August 1, 2016

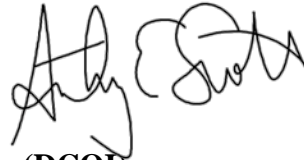**M-16-19**

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.

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[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).

This memorandum defines a framework for achieving the data center consolidation and optimization requirements of FITARA, the criteria for successful agency data center strategies, and the metrics OMB OFCIO will use to evaluate the success of those strategies.

Policy

As of August 1, 2016, the FDCCI is superseded by the Data Center Optimization Initiative (DCOI) established in this memorandum.

The DCOI, as described in this memorandum, requires agencies to develop and report on data center strategies to consolidate inefficient infrastructure, optimize existing facilities, improve security posture, achieve cost savings, and transition to more efficient infrastructure, such as cloud services and inter-agency shared services.[4]

The requirements in this memorandum apply to all CFO Act agencies,[5] including the Department of Defense.[6]

Leadership and Responsibilities

All data center infrastructure and services, including contracts for third-party data centers and services agency-wide, shall be managed by the agency CIO in a manner consistent with FITARA[7] and OMB Memorandum M-15-14, "Management and Oversight of Information Technology."[8] The agency CIO shall be responsible for implementing and measuring progress toward meeting the goals set forth in this memorandum.

Transition to Cloud and Data Center Shared Services

Development Freeze for New and Current Data Centers

Beginning 180 days after issuance of this memorandum, agencies may not budget any funds or resources toward initiating a new data center or significantly expanding[9] an existing data center

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[4] Federal Information Technology Shared Services Strategy, May 2, 2012, https://www.whitehouse.gov/sites/default/files/omb/assets/egov_docs/shared_services_strategy.pdf.
[5] See Chief Financial Officers Act of 1990, Pub. L. No. 101–576.
[6] Per Sec. 834(b)(1)(C) of the FY2015 NDAA, the Department of Defense may submit to OMB, in lieu of the Strategic Plan described in this memorandum, the defense-wide plan and cost savings report required under sections 2867(b)(2) and 2867(d), respectively, of the FY2012 NDAA. If submitting such plans and reports in lieu of the Strategic Plan, DOD shall ensure all information required by the Strategic Plan is included in the submitted plans and reports.
[7] Title VIII, Subtitle D of the National Defense Authorization Act (NDAA) for Fiscal Year 2015, Pub. L. No. 113-291.
[8] OMB Memorandum M-15-14, "Management and Oversight of Federal Information Technology," June 10, 2015, https://www.whitehouse.gov/sites/default/files/omb/memoranda/2015/m-15-14.pdf.
[9] The General Services Administration (GSA) Office of Government-wide Policy (OGP) will coordinate with OMB to define thresholds for what constitutes "significant" expansion within 60 days of publication of this memorandum.

without approval from OMB OFCIO.[10] To request such approval, agencies must submit a written justification that includes an analysis of alternatives (including opportunities for cloud services, inter-agency shared services, and third party co-location) and an explanation of the net reduction in the agency's data center inventory that will be facilitated by the new or expanded data center (such as through consolidation of multiple existing data centers into a single new data center).

Consolidation and Closure of Existing Data Centers

As previously required by the FDCCI, agencies shall continue to principally reduce application, system, and database inventories to essential enterprise levels by increasing the use of virtualization to enable pooling of storage, network and computer resources, and dynamic allocation on-demand. Thereafter, agencies shall evaluate options for the consolidation and closure of existing data centers,[11] by (in order of priority):

1. Transitioning to provisioned services, including configurable and flexible technology such as Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS) to the furthest extent practicable, consistent with the Cloud First policy.[12]
2. Migrating to inter-agency shared services or co-location data centers.
3. Migrating to more optimized data centers within the agency's data center inventory.

Cloud Investment

Cloud environments are scalable and allow agencies to provision resources as required, on-demand.[13] Consistent with the Cloud First policy, agencies shall use cloud infrastructure where possible when planning new mission or support applications or consolidating existing applications. Agencies should take into consideration cost, security requirements, and application needs when evaluating cloud environments. As required by FITARA, agencies utilizing cloud services shall do so in a manner that is consistent with requirements of the Federal Risk and Authorization Management Program (FedRAMP) and National Institute of Standards and Technology (NIST) guidance.[14]

Shared Services Managing Partner

To support the shared services efforts described by this memorandum, the General Services Administration (GSA) Office of Government-wide Policy (OGP) shall serve as the managing

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[10] Data centers certified by GSA OGP as Inter-agency Shared Service Provider data centers are excluded from this development freeze.

[11] This requirement does not apply to GSA OGP designated inter-agency shared services data centers.
[12] Federal Cloud Computing Strategy, February 8, 2011, https://www.whitehouse.gov/sites/default/files/omb/assets/egov_docs/federal-cloud-computing-strategy.pdf.
[13] Ibid.
[14] See FY2015 NDAA Sec. 834(3)(c).

partner of the Federal Government's data center line of business[15] and data center shared services. OGP, in consultation with the Unified Shared Services Management office, shall establish and maintain a data center shared services marketplace and coordinate shared services for inter-agency consumption by:

- Coordinating with OMB to define qualifying operating standards for inter-agency shared services providers, creating guidance materials for becoming such a provider, and identifying and approving candidate providers.
- Maintaining and monitoring inter-agency shared services provider operating standards.
- Maintaining an online inventory of qualified inter-agency shared services providers.
- Establishing an online decision support tool to facilitate agency review, selection, and analysis of inter-agency shared services providers.
- Coordinating with the GSA Federal Acquisition Service (FAS) to create and maintain an inventory of acquisition tools and products specific to the technology and services surrounding data center optimization, including procurement vehicles for the acquisition of automated infrastructure management and monitoring tools.
- Developing, implementing, and maintaining financial and service models, as well as contracts, pertaining to data center procurement with customer/partner agencies and shared service providers.
- Providing a forum for participating and interested agencies to discuss the inter-agency shared services marketplace.

In this role, OGP will serve as a trusted agent and subject matter expert to assist data center providers and consumers of data center services by providing guidance on technology advancements, innovation, cybersecurity, and best practices.

All agencies will have the option of submitting data centers of their choosing for review by OGP. Data centers that OGP determines satisfactory in all of their operating standards will be designated as inter-agency shared services providers.

Optimization of Physical Data Centers

Classification of Physical Data Centers

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. However, rooms containing only print servers, routing equipment, switches, security devices (such as firewalls), or other telecommunications components shall not be

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[15] Formed in 2004, lines of business (LOB) are cross-agency initiatives to define, design, implement and monitor a set of common solutions for government-wide business functions, processes, or desires capabilities. Each LOB is governed by a Managing Partner which is designated as the lead organization responsible for managing the business requirements of their community.

considered data centers. Agencies shall perform a comprehensive review of their data center inventories and continue to maintain complete and updated data center inventories. This comprehensive review shall be completed by August 31, 2016, to align with the Integrated Data Collection (IDC) process.[16]

Data centers shall be categorized into two groups: tiered[17] data centers and non-tiered data centers. 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.[18] Private sector-provided cloud services are not considered data centers for the purposes of this memorandum, but must continue to be included in agencies' quarterly inventory data submissions to OMB.

Agencies shall self-classify data centers as either tiered or non-tiered data centers based on the above criteria; however, any data center previously reported to OMB as a Tier 1-4 data center shall be automatically categorized as a tiered data center.

Under this memorandum, OMB sets closure and optimization targets that are applicable to each type of data center. Additionally, the terms "core" and "non-core" will no longer be used as the categorical benchmarks for OMB oversight.

Energy Metering and Power Efficiency

Agencies shall install automated energy metering tools and shall use these to collect and report energy usage data in their data centers to OMB. The March 19, 2015, Executive Order 13693, "Planning for Federal Sustainability in the Next Decade," requires agencies to install and monitor advanced energy meters in data centers by September 30, 2018.[19]

Consistent with the Implementing Instructions for Executive Order 13693 (E.O. Implementing Instructions), energy metering tools shall enable the active tracking of PUE for the data center and shall be installed in all tiered Federal data centers by September 30, 2018.[20] The E.O.

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[16] Data centers containing only print servers that were previously reported as "closed" shall remain classified as closed data centers in agencies' data center reporting.

[17] The term "tiered" and the definitions that follow are derived from the Uptime Institute's Tier Classification System; however, this shall not be construed as requiring any certification in order for a data center to be considered tiered by OMB.

[18] Data centers previously classified as tiered in past inventories will automatically be classified as tiered under the DCOI.

[19] Executive Order, "Planning for Federal Sustainability in the Next Decade" https://www.whitehouse.gov/the-press-office/2015/03/19/executive-order-planning-federal-sustainability-next-decade.

[20] While Executive Order 13693 requires advanced energy metering in all data centers, OMB will monitor PUE for tiered data centers only.

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."[21]

Consistent with the E.O. Implementing Instructions, agency CIOs are also required under this memorandum to ensure that existing tiered data centers achieve and maintain a PUE of less than 1.5 by September 30, 2018. Agency CIOs shall evaluate options for consolidation or closure of existing data centers in which a PUE target of less than 1.5 is not cost-effective, such as through transition to cloud services or migration to inter-agency shared services data centers.

Accordingly, OMB will monitor the energy efficiency of data center power and cooling infrastructure through the Power Usage Effectiveness (PUE) metric. Consistent with the E.O. Implementing Instructions, effective immediately, all new data centers must implement energy metering capable of measuring PUE and must be designed and operated to maintain a PUE no greater than 1.4, and are encouraged to be designed and operated to achieve a PUE no greater than 1.2.

To the extent permissible under the Federal Acquisition Regulation (FAR), agencies must include PUE requirements for all new data center contracts or procurement vehicles. Further, any new data center contract or procurement vehicle must require the contractor to report the quarterly average PUE of the contracted facility[22] to the contracting agency, except where that data center's PUE is already being reported directly to OMB or GSA through participation in a multi-agency service program. Agencies are encouraged to require the same for extension of existing vehicles. PUE reporting is not required for cloud services.

Automated Infrastructure Management

Agencies shall replace manual collections and reporting of systems, software, and hardware inventory housed within data centers with automated monitoring, inventory, and management tools (e.g., data center infrastructure management) by the end of fiscal year 2018. These tools shall provide the capability to, at a minimum, measure progress toward the server utilization and virtualization metrics defined in the Metric Target Values section of this memorandum.[23]

Any data center initiation, significant expansion, or migration project that receives Development, Modernization, and Enhancement (DM&E) funds in fiscal year 2017 and beyond must immediately implement automated monitoring and management tools. However, agencies are strongly encouraged to implement automated monitoring and management tools throughout their data centers immediately.

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[21] See "Implementing Instructions for Executive Order 13693, 'Planning for Federal Sustainability in the Next Decade'"
https://www.whitehouse.gov/sites/default/files/docs/eo_13693_implementing_instructions_june_10_2015.pdf.
[22] This can be PUE for the facility as a whole in cases where the agency only contracts for a portion of a larger facility; however, if PUE metrics are available specific to the agency's use, that is preferred.
[23] For non-tiered data centers, only automated monitoring of server utilization is required.

To the extent permissible under the FAR, agencies must include automated infrastructure management requirements for all new data center service contracts or procurement vehicles. Further, any new data center contractor procurement vehicle must require the contractor to report to the contracting agency whether the contracted facility utilizes automated infrastructure management, except where such data is already being reported directly to OMB or GSA through participation in a multi-agency service program. Agencies are encouraged to require the same for extension of existing vehicles.

GSA shall make available an acquisition vehicle for automated monitoring and management tools to support agency needs. Once established, agencies shall not issue new solicitations for these requirements unless they have developed a business case, approved by the agency's CIO and shared with OMB, to establish that the separate procurement of these needs results in better value, considering price and other appropriate factors.

<u>Metric Target Values</u>

OMB will measure agency progress for this initiative using the following 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.

Goal 1: Optimization

The following optimization metrics are listed in order of priority. Agencies shall achieve and maintain all listed target values by the end of fiscal year 2018:

Table 1. Government-wide Optimization Targets for Tiered Data Centers[24]			
Metric	**Definition**	**Calculation**	**FYE 2018 Target Value**
Energy Metering	(%) Percent of total gross floor area (GFA)[25] in an agency's tiered data center inventory located in tiered data centers that have power metering.	$\frac{Total\ GFA\ of\ Energy\ Metered\ Data\ Centers}{Total\ GFA\ of\ All\ Tiered\ Data\ Centers}$	100%
Power Usage Effectiveness (PUE)[26]	(Ratio) Proportion of total data center energy used by IT equipment.	$\frac{Total\ Energy\ Used}{Total\ IT\ Equipment\ Energy\ Used}$	≤ 1.5 (≤ 1.4 for new data centers)

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[24] While agencies should strive to achieve each applicable optimization target for each data center, only PUE targets will be calculated on a per-data center basis. All other targets will be calculated at the agency inventory-level.

[25] "Total gross floor area" is defined as total square footage available for IT equipment and includes all associated corridors, walkways, and air circulation requirements. This does not include office space, mechanical rooms, or storage areas.

[26] PUE shall be calculated by OMB based on quarterly average IT and facility electricity usage data.

Table 1. Government-wide Optimization Targets for Tiered Data Centers[24]			
Metric	**Definition**	**Calculation**	**FYE 2018 Target Value**
Virtualization	(Ratio) Ratio of operating systems (OS) to physical servers.	$$\frac{Total\ Server\ Count + Total\ Virtual\ OS}{Total\ Physical\ Servers}$$	≥ 4
Server Utilization & Automated Monitoring	(%) Percent of time busy (measured as 1 – percent of time spent idle), measured directly by continuous, automated monitoring software,[27] discounted by the fraction of data centers fully equipped with automated monitoring.	$Average\ Server\ Utilization\ *\ Percent\ of\ Data\ Centers\ Fully\ Equipped\ with\ Automated\ Monitoring$	$\geq 65\%$
Facility Utilization	(%) Portion of total gross floor area in tiered data centers that is actively utilized for racks that contain IT equipment.	$$\frac{Total\ Active\ Rack\ Count^{28}\ *\ 30\ sq.\ ft.}{Total\ Gross\ Floor\ Area}$$	$\geq 80\%$

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.

Goal 2: Cost Savings and Avoidance

Agencies shall, by the end of fiscal year 2018, reduce Government-wide annual costs attributable to physical data centers by at least 25%, relative to the fiscal year 2016 IT Infrastructure Spending data submitted to the Federal IT Dashboard.[29] Agencies shall collectively achieve the following amounts of savings (combined cost savings and cost avoidance)[30] in each of fiscal years 2016, 2017, and 2018:

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[27] Server utilization shall be collected continuously and reported as a quarterly average.
[28] "Active" racks are those that have IT equipment consuming electricity.
[29] Benchmarked against the sum of all non-cloud data center costs (including data center labor, software, hardware, electricity, and facility) found in physical data center fields of the IT Inventory Summary Table of the IT Dashboard.
[30] Consistent with OMB Circular A-131, the term "cost savings" refers to "a reduction in actual expenditures below the projected level of costs to achieve a specific objective," and the term "cost avoidance" refers to "an action taken in the immediate time frame that will decrease costs in the future."

Table 2. Cost Savings Target	
FY2014 Physical Data Center Spending	**Total Savings Targeted by FYE 2018**
$5.4 billion	$2.7 billion

Within 30 days after publication of this document, OMB OFCIO will set individual cost savings and cost avoidance goals for each agency.

Goal 3: Closed Data Centers

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 for physical servers; or b) no longer house physical servers (whether in a production, test, stage, development, or any other environment).[31]

Based on the number of data centers designated by the agencies as already undergoing some part of the closure process, agencies currently plan to close 22% of tiered data centers and 50% of non-tiered, non-cloud data centers, for a total of 44% of all Federal data centers. OMB's goal for the DCOI is informed by, but exceeds, agencies' existing closure plans.

By the end of fiscal year 2018, agencies shall close at least 25% of tiered data centers government-wide, excluding those approved as inter-agency shared services provider data centers. Furthermore, agencies must close at least 60% of non-tiered data centers government-wide.[32] This target will result in the closure of approximately 52% of the overall Federal data center inventory and a reduction of approximately 31%[33] in the gross floor area occupied by data centers government-wide. 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.

In the long term, all agencies should continually strive to close all non-tiered data centers. Server rooms and closets pose security risks and management challenges and are an inefficient use of resources. As such, although at least 60% of non-tiered data centers are required to be closed before the end of fiscal year 2018, OMB expects that agencies will consider all such facilities as temporary and work to close them.

Within 30 days after publication of this document, OMB OFCIO will share with each agency its individual goal for data center closures, specifying the respective number of tiered and non-tiered data centers the agency must close. 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).

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[31] Excludes print servers.

[32] The baseline number of data centers is based on the agencies' August 31, 2015, data center inventory submissions, as collected by OMB OFCIO through the Integrated Data Collection.

[33] Estimated reduction in gross floor area of data centers is approximate and has been based on the average size, in square feet, of the data centers of each type to be closed.

Reporting

Compliance Measurement

Data will be collected quarterly on an agency-by-agency basis through the IDC, as follows:

1. 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.
2. Agencies must include progress toward meeting all optimization metric target values.[34]
3. 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.

Strategic Plan

In accordance with FITARA,[35] beginning in fiscal year 2016, each agency head shall annually publish a Strategic Plan to describe the agency's consolidation and optimization strategy for fiscal years 2016, 2017, and 2018. The DCOI Strategic Plan and milestones described below replace existing FDCCI requirements for consolidation plans.

Agencies DCOI Strategic Plans must include, at a minimum, the following:

1. Planned and achieved performance levels for each optimization metric, by year;
2. Planned and achieved closures, by year;
3. An explanation for any optimization metrics and closures for which the agency did not meet the planned level in a previous Strategic Plan;
4. Year-by-year calculations of target and actual agency-wide spending and cost savings on data centers from fiscal years 2016 through 2018, including:
   a. A description of any initial costs for data center consolidation and optimization; and
   b. Life cycle cost savings and other improvements (including those beyond fiscal year 2018, if applicable);
5. Historical costs, cost savings, and cost avoidances due to data center consolidation and optimization through fiscal year 2015; and
6. 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. If the agency has not complied with all reporting requirements, the agency must provide a statement describing the reasons for not complying.

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[34] Note: Agencies participating as a tenant in an inter-agency shared services provider data center are not required to report metric values to OMB. The provider will report this data to OMB.
[35] See FITARA Section 834(b)(1)(A)-(E).

Agencies are required to publish their Strategic Plans at [agency].gov/digitalstrategy under a section entitled, "Data Center Optimization Initiative Strategic Plans," within 60 days of the issuance of this memorandum. Subsequent Strategic Plan updates shall be due on April 14, 2017 and April 13, 2018. Strategic plans shall also be made available in a machine-readable JSON format at [agency].gov/digitalstrategy/datacenteroptimizationstrategicplan.json. OMB will provide instructions to agencies, including a schema, at https://management.cio.gov/schema within 5 days of the issuance of this memorandum.

Agencies shall furthermore update their [agency].gov/digitalstrategy/FITARAmilestones.json files, also posted on their websites, to identify, at a minimum, 5 milestones per fiscal year to be achieved through the DCOI. DCOI milestones shall be updated quarterly as progress is achieved and shall be reviewed in quarterly PortfolioStat sessions with agencies' OMB desk officers.

Transparency

Under FITARA,[36] OMB must make publicly available agencies' progress toward the goals established herein and relative to agencies' Strategic Plans.

To this end, beginning in 2016, OMB will report on government-wide and agency-specific data center progress as part of the IT Dashboard, which will display:

- Planned and achieved data center closures by agency;
- Government-wide and agency progress toward meeting applicable optimization targets;
- Cumulative cost savings and cost avoidance realized through the implementation of the DCOI and prior initiatives; and
- Annual data center investment spending per agency, including investment transition costs, cost savings projections, progress made against projections and improvements realized through the implementation of the strategy.

Community Support

Executive agencies are encouraged to join the Data Centers listserv by emailing listserv@listserv.gsa.gov with no subject and "subscribe datacenters" in the body (from a .gov or .mil email address only).

In addition to addressing questions and comments via the Data Centers listserv, https://management.cio.gov will be updated with best practices and other resources as they become available.

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[36] See 2015 NDAA Section 834(b)(2)(C).