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Cloud Computing: Federal Mandates and the Department of Defense (DoD)

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Agenda

- Overview of Cloud Computing
- Federal Mandates
  - Federal Chief Information Officer (CIO) Mandate – Federal Cloud Computing Strategy
  - National Institute of Standards & Technology (NIST) – Technology Roadmap
- Case Study Overview
  - Cross Examination of Federal Cloud Computing Strategy Goals
  - Cross Examination of NIST Requirements
- Cost Considerations
- Challenges
- Summary

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Cloud Computing Overview

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Cloud Computing Definition

- NIST Definition: A model for enabling convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction

More in the cloud, less on personal computers or company servers

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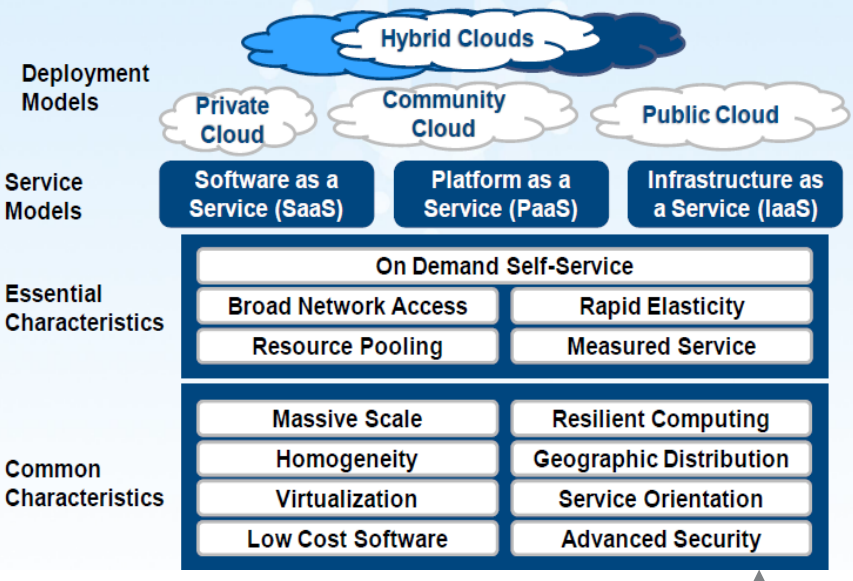
Cloud Computing Basics



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Cloud Computing Basics

- Three service models
  - **Cloud Software as a Service (SaaS)** – Capability provided to consumer to use provider's apps over a network cloud infrastructure, e.g., the Internet
  - **Cloud Platform as a Service (PaaS)** – Capability is provided to the consumer to deploy customer-created apps onto cloud infrastructure
  - **Cloud Infrastructure as a Service (IaaS)** – Capability is provided to the consumer to provision processing, storage, networks and other fundamental computing resources
- Four deployment models
  - **Private Cloud** – Cloud infrastructure operated solely for an organization
  - **Community Cloud** – Cloud infrastructure is shared by several organizations
  - **Public Cloud** – Cloud infrastructure is made available to the general public or a large Industry group
  - **Hybrid Cloud** – Cloud infrastructure is a composition of two or more clouds (Private, Community, or Public)
- Key enabling technologies include:
  - Fast wide-area networks
  - Powerful, inexpensive server computers
  - High-performance virtualization for commodity hardware

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Federal Mandates

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Current State of Cloud Computing in the Government

- In late 2010 the Office of Management and Budget (OMB) told federal agencies that starting in 2012 they are expected to consider cloud first "whenever a secure, reliable, cost-effective cloud option exists."
- In December 2010, a 25 point action plan detailed a plan requiring focus on execution and addresses many of the most pressing, persistent challenges within Federal IT systems. Active involvement from agency leadership is critical to the success of these reforms.
- In February 2011, the government issued the Federal Cloud Computing Strategy that describes cloud computing as a "profound economic and technical shift (with) great potential to reduce the cost of Federal Information Technology (IT) systems while … improving IT capabilities and stimulating innovation in IT solutions."
- The Federal CIO released a new policy in December 2011, *Security Authorization of Information Systems in Cloud Computing Environments*, detailing a unified approach to secure cloud computing services through a standardized baseline set of security controls
- Most recently, *Creating Effective Cloud Computing Contracts for the Federal Government* was published in February 2012 as a joint publication between the CIO Council and the Chief Acquisition Officers Council in an effort to provide specific guidance in effectively implementing the "Cloud First" policy

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Federal CIO Mandate Highlights

- Turnaround or terminate at least one-third of underperforming projects in IT portfolio within the next 18 months
- Shift to "Cloud First" policy. Each agency will identify three "must move" services within three months, and move one of those services to the cloud within 12 month and the remaining two within 18 months
- Reduce number of Federal data centers by at least 800 by 2015
- Only approve funding of major IT programs that:
  - Have a dedicated program manager and a fully staffed integrated program team
  - Use a modular approach with usable functionality delivered every six months
  - Use specialized IT acquisition professionals

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Current Government Environment

Cloud Benefits: Efficiency, Agility, Innovation

EFFICIENCY	
Cloud Benefits	**Current Environment**
Improved asset utilization (server utilization > 60%-70%)	Low asset utilization (server utilization < 30% typical)
Aggregated demand and acelerated system consolidation (e.g., Federal Data Center Consolidation Initiative)	Fragmened demand and duplicative systems
Improved productivity in application development, application management, network, and end-user	Difficult-to-manage systems
AGILITY	
Cloud Benefits	**Current Environment**
Purchase "as-a-service" from trusted cloud providers	Years required to build data centers for new services
Near-instantaneous increases and reductions in capacity	Months required to increase capacity of existing services
More responsive to urgent agency needs	
INNOVATION	
Cloud Benefits	**Current Environment**
Shift focus from asset ownership to service management	Burdened by asset management
Tap into private sector innovation	De-coupled from private sector innovation engines
Encourages entrepreneurial culture	Risk-adverse culture
Better linked to emerging technologies (e.g., devices)	

Federal Cloud Computing Strategy, Published February 8, 2011

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Federal Cloud Computing Strategy Goals

- Select services to move to the cloud
  - Identify sources of value
  - Determine cloud readiness
- Provision cloud services effectively
- Manage services rather than assets

Cloud computing offers a computing architecture that has the capability to provide hardware, middleware, and software on-demand to the user

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NIST Technology Roadmap Initiative

- Volume I – *High-Priority Requirements to Further USG Agency Cloud Computing Adoption*
  - Prioritized interoperability, portability and security requirements that must be met to further government cloud adoption
  - Standards, guidelines and technology that must be in place to satisfy these requirements
  - List of Priority Action Plans (PAPs) recommended for voluntary self-tasking by the cloud stakeholder community to support standards, guidelines and technology development
- Volume II – *Useful Information for Cloud Adopters*
  - Designed as a technical reference for those actively working on cloud computing initiatives
  - Integrates and summarizes the work completed to date
- Volume III – *Technical Considerations for USG Cloud Computing Deployment Decisions* (under development)
  - Developed as an interagency project through the Federal Cloud Computing Standards and Technology Working Group
  - Will serve as a guide for decision makers who are planning and implementing cloud computing solutions

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USG Cloud Computing Technology Roadmap Requirements

Requirement 1
International voluntary consensus-based interoperability, portability, and security standards (interoperability, portability, and security standards)

Requirement 2
Solutions for high-priority Security Requirements (security technology)

Requirement 3
Technical specifications to enable development of consistent, high-quality Service-Level Agreements (interoperability, portability, and security standards and guidance)

Requirement 4
Clearly and consistently categorized cloud services (interoperability and portability guidance and technology)

Requirement 5
Frameworks to support seamless implementation of federated community cloud environments (interoperability and portability guidance and technology)

Requirement 6
Technical security solutions which are de-coupled from organizational policy decisions (security guidance, standards, and technology)

Requirement 7
Defined unique government regulatory requirements, technology gaps, and solutions (interoperability, portability, and security technology)

Requirement 8
Collaborative parallel strategic "future cloud" development initiatives (interoperability, portability, and security technology)

Requirement 9
Defined and implemented reliability design goals (interoperability, portability, and security technology)

Requirement 10
Defined and implemented cloud service metrics (interoperability and portability standards)

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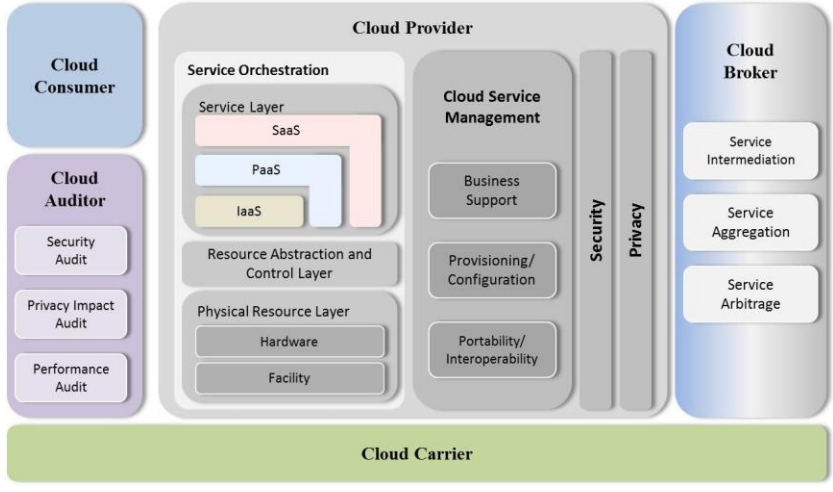
NIST Conceptual Reference Model



NIST Conceptual Reference Model; Published in US Government Cloud Computing Technology Roadmap Volume II Release 1.0 (Draft)

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Case Studies

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Case Studies (1 of 2)

Case Study	Cloud Savings	Other non-cost/non-measurable benefits	Vendor (s)
United States Army Army Experience Center	Initial bids from traditional IT vendors to provide required functionality ranged from $500K to over $1 million. Cloud-based solution operates at an annual cost of $54K	Fewer recruiters handle the same workload as the five traditional recruiting centers the Army Experience Center replaced; cloud application has resulted in faster application upgrades, dramatically reduced hw and IT staff costs, and significantly increased staff productivity	salesforce.com
Defense Information Systems Agency (DISA) Rapid Access Computing Environment (RACE)	DISA has divided the costs of provisioning and operating a single physical server among the users of the various virtual servers	A dedicated server environment used to take 3-6 weeks to provision due to lengthy procurement processes; RACE is able to provision functional server space to users in 24 hours; user obtains an account for a cost	
Defense Information Systems Agency (DISA) Forge.mil	New projects developed in this environment save DISA between $200K and $500K per project; DISA estimates about $15 million in cost avoidance by utilizing an open source philosophy that allows for software reuse and collaborative development	Money saved on licensing and support, provides improved software by giving version control, traceability, and having multiple stakeholders from various projects work on the same software code; promotes collaboration, reuse of developed software, rapid delivery, and shortened time-to-market for projects	Cloud providerCollabNet
United States Air Force Personnel Services Delivery Transformation (PSDT)	Manpower reduction initiative and save over $4 million annually	Able to meet fluctuating demand without compromising customer experience; improvement on search time from 20 minute wait to 2 minutes	SaaS solution by RightNow
Lawrence Berkeley National Labs Cloud Computing Migration	LBL estimates they will save $1.5 million over the next 5 years in hardware, software, and labor costs from the deployments they already have made		Google Federal Premier Apps and Amazon's EC2

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Case Studies (2 of 2)

Case Study	Cloud Savings	Other non-cost/non-measurable benefits	Vendor (s)
Department of the Interior Agency-wide E-mail	Improved service to 80,000 users for 1/3 the amount of money they spend today		External Commercial SaaS model
General Services Administration (GSA) USA.gov	Legacy system cost $2.35 million annually for USA.gov, including total hardware refresh and software relicensing costs of $2 million, in addition to personnel costs of $350K; cloud service pays annual cost of $650K = cost savings = $1.7 million or 72%	site upgrade time from 9 months (including procurement) to a max one day; monthly downtime moved from ~2 hours to near 0 with the cloud solution at 99.9% availability	Terremark's Enterprise Cloud Service
General Services Administration (GSA) Agency-wide E-mail	30% cost savings based on 15,000 mailboxes		
National Aeronautics and Space Administration (NASA) World-Wide Telescope		In a traditional IT environment, it would have taken several months to procure new infrastructure and another one to two months of full-time work by two full-time employees to configure the new equipment to handle the data; savings are 4-5 months of time and roughly 800 hours of labor	Nebula
Securities and Exchange Commission (SEC) Investory Advocacy System		Time required to complete files has significantly been reduced - in some cases it was decreased up to 75%; improvements realized in system reliablity, efficiency and accuracy	SaaS solution Salesforce.com
U.S. Department of Agriculture (USDA) IT Infrastructure	Savings up to $6 million/year, which includes upgrade costs for hardware and software, interface reduction, duplication reduction		

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Case Study Cross Examination to Federal CIO Mandate Goals (1 of 2)

Case Study	Federal CIO Mandate Goal
United States Army Army Experience Center	*Select* ✓ *Provision* ✓ **Manage**
Defense Information Systems Agency (DISA) Rapid Access Computing Environment (RACE)	*Select* ✓ **Provision** *Manage* ✓
Defense Information Systems Agency (DISA) Forge.mil	*Select* ✓ *Provision* ✓ **Manage**
United States Air Force Personnel Services Delivery Transformation (PSDT)	*Select* ✓ *Provision* ✓ **Manage**
Lawrence Berkeley National Labs Cloud Computing Migration	*Select* ✓ **Provision** **Manage**

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Case Study Cross Examination to Federal CIO Mandate Goals (2 of 2)

Case Study	Federal CIO Mandate Goal
Department of the Interior Agency-wide E-mail	*Select* ✓ Provision Manage
General Services Administration (GSA) USA.gov	*Select* ✓ *Provision* ✓ *Manage* ✓
General Services Administration (GSA) Agency-wide E-mail	*Select* ✓ Provision Manage
National Aeronautics and Space Administration (NASA) World-Wide Telescope	*Select* ✓ *Provision* ✓ *Manage* ✓
Securities and Exchange Commission (SEC) Investory Advocacy System	*Select* ✓ *Provision* ✓ *Manage* ✓
U.S. Department of Agriculture (USDA) IT Infrastructure	*Select* ✓ *Provision* ✓ *Manage* ✓

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Case Study Cross Examination to NIST Requirements

Case Study	Requirement 1	Requirement 2	Requirement 3	Requirement 4	Requirement 5	Requirement 6	Requirement 7	Requirement 8	Requirement 9	Requirement 10
	NIST Requirement									
United States Army Army Experience Center				X						
Defense Information Systems Agency (DISA) Rapid Access Computing Environment (RACE)	X	X		X	X		X		X	
Defense Information Systems Agency (DISA) Forge.mil	X	X		X	X					
United States Air Force Personnel Services Delivery Transformation (PSDT)				X						
Lawrence Berkeley National Labs Cloud Computing Migration				X	X					
Department of the Interior Agency-wide E-mail				X						
General Services Administration (GSA) USA.gov	X			X					X	X
General Services Administration (GSA) Agency-wide E-mail	X			X						
National Aeronautics and Space Administration (NASA) World-Wide Telescope	X	X		X						
Securities and Exchange Commission (SEC) Investory Advocacy System				X					X	
U.S. Department of Agriculture (USDA) IT Infrastructure	X	X	X	X					X	X

Requirements Key
- R1: Interoperability, Portability & Security Standards
- R2: High-Priority Security Requirements
- R1: High-Quality SLAs
- R2: Categorized Cloud Services
- R1: Community Cloud Support
- R2: Technical Security
- R1: Unique Government Solutions
- R2: Collaborative Parallel "future cloud" Initiatives
- R1: Reliability Design Goals
- R2: Implemented Cloud Service Metrics

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Cost Considerations

Projected market for cloud computing in 2014 = $149 Billion

Projected market for servers to be used in the cloud in 2014 = $6.4 Billion

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Costs Associated with Cloud Computing

- Transition/Migration Costs
- Software Development and/or Glue Code
- Interface Costs
- Redundant Capability Development and Maintenance
- Integration Costs
- Commercial-off-the-Shelf (COTS) Software, Upgrades
- Infrastructure Costs and Upgrades
- Processing Costs
  - Data Uploading
  - Application Execution
  - Downloading Outputs
- Facility Costs
  - Lease Costs
  - Utility Costs
- Data Storage
- Vendor Management
- Administration Resources
- Cloud application Management
- Security

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Challenges/Areas of Concern

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Challenges

- Security & Associated Costs
- Reliability
- Accessibility
- System Upgrades & Associated Costs
- Redundancy Capability Costs
- Data availability to perform cost analyses

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Summary

- NIST Volume's I and II (Drafts) have been published and shaping the cloud strategy of the U.S. Government
- NIST Volume III currently under development; will serve as a guide for decision makers
- Is the concept of cloud computing actually saving money while not compromising the important missions?
  - Lack of actual data to provide a basis for this analysis
  - Available case studies emphasize successful instances
- Continuing push towards cloud computing within government IT systems

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Questions?

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Backup

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