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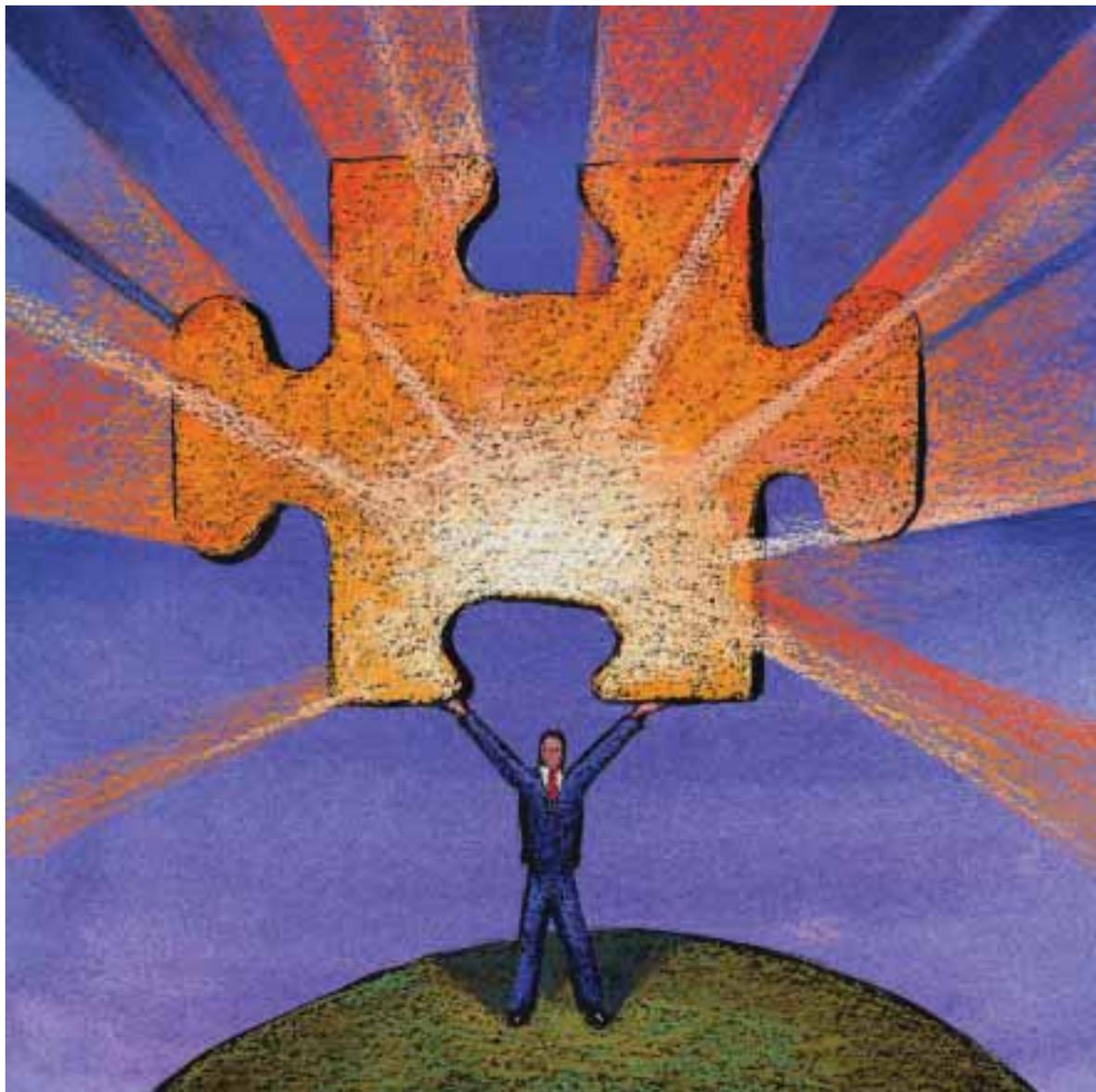
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Ready, Set, Optimize

In order to meet existing and future Administration initiatives around infrastructure optimization, federal agencies must first analyze what they have, and then determine what they need.

Optimizing technology infrastructures to limit spending and eliminate redundancies is a practice that's rapidly spreading from the private sector to government agencies. By leveraging technologies such as cloud computing, virtualization, storage optimization, and automation, IT departments can do more with less, helping to cut technology spending, increase utilization, and simplify systems while also making them more transparent.

Under the current Administration, proving that federal IT dollars are well spent isn't a should, it's a must. With the Administration's launch of the Tech Stat Accountability Sessions in January, agencies will have to be prepared to justify technology investments and prove how those investments enhance their service to the public, said Federal CIO Vivek Kundra.

"Tech Stat sessions enable the government to turnaround, halt or terminate IT investments that do not produce dividends for the American people," said Kundra in a February post to the White House blog. "Investments are carefully analyzed with a focus on problem solving that leads to concrete action to improve performance."

First Steps

Infrastructure optimization plays an instrumental role in helping federal IT departments clear out the clutter and standardize on platforms that will serve them now and in the future. However, in order to achieve this optimization, federal IT departments must first get a handle on what they have, says Deniece Peterson, manager of industry analysis with INPUT, a market research and analysis firm focusing on government business.

"The first thing to do is to find out what you have," says Peterson. "You'd be amazed at how much duplication of investment there is, people don't necessarily know across an entire department how many servers or desktops they have."

As federal agencies dig deep into server closets and across geographically dispersed offices to inventory their technology assets, they should also assess whether they have standard platforms that can act as building blocks for the future; or specialized, customized components that are expensive to maintain and improve, Peterson says. Then, once non-standard systems are taken out of the equation, look at the gaps removing them created – as well as infrastructure gaps that were there to begin with – and determine how to fill them. This could mean some up-front spending, or bringing in contractors to provide those capabilities, or looking to the cloud for answers, Peterson says.

Consider the Cloud

"It's important to consider cloud computing," she says. "If you say `Here's my environment, here's where I have gaps or things that aren't performing well,' maybe it makes sense to replace them with the cloud."

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This process of taking inventory of existing technology to determine gaps and inefficiencies works best when it coincides with regular system refreshes, so that agencies can make sure when they eliminate older technology they're replacing it with systems that are optimized for their current and future needs, Peterson adds.

Federal agencies can also increase the effectiveness of evaluating their infrastructures if they involve both the IT and finance departments, adds Shawn McCarthy, research director at IDC Government Insights.

"Sometimes it's obvious, and the IT group can say `We can cut costs by doing this,' but other times it needs to be driven by the CFO who may see an opportunity for cost cutting," says McCarthy. ❑

Costs Down, Productivity Up

Agencies that make the most of their infrastructures by combining WAN optimization technologies with application visibility can expect to cut bandwidth costs in the near term, while boosting user productivity in the long run.

In the category of infrastructure optimization, it's the optimization of WAN links that have brought significant short-term cost benefits by cutting an organization's communications costs. WAN optimization products work to speed up links between headquarters, branch offices, and mobile and home workers – as well as between an organization and its partners and providers – by employing caching and compression, and also data indexing and deduplication, on either side of the connection.

Using these products gives organizations a relatively quick fix for cutting down on their bandwidth needs and related costs, says Chris Silva, senior analyst with Forrester Research.

"Cost-cutting is achieved quickly," he says. "If the load on your links is at 100 percent, or almost, you're looking at buying more bandwidth, but that's a step function because the applications will saturate it again. Instead of spending $20,000 or $50,000 for a bigger pipe, spend it once up front and forecast a plateau in bandwidth consumption; you can go down to a lower-capability link so cost savings is immediate."

According to networking vendor Riverbed, bandwidth usage can be cut by between 60 percent and 95 percent by using WAN optimization products, and applications can be accelerated by a factor of one hundred.

Boosting Productivity

However, if organizations take a longer-term stance, there's a second set of benefits that can be had. As WAN optimization vendors such as Riverbed and others add application visibility functions to their platforms, federal agencies can begin using these features to prioritize WAN traffic and make good on service-level agreements to speed the delivery of certain applications and data, resulting in significant end-user productivity gains.

Application visibility products, also known as

Making the Right Choice

Before choosing a WAN optimization platform, consider the following:

- Understand the applications and services running on the network, and which protocols they're using;

- Identify network problems, such as excessive latency or bandwidth oversubscription, to understand which issues WAN optimization should address first;

- Have multiple vendors perform real-world, in-house trials to gauge and compare the results before deciding on a platform.

Source: Gartner's Magic Quadrant for WAN Optimization Controllers, 2009

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application delivery products, perform deep-packet inspection to intelligently shape traffic at the application layer so data can be delivered more efficiently, says Forrester's Silva. The techniques employed by these products include caching, protocol optimization, compression, traffic management/quality of service, and error correction in the optimization of WAN performance, he says. By leveraging these capabilities on WAN optimization platforms, IT departments can establish policies regarding how different applications are prioritized across the WAN, limiting the strain that bandwidth-hogging applications such as video put on the connection while maximizing the delivery of mission-critical programs.

By taking advantage of these application visibility features, organizations can go beyond discussions of cost cutting to plan for significant returns on their investments in WAN optimization products, Silva says.

"I'm starting to see better (return-on-investment) stories coming as a result of application visibility," he says.

"Pure optimization comes down to cost, how much are you paying for your link? But when you get into application visibility you can say you're saving users 4 or 5 milliseconds for every transaction they make with, for example, SAP. That may add up to one hour a day of actual productive … time. "

Consolidation Benefits

While advanced deployments of WAN optimization are still few and far between in the enterprise space (defined as companies with 1,000 users or more) – Silva says that of the organizations using WAN optimization today, only ten percent have rolled the technology out to all of their locations to realize cost and productivity benefits across the board - the current economic climate calls for greater use of the technologies in both the commercial and government sectors.

"In 2009 organizations were cutting back on budgets, especially in telecommunications and infrastructure. WAN optimization helps to avoid, if not reduce, costs, so it can get you to the point where you're lowering bandwidth expenses," says Silva. "Now, in 2010, people are starting to consolidate their infrastructures, using virtualization and collaboration - all of these things are happening across all verticals. So in terms of budgets for next year, [WAN optimization saves organizations from] devoting it all to bandwidth."

By using WAN optimization and application visibility as part of an overall infrastructure optimization plan, federal agencies can insulate themselves today and in the long run from budget fluctuations, while lessening the impact of the rising costs of services such as telecommunications, agrees John Trauth, president of IT

solutions provider Merlin International, which works with federal agencies to design and implement dynamic data centers.

"One thing we see is that the government funding guidelines are very dynamic, you can never really count on where they are heading, whether they're going up or down or remaining flat," he says. "We came up with the concept of helping close the gap between the uncertainties of government funding and budgeting, with the increased demands and request for mission-oriented applications. We see what the government wants to get out of IT solutions is always increasing, but their budgets aren't necessarily doing that. We believe we can close that gap between those axes with infrastructure optimization to increase efficiency and effectiveness."

Getting Started

Because infrastructure optimization can encompass nearly all aspects of IT – optimizing storage through decoupling and deduplicating technologies; using virtualization to create dynamic data centers that allow for provisioning on the fly; consolidating IT infrastructures to reduce costs and energy consumption, and implementing life-cycle management to offload data that isn't being accessed frequently on to less-costly storage technologies – federal agencies often end up overwhelmed by attempting to do it all at once. WAN optimization with application visibility can be the right place to get started on the path of optimizing IT infrastructures and cutting costs, Trauth adds.

"You don't want to go out there and try to boil the ocean," he says. "You want to do what gets you the best bang for your buck." ❑

Building Blocks

Dynamic provisioning of virtualized servers lets federal agencies optimize their infrastructures to accommodate computing demands of today and tomorrow.

Looking at virtualized servers in a data center as a collection of building blocks can be a useful exercise in understanding one of virtualization's key benefits: Imagine virtualized servers as blocks that can be put together on the fly and compiled into environments to serve a project or task, and then just as quickly taken apart and reused for another project or task. This kind of dynamic provisioning gives federal agencies the ability to make the most of the servers in their data centers and also to be prepared for computing challenges going forward, regardless of what budget forecasts look like.

Of all the IT components in an organization that can be virtualized – which today includes clients, servers, storage, networks, and others – it's the more mature forms of virtualization that offer the most value and provide the most significant impact on an IT infrastructure, according to Forrester Research. And the most mature of these is server virtualization; a recent Forrester survey showed about 71% of the organizations asked are using server virtualization in some capacity today.

Server Simplification

"Virtualization helps compartmentalize complexity," writes Galen Schreck, senior analyst with Forrester, in his report entitled "TechRadar for Infrastructure and Operations Professionals: Infrastructure Virtualization, Q4 2009", published in November. Server virtualization

The Skinny on Thin Provisioning

While on-the-fly provisioning of virtualized servers is designed to help IT departments make the most of their server investments, thin provisioning is providing similar benefits for storage.

Intended to help control storage costs, thin provisioning lets federal agencies make better use of their storage resources and reduce waste by eliminating the need for dedicated storage, according to virtualization vendor VMware. Thin provisioning achieves this by allocating blocks of data to storage on demand, instead of having those blocks allocated upfront, therefore using all of the capacity available and eliminating wasted space, the company says. This helps federal agencies avoid poor utilization rates, which can be as low as 10 percent with traditional storage methods that allocate storage space that ends up wasted space.

Thin provisioning advocates say organizations can achieve close to 100 percent storage-utilization rates, without requiring significant administrative involvement, resulting in the need to purchase less storage up front and being able to put off storage system upgrades for capacity reasons. Thin provisioning can also help reduce operating costs such as electricity and floor space by requiring less storage overall.

In addition, thin provisioning can help reduce application downtime, according to VMware. Typically the process of managing storage allocations requires coordination between an organization's application owners, the virtual machine owners, and the storage administrators, which takes mission-critical applications offline while this management is worked out. Because thin provisioning eliminates the need for organizations to stop what they're doing and provision more capacity, it gets rid of that application downtime, the company says.

Data management and storage vendor NetApp has gone so far as to guarantee organizations will use 50 percent less storage versus traditional storage products when using its devices and employing techniques such as thin provisioning, data deduplication (a form of compression that eliminates redundant data to improve storage utilization by deleting duplicate data, leaving only one copy of the data to be stored), its NetApp Snapshot software (which creates point-in-time copies of file systems to protect data), and its RAID-DP technology. Called the NetApp Virtualization Guarantee Program, it also promises to reduce storage requirements by at least 35 percent for organizations that are using competing storage technologies with NetApp's V-Series virtualization products. To be eligible for the program, organizations must follow the best practices recommended by NetApp's professional services division and described by the Technical Guide and Best Practices for Citrix, Microsoft, and VMware environments.

"… provides a single interface for provisioning new resources, even though the underlying infrastructure may involve multiple vendors' gear. Automation is simplified because workflows no longer break down when the underlying physical infrastructure changes."

In addition to simplification, the Forrester report listed flexibility and commoditization as other major benefits of server virtualization.

The simplification afforded by being able to provision servers on the fly is key to virtualization's value proposition. According to virtualization software maker VMware, customers are able to deploy new virtual machines in literally two minutes, freeing up IT staff to focus on helping the organization meet its mission, while also minimizing hardware investments. On-the-fly provisioning is made possible because IT managers can establish the configuration of one virtual machine and then simply copy it, and also build templates of virtual machines that can be used over and over.

However, managing the process of provisioning virtual machines can be complicated. According to VMware, IT managers must establish standardized templates, track requests and approvals for virtualized resources, and control the entire lifecycle of a virtualized machine to ensure corporate compliance and optimum resource utilization. Dedicated management tools, such as VMware's vCenter Lifecycle Manager, automate those provisioning tasks and standardize how virtual machines are requested, deployed, and decommissioned.

In 2009, when government agencies were faced with the reality of the recession, server virtualization became a way to put off new server hardware purchases by allowing IT departments to get the most out of the equipment they already owned. In 2010, with the economy showing signs of improving, server virtualization still makes sense by enabling agencies to scale their infrastructures to meet new demand, while also keeping new hardware costs low, says Forrester's Schreck. ❏

Focus on Security

As federal agencies take steps to optimize their infrastructures by maximizing and consolidating resources, opportunities arise to strengthen security along the way.

Last January, the FBI put some perspective on just how seriously organizations should take cyber security: It ranked cyber threats as the third-greatest threat to the security of the U.S., following nuclear war and weapons of mass destruction. Unlike other dangers, cyber threats can't be seen; in fact many organizations don't realize that they've been the victim of an attack until authorities detect an intrusion. And, instead of targeting a person or a place, cyber attackers go after a thing – data.

To defend against cyber threats, federal agencies must keep security a top priority as they look to optimize their infrastructures. Each step toward maximizing resources and consolidating data centers should be viewed as an opportunity to assess security levels and determine if the organization's security posture can be strengthened.

"We have cyber security grouped into Infrastructure Optimization because we think security is pivotal in creating defenses," says John Trauth, president of IT solutions provider Merlin International, which works with federal agencies to design and implement dynamic data centers. "You have to think about security in every aspect when you build out an architecture. "

Where to Start?

Cyber attacks come in so many forms and through so many channels that it's hard to know where to focus defenses. To help organizations prioritize their security efforts, IT security training and certification organization The SANS Institute last September issued a report called Top Cyber Security Risks that outlined some of the top threats facing organizations today. Based on data collected by TippingPoint's intrusion prevention systems installed at 6,000 organizations, as well as on vulnerability data compiled by Qualys from nine million systems and analyzed by the SANS Institute, the group came up with a list of the most pressing vulnerabilities to help organizations tune their defenses:

- **Application Vulnerabilities** – Currently the most used vehicle for infecting and compromising PCs connected to the Internet is via holes in unpatched software. In fact, according to the report, there are now more vulnerabilities being uncovered in applications than there are in operating systems. Exploits come into an organization in the form of e-mail or attachments or by downloaded files from Web sites; users feel programs such as Adobe's PDF Reader and Flash, Microsoft Office, and Apple's QuickTime come from trusted sources, so they are comfortable downloading related files, such as music, video and documents, from the Web. Instead, malicious code is often downloaded that takes advantage of security holes in client software, the report says.

"The victims' infected computers are then used to propagate the infection and compromise other internal computers and sensitive servers incorrectly thought to be protected from unauthorized access by external entities," says the report. By failing to apply security patches that are readily available for popular client applications, organizations leave open known entry points for threats to exploit.

- **Unsecured Internet-facing Web Sites** -–The target of more than 60 percent of all attack attempts observed on the Internet, Web applications are often the back door that hackers use to turn trusted sites into ones that download malware. These vulnerabilities include SQL injections and cross-site scripting flaws. The SANS Institute says most Web site owners aren't scanning effectively for vulnerabilities in their Web applications, and could be infecting site visitors.

- **Zero-day Threats** – These attacks, which attempt to exploit vulnerabilities in a program before that hole is known to the developer or a fix is available, have significantly increased over the past three years. Some of these vulnerabilities have gone unpatched for as long as two years. To help fix this problem, the report says government agencies and software developers should address the shortage of vulnerability researchers in their ranks, who could help fortify systems against zero-day attacks. ❑

Prove It

By leveraging network flow data from existing sources to show compliance, federal agencies can take advantage of what they already have to meet stringent reporting requirements.

While the focus of infrastructure optimization is increasing productivity, containing costs and reducing waste, government agencies need to make sure they keep compliance in mind. Products they chose, vendors they work with, and best practices they subscribe to must all fall within the framework of government regulations and mandates in order to be effective and deliver benefits.

Yet the cost and burden of having to prove compliance can often be daunting. Tasks as simple as running regular audits to prove no unauthorized individuals had access to

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> Jon Oltsik,
> senior analyst, Enterprise Strategy Group.

sensitive data can leave IT departments coming up short when faced with shrinking budgets and staff. And often the burden of proof doesn't end with a simple report; federal agencies need to ensure and prove that both internal and external access to sensitive data is authorized, as well as produce historical data-access records that show the same.

Leveraging What's There

To help ease this burden, IT managers have begun relying on information generated by existing sources – namely network gear – that is presented in meaningful ways. Called network flow data, this information offers high-level descriptions of Internet connections regarding the end points and the volume of data that is transferred, but not information about the data itself, according to the Center for Complex Networks and Systems Research (CNetS), part of Indiana University School of Informatics and Computing's Pervasive Computing Institute.

Beyond just capturing network flow data, it's the way in which that data is presented to network managers that makes it useful. Riverbed, for example, uses technology

acquired when it bought Mazu Networks in January of 2009 to employ grouping and active directory information combined with policy-based and behavioral-based analysis on network activity to log when access to controlled resources has occurred, according to company officials.

For compliance purposes, Riverbed says the advantages of using network flow data are:

- Being able to leverage existing network devices to gather intrusion-detection information, instead of having to purchase dedicated products;
- Monitoring access of resources by authorized and unauthorized users via user-defined policies;
- Detecting anomalies that can be telltale signs of unauthorized activity, such as access to a controlled data store that sends data to remote sites;
- Being able to easily prove that only authorized users had access to controlled assets in the last year.

One Riverbed customer, a hospitality company with worldwide operations that fall under regulations regarding financial customer information set by the PCI Security Standards Council, was faced with the cost and management headache of having to install intrusion-detection system devices at all of their locations. By using network flow data instead, combined with active directory data and user-defined access policies, the company collected information from all of the branch routers that were already deployed globally, and achieved compliance at one-eighth the cost of installing dedicated devices, according to Riverbed.

"Today, WAN optimization has evolved from being seen as a tactical implementation to providing a strategic view of the network," said Jon Oltsik, senior analyst at Enterprise Strategy Group, in a written statement. "By integrating [Riverbed's network analysis technology] Cascade into optimized environments, Riverbed provides a tool for higher level business analytics, visibility and reporting. This gives the technical staff the information and language needed to communicate with C-level executives when providing an understanding of the network and campaigning for IT dollars." ❏

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Merlin's Infrastructure Optimization solutions will enable your agency to control costs, improve security and rapidly adapt to changes all while mitigating risks. We do this by leveraging:

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