Federal Data Center Consolidation Initiative

Social Security Administration

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1 Introduction

The Social Security Administration (SSA) remains strongly committed to the appropriate design of our data center strategy to meet our data processing requirements effectively and efficiently. Over the years, we have moved decisively from a distributed to a more centralized model that takes into account efficiencies of scale, response time, data distribution requirements, and disaster recovery considerations.

Our most recent advancement of our raised floor environment occurred with the addition of the Second Support Center (SSC) in 2009. The SSC is a co-processing facility in North Carolina that works hand-in-hand with our National Computer Center (NCC) in Baltimore to process critical agency workloads and each act as the disaster backup for the workloads of the other center. Some capabilities, such as the public's access to www.socialsecurity.gov, employee access to the Internet, and IT operations control, are possible from both data centers simultaneously, thus ensuring these very important communications and control functions will never be off the air, even in the event of a disaster. The NCC-SSC disaster recovery capability replaced our previous disaster recovery capability, which relied on an expensive leased facility that was not able to provide sufficient capacity to fully support all of the agency's critical systems. The value of the shared operations control function has been proven during severe weather, fire alarms, and earthquakes when the SSC was able to take on additional responsibilities at a time when NCC staff was not able to make their way into work.

Currently, SSA is in the process of designing and building a new National Support Center (NSC) to replace the NCC, which has been in operation for over 30 years. Two independent studies (EYP and Lockheed Martin) have shown that the building's infrastructure (electrical, plumbing, HVAC) is reaching a critical stage and must be replaced with a new and up-to-date facility. SSA has been granted $500M in American Recovery and Reinvestment Act of 2009 (ARRA) money to design, build, and migrate to a new data center that will be located in Urbana, Maryland. SSA will begin the IT migration to the new data center in January 2015 and be complete by June 2016.

As part of the requirements stage, SSA hired a consultant to research and deliver a growth model for the new data center that would provide power, space, cooling, and operational workload projections over the 30 year expected lifetime. As a result of this study, SSA is actively working on a consolidation and virtualization effort to enable the agency to capitalize on state-of-the-art energy efficient equipment layouts and designs. It will allow SSA to move into the new data center, which will have a reduced computer room floor footprint. Federal energy mandates for new federal buildings are the impetus for this effort with the goal to attain Leadership in Energy and Environmental Design (LEED) Gold Certification.

Verifying and tracking the equipment inventory has played a major factor in SSA's acquisition strategy for new data center hardware and is an ongoing process. Any new hardware request is reviewed as a virtualization candidate. The growth model predicts that this acquisition strategy, in conjunction with

the mainframe environment, will realize an overall virtualization percentage of 60%. While the virtualization percentage will increase due to technological advancements, in accordance with a projected 15% year-to-year server workload growth, SSA's goal is to reduce the 2009 baseline of approximately 1300 physical servers and maintain the hardware footprint to less than 1000 physical servers in the NSC over its 30 year lifetime.

Based on the fact that SSA has two data centers and will continue to have two data centers after the migration to the new NSC, SSA in the spirit of the goals of the Federal Data Center Consolidation Initiative (FDCCI) continually strives to reduce power consumption, maximize processing capabilities, and adhere to green IT initiatives. Therefore, all information discussed in this document will concentrate on information related to our consolidation/virtualization efforts in preparation for the migration from the NCC to the NSC, and take into consideration that both the NSC and SSC will co-process and serve as disaster recovery sites for each other. The consolidation/virtualization strategies and goals therefore are applied in both data centers.

2 Agency Goals for Data Center Consolidation

In preparation for the move from the NCC to the NSC, SSA will focus on consolidating and virtualizing major areas of our data processing footprint including servers, storage, and network. SSA is actively engaged in the planning and preparation for the migration. A workgroup has been in place since May 2009 whose original focus was on the requirements for the building but now the current focus also includes the IT migration aspect of the NSC Project. A consultant, procured with ARRA funding, has been hired to provide consultant services and work with SSA to produce a data center migration plan. This public/private partnership will concentrate on consolidation, virtualization, asset management, budget, and acquisition strategies. The goal is to maximize processing power through virtualization technologies to achieve higher energy savings and a decreased equipment footprint, which in turn will reduce operating costs and our carbon footprint.

Qualitative goals for Data Center Consolidation include:

- As a matter of course SSA aims to reduce, the Total Cost of Ownership for data center hardware, software, and operations, by continuing more effective acquisition and operations practices. These practices will automatically assume that any server request will be for a virtual server. A review will be performed when a waiver from virtualization is requested.
- Since SSA deals with a great amount of Personally Identifiable Information we will continue to comply with the Federal Information Security Management Act of 2002 to increase the overall IT security posture of the agency, by standardization, automation, and continuous risk monitoring.
- SSA is in the process of reviewing our current computing platforms to possibly reduce the number of operating systems, and capitalize on alternative and presumably less expensive operating systems like Linux. Linux is the basis for most X86 virtualization efforts, can run on any hardware platform, and is gaining in several sectors like Financial, Insurance, Airlines, and Federal Agencies.

- SSA will continue to adhere to federal recommendations and guidelines promoting the use of Green IT by reducing the overall energy and real estate footprint of federal buildings. The chief directives are Executive Order 13423, Executive Order 13514, 42 U.S.C. and 10 C.F.R. § 433.7 Federal Building Energy Efficiency Standards.

Quantitative objectives for Data Center Consolidation:

- During the requirements phase of the NSC Project in 2009, SSA set a goal of being 60% virtualized by January 2015 for X86 and RISC based hardware as calculated by the following formula: 100x(1-(Phys Srvrs / Phys Srvrs + Virt Srvrs)). Our goal is to achieve less than 1000 servers in each data center.
- Energy efficient equipment containment strategies for both data centers will focus on optimizing the power usage effectiveness (PUE) rating by increasing inlet air temperatures in accordance with the 2008 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) guidelines. SSA's goal is to achieve a PUE rating of 1.3 or better for both data centers.
- For the NSC, a LEED Gold Certification is a requirement. The U.S. Green Building Council (USGBC) will be the accrediting body.

3 Implementing Shared Services/Multi-tenancy

SSA is both a customer and provider of cloud or shared service data processing. It makes sense that services that can be provided by a department or agency, which allows access to information at portal type locations; not directly related to the mission of the agency, be utilized to achieve cost savings and standardization throughout the federal government. Examples for SSA include:

- SSA currently allows other federal and state government agencies access to our internal systems for SSN verification. Used mostly by the Department of Homeland Security, State Motor Vehicle Agencies, and employers, this access allows positive identification verification in compliance with the USA Patriot Act of 2001.
- The FAQs link on SSA's public homepage is a cloud service provided by a private company.
- SSA's Access to Financial Institutions process is part of the Supplemental Security Income process, can be accessed via SSA's public homepage, and is a cloud service provided by a private company.
- SSA hosts data operations for the Health and Human Services Office of Child Support Enforcement (OCSE).
- Human Resources utilizes the Department of the Interior's Federal Personnel Payroll System.
- Human Resources utilizes USAJOBS and USA Staffing hosted by the Office of Personnel Management (OPM).
- Human Resources utilizes eQuip from OPM for security and suitability investigations.
- All SSA employees access payroll records through OPM's Employee Express website.
- All SSA employees access their Official Personnel Folder through OPM's eOPF web portal.

- Citizen Access Routing Enterprise is a cloud-based call center solution utilizing Voice over Internet Protocol technology that improves services for SSA e-Gov initiatives.
- SSA's Office of Acquisition and Grants routinely utilizes FEDBIZOPS to conduct business.
- Electronic Disability is a national disability case processing system in which SSA collaborates with every state and territory of the US, as well as with private health care providers, to exchange and use disability data.

SSA will continue to provide and seek out cloud services that makes sense from a fiscal and operational standpoint. Due to federal building energy mandates, the new NSC is being built to house SSA workloads in addition to existing customer agency workloads only. At this time, multi-tenancy does not fit our business model (with the exception of OCSE) nor will extra space, power, and cooling be available for another agency's equipment.

4 Agency Approach, Rationale and Timeline

SSA has two major efforts underway that dictate how both our data centers will reach parity in processing, as well as in reducing energy consumption. The first project is the SSC. Begun in 2005, the SSC became a co-processing data center in May of 2009 with the migration of our national Electronic Disability Case Processing system from the NCC. In addition, several production processing functions necessary for co-processing and disaster recovery were implemented at both data centers in order for both data centers to become a back up site for the other. This effort will conclude by the first quarter of 2013.

The second project began in early 2009 for the replacement of the existing NCC. Migration of all production services from the NCC to the new NSC will start in January 2015 and conclude in June 2016.

For both efforts, we are aggressively pursuing consolidation and virtualization efforts at both sites. We have committed to the reduction of the number of physical servers that will be housed in the NSC to less than 1000 for the life of the new data center. We will achieve this goal by implementing strict adherence to consolidation efforts tied to our acquisition and capacity planning processes. We have taken metrics of existing equipment, shown physical server utilization, and identified underused equipment. Decisions are then made to add applications and services from underutilized equipment to a consolidated server. We also view any new server acquisition request as a request for a virtual server. If a waiver is requested due to the nature of the application or appliance then decisions are made for the viability and acquisition of new server hardware.

SSA also has efforts underway that will contain the airflow for equipment that studies have shown greatly increase cooling metrics thereby reducing energy consumption, thus reducing operating costs. We need to pursue containment strategies first for the NSC because the projected energy requirements dictate an air containment strategy to meet the strict energy requirements for new federal buildings and second for the SSC to achieve processing parity and energy savings.

We have committed to being 60% virtualized with less than 1000 physical servers in the NCC in order to fit into the footprint of the NSC. Our goal is to virtualize by no less than 15% each year until move-in occurs at the NSC in January 2015. A workgroup is in place that measures and monitors the consolidation/virtualization process. This effort incorporates asset and acquisition management.

By the time we fully migrate to the NSC in June 2016, both the NSC and SSC will have implemented full consolidation/virtualization, air flow containment, will be true co-processing centers and the disaster recovery or back-up site for the other.

5 Agency Governance Framework for Data Center Consolidation

The agency governance for the activities described in this document occurs at two levels. The Office of Telecommunications and Systems Operations proposes activities to occur over a two-year budget-planning horizon. The Deputy Commissioner of Systems/Chief Information Officer (CIO) reviews the proposals, determines that the appropriate planning and oversight is in place, and maintains contact with the project team to ensure the agency achieves the desired outcomes.

The development of the new data center, an effort led by the Office of Facilities and Supply Management, is subject to a much more elaborate and agency-wide governance process. The Associate Commissioner for Facilities and Supply Management reports to a committee comprised of the Deputy Commissioner for Budget, Finance, and Management and the Deputy Commissioner for Systems/CIO. The Deputy Commissioners, in turn, meet regularly with the Chief of Staff and the Commissioner of Social Security to update them on progress and gain their views on directions. The entire process, supported by staff from each Deputy Commissioner organization, collaborates on requirements definition and other tasks. The building procurement activities are managed by GSA who collaborate with the Associate Commissioner for Facilities and Supply Management.

- As part of the ongoing consolidation/virtualization effort fiscal decisions are made that eliminate redundant isolated systems and spending on commodity software, infrastructure, and operations.
- An integrated team of federal employees and consultants has been organized to plan and execute all data center migration and consolidation/virtualization. This team consists of Program and Project managers that oversee every technical area related to data center efficiency.
- Each technical area monitors system compliance for energy savings, operational savings, and fiscal responsibility.
- In February 2008, Michael J. Astrue, the Commissioner of SSA, established the Future Systems Technology Advisory Panel (Panel) by authority of the Federal Advisory Committee Act. The mission of the Panel is to provide independent advice and recommendations on the future of systems technology and electronic services at SSA five to ten years into the future. The recommendations of the Panel will provide SSA a roadmap of future systems

technologies needed to carry out our statutory mission. Advice and recommendations will relate to areas of future Internet applications, customer service, privacy, and other arenas vital to SSA's ability to serve the American people.

5.1 Best Practices

As a result of the IT Workload Growth Model conducted by an independent consultant in response to the requirements phase of the NSC Project, a Consolidation/Virtualization project team was formed to start work on reducing the number of physical servers in the NCC so we will fit into the new NSC. This strategy also applies to the SSC. The study posited that SSA has a 15% year-to-year workload increase along with a 25% jump every 5 years. Our goal is to achieve 60% virtualization while keeping the number of servers in the NCC and eventually the NSC, to less than 1000 even as our workloads increase.

The workgroup first gathered server metrics from every production server to quantify server usage. This information was then presented to the hardware/software owners to show how we could improve efficiency by consolidation/virtualization.

Secondly, a fiscal process was put in place whereby all requests for new servers were first considered to be for a virtual server. If the support component insisted on a physical server then further justification and review is conducted, and finally a decision made. With this process in place, we have seen a monthly net increase of 20 servers in January be reduced to a net increase of zero or less currently. We have started to see a downturn in the total number of servers in the NCC. The SSC, keep in mind, is still being ramped up.

As a result of the higher server densities that can and will be achieved it is necessary to develop an air containment strategy. The new NSC will have Hot-Aisle-Containment while the NCC and SSC can take advantage of cost savings and higher cabinet densities by exploring the use of Cold-Aisle-Containment.

Another area being considered is the ability to be able to monitor both the IT equipment and the IT whitespace environmental metrics. This convergent monitoring will allow better distribution of virtual servers by allowing the movement of virtual servers away from a “hot” aisle to a “cold” or less utilized cabinet or row.

5.2 Cost-benefit Analysis

Our goal for the NCC is to reduce the number of physical servers to 1000 by January 2015, the start of the IT migration to the NSC. We also plan by 2013 to have both the NCC and SSC reach parity in processing and disaster recovery capability. After we achieve processing parity between the two centers, we will continue to pursue aggressive virtualization. As our workloads increase 15-25% per

year it will be necessary to keep up with processing capabilities. We are relying on continuing technological advances to stay within the forecasted footprint of our data centers.

Cost savings will be realized as we reduce the number of servers we have to buy and replace during the typical hardware lifecycle. Industry forecasts predict an eventual cost savings will be also achieved from air containment strategies and utility cost reductions.

For SSA over the next four years we will fully build out a second support center, build a new data center to replace the existing NCC, and continue to operate the NCC until June 2016. In that time, our equipment and workloads will increase. The savings we will realize will come from the approximately 300 physical server reduction in the NCC.

5.3 Risk Management and Mitigation

All projects here at SSA follow strict project management guidelines and principles. Several checks and balances are used to define and monitor risk at each level. All projects are required to have a dedicated project manager who oversees a project plan. If a project is large enough, an OMB 300 is maintained for further project and executive oversight. The project plan is vetted through multiple layers of management and regularly, progress is reported at each level. Deviations in project costs or milestones are dealt with in a collective management process. Appropriate measures are then taken to adjust project timelines and budgets.

5.4 Acquisition Management

SSA will control acquisition costs by carefully monitoring existing inventory, virtualization opportunities, vendor performance, and alternative supply options. SSA will continue to utilize existing government-wide purchasing vehicles, as well as SSA negotiated blanket purchase agreements. Acquisition planning and progress is carefully monitored on a weekly basis and subjected to multiple levels of executive oversight. Our goal is to further reduce acquisition costs by reducing the equipment footprint at both SSA data centers and continuing to explore cloud services offered by other agencies and private industry.

5.5 Communications Strategy

In accordance with the FDCCI, SSA will participate and communicate all necessary information as it relates to the goals and directives of the workgroup. SSA has regimented program and project management reporting processes that will continue as we strive for open and transparent information exchange about our progress. We adhere to all open government and Freedom of Information Act statutes and guidelines. Our Offices of Communications, and Legislative and Congressional Affairs will carry on activities that will inform and educate both the public and private sector.

6 Progress

6.1 FDCCI Consolidation Progress

Since we are still in the process of building out the SSC and experiencing continuing workload growth, our progress is being made by reducing the increase in the number of servers we install through consolidation and virtualization in both data centers. The net monthly increase for the NCC is close to zero, down from a net 11 gain in January 2011, and for the SSC it is averaging 18.

The downward trend for the NCC will continue until we reach the projected 1000 server limit, which is expected by January 2015.

6.2 Cost Savings

By creating approximately 240 virtual servers (X86, RISC) we reduced the number of physical servers purchased in FY11 by 240, which translates into saving an estimated $200K on hardware. As the down-trending of servers continues through FY12, we expect additional savings to be gained in lower electrical operating costs. We also expect energy costs to be reduced by the use of air containment and raising air inlet temperatures. However, since we do not have separate metering of whitespace and office space in the NCC, we cannot fully determine the electrical cost savings generated from consolidation/virtualization thus far.