REPORT REPRINT

US federal government mandates DCIM

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Part 1: Low PUE for its datacenters

An updated efficiency initiative from the US Office of Management and Budget (OMB) requires US federal government datacenters to install datacenter infrastructure management (DCIM) software by 2018. The Data Center Optimization Initiative (DCOI), published in Q1 2016, mandates that all federal government facilities install DCIM by 2018, but suggests that adoption should begin immediately in those facilities that are not already using the tools.

A number of government facilities are already using DCIM from various suppliers, including the US Senate, US Federal Reserve and the US Department of Agriculture. Part 2 of this three-part series will discuss the potential implications of the new mandate on the DCIM supplier market.

Specifying the use of DCIM is part of a wider requirement under DCOI that all existing medium-size to large facilities should achieve a power usage effectiveness (PUE) rating of 1.5 or better by 2018. DCOI also stipulates the use of public cloud services, as well as colocation datacenter services where appropriate. DCOI is part of an ongoing federal consolidation and efficiency strategy, the progress of which will be will be examined in Part 3 of this series.

THE 451 TAKE

The new mandate is likely to be, in effect, a tacit endorsement of the value of (properly implemented) DCIM by the US government, and should help convince skeptical datacenter operators (in both the public and private sectors) of the need for modern datacenter management tools. The mandate is effectively saying that DCIM isn't just nice to have, but is actually necessary to achieve efficient operation and low PUE targets. The new rules also present an obvious opportunity for DCIM suppliers, especially for those with experience selling into federal facilities. There is also an opportunity for a broader range of datacenter technology suppliers – while DCIM software will help drive efficiencies, it is reasonable to assume that, in order to achieve PUE of 1.5 or better, agencies will require new energy-efficient cooling and power equipment, and even innovations such as prefabricated modular (PFM) datacenter designs.

CONTEXT

The OMB's federal chief information officer launched the Federal Data Center Consolidation Initiative (FDCCI) in 2010. The aim was to cut costs, improve efficiencies and consolidate the number of federal datacenters, which grew from about 1,000 in 2010 to close to 10,000 in 2014.

According to the Government Accountability Office (GAO), which works with the OMB to enforce the FDCCI, the 24 agencies that signed up for the program are now on track to close more than 40% of these sites by the end of fiscal year 2016 (ending September 30). There are further plans to close a total of 5,200 datacenters by the end of fiscal year 2019. The datacenter closures and optimization efforts to date have resulted in an estimated $2.8bn in cost savings from 2011 to 2015. Eventual savings are expected to increase to more than $8bn by 2019.

However, the government's definition of what constitutes a datacenter has shifted over the last five years, with various classifications being used based on size, function or both. This has changed the number of facilities that the government is considering for consolidation, but it is estimated that approximately 240 of the 10,000-plus federal datacenters in 2014 were stand-alone datacenters, and that the remainder – the vast majority – were server closets or small server rooms. The OMB has set a goal of eventually closing all server closets or server rooms, since it deems them to be inefficient to operate and a potential security risk. This means that, in theory, as many as 240 federal datacenters might be required to deploy DCIM in the next couple of years, although it is reasonable to assume that some portion of these will also be consolidated. The specifics of the consolidation plan will be examined in more depth in Part 3 of this series.

FROM FDCCI TO DCOI

In March the OMB's federal CIO introduced the Data Center Optimization Initiative, which supersedes the original FDCCI rules. It requires all federal government agencies to implement a range of energy and cost-efficiency measures, including facility consolidation and migrating workloads to cloud services and colocation datacenters, as well as implementing DCIM.

The DCOI stipulates the following actions on DCIM adoption:

- Agencies should replace manual reporting software approaches (we assume this includes spreadsheets that require manual data inputting) with automated monitoring, asset management and other management (capacity) tools. The term 'automated' does not appear to mean 'real time' in this context.
- DCIM tools should provide the capability to measure progress toward the server utilization and virtualization metrics defined by the OMB. Server utilization is currently roughly 5% across federal datacenters, and the OMB has set a target of 65% by 2018. This is an ambitious goal – the current utilization average for enterprise datacenters is less than 20%, according to 451 Research.
- Any new datacenter build or expansion of an existing site in fiscal year 2017 and beyond must immediately implement DCIM. Agencies must include DCIM requirements for all new datacenter service contracts with third parties.
- Agencies are strongly encouraged – but not required – to implement DCIM throughout all other datacenters immediately.

IMPACT ON DATACENTER OPERATORS

The DCOI has a number of direct implications for federal datacenter and IT managers, as well as the wider base of nongovernment datacenter operators. These could include:

Federal datacenter operators may have to allocate a proportion of their budgets to purchasing DCIM and ongoing license fees. Some of this cost will be offset by future efficiencies.

Nonfederal datacenters that want to deploy DCIM, but have faced challenges in having the purchase approved or championing the ROI, may be able to use the introduction of the DCOI to strengthen the business case.

Best practices from government deployments of DCIM may be available to the wider datacenter industry, and may help with successful implementation and operation.

Mandating minimum PUEs for federal facilities may put additional pressure on private and public sector datacenter operators to achieve lower PUEs and improve efficiencies.

Impact on datacenter technology suppliers

The introduction of DCOI will have a number of short- and long-term benefits for DCIM suppliers, datacenter equipment suppliers and datacenter design consultants/engineers:

The most obvious benefit is the potential to sell DCIM tools into the remaining pool of federal datacenters, across 24 agencies that are subject to DCOI. However, a limited number of these sites already have DCIM tools (to be discussed in Part 2 of this series).

DCIM suppliers that have already sold into federal datacenters may be able to expand sales with existing agencies or use these contacts (and experience) to sell into other agencies (including for retrofit and new build projects).

The target of PUE 1.5 for existing facilities, and 1.4 for new builds, could provide more opportunities for datacenter technology suppliers and consultants specializing in energy and cost efficiency, including economized cooling, containment, efficient power distribution systems and PFM datacenter components, among other technologies.

For a more detailed discussion on the suppliers of DCIM software into federal datacenters, and the implications and opportunities the new rules may provide, see 'US federal government mandates DCIM, Part 2: pay dirt for suppliers?' which will be published shortly.

Part 2: Pay dirt for suppliers?

All US federal government datacenters will be required to deploy datacenter infrastructure management (DCIM) software, as part of an updated, broader efficiency mandate (covered in Part 1). Agencies have until 2018 to deploy the software, unless they are expanding or upgrading a facility; any new build or retrofit project before then must include DCIM.

Of course, a number of federal facilities – we estimate at least 30 or so – have already deployed DCIM (according to our definitions, which are somewhat stricter than most), and we are aware of several other presale engagements. Even so, the new rules will mean new opportunities for suppliers; we estimate that 100-150 federal datacenters will be buying DCIM in the next couple of years. That could translate into a $30m-50m opportunity in initial sales for DCIM suppliers.

THE 451 TAKE

Even though the DCIM market is distinctly overcrowded, with about 70 suppliers, only about half a dozen of them – both large and small vendors – offer products that could meet the new federal requirements. This is not just because these vendors form a technical elite. It is also because the US government's requirements are certainly tough. So tough, in fact, that we would not be surprised if some existing DCIM contracts are supplanted, or at least supplemented, with new software. It is almost certain that the new rules will boost DCIM sales, although the opportunity will only be at the top end of the supplier market, and competition will be brutal.

DCIM IN FEDERAL DATACENTERS TODAY

One dozen DCIM suppliers of note already have federal datacenter customers, and about half of these supply to multiple agencies. The table below lists some of these suppliers.

Select DCIM suppliers with US federal government customers

Source: 451 Research, 2016

DCIM SUPPLIER	GOVERNMENT AGENCY	DCIM PRODUCT	NOTES
CommScope / iTRACS	Undisclosed	iTRACS DCIM Software Suite	Multiple federal agencies are DCIM customers
Cormant	US Senate	Cormant-CS	
Eaton	Undisclosed	Foreseer	Several federal government agencies are customers
Emerson Network Power	US Department of Justice, US Department of Labor, US Department of Defense, US Department of the Treasury, others undisclosed	DSView, Trellis, Aperture	Several federal government agencies are DCIM customers via direct sales and integration partners
Geist	Undisclosed	Racknet, Environet	Several federal government agencies are DCIM customers
Nlyte Software / FieldView Solutions	Undisclosed	Nlyte, FieldView	Several federal government agencies are DCIM customers

DCIM SUPPLIER	GOVERNMENT AGENCY	DCIM PRODUCT	NOTES
Panduit / SynapSense	US Department of Agriculture, US Department of Energy, others undisclosed	SmartZone, SynapSense	Several federal government agencies are DCIM customers
Schneider Electric	Undisclosed	StruxureWare for Data Centers	Several federal government agencies are customers
Siemens	Undisclosed	Datacenter Clarity LC	
Sunbird Software	Undisclosed	dcTrack, PowerIQ	Multiple federal agencies are DCIM customers
TSO Logic	NASA	TSO Logic	Monitors compute utilization and automates power states
Vigilent	Undisclosed	Vigilent Dynamic Control	

Only some have products that are capable of meeting the new requirements (see below). Suppliers such as SynapSense and Vigilent have specialist dynamic cooling optimization systems, which are a subsector of DCIM and do not directly compete against DCIM suites. Eaton offers sophisticated power-monitoring and management software and hardware, while Geist is best known for its environmental monitoring systems.

Conversely, there are also suppliers that don't yet have agency customers, but whose products could satisfy the new mandate (we know of at least one that is currently in proof-of-concept trials with multiple large agencies). Product capabilities of specific suppliers are summarized in our DCIM and Beyond: A Guide to Datacenter Management Tools report.

WHAT TYPES OF PRODUCTS WILL WIN?

The nature of federal datacenter deployments is similar to other industries, with the notable exception of security issues. This typically means that DCIM systems must be custom and 'hardened,' with additional encryption and custom network configurations; personnel must have top security clearance; and remote communication capabilities must be disabled.

Because the new mandate requires both energy monitoring and inventory tracking, most demand is likely to be for DCIM suites, as opposed to point products that tackle just one of these areas (although it is certainly possible to integrate point products to achieve an overall solution). Many of the agencies that are using DCIM today are doing so to optimize energy efficiency at the facility level, and to track and manage both IT and facility assets. Agencies also tend to seek operational-cost-transparency features, for chargeback and showback modeling. What-if scenario planning is particularly useful for consolidation projects, as are features to forecast energy reduction savings.

A new requirement is to demonstrate improved facility utilization over time, so products that readily report on total available capacity (power, space, cooling) and actual usage will be sought after. The mandate also requires that DCIM tools provide the capability to measure server utilization – something that many DCIM software tools cannot do natively. Given that server utilization in federal datacenters currently averages about 5% (yes, 5%), and that the new rules appear to set a target of 65% utilization (by 2018), we believe server-power-automation features will also be attractive. Specialist suppliers of server-power management and analytics software, such as TSO Logic, may benefit from allying more tightly with suppliers of complete DCIM tools to target the federal market. Leading DCIM suite suppliers Schneider Electric and Nlyte Software/FieldView Solutions license the Intel Data Center Manager toolkit to enable server-power capping, load shedding and throttling down of idle machines. ABB, Baselayer Technology, CommScope/iTRACS and TSO Logic are also Intel DCM licensees.

We know that at least one large agency is seeking software capabilities to profile the energy consumption of its IT applications, and to detect malware that targets facilities control systems, such as chillers and UPSs. Only a handful of products today have these features – and even then, custom work is likely to be required.

WHICH SUPPLIERS WILL BENEFIT THE MOST?

Suppliers with full DCIM suites that include monitoring and asset management will likely win out over point products – operators typically prefer pre-integrated capabilities, especially when facing a deployment deadline. And as discussed, DCIM suites with capacity forecasting and server-power-control features will be particularly well positioned. Suppliers with these types of DCIM capabilities include ABB, Baselayer Technology, CommScope/iTRACS, Emerson Network Power, Nlyte Software/FieldView Solutions, Panduit, Schneider Electric and Siemens.

Of course, those that have already sold into federal datacenters may be able to expand sales with existing agencies or use these contacts (and experience) to sell into other agencies, including for retrofit and new build projects. However, questions remain around the government's forthcoming procurement program. Little is known to date, except that it will likely be centralized and, once in place, agencies will have to comply with it or prove that it doesn't meet their specific requirements.

Suppliers whose software enables full customization of PUE calculations, cost-based metrics and other KPIs could win out. Eventually, the government will likely standardize on methods for calculating PUE, IT utilization and other metrics, such as water usage efficiency, and these methods could be part of its procurement program. The government will also probably require that some computer rooms be managed centrally, so there will be an opportunity for remote management software and services.

HOW BIG IS THE OPPORTUNITY?

The federal government has yet to determine how many datacenters it actually has and how many it should ideally have. The estimate in 2015 was more than 7,000 datacenters, of which only about 240 are thought to be standalone datacenters (classified as 'tiered' by the government) – the rest were small server closets or rooms that are targeted for closure (nontiered). It plans to reduce its count of tiered facilities by at least 25% and nontiered by at least 60% by 2018.

The government's datacenter classifications and DCIM definitions are open to interpretation, making it tricky to estimate the opportunity. By our reckoning, taking into account current DCIM deployments (roughly 30-50 datacenters) and the government's reduction targets – and given the its broad message to outsource and consolidate where possible – we estimate roughly 150 federal datacenters (maximum) will remain in operation and will be seeking to buy DCIM. Conservatively, the actual number could be closer to 100.

Sizing the US federal government datacenter opportunity: a rough estimate

Source: 451 Research 2016

DATACENTER TYPE	# OF SITES IN 2015	# OF SITES IN 2018	# OF SITES POST-2018	DCIM REQUIRED
All facilities	7,100	2,860	180	
Tiered datacenters (larger)	240	(240 reduced by 25%) = 180 max	Likely to remain about the same	Full DCIM
Nontiered (server closets and small rooms)	6,700	6,700 reduced by 60%) = 2,680 max	0*	Server utilization only (i.e., full DCIM is not required)

**It is unknown whether the federal government will outsource future demand for edge-of-network datacenters to accommodate smart-city, smart-building and other IoT-related applications.*

Assuming an 'average' initial outlay of $330,000 for DCIM software and deployment costs per datacenter (3MW provisioned capacity), the opportunity for total DCIM sales could be roughly $33m-49m by 2018, based on our assumptions. (For details on our DCIM pricing estimates, see our DCIM Software: Adventures in ROI report.)

It is difficult to gauge the average size of these facilities, but we assume they would be at least 1MW in total power capacity – anything smaller could be a potential target for consolidation, outsourcing or sharing services used by other agencies.

The server utilization software opportunity is theoretically about 2,500 sites in 2018, although it could be significantly lower. The number of small sites remaining might be relatively few, and more importantly, agencies may obtain server-utilization metrics and automation capabilities from Intel or similar middleware embedded in the servers. This would be a boost to Intel, although not a material revenue stream for the large chipmaker. Of course, agencies may buy DCIM software to monitor their smaller sites. Either way, the server-closet (nontiered) opportunity for any supplier will shrink as the government steadily moves toward its goal of zero nontiered datacenters.

Beyond 2018, it seems doubtful that the federal government will build new datacenters, or at least very many of them. Additional energy-efficiency, IT and facility-utilization requirements should stymie demand. Plus agencies are required to explore alternatives for additional capacity, including the use of public cloud and colocation services, and shared IT services among agencies.

For a more detailed discussion on the broader US federal datacenter consolidation initiatives, see Part 3 in this report series, which will be published shortly.

Part 3: Removing datacenters from the closet

Since 2010 the US government has been trying to consolidate the large number of federal datacenters and make the remainder significantly more efficient via its Federal Data Center Consolidation Initiative (FDCCI). The latest chapter in this effort came in March, with the introduction of the Data Center Optimization Initiative (DCOI) by the US Office of Management and Budget (OMB). The rules put a freeze on all new datacenter builds, and commit government agencies to consolidate the remaining facilities and achieve minimum Power Usage Effectiveness (PUE) ratings by deploying datacenter infrastructure management (DCIM) software. The specifics of DCOI and opportunities for datacenter technology suppliers are examined in Part 1. The opportunity for DCIM suppliers specifically is analyzed in Part 2.

Alongside the publication of the DCOI regulations by the OMB, US government watchdog the Government Accountability Office (GAO) issued its own in-depth report on the consolidation effort, which includes estimates that the cost savings could eventually reach $8bn (the OMB's estimate is a substantially lower $1.4bn). In this final part, we examine the wider consolidation plans in more depth, the expected cost savings, key drivers and the impediments.

THE 451 TAKE

To some extent, the US federal datacenter consolidation plans mirror the wider shift in datacenter ownership, construction and operation. Our research shows that enterprises are consolidating facilities and gradually moving more workloads to colocation or public cloud (via private cloud). However, just like other organizations, government agencies have hit barriers in this process. These include issues such as security, lack of organizational coordination and the need for dedicated infrastructure for some critical applications (e.g., high-performance computing). The decision to shutter every government server closet and server room is sound from a cost and efficiency perspective, but will probably be very challenging to achieve. While the government is busy closing its server rooms and closets, telcos and service providers will increasingly be investing in small edge datacenters to support the rise of IoT.

CONTEXT

The federal chief information officer (CIO) launched the FDCCI in 2010, overseen by the FDCCI Taskforce. The aim was to cut costs, improve efficiencies and consolidate the thousands of federal datacenters built over the last 20 years. According to the OMB, the federal government had 432 datacenters in 1998; more than 1,100 in 2009; 9,540 in July 2014; and more than 10,000 in 2015. (Only 24 of the 60 or more government agencies participated in the FDCCI.)

The number of facilities – and their ad hoc deployment – has significant intrinsic cost implications, as well as an impact on IT efficiency and management. In 2009, for example, the OMB reported server utilization rates as low as 5% across the federal government's estimated 150,000 servers.

To help spur the consolidation effort, the Federal Information Technology Acquisition Reform Act (FITARA) provisions were enacted in December 2014, including a commitment to close 40% of all noncore (server closets and rooms) datacenters by the end of FY 2015. In March federal CIO Tony Scott introduced the DCOI, which mandates the following actions:

- A freeze on all new datacenter builds or significantly expanding existing facilities without OMB approval.
- A move to interagency shared services or third-party colocation facilities where possible.
- Adoption of the federal government 'cloud first' strategy (introduced in 2011), which requires agencies to use cloud infrastructure (private and public) whenever possible while considering issues such as risk and standards.
- A minimum PUE of 1.5 for existing facilities, and 1.4 (or ideally 1.2) for new builds.
- The introduction of DCIM tools to help improve overall efficiency and drive server utilization.

Under the DCOI, the overall aim is for agencies to close 52% of all federal datacenters, and to reduce by 31% the total floor space occupied by facilities by 2018. Facilities that cannot achieve PUE or efficiency targets should be targeted for closure first.

WHAT IS A FEDERAL DATACENTER?

Ambiguity over what exactly constitutes a datacenter has no doubt hampered some of the government consolidation effort to date. The FDCCI has defined facilities in terms of size, importance/service provision and (with the DCOI) availability.

- In 2010 the OMB defined a datacenter as any room used for the purpose of processing or storing data that is larger than 500 square feet and meets availability requirements.
- In 2011 the federal CIO changed the definition to include a facility of any size, including server closets and rooms.
- In September 2014 agencies reported to own a total of 9,658 datacenters. Of these, 242 were reported as providing 'core' agency enterprise IT services, while the remaining 9,416 were defined as 'noncore' rooms and closets.
- Under the latest DCOI rules, a datacenter is defined as a room equipped with at least one server that provides IT services. The DCOI further classifies datacenters according to whether they are tiered or nontiered, and abandoned the core versus noncore description. Tiered facilities are those that are equipped with dedicated whitespace for IT, a UPS, an independent cooling system and backup generators. All other facilities are considered to be nontiered. (Note: The use of 'tiered' in the DCOI is based on the Uptime Institute – a subsidiary of The 451 Group – Tier Classification System, according to the OMB. However, Uptime Institute explicitly uses the term only to describe those facilities that it has actually certified as Tier I to IV.)

SERVER CLOSETS ARE DEAD; LONG LIVE EDGE DATACENTERS

By 2018, 25% of all tiered, and 60% of all nontiered, datacenters should be closed, according to the OMB. The long-term goal is to close all non-tiered datacenters – the OMB considers them to be a security risk, management challenge and inefficient use of resources.

Agencies' applications and workloads should be moved to colocation datacenters, or cloud services where possible, according to the OMB. In 2011 a report from the federal CIO stated that up to $20bn of the federal government's $80bn in IT spending could be allocated to private and public cloud services. These goals fit with wider industry trends away from enterprise-owned server closets and rooms, and toward centralized facilities and third-party service providers. According to our Voice of the Enterprise research, server rooms and closets made up more than 95% of the 4.3 million datacenters worldwide in 2015. But the proportion of total datacenter floor space owned by enterprises – including government – will likely decrease from approximately 81% in 2015 to 65% in 2018.

While the OMB is right to point out the inefficiency of multiple server closets and rooms, we believe there will be an increasing requirement for more so-called edge datacenters – small facilities located in metropolitan areas – to support the rise of IoT. It is unlikely that the government will need to own edge datacenters in the near term; when it needs to provide IoT services, it will probably outsource to telcos or service providers. However, a small percentage of existing government server rooms and closets – especially those located in buildings in metropolitan areas – could be repurposed for government-related IoT services in the long term. We plan to provide further analysis of the opportunity around edge datacenters later in 2016.

PROGRESS AND SAVINGS

In March, alongside the OMB memo, government watchdog GAO issued a report to congress – Datacenter consolidation: Agencies Making Progress, but Planned Savings Goals Need to Be Established. The report, based on an audit of the progress of individual agencies from August 2015 to March 2016, stated that:

- Consolidation efforts to date have resulted in an estimated $2.8bn in cost savings and avoidances from datacenter consolidation and efficiency efforts from 2011 to 2015.
- The US Departments of Commerce, Defense, Homeland Security and Treasury accounted for about $2.4bn (or about 86%) of the total.
- Eventual savings are expected to increase to more than $8bn by 2019, according to GAO.
- The GAO target is significantly more aggressive than the $1.4bn outlined in the OMB report. However, the OMB plans to set savings targets for individual agencies in Q2 2016.

Completed and planned datacenter closures from 2010 to 2019 (as of November 2015)

Source: GAO analysis of agency data.

TOTAL FEDERAL DATACENTERS (AS OF FY 2015)	10,584 (224 core)
DATACENTERS CLOSED THROUGH THE END OF FY 2015 (30 SEPTEMBER 2015)	3,125
ADDITIONAL DATACENTERS PLANNED FOR CLOSURE THROUGH TO END FY 2019 (30 SEPTEMBER 2019)	2,078
TOTAL DATACENTERS PLANNED FOR CLOSURE BY END OF FY 2019 (30 SEPTEMBER 2019)	5,203

CHALLENGES

According to the GAO report, 22 of the 24 agencies participating in the consolidation initiative made limited progress against the OMB targets.

- By November 2015, agencies identified a total of 10,584 datacenters, of which they reported closing 3,125.
- Agencies collectively fell short of the OMB's initiative-wide goal to close 40% (4,044) of all noncore centers by fiscal year 2015.
- Of the nine metric targets set by the OMB – including server utilization, PUE and virtualization – only one was met by half of the 24 agencies, while the remaining eight were each met by less than half.
- While the OMB's FY 2015 goal was not met, agencies should exceed the goal by the end of FY 2016. Agencies plan to close a total of 5,203 datacenters by the end of fiscal year 2019.

The GAO reported that agencies had a variety of challenges in meeting consolidation and efficiency targets, which have included:

- Decentralized structure: Five agencies reported that their decentralized organizational structure hampered the consolidation and optimization process.
- Mission-critical applications and proximity to users: Four of the agencies reported that a number of their facilities could not be consolidated because the volume or type of data or services required the facility to be close to its users.
- Unfinished consolidation: A number of facilities reported that they couldn't implement efficiency measures until consolidation had been finished.