



Desktop Virtualization in State and Local Governments: Saving Money Without Sacrificing Citizen Service

WHITE PAPER

Sponsored by: VMware

Ruthbea Yesner Clarke
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IDC GOVERNMENT INSIGHTS OPINION

IDC Government Insights has seen an increase in server and desktop virtualization at the state and local levels in the United States and believes there are real and measurable benefits to virtualization that other government organizations should consider. Today, citizens expect 24 x 7 access to information and continuous government availability for services. At the same time, state and local governments are facing large budget shortfalls, the loss of American Recovery and Reinvestment Act (ARRA) stimulus and other funding from the federal government, and increased services needs from populations suffering in the current economic climate.

Given these challenges, desktop virtualization is a strategic initiative for budget-conscious state and local governments to optimize their IT investments. Many state and local governments turn to desktop virtualization following successful server virtualization projects; by streamlining their datacenters and reducing the number of servers, state and local governments have realized cost savings in hardware and maintenance and reductions in electricity, heating, and cooling needs. Desktop virtualization offers many of these same benefits: reduced costs, improved operational efficiency, and a better end-user experience, all of which ultimately result in improved services for citizens.

IN THIS WHITE PAPER

This White Paper was written by IDC Government Insights and sponsored by VMware. It explores the potential advantages of using desktop virtualization for PCs versus the traditional approach where every computer has its own operating system, resident applications, memory, processing power, and storage.

The methodology for this document is based on in-depth customer interviews combined with IDC's desktop virtualization research. IDC Government Insights talked with IT managers in three state and local government organizations that made a commitment to desktop virtualization using VMware. We asked them what worked, what

proved to be a challenge, what they might do differently, and what specific benefits they've experienced.

All of the interviewees said that they achieved significant productivity gains, reductions in costs, and improved services for end users. All are in the midst of expanding their initial commitment to desktop virtualization.

SITUATION OVERVIEW

Key Challenges for State and Local Governments

State and local governments are in a period of intense pressure with budget shortfalls from the prolonged economic downturn and the end of ARRA funding for projects. With heavy demands to reduce operating costs, state and local IT departments are actively seeking ways to meet the ever-increasing expectations of citizens for government services and effective government programs with lean IT staffing resources. State and local IT departments are facing the following key challenges that impact infrastructure technology investments:

- **Reducing costs of operations, "doing more with less."** Managing individual PCs (maintaining the machines, updating software, dealing with security issues, installing patches, and troubleshooting) has become more than a full-time job for IT employees at current staffing levels. Aging hardware, high costs per machine, and severe budget constraints place state agencies and local IT departments under a great deal of pressure to increase productivity. IT departments that had ARRA windfalls are planning ahead for "funding cliffs"; that is, how should they invest their stimulus money in a way that is sustainable over the long term without further federal monetary support?
- **Ensuring high availability and disaster recovery.** Government operations must go on in emergency or special situations, such as natural disasters or major planned events. Government services may even be more critical during these times. Citizens certainly expect continuous access to government services; therefore, workers must be able to access applications from home or mobile devices if they are unable to get to their offices.
- **Protecting sensitive information.** Over 40% of state and local government respondents in IDC's 2011 Vertical Group survey cited security as a top IT initiative, and it is also a concern for citizens who want to make sure their personal information is secure. Government agencies hold highly sensitive information, from social security numbers and tax information to infrastructure work orders, traffic patterns, and public safety records. Field workers who carry laptops, ruggedized handhelds, or mobile devices not only need to access information on the go but also must ensure that data is fully encrypted and protected and not compromised if a laptop is lost.

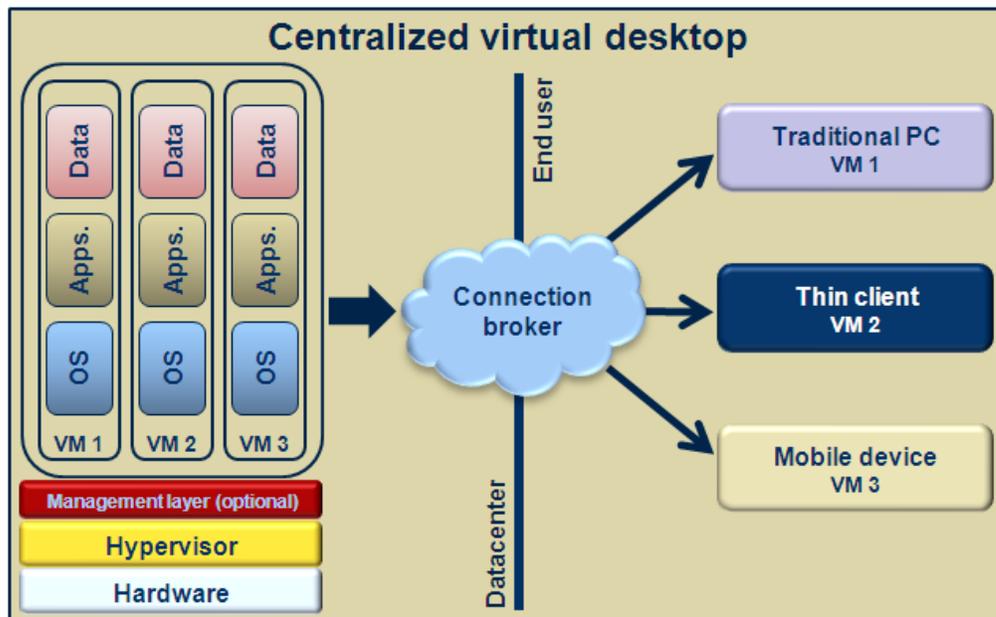
Desktop virtualization offers a solution to all of these issues via centralized provisioning, where IT staff can more efficiently manage desktop environments, and data and applications are accessible anytime and anyplace. Data is more tightly controlled because it resides on a central server, allowing for better security management. Data is also more secure in the event that laptops, or other mobile devices, are lost or stolen because no sensitive information resides on the PC and access can be remotely shut off.

What Is Desktop Virtualization?

Virtualized desktops effectively separate a PC's desktop environment from the physical machine that's displaying and interacting with the environment. "Virtualization" of a desktop means that the person using the computer will experience a traditional PC look and feel while interacting with the computer, but the individual is actually interacting with a remote client machine. The desktop is a window that loads from a remote central server. The operating system, programs, applications, storage, backup, data, and processing are all handled by a server that resides in the datacenter (see Figure 1).

FIGURE 1

Desktop Virtualization



Source: IDC, 2012

The end users may access the virtual desktop from a zero- or thin-client machine that has zero (or minimal) local storage, processing power, or software, or they may open a virtual window on a traditional PC. In the latter scenario, the PC acts like a thin client when interacting with the virtual environment, but the end user also has the ability to use the machine as a regular PC. When all applications reside on a central machine, the applications can be more efficiently managed, and end users always have access without time-consuming manual upgrades by IT staff.

The Advantages of Desktop Virtualization

Today's economic environment means that state and local governments are under great pressure to provide citizen services at lower costs. Virtualized desktops offer one solution to this problem because costs can be reduced and the end-user experience can be improved. Most state and local governments that have virtualized their desktops are extending the life of old PCs, often past seven years, and/or switching to thin- or zero-client devices that are significantly cheaper and require less maintenance than traditional PCs.

Beyond the issue of cost, virtualized desktops allow for faster implementations of new applications, upgrades, or patches and reduce the number of help desk calls. Because less manpower is needed for management and administration, IT staffs are free to work on more strategic projects. Given the increased IT needs of mobile government workers, from social workers to police officers to workers at home in the event of a disaster, virtualized desktops are able to offer rich, personalized virtual desktops to any device in the field and ensure data and application security as well. Virtualized desktops are also highly scalable and available and offer a platform for use of cloud computing, a future trend that will increase in importance for state and local governments.

CASE STUDY HIGHLIGHTS

Making the case for desktop virtualization in a state or local government setting means demonstrating that the proposed solution will do three primary things:

1. Improve overall services levels and functionality for system users and ultimately for citizens
2. Provide improved citizen services at a lower or reduced cost to the government
3. Enable a platform for future use of desktop virtualization, application virtualization, and cloud computing for future cost savings and services implementations in other departments or agencies

The following case studies provide details on how three local IT departments have addressed the issues described earlier and how they made the decision to virtualize their desktops using VMware View.

Ohio Department of Transportation, Ohio

The Ohio Department of Transportation (ODOT) is involved in the planning, building, and maintenance of the transportation infrastructure within the state of Ohio. This includes managing the state system of roads; the public transit system, which includes a fleet of almost 3,500 vehicles; 5,484 miles of railroad tracks; and many other types of transportation. ODOT has more than 5,000 employees working at 15 major locations and several hundred satellite offices across the state. ODOT has about 100 technology employees.

Currently, ODOT has implemented desktop virtualization in 50 construction sites and 15 training rooms with 200 to 500 daily users. ODOT has the ability to power up all 1,200 thin-client machines in case there is a high-priority training session that requires all the training sites. Virtualization is a growing part of ODOT's technology portfolio.

The driving factor that led ODOT to virtualize desktops was the need to improve the performance at the remote sites, which had slower LAN connections. These sites were experiencing poor performance when working with large files or with systems located in the datacenters. The goal was to set up virtual desktops running in the datacenter with a high-speed connection to those systems to provide better performance for the users.

ODOT started to pilot a desktop virtualization project in early 2010. The implementation was carried out entirely by the ODOT team of six IT employees; it took 18 months with a six-month pilot followed by a full-scale implementation. The project was justified by the fact the VDI implementation enabled the IT department to retain 1,000 desktops as thin clients, a savings of \$600,000. The cost of the project was around \$500,000, so there was an immediate cost savings to the IT budget of \$100,000.

The results have been immediate, with performance improvements ranging from 8 to 15 times faster in file and configuration operations at the endpoints. Because the solution uses stateless machines, security has also improved. This means that all user information — documents saved, preferences, etc. — is saved to a network location rather than the user's local hard drive. It also provides a better backup and recovery system, with users being able to access their data 24 x 7 regardless of whether a problem arises with one of the primary datacenters. High availability was one of the key technical requirements for ODOT because it wanted to ensure that it could route users to another site quickly in the event of a disaster.

ODOT learned some lessons along the way. As is common in desktop virtualization, storage became an issue because the original environment wasn't as scalable as it needed to be. ODOT uses solid state drives to leverage a feature called FAST Cache in its storage units to significantly improve performance over more traditional storage architectures.

ODOT also took advantage of user surveys to collect information about which applications were most important to users. This is an important step in aligning the technology with the environment in which it is used. ODOT, as part of its pilot, assessed the different types of users across the state. It found that the users at the construction sites and training centers had very standardized applications, which were a better fit than the computer-aided design and specialized applications being used by users at the central office. For the standardized applications, the IT team was able to use a single image to create hundreds of virtual machines.

Load testing and virtual machine optimization were also critical success factors. While everything seemed fine in the pilot and initial testing, once ODOT performed its load test, it was able to identify bottlenecks in its environment, mainly around storage. ODOT dealt with the issue early in hopes of preventing a more serious situation when it added more users later.

Finally, ODOT made sure that its end users were involved in some of the original testing and that their needs and requirements were taken into account when configuring the virtual desktop environment. This was an important step in building a solution that met the needs of ODOT users.

Following the initial rollout of desktop virtualization, ODOT plans to continue to add users and upgrade the environment. Beyond expanding functionality for current users, ODOT is looking to expand virtualization to other back-office workers who have less standard configurations and considering the deployment of virtual applications to the virtual machines.

City of Gahanna, Ohio

The city of Gahanna, Ohio, is a diverse suburb in central Ohio with 34,355 residents. Gahanna has a strong parks and recreation department that provides key quality-of-life services to its citizens. With 725 acres of parkland, four athletic complexes, and two pools, Gahanna boasts more park space per capita than the rest of central Ohio. The IT department has six sites and 300 employees, 10% of whom are currently using virtualized desktops, mainly for membership operations for the pools and other recreational activities.

At a time when budget cuts and cost reductions are top of mind for many government organizations, it's refreshing to see that citizen satisfaction is still a top priority for the city of Gahanna. The city conducted two major surveys in 2008 and 2010 to measure and monitor citizen satisfaction with a host of different topics, including schools, taxes, roads, quality of life, and the performance of the administration. As Tom Kneeland, director of technology, explained, "Customer service is my primary goal here. We make sure we provide the highest level of customer service — and if we are having issues with our environment, that customer service measurement is way, way down."

In the summer of 2010, when school was out and the pools and parks were in high demand, the Gahanna technology team was faced with a challenging technical environment that was marring the experiences of Gahanna's citizens. The city's parks and recreation management software, which handled scheduling and point-of-sale services, was not functioning properly at the remote terminals. The remote sites were not properly handling membership processing because of database synchronization issues and network latencies, and the city needed a rapid and effective way to gain better control of its remote desktops. "We had a situation where the environment that was originally rolled out wasn't working the way they needed it to, and the effect was exponential labor costs being driven up due to the unreliability of the remote workstations. The only way to have the controls in place and make it work was to quickly roll out desktop virtualization," said Kneeland.

Gahanna was looking to leverage its existing investments and ideally to continue to drive down costs. The city had already virtualized about 70% of its servers and thus was familiar with the concept of utilizing VMware architecture. In addition to solving the technical hurdles in the parks, Kneeland saw desktop virtualization as an opportunity for additional cost savings, especially for the life-cycle management of PCs. Within about a month, the city configured and rolled out VMware's VDI solution to its parks and recreation facilities. The deployment went smoothly.

Kneeland said, "Desktop virtualization eliminated [our issues] because all of the database tasks were being accomplished right at the City Hall datacenter instead of having to travel across the network. Virtualization allowed us to cut that completely out, and basically we're now just transporting the visual data."

The solution brought Kneeland the stability and better customer service he sought. In addition to these benefits, the IT director believes the solution will enhance the city's disaster recovery and business continuity plans. "With a virtual environment, your hardware requirements are cut dramatically, depending on how much you've moved to the virtual environment. I see the virtual servers as well as the virtual desktops playing a very key role, especially during a disaster, because the virtual desktops can be accessed from anywhere," said Kneeland. Although cost

savings weren't the primary driver, the city anticipates reductions in hardware and environmental costs, such as electric power consumption and HVAC consumption. The end users are also benefiting from an enhanced user experience, thanks to a more efficient and effective log-in.

Kneeland and his team are continuing to expand their desktop virtualization efforts to other departments. Any remote site is an initial target because of network latency and connectivity issues that virtualization can dramatically improve. Gahanna is currently working on a pilot project with virtual displays in its safety environment too. Together with the police department, the city is working to counteract some of the problems created by unreliable network broadband services in the field. The plan is to use virtualization in police cruisers to run a computer-aided dispatch (CAD) application in a virtual space.

Kneeland advised organizations considering desktop virtualization to do their homework and seek advice and best practices. "You need a good understanding of what virtualization is, what you're trying to accomplish, and what your end goals are," he said.

City of Pittsburgh

The city of Pittsburgh is the second largest city in Pennsylvania with 305,000 residents. Pittsburgh has substantial economic influence, with downtown Pittsburgh ranked 25th in the United States for urban jobs and 6th in job density. Pittsburgh was ranked as the most livable U.S. city by the Economist Intelligence Unit in 2011 and received a similar accolade from Forbes and Yahoo! in 2010. Despite having a relatively healthy economy, the city still faces budget and cost pressures "to do more with less," said Alex Musicante, network analyst for the city of Pittsburgh.

Musicante is part of a 12-person City Information Systems (CIS) team that supports 2,800 users, including users in City Hall and in the police and finance departments. The city employs eight networking analysts to handle all aspects of server and desktop virtualization and four help desk employees. The IT infrastructure is centralized and supports 175 remote locations. Pittsburgh virtualized its servers starting in 2006, with more than 80% of its systems on the VMware platform and every new production system also deployed on VMware. Desktop virtualization began in mid-2008; currently, the city has 280 concurrent desktop users and is on track for 400 users in the next few months.

In 2008, the city of Pittsburgh faced issues common to many cities and towns, which led to the desktop virtualization project. The team experienced a 33% staff reduction, going from 18 to 12 employees, coupled with substantial budget cuts, which led to more responsibility being placed on the IT staff to keep pace with the needs of city employees and demands for higher availability and reliability. The members of the IT team needed a plan to reduce the number of help desk

calls and improve manageability given their workloads. The CIS team looked at different options for desktop virtualization before turning to VMware. With the city's successful relationship with VMware via the server virtualization and a follow-on engagement for multisite disaster recovery using VMware's Site Recovery Manager (SRM), members of the Pittsburgh IT staff first engaged VMware in a proof of concept.

The proof of concept lasted about 16 months because of the heavy involvement of every department and the need for the team to provide a general virtualization proof of concept. It involved the public safety administration department (police, fire, EMS, and Bureau of Building Inspection) and the finance department, including their software developers. As Musicante said, "Change is always hard from the user's perspective. At the end of the day, we do have the ultimate say, but it's not our intention to push this on people. It's more to try to get them to want to be there." End users had a lot of questions about accessing applications remotely, especially if they were legacy applications; deployments of updated and new software packages; and ensuring 100% reliability.

The city has had impressive results. As Musicante said, "Now we offer higher SLAs to our clients, and the actual infrastructure in the back-end system is more robust and reliable." Calls to the help desk have been reduced; the team can get "10 times the amount of calls done in one day." The number of calls from the finance department dropped from 20 to 2 per day. Productivity improvements in pushing changes take "a matter of hours or days;" previously, they would have taken three months. There have been cost savings in hardware as well. The city has 150 zero clients in use, with 150 more ready to deploy as traditional PCs start to fail. The city used to retire PCs at five years, but now PCs are used for at least seven years, or as long as they last. In addition, zero-client PCs use one-tenth the power of regular PCs. Musicante also feels that security is improved as his team extracts out to the hypervisor level and uses VMware vShield for endpoint security on the server side, providing an extra layer of protection.

Musicante reflected on how his team could have handled situations differently such as when the city hosted the G-20 or when it experienced four days of snowstorms. In the case of the G-20, 90% of city employees were given time off, costing the city hundreds of thousands of dollars. If the city had had virtualized desktops, everyone could have worked from home. Musicante recalled that in 2008, when the city was hit with a virus, the cleanup took hundreds of man-hours. As he said now, "Realistically, with desktop virtualization, specifically with nonpersistent images, that just wouldn't happen. If we somehow got infected with a virus, and it hit our desktop infrastructure and poisoned [the machines], we would destroy all the machines. Assuming we had 2,800 machines, it would take us under six hours to rebuild the entire city."

Musicante believes that the "dedication and devotion" of the teams working on the desktop virtualization initiative was a key success factor. For the members of his team, the sense of ownership and pride in their achievement has boosted morale. His words of advice for other local governments is to plan appropriately for storage performance, gather end-user input, identify end-user concerns right away, and use the information as leverage to show the benefits of desktop virtualization. Desktop virtualization differs from server virtualization in that it has an impact on end users. Musicante said, "If you haven't added in the whole user aspect ... that needs to be reconsidered. Get their input from the get-go. As much as it is your infrastructure from an IT-related standpoint, it is the users [who] end up having to suffer the consequences, if there are any, and who reap the benefits as well."

Next steps for the city of Pittsburgh include application virtualization and merging and consolidating services, possibly through a shared services model. The CIS team will work with other agencies to provide infrastructure as a service in a private cloud deployment model. Server virtualization and desktop virtualization, as well as centralized provisioning, have put the CIS team in an ideal position to help other parts of the city that are looking to reduce costs and improve employee productivity.

Summary of Findings and Benefits

After talking with multiple state and city organizations about why they chose to move to virtualized desktops, we detected a few clear patterns:

- In most cases, the up-front costs of the new virtualized solution were equal to or less than those of the existing PC-based solutions that needed to be replaced or upgraded. In all cases, maintenance, repair, and support costs were significantly lower thanks to virtualization. There were significant reductions in support calls and improved productivity with changes and updates being pushed out in minutes versus hours. With many governments facing staff reductions, IT staff members felt their workloads had become more manageable.
- Government agencies were able to extend the life of existing PCs, often by two or more years, which resulted in significant long-term cost savings. As in the case of ODOT, repurposing PCs as thin clients resulted in enough savings to fund the entire desktop virtualization project.
- Zero- and thin-client solutions offer a significant cost savings as PC replacements. Organizations with desktop virtualization have stopped buying \$1,000 PCs and now use thin-client terminals, which sell for \$250, to provide the same Windows 7 desktop experience to end users.

- Government organizations have availability and disaster recovery. If emergencies such as snowstorms or major events disrupt work, end users can work remotely.
- Security has increased, and concern over security issues has decreased. Without data residing on local hard drives, there is little worry about data leakage. As Musicante from the city of Pittsburgh said, "In terms of desktop virtualization, the security benefits outweigh the security concerns."
- In an ecofriendly age, environmental benefits — such as less power consumption, slower rate of PC disposal, and reduced packaging (including software packaging that formerly was opened and installed on various PCs) — are also important gains.

Virtual desktops provide a highly flexible computing environment that is more efficient for both IT managers and end users. IT staff can focus less on maintenance issues and more on other types of system improvements. End users can focus on their work and providing citizen services rather than on maintaining systems and helping troubleshoot issues.

Virtualized desktops also are a significantly more efficient way to use a group's computing resources in a more secure manner because desktops are more tightly controlled when they reside on a central server. In addition, data is much less likely to be lost or stolen because it no longer resides on multiple PCs located in remote offices or work sites (or taken home).

Lessons Learned

Table 1 summarizes some key lessons learned from state and local IT departments during their desktop virtualization implementations.

TABLE 1	
Lessons Learned by State and Local Governments in Desktop Virtualization Implementations	
Lesson Learned	Description
Take a phased approach and plan, plan, plan	Do a proof of concept, conduct a pilot, or take a measured, phased approach. Take time to articulate what your measurable goals and objectives are. Do a survey to determine the best target end users for VDI, and then work in concert with those users to understand how they use their PCs and with which applications.

TABLE 1**Lessons Learned by State and Local Governments in Desktop Virtualization Implementations**

Lesson Learned	Description
Plan for storage	The storage design of VDI architecture is key. Many organizations encounter a bottleneck with storage and realize that their current environment is not robust or scalable enough. A SAN costs anywhere from \$18,000 to \$26,000 and can get expensive if there is one per site. Look into your storage needs and organizationwide storage. If your storage is on existing network-attached storage devices that are used for other purposes as well, consider a dedicated storage environment for VDI. Consider solutions that are available now to provide high-speed storage arrays specifically for a virtual environment. They use arrays of solid state drives that provide high performance for a stateless environment that may not need large amounts of disk space.
Desktop virtualization may be a different "sell" when allocating budgets	Virtualization has more up-front costs, which is different from the traditional model where expenses are spread out over time. While server virtualization is back end, desktop virtualization affects end users directly, which can lead to more caution in moving ahead with the project. Desktop virtualization has more up-front costs than server virtualization because it involves workstations, aging machines, and storage. The costs can look different compared with thick clients where costs are spread out in smaller increments according to refresh cycles.
Remember that desktop virtualization (unlike server virtualization) impacts end users; make sure you provide training and assist with end-user acceptance	Desktop virtualization differs from server virtualization in that it has an influence on end users. A mindset change may be needed for end users to become comfortable with the new system. Gather user input from the get-go. As much as it is your infrastructure from an IT-related standpoint, the users suffer the consequences (if there are any) or reap the benefits of the solution.
Don't "shortcut" the technical specs, the hardware, or the software	<p>In your initial implementation, don't shortchange on the technical specs, whether hardware or View licenses. You can always scale back or adjust if needed in a subsequent phase. If you don't document your requirements and set expectations, then you don't know what to expect.</p> <p>This includes looking at the documentation provided by VMware on desktop optimization. Optimized machines have less impact on servers, disk I/O, CPU, and memory utilization.</p>
Calculate ROI	<p>Most government organizations do not calculate an ROI formally or even track key metrics. However, it is worthwhile to do a return-on-investment analysis before taking the plunge. Organizations can develop their own cost/benefit analysis tools, use the tool offered by VMware, or look for third-party tools. This enterprise-wide solution has advantages that are easy to measure.</p> <p>Price points per seat are available for the software. Servers do not require any special configurations, so commodity servers can be used. The sizes and performance levels of those servers are dictated by the number of end users being served. End-user client costs are predictable because prices are readily available for thin-client machines, or people can use existing PCs if they prefer.</p>
Account for less measurable savings	Less electricity use, reduced air conditioning costs, more productive use of IT staff time, reduced help desk calls, doing more with the same staffing levels, and anywhere/anytime access for end users are all important factors that contribute to the cost/benefit analysis of desktop virtualization.

Source: IDC Government Insights, 2012

FUTURE OUTLOOK

State and local governments would be well served to research virtual desktops. Desktop virtualization is a strategic investment that enables government to provide a more reliable, scalable, faster, cheaper, and consistent experience for its workers and, ultimately, its citizens. IDC Government Insights estimates that in five years, over 55% of government workstations will be virtualized. By centralizing PC management, virtualization streamlines desktop administration and reduces the costs associated with troubleshooting.

While desktop virtualization may not be the right approach for all departments or government organizations, it is a solution for many of the problems state and local governments face, as detailed in this white paper. Desktop virtualization continues to grow in its ability to support media-rich and specialized applications used in some government agencies. In addition, virtualization is the first step toward application virtualization and cloud computing. Cloud computing is clearly on the technology road map for the federal government and is becoming a strategic priority for state governments as well. As referenced in the city of Pittsburgh case study, many state and local governments are looking at models of shared services, or community clouds, where resources are shared by several departments or even multiple government organizations. The result of this resource sharing will be increased cost savings and an efficient, more secure, centralized approach to desktop and application management.

Strategic IT decisions in state and local governments must be made with an eye toward a positive return on investment and improved services to citizens. Desktop virtualization is the next technology innovation that enables governments to save money and continue providing the high levels of services that citizens expect.

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