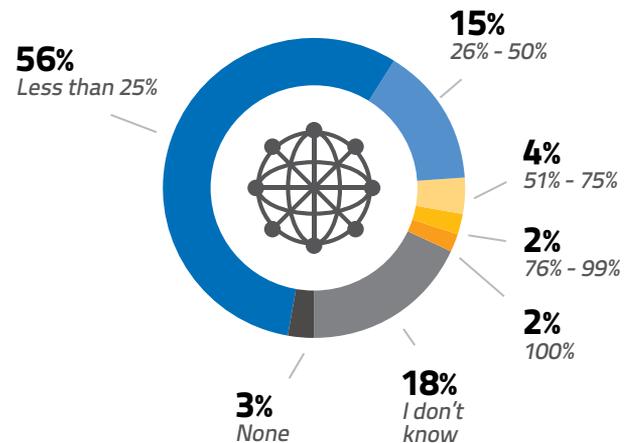
Source: CDG Network Survey, 2014

there's an answer for technology managers trying to balance IT needs and financial challenges: a strategic approach to network design and management that incorporates considerations about this vital resource at the start of any new technology initiative.

When state and local officials take a strategic view of networking infrastructures, their organizations pave the way for connections between agencies and citizens, provide important lifelines to emergency services, promote local business development, and link users and applications to game-changing cloud solutions.

Endnotes

1. www.hollywoodreporter.com/news/video-accounts-53-percent-internet-655203
2. All information from Noel Small from CDG email interview.
3. www.fiercecable.com/press-releases/san-mateo-chamber-commerce-comcast-announce-completion-state-art-broadband
4. http://business.comcast.com/docs/default-source/case-studies/cambridge-innovation-center-case-study_713.pdf?sfvrsn=0
5. www.reuters.com/article/2013/10/02/ma-idc-idUSnBw025137a+100+BSW20131002
6. Ibid.
7. Ibid.

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