U.S. DEPARTMENT OF ENERGY

HPM 2016 Workshop

Data Center Optimization Initiative (DCOI)

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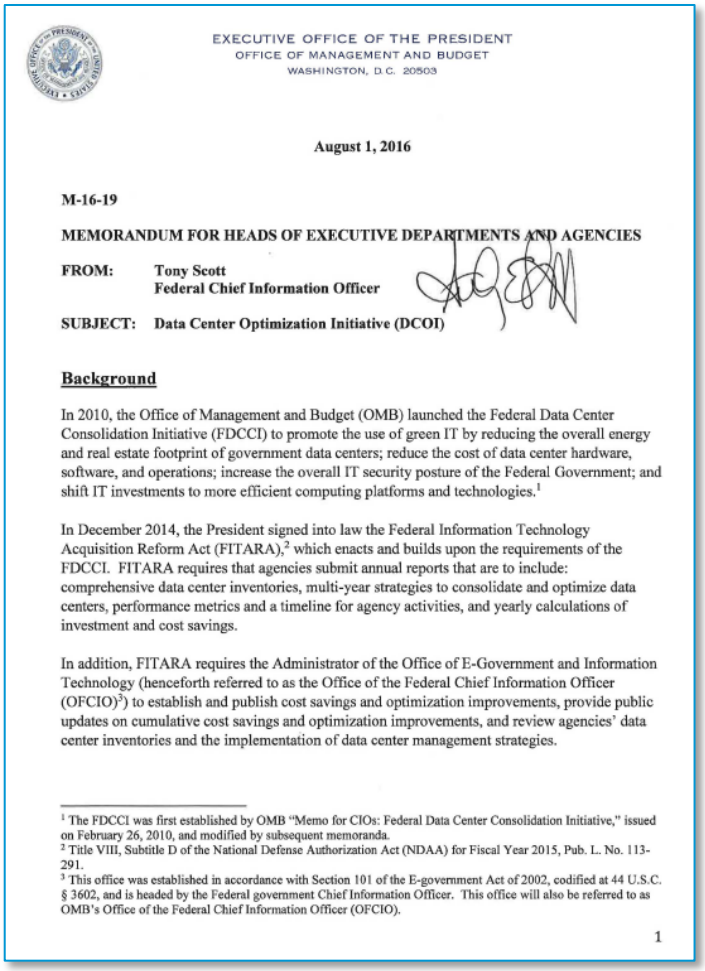
WHAT IS THE OMB DCOI

Background

- On Aug 01, 2016 OMB published the OMB DCOI Memorandum (M-16-19) which formalized the Data Center Optimization Initiative (DCOI)
- The Memorandum defines a framework for achieving the data center consolidation and optimization requirements of FITARA and the performance requirements of EO 13693
- It provides criteria for agency data center strategies
- It also defines metrics OMB Office of the Federal Chief Information Officer (OFCIO) will use to evaluate the success of the strategies



EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
WASHINGTON, D.C. 20503

August 1, 2016

M-16-19

MEMORANDUM FOR HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES

FROM: **Tony Scott**
Federal Chief Information Officer

SUBJECT: **Data Center Optimization Initiative (DCOI)**

Background

In 2010, the Office of Management and Budget (OMB) launched the Federal Data Center Consolidation Initiative (FDCCI) to promote the use of green IT by reducing the overall energy and real estate footprint of government data centers; reduce the cost of data center hardware, software, and operations; increase the overall IT security posture of the Federal Government; and shift IT investments to more efficient computing platforms and technologies.[1]

In December 2014, the President signed into law the Federal Information Technology Acquisition Reform Act (FITARA),[2] which enacts and builds upon the requirements of the FDCCI. FITARA requires that agencies submit annual reports that are to include: comprehensive data center inventories, multi-year strategies to consolidate and optimize data centers, performance metrics and a timeline for agency activities, and yearly calculations of investment and cost savings.

In addition, FITARA requires the Administrator of the Office of E-Government and Information Technology (henceforth referred to as the Office of the Federal Chief Information Officer (OFCIO)[3]) to establish and publish cost savings and optimization improvements, provide public updates on cumulative cost savings and optimization improvements, and review agencies' data center inventories and the implementation of data center management strategies.

[1] The FDCCI was first established by OMB "Memo for CIOs: Federal Data Center Consolidation Initiative," issued on February 26, 2010, and modified by subsequent memoranda.
[2] Title VIII, Subtitle D of the National Defense Authorization Act (NDAA) for Fiscal Year 2015, Pub. L. No. 113-291.
[3] This office was established in accordance with Section 101 of the E-government Act of 2002, codified at 44 U.S.C. § 3602, and is headed by the Federal government Chief Information Officer. This office will also be referred to as OMB's Office of the Federal Chief Information Officer (OFCIO).

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WHAT IS THE OMB DCOI

Policy

- DCOI Memo states that as of August 1, 2016, FDCCI is superseded by the Data Center Optimization Initiative (DCOI)
- It requires agencies to develop and report on data center strategies to:
  - Consolidate inefficient infrastructure
  - Optimize existing facilities
  - Achieve cost savings, and
  - Transition to more efficient infrastructures (Cloud/Inter-agency Shared Services)

WHAT IS THE OMB DCOI

Defines CIO Responsibilities for Data Centers

- Reinforces CIO responsibility for managing data center infrastructure and services
- Consistent with CIO responsibilities defined in FITARA and OMB Memorandum M-15-14, “Management and Oversight of Information Technology”
- States that the agency CIO shall be responsible for implementing and measuring progress toward meeting the goals set forth in this memorandum

WHAT IS THE OMB DCOI

Requires comprehensive inventory of data centers, including:

- Closed Data Centers (2010-2016)
- Planned Data Center Closures (2016-2018)
- Realized Cost Savings and Cost Avoidance (2010-present)
- Quarterly OMB Inventory Updates

Requires annual DCOI Strategic Plan

- Planned and achieved performance levels for each performance metric, by year
- Planned and achieved closures, by year
- Corrective Action Plan(s) – when non-compliant to performance metrics
- Actual vs target costs and cost savings (2016-2018)
- Historical cost savings/avoidance (2010-2015)
- **Agency CIO Compliance Statement**
- Due date – September 30, 2016 (60 days post Memo publication)

DATA CENTER DEFINITION & REPORTING REQUIREMENTS

FITARA (Dec 19, 2015): "Each year, beginning in [FY2016] and each fiscal year thereafter, the head of each covered agency, assisted by the Chief Information Officer of the agency, shall submit to the Administrator [OMB] - A comprehensive inventory of the data centers owned, operated, or maintained by or on behalf of the agency."

EO 13693 Implementing Instructions (June 10, 2015): "Data centers at agency facilities means all Federal data centers – data centers owned, operated, or maintained by or on behalf of the agency, irrespective of the size, as defined by OMB for data center reporting in the IDC. This definition includes contractor/ commercial facilities containing government-funded IT equipment."

OMB DCOI Memo (Aug 1, 2016): "For the purposes of this memorandum, rooms with at least one server, providing services (whether in a production, test, staging, development, or any other environment) are considered data centers."

- Exclusions:
- rooms containing only print servers
- routing equipment, switches, security devices (such as firewalls)
- other telecommunications components

DCOI DATA CENTER TIER DEFINITIONS

Provides a Data Center Tier Specification

- Tiered data centers are defined as those that utilize each of the following:
  1. a separate physical space for IT infrastructure;
  2. an uninterruptible power supply;
  3. a dedicated cooling system or zone; and
  4. a backup power generator for prolonged power outages.
- All other data centers shall be considered non-tiered data centers.
- Continues to require FDCCI defined Tier values for legacy data centers to persist – “Data centers previously classified as tiered in past (FDCCI) inventories will automatically be classified as tiered under the DCOI”

DCOI OPTIMIZATION REQUIREMENTS

Requires Optimization of Enduring Physical Data Centers

- Enduring Data Centers Tiered & Non-Tiered must meet OMB optimization performance metrics by EOY 2018
- OMB will measure agency progress for this initiative using optimization, cost savings, and closure metrics and goals on a quarterly basis, by way of agencies' quarterly data center inventory submissions
- These optimization, cost-savings, and closure metrics and goals apply to all data centers at agency facilities

DCOI PERFORMANCE METRIC REQUIREMENTS

Optimization Metric	Definition	Calculation
Energy Metering	(%) Percent of total gross floor area (GFA) in an agency's data center inventory located in data centers that have power metering	*GFA of Energy Metered Data Centers* / *GFA of All Data Centers*
Power Usage Effectiveness	(Ratio) Proportion of total data center energy used to power the IT infrastructure	*Summed (Data Center Energy Used /IT Equipment Energy Used) for Individual Metered DCs* / *Total Count of Metered Data Centers*
Virtualization	Ratio) Ratio of operating systems (OS) to physical servers	*Total Server Count + Total Virtual OS* / *Total Physical Servers*
Server Utilization & Automated Monitoring	(%) Percent of time busy (measured as 1 – percent of time spent idle), measured directly by continuous, automated monitoring software, discounted by the fraction of data centers equipped with automated monitoring	*Average Server Utilization* x *Percent of Data Centers Fully Equipped with Automated Monitoring*
Facility Utilization	(%) Portion of total gross floor area (in a tiered data center) that is actively utilized for racks that contain at least one physical server	*Total Active Rack Count * 30* / *Total Gross Floor Area*

DCOI PERFORMANCE METRIC REQUIREMENTS

Optimization Metric	Target	Applicability		
		Tiered	Non-Tiered	HPC
Energy Metering	100%	Yes	No[1]	Yes
Power Usage Effectiveness (PUE)	≤ 1.5	Yes	No	Yes
Virtualization	≥ 4	Yes	No	No
Server Utilization & Automated Monitoring	≥ 65%	Yes	Yes	No
Facility Utilization	≥ 80%	Yes	No	Yes
Other Goals				
Cost Savings/Avoidance	≥ 25%[2]	Yes	Yes	Yes
Closures	≥ 52%	25%	60%	Yes

1 - EO 13693 states that all data centers should be metered by FY2018.
2 - Relative to the fiscal year 2016 IT Infrastructure Spending data submitted to the Federal IT Dashboard

DCOI PERFORMANCE METRIC REQUIREMENTS

Optimization metrics, exception notes

- Only the Server Utilization & Automated Monitoring optimization metric shall apply to non-tiered data centers.
- High-performance computing (HPC) nodes can be excluded from calculations of Virtualization and Server Utilization & Automated Monitoring
- HPC Data Centers are not excluded from inventory or OMB reporting
- HPC data centers are expected to address and meet performance metrics
- HPC data centers are expected to “evaluate” consolidation options

DCOI CONSOLIDATION REQUIREMENTS

Requires Consolidation of Physical Data Centers

- Provides a definition for "closed data center":

  "In all cases, the term "closed" for data centers shall refer exclusively to tiered or non-tiered data centers that: a) no longer consume power; or b) no longer house physical servers (whether in a production, test, stage, development, or any other environment)."

- Agencies are required to close:
  - 25% of tired data centers, and
  - 60% of non-tiered data centers
  - Total of 52% of all Federal data centers by EFY 2018
  - Based on baseline of the agencies' August 31, 2015, FDCCI data center inventory submissions

DCOI CONSOLIDATION REQUIREMENTS

Requires Consolidation of Physical Data Centers

- Requires that “Agencies shall prioritize the closure of data centers that are unable to meet applicable PUE optimization targets and/or pose management or security challenges due to age”
- States that “OMB may exclude from these agency-specific targets data centers that are physically inseparable from non-IT hardware (e.g. simulation and modeling devices, sensors, etc.) and that perform a specific, non-standard set of tasks (e.g. do not provide general purpose computing or storage services to Federal facilities).”

DCOI COMPLIANCE REPORTING

Requires Compliance Reporting to OMB

- Compliance data will be reported via the OMB OFCIO IDC
- Agencies must continue to maintain complete inventories of all data center facilities, closure/consolidation plans, and properties of each facility owned, operated, or maintained by or on behalf of the agency.
- Agencies must include progress toward meeting all optimization metric target values
- Agencies must evaluate the costs of operating and maintaining current facilities and develop year-by-year targets for cost savings and cost avoidance due to consolidation and optimization for fiscal years 2016 through 2018
- Agencies shall report all realized cost savings and cost avoidance under the DCOI

DCOI COMPLIANCE REPORTING

Requires Publication of an Agency Annual Strategic Plan

- Requires that in the beginning of FY 2016, each agency head shall annually publish a Data Center Consolidation and Optimization Strategic Plan to define the agency's data center strategy for the subsequent three years (2016, 2017, 2018).
- Agencies are required to publish their Strategic Plans September 30, 2016 (within 60 days of Memo) and subsequent Strategic Plan updates on April 14, 2017 and April 13, 2018
- Requires a statement from the agency CIO stating whether the agency has complied with all reporting requirements in this memorandum and the data center requirements of FITARA

DCOI Strategic Plan Template

Optimization Metrics					
Metric	**OMB Provided Target**	**DOE/OMB Target / Actuals**	**DOE/OMB Target / Actuals**	**DOE/OMB Target / Actuals**	**Notes**
Facility Utilization	≥ 80%	FY16 Planned	FY17 Planned	FY18 Planned	Explanation For Unmet Planned Values
		Actuals	Actuals	Actuals	
Energy Metering	100%	FY16 Planned	FY17 Planned	FY18 Planned	Explanation For Unmet Planned Values
		Actuals	Actuals	Actuals	
PUE	≤ 1.5 (≤ 1.4 New)	FY16 Planned	FY17 Planned	FY8 Planned	Explanation For Unmet Planned Values
		Actuals	Actuals	Actuals	
Virtualization	≥ 4	FY16 Planned	FY17 Planned	FY18 Planned	Explanation For Unmet Planned Values
		Actuals	Actuals	Actuals	
Tiered Server Automated Monitoring	≥ 65%	FY16 Planned	FY17 Planned	FY18 Planned	Explanation For Unmet Planned Values
		Actuals	Actuals	Actuals	
Non-Tiered Server Automated Monitoring	≥ 65%	FY16 Planned	FY17 Planned	FY18 Planned	Explanation For Unmet Planned Values
		Actuals	Actuals	Actuals	
Closures / Savings	**OMB Provided Target**	**DOE/OMB Target / Actuals**	**DOE/OMB Target / Actuals**	**DOE/OMB Target / Actuals**	**Notes**
Tiered Closures	FY18 OMB Target	FY16 Planned	FY17 Planned	FY18 Planned	Explanation For Unmet Planned Values
		Actuals	Actuals	Actuals	
Non-Tiered Closures	FY18 OMB Target	FY16 Planned	FY17 Planned	FY18 Planned	Explanation For Unmet Planned Values
		Actuals	Actuals	Actuals	
Cost Savings	FY18 OMB Target	FY16 Planned	FY17 Planned	FY18 Planned	Explanation For Unmet Planned Values
		Actuals	Actuals	Actuals	
Cost of Closures	Actuals				
Cost of Optimization	Actuals				
Life-Cycle Cost Savings (Estimated)	(Estimate)				

DCOI COMPLIANCE REPORTING

The DCOI Strategic Plan must include:

- Requires Planned and achieved performance levels for each optimization metric, by year
- Planned and achieved closures, by year
- An explanation for areas in which achieved optimization metrics and closures did not meet those planned in a previous Strategic Plan and description of the steps the agency is taking or will take to achieve its future planned performance levels and closure goals
- Year-by-year calculations of target and actual agency-wide spending and cost savings on data centers from FY2016-FY2018, including:
- A description of any initial costs for data center consolidation and optimization;
    - Life cycle cost savings and other improvements
    - Historical costs and cost savings and cost avoidances due to data center consolidation and optimization

DCIM COMPLIANCE

Data Center Infrastructure Management (DCIM):

- The DCOI Memo contains policy requirements for agencies to install automated energy metering tools (advanced metering) and use these to collect and report to OMB energy usage data in their data centers
- These tools are to enable the active tracking of Power Usage Effectiveness (PUE) for the data center and are required to be installed in all enduring, tiered Federal data centers by September 30, 2018
- The Memo also requires the replacement of manual collections and reporting of systems, software, and hardware inventory housed within agency data centers with automated monitoring, inventory, and management tools such as DCIM systems by the end of fiscal year 2018
- These DCIM systems are to provide the capability to, at a minimum, measure and report progress toward meeting the server utilization and virtualization metrics defined in the OMB Memo

DCEP COMPLIANCE

Data Center Energy Practitioner (DCEP)

- The DCOI Memo contains the statement (The E.O. [13693] Implementing Instructions also advise that "[a]ll existing and new data centers shall have at least one certified Data Center Energy Practitioner (DCEP) assigned to manage its performance.“)
- As stated in the EO 13693 Implementing Instructions, all core data centers, to include existing, new and planned, shall have at least one certified Data Center Energy Practitioner (DCEP), either on-site or centralized, assigned to manage data center performance and continued optimization
- A single DCEP may manage multiple data centers. The DCEP shall coordinate with the agency CIO to meet the targets in EO 13693 and in these Instructions
- The main objective for the DCEP program is to raise the standards of those involved in energy assessments of data centers to accelerate energy savings in data centers. The program is driven by the fact that significant knowledge, training, and skills are required to perform accurate energy assessments in data centers

QUESTIONS?