



Federal Data Center Consolidation Initiative (FDCCI)

Workshop I: Initial Data Center Consolidation Plan

June 04, 2010

1. Welcome	Katie Lewin – GSA Director Cloud Computing Program	5 min.
2. Initial Plan Approach Guidance An Agency CIO's perspective <i>(Presentation not available)</i>	Michael Duffy – Treasury Deputy Assistant Secretary for Information Systems & Chief Information Officer	40 min.
3. Preparing Initial DC Consolidation Plan Projected Asset Reduction Metrics	Zachary Baldwin – GSA IT Specialist, Policy & Planning	30 min.
5 Minute Break		
4. Future Deliverables Final Baseline Inventor & Final Consolidation Plan	Zachary Baldwin – GSA IT Specialist, Policy & Planning	20 min.
6. Questions	Zachary Baldwin – GSA IT Specialist, Policy & Planning	15 min.

1. Welcome

Katie Lewin – GSA

Director Cloud Computing Program

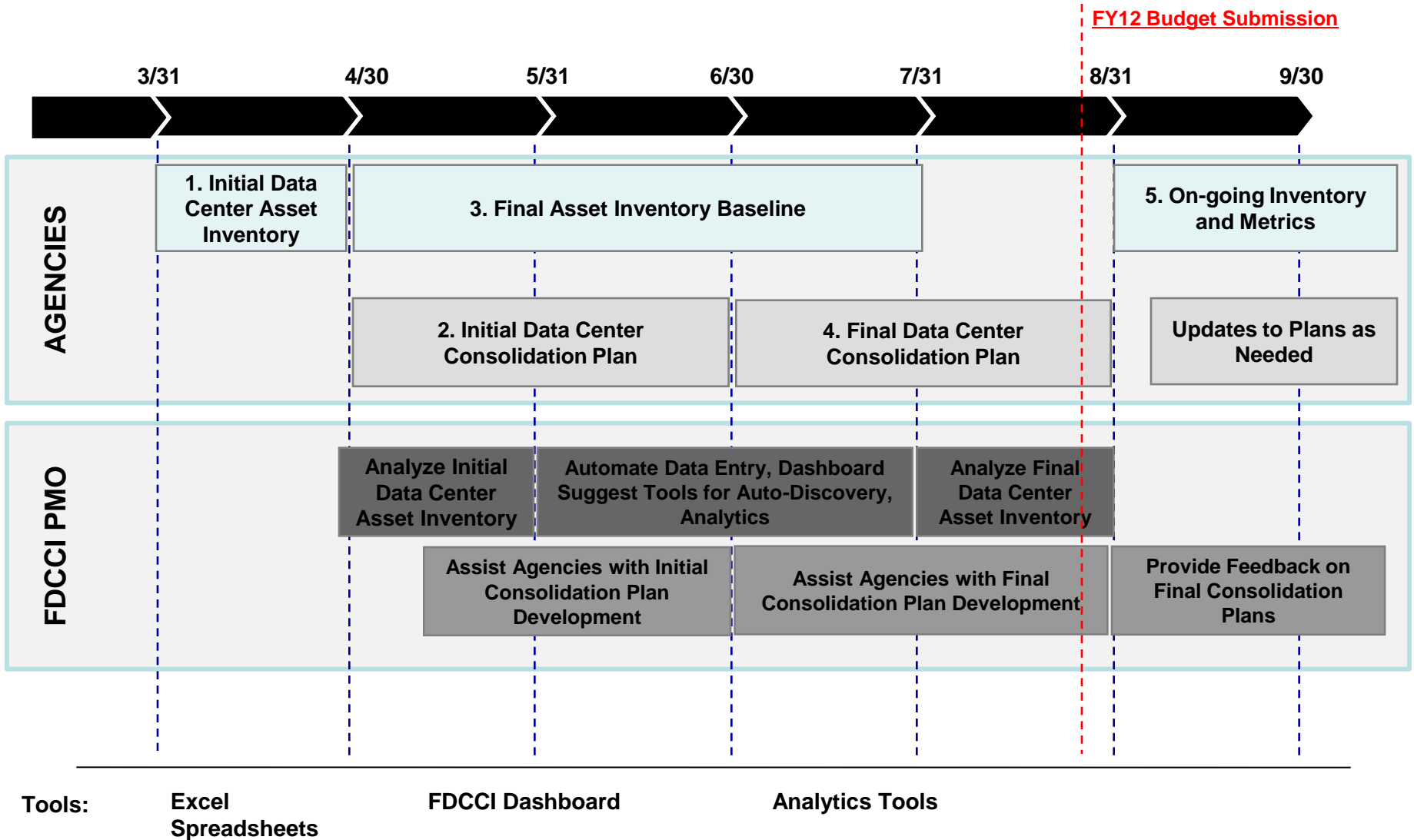
Federal Data Center Consolidation Initiative (FDCCI)

Federal CIO Vivek Kundra launched FDCCI on February 26, 2010, to address the major IT initiatives of President Obama's FY2011 budget proposal.

OMB has requested information on more than 1,100 data centers focusing on:

1. Promoting Green IT by reducing the overall energy and real estate footprint of government data centers
2. Reducing the cost of data center hardware, software, and operations
3. Increasing the overall IT security posture of the government
4. Shifting IT investments to more efficient computing platforms / technologies

Timeline for FDCCI



Deliverables	Agency Task	Agency Deadlines	FDCCI PMO Task	PMO Deadlines
1. INITIAL ASSET INVENTORY	Conduct an initial inventory of data center assets.	April 30, 2010 (Completed)	<ul style="list-style-type: none"> Assist Agencies with the analysis and comparison of data center count, rack and server count, and supported Major Systems across the Federal Government; Identify potential areas of asset consolidation, reuse and cost savings. 	May 31, 2010 (Completed)
2. INITIAL DATA CENTER CONSOLIDATION PLAN	Develop an initial data center consolidation plan.	June 30, 2010	<ul style="list-style-type: none"> Assist Agencies in identifying and proposing potential areas where optimization through server virtualization or cloud computing alternatives may be used and offer a high-level transitioning roadmap. 	July 30, 2010
3. FINAL ASSET INVENTORY BASELINE	Collect the final asset inventory baseline containing more detailed data.	July 30, 2010	<ul style="list-style-type: none"> Analyze detailed utilization patterns and virtualization and cost savings opportunities. This will serve as the foundation for the final data center consolidation plans. 	Aug 30, 2010
4. FINAL DATA CENTER CONSOLIDATION PLANS	Develop final data center consolidation plans. Reflect data center consolidation plans in FY12 budget.	Aug. 30, 2010	<ul style="list-style-type: none"> Evaluate and provide guidance and feedback on technical roadmap and approach for achieving the targets for infrastructure utilization, rack density and consolidation. 	Nov 30, 2010
5. ONGOING MONITORING	Conduct ongoing annual monitoring, reporting starting in FY11. Reflect data center consolidation plans in next FY budget.	June 30, 2011 Sept. 30, 2011	<ul style="list-style-type: none"> Maintain and analyze updated asset inventory annually (FYQ3) Consolidate reporting on FDCCI progress (FYQ4) 	Sept 30, 2011 Dec 31, 2011

2. Initial Plan Approach Guidance

An Agency CIO's perspective

(Presentation not available)

Michael Duffy – Treasury

Deputy Assistant Secretary for Information Systems & Chief
Information Officer

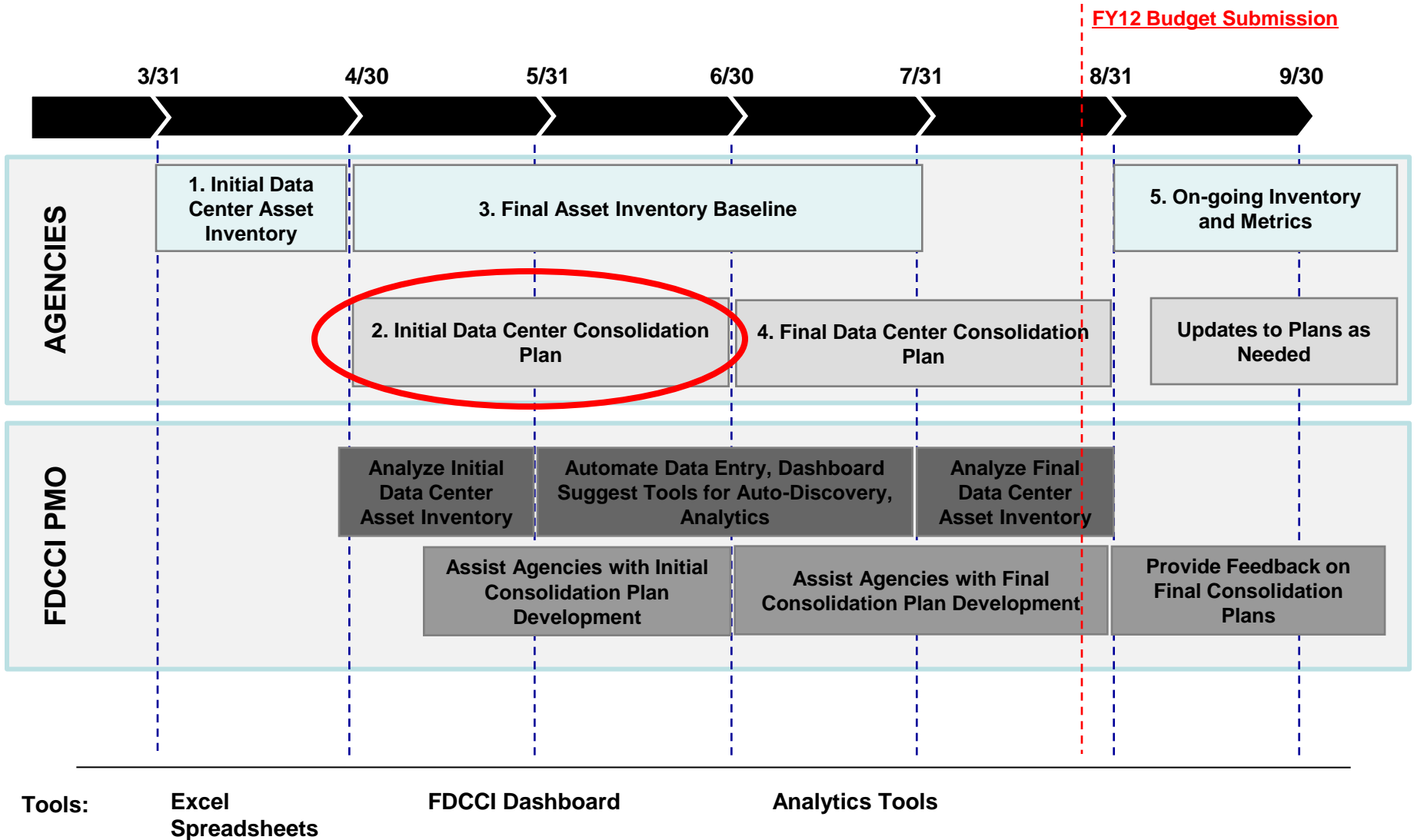
3. Preparing Initial DC Consolidation Plan

Projected Asset Reduction Metrics

Zachary Baldwin – GSA

IT Specialist, Policy & Planning

Next Deliverable – Initial Consolidation Plan



- The next deliverable for the Federal Data Consolidation Initiative is an agency Initial Data Center Consolidation Plan, due on June 30.
- The Initial Plan should provide the agency's high-level goals, approaches and governance consistent with the initiative's consolidation effort.
- Agencies should view the process by which these high level targets are generated as the first step to inform final agency Data Center Consolidation Plans.
- As agencies' final asset baseline inventories are collected and refined, revised consolidation plans will be developed and **the targets may change.**

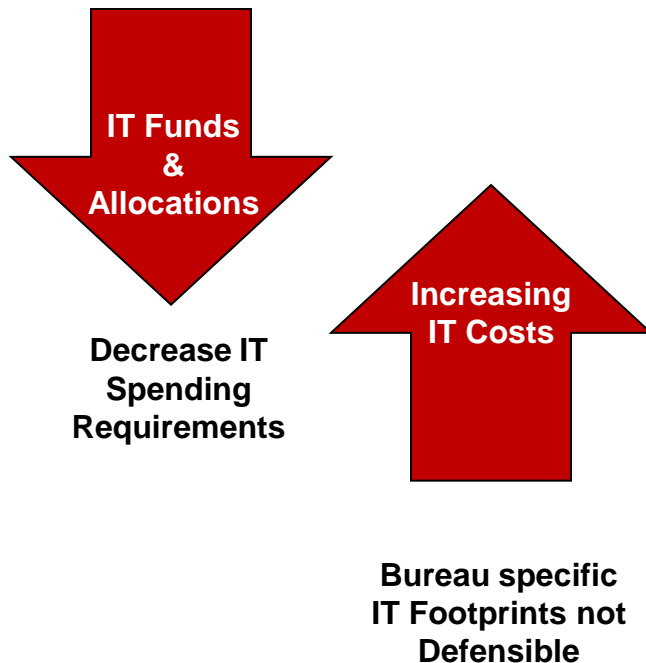
The Initial Plan shall consist of the following components

Section	Length
1. Introduction	½ Page
2. Agency Goals for Data Center Consolidation	½ Page
3. Agency Approach, Rationale, and Timeline	1 Page
4. Agency Governance Framework for Data Center Consolidation	½ Page
5. Appendix: Attached template for Initial Data Center Consolidation Plan	

1. The Introduction

- *Limit to ½ page*
- The introduction should consider the following factors:
 - Downward pressure on Federal agency spending will continue as part of deficit reduction efforts.
 - Bureau-specific, agency component-specific, and program-specific data center footprints with increasing space allocations, energy costs, and real estate costs are not defensible when reasonable rational exists.
 - If agencies require additional expenditures as part of the consolidation efforts, these costs should be offset by corresponding reductions in infrastructure, real property, personnel, and energy.
 - Alternatives to in-house implementation, including valid commercial options to reduce costs of IT services without affecting bureau missions (IaaS, PaaS, and/or SaaS).
 - If “in-house” solutions are needed to meet performance or security requirements, the agencies should maximize Department-wide services, interagency sharing, co-location and virtualization.
- This introduction should highlight agency high level business needs that will be addressed as part of this undertaking.

Agency Drivers for Data Center Consolidation:



Bureau specific IT footprints with increasing costs are not defensible when reasonable rational exists

To make funds available for value add applications, the percentage of IT spending devoted to infrastructure must decrease

Valid commercial options exist to reduce costs while still supporting Agency missions

2. Agency Goals for Data Center Consolidation

- *Limit to ½ page*
- This section should include business related goals and specific and measurable objectives
- Examples of business related goals
 - Improved Performance, Reliability, and Availability
 - Increased security
 - Improved Data Management (Ability to use and share info)
 - Greater Cost Efficiency
- Examples of measurable objectives include
 - Eliminating bureau-specific “data centers” within (#) years (Exceptions: application / system performance requirements; information security requirements);
 - Implementing Shared Services (either government or commercial) within (#) years for:
 - Achieving optimal virtualization and utilization levels (servers, storage, desktops/workstations).

Preparing the Initial Plan – Goals & Objectives (Examples)

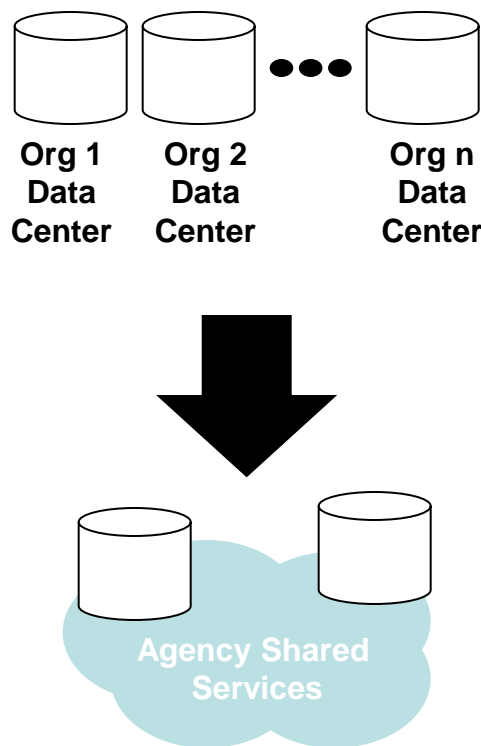
Agency Goals:



Agency Goals will help drive the approach for:

- Developing approaches
- Evaluating rational

Agency Objectives:



The Agency Objectives are more specific and provide a foundation for the consolidation approach.

Potential Agency Goals:

Eliminate silo'd Data Centers

Implement Shared Services (either govt. or commercial):

- WAN and Internet access
- Identity and Access Management
- Email / Collaboration
- Public Web Sites
- All Administrative Support Applications (such as financial management, HR, procurement)

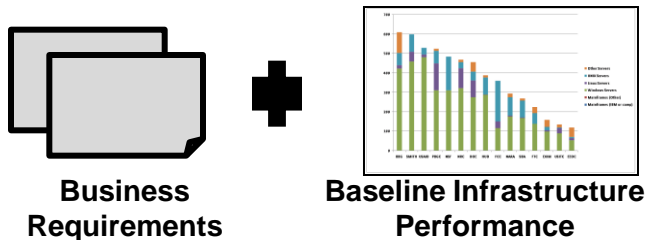
Achieve Maximum virtualization

- Servers and storage, desktops/ workstations)

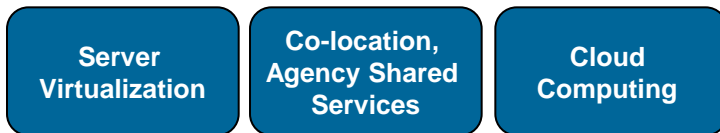
3. Agency Approach, Rationale, and Timeline

- *Limit to 1 page*
- Explain how the approach correlates to goals and achieves the objectives.
- Explain how the approach fits within the agency’s strategic IT goals.
- Include a rationale that supports each approach to be employed.
- Identify Constraints and Considerations that affect each approach and the impact related to the agency’s mission and future strategic IT goals.

Assessment



Alternatives



Agency Opportunities for Achieving Consolidation:

Assessment of Requirements and Baseline Performance will highlight opportunities for both shared services and potential optimization

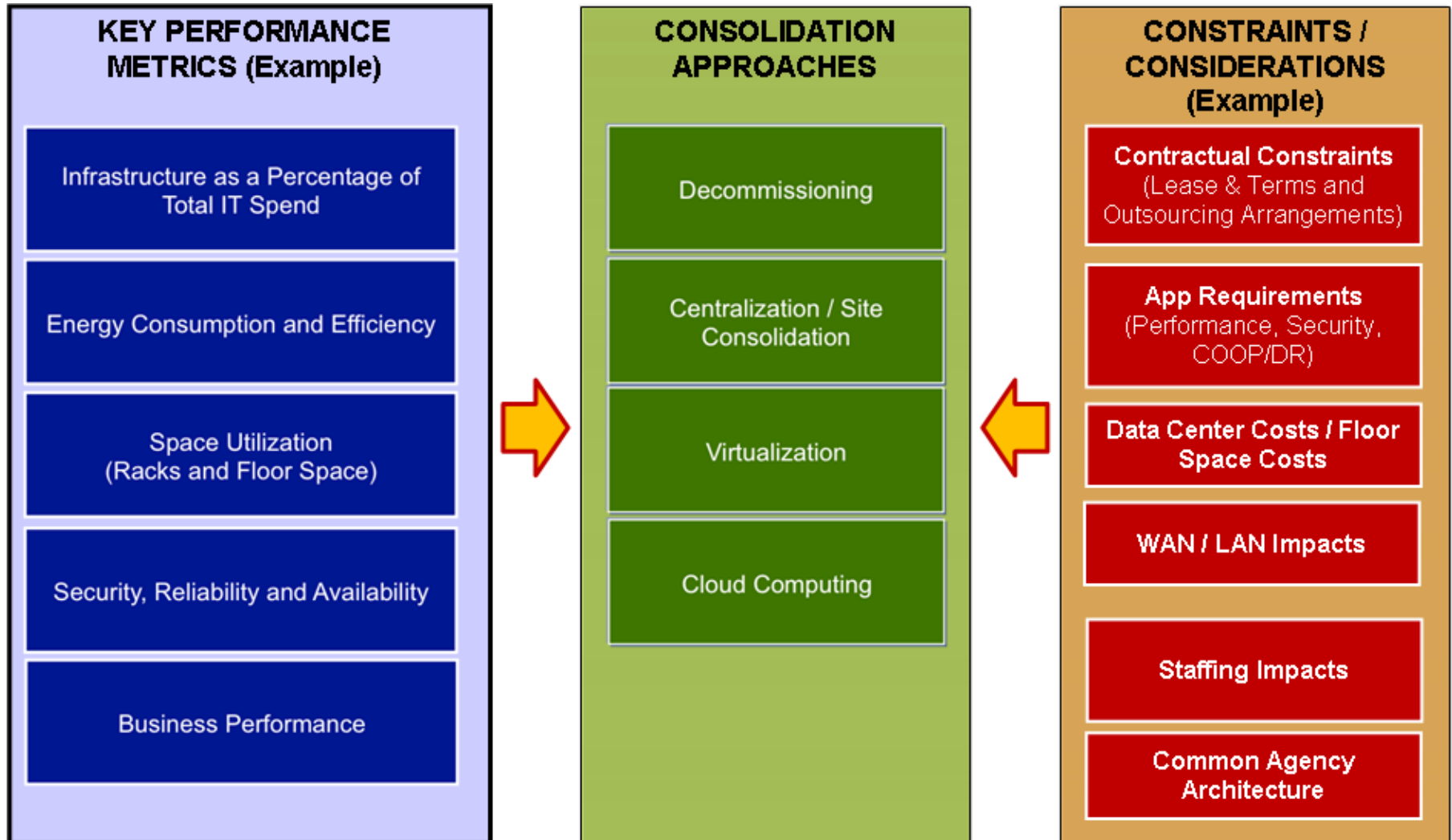
Specific baseline infrastructure performance metrics may consider Server Utilization, Power Usage Efficiency, and Rack Space Utilization

Opportunities for reducing IT spending, especially infrastructure, can be found in regard to space, energy, equipment, software, personnel through “Alternatives”

Approach	Description	Potential Benefits	Rationale
Decommission	Turn off servers that are not being used or used infrequently (e.g. dedicated development environments)	<ul style="list-style-type: none"> • Cost Savings • Energy Efficiency • Frees Floor / Rack Space 	<ul style="list-style-type: none"> • As many as 10-15% of servers may be inactive but still powered on in data centers*
Centralization / Site Consolidation	<p>Move servers/storage to a few selected data centers</p> <p>Consolidate small data centers to larger target centers</p>	<ul style="list-style-type: none"> • Floor Space Cost Savings • Operational Cost Savings • Increase Rack Utilization • Energy Efficiency 	<ul style="list-style-type: none"> • Approximately 430 Government data centers are categorized as "closets" or small sized data centers (less than 1,000)**
Virtualization	Consolidate several servers onto a single server through virtualization of the OS/Platform	<ul style="list-style-type: none"> • Floor Space Cost Savings • Increase Rack Utilization • Increase Server Utilization • Energy Efficiency 	<ul style="list-style-type: none"> • Server Utilization is approximately 21% Government wide**
Cloud Computing	Move application functions to standard, vendor supported enterprise platforms or services	<ul style="list-style-type: none"> • Floor Space Cost Savings • Energy Efficiency • Operational Cost Savings • Cap Ex Cost Savings HW/SW • Reduced SW Maintenance • Improved Service Delivery 	<ul style="list-style-type: none"> • Reduce Operational Risk, lower TCO • Approximately 40% of Civilian Agency Systems are low-impact FISMA security, and therefore may be low-risk candidates for Cloud Computing solutions

* McKinsey Report: Revolutionizing Data Center Efficiency, July 2008

** OMB BDR 09-41 Data Analysis, October, 2009



4. Agency Governance Framework for Data Center Consolidation

- *Limit to ½ page*
- Describe the governance and oversight that will measure and manage performance and risk.
- Identify benchmarking measurements that will create transparency in performance measurements.
- Identify any advisory boards that will be created or used.
- Identify the key project stakeholders, the project management and any other plan governance including:
 - Change Management Plan
 - Risk Mitigation Plan
 - Spending Plan
 - Communications Plan

Key Performance Metrics (Sample)

Infrastructure as a Percentage of Total IT Spend

Energy Consumption and Efficiency

Space Utilization (Racks and Floor Space)

Security, Reliability and Availability

Business Performance

Implications to Data Center Consolidation:

Lower cost infrastructure solutions must be considered to address Agency-wide demand for computing resources

Understand PUE and Energy Consumption across Data Centers

Higher Tier + High Square Footage Centers provide improved economics for operations at high reliability

Future state of IT Infrastructure should offer improved service performance through shared services

Focus on improving time to market, quality of services and ability to innovate to support strategic initiatives.

Approach:

Target Centers with Low Server Utilization and High Server Capacity as “recipient” Data Centers
Determine feasible alternatives including Cloud Computing

Perform Analysis of Server Consolidation which Targets Energy Efficiency and Not Just Costs

Consolidate Low Square Footage / Low Tier Class Centers into High Square Footage with High Tier Class

Target applications that are shared across the Agency and can offer improved operations through centralization

Identify technology to allow for on-demand provisioning of services, to allow Agency to focus on services and not infrastructure

Appendix A – Initial Data Center Consolidation Plan (Template)

Sample - Attached template for Initial Data Center Consolidation Plan

Agency-Wide Savings Plan					
Department Name	Department ABC				
Agency Name	ABC Agency Name				
		Calculated from Baseline	Target		
		4Q10	4Q11	4Q12	4Q13
Total Number of Data Centers (#)	274	250	220	200	
Aggregate Gross Floor Area (sq.ft.)					
Total Number of Racks (#)	3871	3600	3300	3000	
Total Number of Physical Servers by Type (#)					
Mainframes (IBM or compatible)	25	24	24	22	
Mainframes (Other)	9	9	9	7	
Windows Servers	9876	9500	9300	9000	
Linux Servers	4808	5000	5500	6000	
UNIX Servers	2244	2000	1500	1000	
Other Servers	610	550	500	400	
Aggregate Data Center Energy Usage (kWh/year)					
Aggregate Data Center Energy Costs (\$/year)					
Aggregate Data Center Building Operational Cost (\$/year)					
Aggregate FY Construction, Expansion, Consolidation Budget (\$/year)					

4 . Future Deliverables

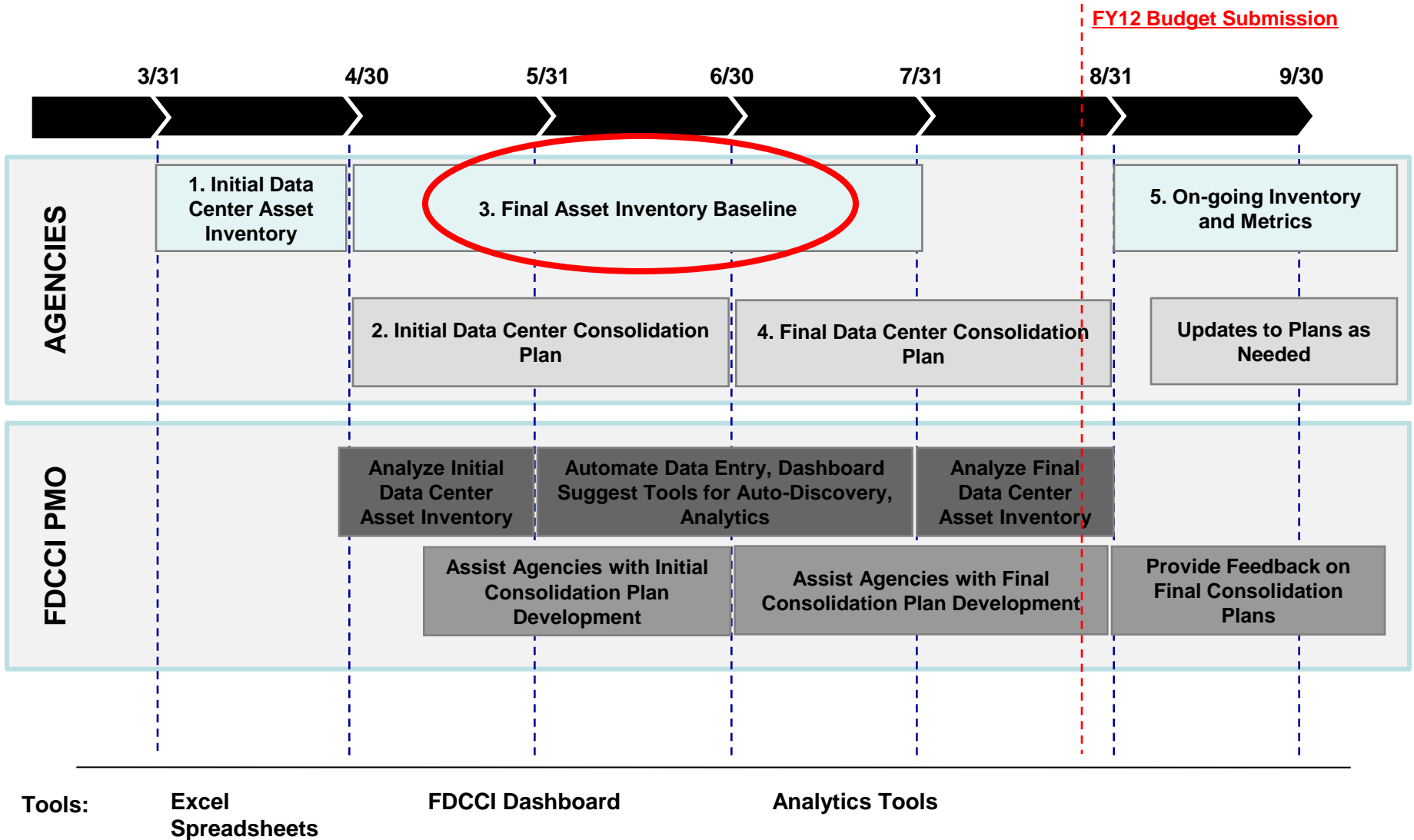
Final Baseline Inventory & Final Consolidation Plan

Zachary Baldwin – GSA

IT Specialist, Policy & Planning

FDCCI Future Deliverables – Final Baseline Inventory

Future Deliverables – Final Inventory Baseline



Final Asset Inventory Baseline due on July 30

IT Software							
Data Center Name	Major or Non-Major Investments (Systems)	Support Platforms (TRM: 865, 866)		Servers / Computers (TRM: 877)		Consolidation Approach (enter value 1-5)	Consolidation Approach - Values (1-5)
		Vendor	Product	Vendor	Product		
Data Center 1							1: Not Applicable
Data Center 1							2: Decomissioning
Data Center 1							3: Consolidation
Data Center 1							4: Virtualization
Data Center 1							5: Cloud Computing

IT Hardware							
Data Center Name	Server Types	Physical Servers			Virtualization		
		Total Physical Server Count (#)	Max Server Utilization (%)	Average Server Utilization (%)	Total Virtual Host Count (#)	Total Virtual OS Count (#)	
Data Center 1	Mainframes (IBM or compatible)						
Data Center 1	Mainframes (Other)						
Data Center 1	Windows Servers						
Data Center 1	Linux Servers						
Data Center 1	UNIX Servers						
Data Center 1	Other Servers						

Final Asset Inventory Baseline - Requested Data:

- IT Software** – Major and Non-major Investments (Systems)
- IT Hardware** – Count and Utilization of Physical Servers; Count of Virtual Hosts and VMs

Final Asset Inventory Baseline due on July 30

IT Facilities, Energy	Data Center 1	Data Center 2	Data Center 3	Data Center 4
FY2010 Construction, Expansion, Consolidation Budget (\$/year)				
Annual Data Center Building Operational Cost (\$/year)				
Annual Data Center Electricity Cost (\$/year)				
Annual Total Electricity Usage (kWh/year)				
Annual IT Electricity Usage (kWh/year) - Measured at the output of the UPS meter, or if not available - at the PDU meter				
Total Data Center IT Power Capacity (kW)				
Rack Count (#)				
Rack Space Utilization (%) - Estimated				

Centralized Network Storage				
DAS (Direct Attached Storage) - Total (TB)				
DAS (Direct Attached Storage) - Used (TB)				
NAS (Network Attached Storage) - Total (TB)				
NAS (Network Attached Storage) - Used (TB)				
SAN (Storage Area Network) - Total (TB)				
SAN (Storage Area Network) - Used (TB)				

Final Asset Inventory Baseline - Requested Data:

- IT Facilities, Energy, Storage** – Budget, Operations Costs, Electricity Usage, Rack Count, Rack Space Utilization, Centralized Network Storage

Final Asset Inventory Baseline due on July 30

Location and Real Estate				
Data Center Name	Data Center 1	Data Center 2	Data Center 3	Data Center 4
Street Address				
City				
State				
ZIP				
Gross Floor Area (sq.ft.)				
Cost (\$/sq.ft./year)				
Ownership Type (enter value 1-8)				
Provider Name (Optional - if Outsourcing or Cloud Provider)				
Data Center Tier (enter value 1-8)				
	Ownership Type Values (1-8)		Data Center Tier Values (1-8)	
	1: Agency Owned Facility		1: Tier I	
	2: GSA Owned Facility		2: Tier II	
	3: Lease and Retrofit		3: Tier III	
	4: Turnkey Lease		4: Tier IV	
	5: Collocation		5: Server Room/Closet	
	6: Outsourcing to Contractor		6: Other Room, Lab, etc.	
	7: Outsourcing to Other Agency		7: N/A (Unknown)	
	8: Using Public Cloud Provider		8: Public Cloud Provider	

Final Asset Inventory Baseline - Requested Data:

- Location and Real Estate** – Location, Gross Floor Area, Tier, Ownership Type, Cost

SW Template - simplified layout;

HW Template - removed several noncritical fields, simplified layout:

Removed 'Average CPU Capacity' and 'Average Power at Full Load'

Removed 'Total Storage' and 'Used Storage' per Server Type

IT Facilities, Energy, Storage Template - removed several noncritical fields (Telecom), expanded on Centralized Storage (per FAQ), clarified Energy Collection fields:

Replaced 'Average Rack Space Utilization (%)' with 'Rack Space Utilization (%) - Estimated', thereby allowing both accurate numbers from Facilities Management Systems and also Estimates, if accurate numbers are N/A

Removed all four Telecom/NW bandwidth fields

Expanded the Total/Used Storage fields by Centralized Storage Type - DAS, NAS, SAN

Location and Real Estate Template - removed several noncritical fields, simplified layout, clarified Ownership Type info:

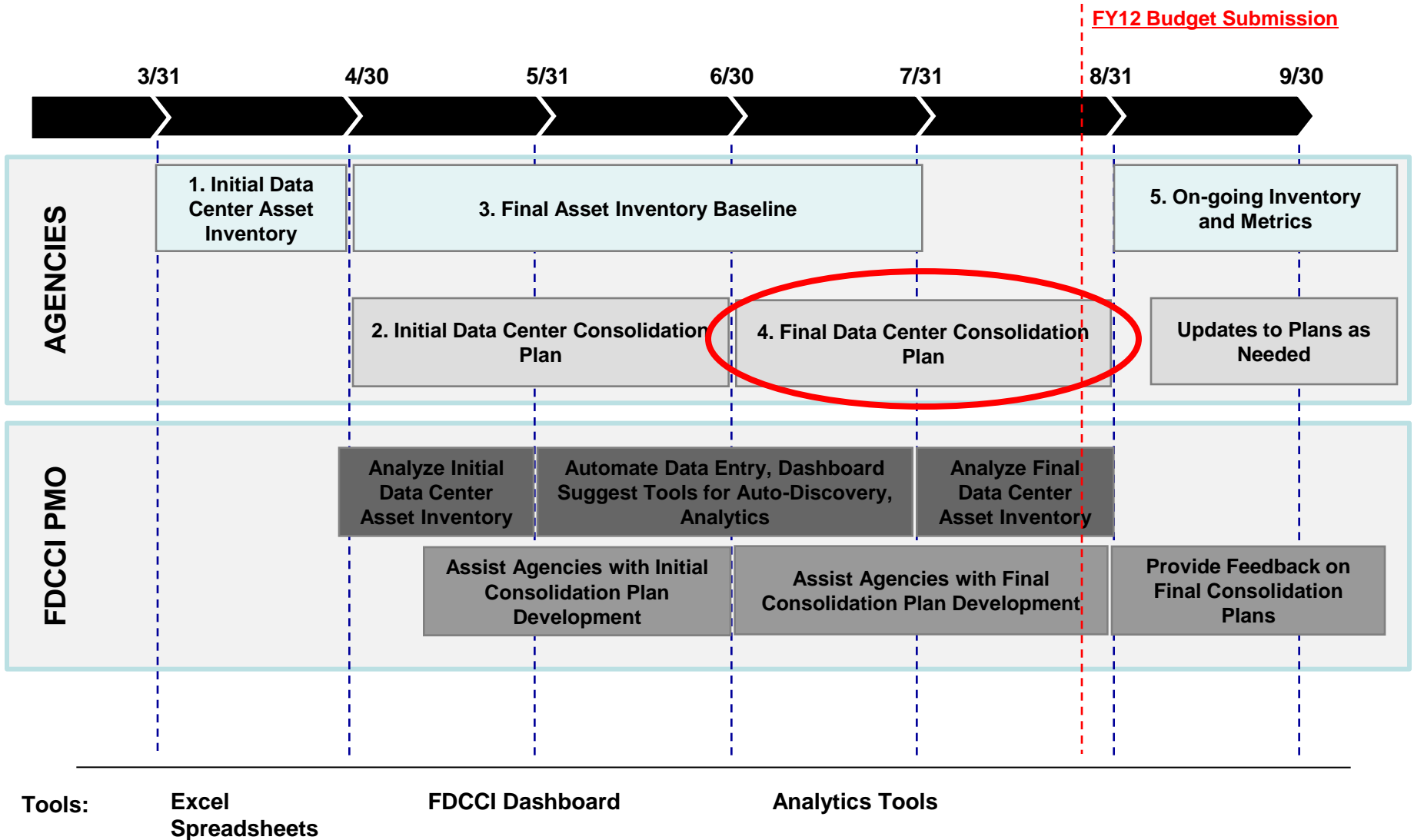
Removed the two 'Potential Expansion' fields

Added more descriptive selection values to 'Ownership Type' and to 'Data Center Tier' to include 'Cloud Provider' and other options that came back with the Initial Inventory

Added an optional field 'Provider Name' for Outsourcing or Cloud Provider ownership type

FDCCI Future Deliverables – Final Consolidation Plan

Future Deliverables – Final Consolidation Plan



- ▶ **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
Average Virtualization (%)	0-10%	30-40%
Average Virtual OS per Host (#)	5-10	15-20
Average Server Utilization (%)	7 – 15%	60 – 70% <i>(application dependent)</i>
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

Asset Count & Savings Metrics

Savings Metrics	Planned Program Cost Savings by 4Q12
Data Center Count Reduction (#)	
Gross Floor Area Reduction (sq.ft.)	
Rack Count Reduction (#)	
Server Count Reduction (#)	
Mainframes (IBM or compatible) Reduction (#)	
Mainframes (Other) Reduction (#)	
Windows Servers Reduction (#)	
Linux Servers Reduction (#)	
UNIX Servers Reduction (#)	
Other Servers Reduction (#)	
Energy Usage Reduction (kW)	
Energy Cost Reduction (\$)	

Initial Analysis

Initial Plan: Asset Count & Savings Targets

Agency-Wide Savings Plan				
Department Name				
Agency Name				
	Calculated from Baseline 4Q10	Target		
		4Q11	4Q12	4Q13
Total Number of Data Centers [#]				
Aggregate Gross Floor Area (sq.ft.)				
Total Number of Racks [#]				
Total Number of Physical Servers by Type [#]				
Mainframes (IBM or compatible)				
Mainframes (Other)				
Windows Servers				
Linux Servers				
UNIX Servers				
Other Servers				
Aggregate Data Center Energy Usage (kWh/year)				
Aggregate Data Center Energy Costs (\$/year)				
Aggregate Data Center Building Operational Cost (\$/year)				
Aggregate FY construction, Expansion, Consolidation Budget (\$/year)				

Utilization Metrics

Utilization Metrics	Typical Results	Target Results
Average Virtualization (%)	0-10%	30-40%
Average Virtual OS per Host (#)	5-10	15-20
Average Server Utilization (%)	7 - 15%	60 - 70% <i>(application dependent)</i>
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

Final Analysis

Final Plan: Utilization Targets

Department Name				
Agency Name				
	Calculated from Baseline 2Q10	Target		
		4Q10	4Q11	4Q12
Average Virtualization [%] [Virtual Host Count / Total Server Count in %]				
Mainframes (IBM or compatible)				
Mainframes (Other)				
Windows Servers				
Linux Servers				
UNIX Servers				
Other Servers				
Average Number of VMs per Virtual Host [#]				
Mainframes (IBM or compatible)				
Mainframes (Other)				
Windows Servers				
Linux Servers				
UNIX Servers				
Other Servers				
Average Physical Server Utilization [%]				
Mainframes (IBM or compatible)				
Mainframes (Other)				
Windows Servers				
Linux Servers				
UNIX Servers				
Other Servers				
Average Rack Space Utilization [%]				
Average Power Density Usage Equivalent [W/sq.ft.]				
Average Power Usage Efficiency [PUE]				

Final Consolidation Plan: Utilization Targets

Department Name				
Agency Name				
	Calculated from Baseline	Target		
	2Q10	4Q10	4Q11	4Q12
Average Virtualization (%) (Virtual Host Count / Total Server Count in %)				
Mainframes (IBM or compatible)				
Mainframes (Other)				
Windows Servers				
Linux Servers				
UNIX Servers				
Other Servers				
Average Number of VMs per Virtual Host (#)				
Mainframes (IBM or compatible)				
Mainframes (Other)				
Windows Servers				
Linux Servers				
UNIX Servers				
Other Servers				
Average Physical Server Utilization (%)				
Mainframes (IBM or compatible)				
Mainframes (Other)				
Windows Servers				
Linux Servers				
UNIX Servers				
Other Servers				
Average Rack Space Utilization (%)				
Average Power Density Usage Equivalent (W/sq.ft.)				
Average Power Usage Efficiency (PUE)				

Final Consolidation Plan - Requested Data:

1. Average Virtualization – by Server Type (%)
2. Average # of VMs per Host – by Server Type (#)
3. Average Physical Server Utilization – by Server Type (%)
4. Average Rack Space Utilization (%)
5. Average Power Density Usage Equivalent (W/sq.ft.)
6. Average PUE