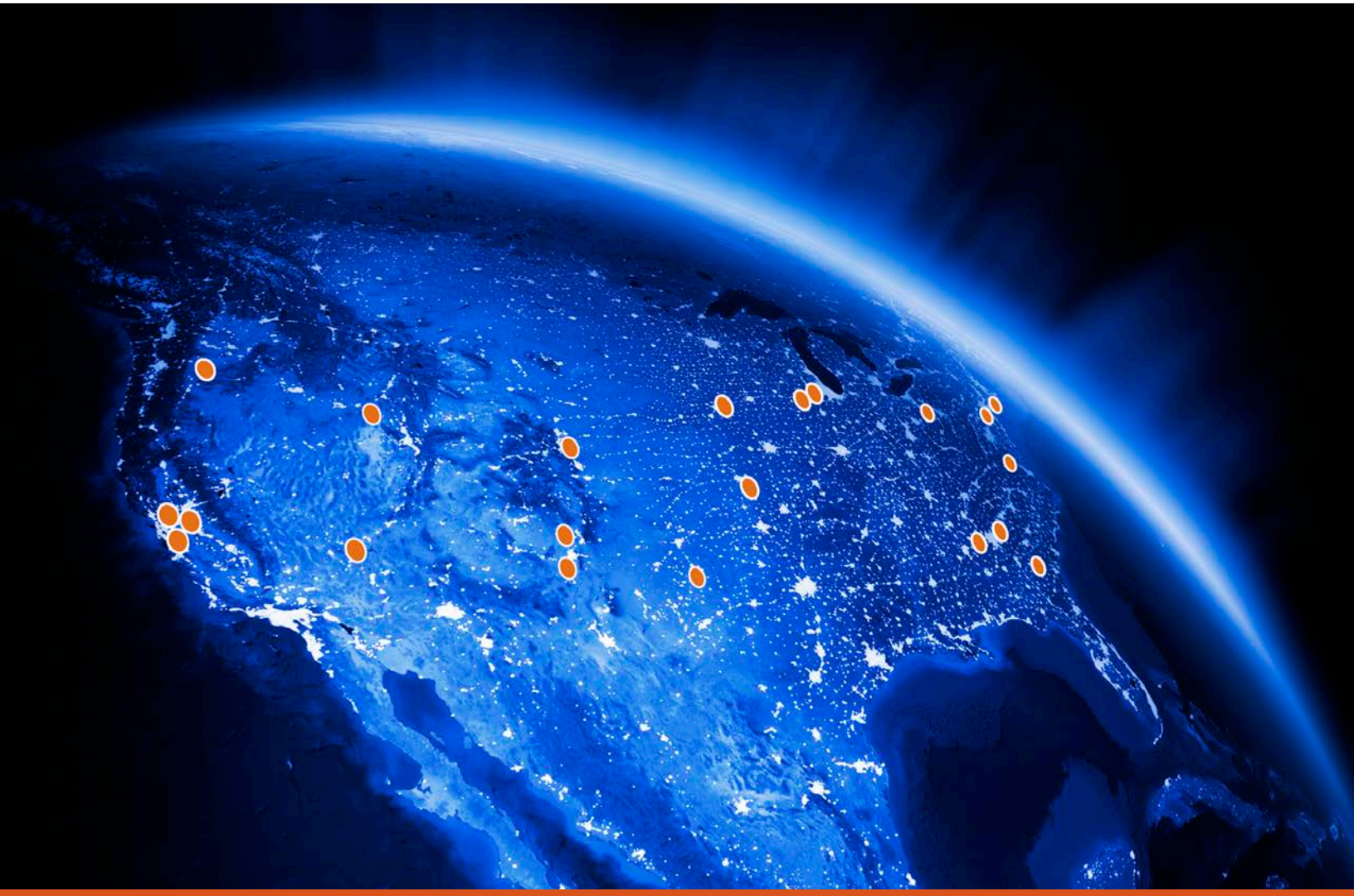
Department of Energy National Laboratories and Plants

Mobility Across the Complex



U.S. DEPARTMENT OF ENERGY

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EXECUTIVE SUMMARY

This report on mobility, published by the National Laboratory Chief Information Officers (NLCIO) Council, highlights the overall status of enabling mobility across the U.S. Department of Energy (DOE) laboratories and plants. Twenty-two laboratories and plants contributed to this report, which contains information on initiatives across the enterprise, examining value and impact to mission, taking a closer look at challenges and opportunities within the complex, and providing strategic approaches for the future.

Mobility is the trend toward a shift in work habits, with more employees working away from the office and using mobile devices and cloud services to perform tasks. The need to enable mobility is recognized as an important capability by the U.S. government, and can be seen in the Open Government Directive—which requires federal agencies to take immediate, specific steps to achieve key milestones in transparency, participation, and collaboration—and in the Mobility Strategy for the Federal Government. One of the stated goals of the Mobility Strategy is to "improve delivery of government information, products, and services through technologies, including those that are mobile[1]."

> The Department's mission fosters open innovation and a collaborative environment where its National Labs provide expertise and are leading the path forward enabling Energy to excel through mobility; allowing the Department's staff to work wherever, whenever. Whether using a smart phone to track water streams with floating robots or furthering research at the Livermore Valley Open Campus, the use of new and emerging information technology enables the critical work we do. Science and technology continue to remain at the heart of our mission and mobility will drastically enhance our ability at accomplishment.
>
> ***–Robert Brese, U.S. Department of Energy CIO***

The term *mobility* refers not only to mobile workers and mobile devices, but also to the mobility of data. An employee may upload a corporate presentation from a desktop PC to a cloud storage service, then access it from a personal device to show to peers, or a researcher may compile energy data and wish to provide the data to the public via application programming interfaces.

Considering that the move toward a mobile-enabled environment doesn't come without risks, embracing mobility is a daunting proposition for many organizations, but it doesn't have to be. Organizations can embrace the technology, allowing employees to do their jobs anytime, anywhere, while still protecting their assets, and provide access to their data and research.

All 22 of the DOE laboratories and plants are implementing and leveraging mobility initiatives in many ways and the DOE complex expects a huge growth in mobile capabilities over the next five years. Delaying or ignoring adoption could cause lost opportunities for partnerships, scientific research, and attracting and retaining staff. However, strategic investments in mobile-enabling capabilities can yield new levels of mission effectiveness, research collaboration and efficiencies, and modernize workplace practices. Most importantly, adopting mobility practices can further the mission of each organization by enabling productivity.

The DOE complex is looking to the future and discussing shifts in existing policies, defining new policies, aligning risks with cyber requirements, and investigating how to leverage mobility to further the mission of each laboratory and plant individually and collectively.

Challenges will occur at all organizational levels with the adoption of a mobile environment. This report provides insight and information to move the conversation forward within the NLCIO and address current and future challenges and opportunities, while exploring the value mobility can provide to each laboratory mission.

WHAT IS MOBILITY?

Across the complex, mobility holds many different definitions. Across industry, there are even more. For the DOE labs and plants, mobility as an Information Technology (IT) function allows employees the ability to stay connected across their campus and from outside the walls of their organization.

1. "Federal Mobility Strategy." Chief Information Officers Council, 2012. Accessed July 1, 2013: *https://cio.gov/federal-mobility-strategy/*.

Mobility does not simply mean giving employees a laptop, tablet, or smartphone and expecting the ability to work effectively. Mobility is about encouraging and enabling better communication and collaboration with peers, coworkers, and the public. It is providing tools and controls that allow appropriate access to the data and tools of the environment to employees and the public. The traditional barriers of location and time zones do not have to exist.

Brian Abrahamson, chief information officer (CIO) at Pacific Northwest National Laboratory (PNNL), emphasizes that mobility is about more than just a new technology in the enterprise IT toolbox—it's about introducing a new consumer-driven user experience within the workplace. Abrahamson states, "The secret sauce to the explosive adoption of mobility in the consumer space is not just the small form factor—it's in the simple, intuitive user experience. When you are designing for a small screen with only the precision of a finger, it requires a new level of simplicity. When is the last time you downloaded an instruction book for an app?"

Mobility means securely accessing digital information, data, and services to/from devices as desired, at any time, from any place. The concept of mobility crosses over traditional IT services, including the network, the service provider, and the device. Across the laboratories and plants, the motto "work is something you do, not a place you go" is commonly used to describe one of the driving forces behind mobility initiatives.

Bruce Wilson, an enterprise architect at Oak Ridge National Laboratory (ORNL) says, "Mobility is user-centric. If we use a virtual desktop infrastructure (VDI) solution to let a user move, even if the device didn't move, it's still mobility."

Sandia National Laboratories has a similar approach. Richard Pinsonneault, solutions architect at Sandia, says, "We've defined mobility from a user experience perspective: their experience must be positive from a throughput, application, and device perspective. We don't want the device to get in the way of a user's productivity. We recognize that we must be fast and agile in meeting the needs of our users."

> "It's about attracting and retaining top talent in the federal workforce and empowering them to do their jobs, and judging their success by the results that they get…It's about creating a culture where, as Martha Johnson [Administrator, General Services Administrator] puts it, 'Work is what you do, not where you are.'"
>
> ***–President Barack Obama, Workplace Flexibility Forum***

From the perspective of the national laboratories and plants, mobility should be focused on the user and the data, not the device.

Andrew Gehring, chief architect at the National Renewable Energy Laboratory (NREL) says, "Open Source software has been the fundamental driver in building the Web into what it is today. In the same way that Open Source software was the foundation upon which the bulk of the Internet was built, I believe that (appropriate) open access to data through open standards will drive uptake, innovation, and choice for the consumers of our services and data."

For the purpose of this report, *mobility* is defined as the ability to make a users' computing capabilities more flexible and responsive, regardless of physical location, through the use of technology that provides access to enterprise information systems and data when they need it—based on who they are and where they are—and doing so with a simple, intuitive user experience.

WHY MOBILE?

Mobile devices are quickly becoming a main entry point and interface to a growing number of computing services and online infrastructures. They are increasingly perceived by the consumer as the most convenient access point for a variety of services. These trends indicate that mobile is no longer a nice-to-have option in IT; it is quickly becoming a key requirement.

The number of mobile-connected devices will exceed the world's population in 2013[2]. Employees and data consumers expect mobility in their day-to-day work environment as they embrace the consumerization of IT. With mobility, it seems that problems are solved more quickly, responses to customers are faster, and being "out of the office" no longer means that work stops. The way employees and consumers conduct business is changing.

2. "Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2012–2017." Cisco, 2013. Accessed March 22, 2013: *http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-520862.html*.

Approaching mobility as a way of value-engineering the IT budget or extending the reach of business into personal time won't leverage the power of the platform. The real value in mobility will be the work experience and access that it provides, and through that experience it will maximize human capital.

The mobile landscape is growing and evolving on a daily basis.

- Mobile broadband subscriptions are expected to grow from nearly 1 billion in 2011 to more than 5 billion globally in 2016.
- By 2015, more Americans will access the Internet via mobile devices than desktop PCs.
- As of March 2012, 46% of American adults were smartphone owners—up from 35% in May 2011.
- In 2011, global smartphone shipments exceeded personal computer shipments for the first time in history[3].

Figure 1. Screenshot of the Brookhaven National Laboratory Mobile Website. *Image Courtesy of BNL*

In May 2013, the White House released a report, *Digital Government: Building a 21st Century Platform to Better Serve the American People*. According to this report, "the Federal Government needs a Digital Strategy that embraces the opportunity to innovate more with less, and enables entrepreneurs to better leverage government data to improve the quality of services to the American people[4]." While the White House's Digital Strategy looks specifically at delivering services more efficiently to the American public, the U.S. CIO's fiscal year (FY) 13 strategic plan confirms the priority of focusing on the productivity gap and a 21st century government, including a future first and mobile strategy[5].

The DOE laboratories and plants share a common view on the benefits of embracing mobility within their organizations. The benefits include attracting and retaining staff, enhancing productivity, increasing employee job satisfaction, and cost savings by various means. But mobility is not just about checking email and calendars from a tablet or smart phone; it is a strategic decision that the DOE laboratories and plants are investing in, incorporating mobility with the needs of the mission and understanding how mobility can transform the way each organization operates from both a mission effectiveness and business perspective.

Brookhaven National Laboratory (BNL) has chosen to make mobility a lab priority because "mobile devices are a transformative technology in the same way that PCs supplanted main frames 30 years ago. This time around, the change is occurring even faster. Our lab will either need to move with this technology or get out of the way. We're choosing to embrace this technology."

BNL's mobile services (*www.bnl.gov/web/mobile/*) provide smart phone users access to select laboratory information. They are providing the information that they believe "will be most useful to staff and guests who are on the go or otherwise without access to their workstations or laptops." This information includes staff directory listings, summaries of the latest lab news and features, an events calendar, local weather, and the lab's Twitter feed. These resources are available to users of iPhones, Android-based devices, BlackBerry devices, and other smart phones.

At Argonne National Laboratory, Deputy CIO Michael Skwarek says, "Today, mobility is loosely coupled to the edge device, such as a tablet or smart phone, and the ability to perform simple tasks like email, calendar, and phone. But in five years, mobility will change how work is conducted." Argonne anticipates the number of mobile devices accessing its network doubling, or possibly even tripling, in the next five years. At SLAC National Accelerator Laboratory, enterprise architect, Mayank Malik, predicts that their network will have more devices than humans in the coming years.

3. "Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2012–2017." Cisco, 2013. Accessed March 22, 2013: *http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-520862.html*.

4. "Digital Government: Building a 21st Century Platform to Better Serve the American People." White House, 2012. Access March 21, 2013: *http://www.whitehouse.gov/sites/default/files/omb/egov/digital-government/digital-government-strategy.pdf*.

5. VanRoekel, S. "Federal Information Technology FY 2013 Budget Priorities: Doing More with Less." Presented at the AFCEA Bethesda Federal Budget Preview, February 2012. Accessed March 15, 2013: *https://cio.gov/wp-content/uploads/2012/09/FY2013-IT1.pdf*.

Idaho National Laboratory's (INL) information strategy strongly supports a mobile workforce. The INL information strategy states: "As INL grows and evolves, there is an increased demand for more mobility among its employee base. This includes the ability for workers to perform functions off premise and the increased push to establish an environment that will support remote workers. This will increase our ability to bring on the right talent regardless of physical location. In FY13–15, Information Management will need to develop systems that can be accessed by multiple devices in locations, both on premise and off premise, enabling employees to be effective in the execution of their work, regardless of location."

Bob Hillier, CIO at Nevada National Security Site, is aware of the generational changes that further push toward a mobile work environment. "The millennial generation is a major segment of the workforce," said Hillier. "The challenge DOE labs and plants will face will not be recruiting Millennials, but retaining them. Being unconnected is not an option for Millennials whose generation leads the consumerization of technology in the workplace. A dynamic mobility approach is no longer a goal to strive for—it is now an assumption in maintaining a diverse, talented workforce."

The Business Case

The business case for a mobile landscape is developing alongside the trend of consumerization of IT—the proliferation of technologies readily available to all of us. The concept of consumerization is rapidly integrating personal and professional spaces. The consumerization of IT challenges workplace policies on the work day, communications, data protection and security, and much more.

The Web, combined with just-in-time manufacturing, has set expectations to allow the customer to customize products and services. What these capabilities have done for consumer markets parallels what mobility can do for the workplace. Consumerization of IT is the driver behind the move toward mobility at an enterprise level. Employees are bypassing IT to find solutions and tools that enhance productivity. By bypassing IT, corporate data and potentially classified or sensitive data can be stored in unsecured locations, amplifying security risks.

The business case for mobility centers around making business operations more efficient and allowing researchers and collaborators the ability to be productive without the boundaries of a laboratory space. The National Energy Technology Laboratory considers the business implications of mobility allowing for a mobile workforce to meet mission requirements from offsite locations, potentially reducing onsite office and infrastructure costs. Other labs and plants express similar benefits.

Mobility can enable the workforce in a way never before possible. Organizations are developing strategies to provide employees with capable devices, apps, and services, and allow the free flow of information (with appropriate security context) while adapting to the employee with regard to data access. Most importantly, the move to mobile solutions must focus around compelling business reasons. Each laboratory and plant has specific challenges that mobile solutions can address.

By adopting a mobile first strategy within the national laboratory and plant complex, mobile technologies will become a priority for strategic decision making and not an afterthought.

The IT decision makers across the DOE complex know that mobility will be transformative. A mobile workplace environment will add value and efficiency. Outdated policies, processes, and supporting technologies must be revised and mobility must become part of a key initiative if labs and plants want to excel in a growing global environment. The following sections of the report highlight both the value and impact that mobility can have across the complex and the challenges that DOE laboratories and plants will face in order to fully embrace a mobile work environment.

THE TWO SIDES OF MOBILITY: BUSINESS AND MISSION

The DOE laboratories and plants each have unique missions ranging from basic science to applied energy, to national security, with facilities ranging from open to classified. For the complex, mobility has two major components—business and mission—with each offering opportunities and challenges. At the center of each is the core issue of mobility in general: productivity.

Productivity

Mobile devices and applications allow for increased productivity and have the ability to replace outdated

processes. A survey by Forrester Consulting at companies that use mobile applications showed that 76% of IT decision makers cited increased responsiveness and decision-making speed as a benefit of utilizing mobile applications[6].

By enabling email and calendar on government-issued and personal phones, employees don't physically have to sit behind a computer to respond to work inquiries and can take advantage of smaller slices of time to allow for productivity. Mobility can also improve processes, eliminating steps and saving time. With research institutions, allowing remote access through a variety of devices means scientists can monitor experiments outside of the lab and support personnel can resolve issues away from their desks. A 9:00 a.m. to 5:00 p.m. work mentality is no longer the norm.

The value and impact of mobility isn't limited to increased productivity through email and calendar access. Data sharing, collaboration, and aligning resources no matter the location are just a few of the potential benefits of adopting a mobility strategy. Changes will occur in the way laboratories and plants do business. A mobile and dynamic workforce means there is no longer a need for a physical connection to, or presence, at the laboratory or plant's physical space.

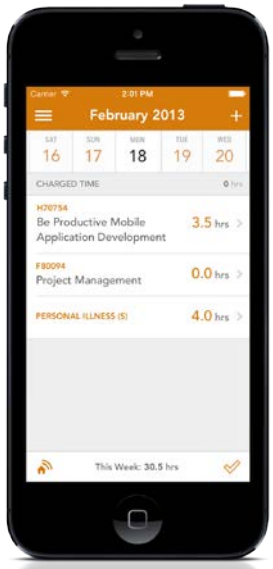

Figure 2. A screenshot of the timekeeping app at PNNL. *Image Courtesy of PNNL*

An anytime, anywhere mentality is a major shift for many IT organizations. Larry Price, strategic technologies team at Savannah River Site, says that in the interim, "Steps in the evolutionary process include expansion of telework capabilities; maturation of security tools and controls; enhanced positioning for Bring Your Own Device (BYOD) as application and desktop virtualization is enabled and deployment scope is broadened; and the continuing shift in focus from platforms to applications." Some of these interim solutions are showcased below, and focus on the way the national laboratories and plants are currently utilizing mobility. These success stories are merely the beginning of mobile adoption and technology.

At Princeton Plasma Physics Laboratory (PPPL), security officers are taking advantage of a new, campus-wide outdoor Wi-Fi system. Going on patrol around the 88-acre campus doesn't mean the paperwork and communications stop. Officers now use iPads on rounds and utilize the DOE security software program called "Night Owl." A virtual map displays on-campus construction, weather, and potential trouble spots. Emergency response will be completely changed—in the event of an emergency, officers can communicate via the Internet, instead of using radios due to security concerns. The outdoor Wi-Fi also offers benefits ranging from finding security and health information immediately, including hazardous chemical information, to providing quicker response in an emergency medical situation. The Wi-Fi access isn't limited to security personnel use; staff also have the ability to work from anywhere on campus, not just at their desks.

Extending capabilities through mobile technologies, such as the deployment of a tool at Thomas Jefferson National Accelerator Facility (JLab) that uses its Wi-Fi network to track and locate portable property with Wi-Fi ID Tags, is another example of enabling technologies within the labs and plants. JLab also uses Wi-Fi-enabled scanners for tracking and recording deliveries to the staff made by the shipping and receiving department.

The Kansas City Plant (KCP) has deployed a guest wireless network to its office building in the newly built National

Figure 3. An access point at PPPL. *Image Courtesy of PPPL*

6. Eggers, W.D.; Jaffe, J. *Boosting Public Sector Productivity by Going Mobile.* Deloitte University Press, 2013. Accessed April 10, 2013: *http://cdn.dupress.com/wp-content/uploads/2013/02/DUP223_Gov-on-the-Go_vFINAL_2.18.pdf?ba7ca0.*

Security Campus and is in the process of designing the deployment of an unclassified wireless network to production areas. The expectations of the KCP wireless and mobility program include enhanced capabilities for an increasingly mobile workforce and capitalizing on wireless infrastructure for administrative and production needs. Research is also currently underway at KCP to incorporate specific wireless technologies into production processes that will exponentially boost efficiencies in production.

At NREL, expanded emergency communications utilize text messaging to employee mobile devices (both government-issued and personal) in the event of a laboratory closure or emergency event. The ability to reach each employees in real-time regardless of physical location keeps employees safer and well-informed.

Many of the labs and plants have deployed technologies that enable their user community access to resources from many devices, including tables and smartphones. NREL utilizes SSLVPN and VDI technology to give users access to resources internal to the organization. SLAC has deployed technologies such as XenApp to provide access to applications on a micro level.

The deployment of Web-based application solutions, such as Google Apps and Microsoft Office 365, are being researched and evaluated at various labs and plants and have been deployed as solutions at INL and Lawrence Berkley National Laboratory.

Mobile Applications

Users expect well-designed solutions that are simple and accessible across a variety of platforms and mobile devices. Mobile applications offer a new frontier of productivity enhancement opportunities for staff and connecting laboratories and plants with the outside world.

SLAC wants to focus on the development of mobile apps, not mobile devices. "It's mobile apps that make our employees more productive," said James Williams, CIO.

At PNNL, the IT personnel has teamed with their research counterparts in setting up a Mobile Innovation Center—a small team of user experience and mobile development specialists dedicated to the development of mobile apps. The PNNL App Store launched in summer of 2013 and its users have a consumer-grade app store available—with a collection of apps enabling things such as approvals, time entry, analytics, location-based staff alerts, lessons learned, and other mission-specific capabilities.

"At PNNL, we are crowd-sourcing innovative ideas from research and operations staff on how mobile might enable new ways of working at the lab. We're doing rapid-development cycles on beta versions of apps to enable those ideas…and then we're using early customer feedback to determine which apps we take through a second round of development," said Brian Abrahamson, CIO. "It's effectively mirroring the development cycle you see in the consumer space."

One of the mobile apps in the initial development stages at PNNL is called *PNNL Connect*—an app that, based on your identity, provides intelligent staff/resource "lookup" capabilities for anything from team members and support staff, to buildings and conference rooms. The development process, based on user-centric design principles, with multiple iterations of development, user testing, and focus groups throughout the development process, will be included as a part of a broader mobility rollout focused primarily on personally owned devices.

Figure 4. *PNNL Connect App. Image Courtesy of PNNL*

At many of the organizations, email, contacts, and calendars are still the primary mobile services offered, seemingly because these applications are easiest to deploy and readily available out of the box. However, as the success of commercial mobile application stores demonstrates, the mobile user community at the DOE laboratories and plants is looking for more than just the traditional corporate communication tools. The ability and willingness to deliver a range of mobile enterprise applications can help reduce the dependency on the traditional laptop and enable the mobile users to be more productive. To enhance their capabilities at the Nevada National Security Site, the site partnered with

VMWare to virtualize most of their applications, and feel it will also allow the site to deliver traditional desktop apps to the mobile user in a much more efficient manner.

As laboratories and plants explore the development of mobile applications for both business and mission purposes, exploring enterprise app stores is important. According to Gartner, "apps downloaded from public app stores for mobile devices disrupt IT security, application, and procurement strategies[7]."

Mobile computing raises a number of concerns and requirements where devices may be corporate or employee-owned, frequently changed, and used for both personal and business purposes. With the growing number of mobile devices in the complex, the following reasons have been identified as drivers for an enterprise app store:

- **Access Control:** Each app needs to be designed in consideration of access controls and user permissions to ensure that only authorized personnel can download and run an application.
- **Smart Phones:** As more and more employees leverage mobiles and smart devices, enterprises need a cost-effective way to incorporate controls on downloading apps. With a custom enterprise app store, enterprises can monitor app downloads, thereby ensuring security and adherence to policies.
- **Version Control:** The enterprise can control the version of apps on an employee's device and ensure that the latest and updated version is pushed to the device.
- **Passage to Public Application Store:** The enterprise app store acts as a mediator for access to the public application store, thereby ensuring all apps are safe and compliant with organization policies.

> "Lawrence Livermore National Laboratory (LLNL) understands the importance of BYOD and that the lines between personal and professional interactions are blurred. 24/7 productivity becomes more important—there is no such thing as a 9–5 job."
> ***–Sue Marlais, Deputy CIO, Lawrence Livermore National Laboratory***

Devices and Choice

Consumers have a choice regarding mobile devices. For employees, the decision is often made for them. This

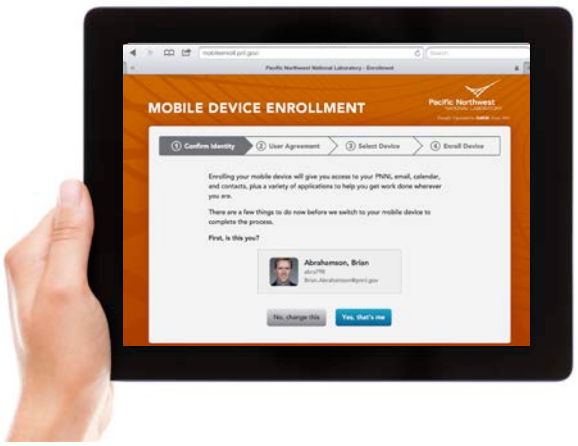

Figure 5. A screenshot of the BYOD enrollment process at PNNL. *Screenshot Courtesy of PNNL; Tablet image from iStock 21529842*

consumerization of IT is liberating the workplace. For many, it has freed the user from IT command and control. There are several strategies that restore the freedom of choice among employees and allow employees to personally select and/or purchase their mobile devices.

While many organizations might view a BYOD program as a cost saving measure, as a long-term strategic investment, BYOD may actually result in the opposite. For organizations that fully embrace BYOD and rely more heavily on software, infrastructure, support, application development, and more, the cost for mobile services increases[8].

Implementing a BYOD program can be seen by executives and staff as progress that is greatly influenced by industry's consumerization of IT and the demand for faster access to information anywhere, anytime, with any device. The research conducted for this report indicates that lab and plant IT organizations are more often required to manage all of the aspects of a BYOD program: the strategy, the business value, and finding ways to fund and subsidize BYOD initiatives.

Some organizations are choosing to operate in the space of Corporate-Owned, Personally Enabled (COPE) and/or Choose Your Own Device (CYOD) with respect to mobile devices, and bear the entire burden anyway.

7. "Gartner Says That by 2017, 25 Percent of Enterprises Will Have an Enterprise App Store." Gartner, 2013. Accessed June 19, 2013: *http://www.gartner.com/newsroom/id/2334015*.

8. "Bring Your Own Device: New Opportunities, New Challenges." Gartner, 2012. Accessed March 15, 2013: *http://www.gartner.com/resources/238100/238131/bring_your_own_device_new_op_238131.pdf*.

PNNL, one of the early adopters of Good for personally owned devices, has recently launched a lab-wide BYOD mobility program—moving almost exclusively to a personally owned model enabled through a Mobile Device Managment (MDM) solution. Through a simple enrollment process that takes only minutes, staff members can securely connect their personally owned devices to the PNNL app store and benefit from a number of PNNL apps as well as a native email and calendar across both Apple and Android devices. At the time of this printing, PNNL was signing up approximately 100 staff members per day on the new BYOD platform—almost half of which were not previously leveraging their Good offering. "The strong response to our BYOD launch demonstrates that, with compelling mobile apps and the appropriate privacy protections, staff members are willing to leverage their personal devices in the workplace. This gives us the flexibility to invest our capital in developing innovative apps versus lifecycling mobile devices for staff," said Brian Abrahamson.

Many questions exist when developing BYOD and COPE programs. How do IT departments support these programs? What expenses, and what percentage of total costs, are reimbursable for personal devices, including equipment maintenance, replacement costs, and upgrades? When an organization supports a BYOD program, they can expect to be the first line of support calls for the employees. Communication is key for BYOD and COPE programs—a Help Desk that has a supported device list for BYOD and spreads awareness to staff on how the help desk will support these devices is important. But if a supported device list is created, does it begin to blur the line of BYOD? For most people BYOD means choosing a device, any device, not just those approved by an organization.

A BYOD program needs to be thoroughly discussed with senior management, Human Resources (HR), and General Counsel and a definitive policy would need to be in place before encouraging the use of employee-owned devices for work purposes. A BYOD program coupled with a remote systems access policy and tools, and/or a VDI implementation, allows workers to access applications, services, and information related to the performance of their job from the mobile device of their choice.

Expanding Wi-Fi networks, capacity, and capabilities across buildings and throughout an entire campus can further enable the benefits of BYOD and allow employees to engage in work activities while also using the capability to tend to personal matters.

Many of the laboratories and plants, including Fermi National Accelerator Laboratory, JLab, KCP, LLNL , NREL, and ORNL, allow personally owned devices to connect to a guest wireless network. However, this network usually has limited or no access to organizational resources outside of the internet connection. Other labs and plants provide additional networks for corporate-owned devices but may still limit the resources the devices can access. There are a few cases where access to business support services are supported through technologies such as virtual private networks (VPN) to personally and corporate-owned devices.

An addition to BYOD, government-issued devices, and COPE is a concept related to government-owned loaner devices. ORNL issues loaner cell phones, smart phones, and laptops. Bruce Wilson says, "There are a number of benefits to loaner devices. By using a loaner device, particularly a highly locked down device, we reduce risks of information loss, particularly associated with travel to sensitive countries. For users who only travel occasionally, it is much more cost-effective to use a centrally managed pool of loaner devices, rather than individuals maintaining a device for only occasional use. We are also able to keep these centrally managed devices patched and up-to-date, which has been a problem with rarely used devices and with some workgroup loaner pools."

Key Players and Issues

Integrating mobility into management decisions is a key factor of successful mobile programs in organizations. A successful approach includes IT working with both HR and General Counsel within an organization.

Human Resources

Employee productivity and satisfaction levels are critical goals of an HR organization. Studies show that mobility increases both of these, but new questions also arise with this adoption. Mobility challenges the definition of a work day; performance indicators become a major factor.

Employment compensation issues may arise with issues of mobility, most specifically with BYOD programs. Tax implications, compensation, and stipend programs are all elements of a mobile-enabled work force. If BYOD programs become more mainstream, employees might be required to bring their personal devices when they report to work, similar to carpenters arriving to work with their own toolboxes. Gartner predicts that by 2017, half of all employers will require employees to supply their own device for work purposes[9].

9. "Gartner Predicts by 2017, Half of Employers will Require Employees to Supply Their Own Device for Work Purposes." Gartner, 2013. Accessed June 19, 2013: *http://www.gartner.com/newsroom/id/2466615*.

Compensation and Stipends

Compensation and stipend programs at laboratories and plants are becoming more popular with a move to implement BYOD programs. Working with HR, labs and plants are researching appropriate reimbursement amounts, usually distributed each pay check, that cover some costs associated with data, voice minutes, and texts. A business requirement is required for these types of programs and several labs are moving toward promoting stipend programs before a government-issued device.

ORNL introduced a stipend program in 2005 with a data stipend added in the fall of 2011. "We offer a $30 or $50 a month stipend for voice usage and a $20 a month stipend for data usage. We have seen a much higher level of usage for stipends than expected and we have seen almost half of government phones go away," said Bruce Wilson.

At INL, the laboratory hosts a mature stipend program for personally owned devices, allowing these devices to access their INL email accounts. Since implementing the stipend program, there are now more than 1,400 stipend devices and fewer than 200 government-owned cell phones.

Legal

For some of the national laboratories and plants, the indemnification language that must be accepted to include applications in various app stores has been considered a large risk for the organization's legal department, managing and operating contractor, and DOE field office to accept.

NREL, in cooperation with its contracting officer and DOE field office, has framed the discussion of risk around the business benefits versus the associated real risks. It has been clarified that there will not be any development of applications where a failure would result in death, personal injury, or severe physical or environmental damage, and it is in these areas that indemnity would present unacceptable risk.

Risk Assessments and Security

The technology landscape across laboratories and plants offers new ways to foster innovation and brings increased efficiency, ease of use, and connectedness, but it is also more difficult to manage. Employees often come to the office equipped with the technologies, applications, and services needed to work effectively. The data and intellectual property of the laboratories and plants needs to be appropriately managed and protected. Embracing mobility means balancing risks and the risks present differ from lab to lab and plant to plant. Different work environments include open and closed campuses, classified and non-classified sites, and include work that occurs inside and outside of the boundaries of the labs and plants.

Smart phones, laptops, and tablets are types of devices that have a larger risk of being stolen or left somewhere accidentally. An unsecured device, even one that only includes email, can provide entry into an organization's sensitive data. As the industry progresses with MDM systems and Mobile Application Management (MAM) systems, the up and coming approach appears to be a Mobile Information Management (MIM) system that has intelligence around the protection of identified data. Additional research into MIM applications, such as Adobe LiveCycle, and the maturity of this space, will play a paramount role in the support of BYOD, CYOD, and COPE as the labs and plants progress with mobility support.

For government-issued devices, this is less of a concern since most devices have added security enhancements enabled and monitored. But as more personal devices are allowed to connect to laboratory mission and business applications and data sources through BYOD, CYOD, and COPE, devices are at an increased risk for penetration if they are not managed appropriately.

The management of mobile devices and applications is extremely important to consider when it comes to navigating the security risks of mobility. Organizations must be able to wipe devices of business-related data if a device is compromised, stolen, or if the employee either upgrades devices or leaves the organization altogether.

KCP uses Good on personally owned or government-issued devices as its mobile smart phone solution. "We have the ability to control what options and services are available from these devices. In addition, the remote wiping capabilities ensure that if the phone were lost or if classified information spillage occurred, we have the secure means to protect any data that may be on the device," said Catherine Boltz, senior manager of Materials.

A major consideration that some of the labs and plants struggle with revolves around the sanitization of devices that may contain sensitive information, as well as the disposal of these devices when identified as excess. While MDM and MAM systems can address some aspects of these concerns, and the maturity of MIM doesn't completely address the issue, policies and end user training will need to be implemented to bridge gaps that are identified.

Training employees on security precautions for mobile devices is a key component of protecting data and becomes more important in the mobility space. ORNL regularly includes mobile device security for both government-issued and personal devices in cyber security meetings and training materials, including a one-time training for stipend devices, a mobile device section in the annual cyber security training, and mobile device security updates in the lab's IT Weekly email.

Personal Devices

In LLNL's policy on usage of unclassified computers and electronic devices, the policy outlines the expectation of both employee behavior and the role that LLNL can play to maintain a secure environment. The policy states,"Employees are allowed to bring their personal devices on-site and connect to the guest wireless network. The guest wireless network is an LLNL resource and data may be audited, intercepted, recorded, read, copied, or captured in any manner and disclosed in any manner, by authorized personnel."

LLNL is one of only several laboratories and plants that allow non-government devices to access email, calendar, and LLNL websites on personal devices through the use of the Good application. BYOD adoption has been hampered at LLNL due to one of the major national carriers charging a monthly fee to users that do not carry a qualified data plan and because of the potential for devices to be destroyed if a contamination occurs.

Classified Sites

With unique missions and research taking place across the DOE laboratory and plant complex, labs and plants deal with varying degrees of classified and unclassified sites and information.

LLNL's Risk Assessment concluded that it should be assumed that the camera and microphone on a smart phone or tablet are always on, either intentionally or through an accidental activation by the user. As a result, devices are removed from the room before and during classified discussions. The laboratory has portable device storage areas for portable electronic devices when these devices are not allowed in classified areas and signage reminds employees what discussions can and cannot take place around portable electronic devices.

Pantex Plant has a need for off-the shelf classified wireless solutions to enable improved efficiencies of core mission operations, many involving classified data. A Plant Directed Research and Development (PDRD) initiative is currently underway at Pantex to develop an approved classified wireless infrastructure design that can support mobile applications addressing these needs.

The Pantex classified wireless initiative closely mirrors ground-breaking work completed by Y-12. Pantex is leveraging the same strategies and contractors utilized by Y-12 to develop solutions that can eventually be deployed at the Pantex site. The Y-12 approach engages the National Security Agency (NSA)/Central Security Service's Information Assurance Directorate and its Commercial Solutions for Classified (CSfC) Program to establish a Suite B compliant infrastructure design. The CSfC Program was established to support the use of commercial products in layered solutions protecting classified data. The Pantex classified wireless initiative will also utilize CSfC support.

The scope of the Pantex initiative is to develop the formal technical proposal for NSA review, create a secure configuration of layered commercially available technologies, demonstrate Suite B compliance with the proposed configuration, obtain NSA certification of the solution, and pursue local approvals for classified wireless use at Pantex. The overall objective of the PDRD initiative is to establish NSA-approved classified wireless technologies, which can then be deployed through follow-on infrastructure projects using other funding sources.

Innovation

One factor for focusing on a mobility strategy is to support the advancement of each lab and plant's mission. One way to support the mission is through eliminating steps in processes on the support and business side of the organization, as mentioned previously in this report.

For many labs and plants, showcasing innovation through mobility and highlighting the mission of each organization is just as important as the productivity enhancement of mobility. Leveraging Laboratory Directed Research and Development and PDRD programs is a potential way to enable mobile technologies across the complex in support of mission objectives.

The Office of Energy Efficiency and Renewable Energy (EERE), working with NREL, launched the Alternative Fueling Station Locator in 2010. The mobile site locator maps fueling stations and allows drivers to find the closest

alternative fuels fueling sites, including biodiesel, electricity, E85 (ethanol), hydrogen, natural gas, and propane. The application connects drivers with alternative fueling stations, while advancing the missions of both EERE and NREL to promote clean energy as a solution throughout the U.S.

Access to the data and additional research facilities allow for increased productivity and have the ability to replace outdated processes. By enabling access to data and the tools and systems developed at each of the labs and plants, employees and other consumers don't have to have physical access to the networks, and other resources, to develop innovative applications and systems.

Efforts, such as the Developer Network at NREL (*http://developer.nrel.gov*), are providing access to a number of data sources, including:

- Services related to energy efficiency and the use of renewable technologies in residential and commercial buildings
- Energy data on individual components or energy conservation measures for buildings. This data can be used to create building energy models
- Services associated with electricity costs, generation, transmission, delivery, and monitoring
- Utility rate information, including time-of-use data, for utility companies from OpenEI's crowd-sourced database
- Access to photovoltaic performance data collected by NREL for systems throughout the country.

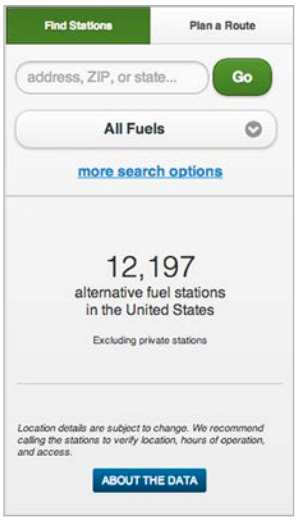

Figure 6. A screen shot of the Alternative Fueling Station Locator. *Image Courtesy of EERE*

The Developer Network is an example of efforts by the labs and plants to provide access to data, through open and published standards.

These types of efforts are not new. Since 1999, PPPL has run the National Spherical Torus Experiment (NSTX) for control, data acquisition, and analysis for diagnostic subsystems. Prior to first plasma on NSTX, software engineers collectively spent one man-year to learn the system and bring it to operation, and four full-time equivalents continue to support its uses. The 30 primary, on-site physicists and 25 part-time physicists adapted to the MDSplus software tools with no real difficulty.

After a few uses, most users valued the features and usability of Scope and Traverser, the most commonly used MDSplus components. Within three minutes of the 1-second plasma "shot" on NSTX, 40 MBs are acquired from CAMAC crates on a VMS system, 22 MBs from UNIX systems, and 13 MBs from PC systems, and loaded into MDSplus hierarchical data structures, called trees. Local users and remote collaborators alike configure their X-windows to display dozens of plots, as data becomes available.

At ORNL, the U.S. Geological Survey Florida Shelf Ecosystems Response to Climate Change Project developed a user-friendly, stand-alone application for the calculation of carbonate system parameters in response to its Ocean Acidification Task. The application is intended as a follow-on to CO2SYS, originally developed by Lewis and Wallace (1998) and later modified for Microsoft Excel® by Denis Pierrot (2006). Besides eliminating the need for using Microsoft Excel on the host system, CO2calc offers several improvements on CO2SYS, including:

- An improved graphical user interface for data entry and results
- New constants including Lueker et al. (2000) and Millero (2010)
- Additional calculations of air-sea CO_2 fluxes (for surface water calculations)
- The ability to tag data with sample name, comments, date, time, and latitude/longitude
- The ability to use the system time and date and latitude/longitude (automatic retrieval of latitude and longitude available on iPhone 3, 3GS, 4, and in the future, Windows hosts with an attached National Marine Electronics Association-enabled GPS)

- The ability to process multiple files in a batch processing mode
- An option to save sample information, data input, and calculated results as a comma-separated value file for use with Microsoft Excel, ArcGIS, or other applications
- An option to export points with geographic coordinates as a KMZ file for viewing and editing in Google Earth™.

This application is supported on many platforms, including the iPhone.

Many of the labs and plants provide access to computing resources to their staff, other researchers, peers, and collaborators. These include JLab (*http://lqcd.jlab.org/lqcd/* and *http://scicomp.jlab.org/scicomp/*), LLNL (*https://computing.llnl.gov/tutorials/lc_resources/*), and others in the complex.

Additional sources for energy data feeds can be found at the U.S. Government Web Services and XML Data Sources site. This site is an index to publicly available Web services and XML data sources that are provided by the U.S. government. It indexes data sources from all three branches of government as well as its boards, commissions, corporations, and independent agencies. The site documents, in one place and in a uniform manner, the Web services and XML data sources that are provided by the U.S. government. It includes detailed information about the data source (e.g., name, description, links to documentation, tech support, etc.) as well as source code snippets to help developers better understand how the data sources can be used.

Responsive Design

An alternative to the development of apps is a responsive design approach that is device agnostic. Mobile Web browsing is increasing at a rapid rate and developing laboratory and plant websites with a responsive approach—a design approach that allows developers to maintain a single website, regardless of device or platform, and serve up content accordingly[10]. Responsive design allows laboratories and plants to showcase their website, mission, and strategic content to users regardless of the device.

BNL, PPPL, and Sandia all have redesigned their external websites to include a responsive design approach while Argonne and Los Alamos National Laboratory have mobile-enhanced websites.

10. "The Future of the Web: The Case for Responsive Design." Forbes, 2012. Accessed June 7, 2013: *http://www.forbes.com/sites/ericsavitz/2012/12/27/the-future-of-the-web-the-case-for-responsive-design*.

MATURITY AND EXPERTISE ACROSS THE COMPLEX

The 22 labs and plants that comprise the DOE national laboratory complex find themselves at varying levels of maturity of mobile adoption. The following section highlights particular areas where the complex excels in mobile adoption. Additional references for developing a mobile strategy can be found in the appendices.

Flexible Work Arrangements

The majority of the DOE laboratories and plants have flexible work arrangements and telecommuting policies in place for their employees. At Ames National Laboratory, Diane Den Adel, a manager in Information Services, sees the advancement of mobility furthering employee telecommuting capabilities and in five years, seeing fewer employees working onsite.

Cameras on laptops and mobile devices, and the tie-in to easy-to-use consumer video applications like Skype, FaceTime, Google Hangouts, WebEx, and Go-To Meeting, make video conferencing a relatively easy way to connect without being in the same room, building, or even state. Remote collaboration becomes easier and many labs and plants are adopting this practice.

Remote Access

Many of the labs and plants have services in place that give employees access to resources and data contained within the facilities. These include VPNs, secure socket layer VPNs, and direct access with controlled access methods.

BNL provides remote access via a VPN. The VPN service allows remote users to securely access the Brookhaven internal network through their own personal Internet Service Provider, so that it appears as if their home computer is right on the BNL internal network. Access to this service requires a token, for which BNL supports the RSA soft token on the iPhone.

KCP also provides remote access via VPN and authenticates users via their fully integrated HSPD-12 credential which is also now used to provision logical and physical access to the new NSC campus and its logical resources.

The tools provide a range from simple application programming interfaces and other service-oriented

architecture approaches such as RESTful and SOAP interfaces, to VDI environments and Remote Desktop Protocol access to the employee's desktop system.

Cloud-Based Services

As the labs and plants work to identify resources to meet the needs of their organization, a lot of cloud-based forms of service are being identified as solutions, including Google Mail, Office365, Workday, and ServiceNow. These services have identified the requirements in the mobility space, and include interfaces for smart devices and small form factor computing, such as tablets.

Cloud-based business services increasingly incorporate responsive design in their interface, improving functionality and connectivity across devices. This allows organizations that use them to quickly adopt mobility functionality without the internal development cycles normally required.

> "The definition of mobility is evolving. Mobile devices are now...mobile identity is the future. The ability to access your identity, profile, apps, and data, without regard to device or location is the future of mobility."
>
> ***–Jill Deem, NREL CIO***

At Los Alamos National Laboratory, as at many labs and plants, cloud-based services will figure prominently into the lab's vision of mobility, but additional time and development are needed to fully understand whether cloud-based services are secure and/or economical solutions.

Wireless Networks

BNL accommodates visitors' use of personal computing devices. By putting policies in place that include online registration, training, and a review of the lab's network policies, visitors can access the lab's guest wireless network. Similarly, JLab provides both its visitors and staff the same experience for personal computing devices. The adoption of such policies allows for quicker collaboration.

Fermi National Accelerator Laboratory is currently investing in building out wireless capabilities on campus to support the growing number of mobile devices and eventually include campus-wide wireless access.

At Y-12 National Security Complex, the enterprise wireless and mobility infrastructure transforms how National Nuclear Security Administration (NNSA) employees connect and how data is exchanged. Currently, Y-12 has deployed an unclassified wireless infrastructure and is in the initial stages of deploying an outdoor wireless mesh network to support outdoor wireless applications.

FUTURE TRENDS AND CHALLENGES

As the trend of mobility continues to evolve, laboratories and plants are faced with many challenges. How will technology and infrastructures evolve to support devices? How can labs and plants strike a balance between usability and productivity with security?

Mobile Strategy and Mission Value

Several notable trends are outlined in this report that create an opportunity to dig deeper into understanding the future value propositions of mobile technology, modernizing business practices, and readdressing technology investment and support models. These include:

- How laboratories and plants advance and support research and information sharing environments through business operations.
- How laboratories and plants invest in and manage mobile devices and the data that the devices utilize.
- How laboratories and plants promote and manage the use of mobile devices, applications, and the data they access.

On the Horizon

This section highlights several trends and challenges CIOs and their staffs are addressing across the complex. Over the next several years, each CIO will need to:

1. Manage multiple mobile operating systems that require unique software
2. Manage multiple device environments and ensure the quality of applications, data, user interface, and security
3. Manage new mobile devices and operating systems as the market evolves

4. Improve network connectivity for various user scenarios
5. Develop, procure, and manage new mobile applications for user productivity.

While there are some emerging technologies that can help reduce the additional time and resources needed to manage mobile environments, it is still an evolving field and much is to be learned. One key concept is the recognition of the shift in resources required to support a robust mobile environment while improving and sustaining current systems and applications. The mobile environment at each lab/plant requires tradeoff decisions on where to best use resources to maximize the value of mobile environments to mission, operations productivity, and improved user experiences.

Trends and Technology

This section refocuses on some major trends and technologies to consider in the evolution of mobile capabilities across the complex. While there are dozens of technologies that could be addressed, this section highlights trends that may challenge many of the labs and sites today and in the near future.

Consumerization will continue to play a pivotal role in the adoption of mobility across the complex. This trend is a reflection of our merged lives and how people are taking advantage of more robust single device environments to perform both personal and professional tasks anywhere, anytime.

Application stores are a increasingly used to quickly distribute, support, and manage mobile applications. Creating an App Store (such as an iTunes) for internal or public use requires a strategy on where to host the application store for the intended users, security considerations, and how best to manage. This includes local hosting for private or lab- or plant-only applications, applications for use in the complex, or applications available to the public for information sharing. Cross-platform application management (e.g., iPhone, Blackberry, or Android) presents an opportunity to learn how to develop efficient processes to move data across application platforms.

Augmented Reality is the real-time use of information in the form of text, graphics, audio, and other virtual enhancements integrated with real-world objects. Examples of this technology trend can been used to discover things in the vicinity (location-based services), to plan or search for real-world objects of potential special interest in operations or scientific work; to show lab/plant employees where to go or what to do; or to provide additional information about research, facilities, or points of interest.

Mobile Information Management (MIM) is technology that can use hardware- or software-based encryption to manage stored enterprise data on mobile systems. Mobile data is not "data in transit" over a network. MIM sets and enforces rules for fixed and removable media used in mobile contexts. Data security, regardless of the device type and operating environments, will continue to be a top priority.

Mobile WLAN access points allow WLAN-enabled devices to connect to the Internet by using a 3G/4G cellular connection. This capability is already being used by some NLCIOs to create wireless hot spots on the site/campus. This capability provides users with access to the internet, communications, and critical information in open and limited areas by leveraging telecommunication carriers such as AT&T, Sprint, Verizon, and others.

Mobile Device Management (MDM) services is the outsourcing and management of mobile devices related to sourcing, provisioning, securing, and managing handheld mobile devices (primarily smartphones and media tablets) to a third party. This trend occurs widely in private industry and provides an opportunity for the labs and plants to explore and identify cost optimization and performance improvements. These managed services can include: hardware (inventory, provisioning, and asset), software (configuration management, software distribution, and updates), security (encryption, antivirus, and authentication), and network service management.

RightPath is a complex-wide initiative promoting a standards-based approach that will support mobility as well as other technologies. It is a framework that combines transformative changes in people, processes, and technology to enable DOE to move toward a virtual workforce and provide employees the ability to work the way they want to, where they want to, on the device of their choice. It also establishes a formal partnership between the DOE Office of the Chief Information Officer and the labs and plants, and grants authorization to an integrated project team. These teams are working to deploy cloud, voice, and network services. RightPath is being implemented in a multi-phased approach to provide the required technology and infrastructure, align policy to enable that technology, and then establish dedicated management attention over a series of years to institutionalize the capabilities across the NNSA enterprise.

CONCLUSION

Mobility continues to evolve across industry, including DOE laboratories and plants, as a strong mix of technology advancement and cultural adoption. National laboratories and plants are seeking to advance their mobile strategies, with budget and resource constraints. Key challenges of adoption include:

1. Data security
2. Managing the growth of mobile applications
3. Focusing mobile capabilities on improving the performance of the lab/plant
4. Managing multiple environments (on-premise and mobile).

As mobile strategies continue to change, understanding and partnering across sites is crucial. As IT organizations work to solidify strategies, a focus should include partnerships and buy-in from executive management, HR, legal, scientists and researchers, and the user community. This report initiates the conversation about the direction of mobility across the complex, but a continued dialog between the laboratories and plants can strengthen the perceived benefits of mobility.

The mobility landscape across the DOE national laboratories and plants will continue to change over the coming months and years. The end state of mobility will include more high value work, with process improvements and improvement of cycle times.

At the end of the day, mobility and the IT support of mobility at each national laboratory and plant are about making the scientists and researchers more productive. Time will continue to see this trend unfold.

APPENDIX A – EXAMPLE OF MOBILITY STRATEGY

Example—Mobility Strategy Table of Contents

This is a sample table of contents and should be used to help develop strategy, plans, and investments. This template is intended to be modified to fit the needs of each laboratory or plant.

Business Drivers

1. What does the laboratory or plant need to do to modernize its business?
2. What does the laboratory or plant need to do to reduce administrative costs?
3. What does the laboratory or plant and its research areas need to do to engage staff and partners?
4. What are the future trends in mobility that the laboratory or plant should leverage?

Business Model

1. What are possible value sources from mobile devices and applications?
2. What are possible efficiencies mobile devices and applications can provide?
3. What are the expected costs of increasing mobility (security and network, IT cost per user)?
4. What are the budget implications for the laboratory or plant and research areas?
5. Are changes needed for policies and financial allowances required for researchers/staff (devices, service plans, and new software purchases)?
6. How should mobile research and business-related applications be licensed, purchased, and managed?

Audience Strategy

1. Who is the Mobility Strategy for?
2. When will they experience the benefits of the strategy?
3. How will the strategy support work styles (alerts, messages, forms, knowledge, workflow)?

Management Strategy

1. What management styles will be used (hands-off, employee-satisfaction, optimize, and control)?
2. Who gets to make what decisions about the mobility strategy, including when to wipe a device?
3. What is the link to telework and other work arrangements?
4. How will innovation in analytics, devices, security, and other areas be addressed?
5. Is the mobility strategy aligned with the overall laboratory strategy?
6. How will the laboratory or plant leaders, CIO, and IT organization support the mobile strategy?
7. What are the dependencies on other strategies?
8. How will the sourcing and financing models change?

Network Strategy

1. What is the wireless network capacity with respect to mobile devices generally?
2. What are current statistics and growth projections?
3. How does the laboratory or plant develop a growth strategy to accommodate a potential exponential growth in mobile devices, applications, and use?
4. Are bandwidth consumption policies still appropriate?
5. Besides the laboratory or plant's wireless/Wi-Fi infrastructure, are there needs for wireless carrier networks (e.g., 3G/4G/internal building Distributed Antenna Systems)?

Security Strategy

1. How does the laboratory or plant secure the expanding network that is accessed by an increasing number of devices?
2. How does the laboratory or plant secure devices/promote the security of devices?

Platform Strategy

1. What devices does the laboratory or plant support?
2. What technologies can the laboratory or plant expect?
3. What software requirements does the laboratory or plant anticipate?
4. What will the base mobile platform entail (developing adaptive designs for both mobile and native web)?

Content and Application Strategy

1. What does content look like for mobile devices (local, usable, meeting the needs of the audience)?
2. How does the laboratory or plant develop content that leverages the mobile environment (create, not convert)?
3. What are appropriate content guidelines?
4. What are appropriate and consistent application guidelines?
5. How does the laboratory or plant support application development?
6. How does the laboratory or plant secure application development?
7. How does the laboratory or plant monitor, register, maintain, and retire mobile applications?

Associated Policies

1. What data access policy needs to be updated or created?
2. What will be different about the data-sharing policy in a mobile world?
3. What are the mobile content guidelines?

Strategy Assessment

1. How does the laboratory or plant assess the overall strategy?
2. How does the laboratory or plant assess the strategy components?
3. How often should the laboratory or plant update the strategy?
4. What governance mechanisms will be used for the mobile strategy and day-to-day operations?

APPENDIX B – ACRONYMS

BNL – Brookhaven National Laboratory

BYOD – Bring Your Own Device

CIO – Chief Information Officer

COPE – Corporate-Owned, Personally Enabled

CSfC Program – Commercial Solutions for Classified Program

CYOD – Choose Your Own Device

DOE – U.S. Department of Energy

EERE – Office of Energy Efficiency and Renewable Energy

FY – fiscal year

HR – Human Resources

INL – Idaho National Laboratory

IT – Information Technology

JLab – Thomas Jefferson National Accelerator Facility

KCP – Kansas City Plant

LLNL – Lawrence Livermore National Laboratory

MAM – Mobile Application Management

MDM – Mobile Device Management

MIM – Mobile Information Management

NLCIO – National Laboratory Chief Information Officers

NNSA – National Nuclear Security Administration

NREL – National Renewable Energy Laboratory

NSA – National Security Agency

NSTX – National Spherical Torus Experiment

ORNL – Oak Ridge National Laboratory

PDRD – Plant Directed Research and Development

PNNL – Pacific Northwest National Laboratory

PPPL – Princeton Plasma Physics Laboratory

VDI – virtual desktop infrastructure

VPN – virtual private network

APPENDIX C – LABORATORY/PLANT CONTACT INFORMATION

Ames Laboratory

Ames, Iowa 50011
www.ameslab.gov

Argonne National Laboratory

9700 South Cass Avenue
Argonne, Illinois 60439
www.anl.gov

Brookhaven National Laboratory

P.O. Box 5000
Upton, New York 11973-5000
www.bnl.gov

Fermi National Accelerator Laboratory

P.O. Box 500
Batavia, Illinois 60510-5011
www.fnal.gov

Idaho National Laboratory

P.O. Box 1625
Idaho Falls, Idaho 83415
www.inl.gov

Kansas City Plant

14520 Botts Road
Kansas City, Missouri 64147
www.kcp.com

Lawrence Berkeley National Laboratory

1 Cyclotron Road
Berkeley, California 94720
www.lbl.gov

Lawrence Livermore National Laboratory

7000 East Avenue
Livermore, California 94550
www.llnl.gov

Los Alamos National Laboratory

P.O. Box 1663
Los Alamos, New Mexico 87545
www.lanl.gov

National Energy Technology Laboratory

3610 Collins Ferry Road
Morgantown, West Virginia 26507
www.netl.doe.gov

National Renewable Energy Laboratory

15013 Denver West Parkway
Golden, Colorado 80401
www.nrel.gov

Nevada National Security Site

2621 Losee Road
North Las Vegas, Nevada 89030
www.NSTec.com

Oak Ridge National Laboratory

1 Bethel Valley Road
Oak Ridge, Tennessee 37830
www.ornl.gov

Pacific Northwest National Laboratory

3320 Innovation Boulevard
Richland, Washington 99352
www.pnnl.gov/

PANTEX

P.O. Box 30020
Amarillo, Texas 79120-0020
www.pantex.com

Princeton Plasma Physics Laboratory

P.O. Box 451
Princeton, New Jersey 08543
www.pppl.gov

Sandia National Laboratories

1515 Eubank SE
Albuquerque, New Mexico 87123
www.sandia.gov

Savannah River Site and Savannah River National Laboratory

227 Gateway Drive
Aiken, South Carolina 29808
www.srs.gov, *http://srnl.doe.gov*

SLAC National Accelerator Laboratory

2575 Sand Hill Road
Menlo Park, California 94025
www.slac.stanford.edu

Thomas Jefferson National Accelerator Facility

12000 Jefferson Avenue
Newport News, Virginia 23606
www.jlab.org

Y-12 National Security Complex

P.O. Box 2009
Oak Ridge, Tennessee 37831
www.y12.doe.gov

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