



Report to the Secretary of Defense

**DoD Information Technology
Modernization: A
Recommended Approach to
Data Center Consolidation and
Cloud Computing**

Report FY12-01

- **Recommendations to enhance and transform combat capability and mission support through IT modernization**
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DoD Information Technology Modernization: A Recommended Approach to Data Center Consolidation and Cloud Computing

TASK

In May 2011, Deputy Secretary of Defense William J. Lynn tasked the Defense Business Board (hereafter referred to as “the Board”) to form a Task Group to provide recommendations as to how the Department of Defense (DoD) might apply proven best business practices to Information Technology (IT) modernization, Data Center Consolidation (DCC), and the efficient, effective, and secure implementation of Cloud computing to support DoD business approaches and its war-fighting mission. A copy of the Terms of Reference (TOR) outlining the scope and deliverables for the Task Group can be found at **Tab A**.

David Langstaff served as the Task Group Chair. The other Task Group members were Atul Vashista, Bonnie Cohen, Patrick Gross, and Kevin Walker. Captain Ronald Carr, USN, and Lieutenant Colonel Edward Lengel, USAF, served as the Board Military Assistants to the group.

PROCESS

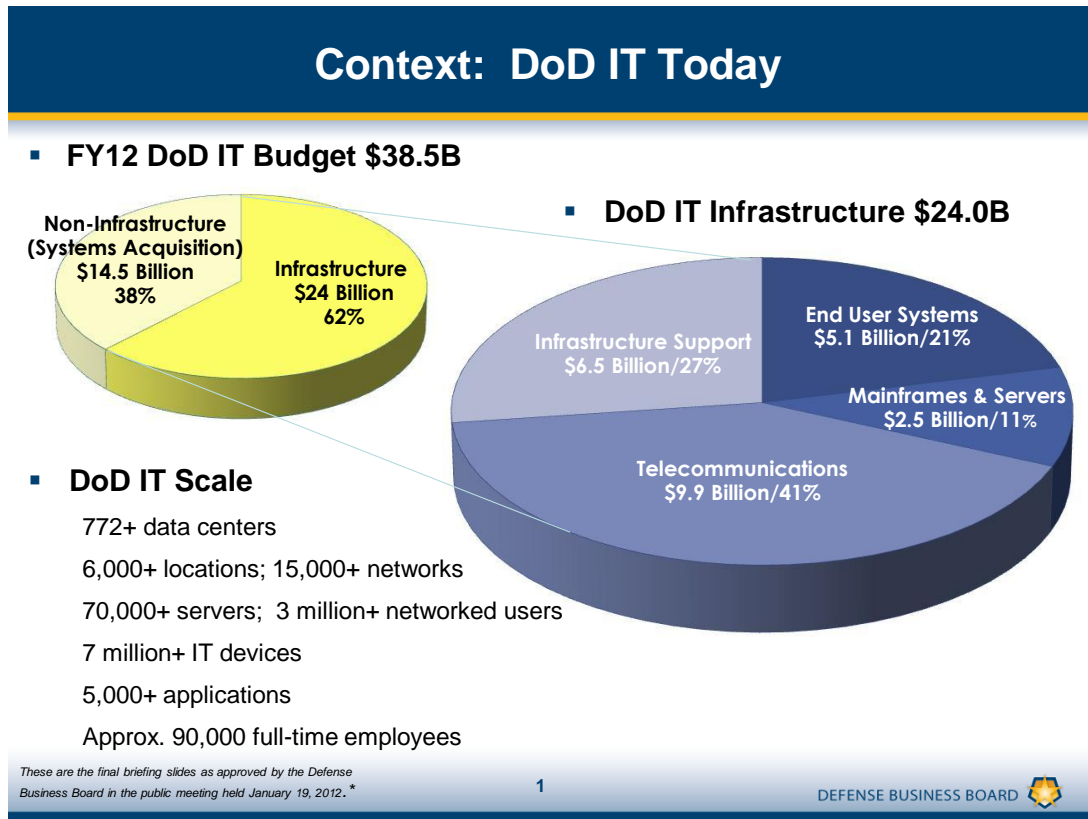
The Task Group conducted extensive interviews of both public and private sector entities as well as reviews of recent journal articles, technical and trade publications, and industry circulars. The intent was not to be prescriptive toward DoD IT systems, but to provide applicable insights gained from successful private sector IT modernization experiences. The study was undertaken with a clear understanding of the mission of the Department, the vital importance of IT in modern warfare, and the need for security with respect to both data centers and Cloud computing.

The Task Group’s draft findings and recommendations were presented to the Board for deliberation at the January 19, 2012 quarterly Board meeting where the Board voted to approve the recommendations. See **Tab B** for a copy of the brief and recommendations as approved by the Board.

FINDINGS

Given today’s technological advances in Cloud computing and data consolidation, DoD has the opportunity for significant positive impact on its core mission through IT modernization. This modernization should not be viewed as an end in itself, but as a means to a greater end of enhanced combat capability. Selected findings are listed below, with the complete findings listed in the accompanying presentation.

The Department’s current information technology systems were built in a decentralized manner, resulting in a myriad of legacy infrastructure that is difficult to blueprint. The Department’s FY12 budget for IT is \$38.5 billion, \$24 billion of which is dedicated to infrastructure alone.



At best estimates, DoD controls over 772 data centers with operations at over 6,000 separate locations. The DoD IT enterprise serves over three million networked users on 70,000 servers and seven million IT devices. These devices run over 5,000 different applications. It is estimated that it currently takes 90,000 employees to accomplish daily operations and maintenance of the DoD IT enterprise. Currently, DoD is

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unable to audit specific spending on IT systems outside the IT budget, and as such, it is estimated that the actual amount spent on IT systems could be significantly greater than budgeted due to use of operations and maintenance funds at local levels to augment the formally budgeted allotment for IT. Also, this budget does not include IT purchased as part of major weapons systems, which is normally budgeted within each specific program.

The current IT enterprise, across the Services and Agencies of DoD, lacks common terminology, accounting transparency, and overall visibility. Similar to many private-sector network designs, DoD network capabilities were created out of necessity for specific, functional requirements. These designs filled, and are filling, needs of the warfighter. However, as seen in the private sector, there is a point where a system becomes resource-intensive both in manpower and maintenance.

The computer industry has made leaps in computing power and data storage which, along with increased bandwidth capability, allows for a change in the service delivery model for IT. The new model has been shown to provide benefits in both cost savings and operational agility in the private sector. Another benefit to the new model is increased visibility across the entire network.

Security is a primary concern with IT systems worldwide. There is growing consensus that not only are cloud-based systems likely to be more secure, but that the security of current non-cloud systems will decline rapidly over time. It will become harder and increasingly expensive to maintain and secure legacy systems. Consolidated data centers and properly designed cloud systems can be more secure due to the fact that there are fewer of them, and proportionally greater resources can be applied to them in order to increase redundancy and strengthen the ability to recover and reconstitute after a breach.

Despite human and institutional nature to resist change, many of the interviewees indicated wide support across DoD for DCC and Cloud computing initiatives. These initiatives would provide efficiency and capability benefits. The strategic question to answer is “At what level should the DoD optimize its IT modernization?” In response to this question, the Task Group identified five key recommendations.

RECOMMENDATIONS

1. **Establish a single strong governance authority.** This was the most critical point that the Task Group heard repeatedly in the private sector interviews. The authority to direct coordinated changes across the entire enterprise is critical to achieving desired operational performance and system efficiency. It should be noted that DoD has already begun to implement elements of this recommendation. For example, the DEPSECDEF's directive-type memorandum dated January 11, 2012 titled "Disestablishment of the Assistant Secretary of Defense for Networks and Information Integration and Related Matters."¹ In this letter, the DoD Chief Information Officer is designated as the "...primary authority for the policy and oversight of information resources management, to include matters related to information technology, network defense, and network operations."
2. **Develop a coordinated, integrated strategy to optimize at the DoD level.** A modernization effort at the Service or Agency level of DoD, rather than at the highest level, increases the risk of operational barriers and will not maximize effective use of resources. Large private sector firms with operations spread over wide geographic areas have noted increased operational capabilities and more effective use of resources when their IT modernization was led at the highest levels. Today's Joint warfare concepts require warfighter access to data and information systems that cross Military Service, Combatant Command, and Defense Agency's boundaries. Military Service IT professionals will always have a responsibility to their respective Military Service, but they will also carry a responsibility to follow policy directives from DoD regarding adherence to a concept of operations, performance metrics, and established standards. This will result in a well-coordinated matrix-type organization for the implementation of the IT modernization effort.

¹ "Disestablishment of the Assistant Secretary of Defense for Networks and Information Integration (ASD(NII)) and Related Matters," OSD 15075-11.

3. **Streamline legal and procurement authorities to address policy barriers.** U.S. Code Title 10 prescribes responsibility for specific systems. However, those with responsibility must regard the overall interaction of their IT systems across the DoD enterprise when executing decisions based on their responsibility and coincident authority. Also, the current acquisition system sometimes cannot keep pace with software and hardware advances that occur over a period of weeks or even days. Provisions should be explored for rapid acquisition of IT systems that can be established as common solutions across the Military Services, Defense Agencies, and Combatant Commands.

4. **Use a sequenced approach to Data Center Consolidation.** Proper sequencing is vital to a favorable modernization and consolidation outcome. The first step is to normalize, standardize, and rationalize critical elements. This step will highlight the truly important and highly utilized IT systems. The second step is to prioritize around applications, then infrastructure, and then data and security. This step will form the backbone of the new architecture and establish the model for integration of systems. The third step is to set deadlines for the termination of legacy systems, personnel, and contractors. This step is important to effectively utilize resources and ensure a full transition to the modernized architecture. The fourth step is to launch Cloud pilot initiatives offering immediate user benefits. This step will entice those who have been apprehensive about the changes and create a “market pull” from users who want the enhanced capabilities and a more effective use of their resources. The fifth and final step is to accelerate the transition when the purpose and desired benefits are clear. This step will apply momentum to the transition and provide a point to validate the original concept of operation.

5. **Utilize commercial business models to set targets and manage expectations.** Data Center Consolidation and transition to Cloud computing will provide benefits, but applicable metrics must be established and tracked to ensure compliance with intended goals. Additionally, accurate accounting practices are necessary to track total cost savings and allow relocations to fund additional modernization efforts. This accountability will require a multi-year budget plan and require audit-level transparency. Successful private ventures have relied on the investment of at least some of the

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savings in updated infrastructure and applications. Modification of the original concept of operations may be necessary to ensure continuous improvement.

Staff optimization is another important consideration. Organizations that have already transitioned to Cloud systems have re-tasked their IT workforce. What used to be a 60% infrastructure support and a 40% programming and application workforce mix changed under a Cloud structure. Under the Cloud system, 40% of employees could handle the infrastructure support workload, allowing 60% to work on programming and applications. Training of these employees will be necessary during the transition but will generate value over time with introduction of enhanced capability from increased manpower focused on applications and software.

Examples of Cost Savings and Efficiencies

CATEGORY	REDUCTION	EXAMPLE
Data Centers	Number: 50% Cost: 25-50%	Typical payback is 5 years
Servers	70%	80 → 4; leverage virtual machines
Server Provisioning	95%	73 days → less than 1 day
Application Development	90%	45 days → 4 days
Bandwidth Utilization	70-90%	ROI in less than 1 year
Personnel	40%	Most organizations retrain support staff into applications staff

**Cost-saving estimates: 25-50% in total annual expenditures
DCC/Cloud initiatives illuminated robust 'shadow' IT infrastructure.**

These are the final briefing slides as approved by the Defense Business Board in the public meeting held January 19, 2012.*

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CONCLUSION

IT Modernization in the form of Data Center Consolidation and transition to a Cloud structure is a strategic DoD enterprise-level imperative. The DoD CIO should be the strategic partner to the Deputy Secretary of Defense empowered to implement the Department's IT Enterprise Strategy and Roadmap.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "David Langstaff", with a long horizontal stroke extending to the right.

David Langstaff
Task Group Chair

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TAB A

TERMS OF REFERENCE

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DEPUTY SECRETARY OF DEFENSE
1010 DEFENSE PENTAGON
WASHINGTON, DC 20301-1010

MAY 20 2011

MEMORANDUM FOR CHAIRMAN, DEFENSE BUSINESS BOARD (DBB)

SUBJECT: DBB Terms of Reference – “Information Technology Modernization”

The Department of Defense’s \$38 Billion FY12 Information Technology (IT) budget supports our global military activities and operations. The Department’s IT infrastructure and environment is highly complex. DoD operates approximately 10,000 operational systems running on 15,000 networks using 67,246 servers and 772 data centers spanning 146 countries and 6,000 locations. This complexity has created numerous operating challenges, including: cyber vulnerabilities, decentralized planning and standards, impediments to joint and allied operations, large cumulative costs, and an inability to capitalize on rapidly evolving technology. For these reasons, it is imperative that the Department identify and pursue every opportunity to economize and increase the efficiency of its IT enterprise.

As the Department’s independent advisory board for economics and business affairs, I request you form a Task Group to provide recommendations on how DoD should apply best business practices to assess and approach:

- IT data center consolidation to increase the efficiency and modernize the DoD IT enterprise.
- Opportunities for the efficient, effective, and secure implementation of cloud computing to support the Department’s business operations and warfighting mission
- Security concerns associated with both data center consolidation and cloud computing

The Task Group will be sponsored by me and co-sponsored by the Acting Assistant Secretary of Defense for Networks and Information Integration/DoD Chief Information Officer. Mr. David Langstaff will chair the Task Group. Captain Ronald Carr, U.S. Navy, will serve as the Task Group’s Military Advisor.

This effort should be completed by the DBB’s October 2011 Board meeting.

As a subcommittee of the Board, and pursuant to the Federal Advisory Committee Act of 1972, the Government in the Sunshine Act of 1976, and other appropriate federal regulations, this Task Group shall not work independently of the Board’s charter and shall report its recommendations to the full Board’s public deliberation. The Task Group does not have the authority to make decisions on behalf of the Board, nor can it report directly to any federal officer who is not also a Board member. The Task Group will avoid discussing “particular matters” according to title 18, U.S.C., section 208.



W.R. [Signature]

OSD 05341-11



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TAB B

FINDINGS AND RECOMMENDATIONS

PROVIDED TO THE BOARD ON JANUARY 19, 2012

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**DoD Information Technology Modernization:
A Recommended Approach to Data Center
Consolidation and Cloud Computing**

Task Group

January 19, 2012

Task Group Overview

Terms of Reference

How should the Department of Defense (DoD) apply best business practices to Information Technology (IT) modernization, Data Center Consolidation (DCC), and the efficient, effective, and secure implementation of Cloud computing to support DoD business approaches and its war-fighting mission?

Task Group

Mr. David Langstaff (Chair)

Ms. Bonnie Cohen

Mr. Patrick Gross

Mr. Atul Vashistha

Mr. Kevin Walker

Military Assistant

Lt Col Edward Lengel, USAF

Task Group Report

- Approach
- Context
- Findings
- Recommendations
- Summary
- Appendix

Approach: Critical Considerations

- Align with DoD mission requirements
 - Do no harm
 - Support and enhance DoD mission
- Recognize cost saving imperative
 - Identify cost reductions
 - Seek operating efficiency and asset utilization gains
 - Consider positioning for future gains
- Address security concerns
 - Understand current system risks and vulnerabilities
 - Understand cloud-specific risks
 - Mitigate transition as well as ongoing operating risks
- Identify and capture 'lessons-learned' experiences
 - Public sector: DoD and other government agencies
 - Private sector: industry, service providers, domain experts, and consultants



Approach: Interviews

■ Public Sector

- CIO and Staff, DoD
- CIO, US Air Force
- CIO, US Army
- CIO, US Navy
- CIO, Defense Intelligence Agency
- CIO, Defense Logistics Agency
- CIO, Dept of Homeland Security
- CIO, US Government
- Director and Staff, NSA
- Vice Chairman, Joint Chiefs of Staff
- Principal Deputy Under Secretary of Defense, AT&L
- Director of Computing Services and CTO, Defense Information Services Agency

■ Private Sector

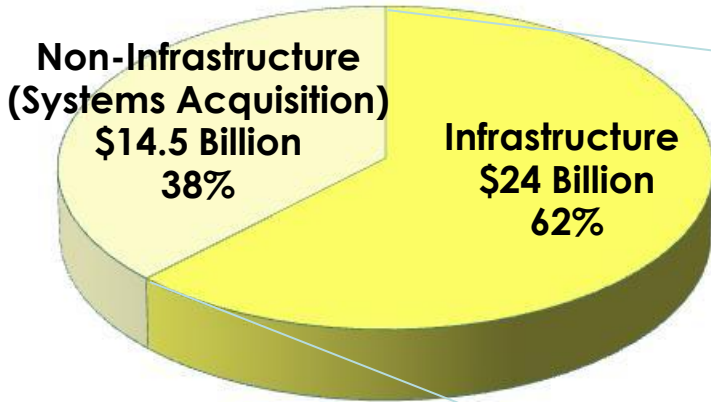
- Amazon
- Chevron
- Citigroup
- CGI
- CSC
- First Data Corporation
- Forrester Research
- Gartner Group
- IBM Corporation
- Kimberly Clark Corporation
- Palantir
- Thompson, Cobb & Bazilio

- See Appendix for documents reviewed

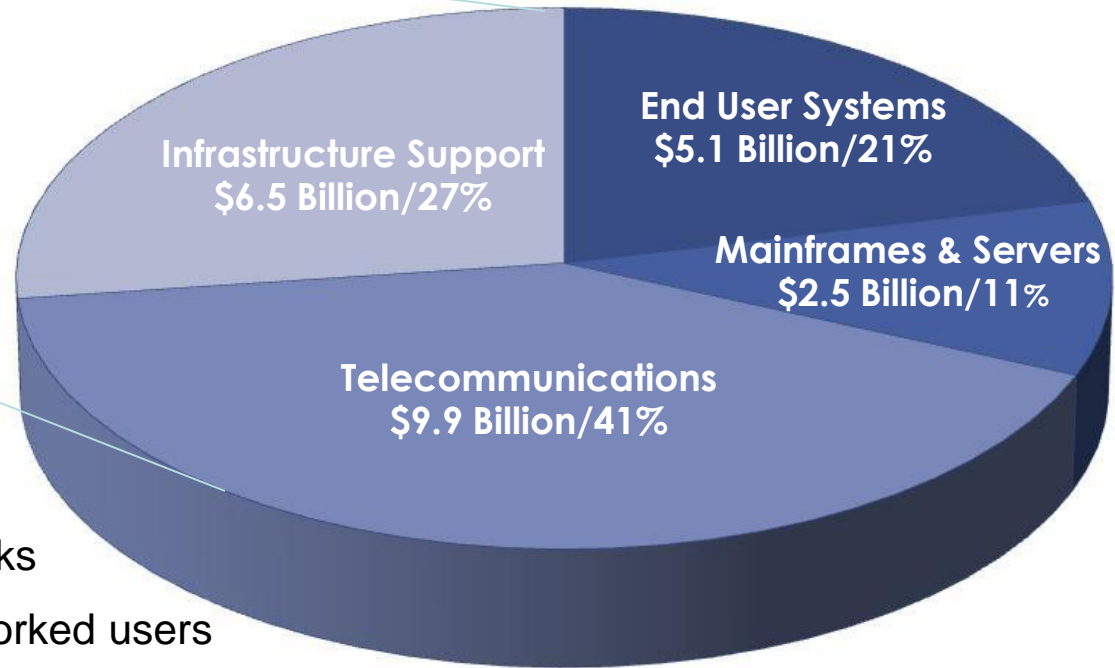


Context: DoD IT Today

- **FY12 DoD IT Budget \$38.5B**



- **DoD IT Infrastructure \$24.0B**



- **DoD IT Scale**

- 772+ data centers
- 6,000+ locations; 15,000+ networks
- 70,000+ servers; 3 million+ networked users
- 7 million+ IT devices
- 5,000+ applications
- Approx. 90,000 full-time employees

Context: DoD Readiness for DCC/Cloud

- Interviews indicate wide support across DoD for DCC/Cloud
 - Cost savings and efficiency benefits are widely understood
 - Budget imperatives create environment for making major changes
 - Early DoD initiatives already showing positive results
- Despite stated willingness to work together, passive resistance is likely
 - Loss of visibility, control, dedicated staff, and contractors
 - Required cultural and job changes will pose significant challenges
 - Requests for exceptions will proliferate
- Concerns expressed about loss of mission capability
 - Particular concern expressed about migration process
 - Recognition that current workforce may be inadequately trained
 - Desire for greater transparency, service focus on output metrics, and service-provider accountability

Key issue requiring explicit decision: IT optimization at what level?

Findings

- Cost Savings
- Return on Investment (ROI)
- Security
- Mission Effectiveness
- Mission Transformation
- Implementation



Findings: Visible and Hidden Costs & Spending

- Staff, hardware, software, enterprise purchases

- Excessive purchasing due to long procurement/deployment cycles
- High support costs to maintain independent systems, multiple networks, and duplicative infrastructure
- High labor costs due to inefficient staff utilization
- Underutilization of servers and untracked O&M purchases

Examples of Cost Savings and Efficiencies

CATEGORY	REDUCTION	EXAMPLE
Data Centers	Number: 50% Cost: 25-50%	Typical payback is 5 years
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Bandwidth Utilization	70-90%	ROI in less than 1 year
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***Cost-saving estimates: 25-50% in total annual expenditures
DCC/Cloud initiatives illuminated robust 'shadow' IT infrastructure.***

Findings: Return on Investment

- Private sector ROI tends to be case-specific; often DCC/Cloud migrations are combined with other initiatives
- However, some conclusions can be drawn:
 - ROI achieved consistently ahead of projected goals in both dollars and time
 - Sustained reductions achieved only with initial up-front investment
 - Unanticipated positive secondary effects were considerable
- Continuation of status quo has a negative ROI
- Additional non-IT 'invisible' ROI achieved by reduction of procurement and deployment cycles and redeploying staff to higher value activities

While there are no 'rules of thumb' regarding ROI benchmarks, in all reported cases ROI was greater than originally anticipated.



Findings: Security

- *Myth: Cloud-based systems are 'less secure'*

Reality: Current systems are difficult to defend
Security will decline over time
Properly designed Cloud systems can be more secure

- *Myth: Cloud will lead to lower performance levels for the user*

Reality: Cloud can offer enhanced and breakthrough performance

- *Myth: 'All eggs in one basket' creates a new critical failure risk*

Reality: Realistically, the data never goes to 'one basket'
Cloud provides greater insurance against critical failure risks

Findings: Mission Effectiveness

- Significant benefits came from unexpected areas
 - Increased speed of data to users; facilitated information sharing and collaboration
 - Greater enterprise understanding due to increased visibility across all operations
 - Staff productivity improvement due to shift of focus from infrastructure maintenance to applications development, support, and service
- Large gains derived from change in personnel/staffing model
 - Staff can be where best talent resides; does not need to be location-specific
 - Fewer systems, networks, and enclaves require support
 - Allows significant reduction/redeployment of contractor staff
- Current system hurts effective mission operations
 - Architecture makes it nearly impossible to share critical data on a timely basis
 - Proprietary systems and closed architecture make in-theater upgrades difficult
 - Lack of common standards make collaboration difficult
 - Lack of portable ID forces individuals to be 'reinvented' with every change
 - Weak security creates need for more enclaves and dedicated networks

Findings: Mission Transformation

- Enables 'thinner' computing and new operating model
 - Reduces hardware, software, upgrade, and maintenance costs
 - Increases quality and timeliness; decreases risks of 'in-theater' support
 - Increases portability of IT systems; lowers risks of loss; improves mission security
- Increases value of data; improves situational awareness
 - Decreases fragmentation of data; increases accessibility
 - Facilitates 'big data' analytics
- Changes balance and costs of network defense/attack
 - Decreases points of entrée; fewer networks to penetrate
 - Enables stronger security, redundancy, and recovery; allows more rapid upgrades
 - Increases required sophistication and costs to attackers
- Shifts emphasis of cyber security from network protection to data integrity and identification/authentication
- Provides platform for future innovation

Findings: Implementation - Authority

- Strong governance and leadership are the most important factors
 - Without it the initiative will fail; must be ‘owned’ by CEO, not CIO
 - Must have authority to say ‘no’; passive resistance can not be tolerated
- Establishing clear strategy and ‘Concept of Operations’ is essential
 - Address both transition and steady-state operations
 - Include risk analysis and mitigation strategies
 - Focus on training and retraining of personnel
 - Develop specific milestones, deadlines, and metrics
- Legal and policy barriers work against success; must be resolved
 - Title 10 sets redundant authorities over business systems
 - Requirement that every Service must ‘own its own data’ is unclear
 - Federal acquisition regulations are out of synch with speed of technology change and evolving mission requirements

Findings: Implementation – ‘Aim’ before ‘Fire’

- Current system configurations will be difficult to rationalize and maintain given proliferation of systems across DoD
- Successful migrations have followed a sequenced approach:
 - Step 1: Applications normalization, standardization, and rationalization
 - Step 2: Data center rationalization and consolidation
 - Step 3: Data and security rationalization
 - Step 4: Cloud migration of appropriate components
- Standardization on numerous fronts will strengthen security
- Consolidation and Cloud initiatives are already underway but may be inconsistent with goal to optimize at DoD enterprise level
- Sequenced approach to migration will provide transparency, build confidence, and reduce risk

Findings: Implementation – Change Management

- Incentives around common goals are critical to changing behavior
 - Early successes were encouraged, visible, and rewarded
 - Applying some of savings to fund future upgrades delivered long-term buy-in
 - Emphasis on staff retraining rather than reduction created powerful motivator
- Encourage pilot programs; don't fight the entire system
 - Build on current initiatives as long as compatible with strategy and Concept of Operations (ConOps)
 - Create 'user-pull' by moving desirable and 'easy/safe' apps to Cloud first
 - Communicate benefits and value of the change (steady-state), not the process
- Risk Management
 - Sequenced approach to migration will greatly reduce risk
 - Use commercially-proven technology where possible; avoid the 'cutting edge'
 - Expertise and track record are key

Owners must be willing to trade control for greater efficiency, lower costs, and increased effectiveness.

Recommendations

1. Establish single strong governance authority
 - DEPSECDEF must 'own' initiative; CIO drives effort, but it cannot be a CIO initiative
 - CIO must have ability to drive change, say 'no,' and force compliance
 - CIO must develop standardized and transparent metrics across DoD
 - Do not create a new committee to oversee effort; will create confusion
2. Develop a coordinated, integrated strategy to optimize at the DoD level
 - Establish clear timeline, milestones, budget, and Concept of Operations
 - Engage Service/Agency CIOs as chief implementers accountable to the DoD CIO
 - Leverage DISA role; insist on commercial-like service level agreements, metrics, and accountability
3. Streamline legal and procurement authorities to address policy barriers
 - Align Title 10 responsibilities with IT modernization governance authority
 - Establish rapid and consolidated procurement capability for IT purchases

Recommendations

4. Use sequenced approach to data center consolidation
 - Normalize, standardize, and rationalize critical elements first
 - Prioritize around applications, then infrastructure, and then data/security
 - Set deadlines for termination of legacy systems, personnel, and contractors
 - Launch Cloud pilot initiatives that offer immediate user benefits
 - Accelerate Cloud when its purpose and desired benefits are clear

5. Utilize commercial business model to set targets/manage expectations
 - Establish multi-year budget plan; require audit-level transparency; use ROI metric
 - Develop shared model to enable both savings and capability upgrades
 - Establish specific output-based metrics for transition, operations, continued business improvement, and mission support
 - Optimize staff for new work mix/model; invest in training
 - Utilize DoD incentive and reward programs to drive behavioral changes

Summary

- DCC/Cloud is a strategic DoD enterprise-level imperative
 - DoD CIO has a good roadmap and can drive initiative on behalf of DEPSECDEF
 - DoD CIO needs to be a strategic partner, not a back-office support provider
- Benefits are dramatic and far-reaching
 - Cost savings, efficiency gains, and security enhancements are significant
 - New architecture provides platform for future innovation
 - Mission support improvement and ultimate transformation are greatest benefits
- Failure to act decisively is a decision, and the wrong one
 - DoD initiatives are already underway; independent and uncoordinated actions will increase barriers to coordination and information sharing
 - Costs will skyrocket and service levels will decrease given need to maintain legacy systems; future rationalization will be harder and more expensive
 - Security will fall further behind, leaving entire IT network increasingly vulnerable
 - IT costs (given DoD ‘color of money’) are a direct tradeoff with warfighter needs

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Questions?

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Business Excellence In Defense of the Nation

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Appendix

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Business Excellence In Defense of the Nation

Documents Reviewed

DoD documents and briefings

- “Defense Information Infrastructure: Rationale for Defense Management Report Decision (DRMD) 918,” Cynthia Kendall, Deputy Assistant Secretary of Defense (Information Systems), September 1992
- Defense Intelligence Agency Strategic Vision Overview 2012-2016
- “Department of Defense Information Technology Enterprise Strategy and Roadmap,” DoD Chief Information Officer, September 6, 2011
- “Department of the Navy Information Management/Information Technology/ Cyberspace Campaign Plan for Fiscal Years 2011-2013,” Terry Halvorsen, DON/CIO, May 2011
- Federal Data Center Consolidation Initiative; Department of Defense 2011 Data Center Consolidation Plan & Progress Report, November 8, 2011
- Remarks by Deputy Secretary Lynn at the 2011 DISA Customer and Industry Forum, Baltimore, MD, August 16, 2011
- Title 10 USC; Subtitle A; Part IV; Chapter 131; Section 2222 Defense business systems: architecture, accountability and modernization; January 2009

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US Government documents

- “25 Point Implementation Plan to Reform Federal Information Technology Management,” Vivek Kundra, U.S. Chief Information Officer, December 2010
- “Cyberspace Policy Review: Assuring a Trusted and Resilient Information and Communications Infrastructure,” The White House, May 29, 2009
- “Data Center Consolidation; Agencies Need to Complete Inventories and Plans to Achieve Expected Savings,” Government Accounting Office Report 11-565, July 2011
- “Information Security: Additional Guidance Needed to Address Cloud Computing Concerns,” Gregory C. Wilshusen, GAO 12-130T, October 6, 2011
- “Information Security: Federal Guidance Needed to Address Control Issues with Implementing Cloud Computing,” Government Accounting Office Report GAO 10-513, May 2010
- “Memorandum for Chief Information Officers, Subject: Security Authorization of Information Systems in Cloud Computing Environments,” Steven VanRoekel, Federal CIO, December 8, 2011
- “State of Public Sector Cloud Computing,” Vivek Kundra, Federal CIO, May 20, 2010



Documents Reviewed

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- “VA Information Technology Strategy,” Statement of Joel Willemsen, Managing Director, Information Technology U.S. Government Accountability Office before the House Veterans Affairs Subcommittee on Oversight and Investigations

Industry reports and reference material

- “IT Service and Cloud Computing Transformation Strategy,” Gartner Consulting, September 2011
- “Cloud First Buyers Guide for Government,” TechAmerica Foundation
- “Security Risks in Cloud Computing; a Preliminary View from the IREC Membership,” Information Risk Executive Council, 2010
- “Enterprise Data Center Consolidation in the States: Strategies and Business Justification,” NASCIO, August 2007
- “Hype Cycle for Virtualization,” Philip Dawson, Gartner, Inc., July 22, 2010
- “Key Issues for Securing Public and Private Cloud Computing, 2011,” John Pescatore, Gartner, Inc., April 15, 2011
- “Amazon’s Corporate IT Migrates Business Process Management to the Amazon Web Services Cloud,” Amazon Web Services, April 2011

Documents Reviewed

Press articles and speeches

- “A Break in the Clouds: Towards a Cloud Definition,” Luis Vaquero, et al
- “Federal IT Needs A Cost-Savings Dashboard,” John Foley, *InformationWeek Government*, December 12, 2011
- “GAO Faults Pentagon Cyber Efforts, Lack Of Clarity,” Ellen Nakashima, *Washington Post*, July 26, 2011
- “Military Networks 'Not Defensible,' Says General Who Defends Them,” Noah Shachtman, *Danger Room (Wired.com)*, January 12, 2012
- “Navy, Marine Corps Under Orders To Slash IT Spending,” Nicole Blake Johnson, *Federal Times*, August 10, 2011
- “Navy Details Data Center Consolidation Plan,” Bob Brewin, *NEXTGOV* July 26, 2011
- “Preparing for the Real Costs of Cloud Computing,” Bob Violino, *Computerworld*, December 5, 2011
- “Selling Umbrellas in the Rain,” Dean Iacovelli, www.public-cio.com, February 2011
- “The Agile Infrastructure; Digital Spotlight Datacenters,” Robert L. Scheier, *Computerworld*, December 2011

Documents Reviewed

Press articles and speeches (cont'd)

- “The Coming Cyber Wars,” Richard Clarke, Boston Globe, July 31, 2011
- “Under Pressure: The Pentagon Faces a Business Challenge at Military Scale,” John Foley, *InformationWeek*, November 28, 2011