

**Department of Commerce**  
**2011 Data Center Consolidation Plan**  
**and**  
**Progress Report**  
**—Public Release—**

---

**Federal Data Center**  
**Consolidation Initiative**

**September 30, 2011**



This page is intentionally left blank.

## Table of Contents

1	Introduction .....	1
2	Department Goals for Data Center Consolidation.....	2
3	Implementing Shared Services/Multi-tenancy .....	3
4	Department Approach, Rationale and Timeline .....	5
5	Department Governance Framework for Data Center Consolidation.....	14
	5.1 Cost-Benefit Analysis .....	15
	5.2 Risk Management and Mitigation.....	16
	5.3 Acquisition Management.....	17
	5.4 Communications Strategy .....	19
6	Progress .....	19
	6.1 FDCCI Consolidation Progress .....	19
	6.2 Cost Savings .....	22

This page is intentionally left blank.

## 1 Introduction

The U.S. Department of Commerce (DOC) has a broad mandate to advance economic growth and jobs and opportunities for the American people. It has far reaching and cross cutting responsibilities in the areas of trade, technology, entrepreneurship, economic development, environmental stewardship and statistical research and analysis. The Department has an Office of the Secretary plus 12 operating units (OUs) that carry out its mission—Bureau of Economic Analysis (BEA), Bureau of Industry and Security (BIS), U.S. Census Bureau, Economic Development Administration (EDA), Economics and Statistics Administration (ESA), International Trade Administration (ITA), Minority Business Development Agency (MBDA), National Oceanic and Atmospheric Administration (NOAA), National Telecommunications and Information Administration (NTIA), National Institute of Standards and Technology (NIST), National Technical Information Service (NTIS), and U.S. Patent and Trademark Office (USPTO).

Recognizing the downward pressure on federal agency spending as a result of deficit reduction efforts and the drive to reduce energy consumption, the Department’s focus on the Federal Data Center Consolidation Initiative (FDCCI) is targeted to reduce our overall infrastructure costs and power consumption by consolidating/closing facilities; modernizing data center operations using automation, standardization, virtualization, and other modern data center practices; shifting IT investments to more efficient and “greener” computing platforms and technologies; achieving efficiency gains and realizing operational cost savings; seeking Department-wide licensing and acquisition vehicles; and seeking enterprise solutions to Department-wide requirements.

To respond to the Federal Data Center Consolidation Center Initiative (FDCCI), the Department established a working group with representation from all OUs. We developed this plan with input from all OUs with consideration for their particular capabilities, requirements (including performance and security requirements), and strategic initiatives. In as much as DOC OUs are very diverse in their mission, size, and information technology (IT) maturity, we had a variety of approaches in collecting and verifying inventory data and ensuring the consolidation plan is complete. OUs collected inventory data through physical inspection, discovery tools, and manual and automated inventory systems. OU management reviewed and validated inventory data and inputs to the consolidation plan. The FDCCI project manager also reviewed each OU’s inventory data and consolidation plan contribution to clarify and update missing or suspect information with DOC points of contact.

While we attempted to collect as complete and accurate information as possible, we did have some significant data limitations. Energy use and cost data were not available or incomplete in a number of data centers. This was due to a lack of metering and some data center services being provided under fixed price contracts or bundled in such a way that it is difficult to accurately identify costs at a granular level. Improvements to metering will be considered if they will provide long-term benefits. As we were collecting inventory data, two of our larger OUs were in the midst of implementing new discovery and

inventory data collection systems. One of these same OUs was in the midst of significantly expanding their virtualization infrastructure. Another challenge was mapping NOAA's High Performance Computing (HPC) facilities to the data elements that describe a typical data center as required by the FDCCI. While the HPC facilities certainly meet the definition of a data center, their components are difficult to describe using the standard terms and definitions required under the FDCCI (e.g., servers vs. nodes, virtualization vs. parallelization). Additionally, these facilities by their very nature cannot be consolidated with other non-HPC facilities and they do not generally provide commodity services, so the opportunities and drivers for consolidation in this area are very different from a traditional data center consolidation.

Another limitation in our plan is that NOAA's current data center baseline may not be complete. This is due in large part to the distributed nature of NOAA's infrastructure. NOAA has a large geographic footprint with a presence in all 50 states and is managed by multiple line offices. While the initial data centers in NOAA's baseline represent substantial and significant infrastructure, we suspect that it may represent a subset of the total inventory. NOAA has established a plan to identify additional data centers and consolidation/closure opportunities. Upon completion of this activity with next year's inventory update, NOAA will be in a position to certify the completeness of its inventory.

The future for green and efficient data centers at the Department requires effective planning, analysis, and architectural processes, as well as sound governance and oversight across the Department. We will continue to analyze the data and focus on cross-OU initiatives to identify further areas for data center consolidation, server reductions, energy reductions, shared services, and other cost savings.

## 2 Department Goals for Data Center Consolidation

In his Memorandum for Chief Information Officers dated February 26, 2010, Subject: Federal Data Center Consolidation Initiative, Vivek Kundra, Federal Chief Information Officer, states "In 2006, Federal servers and data centers consumed over 6 billion kWh of electricity and without a fundamental shift in how we deploy technology it could exceed 12 billion kWh by 2011. In addition to the energy impact, information collected from agencies in 2009 shows relatively low utilization rates of current infrastructure and limited reuse of data centers within or across agencies. The cost of operating a single data center is significant, from hardware and software costs to real estate and cooling costs."

Recognizing the significant cost in dollars and energy usage of DOC data centers and associated information technology in support of our mission, our goals supporting the FDCCI include the following:

- **Reducing the overall energy and real estate footprint of DOC data centers**—DOC has identified 56 data centers in its inventory. The carbon footprint of these data centers is large and the costs for maintaining them can be significant. DOC is committed to work towards fulfilling the

mandates prescribed by Executive Order (EO) 13514 and will reduce the number of data centers through consolidation.

- **Controlling data center hardware, software and operations cost (through cost reduction and cost avoidance)**—While we have focused on supporting the mission of the DOC, and have been successful doing so, the current IT environments are not as efficient as they could be. We will increase the utilization of our IT infrastructure (e.g., servers, storage, and racks) leading to reductions or lesser growth in the infrastructure. In addition, we will seek economies of scale in seeking shared solutions to common problems and consolidate the acquisition of products that are common to all OUs.
- **Shifting IT investments to more efficient and “greener” computing platforms and technologies**—The return on investment in efficient technology (servers, storage, switches, etc.) is twofold. Technologies that consume less energy also throw off less heat, requiring less energy for cooling. It is DOC policy to implement federal green procurement practices to conserve resources, provide sound stewardship, reduce negative impact on the environment, and reduce energy usage and costs.
- **Improving the overall IT security posture of the Department**—Standardization of hardware platforms, operating systems and system configurations will lead to a more secure environment because of reduced complexity and level of effort needed.

### 3 Implementing Shared Services/Multi-tenancy

The FDCCI serves as a foundation for expanding the use of shared services within a department or agency as well as across multiple agencies. The DOC will look at opportunities to seek shared solutions to common problems—enterprise-wide common architectures, shared services, acquisition and software licensing vehicles, etc.—which will lead to efficiencies and reduced costs. DOC is moving forward with a number of activities, including:

- **Enterprise Acquisition Vehicles**— The Department has site licenses in place for Microsoft Office and MacAfee SafeBoot full disk encryption. NOAA has opened its IT support services contract, NOAALink, to the entire DOC. We will pursue strategic sourcing and continue to look for economies of scale in software licensing and other technology acquisitions.
- **HCHB Directory Services Consolidation**—DOC is developing a strategy to implement a directory that covers the Herbert C. Hoover Building (HCHB) campus which houses the headquarters for the DOC as well as several of the smaller OUs. A directory is a necessary component of the HSPD-12 implementation for both logical and physical access as well as a critical component of the email system. The consolidated solution also reduces operational costs and facilities costs. Project funding is still being developed so there is no fixed timeline but we hope to complete this within two years.

- **NIST Directory Services Consolidation**—NIST is consolidating multiple Active Directory implementations across its Boulder and Gaithersburg campuses into a single, centralized Active Directory implementation. This project is scheduled to complete in FY 2012.
- **E-mail Consolidation (HCHB)**—USPTO currently is providing electronic mail for the Office of the Secretary and ESA within the HCHB under a shared services model. DOC is developing a strategy to consolidate e-mail servers and systems within the entire HCHB campus. The cost for each organization to maintain its own e-mail system is not sustainable. Furthermore, security is improved by implementing and enforcing a standardized security baseline for all servers migrated into the new structure. The current timeline is subject to funding and completion of the directory services project, but we hope to complete within two years.
- **HRConnect**—The DOC Human Resources community is seeking to implement a common human resource management system (HRMS). The vision of the DOC’s HR community coincides with that of the Office of Personnel Management (OPM) HR Line of Business (HR LOB) vision to provide a Department-wide, modern, cost-effective, standardized and interoperable HR solution that delivers common, core functionality to support the strategic management of human capital and addresses the manual and inefficient processing of HR transactions across the Department. The Department HRMS will be based on the technology solution of an OPM approved HR LOB shared service center—the Department of Treasury’s HR Connect. The HRMS will be deployed in a phased approach and will support the functions defined within the Department’s segment architecture for HR management.
- **Census Bureau Center of Excellence for Data Center Services**—The Census Bureau established its data center as a “marketplace for data center availability”. Through this marketplace, Census now hosts IT operations for the International Trade Administration (ITA) and offers collocation and hosting services to other government agencies. The Census Bureau is increasing available power capacity, improving cooling performance, implementing a Security Operations Center, modernizing its Enterprise Operations Center, and building a private cloud infrastructure.
- **DOC Enterprise Security Operations Center (ESOC)**—DOC is planning the implementation of an Enterprise Security Operations Center (ESOC) beginning in FY 2012, dependent upon receiving approval of an FY 2012 budget increase. The ESOC will provide a single view of DOC’s risk posture enabling timely risk-based decisions. The ESOC will not be a consolidation of the individual OU SOC operations. The individual OU SOCs will provide data to the ESOC. The ESOC will provide security event correlation, monitoring, reporting and incident response support, providing a broader picture across the Department and supplementing local SOC services. In some cases, the ESOC will provide full SOC services to those OUs that do not have robust SOC capabilities. The ESOC is designed to be an expansion of the NOAA Security Operations Center, which will offset approximately 50 percent of the cost of the ESOC.
- **NTIS is a Shared Service Provider**—NTIS operates a modern data center and provides tailored shared services to other government agencies, including mission specific Help Desk; server and application system hosting; work flow and document collaboration; repository management;



electronic records management; cyber security; energy management, human resource management, learning management, intelligence community information services, and others. Other agencies routinely contact NTIS for assistance with information services including hosting their systems, developing their applications, and disseminating their information. Agencies in the NTIS data center include U.S. Customs and Border Protection, Department of Education, Social Security Administration, Drug Enforcement Agency, Department of Labor, Department of Agriculture, Architect of the Capitol, US Courts, intelligence agencies, and many more. NOAA is partnering with NTIS to develop and pilot a Deepwater Horizon (DWH) Institutional Repository, which will support online discovery and dissemination of NOAA's DWH data and information.

## **4 Department Approach, Rationale and Timeline**

The DOC is a federated IT organization. OUs are very diverse in their mission, size, and information technology (IT) maturity. With Departmental guidance, each OU will develop individual consolidation plans or roadmaps that identify specific approaches each will undertake to achieve the stated goals and target measures and milestones. These plans will take into consideration each OU's mission, IT environment, and underlying constraints such as performance, security, and data sensitivity/confidentiality. Each OU will monitor target measures and milestones to report improvement and overall performance.

Neither DOC nor its OUs have performed a formal FTE analysis of the impact of FDCCI related initiatives on our government staff. However, we don't anticipate reductions in government staff resulting from FDCCI related activities. While virtualization, increased server utilization, public and private cloud, and other FDCCI initiatives will reduce our server inventory, any resulting surplus government staff will be repurposed to other IT activities and priorities.

The following approaches will support our FDCCI goals:

- Implement shared services/multi-tenancy (discussed in section 3)
- Consolidate and decommission data centers
- Increase server virtualization and IT equipment utilization
- Adopt cloud computing solutions
- Acquire Green products and services
- Support and promote Green IT

**Consolidate and Decommission Data Centers**

The Department will significantly reduce the number of data centers through consolidation and decommissioning. Based on leading industry best practices, DOC is evaluating opportunities for consolidation while balancing real world technical and business constraints to ensure achievable results.

Consolidation plans and any potential moves will take into consideration:

- Application/system performance requirements
- Information security requirements
- Server and storage refresh investments linked to the consolidation migration plans
- Potential staffing impacts, which may need to be addressed at the Department level
- Existing support and licensing contracts
- Facility improvements and lease considerations

We have targeted 26 data centers for closure. Because we are adding a new facility in 2012 (described below) our net reduction will be 25. Our goal is to close or consolidate at least 20 data centers and server rooms by FY 2013 and 26 facilities by FY 2015. Some highlights are:

- The Census Bureau closed three 2010 Census Field Data Collection Automation (FDCA) and three 2010 Census Decennial Response Integration System (DRIS) data processing facilities as scheduled with the completion of 2010 Census data collection and processing operations.
- The Census Bureau shut down its Secondary Computer Center three years early.
- The Census Bureau’s National Processing Center (NPC) is consolidating its seven server rooms into two rooms.
- DOC is consolidating 10 server rooms in the HCHB into a new modern facility currently being constructed within the HCHB as part of the HCHB building renovation. We will add this new facility to our data center inventory in FY 12.

The following table identifies data centers targeted for closure.

Data Center Reductions	OU	Data Center	Location	Action To Be Taken	Action Taken During FY	Comments
1	DOC CIO	DOC OCIO Springfield	Springfield, VA	Consolidate / Decommission	FY 2010	Closed
1	BIS	BIS HCHB Server Room 6733	Washington, DC	Consolidate / Decommission	FY 2010	Closed
3	Census	2010 Census FDCA	Reston, VA Bowie, MD Largo, MD	Decommission	FY 2010- FY 2011	Closed

Data Center Reductions	OU	Data Center	Location	Action To Be Taken	Action Taken During FY	Comments
3	Census	2010 Census DRIS	Greenbelt, MD Baltimore, MD Phoenix, AZ	Decommission	FY 2011	Closed
1	Census	Secondary Computer Center	Dulles, VA	Consolidate / Decommission	FY 2011	Closed
1	NTIS	NTIS Silver Spring	Silver Spring, MD	Consolidate / Decommission	FY 2011	Closed
1	ITA	ITA Reston	Reston, VA	Consolidate / Decommission	FY 2011	Closed
5	Census	NPC Server Rooms	Jeffersonville, IN	Consolidate / Decommission	FY 2011- FY 2014	Consolidate seven server rooms into two rooms
9 (Net)	DOC OCIO, DOC OIG, EDA, NTIA, MBDA, ITA, and NOAA	HCHB Server Rooms 1832, 6087, 6830, 6051, 7719, 4630, 6888, 5606, H1840/H1842, and 6814	Washington, DC	Consolidate / Decommission	FY 2012- FY 2014	Consolidate 10 server rooms into new facility under construction within the HCHB

DOC will continue to look for other consolidation opportunities within the Department. However, the distinct nature of the various missions within the Department and their resulting technology, processing, security, data sensitivity and confidentiality requirements, impose constraints that must be evaluated and considered thoroughly.

- Any OUs needing expansion of their current data center capacity will look within the Department or towards cloud providers as a first option.
- NOAA's proactive data center consolidation approach pre-dates FDCCI. In recent years, NOAA has achieved a number of successes with data center consolidation. NOAA has already consolidated: 1) archiving, distribution, preservation, and operation for large data sets at the National Climate Data Center and NOAA Satellite Operations Facility (NSOF); 2) administrative, financial, and management systems at its Information Technology Center; 3) all satellite command and control operations and data and information product production at the NSOF; and 4) research and development and operational supercomputing at three primary high performance computing locations.
- NTIS is a cloud computing center for several federal agencies. Any consolidation that changed the target topology and architecture of NTIS would have a potential negative impact on other government agencies.

### **Increase Server Virtualization and IT Equipment Utilization**

The DOC will pursue optimization of virtualization and utilization levels (data centers, racks, servers, storage). These levels may vary depending upon the underlying applications, system performance, and risk each OU is willing to accept.

Virtualization eliminates the “one server, one application” model, allowing you to run multiple virtual machines on a physical machine. A number of significant benefits are expected from increased server virtualization and IT equipment utilization, including:

- Reduced hardware costs
- Reduced energy consumption and energy costs
- Improved server to admin ratio
- Reduced server maintenance and operations costs
- Reduced facilities maintenance and operations costs (reclaimed space, power, and cooling)
- Improved automation for server management and provisioning

Most OUs have implemented virtualization to varying degrees, with these efforts already showing returns on investment. For example, in its initial Microsoft Windows implementation, the Census Bureau saved \$2.4 million in infrastructure and support costs and reduced server implementation time from acquisition to customer acceptance by two months. Census completed a Linux Server Virtualization Cost Benefit Analysis in FY 2010 and began virtualization of their Linux sever environment in FY 2011.

OUs have developed their own virtualization strategies and will continue to virtualize their environments to the degree possible. The preferred platform for server deployment will be virtual machines. Physical servers will be used only when the virtual solution cannot host the system. The degree and speed of virtualization deployment will be tied not only to the characteristics of the applications but also to the performance capabilities of the hosting platforms and, thus, will be closely aligned to planned hardware refresh cycles.

### **Cloud Computing**

Cloud computing offers another way to reduce the number of servers and, potentially, data centers. Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS) can provide powerful incentives to reduce IT hardware and software and reliance on government data centers. In addition, cloud computing can lead to better IT service, better customer engagement, and faster innovation, all leading to improved business agility.

At this point in time the Department does not have an overall, comprehensive cloud strategy. The Department has been actively engaged in adopting Cloud Computing solutions and is developing a strategy to incorporate the “Cloud First” requirement from OMB.

There are a number of current and planned projects to use various components of Cloud Computing. For example,

- **NTIA Worklenz Project Management:** NTIA selected Métier Worklenz On-Demand to provide a centralized project and portfolio management system that meets the project management planning, execution, control, and reporting needs of NTIA Project Managers, Investment Managers, Functional Managers, and CIO. Worklenz On-Demand is offered as a SaaS cloud model which provides the Worklenz solution to NTIA with hardware, software, and NTIA data provided by Métier, Inc. Métier provides PMO Central to all NTIA’s Worklenz On-Demand users.
- **Akamai Hosting service:** The US Census Bureau used cloud computing technology from Akamai to front the Census Bureau’s 2010 Census website to provide a more cost-effective and reliable delivery of its web content and services to its employees and the public. The Census Bureau was able to stream 2010 Census multimedia content to audiences of any size, at any time, and be assured of a reliably streamed event, keeping a nation informed and up-to-date.
- **NIST Cloud Computing Technology Adoption:** NIST is developing strategic priorities for mission-specific cloud computing technology adoption by building on NIST Special Publication 800-146, “DRAFT Cloud Computing Synopsis and Recommendations.” NIST’s strategic priorities will be supported with a multi-year technology roadmap for the selected IT service areas. NIST anticipates completing the documentation of the strategic priorities, service area selections, and technology roadmap by the end of CY 2011.
- **NOAA Unified Messaging Service—**NOAA has awarded a contract and is transitioning its staff to a “Google Apps for Government” cloud-based solution to replace outdated and unsustainable email and calendar systems. This new system will provide fully integrated email, calendar and collaboration tools with instant two-way PDA synchronization, a built-in archive with self-service restore capabilities, as well as a host of collaboration tools. NOAA is developing operational plans, project plans, and acquisition plans that apply the concepts of cloud computing to realize more efficient IT operations, services, and systems.
- **Census Windows/Linux Private Cloud:** The goal is to be able to rapidly provision compute and storage services to Census customers requiring Microsoft Windows or Red Hat Enterprise Linux servers through a standardized private cloud infrastructure. This will reduce service provisioning times, improve service effectiveness, and reduce or contain costs. Also, Census has implemented a Virtual First policy for server requirements—all lifecycle equipment refreshes and new server requirements will be evaluated for the private cloud virtual environment first.
- **Census SharePoint Document/Content Management:** The Census Bureau is currently establishing the necessary technical infrastructure to host a SharePoint 2010-based enterprise document and content management system (EDMS/ECMS) to be provided as cloud services to internal as well as external customers. The intention is that the infrastructure and the enabling platform in which the EDMS/ECMS resides is reusable and scalable, as necessary, for use by a broad spectrum of customers within the Census Bureau as well as within the entire DOC.
- **USPTO Trademark Document Retrieval:** The Trademark Document Retrieval system (TDR) is a legacy, web-based software application that enables public users to search, view, and download

public documents associated with pending and granted Trademark registrations. TDR 2.0 is a rewrite of the existing TDR application using current development paradigms including PaaS cloud-based elements and internal virtualized elements connected through logical web-services. The purpose of the TDR 2.0 rewrite is three-fold: 1) replace an aging high maintenance system with a modern, cost-effective one; 2) provide enhancements as well as a flexible platform for future enhancements; and 3) provide the experience and lessons learned of a 'live' application piloted in a commercial, public cloud (Google). In order to determine the cloud computing strategy that best fits its needs, USPTO intends to pilot a series of real Trademark system applications on public, private, federal, and hybrid cloud models.

- **NTIS Cloud Hosting Services:** NTIS has a congressionally mandated mission to provide information and information services. In accordance with that mandate, NTIS provides cloud computing services to other agencies, including OMB, GSA, Labor, Education, Homeland Security, Agriculture, Health and Human Services, GPO, OPM, DOD, DOC, U.S. Court System, Architect of the Capitol, intelligence services, and many more. Examples of systems in the NTIS cloud are World News Connection; the Broadband USA Grants application system; the Department of Labor's and OMB's Wage Determination OnLine (WDOL) system; IRS Taxmap; HR Entry On Duty; and the BroadBand Post Award Management (PAM) system. NTIS operates several cloud applications and is an OPM-approved Learning Management System (LMS) provider. NTIS expects 10-15% annual growth in their cloud service offerings.
- **eCPIC:** The Department moved the Commerce-wide Electronic Capital Planning Investment Control (eCPIC) system to a cloud computing solution run by GSA.

USPTO will conduct cloud assessments and deployments related to the Deputy Undersecretary's *Trademarks Next Generation* and *Patents End-to-End strategies*. USPTO has not established firm dates for either of these initiatives.

DOC will review the success with which private cloud strategies are implemented by OUs, seeking first to achieve efficiencies in the OUs. DOC then will look to the private clouds to potentially provide additional computing capacity to other OUs or even to replace their existing computing capacity (as a tool to consolidate data centers). The Census Bureau is very active in initiating IaaS offerings and has established a core hardware environment including servers, network, fiber and SAN. While these services are available now, the Census private cloud will grow and mature through FY 2013 as Census migrates existing legacy systems to this environment through the life-cycle age replacement process.

Cloud computing is not a one-size-fits-all solution. OUs will devise different cloud strategies, both as a consumer and as a provider of cloud services. We will continue to identify potential application/system targets for migration to cloud services. Utilizing cloud-based services as an alternative to our current infrastructure models is something we plan to examine in more detail as part of our strategic planning activities, particularly with regard to 1) IT security and policy enforcement and 2) data confidentiality and security.

### **Improving the Overall IT Security Posture of the Department**

The three approaches described above—data center consolidation, server virtualization, and cloud computing—contribute towards improving the overall IT security posture of the Department by reducing the number of possible points of attack. While we have concerns about using public cloud computing offerings, they too have benefits.

- **Data Center Consolidation**
  - Reduces the risk of intrusion and compromise
  - Provides opportunities to reduce the complexities inherent in typical multivendor environments
  - Provides opportunities to transition to modern data center practices, to modernize hardware and software, and to streamline business processes, while reducing cost.
- **Virtualization**
  - Provides rapid server provisioning—once a virtual server is created, with appropriate baseline security settings, patches applied, and other environment-specific settings, an organization can save an image. The image can be used for recovery or to create other servers of the same type (e.g., SAS, database, file, print, etc.).
  - Quick Recovery from business continuity events—in case of failure, rebuilding the environment from a stored virtual image is a quick way to restore services.
  - Improves patch testing and deployment process through virtual systems—Can test patches in a duplicate environment without the need for a separate, dedicated hardware environment.
- **Cloud Computing**
  - Enables/supports new and timely solutions to fulfill mission requirements.
  - Environments typically are standardized, homogeneous architectures, which are easier to secure.
  - Customers typically have regular and predictable access to their data and applications.
  - Providers typically produce logs and audit trails and work with their customers to ensure that these logs and audit trails are properly secured, maintained for as long as the customer requires, and are accessible for the purposes of forensic investigation.

### **Acquire Green Products and Services**

Green products and services will be acquired to the maximum extent practicable consistent with the requirements of the Federal Acquisition Regulation (FAR) and EO 13514, which set the standard for sustainable acquisition. As our current hardware ages and requires replacement, we will procure new, energy efficient replacement hardware.

DOC will ensure that 95% of new contract actions—including task and delivery orders under new contracts and existing contracts—require the supply or use of products and services that are energy

efficient (ENERGY STAR® or FEMP-designed), water efficient, bio-based, environmentally preferable (excluding EPEAT®-registered products), non-ozone depleting, contain recycled content, or are non-toxic or less-toxic alternatives.

DOC will update affirmative procurement plans (green purchasing plans and environmentally preferable purchasing plans), policies, and programs to ensure that all federally mandated designated products and services are included in all relevant acquisitions.

### **Support and Promote Green IT**

DOC will maintain our long-held commitment to creating a sustainable environment and energy future through both our policies and actions. DOC will update department policy to ensure implementation of best management practices for energy-efficient management of servers and federal data centers; and meet technology energy-consumption reduction goals in our data centers.

Further demonstrating our commitment, we will annually update and publish a Strategic Sustainability Performance Plan (SSPP) containing our department priorities and performance targets. Additionally, because DOC views the requirements of EO 13514, *Federal Leadership in Environment, Energy, and Economic Performance*, and the pursuit of a robust sustainability policy, as laid out in our SSPP, as central to our department's core values and mission, every employee within DOC is charged with encouraging and personally supporting sustainability within the Department. To further efforts toward a transparent government, progress on these targets will be reported on the publicly accessible DOC website.

### **DOC FDCCI Plans and Timelines**

As stated previously, each OU will develop its own individual consolidation plan that will identify specific approaches or roadmaps each will undertake to achieve the stated goals and target measures and milestones.

We have targeted 26 data centers for closure. Because we are adding a new facility in 2012, the HCHB Consolidated Server Room, our net reduction will be 25.



Following is a master schedule of all planned data center closures and their related stage of closure.

<b>Master Schedule—Data Center Closures</b>			
<b>OU</b>	<b>Data Center Name</b>	<b>Target Date (CY)</b>	<b>Phase of Closure</b>
BIS	BIS HCHB Server Room 6733	Q2 / 2010	Closed Q2 / 2010
Commerce OCIO	OCIO Springfield	Q3 / 2010	Closed Q3 / 2010
NTIS	NTIS Silver Spring	Q4 / 2010	Closed Q4 / 2010
Census Bureau	CEN2010 DRIS Baltimore	Q1 / 2011	Closed Q1 / 2011
Census Bureau	CEN2010 FDCA DPC1	Q1 / 2011	Closed Q1 / 2011
Census Bureau	CEN2010 FDCA DPC3	Q1 / 2011	Closed Q1 / 2011
Census Bureau	CEN2010 FDCA IT1	Q1 / 2011	Closed Q1 / 2011
Census Bureau	CEN2010 DRIS Phoenix	Q2 / 2011	Closed Q2 / 2011
ITA	ITA Reston	Q2 / 2011	Closed Q2 / 2011
Census Bureau	CEN2010 DRIS Greenbelt	Q4 / 2011	Closed Q3 / 2011
Census Bureau	Secondary Computer Center	Q4 / 2011	Closed Q3 / 2011
Census Bureau	NPC Server Room 63-A	Q2 / 2012	Stage 4: Migration Execution
Commerce OCIO	OCIO HCHB Server Room 6051	Q2 / 2012	Stage 3: Migration Planning
Commerce OCIO	OCIO HCHB Server Room 6087	Q2 / 2012	Stage 3: Migration Planning
Commerce OCIO	OCIO HCHB Server Room 6830	Q2 / 2012	Stage 3: Migration Planning
Commerce OCIO / EDA	OCIO/EDA HCHB Server Room 4630	Q2 / 2012	Stage 3: Migration Planning
ITA	ITA HCHB Server Room H1840/H1842	Q2 / 2012	Stage 3: Migration Planning
MBDA	MBDA HCHB Server Room 5606	Q3 / 2012	Stage 1: Inventory
NOAA	NOAA HCHB Server Room 6814	Q3 / 2012	Stage 3: Migration Planning
Census Bureau	NPC Server Room 60-A	Q4 / 2012	Stage 4: Migration Execution
Census Bureau	NPC Server Room 60-D	Q4 / 2012	Stage 4: Migration Execution
Census Bureau	NPC Server Room 63-B	Q4 / 2012	Stage 3: Migration Planning
Commerce OIG	OIG HCHB Server Room 7719	Q1 / 2013	Stage 1: Inventory
Census Bureau	NPC Server Room 63-G	Q4 / 2013	Stage 3: Migration Planning
NTIA	NTIA HCHB Server Room 6888	Q4 / 2013	Stage 2: Application Mapping
Commerce OCIO	OCIO HCHB Server Room 1832	Q1 / 2014	Stage 3: Migration Planning

## 5 Department Governance Framework for Data Center Consolidation

The DOC CIO Executive Board and the CIO Council will provide overall governance. With Departmental guidance, each OU will develop its own consolidation plan that will identify specific approaches and activities each will undertake to achieve the stated goals, target measures and milestones.

The Department and OUs will leverage their information technology planning processes and establish sustained IT governance to:

- Establish overall strategy and consensus priorities
- Eliminate/reduce spending on redundant products/solutions on commodity software, infrastructure and operations
- Consolidate purchasing, e.g., enterprise license agreements and purchase vehicles, to obtain optimum pricing on enterprise products
- Seek enterprise solutions and eliminate isolated systems solutions
- Develop a common set of measures and target goals as a basis for executive decisions on infrastructure and data centers
- Monitor progress

The Department and OUs will establish integrated, interdisciplinary project teams with clear division of roles and responsibilities to execute their data center consolidation projects. Key performance indicators with corresponding targets have been identified. A set of key schedule baseline milestones will be selected for reporting and monitoring purposes. Project management activities (e.g., initial approval of and changes to spend plans and baselines, monitoring of cost/schedule performance, etc.) will be handled according to established OU-level policies, processes, and procedures.

As an example, following is the governance process NTIA will follow for its FDCCI initiatives.

Over the life cycle of the initiative, the Governance Review Board will maintain a “monitor and control” presence for the initiative anchored by the execution of a series of governance reviews. Staffed by senior ITD staff representing IA/Security, network engineering and operations, systems support, enterprise architecture and capital planning, and the CIO, the Governance Review Board is the crux of NTIA’s cross-disciplinary program management approach. At each of the governance review milestones in the initiative’s lifecycle, unanimous approval from the Governance Review Board must be obtained before the initiative can proceed. This ensures that appropriate assessment, measurement, and control are exercised with respect to each facet of program management. At the project management level, the PMO will conduct progress reviews on the initiative every two weeks to measure progress, monitor risks, ensure compliance with the NTIA standard lifecycle processes, and give guidance as needed. As the project continues on its life cycle, with the next review milestone being the Preliminary Requirements Review, the initiative manager

will develop the detailed implementation schedule, the list of key baseline milestones, and the spend plan for each fiscal year.

## 5.1 Cost-Benefit Analysis

The following table shows the funding needed for and savings/cost avoidance expected from our planned data center closures/consolidations, virtualization initiatives, and major cloud computing initiatives. Savings reflect reductions in lease costs, energy use, contract services, and IT infrastructure.

Item	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	Total
<b>Server Virtualization</b>						
Cost of virtual infrastructure	9,832,551	16,016,547	9,417,877	9,476,480	7,253,457	51,996,912
Cost of existing legacy environment	16,617,144	24,176,196	15,147,075	15,541,980	13,330,512	84,812,907
Net cost/savings	6,784,593	8,159,649	5,729,198	6,065,500	6,077,055	32,815,995
<b>NOAA Unified Messaging Services (UMS)--Web-based enterprise solution of workplace applications *</b>						
Cost of NOAA UMS cloud computing initiative	1,580,000	4,110,000	2,880,000	2,950,000	3,100,000	14,620,000
Cost of maintaining in-house legacy solution	5,300,000	12,600,000	5,800,000	5,800,000	5,800,000	35,300,000
Net cost/savings	(1,580,000)	8,490,000	2,920,000	2,850,000	2,700,000	15,380,000
<b>DOC-wide HR Management System-- Treasury HR Connect</b>						
Cost	3,695,400	6,678,500	5,939,700	9,210,600	7,151,900	32,676,100
Benefit	0	0	8,583,300	10,117,100	14,749,400	33,449,800
Net Cost/Benefit	(3,695,400)	(6,678,500)	2,643,600	906,500	7,597,400	773,600
<b>Data Center Closures/Consolidations</b>						
Cost	556,616	220,000	30,000	20,000	0	826,616
Savings excluding Springfield closure	115,487	1,829,274	2,021,934	2,088,070	765,207	6,819,972
Net cost/savings excluding Springfield closure	(441,129)	1,609,274	1,991,934	2,068,070	765,207	5,993,356
Savings including Springfield closure	(2,743,524)	(1,029,737)	(837,077)	(770,941)	(2,093,804)	(7,475,083)
Net cost/savings including Springfield closure	(3,300,140)	(1,249,737)	(867,077)	(790,941)	(2,093,804)	(8,301,699)
* In FY11, cloud solution in parallel with legacy system so no offset savings in legacy environment.						

The decision to close the DOC Springfield data center was made prior to the FDCCI and was not driven by a desire to realize cost savings. DOC needed significantly higher service levels, higher availability, and greater IT security than what Springfield provided. Systems and applications were moved to other higher performing facilities resulting in higher costs.

DOC is not requesting any additional funding to support FDCCI related initiatives and activities. We expect to fund these activities out of our existing budgets.

## 5.2 Risk Management and Mitigation

Data center consolidation, virtualization, and cloud computing are major undertakings that require enormous effort and consume significant resources. Each has major risks that need to be identified, assessed, and mitigated. Each OU will utilize risk assessment and risk mitigation strategies to develop their own risk register and risk mitigation strategy for their FDCCI-related projects.

Risk management processes are iterative and a key component of project management. Risks must be identified and prioritized at the OU, data center, and systems level, and assigned. Risk categories will include cost, schedule, privacy, IT security, technology, and project management. Risk mitigation strategies and contingency plans, as needed, must be developed. A risk register and risk matrix will be developed and maintained by the OU. The risk owner will develop alternative courses of action, workarounds, and a recommended course of action for each critical risk. High impact, high probability risks will be carefully monitored.

Following are examples of major risks that may need to be monitored and mitigated:

Risk	Description
<b>Data Center Consolidation</b>	
Poor planning	Underestimating the complexity of data center moves—the time it will take, the resources needed, the skills required
Not understanding application dependencies	The knowledge has to be collected from the people managing the applications—a time-consuming task
Underestimating power requirements	Finding you don't have the power capacity you thought you had to handle current and future requirements
Failure to establish pre-move baselines	Without valid baseline data you can't verify if you are realizing improvements and cost reductions
Upgrading systems during the move	Any change undertaken during planning and execution adds risks and complicates the project
<b>Virtualization</b>	
Hypervisors introduce a new layer of software that can be attacked	A compromise of the virtualization layer could result in the compromise of all hosted workloads; the hypervisor operates like an operating system and could require patching
Virtualization may bypass secure configuration standards	Inadvertently use insecure builds for cloning VMs
Unpatched virtual machines (VMs)	Not enough attention has been paid to patching and confirming the security of virtual machines
Failure to enforce security policy in the virtualized environment	The Information Security Office needs to be involved; the virtual environment needs to be treated with the same care and concern as the physical environment
Poor execution of VM strategy	Improper mixing and matching of VMs with hosts can lead to performance and security issues

Risk	Description
<b>Cloud Computing</b>	
Multi-tenant and intermingled resources	Applications run alongside other companies' applications; data are stored alongside other companies' data
Data protection and confidentiality	How does the provider segregate and protect your data and maintain confidentiality?
IT Security Policy Compliance	Does the provider meet your security certification requirements?
Auditing and compliance reporting	Does the provider provide the necessary auditing and reporting?
Loss of control and transparency	Customers cede control to cloud computing service providers on a number of issues that may impact security, mission, and goals
Long-term viability of the provider	Will the provider be here for the long haul? What is your fall back if the provider fails?

### 5.3 Acquisition Management

As part of the planning process for FDCCI-related initiatives and activities, each OU will develop an acquisition strategy for required goods and services. All acquisition actions will follow Federal, Department, and OU regulation and policy.

The OUs will exercise appropriate vendor management to control costs, drive service excellence and mitigate risks to gain increased value from vendors throughout the acquisition life cycle. Vendor management activities span RFP creation, vendor evaluation, negotiation, and ongoing contract management, vendor relationship, and performance management. Strong vendor management as part of our FDCCI acquisition strategy will help ensure we get the right solutions from the right vendors at the best value to help meet our FDCCI goals and objectives.

The DOC CIO community works with its counterparts in the acquisition community to assess current vehicles for procuring IT commodities and services, such as government-wide acquisition contracts (GWACS), GSA's SmartBuy program, blanket purchase agreements (BPAs), and enterprise licenses. New opportunities for consolidating acquisitions are identified by surveying OUs and acquisition offices. The CIOs work with the Heads of Contracting Offices (HCOs) to identify opportunities to develop consolidated acquisition vehicles. The DOC Office of the CIO investigates high potential candidates for consolidated acquisition, and reviews opportunities for commodity buys. DOC identifies CIO sponsors in the OUs for championing acquisition consolidation efforts and then forms cross-OU integrated project teams with CIOs playing a leadership role. The CIOs and HCOs collaborate to develop requirements, contract documents and applicable schedules.

DOC will leverage and give priority consideration to government-wide acquisition vehicles and Department-wide acquisition vehicles negotiated by individual OUs. DOC strategy is to promote and

strengthen the use of contract vehicles such as GSA's Networx telecommunications contract, Apps.gov, GSA Advantage, GSA Smart Buy, NASA's SEWP IV, and NOAA's IT support services contract, NOAALink, which is open to the entire DOC.

A broad strategic sourcing initiative is underway with several near-term objectives: reduce the price DOC pays; reduce IT complexity through standardization; streamline the acquisition process; and enable future technological, process, and acquisition efficiencies. The DOC currently is focusing on desktops, laptops, monitors, and other associated computer equipment and accessories. Senior leaders at DOC have committed to a more collaborative approach to procuring and managing PCs and accessories across the Department. Pending success with these initiatives, we will explore expanding strategic sourcing into data center related areas. DOC currently is developing a Technical Reference Model. The initial document identifies classes of software that are candidates for strategic sourcing, such as database.

Following are a number of recent and planned contract actions related to the FDCCI:

- In closing its Secondary Computer Center, the Census Bureau terminated its IT support contract early for that data center.
- The Census Bureau recently awarded a blade computer BPA contract to supply its blade architecture.
- The Census Bureau recently awarded a new contract that will provide easy access to HP software tools for business service management, business service automation, IT service management, and application testing at a significant discount. These tools will help the Census Bureau establish IaaS and position itself as a center of excellence for data center services.
- In June 2011, NOAA awarded a contract under a NOAALink task order for a "Google Apps for Government" cloud-based solution to replace its email and calendar services. NOAA intends to leverage this contract and its associated unified messaging services capabilities to consolidate collaboration services across all of NOAA.
- NOAA intends to leverage its department-wide NOAALink contract vehicle to acquire additional enterprise services in the same manner that it was used to acquire the Google collaboration service.
- NOAA's High Performance Computing (HPC) facilities have an ongoing acquisition to replace existing services, with an award currently expected in October 2011. The current operational supercomputing contract expires in September 2011, with a follow-on two year bridge contract to facilitate transition to the replacement operational facilities.

## 5.4 Communications Strategy

Our communications strategy will reflect the two-level governance process established for the FDCCI. The Department will provide overall oversight through the DOC CIO Executive Board and the DOC CIO Council, and each OU will utilize its own established policies, processes, and procedures.

The DOC FDCCI Team will be responsible for maintaining lines of communication between the Department and OUs regarding communications and efforts for the FDCCI. The Team will provide senior leadership—Department and OU CIOs—with regular briefing reports on FDCCI initiatives, activities, and progress. OUs are expected to report on their progress semiannually

In support of these efforts, the FDCCI Team will:

- Maintain consistent, effective communications between the DOC FDCCI Team, DOC Chief Information Officer, DOC CIO Executive Board, DOC CIO Council, OUs, and the FDCCI PMO;
- Establish, manage, and maintain relationships with the OUs and stakeholders to achieve efficient and effective communications regarding project status reporting, issue resolution, risk mitigation, and identification of improvement actions for related FDCCI initiatives;
- Work with the OUs and stakeholders to gain an understanding of their priorities and challenges to effectively provide an oversight element of FDCCI communications and its operational needs, including identifying ineffective communication and providing solution strategies; and
- Collect, update, distribute, and maintain FDCCI reporting requirements; offer outreach for and synthesis of FDCCI reporting requirements.

## 6 Progress

### 6.1 FDCCI Consolidation Progress

DOC has met all consolidation targets for CY 2011 and is on target for planned CY 2012 closures. The Census Bureau accelerated the closure of their Secondary Computer Center. Originally planned for closure in December 2014, the Census Bureau closed the facility in September 2011. The 10 HCHB server room consolidations that are occurring 2012 through 2014 are dependent upon the timely completion of the construction of a new Consolidated Server Room facility as part in the HCHB Building renovation.

The FDCCI has prompted the Department to take a closer look at its data centers and seek cost savings and efficiencies. While the FDCCI related activities—data center consolidation, virtualization, cloud computing, shared services, etc.—were occurring regardless, the FDCCI has brought a greater focus to these activities and prompted us to look deeper for additional opportunities.

**Challenges and Lessons Learned**

Following are challenges experienced to date and lessons learned.

Challenge	Lesson Learned
Collect complete, quality, and comparable inventory data	<ul style="list-style-type: none"> <li>• For consistent and comparable reporting across OUs, Inventory field definitions need greater specificity and clarity. Also need to reconcile and possibly redefine certain inventory field definitions to accommodate unique aspects of our HPC infrastructure.</li> <li>• Better power information is dependent upon full metering, which is lacking in the non-traditional data centers, i.e., the smaller server rooms, and is not cost-effective to install</li> <li>• Automated discovery and inventory tools provide more complete and up-to-date information</li> <li>• Review, review, and review</li> </ul>
Getting customer buy-in for FDCCI-related activities	<ul style="list-style-type: none"> <li>• Communicate with customers early and often; educate them on benefits</li> <li>• Be transparent—no surprises</li> </ul>
Strategic Sourcing	<ul style="list-style-type: none"> <li>• Fully understand and define requirements</li> <li>• Activities do not end with the award of the contract; must follow a continuous cycle</li> <li>• Work proactively and collaboratively with vendors to gain cost savings and improvements in contracts</li> <li>• Practice active vendor management</li> </ul>



Challenge	Lesson Learned
Virtualization	<ul style="list-style-type: none"> <li>• Virtual infrastructure design is critical to ensure resources are balanced and customers do not experience bottlenecks; must take storage into account in design</li> <li>• Right-size the hardware—the biggest and fastest servers may not be the single, best solution</li> <li>• Virtualization is not a one-size-fits-all solution; some applications are not appropriate for virtualization</li> <li>• Need strict policies, procedures, and controls to control the virtual environment and prevent virtual machine sprawl</li> <li>• Implement a virtual first policy</li> <li>• Be sure you have the tools to manage, monitor, and troubleshoot the virtual environment</li> <li>• There is a need for ongoing training as the technology continues to mature; the technical knowledge and skill sets across OUs vary widely.</li> </ul>
Shared services	<ul style="list-style-type: none"> <li>• Fully define and understand requirements</li> <li>• Participating OUs may not have all their individual requirements met by a shared solution</li> </ul>
Cloud computing	<ul style="list-style-type: none"> <li>• Partnering with proven cloud providers will provide greater opportunity for success</li> <li>• Leverage FedRAMP program wherever possible to address security in the cloud</li> <li>• Focus on finding value, not just cutting costs</li> <li>• Customer requirements need to be fully defined in contract</li> </ul>
Data center consolidation	<ul style="list-style-type: none"> <li>• Detailed planning is critical due to the number of moving parts and potential impact on applications and customers</li> <li>• Strong standardization is needed to reduce and contain costs and optimize service</li> <li>• SLAs are needed to manage customer expectations</li> </ul>

Challenge	Lesson Learned
Acquiring funding for FDCCI related activities—FDCCI is an unfunded mandate	<ul style="list-style-type: none"> <li>• Streamline IT operations to reduce costs and reallocate funding to support FDCCI, e.g., eliminate duplicate products, consolidate service contracts, improve vendor management</li> <li>• Demonstrate the cost benefit of FDCCI related strategies to executive management</li> </ul>

## 6.2 Cost Savings

We were able to move forward on our FDCCI initiatives with our enacted FY 2011 funding as well as with funds developed through efficiencies and cost avoidance. We did not encounter any significant unanticipated consolidation costs.

DOC did not realize any net savings this FY from our CY 2011 data center closures. The closing of the Springfield facility, and the relocation of systems and applications to other facilities, resulted in a significant cost increase for the OUs that were using the facility. (The facility was closed for other than financial reasons as described in section 5.1.) Excluding the Springfield data center closure, DOC will begin realizing net savings in FY 2012. The closing of the ITA Reston facility will save \$100,000 per year beginning FY 2012. The savings from the closure of the Census Secondary Computer Center will increase from \$109,000 this FY to \$1.7M in FY 2012. We did not identify the \$6.1 million in lease and operational costs in the Census FDCA and DRIS data center closings as savings since these facilities were planned for closure with the completion of the 2010 Census operations.

DOC realized approximately \$6.8M in cost savings (reduced infrastructure) by moving into a virtual server environment. Efforts establishing virtualization infrastructures will lead to future savings as we migrate more and more into the virtual environments.