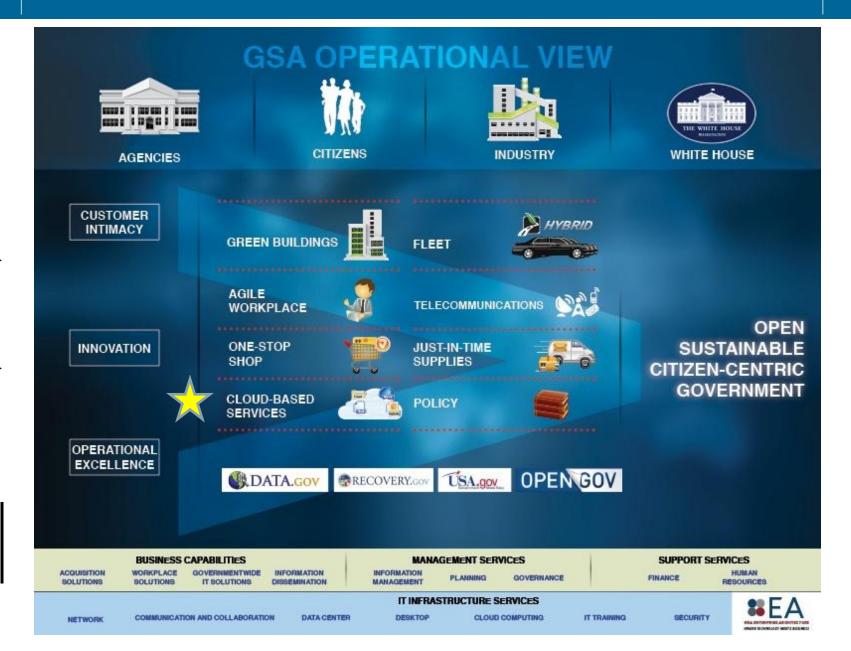# Federal Cloud Computing and
Federal Data Center Consolidation Initiative

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Office Of Citizen Services and Innovative Technologies
GSA

March 29, 2011

Source: GSA OCIO, Chief EA, Dr. Brent Brunk

Federal Computer WEEK
Strategy and business management for government leaders
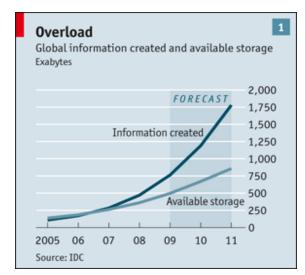
6 bold tech predictions: Fact or fantasy?
FCW (December 8, 2010)

1. **20% of businesses will own no IT assets by 2012 (Gartner)**
2. **75% or more of jobs in stand-alone IT departments will disappear by 2015 (Corporate Executive Board)**
3. **One trillion devices will be connected to the Internet by 2013 (Cisco) – Current=35B**
4. **The government can save $1 trillion in 10 years by harnessing certain proven technologies (Technology CEO Council)**
5. **25% of personal computing devices sold will be tablets by 2015 (Forrester Research)**
6. **Data will grow by 800 percent in the next five years with 80% Unstructured Text and Media (Gartner)**

Volume of digital information increases 10X every 5 years

Source: IDC

Overload
Global information created and available storage
Exabytes

FORECAST

Information created

Available storage

2,000
1,750
1,500
1,250
1,000
750
500
250
0

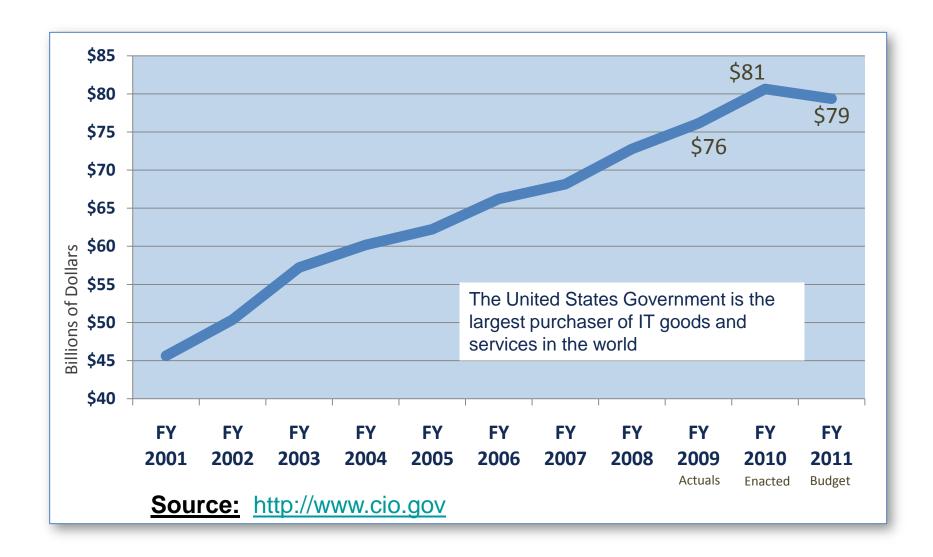2005 06 07 08 09 10 11

Source: IDC

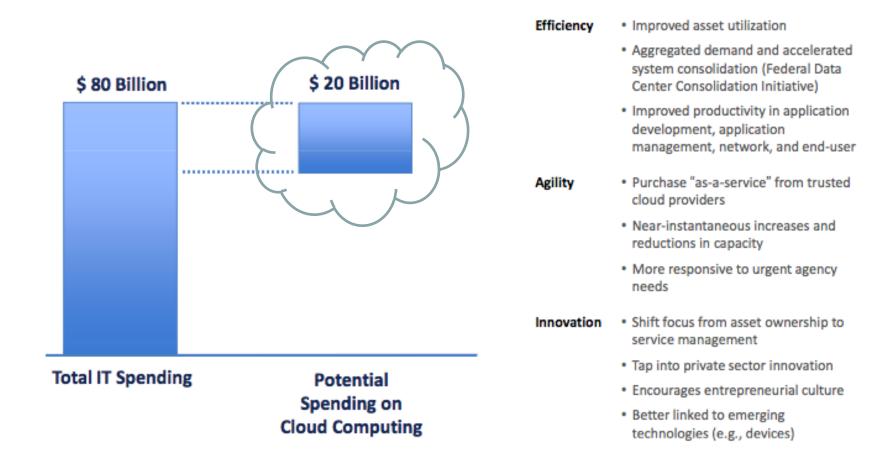And….the data is replicated many times over!

Mobile will be bigger than desktop internet in 5 years
-- Mary Meeker, Morgan Stanley, April 2010

Context: The Government Spends Billions in IT

The United States Government is the largest purchaser of IT goods and services in the world

Source: http://www.cio.gov

4

Context: Federal Government Cloud Computing Potential

$ 80 Billion

$ 20 Billion

Total IT Spending

Potential Spending on Cloud Computing

Efficiency
- Improved asset utilization
- Aggregated demand and accelerated system consolidation (Federal Data Center Consolidation Initiative)
- Improved productivity in application development, application management, network, and end-user

Agility
- Purchase "as-a-service" from trusted cloud providers
- Near-instantaneous increases and reductions in capacity
- More responsive to urgent agency needs

Innovation
- Shift focus from asset ownership to service management
- Tap into private sector innovation
- Encourages entrepreneurial culture
- Better linked to emerging technologies (e.g., devices)

Source: Federal Cloud Computing Strategy (http://www.cio.gov)

Context: Economics are Motivating the Transformation

GSA

New Budget Submission Requirements

Beginning FY 2011

Agencies will be required to complete alternative analyses that includes cloud computing alternatives as a part of their future budget submissions.

By September 2011

Alternative analyses for all newly planned or performing major IT investments.

By September 2012

By September 2012: alternative analyses for all IT investments, making enhancements to an existing investment.

By September 2013

By September 2013: alternatives analyses for all IT investments in steady-state.

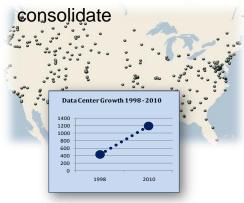**Source: FY2011 OMB Report on Information Technology**

RATIONALIZE SERVICE DELIVERY MODELS*

- Private sector is consolidating data centers while government data centers are growing
- Government needs to reverse this trend and consolidate

Data Center Growth 1998 - 2010

SHIFT SERVICES TO THE CLOUD*

- Leverage shared services through the cloud
- Launched Apps.gov to simplify procurement of cloud services

flickr
amazon.com
salesforce.com Success On Demand.
Microsoft
Google Apps
Socrata

SIMPLIFY ACCESS TO SERVICES*

- End-to-end digital service platforms
- New platforms for delivery – e.g., Mobile Computing

Data Centers = 2094!

Cloud is Here!

Mobile is Growing/Next!

Context: IT Reforms, Cloud and Data Centers

Date	Title of Topic	Key Highlights
June 8, 2010	Closing the IT Gap*	Identify 5% of Bottom Performing Programs
October 25, 2010	Closing the IT Gap – an update	Moving to consolidate data centers and deploy cloud computing technology to reduce IT, real estate and energy costs
November 19, 2010	Driving IT Reform: an Update**	5 Strategies – including "adopting light technologies and shared solutions" (Cloud and Data Centers)
December 9, 2010	25-point Implementation Plan to reform Federal IT***	Each Agency CIO will be required to identify three "must move" services and create a project plan for migrating each of them to cloud solutions and retiring the associated legacy systems. Of the three, at least one of the services must fully migrate to a cloud solution within 12 months and the remaining two within 18 months. Close number of data centers by at least 800 by 2015 (40%)

*http://www.whitehouse.gov/omb/blog/10/06/08/Closing-the-IT-Gap

**http://www.whitehouse.gov/blog/2010/11/19/driving-it-reform-update

***http://www.cio.gov

- Federal Cloud Computing Initiative began in March 2009 at the request of the Federal CIO, Vivek Kundra

- Mission: Drive the government-wide adoption of cost effective, green, and sustainable Federal cloud computing solutions

- The Cloud Computing Program Management Office (PMO) was established at GSA in April 2009

  - PMO manages the Cloud Computing Executive Steering Committee, which reports to the Federal CIO Council.

  - 4 additional government-wide governance groups were established within the program:

    - Cloud Computing Advisory Council.

    - Cloud Computing Security Working Group.

    - Cloud Computing Standards Working Group.

    - SaaS Email Working Group.

Federal Cloud Computing Initiative (FCCI)

GSA

Changing the Way Government Leverages Technology....

Better	Faster	Greener

Better

- **Drive Innovation**: Work with private industry encouraging innovation and furthering competition among providers to drive best value solutions for the Government

- **Use Only What's Needed**: Eliminate high upfront costs by aligning costs with actual use or consumption of IT resources

- **Put the Power in the Hands of the End Users**: Move operating complexities to the Cloud, allowing Agencies to focus on core mission objectives

Faster

- **Provide One-Stop Shop**: Simplify acquisition of IT services by making it as simple as buying a book, booking an airline ticket, or making a dinner reservation online

- **Turn Up of IT Quickly**: Services can be provisioned in hours or days versus traditional IT methods which may take months to deploy

- **Scale Rapidly:** Deliver elastic computing, allowing Agencies to rapidly expand or contract IT resources to support unplanned events or spikes in usage

Greener

- **Energy Efficiency**: Create virtualized hardware and software services so Government uses only what's needed, avoiding overbuilding data center and server capacity

- **Reuse Across Agencies**: Provide shared, resource pooling, for greater reuse and ability to leverage underutilized IT resources across Government Agencies

Budget Realities are Dictating Cost Savings…

Promoting adoption and removing obstacles in the government-wide acquisition and utilization of cost effective, green and sustainable Federal cloud computing solutions.
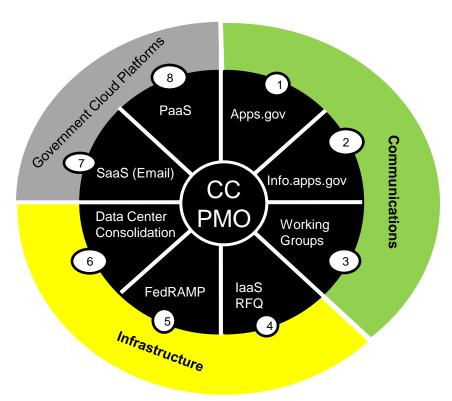

| Apps.gov | FedRAMP | Data Center Consolidation Initiative | Infrastructure -as-a-Service | Software-as-a-Service Email | Platform-as-a-Service (Geospatial etc.) |

http://info.apps.gov

1. **Apps.gov 2.0:**
   Online procurement of SaaS solutions for government.

2. **Info.apps.gov:**
   Informational website to communicate the latest news and information regarding the FCCI.

3. **Federal Working Groups:**
   GSA has established several inter-agency working groups to develop standards, set policies and agree to the overall vision for the FCCI.

4. **Infrastructure as a Service (IaaS):**
   The GSA has awarded a Blanket Purchase Agreement for IaaS. This will serve as a foundation for Cloud Computing services within the Government.

5. **FedRAMP:**
   Establish and operate a Government-wide Authorization Program for performing security C&A and continuous monitoring for commercial Cloud Services.

6. **Federal Data Center Consolidation Initiative (FDCCI):**
   Completed the FDCCI Government-wide study; Supporting the Federal CIO Council in Managing the Government-wide data center consolidation program including guidance, data collection and assisting agencies develop and implement data center consolidation plans.

7. **Software-as-a-Service (SaaS) - Email:**
   GSA CC PMO is leading the Cloud SaaS Email Working Group to define and acquire SaaS Email services for Federal Government through an RFI and RFQ process.

8. **Platform-as-a-Service (PaaS) -** Geospatial
   Working with government agencies in developing a geospatial platform pilot for sharing data and developing applications for geospatial purposes.

Notional

Cloud Computing Vision

Government that Works

Closing the IT Performance Gap by leveraging cloud computing services, improving the management of major IT initiatives and adopting shared services models while maintaining privacy and security

How We Get There

As Is

Efficiency:
- Low asset utilization (server utilization <25% typically)
- Fragmented demand and duplicative systems
- Difficult-to-manage systems

Agility:
- Years required to build data centers for new services
- Months required to increase capacity of existing services

Innovation:
- Burdened by asset management
- De-coupled from private sector innovation engines
- Risk-averse culture

Cloud Framework for Migration

Select → Provision → Manage

Governance
- CIO Council
- Executive Steering Committee
- Cloud Computing Advisory Council

Cloud Examples
- DISA RACE
- NASA Nebula
- Army Experience Center (AEC)

To Be

Efficiency:
- Improved asset utilization (server utilization >70%)
- Aggregated demand and accelerated system consolidation (e.g. FDCCI)
- Improved productivity in Application Development, Application Management, network, and end-user

Agility:
- Purchase "as-a-service" from trusted cloud providers
- Near-instantaneous increases and reductions in capacity
- More responsive to urgent agency needs

Innovation:
- Shift focus from asset ownership to service management
- Tap into private sector innovation
- Encourages entrepreneurial culture
- Better linked to emerging technologies (e.g. devices)

Cloud Services We Can Use

Infrastructure-as-a-Service
- CDN
- Storage
- Web Servers
- Server Hosting
- Virtual Machines

Platform-as-a-Service
- Developer Tools
- Database
- DBMS
- Directory Services
- Testing Tools

Software-as-a-Service
- Government Productivity
- Government Enterprise Applications
- Citizen Engagement

Cloud Deployment Models and Characteristics

Models
- Public
- Private
- Community
- Hybrid

Characteristics
- On-demand self-service
- Broad network access
- Resource pooling
- Rapid elasticity
- Measured Service

Apps.gov is Live!

First Federal storefront site to commoditize cloud services so that buyers may cross-compare products and purchase (launched September, 2009). Currently offering SaaS and Social media products – IaaS Coming soon!

Cloud Computing InfoPortal: Info.Apps.gov

Keeping you informed in upcoming events!

Reference Documents at your fingertips!

News and Information on Cloud and Data Center Topics

Provides tools to navigate the cloud landscape.

Launched in April 2010, Info.Apps.gov is a central Government site providing information about cloud computing and how to procure/use cloud services. It helps create sustainable, more cost-effective IT Services for the Federal Government. It is built on open source and it is hosted in the Cloud!

Infrastructure-as-a-Service (IaaS)

IaaS Services

Storage

- Online Web Based Storage
- Store Files & Data Objects

Virtual Machines

- Online VMs / Computing
- Multiple CPU & OS Types

Server Hosting

- Online Server Hosting
- DNS and CDN Capabilities

On-demand Self Service
Online, self service provisioning capabilities for services

Ubiquitous Network Access
Accessible via the Internet with a sufficiently robust architecture

Location Independent Resource Pooling
Massively scalable services, independent of location of resources

Rapid Elasticity
Scale up or down dynamically based on consumption and/or request

Measured Service
Utilization and consumption GUI dashboard and electronic interfaces

- **IaaS Awarded (October 2010)**

- **12 Awardees completing security authorizations with GSA to support "Moderate" Level Security for Government ~4Q FY11**

- **Services will be made available through purchase on apps.gov**

RFQ Required
Cloud Computing
Characteristics

http://info.apps.gov

12 Awardees across 3 Lots:
- **Cloud Storage**
- **Virtual Machines**
- **Web Hosting**

GSA

- Inter-agency SaaS Email Working Group established in June 2010.

- Developing an RFQ for a government-wide BPA of SaaS email solutions.

- RFI completed

  - 13 respondents and RFI responses leveraged to create RFQ requirements.

  - Pre-solicitation day held November 1 to solicit vendor and government feedback.

- RFQ Procurement to be released Soon (~April, 2011)

- GSA completed security authorization of Google Apps which may be leveraged by other agencies.

  - USAID leveraged Google Apps security authorization package to greatly reduce timeline for system implementation

http://info.apps.gov

Platform-as-a-Service (PaaS): "Geo-Cloud" Vision

Large pool of agency applications identified for cloud migration

FGDC App 1

FGDC App 2

More …

Apps Need Platforms

Federal Platform Reference Implementations

"Geo-Cloud" Community Platform

Platform Savings

Platform building time & effort	Reduced mainten-ance costs	Faster deploy-ment	Cost effective develop-ment / test

Platforms Amplify IaaS Savings

Infrastructure as A Service Savings

Hardware Savings	Operations Savings	Scalability Savings

Cloud Services Improves Citizen Focus and Efficiency for Government Portal, USA.gov

GSA

Problem	Solution
GSA wanted to reduce costs, add scalability and flexibility to USA.gov	Migrate to a cloud platform that resulted in significant lower cost, improved scalability.

	Hardware-Based Hosting	Cloud-Based Hosting
Time to upgrade	9 months including procurement	1 day maximum
Service Cost	~$ M per year hardware and service	~$K per year cloud and service (~67% less)
Downtime	2 hour/month average	Zero

Cloud Computing Improves Flexibility and Reduces Cost at USA.GOV

Unified Government-wide Risk Management Program

- Provides joint security authorization and continuous monitoring
- Agencies participate by leveraging the results for covered products
- Agencies **retain their responsibility and authority** to ensure their security needs are met in the use of systems
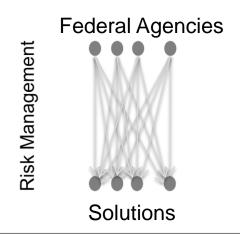
Vendor Benefits

- Government-wide authorization and security compliance cost reduction
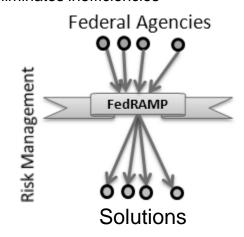
Agency Benefits

- Cost savings through reduced duplication
- Rapid acquisition
- Increased security assurance

Unified Controls/Continuous Monitoring + Policy + Business/Operations Model Coming Soon….at info.apps.gov!

Problem: Independent agency risk management has inefficiencies

Solution: Unified risk management eliminates inefficiencies

FedRAMP is Unifying Cloud Security…

GSA

Problem

- The current security framework in the Federal Government has duplicative efforts across Federal Agencies.
  - Each agency completes a security authorization for each IT system – regardless if that system has been authorized by another agency.
- Additionally, agencies place competing incompatible requirements on the same system and as well as inconsistent application and interpretation of FISMA security requirements.

Solution

- The Federal Risk and Authorization Management Program (FedRAMP) provides a unified risk management framework for cloud computing systems.
- FedRAMP includes an inter-agency vetted and compatible FISMA security requirements.
- FedRAMP will provide effective and consistent assessment of cloud services with associated cost savings.
- Continuous monitoring focus will be on near-real time data feeds from cloud service providers.
- Utilizes the "Approve Once, Use Many" concept.
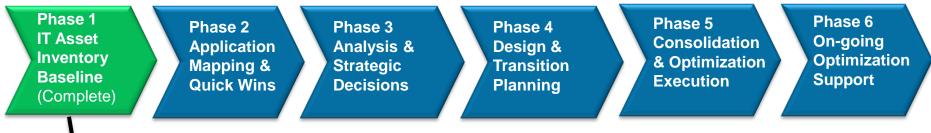
FedRAMP Accomplishments

- GSA, DoD, DHS agree to a baseline set of Security Controls based on FISMA requirements.
- Published FedRAMP documentation (Proposed Security Assessment and Authorization for U.S. Government Cloud Computing).
- Held 5 industry days for industry and government input and buy in.
- Public comment period on published FedRAMP documentation:
  - Received over 1,000 comments.
  - Convened 3 cross-government review teams representing 20+ agencies.

Cross-Government Collaboration
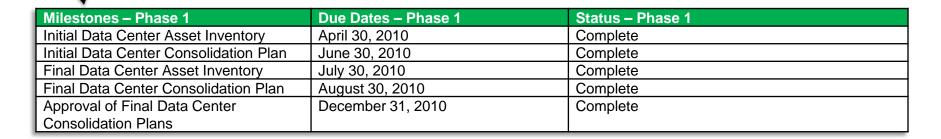
- FedRAMP documentation is a product of the Cloud Computing Security Working Group managed by GSA with participation by 15+ agencies.
- All FedRAMP documentation has been vetted through extensive collaboration with NIST, ISIMC, and the Federal CIO Council.
- Working closely with NIST and NSA to develop a framework for more effective and efficient continuous monitoring of authorized systems.

Federal Data Center Consolidation Initiative (FDCCI)

The Initiative's Six Key Phases

| Phase 1 IT Asset Inventory Baseline (Complete) | Phase 2 Application Mapping & Quick Wins | Phase 3 Analysis & Strategic Decisions | Phase 4 Design & Transition Planning | Phase 5 Consolidation & Optimization Execution | Phase 6 On-going Optimization Support |

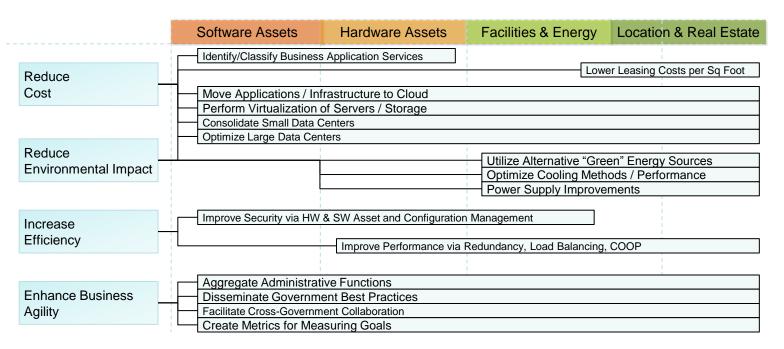| Milestones – Phase 1	Due Dates – Phase 1	Status – Phase 1
Initial Data Center Asset Inventory	April 30, 2010	Complete
Initial Data Center Consolidation Plan	June 30, 2010	Complete
Final Data Center Asset Inventory	July 30, 2010	Complete
Final Data Center Consolidation Plan	August 30, 2010	Complete
Approval of Final Data Center Consolidation Plans	December 31, 2010	Complete

- In February 2010, the Administration launched this Initiative - The scope of the Initiative is limited to CIO Council agencies

- Three agency guidance workshops were provided by the team as well as peer reviews were conducted of the agency's Initial and Final Plans

- Per the CIO Council Memo published October 1, 2010; "As of July 30, 2010, based on agency submissions, there are 2,094 Federal data centers"

http://www.cio.gov

Federal Data Center Consolidation Initiative (FDCCI)

GSA

- **GSA is providing support to OMB and CIOC on the FDCCI in meeting the strategic goals of the program**

- **GSA is assisting agencies on developing long-term consolidation plans which leverage multiple approaches including Cloud Computing / Virtualization technologies.**

- **Four Major Strategic Goals matched with four focus areas as follows:**

Software Assets	Hardware Assets	Facilities & Energy	Location & Real Estate

Reduce Cost
- Identify/Classify Business Application Services
- Lower Leasing Costs per Sq Foot
- Move Applications / Infrastructure to Cloud
- Perform Virtualization of Servers / Storage
- Consolidate Small Data Centers
- Optimize Large Data Centers

Reduce Environmental Impact
- Utilize Alternative "Green" Energy Sources
- Optimize Cooling Methods / Performance
- Power Supply Improvements

Increase Efficiency
- Improve Security via HW & SW Asset and Configuration Management
- Improve Performance via Redundancy, Load Balancing, COOP

Enhance Business Agility
- Aggregate Administrative Functions
- Disseminate Government Best Practices
- Facilitate Cross-Government Collaboration
- Create Metrics for Measuring Goals

FDCCI - Utilization Improvement Metrics (Notional)

Improving IT asset utilization is the key driver for reducing energy consumption per unit of performance. This can be achieved primarily by:

- Server Virtualization (increasing the number of virtual servers per hosts)
- Server Consolidation (decommissioning underutilized physical servers)
- Rack Space Consolidation (relocating underutilized racks)
- Data Center Consolidation (shutting down underutilized facilities)

Utilization Metrics	Typical Results	Target Results (Notional)
Average Virtualization (%)	0-10%	30-40%
Average Virtual OS per Host (#)	5-10	15-20
Average Server Utilization (%)	7 – 15%	60 – 70% (application dependent)
Average Rack Space Utilization (%)	50 – 60 %	80 – 90%
Average Power Density Usage Equivalent (W/sq.ft.)	50 – 100 W/Sq Ft	150 – 250 W/Sq Ft
Power Usage Efficiency (PUE)	3 – 2	1.6 – 1.3

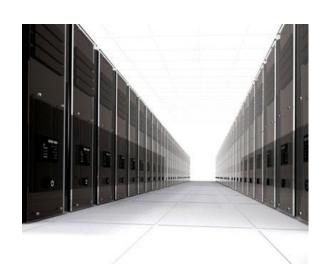**Note: These are NOTIONAL Numbers and <u>NOT</u> Official Goals**
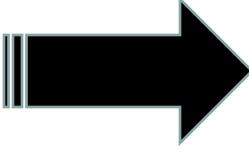
Complete and Stabilize the Foundations for FedRAMP, IaaS, SaaS and FDCCI

1 Cheaper	2 Better	3 Faster

IaaS
Security and Acquisitions

- Complete all security ATO's for cloud vendors
- Support agency acquisitions of IaaS solutions
- Complete ATO's for agency applications on the new IaaS solutions

Cloud Email
Security and Acquisitions

- Complete security ATO's for cloud vendors
- Support agency acquisitions of IaaS solutions
- Maintains Library of Approved Systems

FDCCI
Essential Tasks

- Develop a "Total Cost" model for agencies
- Create a consolidation playbook for agencies
- Upgrade and maintain the inventory tracking portal

FedRAMP
Launch and Manage

- Establish the FedRAMP program management office
- Create a Security Operations Center (SOC)
- Create an archive for maintaining completed security plans
- Establish the Joint Authorization Board (JAB)

"The Best Way to Predict the Future is to Create it"*…

*<u>**Source**</u>:
Alan Kay, Stanford
Peter F. Drucker

http://Apps.gov

http://www.fedramp.gov

http://www.cio.gov

http://info.apps.gov