Data Center Consolidation Plan

Report to the Joint Legislative Oversight Committee on Information Technology

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INTRODUCTION

This report is in response to SL 2015-241 that states “the State Chief Information Officer shall create an inventory of data center operations in the executive branch and shall develop and implement a detailed, written plan for consolidation of agency data centers in the most efficient manner possible.”

The report will mention another requirement from 2015-241 stating "On or before May 1, 2016, the State Chief Information Officer shall report to the Joint Legislative Oversight Committee on Information Technology and the Fiscal Research Division on the number of physical servers eliminated across all departments as a result of data center consolidation and the savings associated with such elimination."

Overview

This report will provide an inventory of the data centers in the executive branch, a list of agencies that are in and out of scope and why, a brief summary of the consolidation efforts and savings from 2012 – 2015, and a consolidation plan.

Scope

The agencies in scope are the participating agencies as defined in SL 2015-241.
(1) Department of Natural Cultural Resources (DNCR)
(2) Department of Health and Human Services (DHHS)
(3) Department of Revenue (DOR)
(4) Department of Environmental Quality (DEQ)
(5) Department of Transportation (DOT)
(6) Department of Administration (DOA)
(7) Department of Commerce (DOC)
(8) Governor's Office.
(9) Office of State Budget and Management (OSBM)
(10) Office of State Human Resources (OSHR)
(11) Office of the State Controller (OSC)

The Department of Public Safety (DPS) and Community College System Office were invited to provide their data center information. DPS responded and the Community College System Office declined to respond but participated in the discussions.

Inventory

DIT reviewed, evaluated, and in some cases included data from a 2011 IT Infrastructure Study and Assessment (INSA) report, the on-going Enterprise Active Directory Service (EADS) project, and agencies’ inventory of their data centers. The agencies provided their data centers (defined loosely as any physical location where a server is stored), the number and type of servers, power and HVAC capabilities, total and available rack space, and other technical specifications. 64 locations were identified; however, many locations were just a room with a server. There are 14 data centers in the state that are considered tier-2 or above. Data center tiers are described in Appendix 1.

Servers

Servers in data centers outside DIT	3485
Servers in DIT data centers	1660
Total	5145

This total inventory of servers in the table above reflects servers inside Department of Information Technology (DIT) data centers, as well as other agency data centers and outsourced hosting of servers.

Consolidation Savings

DIT compared our December 2015 data center information with the INSA report from late 2011. Consolidation efforts over the last four years reduced approximately 587 physical servers at DIT. The consolidation effort represents real savings to agencies by a reduction in charges due to the costs that are no longer incurred by DIT.

Application Analysis

With the collaboration of the agencies, DIT will perform an application analysis of the applications hosted on the servers across the state. Agencies will assist DIT in mapping those applications to their corresponding servers and the services. This information will help tailor our data center consolidation plan, determine risk mitigation strategies, and help identify the appropriate technology to employ in the most efficient manner possible with minimal disruption to service.

Storage Consolidation

As part of the analysis, DIT will perform an assessment of storage associated with applications and develop a plan to consolidate storage more efficiently based primarily on application needs and use, thereby reducing costs.

Legacy Applications

As a separate work stream in conjunction with the DIT Transition team and others reviewing legacy applications, DIT will look for opportunities to retire/consolidate/replace applications allowing the decommissioning of the servers supporting those applications. (143B-1322)

Consolidation Plan

DIT's consolidation plan includes several approaches related to gaining efficiencies and reducing costs. These approaches include existing efforts (including MS 2003 server remediation), server consolidation within agencies, consolidation with DIT, new infrastructure/data center technology, and re-purposing existing data centers.

Current Initiatives

Several projects, such as the EADS project and the Windows 2003 server upgrade, provide opportunities to consolidate servers. For example, when upgrading out-of-support Windows 2003 servers, DIT analysts continue to review with agencies to virtualize servers and/or move servers into the DIT data center. Other projects like the EADS project eliminate domain controllers (on servers) that are scattered throughout remote locations across the state.

Windows Server 2003 is out-of-support and the state currently has 281 servers that have valid exceptions to remain on the network over the next two years. Every Server 2003 instance also incurs an annual extended support cost. The state will realize these cost savings as DIT, working in conjunction with other agencies, consolidates, virtualizes or eliminates the need for these servers over the next two years.

Server 2003	
Reduction of Server 2003 (physical) over two years	281*

*DIT and the agencies may need to procure some servers to accommodate the virtualization of these servers.

DIT is executing an EADS consolidation project that will merge participating agencies' active directory into EADS. AS part of this effort, some domain controllers will be eliminated, which will reduce servers.

EADS Project	
EADS Servers Eliminated	20

PLAN: Both projects have detailed work plans that will continue. However, the details of these projects will contribute to the Application Review activity noted in the Data Center Consolidation Plan on page 5. DIT will monitor the progress of these efforts and document the number of servers actually eliminated through these activities.

Agency Consolidation

Many agencies have multiple data centers and quick savings can be realized by virtualizing more physical servers into existing data centers. The target ratio for virtual to physical servers is 80/20. Virtualizing servers replaces one or more physical servers with a virtualized server. For this report, DIT used a ratio of 2:1 (i.e., for every virtual server we add, two physical servers are removed). This not only reduces physical servers, but the overall number of servers. Servers in

non-DIT data centers are 67% virtualized. The chart below represents the elimination of servers by increasing virtualization from 67% to 80%.

Non- DIT Virtualize 80% (Increased from 67%)	
Total number of servers	3485
Target number of servers (after 80% virtualization)	3240
Eliminated physical servers	490
Additional virtual servers	245
Net Servers Eliminated	245

Note: Virtualization targets may vary due to the application requirements.

DIT Consolidation

The end-goal is to have a handful of data centers where large economies of scale and leveraged technical skill can be utilized. DIT is analyzing the data to develop and execute a schedule that folds in DIT's data center capabilities with the agencies' business and technical requirements. DIT has ample space and FTEs that are solely purposed to provide IT capabilities to the state.

DIT is 62% virtualized and is targeting 80% virtualization. The chart below shows total reduction of servers by increasing virtualization from 62% to 80%.

DIT Virtualize 80% (Increased from 62%)	
Total number of servers	1660
Target number of servers (after 80% virtualization)	1535
Eliminated physical servers	246
Additional virtual servers	121
Net Servers Eliminated	125

PLAN: The virtualization of servers is an ongoing operational effort that not only reduces the number of servers, but prepares the DIT environment for the transition of servers into the data center. (See page 6 for details)

DIT Data Center Preparation

As servers are consolidated into the DIT data centers, substantial cost savings can be realized above and beyond virtualizing multiple physical servers into a single virtual server. Converged infrastructure can dramatically drive down the rate costs per server. These technologies will replace existing stand-alone servers with the capability to consolidate several of them onto a single converged system. This capability alone will be a major factor in eliminating many of the data centers already identified.

PLAN: DIT is collaborating with vendors to evaluate the use of converged and/or hyper converged technology to improve overall utilization of the data center. The result will be a phased solution, which will include a reduction in equipment and costs. Moreover, it will allow server consolidation without the accumulation of all of the equipment from agency data centers.

Additionally, DIT is partnering with storage vendors to develop the best approach for reducing costs and providing appropriate service levels and tiers of storage. Although this may not reduce servers, the new approach should reduce costs and allow an easier data transition from non-DIT data centers.

Currently, DIT at both EDC and WDC have existing physical capacity to support servers for the consolidation effort.

Re-Purpose Existing Data Centers

As consolidation continues, there are data centers that could be re-purposed.

Timeline

Data Center Consolidation Plan			
Activity	**Work Explanation**	**Expected Result**	**Date**
Application Review	Determine what is on each server Categorize (quick win, early consolidation - short term, phased consolidation)	Application Inventory Quick Win* List for early execution (list should also include a server virtualization list and schedule, if applicable)	1/1/2016 - 3/1/2016
	Review should also include retirement opportunities, consolidation opportunities through EADS and MS Server 2003 project	Other category lists for risk assessment	1/1/2016 - 3/1/2016
Server Virtualization	DIT data center will complete virtualization efforts	80% virtualization, Server Reduction	6/1/2016
Quick Win Execution	Use Quick Win list to begin consolidation efforts	Server Reduction	3/1/2016 - 9/1/2016
Risk Plan	Assess risks for non quick win categories by documenting the risks and risk mitigation strategies)	Risk Mitigation Plan that includes any medium or high security implications and customer impact.	2/1/2016 - 6/1/2016
Resource Planning	Partner with agencies to determine resource availability for prioritization of data centers	Priority list of data centers to consolidate	1/1/2016-6/1/2016
Scheduling	Using application review, risk plan, and resource plan to develop detailed schedule	Detailed schedule	3/1/2016 - 9/1/2016
*Quick win = low risk, minimum or available resources, existing hardware			

Conclusion

The report below summarizes the number of servers that have and can be eliminated from the combined efforts. The first chart shows actual servers eliminated since the INSA 2011 report to the beginning of 2014 and the consolidation and virtualization savings completed in 2015. This is actual servers reduced by DIT and state agencies. The second chart shows the ***predicted*** number of servers eliminated by enacting the data consolidation plan, which includes 80% virtualization plan, Server 2003 project, EADS consolidation, and legacy applications review.

A running tabulation of server elimination will be kept and reported by 1 May 2016.

Activity	Eliminated Servers
INSA 2011 Report to January 2015	538
2015 Consolidation/Virtualization Savings	49
Actual Servers Eliminated	587

Activity	Eliminated Servers
DIT 80% Virtualization	246
Non-DIT 80% Virtualization	490
Server 2003	281
EADS	20
Planned Servers Eliminated	1037

Combined Servers Eliminated	1624

Appendix 1 - Datacenter Tier Definitions:

Capability	Tier 1	Tier 2	Tier 3	Tier 4
Distributed paths (power source)	1	1	2	2
Redundancy in power distribution paths	no	no	yes	yes
Redundant and physically separate power	no	no	no	yes
Redundant components in equipment	no	yes	yes	yes
Redundant HVAC	no	no	Maybe	Yes
Staffing	none	none	1+ shift	24/7
Site Availability	99.67	99.75	99.98	99.99
Annual Site Downtime (including scheduled)	28.8 hrs	22 hrs	1.6 hrs	0.8 hrs
Single Points of failure	many	many	some	none

Appendix 2 – Datacenter and Server Inventory