



**Social Security Administration
Data Center Optimization Initiative
Strategic Plan**

(FY2016 – FY2020)

**May 14, 2020
Version 1.0**

Table of Contents

1	Purpose	4
2	Background	4
3	Data Center Goals, Achievements, and Challenges	7
3.1	Centralized Management Model	8
3.2	Migration to The Cloud	9
3.3	Consolidation and Closure of Data Centers	10
3.4	SSA’s Business Resiliency Program	11
3.5	Data Center Optimization	11
3.5.1	Performance Metrics	11
3.5.2	E-Vault Expansion	12
3.5.3	Data Center Tier Certification	13
3.5.4	Shared Service Provider	13
3.5.5	Data Center Fabric Enhancements & Optimizations	13
4	Cost Savings and Accrued Benefits	14

1 Purpose

Under the Data Center Optimization Initiative (DCOI), released August 1, 2016, Social Security Administration (SSA) has developed a DCOI Strategic Plan that will report on data center strategies, goals, and challenges in meeting all requirements outlined in the Memorandum for Chief Information Officers of Executive Departments and Agencies (M-19-19) dated June 25, 2019. This Memorandum supercedes M-16-19.

2 Background

The Social Security Administration has constructed the enterprise-class data center fabric depicted in [Figure 1](#) below over the last decade. The data center fabric consists of:

- the Second Support Center (SSC) is located in North Carolina.
- the National Support Center (NSC) is located in Maryland.
- the Electronic Vault (E-Vault) is located in Colorado (went online June 2019).
- four Service Delivery Points (SDPs). These are geographically located in the NSC, SSC, Missouri, and California.
- presence on Amazon Web Services (AWS) public cloud.
- presence on Microsoft's AZURE public cloud.
- presence on Microsoft's Office 365 (O365) public cloud (started deploying in 2019 and will complete in 2020).

The fabric infrastructure processes casework for the millions of citizens and beneficiaries in the United States. It is designed to provide high-availability, performance, and business resilience.

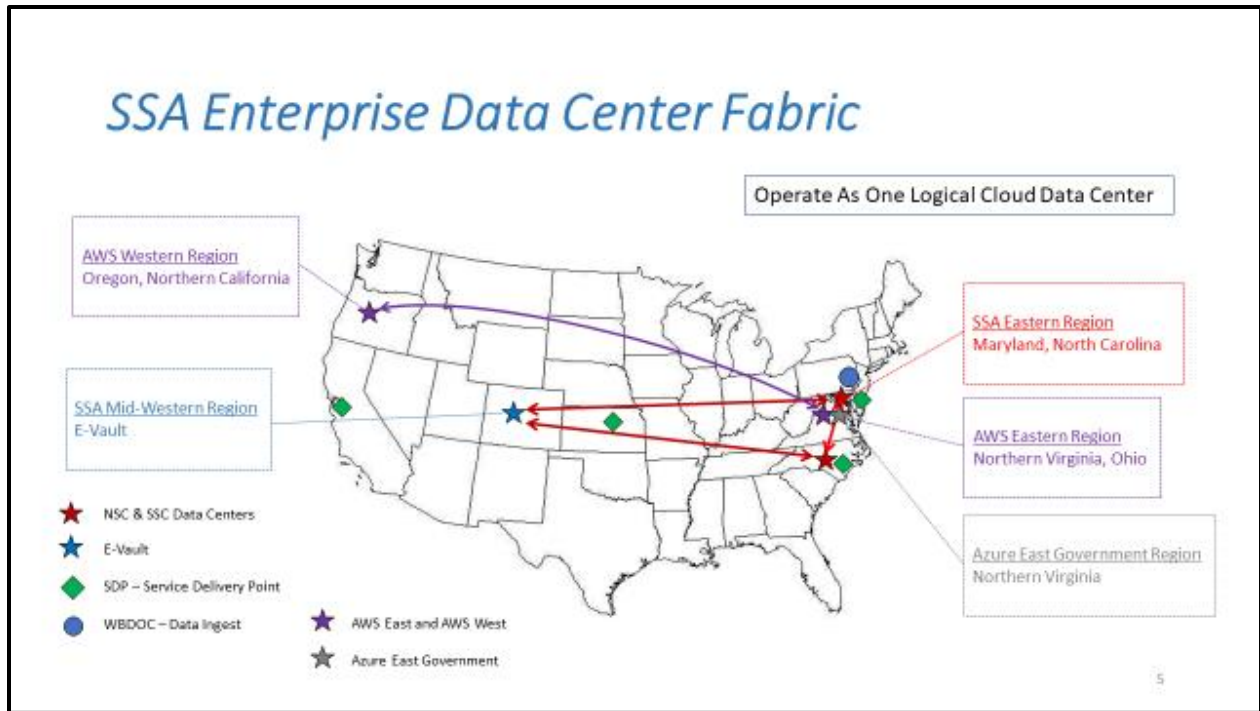


Figure 1 - SSA Enterprise Data Center Fabric

SSA was well down the road of modernizing its Information Technology (IT) Infrastructure when DCOI was published in 2016. However, SSA embraced the “Data Center Optimization Management” aspects of DCOI as it provides an essential foundation for managing a modern, at-scale, data center fabric. Figure 2 below summarizes the data centers SSA has in place in 2019.

The National Support Center (NSC) located in MD, opened for business in September 2014. SSA received ARRA funds to build and migrate the IT infrastructure and operations in the National Computer Center (NCC) to the new data center. The NSC is a LEED Gold and Uptime Tier 3 certified data center. The NSC also is a featured Federal Flagship

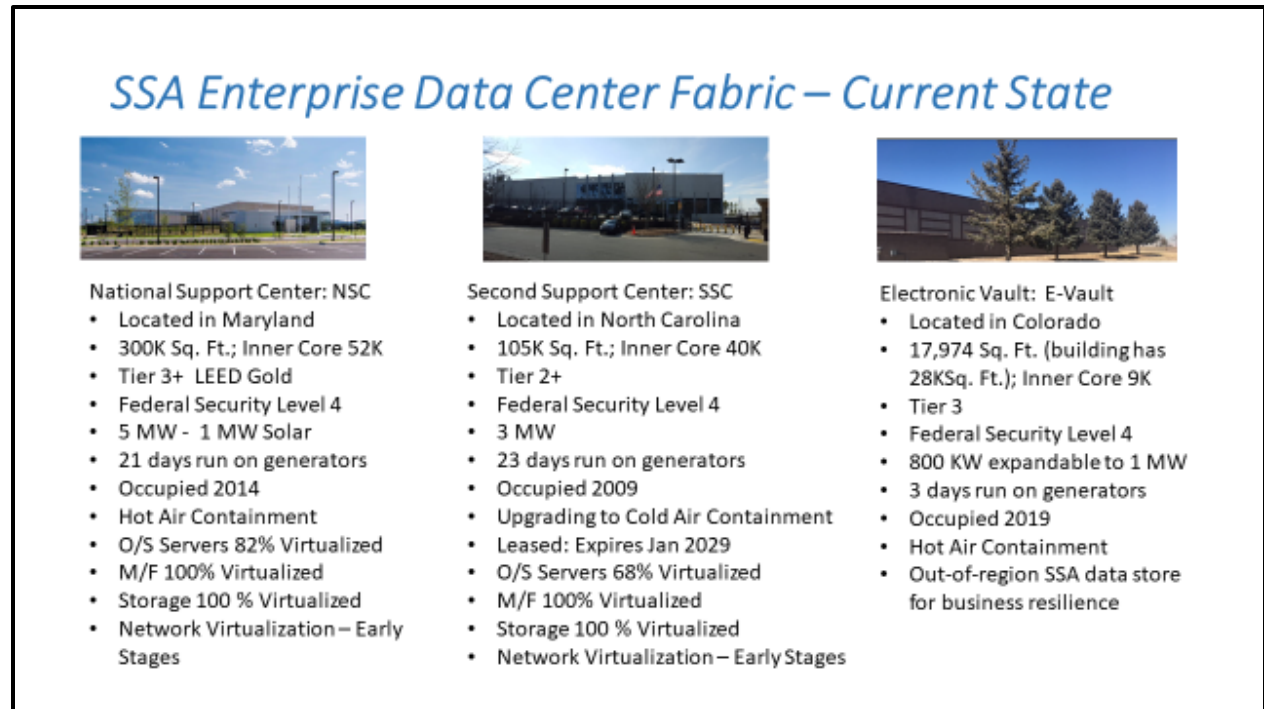


Figure 2 - SSA Enterprise Data Centers

Data Center in the DOE/CEQ Better Buildings Challenge and received the coveted GSA Honor Award in Engineering in 2016.

The NSC is a leader in the data center arena for its design, processing ability and energy efficiencies. It makes use of free-cooling ~200 days a year as well as being a co-generator of power through a 1.2-megawatt photovoltaic solar array. This clean renewable power is directly fed into the data center and on sunny days produces the majority of energy consumed.

Throughout the NSC, there are other energy and cost avoiding features like passive solar water heating, instant-on LED lighting and other heat recovery mechanisms. What we have learned in the NSC will aid us in making the SSC more energy efficient.

The SSC became operational in 2009, greatly enhancing SSA’s data processing and disaster recovery posture. The SSC is a Tier 2 traditional data center that utilizes a hot-aisle/cold- aisle configuration. It is currently being enhanced with cold-air containment and wireless thermal monitoring, management, and control mechanisms to improve the Power Usage Effectiveness (PUE) of the site.

SSA has needed an out-of-region site to isolate its data from a man-made or natural disaster. The E-Vault provides that capability for SSA. Situated 1,600 miles from SSA’s Eastern Region Data centers, the E-Vault provides a geo-dispersed, protected copy of the agency data, arguably one of its critical resources. E-Vault came online June of 2019 and SSA has conducted several Disaster Recovery Tests that demonstrated successful

recoverability using this remote data. SSA has additional plans to utilize the E-Vault to better service our customers located in the western United States. ,

GSA owns the NSC and E-Vault. The SSC is a leased facility. Hence, we must make efficiency changes in accordance with the lease agreement.

What we learn and do in one data center we try to take advantage of in the others. The NSC utilizes a high-density hot-aisle containment solution as well as liquid cooling. The E-Vault uses hot-aisle containment and indirect evaporative cooling. We expect to realize further energy efficiencies as we enhance the SSC through cold-aisle-containment.

The SSA is continuing to economize and evolve their data center optimization management through internal teamwork, participation in the DOE/CEQ Better Buildings Challenge as well as being a leading member in the DCOI Community of Practice. SSA already works closely with the DCOI PMO and currently has open dialogue and information exchange with other Federal and private organizations that will serve to enhance data center operations.

SSA partnered with other DCOI agencies, Department of Energy's (DOE) National Renewable Energy Lab (NREL) and OMB to review the definition of data centers and data center fabric, share deployment knowledge, work to build best practices, and define optimization metrics that will better indicate energy metering, power efficiency, automated infrastructure management, and operations measurement. In addition SSA has also initiated an expanded scope effort to review all information technology systems and solutions located outside of the agency's enterprise data centers. This collaboration resulted in OMB issuing a change to the quarterly Integrated Data Collection (IDC) guidelines for metrics, data center definition and reclassification of data center types.

3 Data Center Goals, Achievements, and Challenges

The following are SSA's high-level goals, achievements and challenges in meeting OMB's DCOI mandates as well as achieve the agency's commitment to enhancing our business resilience, modernizing IT, and exploiting Cloud Computing capabilities. Figure 3 below provides a high-level view of improvement initiatives SSA has in progress or planned.

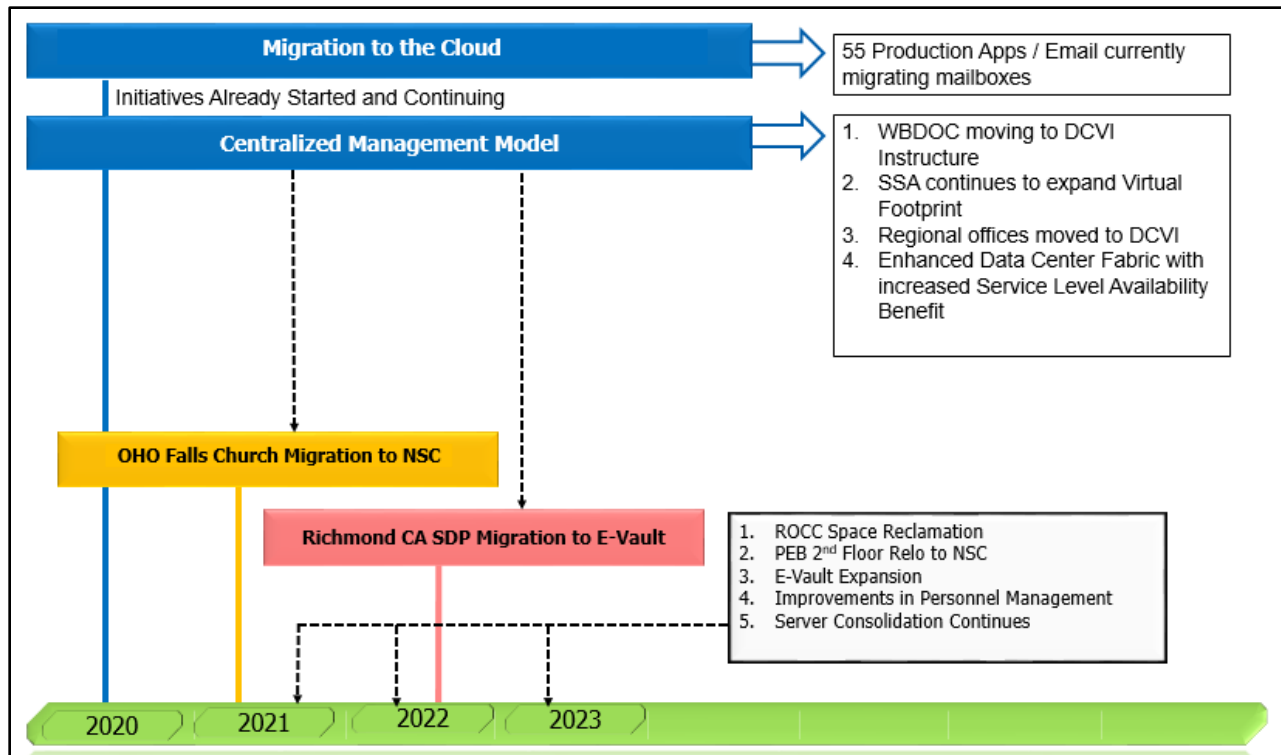


Figure 3 SSA Data Center Optimization and Consolidation Goals & Achievements

3.1 Centralized Management Model

A centralized management model improves line of sight for operations to facilitate speed of execution and lower the overall operating cost by eliminating redundancy in a dispersed operating model.

SSA conducted a cyber-risk and compute rationalization study in 2019 of all information technology systems and solutions in locations outside of the agency’s enterprise data centers. The goal was to identify risks that would potentially disrupt mission-critical operations or damage information technology systems and infrastructure, and assess the efficiency and effectiveness of those operations, whether current IT infrastructure was sufficiently aligned, and look for better ways to reduce cost of maintaining those foundational systems. SSA provided OMB with the findings and site closure plans in June 2019.

SSA recognizes that we require enhanced practices to determine the optimal infrastructure on which to run a digital service. There are multiple dimensions to this decision making: architectural, technological, business resilience, financial, security, flexibility, application design, operational characteristics, networking latency/bandwidth, and customer requirements. We now have multiple ecosystems: open systems, mainframe, private cloud, and multiple public clouds all of which must interoperate in a hybrid manner. In concert with our ongoing IT Modernization, Cloud Smart, Data Center Optimization Management, and Business Resilience Enhancement initiatives,

SSA intends to study and assess the best approaches/techniques to house and operate a digital service.

SSA is working to expand its virtual footprint by consolidating and migrating Regional Offices and Data Processing Centers services and applications to a centralized virtual platform. There are several benefits to this:

- Reduces hardware requirements,
- Accelerates server provisioning time,
- Reduces energy costs by up to 80%,
- Power down servers without affecting applications or users,
- Promotes “Green” the data center while decreasing costs, and
- Improves Service Level Availability.

SSA will continue to virtualize and consolidate as much as practicable. Our goal is to have failover capability within the data center, disaster recovery capability for both data centers and load balancing between data centers. With our “Virtual 1st” policy, constant consolidation review and our assessment of being a shared service provider we feel our strategy is in line with the overall Federal objective.

3.2 Migration to The Cloud

As part of SSA’s infrastructure modernization, SSA is adding the adoption of cloud technologies. The agency is executing a hybrid cloud strategy comprising both an on-premise cloud as well as public cloud services for application systems. Our infrastructure now extends, with an Authority to Operate (ATO), in Amazon Web Services (AWS) and Microsoft Azure Cloud Services / Office365 and an OpenShift based containerized Platform as a Service (PaaS). Later in 2020 or early 2021, SSA will evaluate the AWS OutPosts technology and the potential of bringing the capabilities of an on-prem AWS to our datacenters. The agency is also implementing a Cloud Management Platform (CMP) solution as a complement to enabling automation and management across the infrastructures.

The agency enterprise architecture and associated review process for investments is also promoting a Cloud Smart approach in the selection of platforms for our application systems; ensuring that software applications benefit from modern technologies either as new software systems or planned migrations or upgrades of current business application systems to benefit from cloud computing features such as elasticity and application level availability. Many of our modern enterprise application systems will need to interface with legacy applications and data. The modernization initiatives are also examining capacity needs as well as performance requirements to mitigate risks associated with latency which may result from connecting to a public (off-premise) cloud. We are designing our future applications and data to take advantage of the flexibility that is available.

To date, SSA has moved 55 production applications to cloud technology.

3.3 Consolidation and Closure of Data Centers

SSA had one data center slated to close, the National Computer Center (NCC) located in MD. As of August 23, 2016, the migration to the NSC completed and the NCC is no longer a data center. The physical building has been repurposed and renamed to the Perimeter East Building (PEB).

With M-19-19, the DCOI definition of a data center was modified. Beginning in Q2 2019, SSA reported tiered and non-tiered facilities based upon these definitions, (see [Figure 4](#) below). SSA is working to consolidate and/or migrate these applications and services where feasible, to one of the three Enterprise Data Centers.

Site	Tiered / Non-Tiered	Purpose	Posture
WBDOC	Tier 1	Data Ingest Site	Applications are being virtualized to DCVI infrastructure. WBDOC Assessment completed May 2019
SF SDP	Non-Tiered	Edge-computing site	Currently evaluating move to E-Vault Data Center
KC SDP	Non-Tiered	Edge-computing site	Will evaluate following SF SDP move.
Falls Church	Non-Tiered	Scheduled to move to the NSC 2021 Q3	
CH ROCC	Non-Tiered	Regional Office	No longer used as data centers and will repurpose white space
BI ROCC	Non-Tiered	Regional Office	
PH ROCC	Non-Tiered	Regional Office	
NY ROCC	Non-Tiered	Regional Office	
Test Labs (PEB)	Non-Tiered	Test Lab – not a data center	Currently evaluating the move from PEB to the NSC.

Figure 4 Additional Facilities Reported Q2 2019

This approach to IT service delivery, consolidation of commodity IT systems, services, and related contracts will:

- Increase communications with external and internal stakeholders,
- Implement an integrated governance of processes and services,
- Continue to 'virtualize' first,
- Reduce duplication of services,
- Standardize data and process,
- Enhance Agency IT portfolio return on investment,
- Improve Administrative Functions
- Enhance Data Center DCOI Optimization Metrics for Power Usage Effectiveness (PUE) and Facility Utilization,
- Decrease the Federal IT Footprint Redundancy,
- Strengthen SSA Datacenter posture by migrating mission-critical equipment out of legacy non-Tiered and Tier 1 Service Delivery Points (SDPs) into Tier 3 E-Vault,

- Increase IT optimization efforts by migrating poor performing metric sites into the E-Vault site, which is capable of trending and reporting efficiencies, and
- Increase IT modernization efforts through IT portfolio management (application and compute rationalization).

3.4 SSA's Business Resiliency Program

SSA continues to implement strategic initiatives to continually improve our business resilience over the next 5-10 years:

- Conducting tabletop exercises to 'flush' out and mitigate potential risk.
- Increasing the frequency of Disaster Recovery Exercises using a continuous improvement strategy to identify exposures.
- Striving to have all digital services reside in Tier-3 certified data centers.
- Conducting studies to expand the operational footprint at the E-Vault Data Center.
- Evaluating object storage as a repository for unstructured data.
- Researching isolated storage for cyber-recovery (internal/external attacks, ransomware, etc.).
- Conducted a Single-Point-of-Failure Study to identify hidden risk, exposures and potential failures that would impede SSA operations and availability. Starting mitigation projects.
- Addressing staffing and loss of critical workforce through retirement, etc.
- Implement Level of Resiliency and Auditability metrics.
- Proof of concept underway to automate and replace recovery processes on the mainframe so systems can operate in any data center as required.

3.5 Data Center Optimization

SSA has spent a decade building its data center fabric. The fabric is intended to have a 25 year life. To exploit this investment, to construct a data center optimization management system, and to support our activities in IT Modernization, Cloud Smart, and business resilience, SSA has created a Business Plan for its Data Centers. This plan looks at our entire IT ecosystem holistically and strategically. It is a living plan used to assess needs, develop project justification, provide financial rigor, create partnerships, and launch initiatives to continually improve and enhance the infrastructure. As of April 2020 the plan has 54 strategic initiatives defined or underway.

3.5.1 Performance Metrics

SSA conducted extensive research on data center efficiency and optimization metrics, and collaborated with the Department of Energy's (DOE) National Renewable Energy Lab (NREL) to define a standards-based set of metrics based upon best practices in-

use in by the data center community. SSA is working towards implementing 13 additional standards-based optimization metrics, as depicted in [Figure 5](#), to continuously improve the operations and management of its data center fabric.

The SSA optimization metrics are a superset of the metrics required by DCOI. SSA will continue to enhance our metric definitions and telemetry capture mechanisms as we refine our Data Center Optimization Management system. For example, SSA is deploying Green Grid's Level 3 energy metering standard to precisely monitor and manage power usage at the IT equipment.

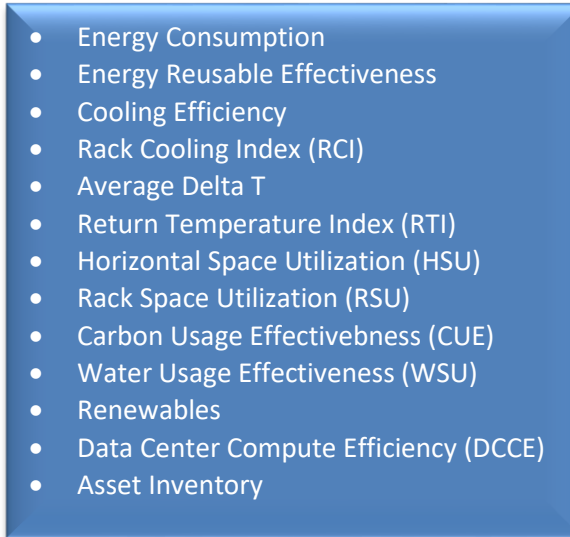
- 
- Energy Consumption
 - Energy Reusable Effectiveness
 - Cooling Efficiency
 - Rack Cooling Index (RCI)
 - Average Delta T
 - Return Temperature Index (RTI)
 - Horizontal Space Utilization (HSU)
 - Rack Space Utilization (RSU)
 - Carbon Usage Effectiveness (CUE)
 - Water Usage Effectiveness (WSU)
 - Renewables
 - Data Center Compute Efficiency (DCCE)
 - Asset Inventory

Figure 5 Additional Performance Metrics

3.5.2 E-Vault Expansion

SSA's Electronic Vault (E-Vault) site is approximately 1,621 miles from SSA's National Support Center (NSC) in MD, and 1,650 miles from the agency's Second Support Center (SSC) in NC. This geographical distance greatly decreases the risk of involvement in a singular regional seismic or weather event involving the SSC and/or NSC, and corrects the current inability to run full workloads during Disaster Recovery (DR). In addition, as the agency's out-of-region data store for business resiliency this improves the agency's high-availability capability to meet and exceed current Recovery Time Objective (RTO) and Recovery Point Objective (RPO) requirements. The E-Vault corrects deficiencies in SSA's DR posture, and closes the gaps in DR and business process vulnerabilities.

SSA is currently conducting a feasibility study on expanding the physical space at the E-Vault for possible future projects such as:

- 3-node topology cloud-object storage for unstructured data. FY21 - FY22.

- Hardened site for the consolidation and migration of non-tiered facilities: DCOI compliance. FY21 – FY22.
- Enhanced networking services for the western U.S: VPN, Trusted Internet Connection, etc. FY21 – FY22.
- Enhanced business resilience mechanisms: cyber-attack protections. FY22.
- Enhanced business resilience: system z cloud (Pre-production workloads.) FY22 – FY23.

3.5.3 Data Center Tier Certification

SSA feels our enterprise data center fabric should be a certified Tier 3. The IT and Facilities teams at SSA are quantitatively looking at all aspects of our data centers. The E-Vault is now online and we are working to have it certified formally as a Tier 3 site similar to the NSC. At the SSC we are going to do an external certification gap analysis to ascertain what would need to be done to make the SSC a Tier 3 site. These detailed engineering findings can be used for us to make a downstream business decision about the SSC which is a leased facility.

SSA has a need for a geo-dispersed data center fabric (hybrid cloud) in order to support current customer base requirements for edge computing and to provide sufficient latency for the numerous sites serving different geographical areas. In addition, this not only supports federally mandated guidelines, but establishes a strong business resilience for recovery.

3.5.4 Shared Service Provider

SSA is currently assessing the best approach to a managed shared services model. These services will be delivered through shared platforms such as cloud-based, or other 'shared' platforms, internal and external host networks and systems, and internal and external governance. SSA is also working to engineer a framework of processes and controls that will support all elements of the model for strategy, design, validation, transition, and management.

3.5.5 Data Center Fabric Enhancements & Optimizations

SSA continues to enhance the data center fabric by:

- Improving the Data Center Infrastructure Management (DCIM)
 - Implementing a DCIM Tool, Nlyte/Neo with a DCOI Dashboard. The tool has been installed on the DEV and Production environments at the NSC, SSC and E-Vault. SSA is working to enhance dashboard and report results.
 - Implementing cold air containment at SSC. Need: z15 mainframe containment and retro fitting DASD for cold air containment.
 - Implementing Green Grid Level 3 energy metering. (All cabinets retrofitted) Open Systems Storage. EMC Power Max Systems include Smart PDUs.
 - Implementing DCIM dashboards for the data center fabric following NREL guidance.

- Enhancing E-Vault 10 gig data replication, VPN gateway, and trusted internet connection.
- Implementing all-flash Tier-1 storage and FICON directors.
- Enhancing SSA data center fabric cost savings/benefits accrued model for DCOI (Refer to Section 4 Data Center Cost Savings).
- Conducting gap assessment of SSC to reach Uptime Institute Tier-3 level.
- Conducted a Single-Point-of-Failure Study at all three data centers.
- Implementing new IT Operations Management suite (IT Service Management, IT Asset Management, and configuration management database)
- Researching and development of:
 - MPO (multi fiber push on) technology – polarity flip/pining
 - Methods to lower fiber optic budget loss and enhance skill sets.
 - CAPRS/Tririaga ticketing system integration
 - Secure Remote Tool (SRT) deployment. Waiting for updated costs for enterprise costs with the newer virtual route
 - Deployment of 13 additional DCOI metrics.

4 Cost Savings and Accrued Benefits

SSA is developing a cost savings / benefits accrued model to assess its data center fabric financially. This model as depicted in [Figure 6](#) below includes savings related to the E-Vault Data Center, NSC energy savings, accrued benefits from the data center fabric availability, and benefits with migrating Exchange to Microsoft's cloud.

Project	Cost Savings	Accrued Benefits
NSC Energy Savings	\$1,786,092	
NSC Availability		\$354,464,000
E-Vault	\$64,980,859	\$98,561,741
MS Exchange Cloud Migration		\$689,410
TOTAL	\$66,766,951	\$453,715,151

	SSA Savings & Benefits	M-16-19 SSA Target	Variance
Total Cost Savings and Accrued Benefits	\$520,482,102	-\$165,000,000	\$355,482,102

Figure 6 SSA DCOI Cost Savings and Accrued Benefits