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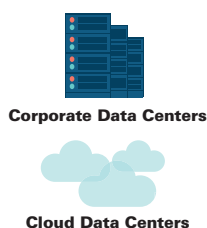*Market Connections' Federal Storage Market Appraisal FY2013.

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THE BUSINESS OF FEDERAL TECHNOLOGY

BIG DATA GOES MAIN- STREAM

Agencies are beyond the buzzwords and bringing analytics to everyday missions

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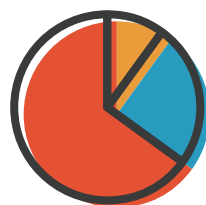
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// **Data Science**
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KEYNOTES

Data to Profit: Revenue Growth through Analytics and Monetization
Barbara Wixom, Ph.D.
Principal Research Scientist, MIT Center for Information Systems Research

The New BI/Analytics Synergy: How to Align Business and IT around Data
Wayne Eckerson
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Piecing together the insider threat puzzle

The federal government is showing mixed results on its goal of implementing policy to reduce data leaks and other risks posed by government insiders and contractors holding security clearances, according to the most recent updates posted on Performance.gov.

The leaks from former National Security Agency contractor Edward Snowden and the Navy Yard shooting drew attention to efforts to improve and automate processes by which clearances are granted and how access to classified information and networks is monitored.

A big piece of the effort is developing systems for continuously evaluating the activities and risks posed by the population of 5.1 million Americans with access to classified information and working on IT strategies to support acquisition and development.

According to the latest update on Performance.gov, the Office of the Director of National Intelligence missed a December 2014 goal to roll out an initial continuous evaluation capability for individuals with the most sensitive clearances. A goal to develop an enterprise IT strategy for security, suitability and credentialing by the end of last year was also missed.

There are bureaucratic and practical obstacles. To cite just one example, the process to add mental health questions to the information collected on standard personnel security and suitability forms is taking longer than planned. But it's clear that the overall objective of preventing leaks and sabotage is a high priority for institutions that collect and guard secret information.

The Defense Department issued a directive establishing an insider threat program in September 2014, and DOD reports that it is on track to have a continuous evaluation capability extended to 225,000 personnel by December.

As it stands, the government is scheduled to deploy an initial governmentwide insider threat program by the end of the year, with final operating capacity achieved by the end of 2016.

The ultimate goal, which is partially complete, is to have regular — ideally electronic — access to insider threat data from a range of sources, including counterintelligence, law enforcement, human resources departments and IT access logs.

However, designing an insider threat program involves more than developing rules-based monitoring and flipping a switch. And there are risks to relying on automation to ferret out insider threats.

"The unintended consequence that I often worry about as we add more and more technological measures for monitoring data and data access is that people will start to think it's not their job anymore to stop anomalies," said Neal Ziring, technical director at NSA's Information Assurance Directorate.

There is also the risk of tuning threat detection to be overly sensitive to single anomalies.

Ziring said that like any intelligence work, insider threat detection requires a mosaic approach, where data is corroborated and fused to shape a larger picture that takes into account employee activities on IT networks and around classified information, financial pressures or sudden unexplained changes in income, among other factors.

— Adam Mazmanian

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Creating an Analytics Culture

The only way to make fast, effective decisions consistently is by putting analytics first

It's no secret that federal agencies are drowning in data, with more flowing in every day. To make the most of that data, agencies have embraced data analytics systems and tools that help identify relevant patterns and foster accurate decision-making. But while these solutions are a critical step forward in managing data, it isn't enough. More data and new types of data flow through agency systems every day, and new threats and challenges merge that require fast, effective decisions.

What's missing in many cases is a culture of analytics—an institutionalized approach of data-driven decision making and operations across the organization. This approach puts analytics front and center in every decision, promoting a structured, thorough approach to decision making. And by giving decision makers access to relevant data in an understandable way, they can more easily focus on the big picture instead of spending time discussing and debating minor details that could delay important decisions.

"By getting the data into the hands of the domain experts along with the tools to access, understand and ask that data anything, you're ensuring that the decisions are being made by the people most qualified to understand the underlying business issues, priorities and goals," said Hjalmar Gislason, CEO of DataMarket, a company that specializes in making statistical data and structured data sources accessible.

For example, every agency must have the ability to react as quickly as possible to potential threats. As the threat landscape changes, data sources expand and it becomes critical to have the most current information in a solution that gives full visibility so decision makers can strategically determine where to invest scarce technology and personnel assets. Without an analytics culture, some part of the equation could easily fall through the cracks.

Identifying fraud, waste and abuse on a continuous basis is another area that requires an analytics culture. If, for example, an agency isn't constantly analyzing ever-changing data sets, it is likely to miss thousands of erroneous payouts to citizens who don't deserve them, or fail to identify new types of fraudulent claims.

Even the process of justifying budget expenditures is easier when an agency adopts an analytics culture.

"When you have a culture of analytics, it's much easier to react to unexpected data calls," said Monica McEwen, Federal Director at Qlik, a vendor that provides self-service solutions for data visualization and guided analytics. "Leaders today have to move fast. They should have all information on hand to inform that decision. For example, government leaders need to know how a budget decrease will impact their overall mission, or how to more effectively justify the need for additional funding."

Mission accomplished

While some areas of federal government are further along than others in promoting an analytics culture, certain segments within the Defense Department lead the way.

"It is simply insufficient in the world we live in to make strategic, global decisions purely based on gut feel," said Dr. Marty Trevino, Senior Strategist and Organizational Architect in a Defense Department Information Assurance Directorate. "With more and more data coming at us than ever before, it's important to figure out how to distinguish between the digital exhaust versus the data that's most important to help drive agency mission. Having a culture of analytics is critical to ensure that the data is used in a way that can help drive an actual decision."

To foster the culture of analytics, DOD researchers and implementers are working to converge the concepts of organizational design, business intelligence and data analytics, and data science. When complete, senior leaders will always be able to view a common operating picture of DOD's current state environment via interactive dashboards. In addition, they're incorporating predictive analytics to highlight potential issues before they become a reality.

"It's a response to a world moving at cyber speeds," Trevino said. "Yesterday's static dashboards and lengthy decision cycles won't work today."

Trevino's group has fully embraced the analytics culture. It uses a system that pulls information from multiple sources into an interactive, dynamic platform where business users and decision makers can dynamically view manpower, capabilities and missions together. The goal is to enhance situational awareness at the strategic level. "We want to be able to answer the fundamental questions at all times without a dependency on IT: Where are my people? What are they doing? Do we have our top-tier talent working on game-changing technologies? Are we deployed properly?"

The culture of analytics is spreading to other parts of the DOD as well. For example, the Army is piloting a program called Automated Continuous Evaluation System that analyzes dozens of social media, government and commercial data to identify employees or potential employees with troubling issues. By flagging these people as quickly as possible, the Army hopes to avert security concerns before they become reality.

Creating an analytics culture

Providing data analytics tools to a handful of data specialists is a good first step, but it does not create an analytics culture. That has to come from the top. Many agencies have taken that step by appointing chief data officers to spearhead the mission. The White House appointed DJ Patil as the government's Chief Data Scientist, sending the message that the government has embraced a data-driven culture. Agencies must also find ways to fully embrace the culture change. Flowing down from the CDO, department heads must lead by example, incorporating data discovery into every decision. Start small with pilots to demonstrate the value of combining analytics with decision making, and build from there.

A recent survey by A.T. Kearney and Carnegie Mellon University found that organizational leaders who concentrate more on collaboration, instilling confidence in their teams and developing an active analytics community, get more value than those who focus solely on technology.

The last part of creating an analytics culture is using the right tools. Data discovery tools like those offered by Qlik can help agencies foster the analytics culture. With these tools, decision makers can turn data to actionable information through interactive dashboards that allow them to drill in many different directions, changing paths to answer new questions as they emerge.

Most importantly, don't be afraid to try something new.

"Don't be afraid to fall—just fall forward," Trevino said. "We have made numerous mistakes in our analytics and business intelligence efforts. We just make it a policy to fall forward. You can't make tomorrow better if you keep doing what you did yesterday and you're afraid to move forward."

Qlik

For more information, please visit **Qlik.com/analyticsculture**.

The Rise of the Federal Chief Data Officer

Over the past six years, the federal government has made great strides in managing, sharing and analyzing data. Data has become so overwhelmingly important that many agencies—from the Departments of Transportation and Commerce to the Federal Communications Commission, the U.S. Drug Administration, and the Center for Medicare and Medicaid Services—have appointed their own chief data officers (CDOs).

Unlike agency CIOs, which manage large IT organizations, CDOs are solely responsible for data analytics initiatives, policies and governance. The CDO is the steward of an agency's data assets and thus should continue to learn and expand ways leveraging solutions that allow an agency to securely and strategically maximize data's potential.

In a telling development, the White House named DJ Patil the country's first Chief Data Scientist and Deputy Chief Technology Officer for Data Policy—essentially, the federal CDO. Patil plans to find ways to provide maximum social return on federal data, create nationwide data policies, and establish best practices for data management.

The trend toward CDOs, and Patil's appointment in particular, is a strong signal of a permanent change in the way data is viewed and used in government. Not only does it show government's dedication to the role of data, but it is a major step toward open analytics and a true culture of analytics.

Trending

36 IT management reporting
activities are required of
most agency CIOs by OMB

FBI wants 'legislative fix' on device encryption

FBI Director James Comey told members of a House appropriations subcommittee that unbreakable end-to-end encryption on the Apple iPhone 6 and some Google Android devices is changing the game for law enforcement, and not in a good way.

Comey told the Commerce, Justice, Science and Related Agencies Subcommittee that federal, state and local law enforcement agencies are bumping up against unobtainable evidence in drug cases, domestic violence cases and even car wrecks.

FBI Director James Comey

"It's an obstacle in a huge percentage of criminal investigations, and it's only going to become worse and worse," Comey said. His goal is to find a way to give investigators lawful access to encrypted devices when it is deemed necessary. "I don't want backdoors. I want — with court process — the ability to gather evidence after I've shown probable cause to believe that on that device is evidence of a crime."

Comey said the device manufacturers and network operators are responding to competitive pressures by offering encryption as a default feature, but that Congress needs to intervene. He said the administration is working on what "a legislative response would look like."

He argued that safe deposit boxes and car trunks can be unlocked by court order, and smartphones should be no different. "To have a zone of privacy that's outside the reach of the law is very concerning," Comey said.

— *Adam Mazmanian*

GAO: Library of Congress rudderless on IT

The Library of Congress has not aligned a strategic plan for IT with its overall strategic plan, leaving the agency "without a clear direction for its use of IT," according to a new Government Accountability Office report.

GAO reviewed the library's IT management practices at the request of the House Appropriations Committee and concluded that the world's biggest library is not effectively managing its $119 million in IT investments for fiscal 2014 and is struggling in key areas, such as privacy controls.

Part of the problem is a lack of leadership, GAO auditors said, noting that the library has been without a permanent CIO since 2012. Moreover, the acting CIO lacks "adequate authority over or oversight of the library's IT," the report states. In a written response to a draft of the report, Librarian of Congress James Billington said he expects to hire a permanent CIO by September.

According to GAO, the library's units were often unsatisfied with the IT services division's performance, leading them to conduct their own IT work. "This in turn has resulted in units purchasing unnecessary hardware and software, maintaining separate email environments, and managing overlapping or duplicative IT activities," the report states.

In addition to hiring a permanent CIO, GAO made 30 other recommendations that ranged from developing a complete inventory of information systems to implementing a library-wide policy for service-level agreements.

Billington said library officials generally agreed with the recommendations and will complete "an initial IT strategic plan" for implementing them in April.

In another report published in March, GAO found that the library's Copyright Office had not presented its proposed IT projects to the library's IT investment review board, which ensures that spending is not duplicative.

— *Sean Lyngaas*

INK TANK

FBI.GOV

Obama declares foreign cyberthreats a 'national emergency'

President Barack Obama issued an executive order April 1 declaring foreign cyberthreats to U.S. economic and national security a "national emergency." The order authorizes the Treasury secretary to levy sanctions on individuals or groups whose "significant, malicious cyber-enabled activities" threaten American national security, foreign policy, economic prosperity or financial stability.

Four categories of cyber behavior could trigger sanctions, according to a White House summary:
• "Harming or significantly compromising" critical infrastructure services.
• "Significantly disrupting" a computer network via, for example, a distributed denial-of-service attack.

• "Causing a significant misappropriation of funds or economic resources" by, for example, stealing credit card information or trade secrets.
• Receiving or using such trade secrets for commercial gain.

The executive order is "both targeted in a sense [that] it has to be very significant and meet those four harms, but it's also very broad in that those harms cut across a wide swath of activity," White House Cybersecurity Coordinator Michael Daniel said.

The order is a more flexible tool than indicting alleged cyber criminals, as the Justice Department has done twice to Chinese nationals, in that the president can adjust sanctions already in place.

The executive order "is significant because you need to get penalties in here to make this work," said James Lewis, a senior fellow at the Center for Strategic and International Studies.

However, Lewis said he was concerned that the administration might have set too high a threshold to trigger sanctions.

That threshold was the result of considerable deliberation on the part of the White House. Advisers debated how high that threshold should be, dwelling on what a "significant" compromise of computer security would entail, according to an administration official. They ended up opting for a high bar.

"The idea is to not use this tool willy-nilly," the official said.

— *Sean Lyngaas*

EDITOR'S NOTE

Good management or measurement make-work?

Metrics, management guidelines and reporting requirements are imperatives for government agencies that ultimately answer to the American people. And, as any effective leader will tell you, things that don't get measured usually don't get done.

Still, it was hard not to sigh when Office of Management and Budget Director Shaun Donovan's memo came out on April 6. Titled "Focusing on Implementation to Drive Improvements," it is a rousing call to document priorities and work toward benchmarks during the final 20 months of this administration.

Agency leaders are encouraged to "identify their priority goals, goal leaders, strategies, indicators and milestones to achieve these important priorities," Donovan wrote.

The memo came just days after the Government Accountability Office published a report detailing the 36 IT management reporting requirements that agency CIOs must address for OMB. The CIOs told GAO that just four of those requirements were of great help in managing agency IT; 24 were of little or no help at all. (Donovan's memo is aimed mainly at agency heads, but it all but guarantees CIO involvement and additional data calls.)

This is not to imply that Donovan's diktat is pointless. The goals that agencies are being pressed to measure are real and outcome-oriented. His requirement that agencies designate a senior career executive to push each goal forward is praiseworthy. And implementation *should* be the emphasis — not just in the final year of an administration but always in government.

Yet the memo reads like a forcing mechanism to keep agencies focused in the administration's waning days. And GAO found that agencies were already spending at least $150 million annually on reporting requirements of questionable value, and that's just for IT.

So it's worth asking: Where does accountable government stop and bureaucratic box-checking begin?

— *Troy K. Schneider*
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Commerce aims to lead feds in data

By any measure, the Commerce Department is a hot Web property, and that's just the way Secretary Penny Pritzker wants it, according to agency CIO Steve Cooper.

Commerce components typically occupy four or five slots on the list of the top 10 most visited websites on the new analytics.usa.gov and a similar proportion of the most downloaded datasets on the Data.gov portal.
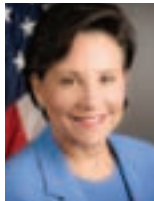
Penny Pritzker

"Our secretary is competitive. She is on us to maintain this lead — in a very positive way," Cooper said at the ModernGov Summit earlier this month. "She wants us to be the premier federal government agency with regard to data."

Weather data from the National Oceanic and Atmospheric Administration and industrial, population and economic data from the Census Bureau are driving the traffic to Commerce websites. But despite the widespread interest in Commerce data, Cooper said there is more to be done.

"Most people in federal service aren't trained to think in terms of financial [return on investment]," he said. "We are always focused on delivering on the mission." Additionally, data collection and dissemination have focused on internal users. "We don't think of people who consume and use data as customers — not yet."

Cooper suggested that geospatial, satellite, economic and population data could yield whole new categories of applications. "We can probably provide some very powerful raw data that can be used in all kinds of ways," he said.

— *Adam Mazmanian*

FCW INSIDER

HHS' Sivak steps down

Bryan Sivak is stepping down as chief technology officer at the Department of Health and Human Services at the end of April.

Sivak, who won a 2015 Federal 100 award for his work, has been a key player in two recent HHS innovations: development of the Buyers Club to share institutional wisdom on procurement and the ongoing administration of the Entrepreneurs in Residence program, which taps private-sector developers to work at HHS on high-profile technology goals. Sivak was also a leader in the HHS Idea Lab, which has empowered tech employees at the department to experiment with new ideas and collaborate with the private sector on data applications.

Bryan Sivak

Sivak came to the federal government after serving as chief innovation officer under Maryland Gov. Martin O'Malley, who is considering a 2016 presidential bid.

Grkavac wins FCW President's Award

Olga Grkavac was honored with the 2015 President's Award at FCW's Federal 100 Awards Gala in March.

Grkavac was a senior executive at TechAmerica and its predecessor organizations for 31 years, and before that was a key aide on Capitol Hill. Although she retired in 2012, she remains a trusted counsel to a wide range of senior officials in government and industry.

"All the groundwork and foundation work for almost every issue, almost every policy, almost every technology the government is adopting today, Olga has a major role in it," said Trey Hodgkins, who succeeded Grkavac at TechAmerica and now leads the IT Alliance for Public Sector.

The President's Award recognizes individuals whose quiet leadership and long-term contributions might otherwise slip under the radar.

GPO promotes Hall

Laurie Hall has been named managing director of the Government Publishing Office's Library Services and Content Management. She will oversee the Federal Depository Library Program, the Cataloging and Indexing Program, the International Exchange Service and the By-Law Program.

Hall had been serving as acting director of library services and was previously director of Library Technical Information Services. She has worked at GPO since 1985.

Goldman named chief digital officer

President Barack Obama has tapped IT product manager Jason Goldman to be the White House's first chief digital officer.

Goldman has held product management positions at Google and Twitter. He takes over as head of the White House's digital outreach with less than two years left in Obama's final term.

Jones moves to DOT

James Jones, chief program officer at the Recovery Accountability and Transparency Board, has moved to the Transportation Department to work for the chief technology officer.

In a note on his Facebook page, Jones said he would begin working at DOT on April 19. He did not specify a job title and did not respond to requests for comment.

— *FCW staff*

375 requests for Snapchat data were made by U.S. authorities from Nov. 1 to March 1

What exactly does a digital service team do?

The White House raised eyebrows with its fiscal 2016 budget request to expand the U.S. Digital Service into most major agencies. The $105 million plan, if fully funded by Congress, would scatter some 500 technology specialists across government.

The immediate question, of course, was obvious: What exactly would this army of agile techies do?

Mike Kruger, the Commerce Department's director of digital engagement, sketched out his agency's vision at BMC's federal IT conference in March. He said such teams will "tackle the 'hair-on-fire' projects," often "the ones that make the news," such as HealthCare.gov, the Department of Veterans Affairs' scheduling system and the State Department's visa-processing system.

But they can also address "less interesting but equally important things like payment systems" and other back-end services.

"People want Google ease and Amazon personalization," he said. "It's got to be that simple."

And hopefully, Kruger said, crisis-mode rescue efforts will be relatively rare, so that digital service teams can spend more time moving systems "from mediocre to great." Although Commerce has no "hair-on-fire" projects right now, "we have plenty" in the second category, he added.

"We're the group that comes in and helps you define need and user experience and gets you going so that you can make the argument for funding, for resourcing, for whatever," Kruger said.

That support would be built around several key principles, including:
• The end-user experience comes first.
• The work will be done by small, nimble teams assembled on a project basis.
• Metrics must be incorporated from the start and relied on to refine the service.
• The development will be iterative and flexible.

Kruger stressed that digital services are not a replacement for agencies' core IT teams or for contracted support.

If the budget does materialize, Kruger said, the biggest challenge will likely be talent. "There aren't enough Python developers in D.C....to staff all these projects," he said. "User experience experts are hard to come by.... So if a lot of federal agencies get this money, we'll all be in the same boat for these same people."

— *Troy K. Schneider*

Anthony K. Robbins
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Why it's time for a town hall meeting

Interactive, regularly scheduled meetings are the best way to share information with employees and address their concerns

You might recall the story of the farmer who decided to save on feed costs for his plow horse by mixing in a little sawdust with the oats. The horse didn't seem to notice, so every day he increased the sawdust and cut the oats.

One day he was heard to remark, "You know, I nearly had him on all sawdust when he up and died!"

Some managers think the way to avoid nagging questions and concerns from employees is to mix sawdust into the information feedbag regularly.

Balmy predictions and platitudes are the sawdust of employee communications and often are provided via email in the dreaded "all-hands memo."

However, many employees are at least as smart as horses! Some will taste the sawdust the first time you mix it in the feedbag, and all will notice eventually. On the other hand, if you want to be a good manager and demonstrate leadership, forget the memos and toss the sawdust. Instead, host a town hall meeting.

Everyone profits from a discussion of current company events in a frank and open forum, and such meetings give you the firsthand knowledge necessary to run an effective organization.

Heckling can be good, too. Someone once said, after I had explained a difficult decision, "So it's mind over matter — you don't mind and we don't matter!" That great icebreaker provided a bit of comic relief that allowed us to move on to the serious business at hand.

You'll get the best results from regularly scheduled town halls because as people become familiar with the format, the meetings will become more interactive.

The following tips can help make the meetings as productive as possible:

When you stand in front of employees and provide the straight scoop, they feel empowered, respected and valued.

• **Get out of the office.** Choose a venue that offers privacy, sit around tables, and make sure the physical environment is comfortable for everyone.

• **Keep it small and feed 'em.** Meet in groups of 50 or fewer people, with appropriate refreshments for the situation. Conduct multiple meetings if necessary.

• **Be prompt and efficient.** Get there early, and start and finish on time (an hour is enough).

• **Be organized but flexible.** Have an agenda but be prepared to stray. Seek out concerns at all levels before the meeting. If discussions at the town hall go too far afield, defer them until after the meeting.

• **Don't read from notes.** Be honest and open, move around the room while speaking (no hiding behind the lectern), offer good and bad news, insert humor, and if you don't know, say so.

• **Follow up personally.** Build employee confidence by ensuring that action items and unanswered questions are recorded. Respond directly to individuals, and report on more general actions to the group at the next regular meeting.

• **Be interactive.** If employees are not used to speaking up, plant a few tough questions in the audience to get the ball rolling and/or address questions asked in similar gatherings.

• **End on a high note.** Save awards for the end of the agenda so that you conclude on an upbeat note and have an opportunity to chat with awardees personally.

Most of all, don't put sawdust in the feedbag. Be genuine and straightforward. If there are limits on what you can say, explain those limits.

Good managers deliver good and bad information *in person* whenever possible. When you stand in front of employees and provide the straight scoop, they feel empowered, respected and valued — vital signs of a great place to work! ■

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STEVE KELMAN is professor of public management at Harvard University's Kennedy School of Government and former administrator of the Office of Federal Procurement Policy.

What's wrong with tying feds' pay to the economy

A proposal to link federal employees' pay to U.S. economic growth overlooks some key elements of pay for performance

Rep. Tom Rice caused a stir in March when he called for linking salaries of federal employees to the country's economic growth rate.

The South Carolina Republican introduced a bill that would immediately institute an 8.7 percent salary cut for all feds earning more than $100,000 a year and tie future pay hikes to increases in the median household income in the United States.

In arguing for the proposal, Rice said the following about civil servants: "Since their salaries are not tied to economic success…bureaucrats do not have any skin in the game. Simply, they do not feel the consequences of the federal government's grip on the economy."

I think this is a bad idea, but it's important to explain why because understanding the problems with Rice's argument teaches us something about the appropriate use of performance measurement in government in general and pay for performance in particular.

And although I think Rice's idea is bad, it is not crazy.

Let's think about growth in median household income as a performance measure for government officials (ignoring for a moment whether the metric should be tied to pay, which is a separate issue). Performance measurement gurus always emphasize the importance of using outcomes as metrics rather than inputs or outputs. For example, instead of using the number of officers on the streets or the number of arrests they make, police should use the crime rate as a metric. Change in median household income is another outcome measure, exactly the kind that gurus like.

Furthermore, although tying pay to performance is somewhat problematic — and politically controversial enough that I believe establishing robust performance

> ### Rep. Tom Rice's error has serious implications for how we think about performance measurement in government.

measurement systems should be a higher priority — I regard pay for performance in principle as a promising idea for government.

So why do I think Rice is wrong?

The contribution almost any individual civil servant makes to the growth in median household income is less than infinitesimal and utterly undetectable. No matter how hard most civil servants try, nothing they do as individuals will have an impact on that metric, which is influenced by so many things.

Therefore, achieving good results on this metric is beyond the employee's control.

Consider a private-sector analogy. Yes, it is true that top executives often have their pay tied partly to the company's profits or stock market performance, even though those metrics are by no means fully under the executive's control. They are influenced by the overall state of the economy and international tensions, among other things, as any diligent CEO who led a company during the 2008 market crash can tell you.

Executives agree to those terms because they are offered the potential of really big bucks in exchange for bearing the risk of being punished for things they can't control.

It is impossible to believe we would ever be willing to reward feds sufficiently if the economy grows fast enough to make them accept the risk of never having their salaries go up if it does not.

Rice's error has serious implications for how we think about performance measurement in government. We should indeed be using outcome measures as metrics, including economic growth, because we want to remind feds of why they are serving in the first place. And outcome measures also encourage innovation in how to reach goals.

But we should be wary of tying rewards or punishments, whether pay or promotion, to such metrics. ■

PETER HARRELL is an adjunct senior fellow at the Center for a New American Security.

Sanctions are a good step toward cyber offense

The Obama administration's new program to target hackers sends the signal that cybercrime is too serious to rely solely on network defenses

On April 1, the Obama administration announced a new sanctions program to target "malicious cyber-enabled activities" — the criminal hackers and government-backed spies who threaten America's security and prosperity with sophisticated online attacks.

The U.S. government did not issue sanctions against any of the individual hackers responsible for thousands of attacks on U.S. companies and government networks in the past two years. Nevertheless, by announcing the new program and creating the legal tools to freeze the assets of individual hackers in the future, the U.S. sent a clear message: After years of playing defense against cyberthreats, America is ready to play offense as well.

Cyberattacks are one of the most serious threats facing the U.S. today. In just the past two years, hackers have broken into computer systems at the White House, State Department and Pentagon; stolen millions of Americans' personal information from U.S. companies; and disrupted the computer networks of some of America's most important companies.

U.S. officials regularly express concern that cyberattacks could undermine the integrity of America's banking sector, power grids and other vital infrastructure, while corporate executives report increasing numbers of attacks, some of which appear to be backed by foreign governments and designed to steal sensitive corporate information.

A 2014 study by McAfee found that cybercrime costs the global economy $400 billion every year.

With the new sanctions, the United States is putting the criminal groups and foreign governments responsible for these cyberthreats on notice: If the attacks continue, the U.S. will begin to freeze their assets and cut them off from doing business in this country. Foreign companies that seek to benefit

> ## A 2014 study by McAfee found that cybercrime costs the global economy $400 billion every year.

from cyberattacks on the U.S. — like foreign companies seeking to purchase trade secrets stolen from their American competitors — will face similar penalties.

Of course, the full impact of the new sanctions program will depend on how the government implements it. Effective implementation will require greater cooperation between the U.S. private sector and the U.S. government to identify the specific hackers who should be sanctioned, and the Obama administration should encourage our allies in Europe and elsewhere, who face similar cyberthreats, to

develop similar sanctions tools.

Of course, sanctions are not a substitute for a broader cybersecurity strategy. Other steps are also critical, and the government and private sector must make investments to harden our defenses and improve our online security.

Individual Americans also need to become more aware of the steps we can all take to make sure that our own computers are not hacked. Indeed, a striking percentage of successful cyberattacks succeed in part because an individual opened a suspicious email message or downloaded an infected file. Such attacks could be prevented by better individual cybersecurity awareness.

In addition, we can't fight 21st-century threats within a 20th-century legal framework. Congress must act on proposals to modernize U.S. criminal laws to better enable federal prosecutors to arrest the individuals and companies that compromise American computer networks.

The sanctions announced by the administration are an important element of an overall strategy to contain growing cyberthreats. To succeed in protecting ourselves from such threats, the United States needs to play offense as well as defense. The president's announcement is a strong signal of U.S. intentions to do just that and to hold to account the hackers and governments breaking into America's networks. ■

Researcher who are fighting the battle against Alzheimer's disease are collaborating on a scale they've never done before thanks to the National Institutes of Health's launch of a new big data portal. The goal is to speed up a painfully arduous and slow process of discovery that had previously been a litany of failure.

The project is one of a growing number of mission-driven collaborations that suggest government is moving beyond the buzzword phase and learning how to make big data part of everyday business.

BIG DATA GOES MAINSTREAM

Agencies have moved beyond the buzzword and are making big data part of their everyday missions

BY SARAH LAI STIRLAND

Federal agencies and businesses have different needs when dealing with big data, of course, but the ability to engage in collaborative analytics with many partners on a large scale is driving much of the activity in the federal government. The NIH portal will enable researchers from disparate areas of expertise to collaborate and quickly share research and analytical models based on the molecular and genome-related data from samples of the brains of 2,000 people who were afflicted with the disease, which currently has no cure.

Suzana Petanceska, health science administrator in the Division of Neuroscience at NIH's National Institute on Aging and coordinator of the Alzheimer's portal, said: "The consortium of scientists will generate a number of predictive models of the disease and will prioritize a new set of targets that could be the foundation for the development of new therapies for Alzheimer's."

NIH's project is the biotech equivalent of an intellectual jam session between the federal government, the pharmaceutical industry, researchers in academia and several nonprofit organizations in a field that is desperate for success. The Alzheimer's Association estimates that 5.3 million Americans currently suffer from the disease, and that number is expected to balloon to 13.8 million among people 65 and older by 2050. Furthermore, the annual cost of care could top $1 trillion by 2050 — 26 times more than the Department of Homeland Security's fiscal 2015 budget request. A study published last summer found that relatively few drug trials are being developed for treating Alzheimer's, and 99.6 percent of those conducted from 2002 to 2012 failed.

"This is a project that is taking many millions of features of each individual sample and trying to compile that information into a snapshot of Alzheimer's disease," said Lara Mangravite, director of the systems biology research group at Sage Bionetworks, the nonprofit organization that built the portal.

The project is expected to generate less than 20 terabytes of data in total. That's not a huge amount of information to analyze by big-data standards, but it's the equivalent of twice the printed collection of the Library of Congress.

"In my opinion, this is a big-data project in that it is taking a large amount of information and trying to distill it down to universal truths," Mangravite said.

Prior to the portal's creation, the molecular datasets needed to perform analyses were scattered in repositories around the country, and the data was not annotated as it is now. As a result, the NIH-funded research was not always easily accessible to the entire research community.

The relevant research is now available on Sage Bionetworks' secure platform, which runs on cloud servers operated by Amazon.

"The technological platform that we've built, which uses Amazon as a framework, has built within it a long series of data security protections to make sure that the data is ethically and appropriately shared," Mangravite said.

The project seeks to remove the intellectual and physical barriers that have developed over the decades between scientists in their niches of expertise so that they can work together to create a larger view of Alzheimer's disease.

"The goal is to collect many molecular measurements from human samples and apply analytical methods to reconstruct the biological processes that drive the disease process and to understand how they interact with each other within and across cells, tissues and organs, rather than studying them in isolation," Petanceska said.

The project, in other words, is not some big-data proof of concept. According to Petanceska, it's enhancing NIH's approach to its central mission: "The intent is to make the most out of the public's investment in research and deliver on the promise to advance public health."

An analytical engine

That quest for the big picture is sweeping through NIH in other ways as well. The agency will soon launch several other big-data projects, the most prominent of which is its Precision Medicine Initiative. And similar pivots are apparent elsewhere in the federal government.

To bring some cohesion to the movement, in February the White House hired Silicon Valley data scientist DJ Patil to be deputy chief technology officer for data policy and chief data scientist at the Office of Science and Technology Policy.

In a public memo released shortly after the White House announced his appointment, Patil said he'll provide the vision for how to maximize the social return on government-generated information and create federal data policies to enable agencies to efficiently execute big-data projects and recruit talent.

The 45-year-old alumnus of LinkedIn, Skype, PayPal and eBay joins a growing cadre of chief data officers at various agencies across the government.

"Organizations are increasingly realizing that in order to maximize their benefit from data, they require dedicated leadership with the relevant skills," Patil wrote. "Many corporations, local governments, federal agencies and others have already created such a role, which is usually called the chief data officer or the chief data scientist. The role of an

organization's CDO or CDS is to help their organization acquire, process and leverage data in a timely fashion to create efficiencies, iterate on and develop new products, and navigate the competitive landscape."

Patil pointed to NIH's Precision Medicine Initiative as a federal priority. That effort, as NIH describes it, is "an emerging approach for disease treatment and prevention that takes into account individual variability in genes, environment and lifestyle." And he said NIH and other agencies "will work to deliver not just raw datasets, but also value-added 'data products' that integrate and usefully present information from multiple sources."

Under the initiative, investigators plan on analyzing the genes, electronic health records and lifestyles of at least 1 million Americans.

One of the agencies leading the way in terms of business intelligence is the Centers for Medicare and Medicaid Services.
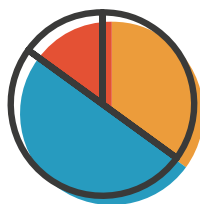
The agency's Office of Enterprise Data and Analytics, launched last November, could serve as a case study for other federal agencies because it has such a clearly defined structure and detailed mission statement. Niall Brennan, who helped establish the unit, is its director and chief data officer. And just like a commercial entity, the office contains an Information Products Group, a formal acknowledgment of the role an agency can play in packaging information that helps support decision-making both inside and outside the government.

That's an especially important role at CMS: The agency is becoming one of the analytical engines behind health care reform. In addition to gathering and analyzing information on payments and medical conditions related to Medicare, Medicaid and the Children's Health Insurance Program, CMS is also responsible for analyzing other data related to programs that seek to reduce the costs and increase the efficiency of health care delivery.

The agency's spending reflects that focus. In fiscal 2014, CMS spent $32.6 million on contracts for analytics, dashboards and reporting — second only to NASA in total spending in that area, according to government market analytics company Govini.

> **In my opinion, this is a big-data project in that it is taking a large amount of information and trying to distill it down to universal truths."**
>
> — **LARA MANGRAVITE**, SAGE BIONETWORKS, ON THE NIH ALZHEIMER'S PORTAL

And although it is not immune to complaints about the usability of its data, the Office of Enterprise Data and Analytics has managed to keep the public focused on how the health care industry operates and what that means for public pocketbooks. For example, its release of data on hospital charges nationwide generated front-page headlines and academic analyses about the potential social impact of widespread discrepancies in charges for similar procedures. Its release of the payment records for the 880,000 doctors and other health care providers paid by Medicare in 2014 had a similar impact.

CMS' Fraud Prevention System is another widely lauded example of a successful big-data project. The system, which launched in 2011, analyzes the 4.5 million claims that flow in daily from the 1.5 million Medicare providers. It uses predictive algorithms that rely on a variety of factors — such as payment patterns, contact information, tips and detailed, eight-year-long historical records — to help CMS detect suspicious patterns in billing activity. The system also helps law enforcement officials speed up their investigations and prosecutions.

As with NIH's Alzheimer's portal, CMS has emphasized the importance of assembling a multidisciplinary team whose members work together to analyze information and achieve the project's goal. In this case, a team that included policy experts, clinicians, field investigators and data analysts developed and tested 74 models used to flag potential cases of fraud, waste or abuse.

In a report to Congress in June 2014, CMS officials wrote that "bringing together teams with a variety of skill sets is a best practice in model development — ensuring that the [Fraud Prevention System] models yield solid, actionable leads."

CMS awarded the contract for developing the system to Northrop Grumman and the modeling contract to IBM. Fifteen full-time staff members oversee the system and run the analytics part of the program.

A CMS spokesperson told FCW it is crucial to involve the end users of the analytics system from the beginning of the development process and on an ongoing basis so that

the system accommodates their work processes.

In addition to prosecutions and sniffing out suspicious payments before they're made, CMS also uses its data to block potentially problematic providers from enrolling and to revoke some entities' status as Medicare providers if they've been identified as having billed the government inappropriately on multiple occasions.

As a result, the Department of Health and Human Services reported in March that its fraud-prevention efforts had contributed significantly to the recovery of $3.3 billion for taxpayers in fiscal 2014.

Improving access to data

Of course, for some agencies, big data is nothing new. The Federal Emergency Management Agency, for example, built a prototype of a data warehouse business intelligence tool 15 years ago, said Mark DeRosa, director of business intelligence and analytics at Definitive Logic, a management consulting and systems engineering firm.

FEMA has been using the cost/benefit analysis tool to analyze the vast streams of data pouring into the agency and help it quantify the relative value of engaging in various disaster-mitigation projects. The goal is to prioritize projects that would provide taxpayers with a maximum return on investment.

However, DeRosa said many agencies still live in a world of multiple, unconnected databases, which makes it difficult — if not impossible — for employees to access the data to derive actionable knowledge.

"We have to recognize that the average user of these systems is not a techie," DeRosa said. "We can't expect them to write code to access their data. What we need to do is to put together solutions that give users the ability to integrate raw data and to transform it into information. What I mean is applying the business rules and logic to that data and converting it into something that the average

Federal Reserve banking on new data sources

The quietest whispers from the Federal Reserve Board can move markets worldwide, so the data the central bank of the United States uses to model its economic projections has to set the standard for reliability and credibility.

The Fed also releases its own set of economic indicators based on data it collects from financial institutions and established financial information suppliers such as Bloomberg and Reuters.

But the Fed is also beginning to reckon with the explosion of commercial, financial, consumer and other data that has been taking place in the past decade. Although there are risks, practical problems and institutional obstacles to incorporating that range of data into the Fed's economic modeling, there are opportunities as well, said Micheline Casey, the Fed's chief data officer.

In her nearly two years on the job, Casey has been building a data organization inside the Fed that has an annual budget of about $12 million and employs about 40 people — and growing. She's starting to think about how the oceans of data generated by e-commerce firms, real estate transaction sites, crowd-sourced gas price tools, and even sensor data from roads and mass transit systems can provide the Fed's policymakers and economists with reliable information.

For example, data from Amazon and Walmart could supply up-to-date consumer price information; real estate bidding and closing information from Trulia and Zillow could send signals about slack or pent-up demand in the market; data on 3D printing could augur shifts in manufacturing; data on the use of emerging companies in the sharing

economy such as Uber and AirBNB could point to changes in car ownership levels or hotel occupancy, respectively.

Collectively, those and other economic signals buried in silos of proprietary data could provide a "Fitband for the economy," giving a near-real-time impression of the macroeconomic health of the U.S. and the world, Casey said.

"We're always looking to improve our forecasting and understand what's really going on in the economy and what will happen tomorrow," she said in a March 31 keynote speech at the annual Enterprise Data World conference. "What we've been trying to do over the past several years, as the explosion of data has become much more prevalent, is to move forward and stop driving by looking in the rear-view mirror and start identifying

human can understand and to visualize that data so they can make a decision."

Along those lines, Definitive Logic works with clients to overhaul and connect disparate databases and create dashboards to tease insights out of the information. A wide array of other contractors — ranging from longtime players such as Unisys to relative upstarts such as Splunk — are engaged in similar projects across government.

And another firm in Silicon Valley is emerging to help companies deal with big-data problems. But instead of consulting on individual projects, venture capital-backed Alation offers its product in the form of software as a service.

Alation enables companies to centralize their datasets so that they can engage in collaborative analytics projects more efficiently, optimize their data warehouse and better manage their data governance processes. Its clients include eBay, Square and MarketShare, a company that provides marketers with predictive analytics services to help them decide where to most effectively allocate their marketing budgets.

DeRosa wasn't familiar with Alation, but concurred with its basic premise. And he suggested that the new cadres of chief data officers — in addition to creating formal data management guidelines for their agencies and establishing return-on-investment calculations for big-data projects to demonstrate their value — could start with the basics. For many government workers, simply knowing where to look for relevant datasets is a complex and torturous process, and chief data officers should help their agencies simplify that process.

"They could focus on...reducing the complexity of getting and using data," he said. "This is a big challenge: being able to simplify the retrieval of the data that you need." ∎

Sarah Lai Stirland is a technology reporter based in Los Gatos, Calif.

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what would be new datasets that could help us predict the future of the economy in near-real time."

The Fed is in the early stages of deciding what kinds of data could support a more up-to-date look at the economy. To put the Fed's needs in context, it is a policymaking organization, not an operational or transactional operation, and it doesn't need the volumes or velocity of data that Google, Amazon or a stock exchange might require.

But the Fed does have "highly complex data needs that span structured, unstructured and semi-structured" data, Casey said. "Just having lots more data isn't necessarily helpful."

She is evaluating sources of high-frequency data, which could speed up publication and reduce the need for revisions of economic measurements, and more granular and geographically targeted data, which could help policymakers focus on how the economy is performing in particular cities and regions.

But managing that data poses some challenges. Many sources of e-commerce-generated data have only been around for a decade or

Micheline Casey, Federal Reserve Board

so, which makes historical comparisons problematic. In addition, there is a selection bias in terms of who is using online products and services. And from a data stewardship standpoint, there's no guarantee that data collected today will be maintained in that format five years — or even five quarters — in the future.

To meet those challenges, the Office of the Chief Data Officer has introduced new management roles, including a dedicated team of data governance analysts and data architects.

"We're taking a holistic, enterprise view of how we do the work we do," Casey said. "But particularly as we deal with some of these newer datasets, we can't just throw them into production. We have to figure out how we manage these, what sorts of stewardship would be needed for newly emerging datasets. We're not sure because some of these data products are so very new, and they're not that stable yet."

There are also technical and infrastructure obstacles to managing new data inventories. "What is big data today will be small data in five years," she said. "This is as small as the data will ever be again, so we have to start adjusting now."

— Adam Mazmanian

The Fish and Wildlife Service's Jason Duke transformed a jumble of files on a variety of media into a searchable database

Reeling in digital records

BY CHAD HUDNALL

Converting computer documents into an indexed, searchable database is a massive undertaking for federal agencies. Such conversions are essential for providing the public with cost-efficient and accurate data, and although they can save time and money in the long run, the process can eat up resources and introduce compliance issues.

Federal IT employees must ensure that digitized records comply with the Federal Records Act, and they could take a lesson from Jason Duke, a regional geographic information system coordinator for the Fish and Wildlife Service in Cookeville, Tenn.

Holly Blalock-Herod, an FWS biologist in the Cookeville office, said Duke's work was essential to the agency's efforts to respond to current and future requests.

"Without his assistance, our agency would not have been able to meet a [Justice Department] request for information," she said. "During the period of archiving, he had to maintain access to and security for the same data and had to respond to [Freedom of Information Act] and agency data requests while building an administrative record."

And he managed to do all that "while ensuring that his superiors always had the data they needed when they needed it," she said.

Out from under the desk

Duke defined the tools, mechanisms and protocols for collecting and collating all the electronic documentation

"We had thousands of pieces of media with data that needed to be centralized and indexed quickly. I had to remove passwords, avert encryption, recover bad sectors and do every copy trick possible from every type of media storage possible."

— JASON DUKE, FISH AND WILDLIFE SERVICE

generated by FWS, including GPS data-collection protocols for hundreds of field personnel.

The collected data is replicated to a central server for daily analysis and mapping uses. Data is preserved in its native format for the official record and a duplicate copy made for analysis and other search requests. Approximately 20 terabytes of data were ultimately archived and indexed for storage and retrieval.

In recalling the process, Duke said: "Add people from multiple state and federal agencies along with contractors all working toward a common goal in different ways. To make the matter even more complex, add encrypted laptops with least user access and people on rotations who take their laptops, cameras and USB drives with them when they are done. You have to compile data in a format that is searchable on many levels and by people who are geographically dispersed with varying levels of computer expertise."

The files he collected included Word documents, Excel spreadsheets, Access tables, digital photos, PDFs, email messages as Outlook files or converted to PDFs, GPS track logs and waypoints, GIS data, and what Duke called a "myriad of miscellaneous file types."

"What I put together is more of a 20 terabyte [network-attached storage] with all of the data sorted for retrieval and archiving, and it is not in a database or in a Word document," Duke told FCW. "I took hundreds of thousands of files of all types and sorted them and indexed them for retrieval."

The files arrived on a variety of media, including SD cards, USB drives, portable hard drives, laptops, desktops, SharePoint servers, NAS servers, CDs and DVDs.

And it all came from multiple offices, Duke said.

"You might have varying levels of Internet connectivity and be working through changing data-compilation standards and styles," he said. "Add thousands of digital camera images with the same names and GPS track logs with duplicate names that all need to be archived in a format supporting retrieval."

To manage it all, Duke essentially crafted a data storage and retrieval system.

"Now when people ask me to retrieve data, I actually have a chance of finding it," Blalock-Herod said. "I can perform a search using keywords. Before, it was in the original format in a box under my desk."

An essential function

"You have entered the Data Conundrum Zone!" Duke said of his conversion efforts. "We had thousands of pieces of media with data that needed to be centralized and indexed quickly. I had to remove passwords, avert encryption, recover bad sectors and do every copy trick possible from every type of media storage possible. All of that data had to be copied to a central site and replicated in its original format for archival purposes."

Although data management is not glamorous — Duke called it "often a tedious and never-ending chore" — it's an essential function in a modern office environment.

FWS doesn't have a price tag for the project, in part because it is difficult to put a dollar value on the end product. Nothing like it existed at the agency prior to Duke's work.

Because much of the conversion work was done in the field, none of the data was stored in the cloud. But that doesn't seem to have had any deleterious effects.

"We used to have all kinds of different media coming in," Blalock-Herod says. "We needed data centrally stored, and we needed access to what we had. Now it's in place, and the bottom line is [that] it works." ■

Chad Hudnall is a freelance writer based in Alexandria, Va.

Cloud brokers, the sequel

The broker definition continues to evolve as new roles emerge and cloud deployments become more complex

BY JOHN MOORE

Agency managers began grappling with the cloud brokerage concept in 2011. At the time, the idea was that brokers would serve as intermediaries between cloud service providers, such as Amazon Web Services, and government customers. Brokers would handle the details of negotiating contracts with vendors and acquire services on an agency's behalf.

Four years later, notions about what constitutes a cloud broker and what role it should play in the government market have changed considerably. That's hardly surprising given the fast-paced development of cloud technology. Some services have matured to the point of commoditization — for example, file sync-and-share services such as Dropbox — while other cloud deployments have grown in sophistication. Similarly, workloads entrusted to the cloud have evolved from low-risk, public-facing websites to business-critical applications.

Those changing market forces have encouraged government and industry executives to rethink and redefine cloud brokerages. Although the broker as contracting agent hasn't entirely disappeared, other services are becoming more prominent. In some cases, brokers are starting to resemble the systems integrators of the 1990s as they pull together comprehensive solutions for customers. In other situations, brokers are taking on a consulting role and serving as trusted cloud advisers for their government clients.

Roopangi Kadakia, Web services executive at NASA, said brokers can serve a valuable role by helping agencies evaluate service providers and determine which platform will suit a given project. "The broker needs to have the ability to find the best services," she said.

Why it matters

Federal agencies have made some headway in cloud adoption since the Office of Management and Budget launched its "cloud first" policy in 2010. The Government Accountability Office recently reviewed seven agencies and found that the number of cloud services they deployed grew from 21 in 2012 to 101 in 2014.

The agencies — Agriculture Department, General Services Administration, Department of Health and Human Services, Department of Homeland Security, Small Business Administration, State Department and Treasury Department — budgeted a collective $529 million for cloud services in fiscal 2014, a 72 percent increase over fiscal 2012 spending levels, according to a September 2014 GAO report.

But the cloud accounts for a tiny slice of the government's overall IT spending. The agencies GAO studied

SHUTTERSTOCK

> ## "I think there is going to be a big role for the technical cloud broker. They are dealing with lots of different providers in the background. Since they are doing that, they have to work at solving interoperability and portability issues."
>
> **BOB BOHN, NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY**

allotted 2 percent of their IT budgets for cloud services. Although those budgets are growing, auditors noted that "agencies are still devoting a large portion of their IT budgets to non-cloud computing expenditures."

So what's hindering wider adoption? According to GAO, agencies have yet to assess the majority of their IT investments for their suitability as cloud migration candidates. A lack of cloud-savvy employees represents another barrier.

"Migrating legacy systems to cloud computing services requires knowledgeable acquisition staff and appropriate processes," GAO's report states, adding that HHS officials said they had the ability to purchase cloud services but "found post-award management to be a challenge."

Cloud brokers say they can address such obstacles. For instance, they can help agencies sort through their IT assets with an eye toward the cloud, said Mike O'Brien, director of the Cloud Solutions Group at Aquilent. Companies like his can "help the customer determine which workloads are ideally suited for which cloud environments," he added.

Brokers can also assist agencies as their cloud deployments become more complicated and even span multiple cloud solutions.

"We have seen a lot of customers that have part of an application sitting in a public cloud and part in an on-premise environment and another part in a different cloud because of security and compliance reasons," O'Brien said.

The fundamentals

When the government began investigating the potential of cloud brokers four years ago, it needed to come up with a definition. The National Institute of Standards and Technology made its first attempt in the 2011 Cloud Computing Reference Architecture, which describes a cloud broker as an organization that "manages the use, performance and delivery of cloud services, and negotiates relationships between cloud providers and cloud consumers."

In 2012, GSA issued a request for information to explore the broker model. The Defense Department went a step further that same year: Then-CIO Teresa Takai issued a memo designating the Defense Information Systems Agency as the DOD Enterprise Cloud Service Broker and directing all DOD components to "acquire cloud services by using the broker."

In the ensuing years, cloud developments have compelled the government to re-evaluate the broker's purpose. NIST is in the process of refining its broker definition. Bob Bohn, NIST's cloud computing technical program manager, said the draft update identifies two types of cloud brokers: business and technical.

A business broker focuses on support functions such as contractual intermediation and billing. The service does not have any contact with the customer's data or operations in the cloud, and the broker never touches a machine.

"All [the business broker has] to do is manage the relationship," Bohn said.

The technical broker, in contrast, gets hands-on with the customer's IT assets. Such brokers aggregate services provided by multiple cloud vendors and address any issues associated with the movement of data and applications among the services.

"I think there is going to be a big role for the technical cloud broker," Bohn said. "They are dealing with lots of different providers in the background. Since they are doing that, they have to work at solving interoperability and portability issues."

Depending on a customer's requirements, an organization could serve as a technical broker, a business broker or both.

NIST's two-part definition underscores the divergence between the administrative go-between in the earlier vision and the broadening role of the broker. NASA is working through this transition with its cloud broker, InfoZen.

Last year, the company helped NASA migrate websites and applications to the cloud. Kadakia said InfoZen has been providing acquisition support and working with cloud service providers on the agency's behalf. But NASA plans to migrate cloud management duties to its Computer Services Service Office, which will purchase services directly from providers such as Amazon Web Services, Microsoft Azure and Google. The office will negotiate and hold master contracts, and serve as a resource for the entire agency.

Kadakia said that approach will help the agency maintain consistency in how it manages cloud service providers. As a result, the broker will get out of the acquisition business and become more of an adviser.

She said one of the biggest advantages of using a broker is the ability to thoroughly analyze a particular cloud service. Many people might want to go directly to a cloud provider to buy a file sync-and-share service, for example, but in doing so, they don't receive the benefit of having the broker study the requirements and assess different cloud options, she added.

"The cloud broker would want to do that analysis and look at the alternatives and provide some options on what the best solution is," Kadakia said.

Raj Ananthanpillai, CEO and president of InfoZen, said his company still handles cloud procurement for some customers, but that service is largely commoditized these days. Instead, the company focuses on helping customers identify requirements and securely migrate complex systems to the cloud.

Mark Pietrasanta, chief technology officer at Aquilent, agreed that customers are looking for a more highly specialized set of services from cloud brokers. "Buying cloud isn't the hard problem at this point," he added. "It is very commoditized."

The hurdles

Cloud brokers face a couple of obstacles that could hinder adoption, including the lack of a definitive, widely accepted definition of what a cloud broker does.

"'Cloud broker' means different things to different people," Pietrasanta said.

The types of companies offering brokerage services might also contribute to the ambiguity. For instance, some cloud service providers say they can also play the broker role and will consider other service providers — not just themselves — when sizing up a customer's needs.

Given that potential conflict of interest, "I don't think a cloud services provider can be the independent broker," Kadakia said.

Another challenge is a maturing market that could reduce the need for a broker as cloud services become even easier to buy. The Pentagon is taking that route with its recently revised cloud policy. In December 2014, DOD CIO Terry Halvorsen issued a memo permitting DOD components to "acquire cloud services directly."

In addition, the Federal Risk and Authorization Management Program eliminates some of the security vetting that a broker might otherwise conduct. However, industry executives said brokers still have room to evaluate cloud security beyond the measures certified under FedRAMP.

What's more, FedRAMP won't help customers understand why they should select one provider over another when it comes to factors such as performance, bandwidth and platform expertise, said Shawn McCarthy, a research director at IDC Government Insights. Among other things, brokers can make recommendations based on differences in the size of workloads providers are capable of supporting, he added. ■

Next steps

1. Expanded definitions. The National Institute of Standards and Technology plans to revisit how it defines brokers and the other players in the cloud field: providers, carriers and auditors. More developments could emerge later this year.

2. More contracts. The General Services Administration awarded a $64.5 million contract to Booz Allen Hamilton in October 2014 to develop a cloud service broker solution for GSA's Integrated Award Environment Office. And in November, GSA awarded a $100 million blanket purchase agreement under which Aquilent will provide cloud services from providers including Amazon Web Services.

3. Continued growth. Despite a few hurdles, the broker segment appears poised for expansion. MarketsandMarkets predicts that the global cloud services brokerage market will grow from $1.57 billion in 2013 to $10.5 billion in 2018.

— John Moore

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'A tale of two contracting methods'

Industry experts say there are some interesting contrasts between GSA's Enterprise Infrastructure Solutions contract and Alliant 2

BY MARK ROCKWELL

The comment period for a piece of the General Services Administration's next-generation telecommunications strategy ended March 31 — the same day that the comment period for the agency's draft Alliant 2 government-wide acquisition contract began.

The comment deadline for the request for proposals for GSA's Enterprise Infrastructure Solutions contract marks a turning point for the vehicle that is expected to be the foundation of the agency's $50 billion Network Services 2020 telecom strategy.

Even though EIS and Alliant 2 are distinct contracting efforts aimed at different needs, analysts said they provide some interesting overlaps and contrasts.

Jennifer Sakole, a principal analyst at Deltek Federal Information Solutions, said Alliant is a successful, known quantity for acquiring innovative IT services and includes some telecom solutions. EIS is the agency's effort to keep up with advancing telecom capabilities while supporting federal agencies' legacy operations.

"It's a tale of two contracting methods," said Larry Allen, president of Allen Federal Business Partners. "NS2020 is a new model aimed at offering cutting-edge solutions," while Alliant 2 is based on a popular, proven

entity for IT services and solutions. And the lines between IT and telecom services have been blurring since digital IP-based communications began.

"There is an artificial barrier between telecommunications and IT

> NS2020 is a new contract model for telecom, while Alliant 2 is based on a popular, proven entity for IT services and solutions. And the lines between IT and telecom services have been blurring since digital IP-based communications began.

contracting," Allen said. And as the two merge, there are no easy answers for GSA's efforts to buy either.

Sakole said EIS will provide a range of telecom services and infrastructure offerings, but it is a complicated platform that requires legacy support of aging systems as well as cutting-edge capabilities, such as cloud.

Some potential EIS bidders told FCW that the draft RFP was extremely complex, and the 30-day turnaround for comments was challenging.

However, they gave GSA credit for talking to the public about EIS

for some time, much like the back-and-forth on the One Acquisition Solution for Integrated Services and Alliant contracts.

They also wondered why EIS had not garnered a section on GSA's Inter-

act dashboard, which other contracts such as Alliant and OASIS used to power their development with public interaction.

Sakole said the government wants more systems integrators to balance out the established telecom carriers, but added, "I'm curious about who will [bid on] EIS."

Systems integrators would have to provide legacy voice and data services, which could be a tall order for companies that do not have an established telecom infrastructure, she said. ■
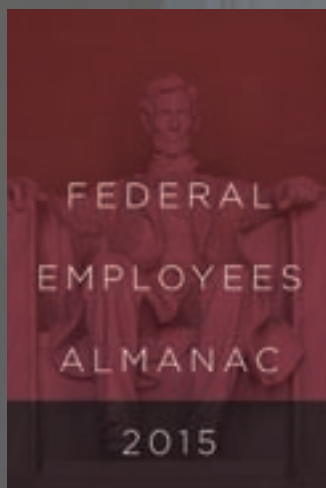
Bookshelf

When search knows what you need

In his new book, Microsoft's Stefan Weitz previews what predictive analytics could mean in practice

BY TROY K. SCHNEIDER

Stefan Weitz is director of search at Microsoft's Bing, so it's no surprise that he has lots to say about the technology. His insights are not limited to the underlying math and mechanics (though he has plenty to offer on those topics) because he believes search has the potential to evolve far beyond an information-retrieval tool and truly make our lives better.

Search is a "hinge that can join together the best parts of machines and the best parts of humans," Weitz declares.

If that sounds a bit utopian for a tool that's often used to settle bar bets and find obscure tax forms, well, Weitz agrees.

That elusive hinge, he writes, is "not the search that you know today, and likely not even the search that the big technology companies are currently building — but it's the search that comes into view when we think about it less as a tool for finding pages and more as a group of functions that can be deployed to make us smarter, happier, and better connected in our real-world lives."

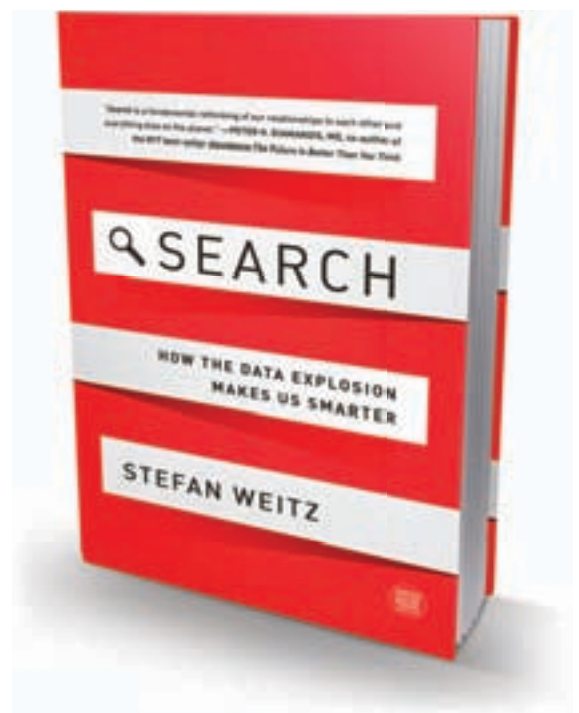In other words, Weitz's focus is not search in the sense most of us think about it. The subtitle of his book, "Search: How the Data Explosion Makes Us Smarter," tips his hand. The real emphasis is on big data and what it increasingly makes possible.

At a recent presentation in Falls Church, Va., Weitz sketched his definition of what "near-term search" could entail:
• Search queries will not be words. They will be any change in state.
• Search won't need to listen to what you say to know what you mean.
• Search will understand and take action in the real world.
• Search will appear when and where you need it, even if you don't know you need it.
• Search will contribute to human knowledge, not just index it.
• Search will simplify our lives.

Again, that's optimistic stuff. But in his book, Weitz offers example after example of how the future is often already here.

Take, for instance, the research that computer scientist Eric Horvitz, a former president of the Association for the Advancement of Artificial Intelligence, has done on searches for first-aid information.

According to Weitz, Horvitz realized that traditional search was not very good for time-sensitive medical queries and that individuals doing the searching often muddled through several unhelpful results before getting to the information they needed.

So Horvitz "analyzed query logs and identified chains of queries (basically a succession of queries within a period of time) in which the final query was something like a hospital address," Weitz writes. "He also looked at mobile query chains and isolated sets where the GPS stopped at a hospital or the user dialed 911. By tying together disparate graphs (location, phone, queries), he was able to train the system to better understand situations where an immediate response was necessary.... For example, if search detected a query that was likely resolved by CPR, the system would not show a YouTube video on CPR that had a two-minute introduction."

Similarly, when the system detected a pattern of queries made via mobile phone, "it could automatically begin to build a route to the nearest hospital or dial 911 in the background."

That's not just data retrieval. It's what Weitz terms "the capable web," and it's where he argues we should be heading as quickly as the technology will allow.

Reality check

It could take a while, however. Weitz reports that "major search systems still see 25 percent or more of queries failing for users, as measured by how quickly users click back to the search results page after they have clicked on a link."

And his optimism comes with reality checks. "Search" has whole chapters devoted to the technology, business, legal and cultural hurdles that could slow or stall this dramatic evolution of our ability to access and use knowledge. (The brief examination of data ownership alone is worth the book's cover price.) What's holding back search? Weitz asks. The answer is "a lot."

Yet for those tasked with making government more citizen-centric or mining data in support of other critical missions, those hurdles are valuable food for thought. How does one cross-correlate the discrete "islands of data" to provide better service while still protecting and respecting privacy? If search can understand what someone has already read elsewhere and can apply probabilistic models, what does that mean for delivering content? As sensors drive the amount of searchable data into new stratospheres, how does one decide what information to ignore? What *is* the best way to help a user find that obscure tax form?

The techno-optimism is informative as well. Weitz is a breezy writer, and there are plenty of fun nuggets scattered through the book. For example, Microsoft has some 33 billion objects modeled in Bing's "knowledge repository." Silicon Valley venture capitalist Vinod Khosla believes machine learning will prove to have a bigger impact than mobile technology. Siri worked better five years ago, before Apple modified it to work at scale.

Far more useful, however, are Weitz's mini-seminars on what analytics and search technologies are making possible and why we need to think bigger than keywords and Web pages.

Ultimately, Weitz argues, "more equal access to information for all people will radically change the world. The end result is better decision-making." ■

Also worth reading

"Leading Digital: Turning Technology into Business Transformation"
Plenty has been written about learning from Silicon Valley startups that are digital from Day One, but government wasn't built that way. This book, which explores how large, traditional companies have "gone digital," offers decidedly more relevant research for IT leaders agitating in agencies that are still organized for analog.
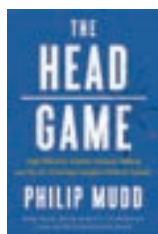
"The HEAD Game: High-Efficiency Analytic Decision-Making and the Art of Solving Complex Problems Quickly"
Former National Security Council staff member Philip Mudd spent more than two decades in government intelligence, wrestling with high-stakes decisions informed by data that was both overwhelming and incomplete. His new book offers a framework for making sense of complex challenges at almost any scale.

— *Troy K. Schneider*

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The future according to DARPA

The Defense Advanced Research Projects Agency exists to peek over the horizon and pioneer breakthrough technologies. Here's what the agency sees coming in IT:
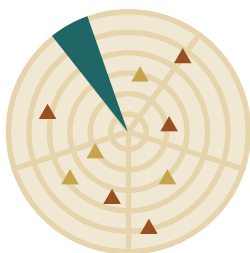
Spectrum

As increasingly powerful technologies have become commercially available, DARPA is developing new algorithms to identify and counter enemy radar in real time, as well as "fully configurable RF systems" to better share precious spectrum.

GPS navigation

Global Positioning System satellites are a signature DARPA innovation, but those same satellites have become a critical vulnerability. The agency is developing new distributed navigation systems that can function satellite-free.

Big data

DARPA scientists are crafting algorithms and analytical systems to sift through video intelligence, track the spread of ideas on social media and "quickly identify anomalous threat-related behaviors of systems, individuals and groups."

"Building trust into information systems"

Passwords can no longer cut it. DARPA promises new user authentication technologies, mathematically "unhackable" embedded devices and other tools to "protect the integrity of data."
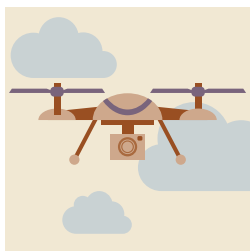
Unmanned aerial systems

DARPA has been investing in drones since the 1960s. Missile-launcher and pizza-sized reconnaissance platforms are already realities; nano-drone swarms and cargo-toting craft are on the drawing board.

Artificial intelligence

AI has been put to work on everything from speech recognition to driverless navigation to tactical decision-making. Automated cyber defense, integration of scientific research on a massive scale and even the building of still-better machine-learning applications are now being enabled by DARPA-driven AI research.
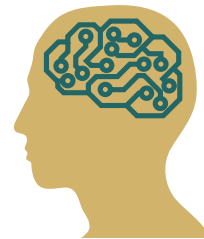
Source: DARPA's "Breakthrough Technologies for National Security" report, March 2015

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22
THE PATH TO
DATA CENTER
CONSOLIDATION

STAY AFLOAT
IN THE DATA DELUGE

**OPTIMIZED
DATA CENTER**
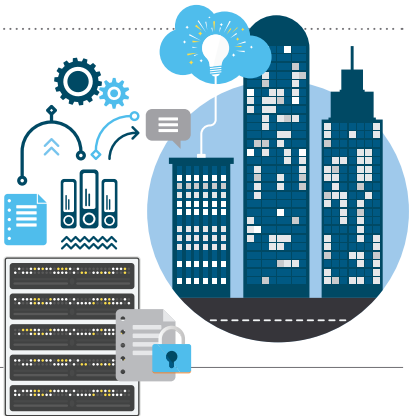
DATA CENTER CONSOLIDATION

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LIMITED RESOURCES — Reduced budgets and limited space place limits on system improvement.

UNDER UTILIZATION — Outdated technologies with higher maintenance costs prevent efficient use of data center resources.

20% **OF I.T. PROS LISTED DATA CENTER INITIATIVES AS THEIR PRIMARY FOCUS FOR 2015.**[1]

[1] Source: CDW, *Surveying Your Network: A CDW Advisory Board Decision Maker Study*, July 2014

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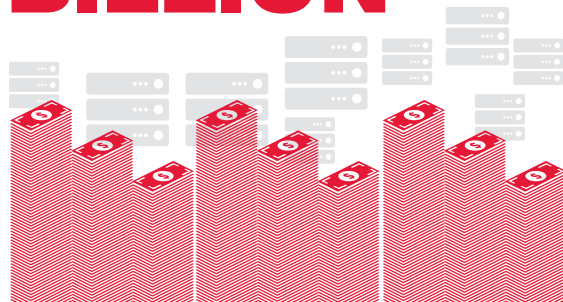
84%

OF DATA CENTERS HAVE HAD ISSUES WITH POWER, SPACE, COOLING CAPACITY, ASSETS AND UPTIME THAT NEGATIVELY IMPACTED BUSINESS OPERATIONS.[2]

$86,000

ENERGY COST SAVINGS FROM A 10% REDUCTION IN POWER CONSUMPTION IN A DATA CENTER WITH 1,000 SERVERS.[1]

70%

OF DOWNTIME ISSUES IN LARGE DATA CENTERS WERE THE RESULT OF HUMAN ERROR[2]

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Sources: [1]BizTech Magazine, *Do You Know the Mysteries Hidden in Your Data Center?*, April 2013 [2]IDC.com, "What IT Managers Want from DCIM: Results of IDC's 2013 Datacenter Survey," December 2013

CLOUD PRODUCTIVITY & COLLABORATION

Faced with rising data needs and constrained budgets, government organizations are turning to cloud computing as a solution. In 2010, the General Services Administration (GSA) was the first federal agency to move basic email and collaboration services into the cloud. Other government organizations soon followed suit.

In 2011, the National Oceanic and Atmospheric Administration (NOAA) signed an $11.5 million, three–year contract with systems integrator Earth Resources Technology for cloud–based unified messaging services.

NASA shut down Nebula – its own private cloud–computing data center – in 2012 after testing its capabilities against those of Amazon and Microsoft and concluding that public clouds were a more reliable and cost–effective option.

If you're ready to make the transition to the cloud, CDW·G can help make sure it's a smooth one. Learn more at CDWG.com/Cloud.
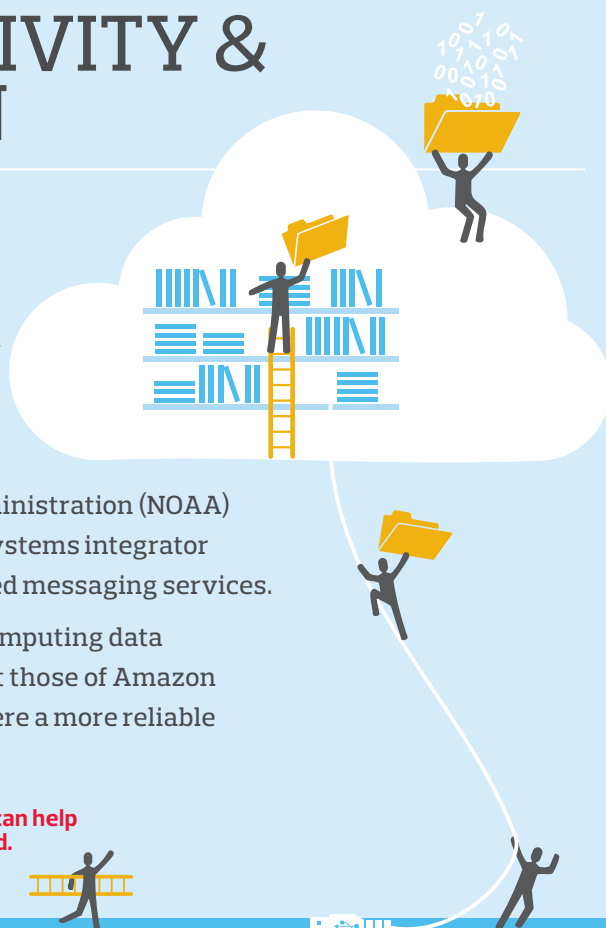
38% THE PERCENTAGE OF FEDERAL I.T. MANAGERS WHO SAY THEIR AGENCIES ARE EITHER FULLY DEPLOYED OR PARTIALLY DEPLOYED WITH CLOUD SERVICES; ANOTHER 28% SAY THEY ARE PLANNING TO ADOPT THE CLOUD, AND 23% ARE CONSIDERING CLOUD SERVICES.[1]

5% THE PERCENTAGE OF THE FEDERAL GOVERNMENT I.T. BUDGET SPENT ON CLOUD SERVICES.[2]
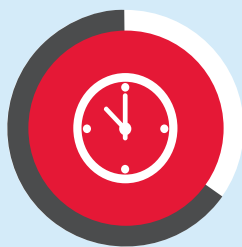
32% THE PERCENTAGE REDUCTION IN UNPLANNED DOWNTIME ORGANIZATIONS REPORTED AFTER MIGRATING TO A CLOUD INFRASTRUCTURE.[3]

6X THE CLOUD MARKET IS GROWING SIX TIMES FASTER THAN THE OVERALL I.T. MARKET.[4]

Sources: [1]MeriTalk.com, "Show Me the Money: The Key to Doubling Agency Savings," April 2014 [2]IDC Government Insights, *Perspective: Looking Up – U.S. Federal Cloud Forecast Shows Sustained Growth Through 2018,*" September 2014 [3]Nucleus Research, *Availability and Reliability in the Cloud,* March 2014 [4]IDC, *Worldwide and Regional Public Cloud IT Services 2014–2018 Forecast,* November 2014

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Polycom® HDX 7000-720® Video Conferencing System
Affordable HD video conferencing for high-quality communication
CDW 2055132

CALL FOR PRICING

- HD communications from low bandwidths with H.264 high-profile technology
- Delivers Polycom UltimateHD™ technology – HD voice, HD video and HD content
- Voice-locating technology allows users to have a truly immersive experience
- Quality video calls across your network or over the public Internet with Polycom Constant Clarity™ technology

lifesize.

CDWG.com/lifesize

LifeSize® Express 220™ 10X Camera and 2nd Generation Phone
Full HD video communications to help increase collaboration
CDW 2692021

CALL FOR PRICING

- Now offered with the new LifeSize® Phone™, LifeSize Express 220™ gives you Full HD video quality for natural, realistic interactions at the lowest possible bandwidth
- Features crisp, crystal clear data-sharing and an all-new digital I/O with Full HD support
- Support for dual HD displays, Full HD camera, and phone or microphone options
- LifeSize Express 220 offers strong flexibility

Plantronics® Savi® W730–M Headset[1]
You'll wonder how you ever lived without it
CDW 2452687

$ **295** .25

- Optimized for unified communications, the system automatically updates your status to busy on PC, mobile and even desk phone calls so colleagues can see your availability
- This intelligent system combines exceptional sound quality, hands–free mobility and hours of talk time for high efficiency

Plantronics Savi W720 Headset
An intelligent wireless headset system
CDW 2433288

$ **312** .21

- Connects to multiple devices
- With this convertible headset, you can easily manage PC, mobile and desk phone calls

Plantronics CS 540 Headset
Setting a wireless standard for desk phone communication
CDW 2468326

$ **237** .40

- Features light DECT headset
- Go mobile and multitask up to 350' from your desk with answer, end and mute controls at your fingertips
- No matter what your preference, with three wearing choices there's one to match your personal style

Display sold separately

Ergotron® WM Low Profile Wall Mount
Supports up to 175 lbs. and 65" displays
CDW 1934809

$ **87** .77

Wall–hugging design hangs your large flat–panel display just over an inch from the wall for an extremely slim profile.

- Integrated security fasteners hold display in place and deter others from removing your display
- Includes wall plate, two display brackets and a hardware fastener kit
- Composed of extruded aluminum and steel

Ergotron 60–602–003 Low Profile Wall Mount, XL
CDW 1941805 $ **95** .75

'Optimized for Microsoft Lync and OCS

PLANAR CDWG.com/planar

Planar® PS7050T
70" LED–backlit LCD flat panel
CDW 3401868

$**5536**.12

Multitouch LCD offers up to 10 touch points and is compatible with Windows®, Mac OS X® and Linux®.

• Max. resolution: up to 1920x1080 Full HD

• Panel brightness: 400 cd/m²

• Logo-free symmetrical metal bezel

• CustomerFirst™ three–year warranty featuring two–day advance replacement

ViewSonic the choice of professionals CDWG.com/viewsonic

ViewSonic® CDE6500–L
65" Full HD LED commercial–grade display
CDW 3355982

$**2299**.99

Features hospitality mode for customized settings.

• 1080p Full HD commercial display for high–definition multimedia applications

• USB multimedia player for scheduled playback of photos and music

• Mercury–free LED backlight reduces power consumption

• SuperClear® wide viewing angle technology delivers accurate and vivid colors from nearly any angle

• Versatile I/O ports: HDMI™, DVI™, CVBS, YPbPr (YCbCr), VGA and RS232 for easy connection to a variety of equipment

SAMSUNG CDWG.com/samsung

Samsung® DB48D
48" LED-backlit LCD flat panel
CDW 3327547

$**708**.22

• Enhanced SSP System-on-Chip (SoC) performance with quad–core processor

• Sleek industrial design with symmetrical 10.5 mm bezel

• Slim 2" chassis depth with slim-direct LED backlight technology

• Max. resolution: up to 1920x1080

• Panel brightness: 350 cd/m²

NEC CDWG.com/nec

NEC E705–AVT
70" LED backlit display with integrated tuner
CDW 3578061

$**3399**.00

• Temperature sensors and fans protect the panel from damage

• Max. resolution: up to 1920x1080

• Panel brightness: 350 cd/m²

• Contrast ratio: 4000: 1

• Three-year parts and labor warranty

11

DATA CENTER OPTIMIZATION
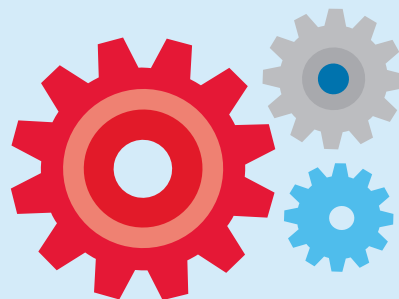
It's not hard for traditional data centers to sprawl into a disjointed hoard of equipment. On top of high–maintenance, outdated technologies, a growing hodgepodge of nonuniform systems can hinder performance and growth.

That's why no data center remodel is complete without converged infrastructure, which combines servers, data storage, networking equipment, and software into a single unified computing system.

CDW·G's solution architects will work closely with your organization to help you find the best servers, data storage, devices, equipment and virtualization software to optimize your data with converged systems built for your specific workload.

3X

DATA CENTER TRAFFIC WILL TRIPLE BY 2018.[1]
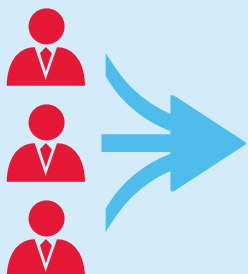
24% OF AGENCIES' I.T. BUDGETS THAT COULD BE SAVED IF THEY FULLY IMPLEMENTED FIVE I.T. SOLUTIONS:

1. **CONSOLIDATION**
2. **VIRTUALIZATION**
3. **CLOUD COMPUTING**
4. **REMOTE ACCESS**
5. **INFRASTRUCTURE DIVERSIFICATION.**[2]

143%

THE INCREASE IN REPORTED FEDERAL SECURITY INCIDENTS INVOLVING PERSONALLY IDENTIFIABLE DATA FROM 2009 TO 2013.[3]

50%

ADOPTING CONVERGED INFRASTRUCTURE CAN CUT YOUR AVERAGE ANNUAL DATA CENTER COSTS IN HALF.[4]

Sources: [1]Cisco.com, "Global Cloud Index," November 2014 [2]MeriTalk.com, "Show Me the Money: The Key to Doubling Agency Savings," April 2014 [3]gao.gov, "Federal Agencies Need to Enhance Reponses to Data Breaches," April 2014 [4]IDC, *Converged with Vblock Systems: A Value Measurement,* September 2013

CDWG.com/hp

HP 3PAR StoreServ 7200 Bundle
Grow with freedom in any direction
CDW 3513732

CALL FOR PRICING

- Compromising between application availability and affordability is now a thing of the past
- Double efficiency in virtualized environments, cut storage capacity requirements by up to 50%, and allow for up to 50% fewer physical servers to be used
- Mixed workload support increases consolidation opportunities
- Persistent technologies deliver high availability and Tier 1 resiliency
- Automated subvolume tiering optimizes service levels and reduces costs
- SmartStart and Rapid Provisioning get you up and running in minutes
- Reconfigurable in just seconds without disruption

Hard drives sold separately

HP DL360 Gen9 Server
Lower IT service costs and service delivery time
CDW 3466978

$**1885**.27

The HP ProLiant DL360 Gen9 Server is a performance-driven 1U server that you can easily deploy for virtualization, creating databases or for high-performance computing.

- Memory: 8GB std., 384GB max.
- Six-Core Intel® Xeon® E5-2609v3 processor (1.9GHz)
- Hard drive: none ship std.

CITRIX® CDWG.com/citrix

Citrix® NetScaler®
Advanced application delivery and web application acceleration
CALL FOR PRICING

Citrix® NetScaler® is an all-in-one web application delivery controller that helps reduce web application ownership costs, and ensures that applications are always available. It is deployed in thousands of networks around the globe to optimize, secure and control the delivery of all enterprise and cloud services and maximize the end-user experience for all users including mobile clients.

- All-in-one web application delivery controller that ensures applications run up to five times faster
- Available as a separate hardware network device or as a virtualized appliance
- Offloads servers, accelerates performance and integrates application security
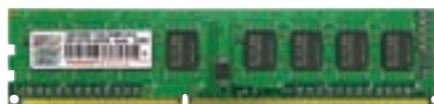
Transcend®

TRANSCEND MEMORY FINDER
Search for compatible server memory at:
CDWG.com/memoryfinder
Transcend® Memory Upgrades
Equip your HP server with additional memory from Transcend

- 100% tested for stability, compatibility and performance
- Limited lifetime warranty

STORAGE GETS FLASHY

The EMC XtremIO is an all–flash, scale–out enterprise storage array that provides substantial improvements to I/O performance. Purpose–built to leverage flash media, XtremIO delivers new levels of real–world performance, administrative ease, and advanced data services for applications.

Flash Array — XtremIO is a scale–out clustered design that grows capacity and performance linearly to meet any requirement. XtremIO arrays are created from building blocks called "X–Bricks" that are each a high–availability, high–performance, fully active/active storage system with no single point of failure.

XIOS Operating System — the XtremIO powerful operating system, XIOS, manages the XtremIO storage cluster. XIOS ensures that the system remains balanced and always delivers the highest levels of performance without any administrator intervention.

EMC² CDWG.com/emc

EMC® XtremIO™ Enterprise Storage Array
Unlock the full potential of flash and solid–state disk
CDW 3227160

CALL FOR PRICING

- As a scale–out design, this array delivers very high performance levels by creating clusters of multiple X–Bricks
- The consistent method of evenly distributing data across all SSDs for all volumes means that every volume gets the full performance potential of the array
- Load balanced — as clusters grow, data is always balanced across all controllers and SSDs
- Requires no tuning — you don't have to plan for RAID levels, drive groups, stripe sizes, LUN to RAID–group mappings, etc. to achieve maximum performance
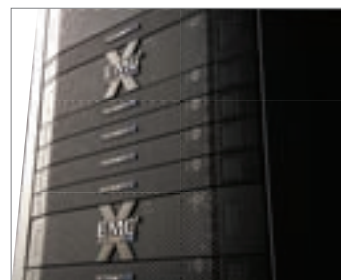
EMC VNXe3150™ Unified Storage System
Simple, efficient, powerful
CDW 2773497

CALL FOR PRICING

- Flash optimization delivers high levels of transactional performance with increased bandwidth and low latency
- Built for high availability in mission–critical environments
- Scalable, easy–to–use solution for multiprotocol file and block data services
- Centralized management makes administration simple
- Data efficiency services reduce your capacity requirements up to 50%
- Optimize for virtual applications with VMware® and Hyper–V® integration

EMC VNX5600™ Unified Storage Platform
Powerful multi–core optimization
CDW 3097207

CALL FOR PRICING

- Scalable, easy–to–use solution for multiprotocol file and block data services
- Centralized management makes administration simple
- Data efficiency services reduce your capacity requirements up to 50%
- Optimize for virtual applications with VMware and Hyper–V integration
- Flash optimization delivers high levels of transactional performance with increased bandwidth and low latency
- Built for high availability in mission–critical environments

CDWG.com/lenovo

intel inside Xeon

Hard drives sold separately

Lenovo ThinkServer® RD640 70AY 2U Rack Server
Storage-rich design and optimized for virtualization
CDW 3213210

$1262.83

RD640 delivers impressive compute power per watt, with an energy-efficient 2U design featuring 80 PLUS Gold redundant power supplies, low volt memory choices and innovative Lenovo Smart Grid power management technology.

- Intel® Xeon® E5-2620 V2 processor (2.10GHz)
- Memory: 8GB std., 320GB max. (DDR3 PC3-10600)
- Hard drive: none ship std.

Lenovo ThinkServer RD540
Density meets performance
CDW 3226401

$1823.42

The ThinkServer RD540 server combines expansive networking, storage and RAID choices to handle compute-intensive deployments in collaborative apps and heavy web traffic workloads.

- Eight-Core Intel® Xeon® E5-2640 processor (2GHz)
- Memory: 8GB std., 320GB max. (DDR3)
- Hard drive: none ship std.

---

hp CDWG.com/hp

intel inside Xeon

Hard drives sold separately

HP DL380 Gen9 Server
The right compute, for the right workload
CDW 3466969

$1929.99

The HP ProLiant DL380 Gen9 Server delivers the latest performance and expandability in the HP 2P rack portfolio. Reliability, serviceability and near continuous availability, backed by a comprehensive warranty, make it ideal for any server environment.

- Six-Core Intel® Xeon® E5-2609v3 processor (1.90GHz)
- Memory: 8GB std., 384GB max.
- Hard drive: none ship std.

Kingston TECHNOLOGY CDWG.com/kingston

Kingston® Server Upgrades
Search for and equip your systems with additional memory from Kingston

CALL FOR PRICING

- 100% individually tested modules
- Patented dynamic server burn-in
- 100% compatible — will not void your system warranty
- Unlimited 24-hour Kingston® technical support

Tripp-Lite
CDWG.com/tripplite

CDW·G EXCLUSIVE PRICE

Tripp Lite SR42UB
SmartRack™ Enclosure
42U premium enclosure designed
for secure, high-density server and
networking applications
CDW 858765

$**897**.74[1]

The SR42UB is packed with features designed to simplify rack
equipment installations and maintenance and is compatible with
Tripp Lite's extensive range of rackmount accessories, enabling you
to customize your solution to meet any requirement.

- Compatible with all EIA-310-D compliant 19" rackmount equipment
- 42U enclosure, 78.5x23.63x43 (HWD), heavy-duty load
  capacity up to 3000 lbs.
- Locking and removable front and split rear doors; locking,
  removable split side doors
- Five-year product warranty

25U Rack Enclosure   CDW 858178 $**879**.79

CDW·G EXCLUSIVE PRICE

Tripp Lite OMNI1500LCDT

Advanced line-interactive LCD UPS for PCs,
network equipment and more
CDW 2885460

$**145**.99[1]

- 1500VA, 10 outlets, USB/TEL/DSL/Ethernet protection
- Automatic voltage regulation (AVR) corrects brownouts without
  draining battery power
- LCD continuously reports operating mode and battery charge level,
  plus additional UPS and site power data
- $250,000 Ultimate Lifetime Insurance

Tripp Lite SU1000RTXLCD2U SmartOnline™ LCD UPS
High-level power protection
CDW 2698655

$**673**.30

- 1000VA, 900W, six outlets, true online protection,
  zero transfer time
- LCD control panel with nine selectable screens of UPS
  and site power data
- USB port, DB9 port, SNMP/web interface and included
  PowerAlert® software

Tripp Lite 1U Rackmount Console KVM
Control an entire network — in just 1U of rack space
CDW 913496

$**730**.16

- Combines 17" LCD screen, keyboard and touchpad in a 1U
  rackmount, heavy-duty steel drawer
- Connects to a PS/2 or USB server or KVM switch

1U KVM Rackmount Console, 19" LCD   CDW 1324748 $**732**.16

1U Dual Rail KVM Rack Console, 17" LCD   CDW 2306940 $**1125**.17

¹Exclusive price (offer valid through 3/31/15 while supplies last); contact your CDW·G account manager for more information

Raritan CDWG.com/raritan
Know more. Manage smarter.

Raritan® Dominion® LX
16-port KVM over IP switch
CDW 2544855

$**1186**.02

Dominion® LX is a true next-generation switch with an advanced hardware and software architecture. This innovative design enables new levels of KVM over IP performance, reliability, usability, compatibility and security.

- One remote with BIOS-level access, one local user, up to 16 servers
- Supports PS/2, USB, DVI™, HDMI™ and DP Servers
- Universal Virtual Media™ — installs software, transfers files and backs up data remotely
- Absolute Mouse Synchronization™ — reduces installation time

BLACK BOX CDWG.com/blackbox

Black Box® ServSwitch™ Agility DVI, USB and Audio Extenders over IP Kit
Go farther, do more, with digital KVM extension over IP
CDW 2311088

$**2006**.96

- Flexible topology for KVM extension
- Delivers exceptional digital video with no loss
- No-loss compression minimizes bandwidth use while maximizing the user experience

belkin CDWG.com/belkin

Belkin® 1M MTP to LC Fiber Optic Cable
High-speed fiber connectivity
CDW 3287085

$**185**.53

- Designed to meet the growing demand for 40GbE connectivity
- Belkin's MTP-LC OM3 plenum 12 fiber breakout fiber cables are an ideal solution for high-performance patch and fiber data distribution systems
- Manufactured with 50/125 Corning® fiber, the cable jacket is UL CMP rated for plenum applications
- Each cable breaks out to eight duplex LC connections at 40Gb performance

Belkin MTP to 8x LC OM3 Plenum 12 Fiber Breakout Fiber Cable
Ideal solution for high-performance patch and fiber data distribution systems
CDW 3287092

$**204**.48

- MTP/MPO multimode
- 8x LC multimode
- OM3
- 50/125 micron
- Two meter (6.6 ft.)

STORAGE VIRTUALIZATION
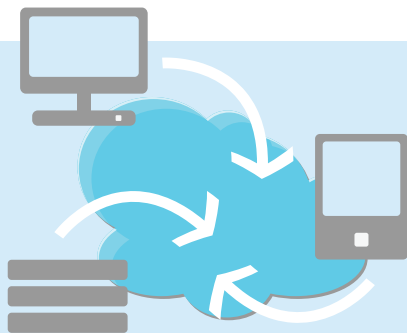
With the increase in stored information and managed applications driven by growth in cloud services, data centers are challenged more than ever with protecting the valuable data contained on their hardware. Moving your infrastructure to the cloud can help keep your organization agile and productive. Virtualized storage offers numerous advantages including improvements in efficiency, cost savings and disaster recovery.

Our solution architects can draw up a virtualization plan tailored to the needs of your organization. In addition to maximizing the efficiency of your physical resources, they'll keep your data center standing through the challenges that lie ahead.

42%
OF ORGANIZATIONS HAVE 100TB OF DATA OR MORE UNDER ACTIVE MANAGEMENT.[1]
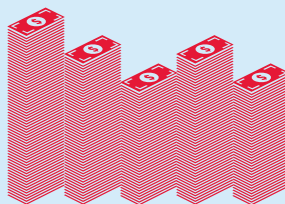
$50 BILLION
IT IS ESTIMATED THAT BY 2016, SPENDING ON STORAGE FOR REPLICATED DATA WILL APPROACH $50 BILLION, AND ITS CAPACITY WILL EXCEED 300 EXABYTES.[2]
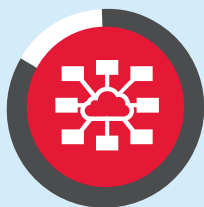
86%
OF DATA CENTERS WILL BE VIRTUALIZED BY 2016.[3]
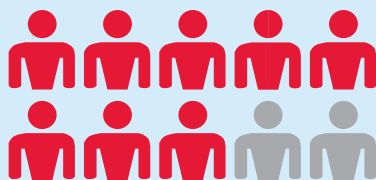
71%
OF IAAS ADOPTERS SAY THE SERVICE IMPROVES THEIR ABILITY TO ADJUST QUICKLY TO OPERATIONAL DEMANDS FOR ADDITIONAL SERVERS, DATA REPOSITORIES AND OTHER SOLUTIONS.[4]

Sources: [1]Reportsinformationweek.com, ''State of Storage by the Numbers,'' 2013 [2]IDC Insight, *The Copy Data Problem,* June 2013 [3]Thedatacenterjournal.com, ''Data Erasure in Virtualized Environments,'' December 2014 [4]Techproresearch.com, ''IaaS Impact on Data Center Design and Staffing,'' September 2013

NetApp

CDWG.com/netapp

NetApp® FAS8060 Series Scale–out Unified Storage Systems
Powerful, affordable, flexible data storage

FAS8060 (2U base) CDW 3337198

CALL FOR PRICING

- Boost throughput and decrease latency to deliver consistent application performance
- Integration with Windows® and VMware® simplifies management
- Nondisruptive operations simplify long-term scaling and improve uptime
- Proven storage efficiency and a 2x increase in price/performance over the previous generation
- FlexArray storage virtualization software lets you integrate existing arrays with the FAS8060

nimblestorage

CDWG.com/nimble

Nimble Storage CS–Series Adaptive Flash Storage Systems
Flash–optimized from the ground up

CS700 array CDW 3542359

CALL FOR PRICING

- Designed for consolidating multiple large–scale critical applications
- Up to six disk expansion shelves
- Maximized data and storage availability with integrated data protection and disaster recovery
- Flash capacity per array: up to 3200 base, 6400 max.

hp

CDWG.com/hp

Hard drives sold separately

HP ProLiant DL180 Gen9 Server
Designed with the right balance of expandability, performance, reliability and manageability
CDW 3466987

$1289.00

The HP ProLiant DL180 Gen9 Server delivers an optimized 2U server, designed with the right balance of expandability, performance, reliability and manageability all in a new compact chassis.

- Six–Core Intel® Xeon® E5–2603v3 processor (1.60GHz)
- Memory: 8GB std., 256GB max.
- Hard drive: none ship std.

vmware

CDWG.com/vmware

VMware® Horizon™ 6
Delivers virtualized desktops or just applications through a single platform

CALL FOR PRICING

Horizon™ 6 allows IT to centrally manage virtual, physical and BYO Windows images to streamline management, reduce costs, and maintain compliance. With Horizon 6, virtualized or remoted desktops and applications can be delivered through a single platform to end users. These desktop and application services — including RDS hosted apps, packaged apps with ThinApp, SaaS apps, and even virtualized apps from Citrix — can all be accessed from one unified workspace to provide end users with all of the resources they want, at the speed they expect, with the efficiency they demand.

WE GET THE NEXT-GENERATION DATA CENTER

When storage area network (SAN) and network-attached storage (NAS) were first introduced to data centers more than a decade ago, IT administrators' jobs were simplified. Unfortunately, SAN and NAS storage infrastructures weren't built with virtualization in mind. As a result, IT administrators have struggled with bottlenecks, complexity and costs of legacy storage networks. Now there is a better way, the Nutanix Virtual Computing Platform.

The Nutanix Virtual Computing Platform is a web-scale converged infrastructure solution that consolidates the server tier and the storage tier into a single, integrated appliance. It offers a radical reduction in costs, and is easy to deploy and manage.

A single Nutanix appliance replaces entire racks worth of legacy equipment. Source: Nutanix.com, "Nutanix in 2 Minutes" video

NUTANIX. CDWG.com/nutanix

Nutanix™ NX–1450 Virtual Computing Platform
Converged infrastructure for remote and branch offices
CDW 3075609
CALL FOR PRICING

- Standardize branch office infrastructure to ease IT headaches
- Eliminate SAN storage and simplify IT infrastructure
- Run any VM on a turnkey appliance in less than 30 minutes
- Deliver continuity of operations with built-in replication and backup
- Remotely manage all locations with simplified workflows from a single interface

Nutanix NX–1350   CDW 3075608   **CALL**

Nutanix NX–3450 Virtual Computing Platform
Converged infrastructure for enterprise data centers
CDW 3075628
CALL FOR PRICING

- Provide server and storage in a single 2U appliance
- Run any VM on a turnkey appliance in less than 30 minutes
- Eliminate SAN storage and simplify IT infrastructure
- Deliver up to 80% savings in space and power

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arcserve®
∧ssured recovery™

NEW VERSION
Visit CDWG.com/Arcserve for a no–cost download of
UDP for Workstation

Arcserve® Unified Data Protection
Leverage advanced backup and recovery capabilities

CALL FOR PRICING

Arcserve® UDP is based on a next–generation unified architecture
for both virtual and physical environments. Its wide range, ease of
use and Assured Recovery® capabilities make it an effective, unified
data protection solution.

- Unified management console for all data protection needs
- True global deduplication
- Very flexible yet powerful data protection and availability plans

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Symantec. CDWG.com/symantec

Symantec™ System Recovery 2013 Server Edition
Delivers backup and disaster recovery for servers,
desktops and notebooks

CALL FOR PRICING

- Single unified image–based solution that protects both virtual and
  physical machines
- Backs up servers, virtual machines, desktops and notebooks
  automatically without disrupting user productivity
- Provides fast, flexible and reliable recovery of data and systems
- Performs a full system restoration to a specific point in time entirely
  from bare metal and eliminates time consuming and error prone
  manual system rebuilds
- Seamless and automated P2V
- Dramatically minimizes downtime and avoids operational disruption
- Eliminates the need for duplicate hardware for disaster
  recovery purposes
- Reduces storage costs, backup windows, and network traffic with
  integrated data reduction technologies

SEAGATE CDWG.com/seagate

Seagate 8–bay Rackmount NAS
Great for backing up PCs in one central location

32TB CDW 3151540
$**5099**.99

- 1U rack with eight hot–swappable 3.5¨ drives doubles your
  storage capacity in the same footprint
- A powerful 2.3GHz Dual–Core Intel® processor delivers incredible
  file transfer performance of up to 200MBps
- Included Wuala™ cloud service and apps for seamless, secure
  collaboration and anywhere access from most devices
- Centralized back up for PCs, plus Time Machine® support for
  Mac® computers

WD® CDWG.com/wd

WD Sentinel™ RX4100 Storage Server
Secure unified storage with complete data protection

4–bay, 1U rack, 16TB max. capacity

8TB CDW 3045792
$**1977**.99

- Unified storage with integrated NAS, iSCSI SAN and backup server
- Backup and restore for 25 Windows® or Mac computers
- Enterprise–grade data protection: WD® drives, RAID, automatic
  backup, dual Ethernet ports, optional power supply and optional
  disaster recovery
- Secure local and remote access to your mission–critical data
- Fast and easy restore functionality in case of data
  loss or system failure
- Easy management with an intuitive administration dashboard

THE PATH TO DATA CENTER
CONSOLIDATION

Savings from FDCCI are predicted to exceed the original $3 billion goal, but that's far from the only benefit agencies are seeing.

Since former Federal CIO Vivek Kundra announced the Federal Data Center Consolidation Initiative (FDCCI) in 2010, agencies have been hard at work, closing hundreds of data centers to reduce hardware, software and operational costs. Around the same time, the governmentwide Cloud First policy directed agencies to start migrating services to the cloud. Both initiatives were intended to address an epidemic of data center sprawl that inventories revealed numbered well into the thousands.

While there have been some criticisms about the depth of agency reporting, it's clear that consolidation has brought significant savings. In a September 2014 Government Accountability Office report, agencies reported an estimated $1.1 billion total cost savings via data center consolidation from 2011–2013. They predicted an additional $2.1 billion by the end of fiscal 2015, which would bring the total savings higher than the original FDCCI goal of $3 billion.

$5.3 BILLION TOTAL EXPECTED SAVINGS AND COST AVOIDANCE FROM THE FEDERAL DATA CENTER CONSOLIDATION INITIATIVE BY 2017

$5.3
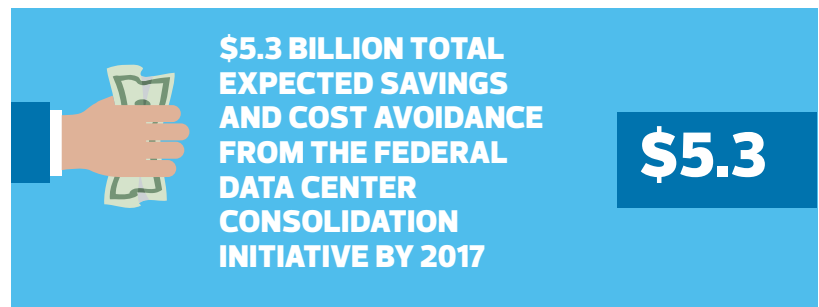
SOURCE: Government Accountability Office

Savings have come not only from reduced data center hardware and software costs but also reductions in the real estate needed to house IT infrastructure. Agencies also have made significant strides in improving the efficiency of powering and cooling their data centers.

But saving money is only one goal of the initiative. Centralized infrastructure management has helped to optimize operations within data centers, and the efficiency gains have also reduced the time and resources needed to get new applications and initiatives up and running.

Many of the efficiencies come from virtualization, which allows organizations to combine multiple physical servers as virtual machines to provision computing and storage for applications from a single virtual storage pool. Software-defined networking and network virtualization are bringing the same pooling capabilities to the network.

Agencies are also finding that they can transfer capital costs to operational expenses by taking advantage of cloud services such as Infrastructure, Software and Platform as a Service (IaaS, SaaS, PaaS). Instead of taking weeks to purchase and install new servers, IT staff can provision hardware and software in minutes.

Security and Business Transformation

Another big payoff of consolidation is enhanced cybersecurity, a major concern as agencies face constant threats from increasingly sophisticated and well-funded cyberattackers. "Five years ago, there were far too many federal data centers to secure, especially with scattered servers running in a closet or under a desk in many agencies," says Luanne Pavco,

managing partner and federal industry leader for IBM Global Business Services. "It was clear there would have to be a better understanding what and where all that hardware and software was in order to close down any security issues." Centralizing, consolidating and optimizing hardware, software and data centers enables IT departments to manage security effectively and get a better understanding of what data is being accessed by whom.

Several large cloud providers, including IBM and HP, have set up cloud computing data centers specifically for public-sector use. These facilities meet stringent standards such as the Federal Risk and Authorization Management Program (FedRAMP) and Federal Information Security Management Act (FISMA) requirements. IBM recently opened SoftLayer federal cloud centers in Ashburn, Va. and Dallas.

CLOUD FIRST APPROACH

The Cloud First policy established by the December 2010 25-Implementation Plan to Reform Federal IT Management required agencies to implement cloud-based solutions whenever a secure, reliable and cost-effective cloud option existed. It directed agencies to begin re-evaluating and modifying their individual IT budget strategies to include cloud computing. Agencies responded by greatly increasing their cloud adoption. IDC has predicted that by 2017, agencies will spend $7.7 billion on cloud services.

According to a December 2014 Government Business Council report, Lessons Learned in Federal Cloud Adoption, most agencies started their cloud migrations with what might be called low-hanging fruit — applications that were low-risk, could be moved easily and benefited from cloud scalability and flexibility. 62 percent of the report's respondents work for agencies that deployed email in cloud, while 46 percent deployed data storage, 42 percent collaboration tools and 39 percent web servers.

According to *InformationWeek*, however, the low-hanging fruit stage is ending, as agencies move to hosting more important applications in the cloud. Roughly 33 percent of agencies have deployed what they consider mission-critical applications in the cloud, according to the Government Business Council report. This trend is likely due to the emergence of specialized FedRAMP- and FISMA-compliant cloud offerings from vendors such as IBM, HP and others as well as federal community cloud services.

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Other advantages of application consolidation include improved government services and constituent relations. "Many agencies wrestle with duplication of applications for the same or overlapping purposes," says Greg Schulz, senior advisory analyst for StorageIO. "Consolidation means not just reducing the number of data centers and servers but the applications running on those servers."

Scalability, agility and quick delivery of new services are also benefits of consolidation, virtualization and the cloud. "We see an exponential technology change in some federal agencies," says Scott Gaydos, chief technologist for the U.S. Public Sector at HP. "The first wave was virtualization and automation for compute, storage and the network. The next is a business transformation that coalesces infrastructure into services that make sense to IT's business users. IT can offer a consistent catalog of well-defined services such as compute, email, identity and phone services and one place to go for them across the entire agency."

Data analytics is a big consolidation payoff. The tremendous volume of structured and unstructured data generated from digitized services not only makes storage requirements skyrocket, it holds the promise of major new insights and services. "The General Services Administration consolidated its supply chain into a single-view order management system running in the cloud," says Pavco. "Not only did this save costs by consolidating ordering, it made it easier to apply advanced analytics that have helped the GSA improve the supply chain and better predict customer needs." The Army hopes to achieve similar results with its supply chain system.

Other agencies, such as the Centers for Medicare and Medicaid Services, the Veterans Affairs Department and National Institutes of Health, are using healthcare data analytics to improve research and patient care.

CLOUD BENEFITS

Cloud computing can bring a number of benefits to agencies, including predictable costs, scalability, agility and faster delivery of new applications and services. In the case of SaaS, IT departments can delegate application management, security patches and server upgrades to the provider, leaving more time for IT staff to focus on strategic initiatives rather than mundane tasks.

According to MeriTalk's Cloud First Consumer Guide, agencies are reaping some other interesting benefits as well. Thanks to the subscription model, some agencies have found it easier to track numbers of users per application, and therefore the actual cost of using IT services. Moving directly to the cloud enabled the Recovery Accountability and Transparency Board to meet its statutory obligations without having to manage a data center. And the Commerce Department's Office of the Inspector General improved the reliability of its emergency messaging system by putting it in the cloud. Because the provider operates multiple locations across the country, the OIG can switch operations during natural disasters.

According to the December 2014 Government Business Council report, Lessons Learned in Federal Cloud Adoption, the cloud is largely fulfilling its promise, as 76 percent of federal respondents said that their cost savings from cloud adoption either met or exceeded their expectations. 83 percent agreed that security met or exceeded expectations.
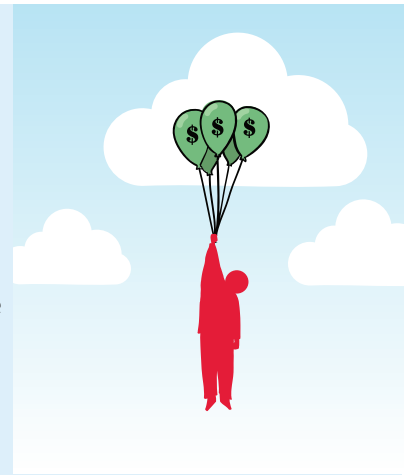
Data Explosion Requires Efficiencies

A tidal wave of data from mobile devices cries out for more efficient storage and analysis. "You have so much more data coming in from citizen outreach, social media, mobile devices, sensors and imaging data that requires orders of magnitude in terms of storage," says Gaydos.

"Twenty years ago, soldiers didn't have anything on them that communicated with the network," says Sam Ceccola, HP's Department of Defense account chief technologist. "Today, just about everything they have – from cameras, GPS devices

and tanks – is computerized and transmits data." The Internet of Things promises even more data from a host of environmental sensors and other devices.

In fact, the tremendous growth of data and applications demands that agencies adopt new strategies to deal with the volume. "We simply can't afford anymore to meet these needs simply by buying a lot more servers, storage and bandwidth," says Ceccola. "If we don't get a lot more efficient, at some point soon, we won't be able to keep the lights on."

A Step–by–Step Approach

The first step in any data center consolidation effort should be an agencywide inventory of data centers and applications as well as associated hardware and software. "Agencies typically have multiple data centers with different servers, storage, networking, operating systems, software and IT staffs running them," says Schulz. "Much of this comes from regionalization and carries over from the days of decentralization into branch offices."

When looking at which data centers to consolidate or close, IT decision–makers

"TWENTY YEARS AGO, SOLDIERS DIDN'T HAVE ANYTHING ON THEM THAT COMMUNICATED WITH THE NETWORK. TODAY, JUST ABOUT EVERYTHING THEY HAVE — FROM CAMERAS, GPS DEVICES AND TANKS — IS COMPUTERIZED AND TRANSMITS DATA."

—SAM CECCOLA, HP DEPARTMENT OF DEFENSE ACCOUNT CHIEF TECHNOLOGIST

should identify those that have room to grow and those that have reached their capacity. "Some data centers are very old, out of physical space or power, or just expensive to maintain for some reason," says Schulz." These are candidates for closure." Others may be underutilized and have plenty of room for growth, not only in power and real estate but in underutilized servers and storage.

Agencies should also look for ways to consolidate software that serves

the same purpose or overlapping purposes. "An agency like the Army is going to have data centers all over the world, and each location may have its own SharePoint, for example," says Chris Howard, vice president for federal sales at Nutanix. "Why not consolidate into one SharePoint deployment?"

Consolidation can help agencies to deploy the appropriate resources for specific applications. The key is to identify applications that are growing or shrinking and for which agencies have over- or under–provisioned resources, says Anil Desai, an independent IT consultant. "You may have applications that were built for 1,000 users but are only being used by 200, or vice versa," he adds. "Those are good cases where virtualization will help you scale better and have more IT agility."

As they address these application issues, many agencies have begun thinking about the cloud. Email is a great candidate for migrating to the cloud, since it may be accessed from anywhere by a mobile device.

Many agencies have migrated their email services to a cloud provider such as Microsoft or Google, while others have opted for a federally shared private or community cloud service, such as services offered by the Defense Information Systems Agency (DISA). "DISA does a lot of hosting for the Department of Defense," says Howard. "All of the Army and many DOD agencies have their email hosted in DISA."

Many agencies are exploring PaaS services by migrating development platforms and testing to the cloud, which allows them to spin up a testing platform — and tear one down — quickly. The agency pays only for the resources it uses and avoids costly over–provisioning. Cloud backup is another way to test cloud computing without putting production systems at risk.

After agencies have rationalized their applications, the next step is to determine which apps can and cannot be virtualized. "Without virtualization there's very little hope

of consolidating," says Howard. "Most agencies can certainly virtualize 80 to 90 percent of their environment, with the possible exception of legacy government–created applications where you can't find the people who developed them."

In data centers where extensive virtualization hasn't taken place, servers may be at utilization levels as low as 20 percent. Virtualization is the first step toward a private cloud, enabling fast provisioning, automation and user self–service cloud components.

Virtualization can also be part of a hardware refresh that takes advantage of more robust infrastructure platforms. Agencies should consider alternative platforms such as blade server technologies and solutions from Cisco, HP, Nutanix and others that converge computing, storage and networking components into a single platform with management software geared to control it all intelligently.

These solutions, commonly referred to as converged infrastructure, can deliver easier management, agility and reduced data center footprint, which can result in a lower total cost of ownership or TCO. "You set it up, you virtualize, and thereafter there's very little virtualization administration," says Howard of the Nutanix platform. "It's like a purpose–built virtualization appliance."

As they pursue data center consolidation, agencies are finding that optimization is a far more important benefit than a raw reduction in the number of data centers they run. They must continuously address demands for newer, better and faster services while dealing with flat or declining budgets. A strategic approach to meet these demands — one that includes technologies such as converged infrastructure and cloud computing — will help them deliver services quickly, efficiently and securely. ∎

To learn more about the next generation of data center technology, read CDW's white paper "Defining Moment: The Software–Defined Data Center."

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Sources: [1]Seagate.com, "Storage and Application Guide," 2014 [2]Cisco.com, "Cisco Visual Networking Index: Forecast and Methodology 2013–2018," June 2014 [3]Mobileworkexchange.com, "The 2014 Mobilometer Tracker: Mobility, Security, and the Pressure In Between," January 2014 [4]Ciscosystems.com, "Internet of Everything: A $4.6 Trillion Public-Sector Opportunity," 2013 [5]Gartner, *Predicts 2015: The Internet of Things*, December 2014

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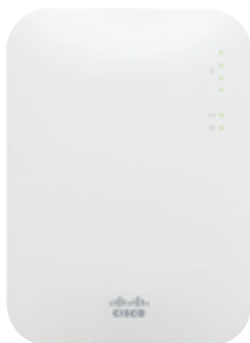
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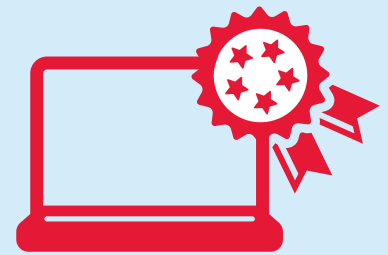
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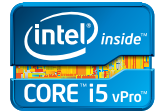
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- 11.6'' widescreen LED backlit HD display with camera
- Windows 8.1 Pro 64–bit

¹See page 45 for HP Smart Buy details

HP
CDWG.com/hp

AMD

HP ProBook 455
Protect your data and investment with an AMD A–series processor
CDW 3379613

HP SMART BUY

$**499**.99[1]

- AMD A6–7050B processor (2.20GHz)
- Memory: 2GB/500GB hard drive
- 15.6" HD LED display with camera
- AMD Radeon™ R4
- Windows® 8.1 64–bit

HP EliteBook 725
Work proficiently and confidently with HP technology and AMD A–Series Pro APUs
CDW 3379790

HP SMART BUY

$**779**.99[1]

- AMD A10–7350B Quad–Core processor (2.10GHz)
- Memory: 4GB/500GB hard drive
- 12.5" HD SVA display
- AMD Radeon R4
- Windows 8.1 Pro/Windows 7 Pro 64–bit downgrade

HP UltraSlim Docking Station
Be more productive throughout the day
CDW 3145533

$**159**.00

- Simple one–click, slide–in connectivity
- Get high–speed connectivity to the USB devices you use most with four USB 3.0 ports
- Two DisplayPort® ports and one VGA port

HP EliteDisplay S270c
27" analog/digital LCD monitor
CDW 3530541

$**400**.99

- Curved commercial display
- Max. resolution: up to 1920x1080
- Panel brightness: 300 cd/m²
- Response time: 8ms
- Contrast ratio: 10,000,000:1 (dynamic)
- Three–year limited warranty

WE GET UPGRADE ANXIETY

Replacing worn–out technology can be a pain. There's the hassle of implementing new machines and the risk of downtime. Not to mention the slew of questions you inevitably get about how these new machines work. It's enough to put anyone on edge.

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Packed with integrated performance and security
CDW 3374853
HP SMART BUY
$**599**.99[1]

- 4th generation Intel® Core™ i5–4590T processor (2.0GHz)
- Memory: 4GB/500GB hard drive
- Intel® Wireless–N 7260
- Intel® HD Graphics 4600
- Windows® 8.1 Pro/Windows 7 Pro 64–bit downgrade

HP EliteDesk 800
Built for high performance, engineered for security, ready for the future
CDW 3437383
HP SMART BUY
$**769**.99[1]

- 4th generation Intel® Core™ i5–4590 vPro™ processor (3.30GHz)
- Memory: 4GB/500GB hard drive
- DVD SuperMulti drive
- Intel HD Graphics 4600
- Windows 8.1 Pro/Windows 7 Pro 64–bit downgrade

HP EliteOne 800 23" All–in–One Desktop
Widescreen all–in–one that is built to handle the demands of virtually any environment
CDW 3435515
HP SMART BUY
$**1459**.99[1]

- 4th generation Intel® Core™ i5–4790S vPro™ processor (3.2GHz)
- Memory: 8GB/1TB hybrid drive
- DVD SuperMulti drive
- Radeon HD 7650A
- Windows 8.1 Pro 64–bit/Windows 7 Pro 64–bit downgrade

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AMD

HP Flexible Thin Client t620
**Delivers added security, broad expansion options
and a PC–like multimedia experience for virtualized desktops**
CDW 3222857
HP SMART BUY
$**479**.99[1]

- AMD GX–217GA Dual–Core processor (1.65GHz)
- Memory: 4GB RAM
- AMD Radeon™ HD 8280E graphics
- Windows® Embedded Standard 7E 32–bit

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HP Z230 Workstation
**Powerful processor, graphics technologies and scalability to
match your organization's needs**
CDW 3379117
HP SMART BUY
$**1169**.06[1]

- 4th generation Intel® Core™ i7–4790 vPro™ processor (3.60GHz)
- Memory: 8GB/1TB hard drive
- Intel® HD Graphics 4600
- Windows 8.1 Pro 64–bit / Windows 7 Pro 64–bit downgrade

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LG CBV42–B PCOIP Zero Client
Cost–effective, ultrasecure desktop virtualization endpoint
CDW 3028943
$**299**.99

- Teradici® Tera2321 processor
- Memory: 512MB
- Gigabit LAN
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- Stand vertically with a cradle or it can attach to the backside of a
  monitor for increased space efficiency

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Lenovo ThinkCentre® M93p Tiny
Tiny desktop that fits anywhere
CDW 3097539
TOPSELLER
$**695**.25

- 4th generation Intel® Core™ i5–4570t vPro™ processor (2.90GHz)
- Memory: 4GB/500GB HDD
- DVD–RW drive
- Intel HD Graphics 4600
- Windows 8 Pro 64–bit / Windows 7 Pro 64–bit downgrade

ViewSonic® VG2239M–TAA

22" widescreen display

CDW 2806710

$**259**.99

Trade (TAA) compliant display that supports GSA schedule needs within the federal government.

- Provides native Full HD 1920x1080 resolution and 20,000,000:1 MEGA dynamic contrast ratio for stunning display quality
- Easy data transfer of high–definition video and audio
- Connectivity options include DVI™ and VGA inputs, a two–port USB hub for peripheral support, and a hidden stereo speaker to complete the multimedia package
- Features 90° pivot, height adjust, swivel and tilt for maximum screen viewing
- Three–year limited warranty

ViewSonic VG2439M–LED

24" analog/digital/DisplayPort®

CDW 2756670

$**303**.23

Slim bezel design coupled with hidden stereo speakers make this display a space saver.

- Monitor is also fully ergonomic with 90° pivot, height adjust, swivel and tilt
- Max. resolution: up to 1920x1080
- Panel brightness: 300 cd/m²
- Contrast ratio: 20,000,000:1 (dynamic)
- Response time: 5ms

Logitech® Wireless Combo MK520

Full–size keyboard and hand–friendly laser mouse

CDW 2154459

$**55**.85

- Advanced 2.4GHz wireless technology
- Logitech® Unifying receiver
- Logitech Incurve keys™ position your fingers properly on the keyboard
- Battery life of up to three years for the keyboard and one year for the mouse

Logitech Multi–Device K480 Keyboard

Bluetooth® keyboard

CDW 3467477

$**55**.85

- Bluetooth wireless capability
- Easy–switch dial switches typing between three connected Bluetooth wireless devices
- Compatible with Windows®, Mac®, Android™ and iOS
- One–year limited warranty

Peerless® LCT620AD

Desktop mounting kit

CDW 2544654

$**205**.48

Increase productivity by freeing up desk space with more efficient display positioning.

- Dual display mount with flexible articulating arms
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- Able to pan and rotate for a comfortable portrait or landscape viewing

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Kingston® Desktop Memory Upgrades

- 100% individually tested modules
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Reliable and secure centralized storage and backup

8-bay, 24TB max. capacity

24TB CDW 2805462

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- Simultaneous NAS and iSCSI target functionality
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- Scheduled or real-time replication to other TeraStation™ devices
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Advanced and easy-to use unified storage solution

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- Modern interface for easy cloud-based discovery and file management
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Today's printers deliver the features and functionality that will boost productivity and efficiency across your organization. And when you buy your printers from us, you get more than machines — you get access to a dedicated account manager to help guide you through your purchase. So you don't just get new printers — you get the right printers.

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HP LaserJet® Pro 400 Color M451nw
Color laser printer
CDW 2612968

$399.00

Maximize your productivity with a versatile color laser printer. Easily manage networked resources, using convenient, intuitive setup and easy-to-use management features.
- Mfr. speed rating: up to 21 ppm, black and color
- Print resolution: up to 600 dpi
- Duty cycle: up to 40,000 pages per month
- Built-in wireless card

HP LaserJet Pro 1102w
Wireless monochrome laser printer
CDW 2728446

$159.00

- Mfr. speed rating: up to 19 ppm
- Print resolution: up to 600x600 dpi
- Duty cycle: up to 5000 pages per month
- Print on a wide variety of media, using the 150-sheet paper tray and 10-sheet priority input slot

HP Designjet T520
36" large-format, color inkjet printer
CDW 2827801

$2850.00

- Conveniently print CAD documents with print speeds up to 35 seconds for D/A1-sized documents
- Print resolution: up to 2400x1200 dpi
- HP Instant Printing — quickly print your HP-GL/2 and PLT files with the simple click of a button
- Separate ink cartridges and printheads at a low price and efficient servicing routines without any need to replace maintenance tanks keep running costs down

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HP Officejet® Pro X451dn
Network–ready color inkjet printer
CDW 2937679

$**449**.99

- Mfr. speed rating: up to 55 ppm, black and color
- Print resolution: up to 1200x1200 dpi black, 2400x1200 dpi color
- High volume printing — up to 4200 pages a month
- 550–sheet capacity

HP Officejet Pro X576dw MFP
Cost–efficient, laser–like quality
CDW 2940212

$**799**.99

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- Print resolution: up to 1200x1200 dpi optimized
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- Help workgroups thrive with proactive manageability tools
- Improve workflow — send quick faxes, scan documents to a PC, email and more

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- HP LaserJet multipacks deliver 10% savings by bundling multiple toner cartridges in one package
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HP CARE PACK SERVICES

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West Point Products

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- Will not void your printer's warranty
- All toners are 100% satisfaction guaranteed[1]

Description	Compatibility	CDW	Price
Black 1–pack compatible with HP CF280A 80A Black	For the HP Laserjet Pro 400	2940742	$66.99
Black 1–pack compatible with Brother TN450 Black	For the Brother DCP-7065DN	2593096	$43.99
Black 1–pack compatible with Lexmark T650H11A	For the Lexmark T650DN, T650DTN, T650N, T652DN, T652DTN, T652N, T654DN, T654DTN, T654N, T656DNE, X651DE, X652DE, X654DE, X656DE, X656DTE, X658DE, X658DFE, X658DME, X658DTE, X658DTFE, X658DTME – Lexmark Compliant	3536652	$105.99
Black 1–pack compatible with Dell 330–2667	For the Dell Laser Printer 2330d/2330dn, Canon Color ImageClass MF8280CW, 6273B001AA	3224912	$99.99

RICOH CDWG.com/ricoh

Ricoh Aficio® SP 5200S
Network– and duplex–ready monochrome laser printer, copier and scanner
CDW 2561095

$2599.00

- Mfr. speed rating: up to 47 ppm
- Print resolution: up to 1200x600 dpi
- Gain clear, unobstructed access to critical device information with an innovative 8.5'' full–color tilting LCD panel
- 50–sheet automatic reversing document feeder
- Extend acceptable paper sizes up to 35'' long in the bypass tray

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Canon CDWG.com/canon

Canon imageCLASS® MF216n
Monochrome multifunction laser printer
CDW 3472558

$199.00

- Mfr. speed rating: up to 24 ppm
- Print resolution: up to 1200x1200 dpi
- Duplex print capability
- 250–sheet capacity/35–sheet ADF
- AirPrint™, Mopria™, Canon Mobile Printing and Scanning (requires Wi–Fi® router)

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Zebra® QN2-AUNA0M00-00
Mobile direct thermal printer
CDW 3454137
$983.53
- Mfr. speed rating: up to 4 ips
- Print resolution: up to 203 dpi
- CPCL and ZPL programming languages
- Easy-to-use peel-and-present mode
- With BT3.0+MFi
- Supports MiFi

Zebra® Symbol® LS2208 Kit
Fast, reliable scanning in an ergonomic, lightweight form
CDW 3021135
$131.66
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- Accurate first-time capture of 1D barcodes; wide working range — from near-contact to 17"
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NEC NP-M402H
4000-lumen widescreen 3D DLP HD resolution projector
CDW 3499117
$1849.00
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- USB viewer allows you to present without a PC using a USB flash drive
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- Integrated active lens cover mutes audio and video while lowering the lamp power to conserve energy
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*Source: Customer review, June 2013

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