



State of Florida

Primary State Data Center Consolidation

March 1, 2016 – June 30, 2016

Enterprise IT Management Initiative



Robert C. Thompson, Chief Operations Officer
850.412.6887
robert.thompson@ast.myflorida.com

Executive Summary

In 2014, Florida Governor Rick Scott signed legislation creating the Agency for State Technology (AST). AST directly manages roughly \$70 million per year in information technology (IT) spending; oversees the State Data Center (SDC); develops IT security, architecture, infrastructure, and project standards; oversees a portfolio of projects totaling over \$800 million; and has identified numerous opportunities for the enterprise standardization of IT services.

In the spring of 2016, the Florida Legislature directed the State Chief Information Officer (CIO) to vacate from a state leased space that included the Northwood Shared Resource Center (NSRC), one of the two remaining already consolidated state data centers due to environmental issues. AST was provided a deadline of June 30, 2016 (the end of the fiscal year), which allowed AST only three months to plan and implement this major move, and included a requirement that there be no direct impact to the services provided to the public by 34 state agencies and other government entities served by AST. Preliminary planning for this move had been previously initiated and was originally forecasted as an 18-month (or greater) project.

The move required more than 100 SDC staff to relocate their offices, along with all the equipment typically found in a large data center; including a mainframe computing environment, more than 2,000 servers, storage arrays housing a petabyte of data, multiple backup and network devices, and hundreds of supporting appliances. Agency and Data Center staff worked around the clock and on weekends to accomplish the move to the other state-owned data center located at the Southwood Shared Resource Center (SSRC) in Tallahassee. Due to environmental factors, each IT asset had to be disassembled, cleaned, and decontaminated prior to moving, and then reassembled to prevent contamination at the SSRC facility over eight miles away.

The scope of the project also included vacating the former site in the same way one would leave a rented apartment. Staff offices were emptied, furniture removed, holes patched, and floors cleaned. From a data center perspective, each of the floor tiles of the 36,000-square foot facility was lifted to remove miles of network, phone, and electrical cables. Badge and security camera systems were retired, along with multiple data circuits and external provider contracts.

While the move was occurring, the daily sustaining operations supporting customers could not be interrupted. The move created an extraordinary amount of additional overhead on the data center teams as well as their agency counterparts. Communications alone included multiple daily and weekly status reports, constant communications through email, countless planning conference calls, and extensive face-to-face meetings with customer agency stakeholders. Even with all the stress on staff (additional communications, risk management, procurement, design, logistics, and testing activities), regular workloads could not be delayed and did not decrease.

To meet the 90-day firm, fixed deadline, the team applied best practices in detailed schedule development to create intermediate milestones working backwards from the deadline. Scope management was not an issue as scope was fixed without much chance of change. The multitude of risks and issues were managed through daily team teleconferences with specific risks assigned and resolution targets closely monitored. Collaboration with the state agency technical teams was tied to scheduled activities and customer agency teams were available to support. In addition to the more routine project status reporting, the State CIO provided formal weekly status report communications with customer executive management, the Governor's office, and legislative staffers.

Using innovative solutions to complex logistical and operational issues, the move was completed on-time and dramatically under budget. The project was provided a \$2.2 million budget (for project related contracted services, overtime and expense) and the project was 100% completed by June 30, 2016 and for \$1.1 million (50% under budget).

Concept

The consolidation of the NSRC into the SSRC (renamed the State Data Center) had been in the planning stages when the state became aware of environmental circumstances that required the immediate abandonment of the NSRC leased space site.

The project management approach taken was in conformance with Chapter 74-1, Florida Administrative Code, the *Florida Information Technology Project Management and Oversight Standards*. The high risk/high complexity of the project required use of the most rigorous project management standards required by administrative rule.

The rule, promulgated by the AST Project Assurance team, closely resembles the Project Management Body of Knowledge (PMBOK®). Best practice project artifacts for this project were created and maintained including Project Proposal, Pre-charter Risk and Complexity Assessment, Project Management Plan, Project Schedule, etc.

There were numerous constraints, the most impactful to the ability to manage the project's time, cost, and quality, including:

- a. Time – the project must be complete by June 30, 2016 (90-days).
- b. Cost – the project must not exceed \$2,265,350 in additional cost.
- c. Quality – the AST meeting or exceeding its Service Level Requirements as defined in its Service Level Agreements (SLAs) during and after the execution of this project.
- d. Unplanned outages of customer services were not acceptable; planned outages must be minimized and only occur at night or weekends.
- e. Power – the power consumption at the SSRC (the data center to be consolidated into) must not increase by more than 400 KW.

There were also numerous existing internal and external projects already underway, each that had a direct impact to operations and required orchestration to support, and not hinder, the move. Examples include:

1. A data center interconnect project to establish a high-speed network link between the NSRC and SSRC facilities.
2. The purchase and deployment of a new converged infrastructure and the associated server migrations to vacate legacy hardware and move to it.
3. An ongoing server virtualization initiative.
4. A multi-tenant Active Directory expansion project.
5. Support of ten agency disaster recovery (DR) operations.
6. The third and final stage of an Enterprise Backup initiative.

There was no slack in the schedule, miscommunications could not be tolerated, and resources were over-allocated as a matter of course. Although being a schedule-driven effort, the work had to be both managed as a project and undertaken as a systems engineering effort. Since it impacted all customers and the risks were high, the application of best practice IT Service Management protocols was required. The creation of project management artifacts to mitigate risk, extensive engineering analysis/design/testing and ISO standard incident, capacity, and change management all had important roles. More importantly, the coordination of activities to reduce impact to customers (and therefore citizens) was of paramount concern.

Although the NSRC included a mainframe, thousands of servers, and related infrastructure, the real move had to be accomplished without impacting customer agency business processes, which meant that moves had to be based on applications, not servers. One application may only use several components, where another may utilize over a dozen. There could also be dozens of applications on one server with component connections to dozens of other components, including the mainframe. This required the careful assessment and rationalization of applications so applications could be moved to eliminate downtime.

The process of rationalizing the applications was worthwhile and necessary, not only to minimize downtime by grouping assets to be moved but also to shed light on what applications could be considered for future cloud-based hosting. Other important benefits of the application rationalization effort included:

1. Significantly augmented the existing understanding and inventory of customer systems and components, which often did not exist, even within agencies. The inventory data was used to:
 - a. Improve the populated configuration management database (CMDB) enabling more effective configuration management of application environment baselines.
 - b. Populate the CMDB with additional classifications of sensitive data in applications.
 - c. Meet the prerequisites of implementing software asset management tools.
 - d. Improve customer DR stance and readiness.
2. Identified high risk application components that have significant security risks, have limited or no support from the vendor or are incapable of supporting any future cloud infrastructure initiatives.
3. Fostered an understanding of similar and duplicative cross-agency applications and application components to determine which could be offered as an enterprise service to produce the greatest benefit to the enterprise or would benefit most from migrating to cloud-based services such as Platform as a Service (PaaS) and Software as a Service (SaaS).
4. Provided information that can be used in the prioritization of application rewrites based on objective criteria of comparative application performance.

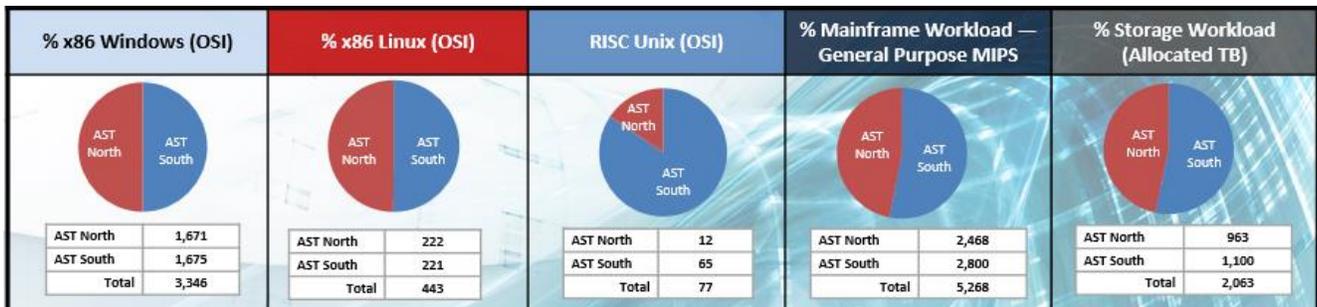
The team rapidly developed ‘ground rules’ for the multi-phased migrations:

1. Anything that was already virtualized would be migrated live “over the wire” once the high-speed interconnect and hypervisor pre-requisites were validated.
2. Anything that had a successful, recently executed DR solution, the DR plan would be executed to fail over, then move the source systems, and fail back.
3. Anything configured in clusters for high availability, the cluster would be broken, moved in pieces, and the cluster re-established.
4. Anything that could be moved during business hours was moved during those hours to reduce overtime and staff strain, anything that had to move after hours was scheduled for after-hours migration.
5. Anything that required absolutely zero downtime (life safety applications) was moved using a jointly (AST and customer agency) designed solution.

Trucks and specialized equipment (including police escort for some systems) had to be coordinated, and vendor certifications of hardware prior to and after the move was often required. The SSRC data center required additional power and cooling be installed. Perhaps most importantly, to effectively migrate the petabyte of data, improved connectivity between the two data centers was essential. In a rolling fashion, the move schedule was coordinated to saturate the available capacity at the SSRC, then compute, storage, and network components would be moved from NSRC to SSRC, then capacity saturated again and the process continued.

Significance

The scope included all primary data center customers, including 34 major state agencies, some independent districts, and local governments. The primary operational environment components are:



Backup services, tens of thousands of mainframe batch processing jobs, and network services for agency customers could not be interrupted.

All NSRC workloads for all customers were migrated from the NSRC to the SSRC. This had to occur without interruption to customer activities at the SSRC, and with minimal disruption to the NSRC customer business operations, many with state-wide visibility. The migrated NSRC customers included:

Dept. of Highway Safety & Motor Vehicles
Florida Fish & Wildlife Commission
Department of State
Department of Health
Department of Juvenile Justice
Department of Environmental Protection
Department of Economic Opportunity

Department of Children & Families
Dept. of Business & Professional Regulation
Department of Citrus
Agency for Persons with Disabilities
Agency for Health Care Administration
Agency for State Technology

While data center consolidation in the IT industry and state governments is considered a best practice, the success within the extraordinarily restrictive schedule is remarkable and clearly not common. To illustrate, it took over four years to consolidate the 34 state agencies into the two primary data centers. With the expedited move, it took just three months to consolidate the two primary data centers into the single State Data Center.

This initiative is in alignment to national trends and NASCIO's "State CIO Top Ten Priorities" due to the significant positive impacts to the 34-state agency and other governmental entity customers.

1. *Removed technology debt and reduced costs.* During the previous years during the consolidation of agency data centers, the two primary state data centers inherited decades of agency hardware and software, much of it very old. For example, in the NSRC alone, there were 13 different backup products inherited, eight different versions of those products, and over 50 media servers. Additionally, there were hundreds of physical servers serving various roles that had not yet been virtualized. The move facilitated rapid virtualization on the part of customers (as virtualized servers could be moved with much less friction and impact) and improved the pace of consolidation of backups into the enterprise backup solution.
2. *Security enhancements.* The move required risk assessments and security governance, forced a more consolidated and consistent security framework, and placed a renewed emphasis on data protection and security awareness.
3. *Consolidation/optimization.* The additional customer scrutiny on the systems hosted by the NSRC led to the consolidation and optimization of many. Assets freed up in that analysis were subsequently re-purposed to service the disaster recovery site to provide additional capacity. Services, operations, resources (expertise), infrastructure, communications, command, and control all benefited from this effort.
4. *Facilitation of the standardization of shared service models.* Although both the NSRC and SSRC were full cost recovery operations, they had separate service catalogs with slightly different offerings and costs. The consolidation required the standardization of services.
5. *Promotion of AST "enterprise" thinking.* The barriers that physically and logically separated the data center teams were identified and resolved. The people were moved first and then nearly identically chartered sections from both facilities came together to work on a critically important and common goal.
6. *Improved disaster recovery/business continuity planning, readiness, and testing.* Florida has now engineered a dynamic disaster recovery implementation where 100% of the state's data is replicated to the DR site within 24 hours. DR 'test anytime' capabilities now exist for the first time in state history.

7. *Facilitated capacity management to enable logical cloud migration planning.* As a part of the move, AST acquired software tools to identify and visually display system dependencies and server communication patterns as the first step in rationalizing systems destined for the cloud.
8. *Cost savings and improvements.* The impacts not only provided cost savings to customers, but fostered improvements in operational, logistical, and procedure maturity; improved transparency, consolidated governance, and strategic IT planning; and improved the development of the vision and roadmap for the State Data Center with consideration of future IT innovations. Aligning with executive and legislative policy agendas, these changes better enable AST’s modernization efforts to take advantage of technology to serve multiple agencies performing similar activities.

Impact

As noted above, the expedited staff and data center [hardware and software] move out of the NSRC has dramatically improved the efficiency and effectiveness of the organization. While the impetus for the move was primarily to address building environmental issues, plans had already begun for the merging of the NSRC and SSRC teams, and eventually the data centers themselves. Merging the previously geographically separated teams has facilitated integrated operations and enables more consistent, operational maturity and a unified team. The relocated IT infrastructure also gained the benefit of now being housed in an independently certified Tier III facility, which is one of only three government owned data center facilities in the world to have achieved this level. Since Tier III facilities have many built-in redundancy requirements, the benefit to the citizenry is greater uptime and accessibility to agency services.

As noted above, consolidating into one data center was already in the planning stages for the purposes of optimizing staff, resources, and space; reducing costs and improving services to agency customers; enabling more effective monitoring, architecture control, and to reducing the scope of security (both logical and physical security); improving DR; promoting further process and system automation; easing the development of procedures and functions that must be executed to maintain compliance with relevant policies, regulations, standards, and quality of service metrics; improving build resilience, flexibility, and scalability combined with more reliable systems and better optimized storage (allowing for fewer unanticipated outages, improved employee productivity and happier customers); and finally facilitating a future path to the cloud to support cloud bursting for capacity management of the on-premises infrastructure.

During the timeframe of the move, AST took advantage of the timing of several planned major capital acquisitions. Since the NSRC mainframe was going off lease, AST negotiated with the vendor to overlap the mainframe service so the new mainframe could be stood up at the SSRC, while at the same time the workload being transferred and the NSRC mainframe being decommissioned. AST also had additional compute and storage acquisitions planned that were accelerated at the SSRC, and this too facilitated migrations, as did the high-speed data center interconnect that was upgraded for the project.

Several other states have similarly consolidated their data center’s operations into one or several data centers, though none at the same compressed scheduled as AST. All work was completed while maintaining its current level of service with very few unplanned service outages. Due to the urgent nature of the consolidation effort, AST was provided special budgetary authority for the effort:

Project Category	Budgeted Spend	Actual Spend
Labor	\$904,852.30	\$204,808.17
Hardware	\$778,247.37	\$323,832.74
Other Costs	\$698,258.40	\$579,278.50
Total	\$2,381,358.07	\$1,107,919.42

Although the preliminary estimates of the level of effort were high, the ingenuity of the staff, the cooperation and participation of customer agency resources, the rapid deployment of dramatic time-saving technologies, the brilliant scheduling to reduce overtime and staff burnout, and the tremendous support of vendors and suppliers (often simply ‘pitching in’ to help) significantly reduced manpower costs.

Since the consolidation there have been significant changes and successes:

1. Over \$2.1 million in annual savings was recognized;
2. Operations have continuously stabilized and technical debt associated with the move reduced;
3. Customers have realized the associated savings due to chargeback reductions;
4. The State Data Center’s budget within AST has gone from \$63,772,764 and 216 FTEs (prior to consolidation) to \$58,325,668 and 170 FTEs (just approved FY 18/19);
5. DCC has been a remarkable success in each of these categories. Statewide IT costs have dropped;
6. Cybersecurity has been enhanced;
7. Transparency and governance have been vastly improved; and
8. Expertise in supporting the wide variety of agency requirements have been consolidated and is more effectively utilized.

Since the creation of AST, the main goal of the organization has been to add value. This consolidation accomplishment – along with the operational and strategic improvement efforts – is intended to preserve and protect the long-term interests of the state’s automated operations in an enterprise fashion and does just that.