

GCM

TECHNOLOGY, TOOLS AND TACTICS FOR PUBLIC SECTOR IT
MAY 2015 • VOLUME 34, ISSUE 5

THE INSIDER THREAT

Five experts offer advice
on managing risks
when agency employees
bring their own mobile
devices to work

Page 18



MOBILE:

**Houston's solution
for digital house calls**

Page 22

OPEN DATA:

**How to calculate
the ROI**

Page 30



Take on bigger projects.



You'll find government compliant Fujitsu scanning solutions in some high places. From the world's fastest high-volume document scanners to versatile, easy-to-use scanners for desktops, Fujitsu has one you should consider. Include the ability to integrate with dozens of leading software providers and you have a strong and reliable solution that lasts. Get started today by visiting ez.com/gcnews



See the New FUJITSU Document Scanner fi-7160





INSIDE

FEATURES

18 **The insider threat in employees' pockets**

Five experts offer advice on managing risks when agency employees bring their own mobile devices to work

BY WILL KELLY

22 **Firefighters bring digital doctors on calls**

Houston is cutting down on costly emergency room visits with a tablet-based video system

BY CARRIE FEIBEL

32 **Q&A with Terry McAuliffe**

Virginia's governor is getting serious about big data, biotech and cybersecurity

BY TROY K. SCHNEIDER

CASE STUDIES

26 **What it takes to build DOD networks at scale**

As the Army consolidates operations at two South Korean bases, Col. Mollie Pearson's team is tackling some daunting IT challenges

BY ADRIENNE ANDERSON

28 **Ebola modeling flows into flood app**

Virginia Tech graduate students built a tool that integrates local open data to aid emergency response to flooding

BY STEPHANIE KANOWITZ

HOW TO

30 **Calculating open data's real ROI**

A new formula helps agencies weigh the costs and benefits of making their data available to the public

BY STEPHANIE KANOWITZ

BRIEFING

- 6 'Minority Report' gets real with gesture tech
- 7 Salary shortfalls and scary skill gaps
- 8 Microsoft denies SMB security flaw in Windows
- 9 Researchers find weakness in air-gapped systems
- 10 GIS offers pre-hardened resources for Amazon cloud
- 11 Partnership to enhance dispatch, GIS tools for public safety
- 12 NOAA's no-cost plan to get more data into the cloud

COMMENTARY

- 13 **CYBEREYE**
Progress toward an identity ecosystem
- 16 **EMERGING TECH**
Early earthquake warnings? There's an app for that.
- 17 **INDUSTRY INSIGHT**
4 steps to smart network modernization

WISH LIST

- 34 Emerging tech that we hope hits the public sector

GCN (ISSN 0738-4300) is published 11 times a year, monthly except Dec by 1105 Media, Inc., 9201 Oakdale Avenue, Ste. 101, Chatsworth, CA 91311. Periodicals postage paid at Chatsworth, CA 91311-9998, and at additional mailing offices. Complimentary subscriptions are sent to qualifying subscribers. Annual subscription rates payable in U.S. funds for non-qualified subscribers are: U.S. \$125.00, International \$165.00. **Subscription inquiries, back issue requests, and address changes:** Mail to: GCN, P.O. Box 2166, Skokie, IL 60076-7866, call (866) 293-3194, outside U.S. (847) 763-9560; fax (847) 763-9564 or email GCNmag@1105service.com. **POSTMASTER:** Send address changes to GCN, P.O. Box 2166, Skokie, IL 60076-7866. Canada Publications Mail Agreement No: 40612608. Return Undeliverable Canadian Addresses to Circulation Dept. or XPO Returns: P.O. Box 201, Richmond Hill, ON L4B 4R5, Canada.

SALES CONTACT INFORMATION

MEDIA CONSULTANTS

Ted Chase
Media Consultant, DC, MD, VA,
OH, Southeast
(703) 944-2188
tchase@1105media.com

Bill Cooper
Media Consultant, Midwest, CA, WA, OR
(650) 961-1760
bcooper@1105media.com

Matt Lally
Media Consultant, Northeast
(973) 600-2749
mlally@1105media.com

Mary Martin
Media Consultant, DC, MD, VA
(703) 222-2977
mmartin@1105media.com

EVENT SPONSORSHIP CONSULTANTS

Stacy Money
(415) 444-6933
smoney@1105media.com

Alyce Morrison
(703) 645-7873
amorison@1105media.com

Kharry Wolinsky
(703) 300-8525
kwolinsky@1105media.com

MEDIA KITS

Direct your media kit
requests to Serena Barnes, sbarnes@1105media.com

REPRINTS

For single article reprints (in minimum quantities of 250-500), e-prints, plaques and posters contact:

PARS International

Phone: (212) 221-9595
Email: 1105reprints@parsintl.com
Web: magreprints.com/QuickQuote.asp

LIST RENTALS

This publication's subscriber list, as well as other lists from 1105 Media, Inc., is available for rental. For more information, please contact our list manager, Merit Direct. Phone: (914) 368-1000
Email: 1105media@meritdirect.com
Web: meritdirect.com/1105

SUBSCRIPTIONS

We will respond to all customer service inquiries within 48 hours.
Email: GCNmag@1105service.com
Mail: GCN
PO Box 2166
Skokie, IL 60076
Phone: (866) 293-3194 or (847) 763-9560

REACHING THE STAFF

E-mail: To e-mail any member of the staff, please use the following form: *FirstInitialLastname@1105media.com*.

CORPORATE OFFICE

Weekdays 8:30 a.m.-5:30 p.m. PST
Telephone (818) 814-5200; fax (818) 936-0496
9201 Oakdale Avenue, Suite 101
Chatsworth, CA 91311

Editor-in-Chief Troy K. Schneider

Executive Editor Susan Miller

Print Managing Editor Terri J. Huck

Senior Editor Paul McCloskey

Reporter/Producers Derek Major, Amanda Ziadeh

Contributing Writers Adrienne Anderson, Kathleen Hickey, Stephanie Kanowitz, Will Kelly, Suzette Lohmeyer, Carolyn Duffy Marsan, Patrick Marshall, Brian Robinson

Editorial Fellow Mark Pomerleau

Vice President, Art and Brand Design

Scott Shultz

Creative Director Jeff Langkau

Assistant Art Director Dragutin Cvijanovic

Senior Web Designer Martin Peace

Director, Print Production David Seymour

Print Production Coordinator Lee Alexander

Chief Revenue Officer Dan LaBianca

PUBLIC SECTOR MEDIA GROUP

**Chief Operating Officer and
Public Sector Media Group President**
Henry Allain

Co-President and Chief Content Officer
Anne A. Armstrong

Chief Revenue Officer
Dan LaBianca

Chief Marketing Officer
Carmel McDonagh

Advertising and Sales
Chief Revenue Officer Dan LaBianca
Senior Sales Director, Events Stacy Money
Director of Sales David Tucker
Senior Sales Account Executive Jean Dellarobba
Media Consultants Ted Chase, Bill Cooper, Matt Lally,
Mary Martin, Mary Keenan
Event Sponsorships Alyce Morrison,
Kharry Wolinsky

Art Staff

Vice President, Art and Brand Design Scott Shultz
Creative Director Jeffrey Langkau
Associate Creative Director Scott Rovin
Senior Art Director Deirdre Hoffman
Art Director Joshua Gould
Art Director Michele Singh
Assistant Art Director Dragutin Cvijanovic
Senior Graphic Designer Alan Tao
Graphic Designer Erin Horlacher
Senior Web Designer Martin Peace

Print Production Staff

Director, Print Production David Seymour
Print Production Coordinator Lee Alexander

Online/Digital Media (Technical)

Vice President, Digital Strategy Becky Nagel
Senior Site Administrator Shane Lee
Site Administrator Biswarup Bhattacharjee
Senior Front-End Developer Rodrigo Munoz
Junior Front-End Developer Anya Smolinski
Executive Producer, New Media Michael Domingo
Site Associate James Bowling

Lead Services

Vice President, Lead Services Michele Imgrund
Senior Director, Audience Development & Data
Procurement Annette Levee
Director, Custom Assets & Client Services Mallory Bundy
Editorial Director Ed Zintel
Project Manager, Client Services Michele Long
Project Coordinator, Client Services Olivia Urizar
Manager, Lead Generation Marketing Andrew Spangler
Coordinators, Lead Generation Marketing Naija Bryant,
Jason Pickup, Amber Stephens

Marketing

Chief Marketing Officer Carmel McDonagh
Vice President, Marketing Emily Jacobs
Director, Custom Events Nicole Szabo
Audience Development Manager Becky Fenton
Senior Director, Audience Development & Data
Procurement Annette Levee
Custom Editorial Director John Monroe
Senior Manager, Marketing Christopher Morales
Manager, Audience Development Tracy Kerley
Senior Coordinator Casey Stankus

FederalSoup and Washington Technology
General Manager Kristi Dougherty

OTHER PSMG BRANDS

FCW

Editor-in-Chief Troy K. Schneider
Executive Editor John Bicknell
Managing Editor Terri J. Huck
Senior Staff Writer Adam Mazmanian
Staff Writers Sean Lyngaas, Zach Noble, Mark Rockwell
Editorial Fellow Jonathan Lutton

Defense Systems

Editor-in-Chief Kevin McCaney

Washington Technology

Editor-in-Chief Nick Wakeman
Senior Staff Writer Mark Hoover

Federal Soup

Managing Editors Phil Piemonte,
Sherkiya Wedgeworth

THE Journal

Editor-in-Chief Christopher Piehler

Campus Technology

Executive Editor Rhea Kelly

1105 MEDIA

Chief Executive Officer
Rajeev Kapur

Chief Operating Officer
Henry Allain

**Senior Vice President &
Chief Financial Officer**
Richard Vitale

Executive Vice President
Michael J. Valenti

**Vice President, Information Technology
& Application Development**
Erik A. Lindgren

Chairman of the Board
Jeffrey S. Klein



DDS 5900 Digital Discussion System

WHAT GREAT SOUND LOOKS LIKE.

DC 5900 F FLUSH MOUNTED CONFERENCING UNIT delivers the exceptional sound quality, flexibility, and styling that are hallmarks of the DDS 5900 Digital Discussion System. Innovative design and new automatic configuration technology makes set up and installation quick and easy for conference rooms where style and performance are critical.

- **Compact** form factor and sleek appearance
- **Modular** design suits many applications
- **Multiple** configurations: Delegate or Chairman button overlays
- **Easy** setup: Overlays automatically activate distinct configurations
- **Compatible** with Shure Microflex® gooseneck microphones



www.shure.com/conferencing

SHURE[®]
LEGENDARY
PERFORMANCE™

© 2015 Shure Incorporated



Oblong's gestural technology is no longer just for Hollywood movies. Public-sector agencies are now starting to use it for presentations and collaboration.

'Minority Report' gets real with gesture tech

BY STEPHANIE KANOWITZ

When Tom Cruise waves his hands in the 2002 film "Minority Report" and manipulates data on multiple screens, it's the stuff of science fiction. Today, though, movie stars aren't the only ones using gestural technology — government agencies are, too.

John Underkoffler, CEO of Oblong Industries, created the futuristic technology for the blockbuster film.

"Steven Spielberg came calling and said basically, 'Can you tell me what computer interfaces are going to look like in 50 years?'" said Michael Friedel,

Oblong's federal director. "They came up with the glove-based gestural system — being able to orchestrate massive amounts of data visually without ever touching a screen or a keyboard or a mouse."

For years, the technology was available only as a custom solution. In 2012, however, Oblong released Mezzanine, a commercial version that about a dozen agencies have picked up so far. By wearing a glove or using a wand, customers manipulate information on multiple screens through gestures.

Gestural technology is about more

than videoconferencing, Friedel said. The differentiator is how it enables people to work with the same data in real time.

"That's what we call infopresence," he said. "It's one thing to be able to do videoconferencing, which a lot of people do today, but it's another when you take collaborators in multiple locations and you start sharing content [and] data across time and distance."

He said customers use Mezzanine in a number of ways, including executive briefings or customer presentations. It is also a valuable tool for collaboration because a group of local or dispersed

users can get together to manipulate many data sources, such as PDFs, JPEGs, reports, analytics and websites.

“It will accept any data, any content from any application, and there are no integration services that are required to do that,” Friedel said.

Users don’t even have to be in the same room to collaborate. They can connect remotely and from one Mezzanine-enabled room to another.

The third common use, which is especially popular with the military, is on-demand, real-time situational awareness. For example, Mezzanine can be helpful in crisis or emergency management, when many agencies need to work together efficiently.

Mezzanine rooms start at \$150,000 and can cost as much as \$250,000, depending on what’s needed. A room typically consists of three high-defini-

tion dynamic screens and three other screens called corkboards that hold static images for future use. Information flows into the appliance via a variety of connected devices, and the appliance presents the data on the dynamic displays and corkboards.

As changes to the data occur, all users see the updates at the same time. What’s more, Friedel said, if people in one Mezzanine room have an application that the users in another lack, the second group can use the wand to essentially reach through and access that application.

“It’s almost like a video game,” he said. “You point and click on the wand, and there are a couple basic functions that you can perform.... You can add content, you can stretch content, you can zoom in, you can cut and paste that content.”

Mezzanine provides a high return on investment, Friedel said. For instance, it requires no middleware, whereas connecting two or more applications or environments — such as data warehouses, enterprise resource planning systems or business intelligence systems — typically requires a significant amount of middleware.

It also eliminates the need for employees to travel for meetings, cutting costs and increasing productivity.

Looking ahead, Oblong officials want to enable users to walk into a Mezzanine room, present an ID card such as a Common Access Card and automatically access the information they need.

The company also plans to offer a modular design to make Mezzanine more scalable. •

— *Stephanie Kanowitz is a freelance writer based in northern Virginia.*

Salary shortfalls and scary skill gaps

BY SUZETTE LOHMEYER

States are struggling to recruit and retain IT talent, and the problem is already affecting their IT plans and strategies, according to a new report from the National Association of State CIOs.

Filling the skill gap left by retiring baby boomers is one of the biggest challenges. States are doing their best to direct new talent toward vacant positions, but 92 percent said public-sector pay makes it challenging to recruit the talent they need, and positions remain vacant for months.

Salary is also the biggest issue when

it comes to the most pressing skill set state CIOs want in new recruits: cybersecurity. Application development, programming and support, and architecture also ranked high on the list of IT talent that states are having a hard time hiring.

As a result, many states are looking for other means to attract skilled IT workers. Noting that 86 million millennials will be in the workforce by 2020, the report says many states are trying to cater to that group’s priorities, including flexible work hours, a collaborative work environment and work/life integration.

The report makes a number of

related recommendations to CIOs in the “Call to Action” section by urging IT shops to make work environments stimulating and minimize bureaucracy. The report also calls on CIOs to document what is working and what isn’t in terms of hiring and retaining employees and to incorporate those lessons into a formal recruitment strategy.

In the short term, outsourcing seems to be the solution of choice for many states. “Expand outsourcing,” “outsource business applications through a SaaS model,” and “expand existing IT shared services model” were the most popular responses to how states will deal with IT shortages in the next three years.

Forty-nine states and territories took part in the survey. •

— *Suzette Lohmeyer is a freelance writer based in Arlington, Va.*



README

What: A case study by the National Association of State CIOs evaluating California's CalCloud project.

Why: NASCIO's assessment is based on a series of interviews with three of the top players in CalCloud's procurement and implementation. NASCIO asked for specifics on how well the process went and what they would do differently.

CalCloud Project Director Neeraj Chauhan said the project appears to be a success. "Our cloud infrastructure environment provides a highly available, 100 percent virtual environment to customers through agile, cost-effective, innovative, reliable and secure technology," he said.

And it meets the five most important cloud-computing characteristics: on-demand self-service, resource pooling, broad network access, rapid elasticity and measured service.

Chauhan, California Chief Procurement Officer Jim Butler and Carlos Ramos, director of the state's Department of Technology, said a key lesson they learned is to respect the reality that "communication is king," especially between CIOs and chief procurement officers.

"Early and ongoing communication helps keep everyone on track and brings in two different and very valuable perspectives," Ramos said.

Now that the CalCloud system is up and running, state officials are watching to see who will jump on the bandwagon.

Full report: is.gd/GCN_CalCloud

Microsoft denies SMB security flaw in Windows

BY CHRIS PAOLI

Researchers at Cylance said they've uncovered a new technique for stealing login credentials from any Windows device, including those running previews of Windows 10.

The approach, dubbed "Redirect to SMB," allows attackers to steal user credentials by "hijacking communications with legitimate web servers via man-in-the-middle attacks, then sending them to malicious SMB (Server Message Block) servers that force them to spit out the victim's username, domain and hashed password," wrote Cylance software engineer Brian Wallace on the company's blog.

"The Redirect to SMB attack builds on a vulnerability discovered in 1997 by Aaron Spangler, who found that supplying URLs beginning with the word 'file' (such as file://1.1.1.1/) to Internet Explorer would cause the operating system to attempt to authenticate with a SMB server at the IP address 1.1.1.1," Wallace wrote.

Attackers would gain access by having a targeted user click on a malicious email link or harmful ad that connects a system to a server controlled by the attackers. The company said the flaw can be found in every version of Windows and could be executed with the use of one of the 31 vulnerable software packages discovered, which include Adobe Reader, Apple QuickTime, Internet Explorer and Windows Media Player.

Because many products use HTTP requests to check for software updates, for example, a hacker could intercept such requests and redirect the victim to a malicious SMB server, according to the Vulnerability Notes Database maintained by Carnegie Mellon University's CERT Division.

"If the redirect is a file:// URL and the victim is running Microsoft

Windows, Windows will automatically attempt to authenticate to the malicious SMB server by providing the victim's user credentials to the server," the CERT database entry states. "These credentials can then be logged by the malicious server. The credentials are encrypted, but may be 'brute-forced' to break the encryption."

Although the Cylance team has provided proof of concept for the flaw, it said there have been no known attacks using Redirect to SMB.

Microsoft responded by saying the SMB flaw was not as serious as Cylance claims because of the difficulty attackers would have when attempting to take advantage of the vulnerability.

"Several factors would need to converge for a 'man-in-the-middle' cyberattack to occur," Microsoft officials said in a statement to Reuters. "Our guidance was updated in a Security Research and Defense blog in 2009, to help address potential threats of this nature. There are also features in Windows, such as Extended Protection for Authentication, [that enhance] existing defenses for handling network connection credentials."

The CERT division said it is unaware of a full solution but suggested some workarounds:

- Consider blocking outbound SMB connections (TCP ports 139 and 445) from the local network to the wide-area network.
- Don't use the NTLM authentication protocol by default in applications.
- Use group policies to restrict NTLM traffic.
- Use strong passwords and change them frequently. •

— Chris Paoli is associate Web editor for 1105 Enterprise Computing Group's websites. A version of this article originally appeared on Redmond-mag.com, a sister site to GCN.

Researchers find weakness in air-gapped systems

BY MARK POMERLEAU

For many years, common wisdom held that air-gapped systems provided the most secure platform for classified government and financial systems because they are physically isolated from other machines, networks and the Internet. They are only compromised if one is able to gain physical access to the machines.

Or so we thought.

According to Wired, a group of researchers at Israel's Ben-Gurion University have demonstrated a way

to gain access to such systems. Using heat emissions and the thermal sensors built into computers, the researchers were able to siphon data from an air-gapped system. The technique could also lift passwords from air-gapped machines or transmit malicious commands from Internet-connected devices to the machines.

Nicknamed BitWhisper, the attack communicates with the internal system via heat signatures caused by certain commands and translates them into binary code, Wired's Kim Zetter wrote.

Last year, researchers at Ben-Gurion

University demonstrated AirHopper, a method for leaking data from an isolated computer to a mobile phone without using Wi-Fi or Bluetooth. Instead, the app taps radio frequencies to transcribe keystroke data from the computer screen to a phone's FM radio receiver.

Separately, another group of researchers from the Georgia Institute of Technology showed how air-gapped systems can be compromised using keystrokes that capture side-channel signals from computers connected to secure, isolated networks, according to a report on TechRepublic.

However, researchers admit that it is difficult to distinguish useful information from the electromagnetic radiation. •



EDITOR'S NOTE

The more things change...

When tracking public-sector IT, I'm often struck less by the cutting-edge innovations than by the common threads that can span decades.

Yes, of course the cloud – and tech's steady shift toward software-defined everything – represents real change. Mobile truly is transformative, and today's cybersecurity threats are orders of magnitude greater than what governments dealt with just a few years ago. Yet when one looks at the fundamental challenges facing most agencies – balancing mission-specific needs against standardized systems, bolting new technologies onto legacy infrastructure, finding the tools to manage it all – the lessons and stories from long ago often still resonate.

That's one of the great things about a publication like GCN. With more than

30 years of coverage, the GCN archives are a reminder of both the innovative and timeless aspects of government IT.

And today's writers, editors and (often longtime) readers represent a remarkable brain trust that can be built only with years of labor in the government tech trenches.

As GCN continues to evolve, that rich history remains central to the publication – to our ability to separate fads from fundamental shifts and to put the newest technology in the proper perspective.

And GCN is indeed evolving. You'll notice some changes beginning in the pages of this issue, some new bylines complementing the familiar names and some important additions to the masthead on Page 4. Look for more of the same, both in print and on GCN. com, in the weeks and months to come.



You'll also notice that Paul McCloskey, GCN's longtime leader, has stepped into a new role. He is now focusing his talents on writing features for GCN, with a particular emphasis on the technology that makes truly citizen-centric government possible. Look for the first of those stories in next month's issue.

Evolution, of course, is a continuous thing – and one that involves the reader as well. So although we have some definite ideas about GCN for 2015 and beyond, we want to hear yours, too! What topics matter most? What do you wish GCN covered differently? Are there stories you'd rather we hadn't covered at all?

Please go to is.gd/GCN_survey and share your take on GCN. It's going to be a fun few months, and your input can only make it better.

– Troy K. Schneider
tschneider@gcn.com
[@troyschneider](https://twitter.com/troyschneider)

Army seeks alternative for Windows XP support

BY SUSAN MILLER

The Army has been looking for a new source of support for its Windows XP users.

According to a recent request for information, the Army said it would be ending its support contract with Microsoft but wanted to ensure it could still avoid security vulnerabilities on its 8,000 Microsoft Windows XP devices.

After Microsoft ended software updates for the popular operating system in April 2014, the company offered custom support at a cost of \$200 per device for the first year.

After that first year, the cost of custom support was expected to double, Michael Silver, vice president and distinguished analyst in Gartner's mobile and client computing group, told GCN sister publication Redmond last year.

The Army was seeking a company that could provide continued coverage for security updates for vulnerabilities rated "critical" and security hotfixes rated "important" from May 1, 2015, through April 30, 2016, while the Army continued its migration from the outdated operating system.

Moving off XP has not been easy for agencies with legacy applications. Earlier this year, Labor Department CIO Dawn Leaf said her agency still had 10,000 machines running Windows XP, despite efforts to upgrade.

And even though Microsoft has not officially supported Windows XP for the past year, some 250 million machines were still actively using the OS in March 2015, according to market analysts. •

CIS offers pre-hardened resources for Amazon cloud

BY SUSAN MILLER

The Center for Internet Security announced the availability of Amazon Machine Images (AMIs) for a variety of operating systems, which will enable organizations to reduce time, cost and risk in their cloud deployments.

Offered via the Amazon Web Services Marketplace, the AMIs are hardened according to secure configuration baselines prescribed by the center's expert consensus teams. The AMIs are available for organizations using Amazon Elastic Compute Cloud and for six CIS benchmark-hardened systems: Ubuntu Server 14.04 LTS, Red Hat Enterprise Linux 6 and 7, Amazon Linux 2014.09, Microsoft Windows Server 2012 R2 and CentOS 7.

The AMIs, which can be obtained on demand on a computer-hour basis, are the only virtual machines available in the cloud that are preconfigured according to the center's internationally recognized secure configuration recommendations.

"The need for flexible, affordable and secure resources is urgent, and as more organizations move their business into the cloud, the CIS AMIs are a cost-effective way for entities in the public and private sectors to customize solutions that meet their needs," said William Pelgrin, the center's CEO.

CIS produces consensus-based secure configuration benchmarks and content and serves as a cybersecurity resource for state, local, territorial and tribal governments. •



RETRO TECH



GCN has covered government IT since 1982, and the technology started earlier still. To wit: In November 1959, Jonnie Daw performed a final run on Lawrence Berkeley National Laboratory's Univac mainframe as several of her colleagues looked on. (Energy Department photo by Donald Cooksey)

Partnership to enhance GIS tools for public safety

BY MARK POMERLEAU

Two veteran suppliers in the geospatial marketplace have joined forces to help improve the management and precision of the software and solutions that support public-sector emergency response.

Intergraph, a longtime vendor of computer-aided dispatch technology, and geospatial and mapping software developer Esri said they plan to collaborate to “more tightly align their respective public safety response platforms.”

The companies said they would combine efforts to integrate aspects of Intergraph’s computer-aided dispatch system, called I/CAD, and Esri’s

ArcGIS platform to improve both systems.

Computer-aided dispatch and geographic information systems are essential to public safety and incident management. Together, call-taking and dispatch software, maps and spatial data provide agencies with the information they need to provide for and protect the public. Solutions that work together enable agencies to do their jobs more quickly and efficiently.

The first step of the partnership will involve integrating Intergraph’s I/Map Editor for ArcGIS. It will work directly with Esri’s ArcGIS to produce maps in I/CAD and create a more efficient workflow in both systems.

I/Map Editor allows users to build

and edit road networks, maintain address points, and create emergency service zones that represent the available police, fire and emergency medical services.

Among its intelligent mapping capabilities, I/Map enables users to define configuration and legend settings, edit streets for routing, and locate map features based on addresses, streets, common place names or intersections.

“Esri is pleased that Intergraph has chosen to enable its computer-aided dispatch solution to work more directly with our ArcGIS Platform,” said Russ Johnson, Esri’s director of public safety and homeland/national security.

“The combined solution will benefit the computer-aided dispatch market, the public safety GIS community and citizens around the globe.” •

ANY APP ANY NETWORK

GET A FREE TRIAL

Classified Mobility
Run COTS mobile apps on networks up to Top Secret without needing to certify each mobile app.

Unclassified Mobility
Enable BYOD in compliance with the Teleworking Enhancement Act, reduce mobility costs by 80%, secure phones.

"We prefer Virtual Mobile Infrastructure, where a commercial mobile device secure application interacts with data via a virtual phone running in our data center."
— Rob, DoD

For more details and to get a free trial, go to www.hypori.com/GCN

800-789-7104
contact-info@hypori.com

HYPORI

NOAA's no-cost plan to get more data into the cloud

BY TROY K. SCHNEIDER

The Commerce Department is one giant step closer to its goal of unleashing its vast stores of environmental data to the public. That expanded access, however, is likely to come with a price tag attached — not for the agency but for the data's end users.

Secretary of Commerce Penny Pritzker announced a project to bring the National Oceanic and Atmospheric Administration's vast datasets to the cloud and make them broadly available. In partnership with Amazon Web Services, Google Cloud Platform, IBM, Microsoft and the Open Cloud Consortium, NOAA will seek to more effectively distribute its data to create innovative products and services.

The agency gathers more than 20 terabytes of environmental data every day from a wide variety of sources, including Doppler radar systems, weather satellites, buoy networks and real-time weather stations. However, right now only a small percentage of that data is easily accessible to the public. As the demand has increased, the agency said it is imperative to find ways to effectively and efficiently distribute that data to decision-makers and industry.

Accordingly, last year NOAA issued a request for information asking for suggestions on ways to more effectively distribute its data. The process led the agency to sign cooperative research and development agreements with its new partners.

According to a 2013 McKinsey Global Institute report, open data could add more than \$3 trillion in total value annually to the education, transportation, consumer products, electricity, oil and gas, health care, and consumer finance sectors worldwide. If more data could be efficiently re-

leased, organizations would be able to develop new and innovative products and services to better understand the planet and keep communities resilient during extreme events, Commerce officials said.

The new project's website states that the industry partners "are tasked with distributing the original data content and may recover their costs for that distribution. They may decide to provide multiple data access and distribution methods...and these different access methods could potentially result in different levels of cost for different offerings." •

FROM THE LABS

IBM positions tape for cloud storage

BY SUSAN MILLER

IBM researchers have figured out a new way to squeeze even more data onto low-cost magnetic tape, a breakthrough the company said is an 88-fold improvement over the latest industry-standard magnetic tape product and a 22-fold improvement over IBM's current enterprise-class product.

The company demonstrated an areal recording density of 123 billion bits of uncompressed data per square inch, which is the equivalent of a 220 terabyte tape cartridge that could fit in the palm of your hand, IBM Research said.

Although tape has traditionally been used on premise for video archives, backup files and data retention, off-premises applications are beginning to emerge in the cloud because of the storage medium's low cost.

IBM Research scientists are exploring the integration of tape technology with current cloud object storage systems such as OpenStack Swift. The new approach would enable object storage on tape and allow users to seamlessly migrate cold data to an extremely low-cost, highly durable cloud-based storage tier for backup or archival use, the company said.

The history of tape at IBM

	2006	2010	2015
Areal density (bits per square inch)	6.67 billion	29.5 billion	123 billion
Cartridge capacity	8 terabytes	35 terabytes	229 terabytes
Number of books stored	8 million	35 million	220 million
Track width (micrometers)	1.5	0.45	0.14
Tape thickness (micrometers)	6.1	5.9	4.3
Tape length (meters)	890	917	1,225

Source: IBM

Progress toward an identity ecosystem

FIRST, A BIT OF GOOD NEWS. The National Institute of Standards and Technology met its March 16 deadline to produce baseline requirements for its Identity Ecosystem Framework (IDEF), the bedrock document aimed at revving up a move to more secure credentials that are interoperable across the Internet and a big advance toward the holy grail of a single, Internet-wide sign-on for individuals.

The first version of the IDEF will be launched sometime this summer. By defining the overall set of interoperability standards, risk models, privacy and liability policies needed to fully describe an identity-based ecosystem, both government and private organizations will be able to see how their identity efforts match up to IDEF's requirements.

IDEF springs from the Obama administration's National Strategy for Trusted Identities in Cyberspace (NSTIC), which launched in 2011. The intent was for the government, through NIST, to bring together the private sector, advocacy groups and government agencies to create an environment that replaces the current one, which uses many different kinds of authentication to access online services.

NIST has a rundown of

the kinds of things such an identity ecosystem can be used for, and it does seem enticing when compared to today's authentication systems. IDEF by itself won't be enough, of course, because such an ecosystem depends on a broad level of trust

NSTIC initiative at the end of April.

"If we have easy-to-use identity solutions that enable secure and privacy-enhancing transactions, we can enable citizens to engage with government in more meaningful ways,"

The key to online trust

23,922

keys and certificates on average per company

\$1,000 price tag

for a stolen certificate in the underground marketplace

54%

of organizations do not know where all their keys and certificates are located, up from 50% in 2013

Sources: Ponemon Institute and Venafi

among parties, and that will be a huge nut to crack.

But identity is increasingly the focus for future security platforms because — as has become obvious over the past couple of years — traditional network, data and systems protection techniques are of limited use against the focused efforts of today's more sophisticated cyber criminals.

Beyond security, a strong identity solution will also act as an enabler, said Jeremy Grant, who stepped down as leader of the

Grant wrote in an October blog post. "With a vibrant identity ecosystem — where citizens can use the same credential to access services at multiple sites — we can enable a wide array of new citizen-facing digital services while reducing costs and hassles for individuals and government agencies alike."

The trust needed to build that ecosystem should be at the top of the list of requirements, which is made clearer by a report from the Ponemon Institute that looked at the use of security

certificates and cryptographic keys around the world and found rampant abuse.

In the institute's survey of more than 2,300 security professionals, 58 percent believed their organizations needed to do better in securing certificates and keys in order to stop man-in-the-middle attacks. More than half of the respondents didn't even know where all their certificates and keys were located.

In the past two years, the number of keys and certificates deployed on Web servers, network appliances and cloud services grew to almost 24,000 per enterprise, the survey found. The major fears respondents listed were of a "cryptopocalypse" and misuse of mobile certificates, all of which could cost organizations \$53 million over the next couple of years, up by 51 percent from 2013.

NIST has already funded four rounds of pilot programs aimed at developing the technologies needed for the identity ecosystem, for a total so far of around \$30 million. According to Grant, the intent is that by 2019 consumers "will think it's quaint" when online service providers ask them to create a new account, and the NSTIC program office will have become "a blessed memory." •

SNAPSHOT

CYBERSECURITY

Encryption is Tagged for Data Security

While the security of the cloud overall is a concern for users, the hybrid cloud poses particular problems because data will be used in both a private cloud, where tight security and oversight can be applied, and with the public cloud component where security is less certain. Securing data in both kinds of cloud, and when moving data between them, is a major priority.

A recent survey of the 250,000-plus members of LinkedIn's Information Security Community found a range of preferences for technologies to protect data in the cloud, including access control, intrusion detection and prevention, firewalls and log management and analysis. But, encryption—for both data at rest and in motion—was the clear winner.

That said, it's not a case of simply encrypting all data since encryption, which also means decryption at some point, adds complexity and overhead management costs. Sensitive data obviously needs to be encrypted, and that may even be required for compliance reasons, but other data that's considered not so sensitive could be left unencrypted.

The Cloud Security Alliance says a range of factors has to be understood when considering encryption:

- Encryption should be implemented for data at rest, in motion, and in use. Use data-centric encryption for

Breaking Through the Security Cloud



For more coverage of cybersecurity issues – including hybrid cloud, identity and access management and encryption and compliance – go to

GCN.com/2015SNAPSHOTCYBERSECURITY

unstructured files that must be protected or stored in the cloud, or use encryption embedded into the file format whenever practical to apply protection directly to the files.

- Don't forget to protect files that are often overlooked but that also can hold sensitive information, such as log files and metadata.
- Use "sufficiently durable encryption strengths" that comply with the same standards used for encrypting files that are internally maintained within the enterprise. The National Institute of Technology and Standards (NIST) recommends encryption that's FIPS 140-2 compliant should be used.
- Understand how all encryption/decryption keys will be managed for the entire lifecycle of the data, and whenever possible the data owner should control the encryption keys and not the cloud provider. That ensures the owner has access to critical information both now and in the future.

Agencies should not assume that simply choosing cloud providers that are certified through the Federal Risk and Authorization Management Program (FedRAMP)

process will fully protect them when it comes to encryption and key management. FedRAMP refers only to a baseline of necessary security controls, so organizations should expect to have to specify key management through the service level agreements they negotiate with cloud providers.

Where data is encrypted and decrypted is also important. The user encrypting data before it's sent to the cloud provides the highest level of security since it ensures protection even if something happens to the data on the way there, or when it arrives. It also means that data, when it's stored in the cloud, can only be decrypted by the user if the keys are always controlled by the user.


However, encryption at this level is a complicated issue. Large IT departments may be capable of doing it, but smaller ones won't have the resources, which is where managed security services will prove valuable.

There are alternatives to encryption such as data anonymization, where, for example, personally identifiable or sensitive information can be stripped out of the data before it's processed. •



Federal Solutions on a Mega Scale.

FedRAMP Compliant. 24x7x365 Secure.

 **FedRAMP** Whether it's building infrastructure, consolidating data or moving apps to a virtualized platform, QTS delivers what agencies want most: FedRAMP compliance and best-in-class physical and logical security. That's a mega data center that agencies can trust.



Data Centers Powered by People

qtsdatacenters.com

Atlanta-Metro GA | Atlanta-Suwanee GA | Chicago IL | Dallas-Fort Worth TX | Jersey City NJ | Miami FL
Overland Park KS | Princeton NJ | Richmond VA | Sacramento CA | Santa Clara CA | Wichita KS

Early earthquake warnings? There's an app for that.

FOR MANY OF US, smartphones have become the primary tool for organizing our lives. Scientists at the U.S. Geological Survey are trying to turn them into tools for not just organizing but *saving* lives.

USGS geophysicists are developing earthquake early-warning systems that can grab data from smartphones and pass alerts to those in the path of a quake's shock waves.

According to USGS geophysicist Sarah Minson, the idea for smartphone crowdsourcing came out of the agency's work on the ShakeAlert early-warning system that is being deployed on the West Coast using data from seismic instruments.

A team member suggested using GPS to supplement the data from the agency's scientific instruments. "It was really pretty spontaneous," she said. "People hadn't really looked at consumer GPS before, probably because the accuracy in terms of your location of GPS in your phone is really quite terrible. But its ability to sense your change in position from point A to point B is really quite good."

In fact, the team determined that the GPS available in smartphones is capable of detecting earthquakes with a magnitude of

7 or greater. Using specific software, a smartphone can transmit an earthquake's detected location and magnitude to USGS, which can then send alerts to others in the path of the shock waves.

"You can transmit information at the speed of light," Minson said. "The damaging secondary waves

to be doing during an earthquake, such as a doctor operating on a patient."

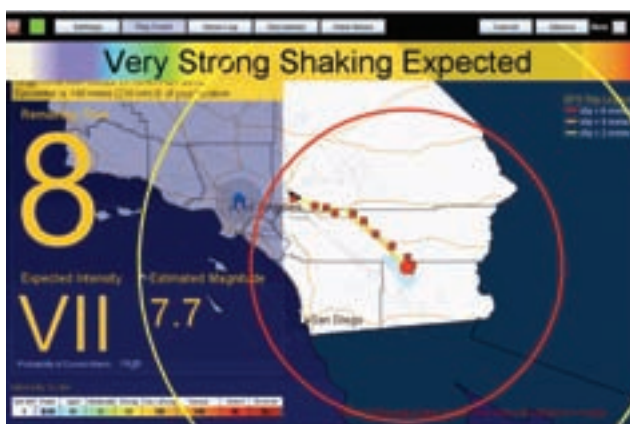
Although Minson's team has proved the viability of using smartphones in an early-warning system — and published their results in the April 10 edition of the American Association for the Advancement of Science's new journal *Sci-*

that we are building with scientific instruments." But she added that many areas of the world have no early-warning system at all, so even the limited sensitivity of smartphones can provide a critical advantage.

Another hurdle is that consumer smartphones don't allow direct access to GPS data. "The hardware in the phone is great, but the OS usually doesn't let you actually access that data," Minson said. Therefore, smartphone manufacturers would have to cooperate before volunteers' smartphones could be looped into a crowdsourced early-warning system.

In the meantime, the USGS team just received funding from the U.S. Agency for International Development for a one-year project to develop a smartphone-based earthquake early-warning system in Chile. According to Minson, the project will not use crowdsourced data.

"These will be phones that we own and dedicate full-time to early warning," she said. "But it will give us an opportunity go through the exercise, providing the software for the phone, pulling acceleration data off the phone, pulling GPS data off the phone and [bringing] the data back for analysis." •



The ShakeAlert system has been sending warnings like this one to test users' smartphones since 2012. Now those phones can serve as seismic sensors as well.

— S waves — travel about 3.5 kilometers per second. That's fast but not as fast as the speed of light."

Although the warning might reach people only seconds in advance of the earthquake, those seconds can be critical. "If you get a warning, you can get under your desk and hold on," she said. "A few seconds is also long enough to stop doing something you don't want

ence Advances — there are currently some practical limitations.

First, of course, is that earthquakes with a magnitude of less than 7 cannot be accurately detected using the current GPS in consumer smartphones.

As a result, Minson said, "in the United States, the system would be at most a supplement, augmenting the early-warning system



4 steps to smart network modernization

AFTER YEARS OF POST-PONING network upgrades due to tight budgets, public-sector IT managers are in the process of modernizing legacy infrastructures. IT professionals need to address this challenge in two dimensions: by increasing raw performance and efficiency through automation and ensuring that everything remains highly secure.

Modernization can alleviate many IT pain points, including provisioning new services with fewer resources and more efficiently managing larger scale while helping agencies become more streamlined and agile.

Here are four steps that can help government IT managers begin the modernization process:

Step 1: Implement automation. Automation enables high performance, greater efficiency and agility while ensuring carrier-class reliability with six nines of availability (99.9999 percent) and far less manual intervention.

Manual network management can be error-prone and costly, and it simply does not work well in today's cost-constrained, short-staffed environment. Automation reduces the need for IT managers to actually touch the network, allowing them to focus on areas that truly highlight their skills, such as

the creation of new applications and services.

Further, automation solutions can help IT professionals gain an unprecedented level of insight into everything that's happening on their networks.

Step 2: Embrace open standards. Effective network modernization and automation require a highly flexible environment built

quickly and resulting in overall improvements in threat response.

It's important that network administrators carefully consider their encryption methods and ensure that they adhere to certifications, particularly as commercial software becomes more widely used in government. Such solutions are appealing because

maintenance and support. In fact, many organizations that embark on network modernization initiatives see total-cost-of-ownership savings of as much as 30 percent. Some agencies experience rackspace savings of 72 percent, cooling savings of 67 percent and per-port wattage savings of 56 percent. We've also seen maintenance costs drop by

Effective network modernization and automation require a highly flexible environment built on open standards and best-of-breed solutions.

on open standards and best-of-breed solutions. From a technology standpoint, an open approach allows organizations to build highly agile and scalable networks that offer greater flexibility. They no longer must (or even should) rely on proprietary technology, which creates vendor lock-in and limits the ability to take advantage of scale and innovation. From an economic standpoint, open standards also promote greater competition, which helps keep costs down.

Step 3: Automate and ensure security. Automation can immediately alert IT professionals to threats, allowing managers to react

they can be procured and deployed more quickly than custom-made technologies.

Fortunately, many agencies are already displaying a commitment to network modernization security, as exemplified in federal efforts such as the Department of Homeland Security's Einstein program and the Defense Information Systems Agency's Joint Regional Security Stacks, which are sound and modernized security systems designed to limit and consolidate Internet access points.

Step 4: Reduce total cost of ownership. All this effort can culminate in significant savings in terms of network

51 percent and software-licensing costs fall by 27 percent. Those improvements have proven to be continuous and dramatic, even as agencies become larger in scale.

Network modernization provides benefits for just about everyone. Agencies get a faster, more efficient and streamlined network, while IT professionals get more time, fewer headaches and assurance that their networks are secure, up to standards and seamlessly operating 24/7. •

— Brian Roach is vice president of Juniper Federal and managing director of worldwide government at Juniper Networks.



The insider threat in employees' pockets

Five experts offer advice on managing risks when agency employees bring their own mobile devices to work

Although organizations like the FBI might be restricting their employees to agency-issued mobile devices, a growing number are embracing at least some degree of a bring-your-own-device environment. But agencies that choose that path must figure out how to balance security with usability.

GCN asked several mobility experts to share their advice on how agencies can support BYOD while protecting data from insider threats, accidental and otherwise.

BY WILL KELLY

INSIDER THREAT

POLICY

"It's about governance first," said Susie Adams, chief technology officer for Microsoft's Federal Business Practice. "You have to carefully balance information security classifications."

Agencies must develop an understanding of the sensitivity of their data. She advised classifying data as low, moderate or high impact.

"You also have to balance the policies that govern access to the data," she added. "Just in general: Who should be able to access that data?" The answer might depend on the trustworthiness of the device itself.

"Not all devices are created equal," Adams said. "We know it depends on the version of the device, how old the device is, does the device have malware on it? Has it been compromised?"

MANAGEMENT TOOLS

"There are a few considerations when implementing a BYOD program," said Paul Brubaker, director of government solutions at VMware's AirWatch. "What's most important is to partner with an [enterprise mobility management] solution that can accommodate the broad range of available devices and applications while also [giving] IT the security tools they need to securely deploy and manage this breadth of devices and applications."

In an email interview, Brig. Gen. Kevin Wooton, principal deputy director of integrated operations at Air Force Space Command, said a commitment to a risk management framework is essential.

"Any attempt to translate a traditional 'risk-averse' security model will likely make the devices so locked down as to be useless," he wrote. "This doesn't mean you don't want your security folks to be muted or to give them short shrift, but decision-makers must understand rationale, modern security capabilities within mobile device management 'sandboxes' and their own agencies' risk

tolerance. Key to that will include not treating all data the same with regard to sensitivity and then drawing appropriate lines in the sand that maximize the user experience while incorporating the critical security requirements."

Wooton concluded by saying, "If one doesn't understand the already value-added security coming from modern mobile device makers and the MDMs, typical agencies will have trouble finding the happy medium between security and usability."

Chris Roberts, vice president of the worldwide public sector at mobile security platform provider Good Technology, took a broader view.

"I think usability doesn't just mean the native applications on the device," he said. "It means [asking] what sort of a password do I need to put in just to get access to my phone? Is that more complicated today than it was yesterday when this device fully belonged to me? It means [asking] would I possibly lose data or applications on that device? There are a number of things that affect usability beyond the ease of use, which is why they got the devices in the first place."

Justin Marston, CEO of Hypori, a startup company that developed a virtual mobile infrastructure platform, offered another usability/mobile security balancing option.

"What we've seen the government actually doing...is enabling dual personas but doing it with enterprise-owned phones," Marston said. "They've been trying Samsung Knox, they've been trying Good, and you have this incredibly ironic situation where you have an enterprise-owned phone provided by [the Defense Information Systems Agency] under the [DOD Mobility Unclassified Capability] program that lets you do email and calendar in a special container, the Good container, and that's all you can do."

He added that users can download any app on the personal side of a



"I think usability doesn't just mean the native applications on the device. It means [asking] what sort of a password do I need to put in just to get access to my phone?"

**CHRIS ROBERTS,
GOOD TECHNOLOGY**

INSIDER THREAT



“What we’ve seen the government actually doing...is enabling dual personas but doing it with enterprise-owned phones.”

JUSTIN MARSTON, HYPORI

government-owned device, but the government side maintains a “BlackBerry experience.”

BRINGING IT ALL TOGETHER

Ensuring mobile security in a government enterprise requires an approach that brings together MDM, containerization or virtualization, mobile application management (MAM) to counter risky mobile apps, identity management and even a tool for securing agency data from insider threats.

Wooton recommended that agencies “push the MDM vendor in this area and make sure the contractual relationship takes advantage of the MDM’s capabilities to do just this. Most of the major ones are looking at this issue and offer capabilities that can provide awareness and supplement or create coverage in the insider-threat arena.”

To mitigate insider threats, he said agencies should monitor the usage data from their MDM servers and note the increased segregation of native applications outside the MDM and the greater availability of mission applications within the MDM’s control. He also said contracts with MDM vendors should include requirements that they upgrade their capabilities to counter insider threats.

“The risk associated with maximum usability of mobile devices, even within the BYOD environment, almost always outweighs the danger of employees trying to circumvent device or agency policies,” Wooton said. “By pro-

viding an acceptable-risk approach, an agency has a much greater opportunity to increase productivity (a given with a workforce using mobile devices) while still being able to monitor threats, both from the inside and external.”

Brubaker agreed. “The key to mitigating and monitoring insider threats is setting up and enforcing policies,” he said. For example, the IT staff can institute an action that automatically removes agency data from a rooted or jailbroken mobile device.

Roberts added that “in terms of securing data on the device, I think that containerization is absolutely the right way to go. There are a couple of models that are emerging right now for how to do this, and containerization and virtualization seem to be the two dominant ones being discussed in the federal space. I don’t see people discussing that MDM, pure mobile device management alone can work to give you a balance between usability and security.”

Adams, meanwhile, advocated that agencies move from device-centric to user-centric security and establish a platform for identity management.

“The devices may change, but the users are going to stay the same most of the time,” she said. “Maintaining control over employee access to data regardless of the device becomes probably the most important thing you need to do, especially if you are going to enact a BYOD policy.” •

— Will Kelly is a freelance technology writer based in Springfield, Va.



“What’s most important is to partner with an [enterprise mobility management] solution that can accommodate the broad range of available devices.”

PAUL BRUBAKER, AIRWATCH

CALL FOR NOMINATIONS

Nominate outstanding federal and state & local government IT teams who have made significant contributions to the performance of their agencies.

Winners will be featured in the October issue of *GCN* and at the GCN Awards Gala celebration on October 14, 2015.

Deadline for nominations:
MAY 22, 2014

**Submit your
nomination
today!**



gcn.com/gcnawards



Houston firefighters bring digital doctors on calls



HOUSTON FIRE DEPARTMENT

City officials are cutting down on unnecessary emergency room visits by connecting residents with a doctor in their homes via a tablet-based video chat app

BY CARRIE FEIBEL

It seems as though every firefighter you ask in Houston can rattle off examples of 911 calls that didn't even come close to being life-threatening.

"A spider bite that's two or three weeks old," says Jeff Jacobs.

"A headache or a laceration," says Ashley Histand.

Tyler Hooper sums it up: "Anything from simple colds to toothaches, stubbed toes to paper cuts."

The Houston Fire Department logged more than 318,000 incidents last year, but only 13 percent of them were fires. The rest were medical calls, making a career in firefighting seem more like a career in health care.

Hooper drives the busiest ambulance in the city, based in a southside firehouse three miles east of the old Astrodome. Last year, it answered more than 5,000 calls, and some of them were pretty frustrating, he says.

"We make a lot of runs to where it's not an emergency situation," he says. "And while we're on that run, we hear another run in our territory. It could be a shooting or a cardiac arrest, and now an ambulance is coming from further away, and it's extending the time for the true emergency to be taken care of."

Hooper says the area his ambulance serves has many lower-income residents who don't have insurance. But even those who do have coverage don't always have a regular medical provider or a car to get to appointments.

"They don't know they could walk into certain clinics without appointments or without insurance," he says. Calling 911 is "just what they've always done or what they've been taught."

City officials hope to break that

cycle with a program designed to connect those residents with a doctor in their homes, via the emergency medical technicians and firefighters who answer the calls.

On a recent morning, Hooper drove through the rain to answer a call at an apartment complex near William P. Hobby Airport. Susan Carrington, 56, sits on her couch in a red tracksuit, coughing and gasping.

"Have you seen your doctor?" Hooper asks. Carrington shakes her head.

"No? Okay," Hooper says.

Carrington doesn't have a regular doctor. She called 911 because she got "scared." It hurt to breathe, and the cough had been bad for four days, she says. In January, she had visited an emergency room for similar symptoms and had been given an antibiotic for pneumonia.

"Based on your vital signs, everything looks stable to us," Hooper says. "Your lungs are clear, your blood pressure's great, your pulse is good. Everything looks good."

Previously, Hooper might have taken Carrington to the emergency room, just to be safe. But now he has an alternative: a computer tablet loaded with a video chat application.

He launches the app, and Dr. Kenneth Margolis appears on the screen. He is seated in the city's emergency management and 911 dispatch center, almost 20 miles away. Hooper swivels the laptop screen toward the couch, bringing doctor and patient face-to-face.

"Ms. Carrington, I'm a doctor with the fire department," Margolis begins. "So you're having a cough and feeling weak and having some trouble breathing, is that right?"

"Yes, sir," Carrington says.

"And it hurts when you breathe and cough?"

"Yes."

MOBILE

The questions continue, with Margolis able to watch Carrington's face and reactions.

Margolis agrees an emergency room visit isn't necessary. Instead, he schedules an appointment for her at a nearby clinic for the next morning. He also arranges a free, round-trip cab ride.

'A NOVEL IDEA'

The intervention is known as Project Ethan, an acronym for Emergency TeleHealth and Navigation. It launched at all the city's firehouses in December 2014.

"I think a lot of people are very surprised that they can talk to a doctor directly and have been very happy with that," says Dr. Michael Gonzalez, the program's director and an assistant professor of emergency medicine at Baylor College of Medicine.

Gonzalez says the idea is to direct patients such as Carrington to primary care clinics instead of automatically bringing them to the emergency room, where ambulances can be tied up for precious minutes — even an hour — as EMTs do paperwork or wait for a nurse to admit the patient.

By diverting some patients to clinics, ambulances can stay in the neighborhoods, and overloaded emergency rooms can focus on urgent cases.

Across the country, emergency medical services can't keep up with the demand, said Dr. Richard Bradley, chief of the Division of Emergency Medical Services and Disaster Medicine at the University of Texas Health Science Center in Houston.

"I think that the Ethan approach is really a novel idea and really quite good," said Bradley, who is not involved in the project. "One of the advantages of having an emergency physician on the other end of the line is you've got someone who is best suited to be able to look for subtle indicators of what may be an emergency."

Other cities have experimented with programs to relieve the burden on

emergency responders. Some programs analyze 911 data to identify "super-utilizers" and send teams into their homes to arrange needed services such as transportation and follow-up care after hospitalization. Those home-visit programs are often called community paramedicine, especially if they use paramedics to troubleshoot the medical issues.

Other cities have sought to divert 911 callers by using hotlines staffed by nurses. Houston tried that approach,

TECHSTATS

PROJECT ETHAN IN BRIEF

Project Ethan is a **Medicaid Section 1115** demonstration project funded by the Centers for Medicare and Medicaid Services.

More than **100 Houston fire stations** are now using the system, which relies on **Panasonic Toughpad tablets** and a **Verizon commercial network** for in-the-field connectivity.

An on-duty physician mans a base station — a standard PC desktop, coupled with a **Cisco EX90 telepresence system** — in the Houston Emergency Center/911 call center.

Field personnel and the Ethan physician create a medical record for each visit, and the entire audio/video encounter is stored as well. The Houston team is still refining its **storage-area network solution**.

— GCN Staff

but firefighters complained that it took too long, and patients never spoke directly with a nurse.

AN ALTERNATIVE TO THE ER

Gonzalez says a key component of the telemedicine program is that it doesn't simply turn patients away from the emergency room. It offers an alterna-

tive — a doctor's appointment that day or the next, and transportation there and back. City health workers also follow up with Ethan patients to identify other issues that might be leading them to use 911 inappropriately.

The program costs more than \$1 million a year, but the city has secured some grants and federal funding to help cover those expenses. And Gonzalez predicts it will eventually reap far more in savings for the region's overburdened emergency system.

A 2011 study of Houston-area emergency rooms revealed that 40 percent of visits were for problems related to primary care. Treating those problems in an emergency room cost, on average, \$600 to \$1,200 per visit, compared to \$165 to \$262 if the patients had been treated in outpatient clinics. If all those emergency visits could have been diverted to clinics, the savings would have been more than \$2 million.

Firefighter Alberto Vela recounted the case of one woman who called 911 as many as 40 times a month, often for very simple things, such as getting a prescription refilled. On one of those calls, he tried the video chat with her.

"I was so surprised by how long it took. It took maybe six to seven minutes, tops" to deal with her issue, Vela said. "It was awesome, and then we left the scene and were making more calls after that."

Vela believes the program helped the woman find a regular clinic and transportation because he hasn't visited her home for months. "I would ask others shifts, 'Hey, did you meet this lady?'" The other shifts said they hadn't heard from her either," Vela said. "And that's very rare. So it's working." •

Carrie Feibel is the health and science reporter for Houston Public Media. This article originally appeared in Kaiser Health News, a nonprofit national health policy news service. The story is the result of a reporting partnership among NPR, Houston Public Media and Kaiser Health News.



CODE BY THE BAY

Visual Studio Live! returns to **San Francisco June 15 – 18** for the first time since 2009! Bring on the cable cars, Chinatown, Pier 39, Alcatraz, and the Golden Gate Bridge. We can't wait to Code by the Bay!

Join us as we explore the latest features of Visual Studio, JavaScript/HTML5, ASP.NET, Database Analytics, and more over 4 days of sessions and workshops. Code with industry experts, get practical answers to your current challenges, and immerse yourself in what's to come on the .NET horizon.

DEVELOPMENT TRACKS INCLUDE:

- Visual Studio / .NET
- Web Development
- Cloud Computing
- Mobile Client
- Database and Analytics
- Windows Client

REGISTER BY MAY 13 AND SAVE \$200!



Scan the QR code to register or for more event details.

Use promo code **SFMAY1**

What it takes to build DOD networks at scale

As the Army consolidates operations at two South Korean bases, Col. Mollie Pearson's team is tackling some daunting IT challenges

BY ADRIENNE ANDERSON

Building a plane while flying it seems simple compared to the Yongsan Relocation Plan and Land Partnership Plan. The Defense Department's largest base-relocation program seeks to "right-size" the U.S. and South Korean forces.

The project consolidates U.S. forces into two primary hubs in South Korea — U.S. Army Garrisons Humphreys and Walker — and involves moving 20,000 people and consolidating 104 posts, camps and stations without disrupting IT services.

Col. Mollie Pearson's team is responsible for building the network infrastructure to provide data, voice and video to more than 500 buildings at Camp Humphreys. The \$828 million project requires the migration of 65 command, control, communications, computers and intelligence (C4I) systems; a new communications center; and roughly 20,000 miles of conduit and cable.

Besides creating a consolidated footprint for U.S. forces, the project will provide new and enhanced capabilities for the IT transport infrastructure and command centers for the Joint Information Environment, which is a shared IT infrastructure and enterprise services approach designed to increase security and improve IT efficiencies.

As part of the transition to Camp Humphreys, Pearson's team is tasked with modernizing and migrating exist-

ing systems and services, and installing new ones without disrupting classified and unclassified communications.

Pearson, who is product manager for

Power Projection Enablers in the Army's Fort Belvoir, Va.-based Program Executive Office for Enterprise Information Systems, cited several challenges that



Col. Mollie Pearson and Lt. Col. Eddie Galarza met with representatives from the U.S. Forces Korea Relocation Office during an Industry Day for DOD's largest base-relocation plan.

such a project presents, including a half-day time zone difference between the two countries.

The project is also highly visible because it supports government-to-government agreements critical to both countries' interests, she added.

"The relationship between these nations is vital to both," Pearson said. They're meeting security challenges they face today and "evolving to ensure [they] can meet any potential challenge in the future, together."

To stay on schedule, she said, officials have built contracts "in a way so work can be done [and paid for] when all are ready. This saves costs and is a more efficient way of contracting work."

The team has also been integrating the C4I side of the project throughout

the design, construction and transition, which results in fewer delays, she said.

IT work is also contracted in pieces. "For example, we have an outside plant contract with one industry partner and another partner that will be doing implementation for general facilities and C4I-intensive facilities," Pearson said. "This enables them to integrate their delivery approach and standardize the design to gain efficiencies with costs and schedule."

Because a flight to South Korea takes about 14 hours, Pearson said she established a forward team in that country to help manage the project — a boots-on-the-ground approach that enables the team to be more efficient and save money.

"Projects always have their own set

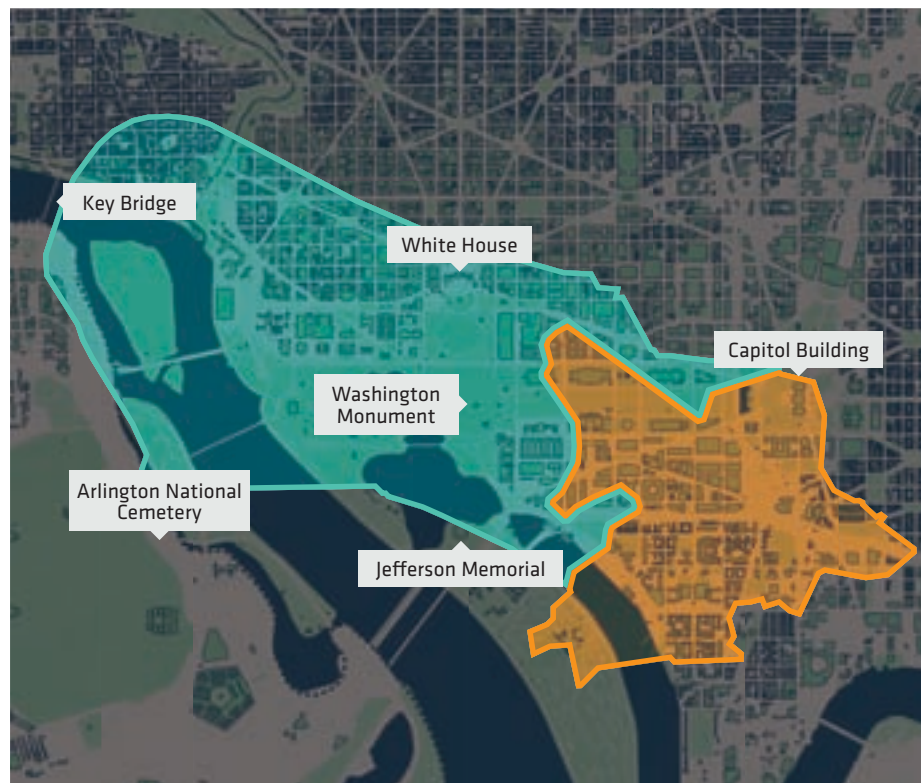
of challenges," she said. "It is key that projects are actively managed as close to the physical location of the project as possible to minimize such challenges."

However, "merging offices and teams is not an overnight project, especially when there is a significant time zone difference," she added. "It takes a strong, dedicated, smart team of individuals who have the patience and willpower to overcome challenges inherent with such a task."

Her said her team has risen to the challenge. "I've found everyone usually has something to offer," Pearson said. "What's important is you seek what [people are] good at and put them in that role. Most will amaze you if you put them in the right job." •

— *Adrienne Anderson is a freelance writer based in northern Virginia.*

The USAG-Humphreys expansion plan



Think your agency's network project is big? Try wiring a 3,500-acre installation to serve some 17,000 personnel — and managing it from 11 time zones away.

The IT portion of the U.S. Army Garrison-Humphreys expansion plan is an \$828 million effort that involves:

- 140,000 voice and data outlets
- Connections in more than 500 buildings
- Migration of 65 C4I systems
- More than 15,500 miles of conduit
- Nearly 5,000 miles of cable

To put the size in perspective, we've superimposed the outline of the current base (orange) and its expansion (green) on a map of downtown Washington, D.C.

Ebola modeling flows into flood app

Virginia Tech graduate students built a tool that integrates local open data to aid in emergency response

BY STEPHANIE KANOWITZ

When natural disasters hit, responders depend on quickly having accurate geospatial data to help them coordinate rescue efforts, and they often turn to the Federal Emergency Management Agency or the American Red Cross. But the next time a flood hits Hampton Roads, Va., the region will be better prepared to handle it, thanks to a mapping model from an unlikely source: Virginia Tech's Virginia Bioinformatics Institute (VBI).

The model was created to help health workers in Ebola-stricken parts of Liberia figure out where to best establish central resource centers. It used information on demographics, family structures, travel patterns and activities to help model what would potentially happen as the disease spread. With those models, VBI helped the Defense Department quickly find the best locations for emergency treatment centers by looking at the road infrastructure in West Africa and identifying hot spots where additional outbreaks were considered likely.

The eureka moment came when two graduate students in the university's genetics, bioinformatics and computational biology program realized they could adapt the Ebola model for use in local emergency response to flooding. After about 30 volunteer hours during an open-data hackathon, they had their solution.

The team modified the Ebola model by adding a 100-year storm surge — or a 9-foot rise in sea levels — to see how roads would be affected, said Pyrros Telionis, who is pursuing a doctorate in computational epidemiology and a post-graduate certificate in geospatial analysis.

"You're trying to decrease the distance from each member of the population to the nearest resource [so] that the population as a whole has reduced

travel time," said James Schlitt, also a Ph.D. candidate in the program.

For the model, the team pulled open data from various resources. OpenStreetMap provided the road network, population density was calculated using Census Bureau information, and elevation data came from the U.S. Geological Survey.

Meanwhile, Schlitt built a scraping tool to find the locations of schools and parking lots of big-box stores, which



Graduate students came up with a flood-response app by adapting a tool used to predict the spread of Ebola in Liberia. They incorporated a variety of data to identify locations for post-flood resource centers in Hampton Roads, Va.

can serve as hubs after large-scale flooding disasters because they offer tools, hardware, food, water and ready access by highway.

“They’d be the most active places in town,” he said.

The flood model uses the same basic calculation as the Ebola-focused one, Telionis said. If responders had to pick one place to set up a resource center, it should be based on travel time for the local population.

Road segments below the 9-foot waterline were mapped based on the assumption that vehicles would only be able to travel on them at one-third their normal speed because of debris, Schlitt added.

“A lot of the challenge was adapting the newest data source into our workflow,” he said. “Our hope is if there was a major disaster scenario, even

with three hours’ notice, we could have these locations.”

The team plans to continue streamlining the model and find ways to apply it to other situations in which data can be used to explain the geographic distribution of the damage from, for example, forest fires and blizzards.

Virginia Tech’s first Open Data Day and CodeAcross events were held in February as part of Code for America’s annual events of the same name. The initial meeting included roundtable discussions on how open data can be helpful in journalism, public policy and mapping, said Ben Schoenfeld, the university’s Code for America brigade captain.

For instance, from the mapping discussion, the university’s Center for Geospatial Information Technology found it could use Virginia Department

of Transportation crash data to make a map of accidents.

“We are interested in building tools that take that data and mash it up with other data or visualize it in really interesting ways,” Schoenfeld said. “The state has a lot of data that would be really important for the cities and towns to have, but the government doesn’t share it.”

He said he’d like to see the flood model included at an IT conference hosted by Virginia’s governor in the fall.

“This project from these researchers is an amazing example of what can really happen when people step up and volunteer to help government,” he said. “For us, this is really a longer-term goal of developing these ideas, having projects that really go beyond a hackathon...and become tools that are really useful for the community.” •

Fellowship Opportunity

A fellowship opportunity is currently available with the Office of Strategic Programs (OSP) within the Office of Business Informatics (OBI) at the Center for Drug Evaluation and Research (CDER) of the U.S. Food and Drug Administration (FDA).

The Risk-Based Quality Assessment & Inspections Fellowship project is administered by ORAU for the Oak Ridge Institute for Science and Education program.

The objective of this research project is to transform drug quality review and inspection management processes by infusing modern risk-based regulatory approaches and tools in submission review, manufacturing facility assessment, and surveillance of marketed drugs and therapeutic biologics.

The selected participant will support the implementation, expansion and evaluation of the informatics quality platform by utilizing methods from the fields of computer science, decision science and operations research. One specific area of focus is identifying means to improve data quality of a facility or process. The participant will apply modern tools for decision analysis, and visualization of big data and data management solutions to analyze research and develop the application to FDA’s regulatory review processes.

- A Bachelor’s, Master’s or Doctoral degree in a computer science, health informatics, operations research or a related field received within the last five years.
- Students currently pursuing a Master’s or Doctoral degree in the aforementioned fields at an accredited U.S. college or university are also encouraged to apply.
- Demonstrated informatics and analytical skills and experience in analyzing and documenting complex processes are desired.

To be considered, please send a current CV/resume to the attention of **CDEROSPRecruitment@fda.hhs.gov** and reference source code FDA15OBI008 in all communications.

Calculating open data's real ROI

A new formula helps agencies weigh the costs and benefits of making their data available to the public

BY STEPHANIE KANOWITZ

The White House's 2013 mandate to open more data to the public has spurred many agencies to act, but releasing data just to meet requirements doesn't mean the data will be useful.

Fortunately, a new formula can help agency IT managers decide which datasets are worth opening.

"It was hard to have a conversation about open data because lots of people have biases," said Arnaud Sahuguet, chief technology officer at New York University's Governance Lab. "People want government to open more data, government is a little bit scared of opening the data, and private companies, honestly, they have no clue. So we were trying to find an icebreaker where you start the conversation."

That's how he and David Sangokoya, a research fellow at the lab, came to take a calculus formula used for voter turnout and adapt it to open data.

The calculus is: $P \times B + D > C$.

P is the probability that opening the data will have some effect, B is the individual benefit of opening the data, D is the global or ecosystem impact, and C is the cost of opening the data.

The last piece, especially, often gets overlooked. In a blog post, the researchers wrote that costs come in the form of reformatting data into an open format, publishing it, ensuring it meets legal requirements, and covering liabilities and risks should something go

wrong with the data — for instance, if personal or incorrect data is released.

"Oftentimes, it's not a binary decision," Sahuguet added. "It's more a decision about cost, and when the cost is too high, the decision [to open] is no."

"If there is not an ecosystem of developers, hackers, community members who are really going to be engaged with your data, if there is no future of data-drivenness or data acumen on the recipient side, it's just like screaming in a forest. Nobody is going to hear you."

— ARNAUD SAHUGUET,
NEW YORK UNIVERSITY'S GOVERNANCE LAB

For example, it might not be worth the risks to share data when there are privacy issues, liabilities or lack of frameworks. "Our point of view is, at the end of the day, you will get a number on the left, you will get a number on the right, and you have to compare the two and make your own decision," he said.

Precise numbers aren't necessary for drawing conclusions, he added, and estimates can go a long way in facilitating decisions.

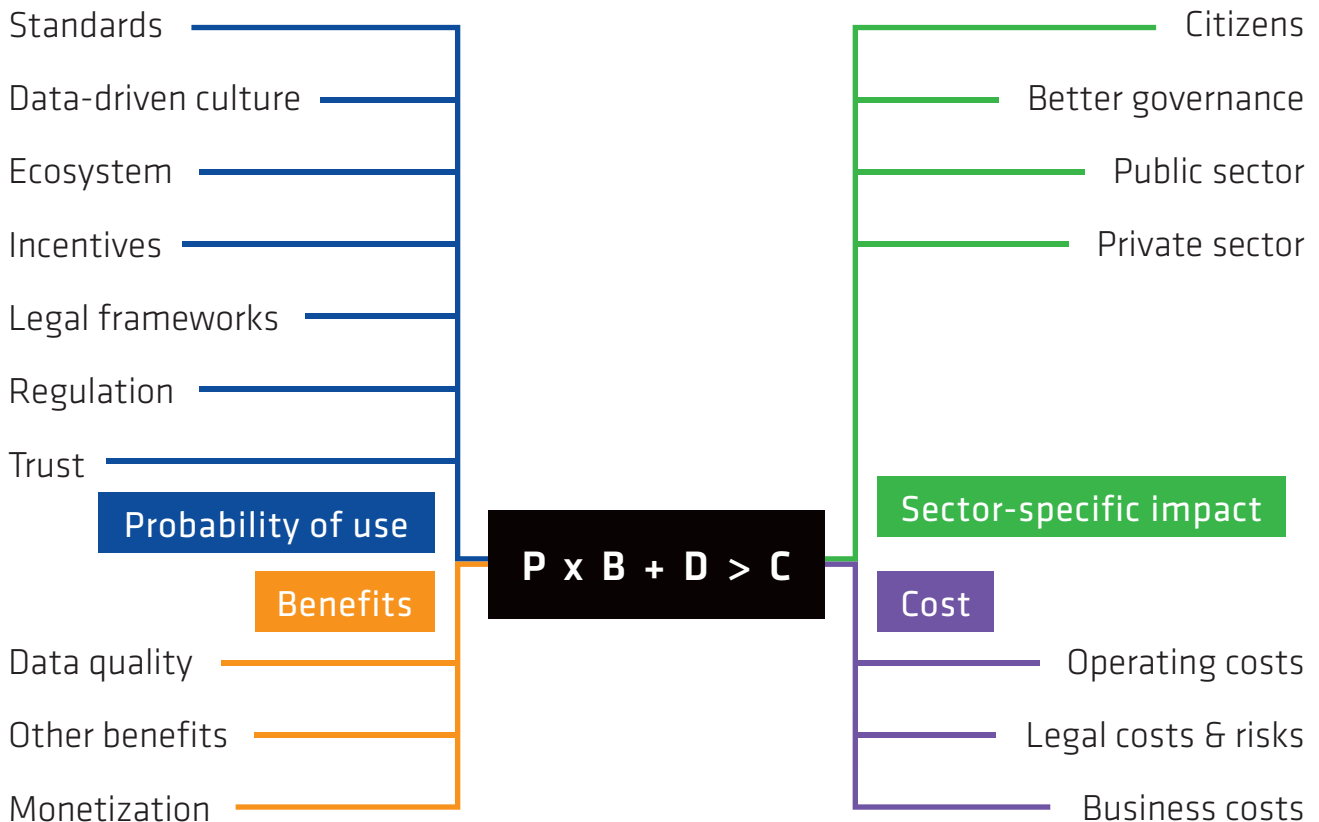
Opening data for the sake of opening data is only one mistake agencies are making, the researchers said. Another issue is that each agency seems to open data its own way, Sahuguet said.

"There is a big Tower of Babel issue where if you have to compare response time for 911 emergencies in various cities in the United States or compare spending on education, [it's difficult]. So I'd say the No. 1 mistake is the fact that everybody's opening the data the way that it fits, and there is no real standard."

Additionally, agencies aren't considering the full ecosystem. The work doesn't end when the data is open, Sahuguet said, because a workflow needs

A calculus for open data

Here are the factors that influence each element of a formula that can help public-sector agencies decide which data is worth opening



to be in place to keep that information fresh and available.

IT managers should also consider who the data recipients are and whether the data corresponds to actual needs.

“This is what we tried to capture in the calculus though P , the probability that opening the data is going to create positive outcomes,” Sahuguet said. “If there is not an ecosystem of developers, hackers, community members who are really going to be engaged

with your data, if there is no future of data-drivenness or data acumen on the recipient side, it’s just like screaming in a forest. Nobody is going to hear you.”

Feedback on the calculus has been positive and widespread, Sangokoya said. For instance, it has been put to use in Italy, and Belgium used it in an open-data day. Overall, government workers have said it put on paper the ideas they had in mind.

Still, the calculus is not perfect. Sa-

huguet and Sangokoya are considering factors such as how the decision to open data is made by multiple people over time, not by a single individual in the moment.

“The element of peer pressure, group behavior and game theory is not captured in the calculus,” Sahuguet said. “This is not the formula that is going to revolutionize the field of open data. It is a very, very modest contribution, and we really want to open the conversation.” •

'We've got to break down the silos'

Virginia's governor wants more biotech, big data and cybersecurity investments in his state

Virginia Gov. Terry McAuliffe is pushing hard to turn his state's IT resources into a booming biotech community. He's also positioning Virginia as a cybersecurity leader and argues that the two efforts are very much related.

McAuliffe sat down with GCN Editor-in-Chief Troy K. Schneider at the Thrive 2015 biotech conference to discuss his vision for Virginia's IT. This interview has been edited for length and clarity.

Let's start with today's focus and the push to get more biotech into Virginia. How does the state government get involved in that? How do the pieces fit together?

It can't happen without the government. It's impossible, and you really need an administration that is willing to drive it. We've got to break down the silos. Cybersecurity, bio — these are the jobs of the future.

We have to really turbocharge this area. Turbocharge it with investment, with knocking down walls to make sure our universities can commercialize our data.

I often talk about what an advantage we have because of our military assets — the CIA, Pentagon, all these other defense-related facilities — we have all of this cabling and capacity in Virginia today.

We have more data centers than any state in America. And

we have very talented people who know how to analyze data. I think we have real potential.

Are you seeing a connection between biotech and cyber because of the big data involved in both?

Yes, totally. We just started a new cyber commission. I've asked Richard Clarke to chair it for us. He has been [an] adviser to three presidents. He actually wrote a lot of memorandums for the White House on cyber. He now heads up our whole cyber piece.

We view preparing for cyber as something that gets us into the bio space as well because they're the same protocols to really be able to handle a tremendous amount of information in a secure environment. Actually, in the bio space and the health-related space, that data is even bigger.

But I'd put our cyber capabilities up against any state in America. Obviously, with the military and intelligence agencies headquartered here, that's a huge opportunity for us to take advantage of.



Virginia Gov. Terry McAuliffe, speaking April 23 in Chantilly, Va.: Biotech is "going to be a gigantic brass ring."

Virginia is the first state to launch an Information Sharing and Analysis Organization for sharing cyberthreat information with the federal government. Can you talk a little bit about that?

Because of the unique relationship with intelligence and the military that we have in Virginia, we have a specific responsibility. You have information [on a cyberthreat]; the state clearly needs to have it. When are we then allowed to provide that to private businesses who might be at risk? Protocols today don't let you do a lot of that.

We're the first out of the box with this. We want to be the template for how federal and state [agencies], National Guard, local law enforcement, as well as your business community can take this data and share it and use it in a way that protects us. •

Fujitsu Computer Products of America, Inc.

www.ez.com/gcnews 2

GCN Award Nominations

www.gcn.com/gcnawards 21

FDA

email to: CDEROSPRRecruitment@fda.hhs.gov 29

QTS

www.qtsdatacenters.com 14-15

Shure Inc.

www.shure.com/conferencing 5

Sprint

www.sprint.com/fed 36

The Federal IT Acquisition Summit

<http://fcw.com/fias> 35

Visual Studios Live - San Francisco

www.vslive.com/sf 25

This index is provided as an additional service. The publisher does not assume any liability for errors or omissions.

MEDIA CONSULTANTS

Mary Martin
(703) 222-2977
mmartin@1105media.com

Bill Cooper
(650) 961-1760
bcooper@1105media.com

Matt Lally
(973) 600-2749
mlally@1105media.com

Ted Chase
(703) 876-5019
tchase@1105media.com

PRODUCTION COORDINATOR

Lee Alexander
(818) 814-5275
laalexander@1105media.com

GCN HAS GONE MOBILE.

Go to **gcn.com/tablet** and download the tablet app today!



Your mobile gcn.com experience — optimized.

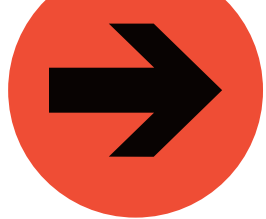
Visit gcn.com from your smartphone and enjoy the easier navigation and new sharing options



© Copyright 2015 by 1105 Media, Inc., 9201 Oakdale Ave., Suite 101, Chatsworth, CA 91311. All rights reserved. Reproduction of material appearing in Government Computer News is forbidden without written permission. The information in this magazine has not undergone any formal testing by 1105 Media, Inc. and is distributed without any warranty expressed or implied. Implementation or use of any information contained herein is the reader's sole responsibility. While the information has been reviewed for accuracy, there is no guarantee that the same or similar results may be achieved in all environments. Technical inaccuracies may result from printing errors and/or new developments in the industry.

**PUBLIC SECTOR
MEDIA GROUP**

CORPORATE HEADQUARTERS
9201 Oakdale Ave., Suite 101
Chatsworth, CA 91311
www.1105media.com



Tech we hope to see in the public sector



IBM quantum computing

Quantum computing has the potential to make Moore's Law moot – if only quantum errors could be better managed.

Traditional computing deals in bits – each bit is either 0 or 1, and will generally stay that way until it's deliberately changed. Quantum computing involves qubits, which can hold values of 0, 1, 0+1 or 0-1 – but qubits can “flip” without warning.

IBM scientists, however, have designed a square lattice of four superconducting qubits, where two qubits essentially monitor the other two for errors. Mass-manufacturing such chips is not yet practical, but IBM says the design itself will scale. For cryptography, analytics and data-intensive research, that would mean a whole new ballgame.



ReadMe

Deloitte has deemed “the API economy” a key tech trend for 2015, and application programming interfaces are critical to making open government data truly useful. An API is not much good, however, if no one knows how to use it.

ReadMe aims to take the mystery out of your application or platform. The new service creates easy API documentation, generates application keys and gives interested users the ability to test-drive the API from within the hosted developer hub. It also syncs with GitHub to keep reference docs current with the actual code.



Microsoft HoloLens

Microsoft's augmented reality system has been in the works for some time now, and Technical Fellow Alex Kipman announced at the company's Build 2015 conference that HoloLens has improved exponentially over the last year or two. The headset device is now ready for developers to start tinkering.

HoloLens can layer interactive holograms into the real world, allowing the wearer to “step into” building designs, control robots via gestures or monitor security. (NASA has already been testing the devices.) And virtual training – a big priority for the Defense Department and many other agencies – could get very, very interesting.





The Federal IT Acquisition Summit

Exploring Strategies, Options & Innovations

June 2, 2015

National Press Club, Washington, DC

**EDUCATION &
TRAINING FOR
KEY CONTRACT
VEHICLES**



Joanne Woytek,
NASA SEWP



Robert Coen,
NIH-NITAAC



Mary Davie, GSA

**Free for
Government
& Military
Attendees**

Participating Agencies



For Sponsorship Opportunities Contact

Alyce Morrison: amorrison@1105media.com or Kharry Wolinsky: kwolinsky@1105media.com

For More Information Visit: <http://fcw.com/fias>

Budget cuts anyone would approve.

**SPRINT
DISCOUNT
PROGRAM**

15% discount for federal employees.

Applies to select regularly priced Sprint monthly service.

Switch to Sprint, turn in your current phone, and register and upload your last bill. We'll pay off your contract and whatever you owe on your phone via an American Express® Reward Card.

To verify eligibility or learn more:

Visit sprint.com/fed

Call 866-639-8354



May Req. Activ. Fee: \$36/line. Credit approval req. **Contract Buy Out Offer:** Offer ends 7/9/15. Consumer, SDP and CL lines purchasing a new device with: Sprint Easy Pay, Sprint Lease, iPhone for Life Plan, at full MSRP, or Certified Pre-Owned and porting the new line on a service plan. Amount based on ETF (early termination fee) charged or remaining balance on install-bill device (excludes prepaid devices). All lines must be ported from an active wireless line at another carrier and remain active and in good standing to receive the American Express Reward Card. Requires you turn in your current competitor phone associated with the installment billing balance or ETF submitted to Sprint. Important: If you do not turn in the correct device in good working order (i.e. phone powers on, screen is intact, no broken, cracked or missing pieces. iPhones must have activation lock disabled), you will be charged up to the amount of the Reward Card provided to you. You must register and submit your final bill showing your ETF or installment balance within 60 days of switching to Sprint. Allow approximately 15 days after registration approval for your Reward Card to arrive. Register at sprint.com/joinsprint after your registration has been approved. Excludes 100+ Corporate-liable, upgrades, replacements and ports made between Sprint entities or providers associated with Sprint (i.e., Virgin Mobile USA, Boost Mobile, and Assurance). **Reward Card:** Terms and conditions apply to Reward Cards. See Cardholder Agreement or visit www.americanexpress.com/sprint for details. Subject to applicable law, a \$3.00 monthly service fee applies beginning in the seventh month after Card issuance. Card is issued by American Express Prepaid Card Management Corporation. American Express is not the sponsor of this promotion. **Gov't Employee Discount:** Avail. for eligible employees of gov't agencies participating in the discount program (ongoing verification). Discount may be subject to change and is available upon request for monthly svc charges. Discount only applies to Talk 450 and primary line on Talk Share 700; and data svc for Sprint Family Share Pack, Sprint \$60 Unlimited Plan, Unlimited, My Way, Unlimited Plus Plan and Sprint Family Share Plus plans. Not avail. with no credit check offers or Mobile Hotspot add-on. **Other Terms:** Offers and coverage not available everywhere or for all devices/networks. Restrictions apply. See store or sprint.com for details. ©2015 Sprint. All rights reserved. Sprint and the logo are trademarks of Sprint. Other marks are the property of their respective owners.



Government Edition
pcm-g.com | 1-800-625-5468



Data Center

Networking

Endpoint & Mobility

It's Time to Migrate

WINDOWS SERVER 2003 SUPPORT IS ENDING.

PCM-G CAN HELP. PAGE 20



SERVER BACKUP WIZARD



SECURE REMOTE ACCESS



CLOUD INTEGRATION



SERVER VIRTUALIZATION



Windows Server 2012



Windows Server 2003



NO UPDATES



NO SUPPORT



NON COMPLIANT



PCMG can help with an **Intel vPro Management Solution**



SCAN CODE to watch video

Inside this issue:

HARDWARE

Systems

Tablet Computers	6, 10, 12, 33
Laptops & Notebooks	7-8, 12, 24
Desktops	32-33
Apple Systems	38-39

Peripherals & Add-ons

Displays	35
Printers & Scanners	36-37

Data Center Solutions

Storage and backup	22, 24-27
Servers	21, 30-31
Network Storage	28-29

ARTICLES

Chromebooks	9
Touch for productivity	13
Windows Server 2003	20
Virtualization	25

SOFTWARE

Microsoft Software	11
Mobility Software	14-16
Creative Software	17
Security Software	18-19
Backup Software	19
Virtualization Software	22

TERMS OF USE & SALE

37

Intel

Ultrabook, Celeron, Celeron Inside, Core Inside, Intel, Intel Logo, Intel Atom, Intel Atom Inside, Intel Core, Intel Inside, Intel Inside Logo, Intel vPro, Itanium, Itanium Inside, Pentium, Pentium Inside, vPro Inside, Xeon, Xeon Phi, and Xeon Inside are trademarks of Intel Corporation in the U.S. and/or other countries.

The PCMG Advantage

Government Drives Our Business

From single item purchases to complex procurements, PCMG is the reseller of choice for thousands of federal, state, and local government customers. And from tablet computers to the data center—and everything in between—we have the solutions and services you need to fulfill your IT mission.

Contracts & Procurement Options

Federal Government Wide Acquisition Contracts

GSA Contract: GSA-35F-5946H

ECS III Contract: HHSN263999900456I

NASA SEWP IV Contract: NNG07DA08B & NNG07DA62B

Netcents-2 Contract: FA8732-14-D-0006

Agency Specific Contracts, Blanket Purchase Agreements, and Portals

NASA HQ, World Bank, DoD Email, DOE, AFWAY, Intramalls, and many more.

Leading State and Local Contracts

California Multiple Award Schedule

California Department of General Services (Microsoft)

Commonwealth of Virginia Accessories, Peripherals, & Software

Los Angeles Department of Water and Power

Texas DIR Adobe

And more...

Authorizations and certifications at the highest levels from most major manufacturers:



No Credit Card Surcharges

We accept MasterCard, Visa, Discover, American Express, and Diners Club



PCMG Sales **1.800.625.5468**

Web: **pcmg.com**

E-mail: **sales@pcmg.com**

PCMG goes green!

The paper used in this catalog, except for the inserted material, was printed on paper certified under the Sustainable Forestry Initiative® program. The SFI certified sourcing label is proof that PCMG is using fiber from responsible and legal sources.



Visit www.sfi-program.org for more information on the SFI program.

PCM-G Services Portfolio



Procurement & Logistic Services

PCM-G takes the hassles out of IT procurement and logistics with advanced eProcurement, warehousing, and integration systems that give you the tools and resources to reduce costs and track assets across the technology lifecycle.

- eProcurement
- Logistics
- Distribution Facilities
- Product Staging
- Imaging
- Integration
- Refurbishment



Consulting & Implementation Services

Our national team of certified engineers, technicians, and project managers are experts in their field with certifications spanning today's best-in-class technologies.

- Enterprise Mobility Management
- Network, Wireless and Voice
- Data Center
- Application Support
- Private Cloud
- iSeries



Managed Services & Hosting

Trusted by customers for more than two decades, PCM-G Managed IT Support Services provide you the highest level of expertise and professional oversight of your IT operations.

- Data Center Hosting
- Managed Services
- Monitoring
- Public Cloud
- Staffing
- Break/Fix
- Service Desk
- Field Support Services

PCM-G offers seven crucial services aimed at improving the efficiency of your organization

We offer you a set of comprehensive IT solutions that are relevant to your organization's needs by leveraging our expertise in a variety of individual practice areas. Each one of our services is customized to your organization and thoroughly researched, coordinated, and executed by our team of skilled engineers. PCM-G is equipped to offer you the following high-quality services:

✓ Network RISC Analysis

We'll analyze your network, give you a traffic and asset report along with recommendations based on the risks, costs and opportunities of improving your growing network.

✓ Enterprise Mobility Management

As mobile devices become more prevalent in the workplace, we can help deploy, secure and resolve technical challenges your organization might face with mobility management and integration.

✓ Office 365 Migration

Get Professional Office 365 migration services to ensure a successful transition from on-premise Exchange, SharePoint and Lync to the Microsoft Cloud-based Office 365 Platform.

✓ Cisco Business Edition 6000

Benefit from premium voice, video, mobility, messaging, conferencing, instant messaging and presence, and contact center features on a single, integrated platform.

✓ PCM-G Smart Care

Keep your network running fast and efficiently with PCM-G Smart Services. PCM-G works with Cisco to offer you expert support in device management and technical services.

✓ Windows 2003 Server Migration

Ensure your software and hardware servers are up to date and remain in compliance, even after the end of life for Windows Server 2003. PCM-G can help you migrate and update your server through solutions that best fit the needs of your organization.

✓ Virtualization Assessment

Receive an in-depth analysis of your computing footprint including recommendations on systems, memory and processors needed to support your organization's virtual design.

**Speak with a PCM-G
Service Expert Today**

1.800.625.5468



Ultra Mobile

Discover the right mobile device for your organization

Organizations need the right tools to keep up with everyday tasks

In today's workforce there is a communal reality in terms of how employee's use technology in all its various forms. More than ever, they seem to find themselves being wirelessly tethered to a mass of no less than 3 computing devices at any time.

An observer can watch as people check emails, texts, and schedules on smartphones and then jump into seemingly urgent calls, while simultaneously pulling out their favorite tablet to continue consuming content without missing a beat, reaching back into their bag to pull out a laptop to begin rapidly typing away. Smartphone held between shoulder and ear, tablet balanced on one knee, and notebook balanced on the other. No wonder so many need yoga or chiropractic services to make it through the week. Something will eventually have to give.

The problem seems simple enough; consuming and producing information and content continuously throughout the day no matter where they happen to be is a fact of life for today's professional,

and each of their mobile devices both excel and fail in these efforts in various ways. So will it ever be possible to get back to carrying a single multi-purpose device that's both capable and effective in delivering the experience and features they need? Will there ever be a simpler, less painful path?

It may come as little surprise that laptop sales have undeniably been in a decline for the last few years, but perhaps we should not yet hammer in the coffin nails for the lot of them. Working on a complex project or even a moderately complicated Excel file from a tablet is nearly impossible. Yes,

in many instances it's the immaturity of mobile applications causing much of the conundrum and these too will change - in time.

In 2014, semiconductor technology hit new milestones as manufacturers produced smaller, lower-power consuming, and more affordable components for ultramobiles. Gartner, a leading information technology research and advisory firm, predicts that by 2018 – just 3 short years from now - ultramobiles/ultrabooks will dominate mobile PCs.¹ Perhaps this is the silver lining that will lead to the better path users have been looking for?

An ultrabook has all the power of a laptop with a fraction of the bulk and increased battery efficiency.

¹van der Meulen, R., Rivera, J. (2014). Gartner Forecast: PCs, Ultramobiles and Mobile Phones, Worldwide, 2010-2017, 4Q13 Update. Retrieved from <http://www.gartner.com/newsroom/id/2791017>.

Ultrabooks are powerful and portable

The term "Ultrabook" was created by Intel as nomenclature for a new generation of Laptops featuring Intel® technology and the Microsoft OS. An ultrabook has all the power and versatility of a laptop with a fraction of the bulk and increased battery efficiency for longer endurance between charges.

Hybrid, convertible, or two-in-one

These terms all confusingly describe the same type of device. Users who are on the fence about how mobile they need to be, this might be the right choice.

They straddle the fence between laptop and slate, providing laptop functionality when it's needed to get things done, and a tablet form factor when a user wants to relax with a touchscreen. Laptop-first convertibles are essentially full ultrabooks or laptops with screens that fold, flip, or rotate to convert to a flat tablet form factor.

Chromebooks run Google ChromeOS

Unlike windows, Chromebooks are designed for the web, are very affordable, thin and light. If most of work is done online using web tools and cloud based applications – Chromebooks may be a great option. However, they do have some limitations that should be

considered—most notably ChromeOS's online requirements and limited ports and optical disc drive options.

Laptops vs. Chromebooks

If a two-in-one the high-end frills of ultrabooks, or Chromebooks limitations don't fit the requirements, a laptop without a catchy marketing buzzword attached might be the device of choice. Whether an organization needs a desktop replacement, a pixel pushing video editing powerhouse, or a basic (yet capable) laptop, the good news is, there's a vast assortment of them on the market.

Tablets, notebooks, ultrabooks, hybrids and ultra-portables all suffer from the same deficiencies – they aren't phones. The solution for this is software based phones and video collaboration software on these devices, single number reach can be achieved so they all share a single phone number, but it's still not an optimal experience.

Enhance your computing capabilities

It's unlikely that a single platform will evolve within the next three to five years. Smartphones still serve their primary purpose better than any other device. Smartphones are capable of handling most of the day to day

content consumption needs but despite enhancements to their capabilities or attempts to morph them into tablets, limited screen real-estate and lack of full qwerty keyboards will keep them from being a solo act.

A shift in communication and work trends has signified a wanted abandonment of email and traditional office applications for a more freeform real-time collaboration experience. This need to connect and unwillingness to settle will ultimately drive designers and engineers to create an uncompromised experience, pushing boundaries of both what's possible and what's expected.

How PCMG can help

PCMG has a dedicated team of experts ready to help your organization find the perfect mobile devices optimized for your needs. From tablets to ultrabooks, we have the product inventory, deployment capabilities and management tools customized to meet your requirements.

Contact your PCMG Account Executive today to learn how PCMG can implement a customized mobility solution for your organization.

1-800-625-5468 | www.pcmg.com

Flexibility and productivity on-the-go



11.6" HP Elite x2 1011 G1

- Intel® Dual-Core processor (4MB cache)
- 4GB DDR3L SDRAM
- 128GB SSD

only **\$926⁹⁹** #13400769



PartnerDirect
Preferred



13" Dell Latitude 13 7000 2-in-1

- Intel® Core™ M 5Y10 processor (800MHz, 4MB cache)
- 4GB DDR3L SDRAM

only **\$1010⁹⁹** #13326982

lenovo FOR
THOSE
WHO DO.



Lenovo ThinkPad Yoga 20CD

- 4th gen Intel®Core™ i7 processor (2.10GHz, 4MB cache)
- 8GB DDR3L SDRAM

only **\$1609⁹⁹** #9901998

Take your work to go

SAMSUNG

10.5" Samsung Galaxy Tab S 16GB Tablet

With the Samsung Galaxy Tab S you'll immediately feel the difference of having the thinnest and lightest tablet in the world. Turn it on, and you will experience a pixel-packed super-AMOLED screen with richly saturated colors and deep contrast levels, resulting in a visually immersive user experience and HD content that looks better than real-life.

- 16GB storage capacity
- 10.5" Super AMOLED display
- 1.90GHz Samsung Exynos 5 Octa processor
- 2560 x 1600dpi resolution
- Android 4.4 KitKat OS
- 8MP rear-facing camera

See photos, videos, and files in vivid colors, dark shadows, and stunning contrast.



only **\$359** #13157174
#13157175 Samsung Galaxy Tab S 10.5 (16GB)

\$459⁹⁹



10.1" Samsung Galaxy Note 2014 Edition 16GB Tablet

The ultra-sleek Galaxy Note 10.1 2014 Edition has more than four million pixels—that's 2 million more than HDTV. And with a pixel density of 299 PPI, colors are rendered much brighter and everything's lifelike and clearer.

- 10.1" TFT display
- 2560 x 1600 resolution
- 8-core Exynos 5 Octa processor
- 3GB RAM

only **\$359** #9777940

10.1" Samsung Galaxy Tab 4 16GB Tablet

With a slim design and weight, the Galaxy Tab4 10.1" model provides maximum portability while still allowing users to enjoy the beautiful screen for work, play and everything in between.

- 10.1" TFT display
- 1280 x 800 resolution
- Supports 16 million colors
- 1.50GB RAM



only **\$309⁹⁹** #13004928



For speed, simplicity and security.

Chrome has more than 100 policies to fit your organization's needs. Choose auto-updates to get the latest security fixes or manual updates for more control. Configure which applications and extensions employees receive and make the most of your organization's mobility.



Easy to manage

Managing 40,000 Chromebooks is the same as managing 4 Chromebooks



Easy to share

A user can login to any Chromebook and have access to all of their Apps, files and policies



Security Built In

Virus protection built-in with multiple layers of security likes and boxing, data encryption and verified boot for added security



No updates needed

All of your apps stay up-to-date, and you get the latest version of the operating system



Always backed up

All data, profiles and setting are 100% backed-up in Google's Cloud - never lose anything ever again

Compatibility

Always up to date with modern web standards, Chrome lets you run the latest cloud apps. It even offers legacy support for older applications.

Cloud Management

Chrome's cloud-based management lets you customize policies, whether they're on a company's desktop or personal smart phone.

Safety & Productivity

Chrome uses security technologies like Safebrowsing, sandboxing, and auto-updates to protect your organization from malicious sites, viruses, malware and phishing attacks. Our cross-site scripting protects against sites that try to steal company and employee data.

Chrome is built to be fast in every way—starting up from the desktop, loading websites, and running complex, office web applications.



Call for Pricing #13400736

Get access to tens of thousands of web apps in the Chrome Web Store that lets you work online and off.

Call 1.800.625.5468 or visit pcmg.com



Portability and performance

11.6" Dell Chromebook 11



The lightweight, easy-to-use Dell Chromebook 11 helps you take your work tasks to a new level of speed with no worries of safety or security.

- Intel® Celeron® processor (2MB cache, 1.40GHz)
- 2GB DDR3L SDRAM • 16GB SSD



only **\$263⁹⁹** #13165115
#9984497 Dell Chromebook 11 - Celeron 2955U **\$253⁹⁹**

Samsung Chromebook 2 with Intel!



Its' optimized video conferencing, and enhanced processor enable outstanding performance, especially with 3x faster Wi-Fi speeds.

- Intel® Celeron® processor (1MB cache, 2.16GHz)
- 2GB DDR3L SDRAM • 16GB SSD



only **\$249⁹⁹** #13272610
#13365228 11.6" Samsung Chromebook 2 with Intel! **\$296⁹⁹**

14" HP Chromebook 14 G3

- NVIDIA Tegra K1 processor (2.10GHz) • 4GB DDR3L SDRAM • 32GB SSD



only **\$377⁹⁹** #13281571
#13281567 14" HP Chromebook - 2GB RAM - 16GB SSD **\$319⁹⁹**

11.6" HP Chromebook G3

- Intel® Celeron® processor (1MB cache, 2.16GHz)
- 4GB DDR3L SDRAM
- 16GB SSD



only **\$267⁷⁹** #13255387
#13072268 14" HP Chromebook - 2GB RAM - 16GB SSD **\$328⁹⁹**

11.6" Lenovo ThinkPad 11e Chromebook 20DU

- Intel® Celeron® processor (2MB cache, 1.83GHz)
- 4GB DDR3L SDRAM
- 16GB SSD



only **\$358⁹⁹** #13074803

11.6" Lenovo ThinkPad Yoga 11e Chromebook 20DU

- 360° flip design
- Intel® Celeron® processor (2MB cache, 1.83GHz)
- 16GB SSD



only **\$468⁹⁹** #13110472

8 Reasons Why Chromebooks are the Future of Computing

Chromebooks are designed exclusively for web browsing, email answering, and getting down to work when you're on-the-go.



Chromebooks are growing in popularity amongst organizations

- ▶ **Cost Effectiveness:** With today's growing expenses, agencies are hard-pressed to cut costs in any way possible. An average Chromebook runs about \$180-\$300, and at the rapid pace that hardware is replaced these days, that price is a welcome value for organizations. Even after years of wear and tear, your Chromebook is guaranteed to remain just as fast and efficient as the day you bought it.
- ▶ **Seamless Integration with Google Apps:** Finally Google Apps and your iPhone will work together in harmony thanks to the Google Chromebook. Enjoy seamless integration with Google Apps that you can view on your iOS device and your Chromebook.
- ▶ **Speed:** No other device gives you this much speed for such a low price— it's a single-minded platform. That means it isn't difficult to use like other operating

systems. And with a boot time between four and ten seconds, the Chromebook surpasses any other notebook in its category in terms of speed.

- ▶ **Efficiency:** When you work on a Chromebook, you'll experience the difference. You can work full-screen and focus on the task at hand rather than be distracted by multiple windows like on another notebook or laptop. There's little learning curve with the Chromebook, allowing you to maneuver naturally— as easy as switching from browser to browser.
- ▶ **Reliability:** ChromeOS is based on the Linux operating system, which means it is already running on an incomparable level of reliability. Users won't need to install standard applications, so there's little to no room for malware and virus infections. Imagine a world where you don't have to spend hundreds of dollars on anti-virus and malware removal on a daily basis. Wouldn't that be nice?
- ▶ **Browser-based work:** Chromebooks run on applications hosted online, instead of loading all of the software onto the computer itself. Why host it online? It keeps the system running smoothly and efficiently without needing to process a number of applications running in the background.
- ▶ **Apps and Add-ons:** The Chromebook is more than just a light, ultra portable, web-browser notebook that you can take almost anywhere. It's an app store that is constantly growing and expanding its organization-focused tools like Gmail, Mailchimp, Hootsuite, Podio, and more to help you get down to work wherever you are.
- ▶ **Cloud Friendliness:** For IT professionals today working in the Cloud is essential for ultimate productivity and collaboration. That's why the Chromebook is an optimized tool for the cloud. You can work, share, save and retrieve files from the Cloud faster and easier than any other notebook or laptop.



Designed for performance

Chromebooks are made to be portable, durable, light-weight, sleek and stylish allowing you to take it with you on the road and compute in comfort.

Contact your PCMG Account Executive today

to gain access to the highest quality technology, industry leading partners, and exceptional service.

Call 1.800.625.5468 or visit pcmg.com

PCMG

Surface Pro 3

Productivity at your fingertips



The power of a laptop in a tablet

Surface Pro 3 gives you the complete laptop experience with the power to run all the Windows software you need, including the full Microsoft Office Suite, Adobe Creative Cloud, and iTunes. So replace your laptop with the light-weight Surface Pro 3, the most convenient everyday-computing device.

- 4th gen Intel® Core™ i3 processor (3MB cache, 1.50GHz)
- 4GB LPDDR3 SDRAM
- 64GB SSD
- 12" multi-touch screen
- Intel® HD Graphics 4200



starting at **\$799** #13156226

New Features Galore

Lighter and Larger Display

Featuring a gorgeous 12" display encased in a sleek magnesium frame, the Surface Pro 3 is the thinnest and lightest in our Surface Pro family of devices.



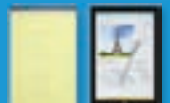
Run More Apps and Programs

Pre-loaded with Windows® 8.1 Pro, you can install your favorite desktop software, including the full Office Suite and thousands of Windows programs.



Unmatched Tablet Versatility

Go from tablet to laptop with the multi-position Kickstand. Magnetic stability keeps the Surface Pro 3 Type Cover steady, so you can work just as comfortably on your lap as at your desk.



Microsoft docking station

Take your Surface to the next level

Transform your Surface Pro 3 tablet into a complete desktop workstation with this docking station. Easily connect an HD monitor and your favorite accessories via multiple inputs and five USB ports.

only **\$199⁹⁹** #13188410



Microsoft Surface Pro 3 Type Cover (Cyan)

Compute in premium style

One of the thinnest keyboards around, the Type Cover turns your Surface Pro 3 into a premium laptop. And it sits perfectly stable on your lap with enhanced magnetic stability to keep the Cover steady, you can work just as comfortably on your lap as at your desk.

only **\$129⁹⁹** #13156234



Inspire team collaboration

Share mission-critical documents, files, and more with your team anytime and anywhere with the speed and convenience only Office 365 can offer.

Enjoy high-quality teamwork tools anywhere and anytime.



Go Mobile

Whether you're working in your office or on the go, you get a familiar, top-of-the-line set of productivity tools. Office applications let you create, edit, and share from your PC/Mac, iPad®, tablet, or phone with anyone instantly.



Maintain Recognition

Brand your email address with your organizations name to help solidify name recognition. Market your organization with customized marketing materials that are easy to create with a range of tools.



Set-up Fast

You can access the easy-to-use admin center from anywhere to manage all your services. And Office 365 takes care of IT for you, so your services are always up and running and up to date.



Store All Your Files

With 1TB of storage per user, you'll have plenty of space for all your files. Plus, because your files are stored online, you can share with people in or outside your company, from wherever you're working, whenever you need. .

Microsoft Office 365 (Plan E3) subscription license

Get the most dependable office suite software you know and love along with email, video conferencing, file storage, and sharing, with enhanced communication tools and ultimate work-from-anywhere mobility.

\$18⁹⁹/month* #13254945

*1-year subscription required



Call 1.800.625.5468 or visit pcmg.com

PCM-G

Compute dynamically on the go

Dell Venue 11 Pro tablet



Dell has an exciting innovative lineup of high-class devices with Windows® 8 Pro that will delight you!

Dell's touch-enabled notebooks, tablets, all-in-one desktops, and Ultrabooks™ featuring Windows® 8 Pro.

Together, Dell and PCM create a perfect technology partnership to outfit your organization with transformative, powerful and sought-after devices that will help boost your workforce's productivity and help safeguard their data.



only **\$1109⁹⁹** #13318845

10.1" HP ElitePad 1000 G2



Enjoy a great visual experience with outdoor viewable diagonal, full high-definition multi-touch panel, protected by Corning Gorilla Glass 3.

- Intel® Atom™ processor (2MB cache, 1.60GHz)
- 4GB LPDDR3 SDRAM
- 64GB SSD



only **\$762⁹⁹** #13154322

11.6" HP EliteBook Revolve 810 G2 Tablet

- Intel® Core™ processor (3MB cache, 1.90GHz)
- 12GB DDR3L SDRAM
- 128GB SSD



only **\$1539⁹⁹** #13236982

Bend over backwards productivity

lenovo FOR THOSE WHO DO.

10.1" Lenovo ThinkPad 10 20C1

Optimized for professionals seeking the ultimate in flexibility and connectivity, its constructed from premium aluminum with Gorilla glass to protect its vivid display.

- Intel® Atom™ processor (2MB cache, 1.60GHz)
- 4GB LPDDR3 SDRAM
- 128GB SSD
- Intel® HD Graphics



only **\$844⁹⁹** #13214572



12.5" Lenovo ThinkPad Yoga 20CD

The ThinkPad Yoga delivers flexibility for organizations. It's 12.5" display rotates 360 degrees to offer four different usage modes: Laptop, Tablet, Tent, and Stand.

- 4th gen Intel® Core™ i5 processor (3MB cache, 1.60GHz)
- 4GB DDR3L SDRAM
- 500GB HDD • Intel® HD Graphics 4400

only **\$949⁹⁹** #9947381



Make your organization a **TOUCH** more productive

Touch-based user interfaces (or “touch” for short) are being rapidly adopted today, with smartphones, tablets, and desktops. The way that people compute is changing – in a good way. Touch has changed the way we vote, draw, consume news, take notes, deliver presentations, and reply to emails. Fed by the consumerization of IT, touch has begun to move from consumer apps on personal devices to highly productive, collaborative office applications on PCs.

and employers are expecting touch-proficiency. With the growing rate of applications and accommodating the superior user experience, organizations need to deploy touch into their IT infrastructures.

Major Integration Advantages

Implementing touch devices into your organization will improve the speed and efficiency of your agency and help you cater to a more diverse set of employees.

Because of the intuitive nature of a touch-screen device, employees

an icon with your finger compared to dragging a mouse across a screen to point and click. Touch screen devices also do a much better job accommodating physically challenged users, especially those with limited hand and finger mobility due to ailments like arthritis.

Embrace new technology

Touch will generally work best when people want to use it, and integrate it into their everyday lives. Those people will end up being the most productive with these touch screen sorts of devices.

Many organizations have already seen the wisdom in embracing touch and taking advantage of mobility that touch devices can afford their employees. Agencies worldwide are adapting to these new environments and adjusting their expectations to accomplish more work every day.

The potential boost in productivity is one of the many reasons that **touch is a fundamental aspect** of the future of computing.

Enhancing productivity

The potential boost in productivity is one of the many reasons that touch is a fundamental aspect of the future of computing. Employees expect employers to support this new trend,

will require little to no training time. And because there is little to no learning curve, employees will be able to accomplish tasks faster than when they are tethered down by a keyboard and mouse. Think about how much faster it is to tap

Contact your PCMG Account Executive today

to gain access to the highest quality technology, industry leading partners, and exceptional service.



*AirWatch provides
unprecedented choices over
the types of devices you deploy,
without compromising security.*



Mobility management like you've never experienced.

AirWatch Be Mobile Jump Start Kit

Mobile devices are proliferating organizations at an exponential rate. With the growing number of device models, platforms and operating system versions available, organizations are facing new and complex mobility management challenges. Accessing resources from a mobile device can introduce a significant threat to corporate security.

The efficient solution

AirWatch® Mobile Device Management enables organizations to address challenges associated with mobility by providing a simplified, efficient way to view and manage all devices from the central admin console.

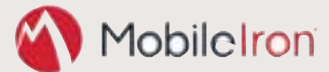
The AirWatch solution enables you to enroll devices in your environment quickly, configure and update device settings over-the-air, and secure mobile devices.

Reliable mobile security

Because security is at the core of every AirWatch solution, PCMG and AirWatch ensure your organization's deployment is secure and that your data is protected with end-to-end security that extends to users, devices, applications, content, data, email and networks.

only **\$326⁹⁹** #9290245

Maintain security without compromising mobile functionality



Trust the MobileIron solution.

With this purpose built EMM platform, your organization can spend more time innovating and driving business and less time securing mobile devices.



Enables IT to secure and manage a diverse range of mobile devices.



Provides end-users with secure access to organization email.



Keeps historical phone location information for future reference.



Built on layered security allowing organizations to customize security.

MobileIron Enterprise Mobility Management Silver Bundle per User Perpetual License

The MobileIron Enterprise Mobility Management solution is a purpose-built mobile IT platform. It provides users with seamless access to the organization processes and content they need on mobile devices of their choice while providing IT the ability to secure corporate data.

Our mobile IT platform fundamentally enables organizations to achieve their Mobile First goals.

- Core – Central administrative console
- Sentry – Secure Enterprise Gateway
- Apps@Work – Enterprise App Store

only **\$91⁹⁹** #13275609

Call 1.800.625.5468 or visit pcmg.com



Get the easy, comprehensive management solution



JAMF Software JumpStart Remote installations & configuration

The iOS Casper Suite is designed for customers who already have an IT professional on staff with a high degree of expertise in the Apple platform, the Casper Suite, and previous experience in implanting client management concepts within an enterprise environment. You get:

- Installation of your JAMF Software Server (JSS)
- Overview of Casper Suite features and functions for iOS
- APNs certificate authority setup
- Inventory management and workflows
- Configuration and security management

JumpStart

only **\$950⁹⁹** #9503511



JAMF Software iOS JumpStart One-day installation & configuration

The iOS Jumpstart is customized for your organization's experience, technical capabilities and resource capacity. The JumpStart covers key tasks as they apply to your unique environment of iOS devices.

- Installation of your JAMF Software Server (JSS)
- Overview of Casper Suite features and functions for iOS
- APNs certificate authority setup

only **\$3429⁹⁹** #9503512

Superior mobility management in the palm of your hands



MaaS360 Advanced Mobility Management Solutions

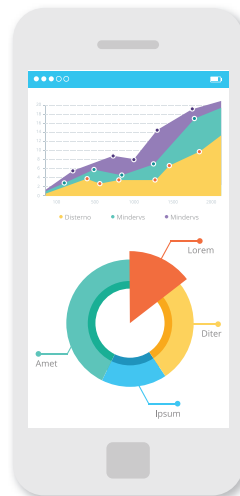
Get the bigger mobility picture of your organization

MaaS360 provides a clear view of your mobility environment and the actionable intelligence you need to keep corporate data secure, employees productive, and costs down, while embracing the consumerization of IT.

Enjoy the one-stop-shop platform

MaaS360 delivers a complete enterprise mobility management solution with one platform that integrates comprehensive security for all your mobile assets. At the same time, it enables the flexibility and modularity needed to match the challenges and use cases for your organization with standalone products.

- Integrates comprehensive security for all mobile assets
- Options across different categories of users, devices, content, and apps
- Monthly software license agreement



Offers the flexibility to implement tiered or layered mobile security to address varied end user needs.

only **\$37⁹⁹** #13337319



SAVE UP TO
33%



Adobe® Creative Cloud™ for Teams

A better way of working together

Imagine if your team always had the latest tools. Imagine if they could save time by seamlessly sharing files and folders. That's Adobe® Creative Cloud™ for teams.

You get the entire collection of CS6 tools and exclusive updates, along with team-specific features that make working together—and managing licenses—easier than ever. All for one affordable price.

The world's best tools

Equip your entire team with every Adobe® Creative Suite® 6 desktop application, plus Adobe Muse™, Photoshop®, Lightroom® 4, Acrobat® XI, Adobe Edge Tools & Services, and more. And everyone gets immediate access to new applications and features when they're released.

Publish apps and websites

Explore new outlets for your content with the publishing services included with Adobe Creative Cloud.™ Create and host websites, deliver apps to the iPad device, and more.

Share widely. Collaborate privately.

Now it's easy to keep everyone on the same page. Share files or folders with one person or with a larger team. The latest industry-leading security and encryption technology is built right in.

The files you need. Where you need them.

Work on files at the office, from home, on your tablet. Just save to the Creative Cloud Files folder on your desktop, which includes 100GB per person, and start sharing between devices and team members, or with clients.

Centralized administration

Manage and scale your team's software with centralized purchasing and license management tools. You and your designated administrators can quickly add, assign, or transfer seats, and track usage by team members.

\$49⁸⁸/month* #9430575

*12-month subscription required

Call 1.800.625.5468 or visit pcmg.com

PCM-G

Ultimate endpoint security without the complexities

Symantec Enterprise Solutions help you accurately identify and address risks while delivering strong data protection for mobile, endpoints, and mail/web infrastructure. Symantec Enterprise Solution combines products to protect against today's complex malware, data loss and spam threats with the fastest, most-effective endpoint security, drive encryption, and system recovery.

Symantec is simplifying protection

By bundling our security solutions into a subscription model complete with support and maintenance that is attractively priced, Symantec simplifies license management and standardizes IT costs. There is no additional surprise with cost which allows for budget discussions to move from CapEx to OpEx classification. Symantec Enterprise Solution, one solution with 3 layers of defense to better protect your organization and keep you compliant.

- 24 x 7 Support included with the bundled solution
- Easy, Flexible, and cost-effective management



- Maintains reliability of TrustedDWG technology
- Ideal for short or long term projects based on your needs
- Helps you manage your software expenses



Endpoint management simplifies application patching across multiple platforms including Windows®, Mac OS® X, and Linux™.

Symantec Enterprise Solution License Subscription

- 1-year license for multiple users
- Protects from malware, data loss, and spam
- Reliable endpoint security and drive encryption

only **\$77⁹⁹** #13036162
#13036165 Symantec Enterprise Solution 1 yr. Multi User

\$61⁹⁹

Take control of your IT protection

SOPHOS



Sophos SG115w TotalProtect 24x7

Sophos UTM TotalProtect combines purpose built, high-performance hardware with all the network security you need from next-gen firewall to secure Wi-Fi. All in a single appliance it simplifies your IT security without the complexity of multiple-point solutions. The intuitive interface helps you quickly control security risks and clear, detailed reports will give you the insight you need. Quickly protect your network using proven protection technologies including IPS, VPN, email and web filtering combined with the industry's simplest admin interface.

Protect confidential emails with email encryption and quickly harden your web servers and apps against attack with no training required for admins or web developers.

- Firewall, VPN, IPS, email, web filtering and app control
- Intuitive browser-based interface
- Built-in reporting on all models
- UserPortal allows spam management/ install VPN Clients
- Integrated wireless controller
- 3-year license

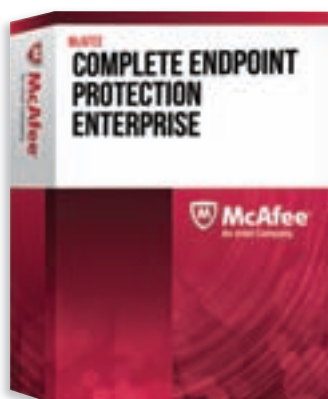
only **\$849⁹⁹** #13347805



McAfee Complete EndPoint Protection Upgrade License

McAfee Endpoint Protection provides continuous, updated, and powerful security against the entire spectrum of threats, from zero-day exploits to hacker attacks and so much more.

- 3 Years Gold Support
- Optimized for mobile devices and virtualized environments
- Reduces costs, helps maintain and prove compliance



only **\$79⁹⁹** #9638988



ESET Endpoint Antivirus

Turn to ESET for a solution that takes the worry out of HIPAA, HITECH, PCI, SOX and GLBA compliance so you can focus on what matters: keeping the organization running and serving clients and customers.

- 3 Years Gold Support
- Combines antimalware, antispam, two-way firewall, content filtering and remote administration

only **\$37⁹⁹** #9232821



Support for Windows Server 2003 is ending July 14, 2015

In a few short months, organizations will find themselves scrambling to migrate over to a new server; a disruption caused by the end of support for Windows Server 2003/R2. With mainstream support coming to an end since July 2010, Windows Server 2003/R2's Extended Support, which only provided security updates, is slated to come to an end on July 14, 2015.

Why it's the time to migrate

Staying put will cost your organization more in the end. Maintenance costs for aging hardware will also increase. Added costs will be incurred for intrusion detection systems, more advanced firewalls, network segmentation, etc. 37 critical updates were released in 2013 for Windows Server 2003/R2 under the Extended Support. With it coming to an end, no updates will be developed or released after end of support, including all vital Microsoft applications.

Lack of compliance with various

standards and regulations can be devastating. This may include various regulatory and industry standards for which compliance can no longer be achieved. For example, lack of compliance might mean an increased cost of operating which will include paying catastrophic penalties and astronomically high transaction fees. The solution is to simply isolate Windows Server 2003 servers and migrate to a compliant system.

How PCMG can help

Migrating to a new server can present its challenges; it is perceived to be costly and thought to interfere with custom and legacy applications. With PCMG, it doesn't have to be challenging. PCMG, in partnership with Microsoft, provides the tools that can help increase the mobility, productivity, collaboration, and be compatible with most existing custom and legacy applications. These services help organizations become more productive through

better communication, anywhere access and coordination of messages, contacts, calendars, task lists, and important documents. It's the power of the cloud delivering a new kind of productivity and efficiency — all without the burden of costly infrastructure.

Experts you can trust

Our teams of experts are here to guide you through the migration process and solve your server needs. For Windows Server assessments, installation, migrations, and upgrades, our Services team is here to help. Our services portfolio spans the entire information technology lifecycle – from the initial design to the implementation and continuing management. ■

Contact your PCMG Account Executive today

to learn more about the server migration option that's right for you.

1-800-625-5468 | www.pcmg.com

Unmatched Capacity and Reliability



HP ProLiant ML350 Gen9

The HP ProLiant ML350 Gen9 Server delivers a class-leading combination of performance, expandability, manageability, reliability and serviceability making it the choice for expanding organizations, remote offices, and data centers. Get a 70% performance gain, plus the latest HP DDR4 SmartMemory offering a 14% performance boost.

- 6-core, 1.90GHz Intel® Xeon® E5-2609V3 processor
- 5U, 2-way tower server with 8 hot-swappable bays
- SATA-600 and SAS 3.0 interface
- 2 x 300GB 6G SAS 10K 2.5" SC Enterprise Hard Drive

only **\$2429⁹⁹** #13345838

Supports up to two Intel® Xeon® processor E5-2600 v3 processors.



Up to 40Gb Networking with new Infiniband options.

HP Smart Buy ProLiant DL380 Gen9

The HP ProLiant DL380 Gen9 Server has a flexible redesigned chassis, including new HP Universal Media Bay configuration options with 8 to 24 Small Form Factor and 4 or 12 Large Form Factor drive options; with additional rear drive support for expandability.

- 2 x 10-core, 2.30GHz Intel® Xeon® E5-2650V3 processor
- 2U, 2-way rack-mountable server
- 32GB RAM • 24 hot-swappable bays
- 4 x 600GB and 2 x 300GB HDD storage capacity

only **\$6619⁹⁹** #13345839

Flexible high-density compute performance

HP ProLiant DL360 Gen9

HP's leading server for dense general-purpose computing, the HP ProLiant DL360 Gen9 Server delivers increased performance with the best memory and I/O expandability packed in a 1U dense rack design. Reliability, serviceability and always on availability, backed

by a comprehensive warranty, make it ideal for the most space constrained server workloads.

- 2 x 2.50GHz 12-Core Intel® Xeon® E5-2680v3 processor
- 1U, 2-way rack-mountable server • 64GB RAM
- 8 hot-swappable bays • 2 x 80GB SSD



only **\$6949⁹⁹** #13269427



Enjoy a simplified cloud computing environment



VMware vSphere 5 Standard

VMware vSphere 5 standard is the premier server consolidation and continuity solution.

- Virtualize your x86 server resources and aggregate them into logical pools for allocation of multiple workloads
- Get network services optimized for the virtual environment, along with simplified administration and management
- Reduces the complexity of back-end storage systems

~~\$995~~ **\$895⁹⁹** #8851032

VMware vSphere 5 Enterprise

VMware vSphere 5 Enterprise is the ideal software for your organization's resource load balancing.

- Protect your data and applications with the industry's most secure "bare-metal" server virtualization platform.
- Maximize uptime across your cloud infrastructure, reducing unplanned downtime and eliminating planned downtime for server and storage maintenance
- Lowers your operating expenditures

~~\$2875~~ **\$2659⁹⁹** #8851072

VMware vSphere 5 Enterprise Plus

The best platform for building out cloud infrastructures. VMware vSphere Enterprise Plus includes the full range of vSphere features for transforming data centers into dramatically simplified cloud computing environments providing the next generation of flexible, reliable IT services for your organization.

- Reduce capital and operating costs by over 50%
- Simplify the operational management of large virtualization deployments for your organization

only **\$3229⁹⁹** #8851284

The most available platform

Oracle Exadata is specifically engineered to provide the highest performance in a database with unmatched dependability.



The Oracle Exadata Smart Combo delivers Exadata power and impressive performance along with high bandwidth ZS3 storage for backup plus data protection options for your database. It's a complete, ready-to-go solution that saves you power, floor space, and integration costs while providing low TCO and ultra-fast performance for all of your users and backup processes.

- Fastest possible backup and recovery for Exadata with ZS3 storage
- Highly Available Database and Disaster Recovery
- NO more Database to Storage tuning
- Run Database queries FASTER
- Analyze Data warehouses FASTER
- Lower TCO with pay as you grow (from 1/8th rack)
- Faster ROI



Rely on a fully redundant integrated system designed to give you the function, protection, and expansion options you're looking for.

JD Edwards EnterpriseOne software, optimized for the powerful Oracle engineered system, gives you the complete IT solution for your organization.

The Oracle Database Appliance

An integrated solution of database and system software, server, storage, and networking, the Oracle Database Appliance is engineered to work together, in a single package that is simple to install and manage.

Oracle's JD Edwards EnterpriseOne

This software suite of 80 enterprise resource planning applications combines value, standards-based technology, and deep industry experience to offer comprehensive solutions with low total cost of ownership.

Oracle Real Application Clusters

Ensures database availability by removing the database server as a single point of failures. Real Application Clusters reduce downtime and maintain continuity.

The Smart Combo's cost-effective to run with integrated one-click patching and maintenance, plus savings on floor space and power consumption which frees up budgets.



The Flexibility Model

With the capacity-on-demand database software licensing model, you only pay for what you need.

Call 1.800.625.5468 or visit pcmg.com



Experience ultimate server reliability

lenovo FOR
THOSE
WHO DO.

Lenovo ThinkServer TS440 70AQ

The ThinkServer TS440 is a true high-class server. Thanks to the increased performance of the powerful processors, the TS440 has the power and speed to handle your workload with ease. To help keep you up and running and your data safe, the TS440 includes reliability features such as error correcting code (ECC) memory and an onboard storage controller with the capability of implementing RAID. You can also choose between enterprise SAS or SATA hot-swap drives. Plus, the TS440 is designed for 24/7 operation and is certified for MSP support with many ecosystem vendors.

- Intel® Xeon® processor E3-1225V3 (8MB cache, 3.20GHz)
- 4GB DDR3 SDRAM ECC
- ThinkServer RAID 100
- Intel® HD Graphics P4600

The Lenovo ThinkServer TS440 is ENERGY STAR certified and made with 65% recycled materials to alleviate energy costs.



only **\$699⁹⁹** #9783862



Lenovo ThinkServer RD640 70B0

The Lenovo ThinkServer RD640 server combines the powerful Intel® Xeon® microprocessor performance, legendary Think quality, and excellent power efficiency. This 2U server provides enterprise performance with great flexibility and scalability. The server also provides users much room for performance improvement.

- 2U rack-mountable server
- 1 x Xeon® E5-2650V2
- 8GB RAM
- 2.5" hot-swappable drives
- Supports up to 32TB hard disk drive capacity

only **\$2207⁸⁷** #9879225


Lenovo ThinkServer RD340 70AB

With reliability features such as hot-swap hard drives, integrated RAID, and redundant power and cooling, you get peace of mind that your data will stay safe and your system will stay up and running. This enterprise-class server has enough computing power for your infrastructure, collaboration, and line-of-business applications.

- 1U rack-mountable server
- Intel® Xeon® E5-2450v2
- 8GB DDR3 SDRAM
- 3.5" hot-swappable drives



only **\$2889⁹⁹** #9933113



Virtualization has Evolved

Experience ultimate virtual flexibility

Adopt a hybrid architecture for complete cloud control and security

Virtualization software has rapidly transformed the IT landscape and has fundamentally changed the way people compute. Our servers, storage devices and networks have been transformed and ‘virtualized’ from physical and tangible artifacts to mere ‘files’ sitting atop a thin layer of software called a hypervisor. Decoupled from the physical world, these compute resources and virtual machines can be dynamically allocated with just a few clicks and keyboard strokes.

Virtual Machine means no hardware

The operating system can’t tell the difference between a virtual machine (vm) and a physical machine, nor can applications or other computers on a network. Virtual machines think and act like a “real” computer, but since VMs are composed entirely of software and contain no hardware components they offer a number of distinct advantages over physical hardware. VMs can be copied, replicated, migrated and even scripted; they are after all merely files sitting on a layer of software.

A variety of advantages

In 1999, VMware found a way to completely virtualize an IT’s hardware infrastructure. The advantages brought on by virtualizing technology are more impactful than ever before. Virtualization has enabled IT to more effectively deal with shrinking IT budgets, scarcity of resources, the need for operational flexibility, energy conservation, and dramatically increased information security. If your agency has already taken the leap into virtualization, what’s next on the horizon?

Hybrid offers complete control

For many organizations, developing a hybrid cloud strategy is the next logical step. Bridging your virtualized data center with the public cloud (aka Hybrid Cloud) combines the advantage of scalability and cost-effectiveness that a public cloud computing environment offers, without exposing critical applications and data to third-party vulnerabilities. Adopting hybrid architecture provides you with complete control over your cloud

environment, higher security and privacy control, the ability to react and evaluate outages, man-made issues or natural disasters, and will often provide additional budgetary flexibility.

A new wave of VM

With the rapid pace of technological change becoming commonplace, it is only expected that new breakthroughs will continue to push boundaries. So what’s next? We are likely to see the wide spread adoption over the next couple years of both automated and virtualized networks, security and even virtualized operations. Both virtualization and automation have become a necessity, both for driving down costs and enabling us to operationalize our ability to deliver new services at an ever-increasing pace. But the biggest change might just be a completely new approach.

Bridging your virtualized data center with public cloud offers the advantage of scalability.

Adopting the new approach

Virtualization’s intent is to provide a self-contained platform for building, shipping and running distributed applications. Essentially providing applications or portions of an application packaged in self-contained lightweight containers that run independent of either a physical or virtual platform. ■

Contact your PCMG Account Executive today to gain access to the highest quality technology, industry leading partners, and exceptional service.

1-800-625-5468 | www.pcmg.com

Scale Smarter | Manage Easier | Innovate Faster with Dell PowerEdge Servers

Dell PowerEdge R730xd

Maximize server-based storage flexibility and performance with the remarkable PowerEdge R730xd, part of the new 13th generation of PowerEdge servers. The R730xd offers an optimal balance of storage utilization, performance and cost with an optional in-server hybrid storage configuration that can support tiering and capacity for up to 28 drives in a 2S/2U system, including up to 18 x 1.8" SATA SSDs.



- 2U rack mountable server
- Intel® Xeon® (15MB cache, 2.40GHz)
- 16GB DDR4 SDRAM-ECC • 1TB HDD

only **\$3479⁹⁹** #13365214



Dell PowerEdge R630

Packing all of the performance of a 2-socket server in just 1U of rack space, the R630 delivers incredible resource density for your data center while still offering high flexibility and scalability.

- 1U rack mountable server
- Intel® Xeon® (15MB cache, 1.90GHz)
- 8GB DDR4 SDRAM - ECC
- 300GB HDD

only **\$2459⁹⁹** #13365205

Dell PowerEdge R730

A 2-socket, 2U rack servers with support for multiple GPUs or accelerator cards, the R730 offers tremendous performance and flexibility for demanding data centers.

- 2U rack mountable server
- Intel® Xeon® (30MB cache, 2.50GHz)
- 16GB DDR4 SDRAM - ECC • 300GB HDD



Features powerful processors, large memory, fast storage and GPU accelerator support.

only **\$4819⁹⁹** #13365218

Drive a wide range of demanding workloads with a flexible server offering peak 2-socket performance and huge internal storage capacity.



Dell PowerEdge T630

A 2-socket tower server which can also be utilized as a 5U rack mounted server, the T630 delivers extensive internal storage, performance and scalability primarily for mid-size offices and smaller data centers.

- 5U tower server
- Intel® Xeon® (15MB cache, 1.90GHz)
- 8GB DDR4 SDRAM - ECC
- 300GB HDD

only **\$1959⁹⁹** #13365201



PartnerDirect
Premier

Provide all-flash or hybrid storage and supports up to 10,000 MS-Exchange mailboxes in just 2U of rack space.

Extending the benefits of high-class storage to small and midsize deployments

Dell Storage SC4020 “all-in-one” Array

With an organization of your size, you need efficient, real-time data access to quickly turn customer interactions into transactions and information into insights. The Dell Storage SC4020 puts the high IOPs and low latency your applications demand within reach.

Top tier features

Ideal for stand-alone SANs or departmental/branch office deployments, the SC4020 is based on our larger high-class storage solution, SC8000.

Energy saving design

Dual controllers, 24 internal drive slots and high performance Fibre Channel or iSCSI network ports come standard in a space-saving 2U chassis. This compact footprint helps to lower data center energy costs while the automated and intelligent data placement architecture reduces lifecycle hardware costs.

Call for Price!

Unified Threat Management Firewall

Dell SonicWALL

Dell SonicWALL TZ 205 TotalSecure - 1 Year

Organizations with remote sites and branch offices can benefit from the powerful security and performance with virus prevention, anti-malware and content/URL filtering with the broadest, most secure mobile platform support for laptops, smartphones and tablets.

Get configuration flexibility in an affordable desktop appliance that's easy to set up, operate and manage.



only **\$463** #9098257

#9053121 Dell SonicWALL TZ 215 TotalSecure - 1 Year

\$931



Dell SonicWALL Network Security Appliance 2600 TotalSecure

Delivers gateway anti-virus, gateway anti-spyware, and application intelligence for organizations of all sizes.

only **\$3080** #9797493



Dell SonicWALL Network Security Appliance 3600 TotalSecure

Provides comprehensive next-generation firewall protection without compromising performance.

only **\$4689⁹⁹** #9638246

The diagram illustrates a Cloud Hosted Services Network architecture. A central cloud icon labeled "Cloud Hosted Services Network" is connected by dashed green lines to four nodes: "Campus / HQ" (represented by a building icon), "Branch Office" (represented by a building icon), "Retail Store" (represented by a building icon), and "Teleworker" (represented by a house icon). To the right of the diagram, a man in a blue shirt and tie is smiling and holding a tablet.

Trust Meraki for a fast, secure, and dependable network

The beauty of a cloud-managed networking solution is that IT staff tasked with managing it don't even need to be wireless engineering specialists in order to deploy, configure and manage a complex solution.

Meraki's new clean, intuitive interface

Meraki allows customers to log into a single cloud based "Dashboard" to manage all of their equipment, including wireless access points, switching and security appliances. The user interface is intuitive and flows naturally resulting in very little learning curve.

Cisco's Meraki solutions use cloud connectivity for a secure "out of band" management session. All LAN/WAN traffic stays locally on the network. If the equipment loses connectivity with the Meraki cloud management platform for any reason, all equipment continues to function as configured and changes will be made with a re-sync upon connection.

Advanced management features

User traffic and proximity analytics for wireless are unprecedented for an out-of-box solution. Advanced management features like Traffic-shaping and application access management for wireless networks are uncomplicated and the mobility solution allows for full IOS, Android and Windows device management and security. Reporting and analytic capabilities are detailed and provide statistical data on utilization down to the individual application and device level. Additional security measures include single sign-on, full integration into active directory and Cisco's Identity Services Engine solution (ISE).

Easy configuration and shipment

Meraki offers a plug-and-play experience for high-level network environments; providing for rapid deployment, allocation, and re-allocation of resources, without hands-on support and without compromise. ■



Meraki Cloud Managed Switch MS220-48

- IEEE 802.1X support for port based network access
- MAC-based RADIUS authentication and MAC white listing
- Voice VLAN support for simplified VoIP deployments
- Port Mirroring to monitor network traffic
- DHCP snooping to prevent users from adding unauthorized DHCP servers on the network

~~\$3775~~ **\$2579⁹⁹** #9841067



Cisco offers performance, density, and complete stability

Cisco UCS B200 M4 Blade Server

The UCS B200 M4 Blade Server is built with the Intel® Xeon® E5-2600 v3 processor family, up to 768GB of memory (with 32GB DIMMs), up to two drives, and up to 80Gbps total bandwidth. It offers exceptional levels of performance, flexibility, and I/O throughput to run the most demanding applications.

- Suitability for a wide range of applications and workloads
- Highest-performing CPU and memory options without constraints in configuration, power or cooling
- Half-width form factor offering industry-leading benefits
- Latest features of Cisco UCS Virtual Interface Cards (VICs)

only **\$1299⁹⁹** #13286197

Advanced cloud networking architecture: Welcome to the powerful, reliable, plug-and-play access platform



Meraki Cloud Managed Switch MS220-24P

The Cisco Meraki MS220-24 has pre configured switches for zero-touch deployment and contains rogue DHCP servers. The MS220-24 identifies and locates switch ports, identifies bandwidth hogs with locked down switch access.

- Includes 370 W PoE/PoE+
- Voice and Video QoS Visibility and control over thousands of ports
- Built-in multi-site management
- Real time trouble shooting tools

only **\$1879⁹⁹** #9884686

Ongoing feature upgrades and enterprise support are included.



Meraki MS Series 22 Subscription License

Enterprise 3-year License and Support. Ideal for network administrators who demand both ease of deployment and a state-of-the-art feature set.

- Built-in multi-site cloud management and monitoring
- Switch is automatically monitored from the cloud
- Alerting tools to notify administrators of downtime and configuration changes
- Rich web-based diagnostics for troubleshooting

only **\$257⁹⁹** #9901410

Grow your infrastructure with power and resilience



HP 3PAR StoreServ All Flash Array

HP 3PAR StoreServ can lower storage TCO today and enable agility for what's next. Flash-optimized performance, unified protocol support, proven availability, and Thin Deduplication plus self-managing features reduce complexity. It's primary storage for all your needs. With storage federation, you can non-disruptively move data between any 3PAR StoreServ system to make life easy down the road.

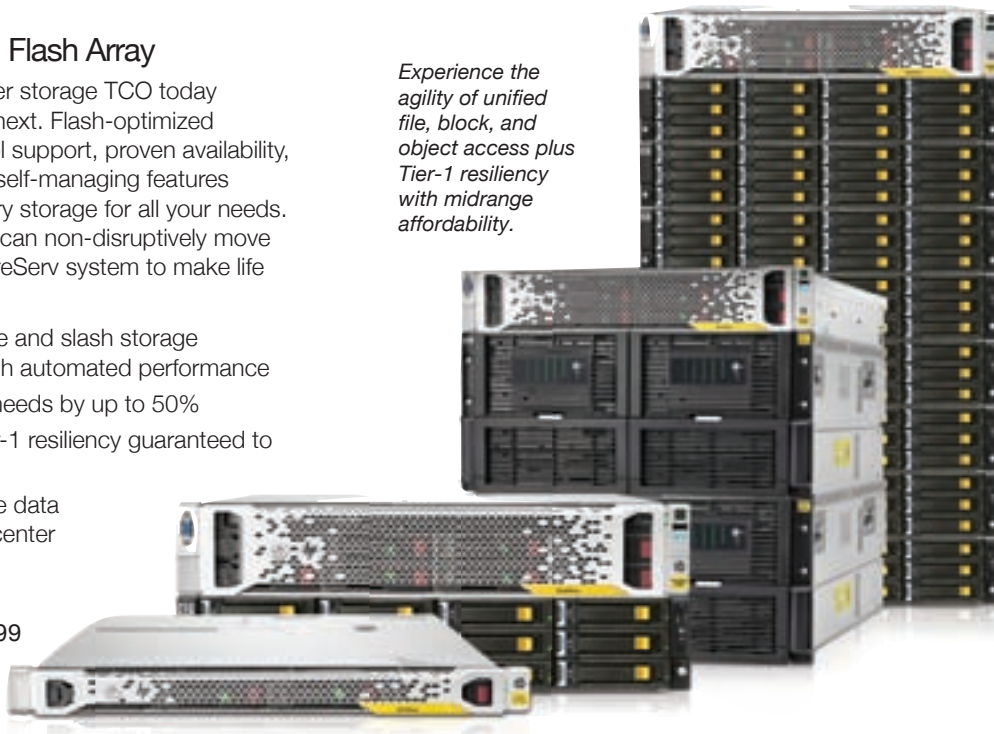
Experience the agility of unified file, block, and object access plus Tier-1 resiliency with midrange affordability.

- Eliminate the learning curve and slash storage management overhead with automated performance
- Reduce storage capacity needs by up to 50%
- Experience multitenant Tier-1 resiliency guaranteed to double your VM density
- Federated, simple, risk-free data mobility across your data center

As low as

\$41999⁹⁹ #13345699

This offer is not available online. Please call your PCMG Account Manager for more information.



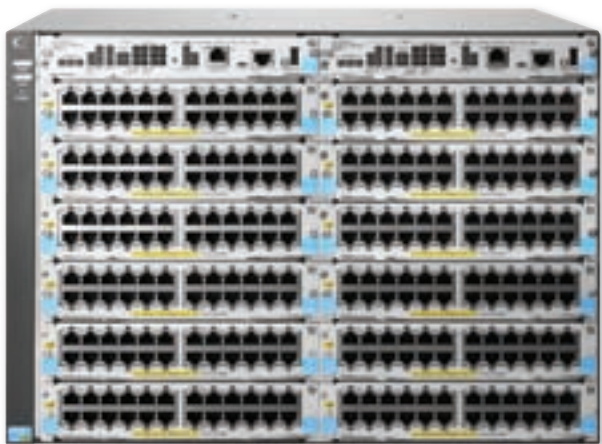
Flexibility and scalability all in one

HP 5412R z12 Switch Rack Mountable

This next-generation modular switch is designed for enterprise edge, small to medium organizations, and branch office core deployments. With high levels of

resiliency and unprecedented flexibility, scalability and ease of use, the 5400R supports demanding network features such as hitless failover, power supply and management redundancy, QoS and security with full L3 features. Robust virtualization with HP AllianceOne solutions and flexible connectivity including 10 Gigabit Ethernet and full PoE+, the 5400R requires no add-on software licensing and is SDN ready with OpenFlow support.

- 7U rack-mountable switch
- 785.7Mpps throughput performance
- 4GB RAM, 1GB flash memory
- PoE+ power for 288 ports, internal power supplies
- SDN Ready with OpenFlow support
- Lifetime hardware warranty, 3 years 24 x 7 phone support



Hot-swappable modules and optional redundant power supply provides uninterrupted power with no impact on the network.

only **\$3689⁹⁹** #13285977

The Back-UPS solution for irreplaceable agency data



APC Power Savings Back-UPS Pro 1000

This Back-UPS Pro features power-saving outlets that automatically cuts power supply to equipment that are idle and provides protection to operational equipment. This helps you save electricity and lower energy costs.

This UPS device from APC also has a resettable circuit breaker, which allows you to easily recover from overloads without having to replace a fuse. Power outages can hinder our productivity. The APC back-ups Pro 1000 is the remedy for every business, home, or office

- 600 watt/1000VA
- Maintenance-free sealed Lead-Acid, leak-proof battery
- Runs clean and helps you save energy
- Telephone, network and coaxial cable data line protection
- PowerChute software provides file protection



Call for price! #8076121

Protect your power and gain peace of mind

CyberPower

CyberPower PR1500LCD Smart App Sinewave Tower UPS 1500VA/900W

Power protection designed for organizational servers and networks, storage appliances and telecom installations. This UPS features pure sine wave output, full Automatic Voltage Regulation (AVR), and an extendable multifunction LCD control panel.

- Convenient tower design when rack space is limited
- Extendable LCD control panel (monitor power status up to 4.5ft. away)



Patented GreenPower UPS advanced circuitry reduces UPS energy costs by up to 75% compared to competitive models.



Call for price! #9189403

#9690588 CyberPower EC650LCD Ecologic UPS **\$64⁹⁵**

Call 1.800.625.5468 or visit pcmg.com



Exceed your productivity expectations with HP



HP Ultrabooks

14" HP ZBook 14 Mobile Workstation

This superbly thin, customizable workstation is light enough to carry when you're on the go — and powerful and reliable enough to carry you through the workday.

- 4th gen Intel®Core™ i5 processor (3MB cache, 1.60GHz)
- 16GB DDR3 SDRAM • 500GB HDD



~~\$1399~~ **\$1246⁹⁹** #9836767



14" HP EliteBook Folio 1040 G1

The HP Elitebook Folio 1040 is packed with enterprise-class features like docking capabilities and premier security to help keep you productive and your data safe.

- 4th gen Intel®Core™ i5 processor (3MB cache, 1.70GHz)
- 8GB DDR3 SDRAM • 128GB SSD

only **\$1329⁹⁹** #13237004

HP Desktops



HP Pro 3500 Desktop

- 3rd gen Intel®Core™ i3 processor (3MB cache, 3.40GHz)
- 4GB DDR3 SDRAM
- 500GB HDD
- DVD±RW SuperMulti DL drive
- Intel® HD Graphics 2500

only **\$499⁹⁹** #9777064

HP ProDesk 600 G1

- 4th gen Intel®Core™ i5 processor (6MB cache, 3.30GHz)
- 4GB DDR3 SDRAM
- 500GB HDD
- DVD±RW SuperMulti DL drive
- Intel® HD Graphics 4600



only **\$699⁹⁹** #13259110



HP EliteDesk 700 G1

- 4th gen Intel®Core™ i5 processor (6MB cache, 3.30GHz)
- 4GB DDR3 SDRAM • 500GB HDD

only **\$679⁹⁹** #13247891



HP ProDesk 400 G1

- 4th gen Intel®Core™ i5 processor (6MB cache, 3.30GHz)
- 4GB DDR3 SDRAM • 500GB HDD
- DVD±RW SuperMulti DL drive

only **\$549⁹⁹** #13259106

Dell gives you a faster, sleeker way to compute



PartnerDirect
Premier

Dell OptiPlex 3030 All-in-One

Free your workspace from clutter with the OptiPlex 3030 All-in-One desktop featuring an optional touch screen for easy navigation even without a mouse.

- 4th gen Intel® Core™ i5 processor (6MB cache)
- 4GB installed RAM HDD
- 1600 x 900 display resolution



only **\$796⁹⁹** #13200259



Dell OptiPlex 9030 All-in-One

Streamline your organization with the space-saving OptiPlex 9030 All-in-One desktop with best-in-class security and manageability features.

- Intel® Core™ i7 processor (8MB cache)
- 8GB installed RAM • 500GB HDD
- Equipped with HDMI and 6 USB 3.0 ports

only **\$1089⁹⁹** #13216019

The perfect on-the-go companion

Versatile Productivity

The Venue 11 Pro 7000 Series delivers the portability of a tablet, power of an Ultrabook™ and experience of a desktop when combined with dock.

Engineered to impress: The high-resolution 10.8" Full HD (1080p) display allows you to be productive anytime and anywhere. Delivering wide viewing angles the Venue 11 Pro is perfect for multi-tasking, creating stunning presentations or watching your favorite HD movie.

Simplified collaboration: Wirelessly stream HD videos, presentations and photos from your tablet to the big screen via projector or display with built-in wireless

technology. All you need is a compatible media adapter (sold separately) and an HDMI-enabled display.

Leave your charger at home: Power through a full workday (up to 8-10 hours*) with the Venue 11 Pro 7000.

Portability partner: Take on whatever comes your way with desktop performance in a tablet loaded with Intel® Core™ processors, Windows® 8.1 and a 10.8" Full HD.



Dell Venue 11 Pro

- 4th gen Intel® Core™ i3 processor (3MB, 1.50GHz)
- 4GB DDR3L SDRAM
- 128GB SSD

Starting at **\$751⁹⁹** #9848257

*With optional Dell Tablet Mobile Keyboard

Call 1.800.625.5468 or visit pcmg.com

PCM-G

Designed to outperform



12.5" Lenovo ThinkPad Yoga 20CD

The ThinkPad Yoga delivers flexibility for organizations. Its 12.5" display rotates 360 degrees to offer four different usage modes: Laptop, Tablet, Tent, and Stand. Boasting legendary ThinkPad reliability and a range of advanced computing and security features, it's the ultimate multimode Ultrabook.

Enjoy a multi-touch experience

Interact with your ThinkPad Yoga by using simple, intuitive gestures directly on the 10-point multi-touch display—optimized for Windows 8. Its advanced multi-touch technology provides a superior touch experience, greater responsiveness, and faster response times.

- 4th gen Intel®Core™ i7 processor (4MB cache, 2.10GHz)
- 8GB DDR3L SDRAM
- 256GB SSD
- 1920 x 1080 Full HD resolution
- Intel® HD Graphics 4400



At a mere 3.5lbs, the ThinkPad Yoga is ultra portable and perfect for professionals on the go.

only **\$1654⁹⁹** #9901998

Rethink your mobile computing possibilities



14" Lenovo ThinkPad T440p 20AN

With the Lenovo ThinkPad T440P, you are assured that your files stay safe even after getting a nasty bump, thanks to its roll-cage technology. For durability, this ThinkPad laptop is equipped with a carbon fiber top and a lightweight magnesium bottom—optimized for travel.

- 4th gen Intel®Core™ i5 processor (3MB cache, 2.50GHz)
- 4GB DDR3L SDRAM • 500GB HDD • Spill-resistant, multi-touch touchpad • Intel® HD Graphics 4600

only **\$724⁹⁹** #9811024

14" Lenovo ThinkPad E440 20C5

The Lenovo ThinkPad E440 includes unique security and productivity features to keep your organization up and running: after-hours maintenance, software monitoring, USB blocker, energy savings, and the ability to backup and restore applications.

- 4th gen Intel®Core™ i5 processor (3MB cache, 2.50GHz)
- 4GB DDR3L SDRAM • 500GB HDD
- Intel® HD Graphics 4600



Login with a quick finger swipe on the integrated fingerprint reader.

only **\$649⁹⁹** #9932983

Enjoy enhanced resolution



24" HP EliteDisplay E241i

If your workspace requires a large screen display with extra-wide viewing angles and extraordinary comfort, look no further than the HP EliteDisplay E41i. With its sleek look, outstanding resolution quality, and Eco-friendly design, the EliteDisplay E41i

- 24" Widescreen LED Backlit IPS Monitor
- 1920 x 1200 Resolution
- 16:10 Aspect Ratio
- 8 ms response time
- Tilt, Swivel, Pivot Adjustable

only **\$249⁹⁹** #9966147



HP EliteDisplay E190i

- 18.9" LED Monitor
- 1280 x 1024 resolution
- 16.7 million colors

only **\$157** #9888804



18.5" HP v193

- 16:9 widescreen
- 1366 x 768 resolution
- 16.7 million colors

~~\$89⁹⁹~~ **\$84⁹⁵** #13266658



Put your work onto vivid display



24" Samsung S24C450D Monitor

The Samsung S24C450D monitor is not only stylish, it's ergonomically advanced. With a 4-way adjustable stand, it adapts to different work styles, keeping users comfortable, focused and productive.

- 1920 x 1080 native resolution
- 16:9 widescreen
- Supports 16.7 million colors



only **\$239⁹⁹** #9454210

22" Samsung S22B420BW Monitor

Adjust the Samsung 420 series monitors to you, not the other way around. Swivel, tilt, pivot and height-adjust to your absolute comfort. Then sit back and marvel at the brilliant color and clarity only Samsung can offer.

- 1680 x 1050 native resolution
- 16:10 widescreen
- 1000:1 contrast ratio



only **\$199⁹⁹** #9113500

Call 1.800.625.5468 or visit pcmg.com



Print, scan, and fax with confidence



Xerox ColorQube 8580DN Color Solid Ink Printer

The powerful and environmentally friendly printing solution that's simple and highly productive, with the advantage of superior color.

- Up to 51ppm color print speeds*
- 2400 FinePoint™ print resolution
- 85,000-page monthly duty cycle

Solid Ink gives your documents rich, vibrant colors on all media.



only **\$699** #13367727



Rip through files faster with high-performance 600MHz CPU and vast megabytes of memory.



Ricoh Aficio SP C430DN Color Laser Printer

Invest in something that can withstand the test of time and is heavy-duty enough to endure wear and tear.

- Up to 37ppm B&W, color print speeds*
- 1200dpi maximum print resolution
- 150,000-page monthly duty cycle

only **\$1199** #8171008
Check PCMG.com for up to date pricing



Lexmark CX410de Multifunction Printer

Deliver PANTONE color matching, fast print, fax, copy and scan speeds and a convenient color touch screen.

- Up to 32ppm B&W, color print speeds*
- 1200 x 1200dpi print resolution
- 75,000-page monthly duty cycle



only **\$799** #9402905



Brother MFC-J6720DW Color Inkjet All-in-One Printer

Combines business essential features including fastest prints, copying, scanning and faxing up to 11"x17".

- Up to 35ppm B&W and 27ppm color print speeds*
- 6000 x 1200dpi print resolution
- 26,000-page monthly duty cycle

only **\$265⁹⁹** #9760533
Check PCMG.com for up to date pricing

*Print speeds vary with use

Let creativity flow at high speed with fast, innovative HP Printers



HP LaserJet Pro 400 M401n Monochrome Laser Printer

- Up to 35ppm B&W print speeds vary with use
- Up to 1200dpi resolution
- AirPrint enabled



Up to
50,000 pages
monthly

only **\$219** #9222451



Up to
40,000 pages
monthly

HP LaserJet Pro 400 M451dn Laser Printer

- Up to 21ppm B&W print speeds vary with use
- 600dpi resolution
- HP ePrint technology

only **\$574⁹⁹** #9003889



Up to
75,000 pages
monthly

HP Officejet Enterprise X555dn Ink Jet Printer

- Up to 72ppm B&W and color print speeds vary with use
- 1200 x 1200dpi resolution
- 4.3" touchscreen display

only **\$804⁹⁹** #13017787

PCMG Terms of Use & Sale

- All returns require a return authorization number. Requests must be made within 15 days of purchase. Returns may be subject to a minimum 15% restock fee. The amount refunded will be the lower price of either the date of purchase or date of return.
- To request a return authorization number, please call your Account Executive at the phone number listed on the front of this packing slip.
- Tape the return label provided to you on the box and ensure the return authorization number is clearly marked. Do not write on the original manufacturer's box.
- Returned product(s) must be complete including manufacturer's original package, accessories, software and manuals. Incomplete returns may be refused.
- A product must be received in our warehouse within 10 business days from the date the return authorization is given.
- The customer is responsible for all return shipping costs. COD shipments will not be accepted.
- We are not responsible for lost or stolen packages. We recommend using a courier that can track your package with a tracking number.
- Pack your return securely. We recommend insuring it for your protection.
- All other policies are in accordance with the policies published in our latest catalogs and on our website www.pcmg.com.
- We are not responsible for integrity or backups of data on any drive returned to us even if included in a system.
- Subsequent to an approval authorization, a credit to an account or issuance of a check can take up to 30 days.
- Missing a rebate? Look it up on our website: www.pcmg.com or call your Account Executive.

Terms/Warranty Disclaimer. PCMG expressly disclaims all expressed or implied warranties. Including any implied warranty of merchantability or of fitness for a particular purpose non-infringement. PCMG shall have no liability to anyone for incidental or consequential damages or any other liability, loss or damage arising out of or related to the merchandise sold. All merchandise is so "AS IS". PCMG makes no warranty as to the performance of any merchandise sold. We are not responsible for the system downtime, lost date, etc. This disclaimer by PCMG in no way affects the terms of a manufacturer warranty, if any. The following manufacturer's products cannot be returned for any reason. The manufacturer must be contacted for all repairs and warranty replacements. The warranty on the product is directly from the manufacturer. We will be happy to assist with the installation and instructions. However, the following manufacturers require you to contact them directly for repairs or replacement of your product. Unless subject to applicable master agreement or SOW signed by each parties, the offer and sale related to this invoice/packing slip is subject to the Terms of Use and Sale @ <http://www.pcmg.com> and those set forth herein notwithstanding any purchase order to the contrary. Any disputes related hereto must be brought individually and not part of any class, in accordance with the above relevant Terms of Use and Sale.

The following manufacturer's product cannot be returned for any reason. The manufacturer must be contacted for all repairs and warranty replacements.

VENDOR	Acer	APC	Apple	Cisco	Eaton
TECH SUPPORT #	800.816.2237	800.555.2725	800.275.2273	800.553.2447	800.356.5794
WEBSITE	www.us.acer.com	www.apc.com	www.apple.com	www.cisco.com	www.eaton.com
VENDOR	Garmin	HP/COMPAQ	Hitachi	IBM	Lenovo
TECH SUPPORT #	800.800.1020	800.474.6836	800.448.2244	Parts & Warranty 800.388.7080	800.426.7378
WEBSITE	www.garmin.com	www.hp.com	www.hitachi.com	Hardware Service 800.428.7378	www.lenovo.com

VENDOR	Lexmark	Logitech	Microsoft	Olympus	Quark	Samsung CE
TECH SUPPORT #	800.332.4120	646.454.3200	800.642.7676	888.553.4448	800.676.4575	800.726.7864
WEBSITE	www.lexmark.com	www.logitech.com	www.microsoft.com	www.olympusamerica.com	www.quark.com	www.samsungelectronics.com
VENDOR	Seagate	Sharp	Sony PC's	Tom-Tom	Toshiba	Western Digital
TECH SUPPORT #	800.732.4283	800.237.4277	888.476.6972	866.486.6866	800.457.7777	800.275.4932
WEBSITE	www.seagate.com	www.sharpsusa.com	www.sony.com	www.tomtom.com	www.toshiba.com	www.wdc.com

Call 1.800.625.5468 or visit pcm-g.com

PCM-G

Redefine productivity

Pages®, Numbers®, and Keynote® are now free with every iPad®, so you can work with documents, spreadsheets, or presentations on the go. With iCloud®, your documents stay in sync across your iPad, iPhone®, Mac®, or PC, enabling you to collaborate wherever you are.



iPad Air™ 2

Starts at **\$499***
Available in Space Gray, Silver or Gold.

iPad mini™ 3

Starts at **\$399***
Available in Space Gray, Silver or Gold.

Surround your iPad with protection



iPad Smart Cover®

- Covered hinge fits iPad's thin profile
- Designed for ultimate portability
- Comes in a variety of sleek colors

only **\$39***

*Price is as of March 2015, is subject to change, does not include taxes or shipping, and is U.S. pricing. Pages, Numbers, and Keynote are free on the App Store for qualifying iOS 8 compatible devices with initial activation on or after September 1, 2014. See www.apple.com/ios/whats-new for iOS 8 compatible devices. Downloading apps requires an Apple ID. Apple, the Apple logo, iCloud, iPad, iPhone, Keynote, Mac, Numbers, Pages, and Smart Cover are trademarks of Apple Inc., registered in the U.S. and other countries. iPad Air and iPad mini are trademarks of Apple Inc.

Computing companion



MacBook Air

Thin, light, power-packed and ready for an entire day of work or play.

Get everyone's favorite work-on-the-go companion, the MacBook Air. Whether used for work or fun, the 11-inch MacBook Air lasts up to 9 hours between charges and the 13-inch model lasts up to an incredible 12 hours. So from your morning coffee till your evening commute, you can work unplugged. When it's time to sit back and relax, you can get up to 9 hours of iTunes movie playback on the 11-inch model and up to 12 hours on the 13-inch model. And with up to 30 days of standby time, you can go away for weeks and pick up right where you left off.



Model	Size	5th Gen Processor	RAM	Flash Storage	Graphics	List Price	SAVE!	PCMG Price*
#13446762	11.6"	1.6GHz Intel® Core™ i5	8GB	128GB	Intel® HD Graphics 6000	\$999	\$5	\$994
#13446724	11.6"	1.6GHz Intel® Core™ i5	4GB	256GB	Intel® HD Graphics 6000	\$1099	\$5	\$1094
#13446727	13.3"	1.6GHz Intel® Core™ i5	4GB	128GB	Intel® HD Graphics 6000	\$999	\$5	\$994
#13446776	13.3"	1.6GHz Intel® Core™ i5	8GB	128GB	Intel® HD Graphics 6000	\$1099	\$5	\$1094
#13446781	13.3"	1.6GHz Intel® Core™ i5	8GB	256GB	Intel® HD Graphics 6000	\$1299	\$5	\$1294
#13446789	13.3"	2.2GHz Intel® Core™ i5	8GB	256GB	Intel® HD Graphics 6000	\$1449	\$5	\$1444
#13446791	13.3"	2.2GHz Intel® Core™ i5	8GB	512GB	Intel® HD Graphics 6000	\$1749	\$5	\$1744

MacBook Pro with Retina display

Brilliant display and phenomenal performance in a sleek, thin package.

MacBook Pro packs a lot of power into not a lot of space. Engineered to reconsider each detail of every internal component and maximize performance and minimize size for ultimate portability.

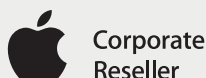


Model	Size	Processor	RAM	Flash Storage	Graphics	List Price	SAVE!	PCMG Price*
#9824732	13.3"	2.4GHz Intel® Core™ i5	4GB	128GB	Intel® Iris™ Graphics	\$1299	\$229	\$1069⁹⁹
#13446711	13.3"	2.7GHz Intel® Core™ i5	8GB	128GB	Intel® Iris™ Graphics 6100	\$1299	\$5	\$1294
#13446712	13.3"	2.7GHz Intel® Core™ i5	8GB	256GB	Intel® Iris™ Graphics 6100	\$1499	\$5	\$1494
#13446716	13.3"	2.9GHz Intel® Core™ i5	8GB	512GB	Intel® Iris™ Graphics 6100	\$1799	\$5	\$1794
#13240565	15.4"	2.2GHz Intel® Core™ i7	16GB	256GB	Intel® Iris™ Pro Graphics	\$1999	\$10	\$1989
#13240566	15.4"	2.5GHz Intel® Core™ i7	16GB	512GB	NVIDIA GeForce GT 750M (1GB GDDR5)	\$2499	\$10	\$2489

*Price is as of March 2015, is subject to change, does not include taxes or shipping, and is U.S. pricing.

Call 1.800.625.5468 or visit pcmg.com





MacBook

now available at PCMG.



The new MacBook® delivers a full-size experience in the lightest and most compact Mac® notebook ever. Every element, from the new keyboard and Force Touch trackpad to the 12-inch Retina® display, USB-C port, battery and logic board, has been completely re-imagined to make it not only thinner but also better. The result is more than just a new notebook. It's the future of the notebook. Available in gold, space gray, and silver.

- 12-inch (diagonal) LED-backlit Retina display
- Up to 1.3GHz Dual-Core Intel® Core M Processor
- Intel HD Graphics 5300
- Flash Storage
- 802.11ac Wi-Fi
- Up to 9 hours of battery life¹
- Force Touch trackpad

Call for Pricing!

¹Battery life varies by use and configuration. See www.apple.com/batteries for more information. Apple, the Apple logo, Mac, MacBook, and Retina are trademarks of Apple Inc., registered in the U.S. and other countries.

1.800.625.5468 pcmg.com

Fax additions, corrections, or a request to remove your name from this list to 310.630.3510. We do not release your private information. We occasionally share your postal address with other reputable companies.