State of Montana

Data Center Consolidation/Virtualization
Working Group Executive Summary

December, 2010

CONSOLIDATION/VIRTUALIZATION WORKING GROUP – FINAL RECOMMENDATION

DECEMBER 2010

Through the Information Technology Managers Council, a working group representing a number of state agencies was formed to analyze and make recommendations on server virtualization and the possible consolidation of assets. Members included: Dick Clark (State CIO), Tammy LaVigne (DLI), Stuart Fuller (DOA/ITSD), Warren Dupuis (DOA/ITSD), Tom Livers (DEQ), Jeff Holm (DPHHS), Byron Molyneaux (OPI), Larry Krause (DOC), Karen Nelson (JUD), Mike Bousliman (MDT), John Daugherty (COR), Shawn Graham (GOV OBPP).

The primary goal was to identify and set a course of action for leveraging opportunities available through the new state data centers that include but are not limited to:

- Economies of scale
- Disaster Recovery
- Monitoring capacity
- Taking advantage of technology
- 24x7 virtualized monitoring
- Green Benefits

For purposes of the working group, virtualization, consolidation and branch offices are defined as follows:

Server Virtualization is the abstraction of physical server resources, including the number and identity of individual processors, disc systems, and network systems from server operating systems. The server administrator uses a software application to divide one physical server into multiple isolated virtual server environments.

Consolidation focuses on how the state organizes the delivery of IT services, taking existing organizations, services or applications and combining them into a single operation.

Branch Offices are agency business locations that are remote from the agency headquarters. These are locations generally outside Helena and connected to the state network via commercial providers.

BACKGROUND

For the last several years when NASCIO (National Association of State CIOs) asked state CIOs to identify their top priorities, budget and cost control; and consolidation of infrastructure, services, operations and resources were at the top of the list. In NASCIO's 2010 survey, 62% of states responded that consolidation was underway in some form with another 14% stating they had completed consolidation initiatives.

Factors driving consolidation were:

- Improve disaster recovery/ business continuity
- Eliminate replication, redundancy and fault tolerance
- Cost Control – reducing agency data centers, equipment, operational costs
- Energy Efficiency
- Strengthen IT security
- Access to new technologies for all agencies
- Aging state facilities

Based on a 2006 NASCIO survey of 34 states and the District of Columbia, cost savings along with improved information sharing and data integration were reported to be the driving force behind states decisions to consolidate. Secure infrastructure and better access to new technologies ran a close second as reasons for states to consolidate efforts. Other benefits identified by states included: unified direction; succession planning; elimination of duplication of effort; project management improvements; better IT alignment with gubernatorial polices and priorities; central control of IT spending/costs; reduce duplications; focus of agencies on core missions; improved availability and reliability; and improved services overall.

In Montana, virtualization and consolidation efforts began in Department of Admin/SITSD's data center in the Mitchell Building in 2002. As part of its efforts in regards to further virtualization, SITSD commissioned IBM to perform a rationalization workshop. The result was a three year summary business case that showed a potential savings of $2.8 million over three years. ITSD estimates that the actual savings from 2005 to date are over $4.9 million; $3.3 million in hardware costs and $1.5 million in energy costs.

In the design of the new primary data center, State of Montana Data Center (SMDC), the focus was to design the most efficient and cost-effective data center possible with current technologies. The center is equipped with a state-of-the-art cooling system designed specifically for data centers based upon the use of low external air temperatures through air-to-air energy recovery wheels; a high efficiency UPS system that provides continuous protection for the data center's equipment in the event of power interruptions; and the use of heat recovery coils to capture waste heat from the data processing equipment for reuse external to the data center.

There are at least 17 agency "data centers" in Helena based on agency inventories provided in the Biennial Report. There is a significant potential for operational savings plus intangible benefits such as increased security and reliability for moving to the SMDC.

WORKGROUP TACTICS

Assessment of current environment

The workgroup signed a Statement of Work with IBM to assess the current statewide server environment. Thirteen state agencies were selected, based on number of servers, to participate in a rationalization study. Twelve agencies participated in the study: Office of Public Instruction, Administration – ITSD, Commerce, Environmental Quality, Labor and Industry, Transportation, Fish and Wildlife, Health and Human services, Revenue, Corrections, Judiciary Courts, and Natural Resources. Agencies completed a detailed template which included a server inventory; identification of applications and functions; identified boundaries; and provided an assessment of hardware, software, support and environmental costs. IBM concluded that a number of these agencies servers had already been optimized to some degree, however, based on input from each agency, there are a number of servers that can immediately be optimized to an even higher level through virtualization, and where appropriate, centralization.

Current State	*Target State Benefits*
• *Complexity due to server sprawl and high HB diversity* • *Some limited potential to improve utilized compute capacity* • *Ageing server environment* • *Good virtualization on x86* • *Old servers not energy efficient* • *Limited D/R and physical security outside of main DC*	• *Highly virtualized server environment* • *95% fewer servers, 65% fewer cores using standard HW and software building blocks* • *Improved utilization of capacity* • *77% reduction in server energy consumption by using energy efficient server technologies* • *Up to $14M in savings over 5 years in real and avoided costs*

Identify obstacles/challenges

Workforce resistance to change was the overwhelming obstacle or challenge other states have experience as a result of consolidation initiatives and most agencies agree that this will also be a challenge to Montana. Other obstacles or challenges identified by states as a result of consolidation initiatives included:

- Seeking exemptions from state statutory and regulatory requirements
- Backlash when consolidation doesn't meet specific business needs or potential savings
- Possible failure to identify and adhere to service levels
- Start up costs
- Meeting the wide array of agency requirements
- Agencies need to control their computing environments
- Management capacity to integrate functions
- Competing priorities, costs
- Developing and documenting the business case
- Threatens the authority of agencies

- Existing business models
- Labor unions
- Agency desire to remain autonomous
- Cost Recovery

Identify keys to success

Communication - Some form of inclusive participative process that emphasizes communication and includes participants and stakeholders at all levels is key to successful implementation. This may be achieved through regular meetings through oversight and advisory boards, governance committees, joint councils, executive councils, cross organizational user groups, task forces and a well developed communication plan. The workgroup recommends establishing a Board of Directors or Management Advisory Council composed of agencies who work with the state CIO to plan for statewide virtualization and consolidation implementation as well as ongoing operations.

Business Case – Development of a complete and thorough business case which emphasizes quality and price-sensitivity of services provided is important. Costs should be looked at on a life-cycle basis versus a one-time basis. Expected outcomes and how they will be measured should be identified.

Implementation Plan – A detailed implementation plan is imperative to success. The plan should outline goals, set milestones and measure results. Assigning a cross-agency management team committed to the success of the new organization that is willing to accept responsibility for success and problems and provide clear accountability for actions and follow up on issues immediately is paramount.

Funding – Dedicated funding and budget support are important. At present, new funding may not be an option, however, an analysis of long-term savings - i.e. energy, hardware, software and general operations - and cost avoidance should be considered.

Managing Resistance to Change – Anticipated workforce changes should be considered in advance to give impacted employees a chance to accept and adjust to the change. Opportunities for staff including retraining or reassigning should be emphasized.

Executive Sponsorship – Clear gubernatorial support is a key factor for success.

RECOMMENDATION – ADOPT A CONSOLIDATION STRATEGIC VISION

The workgroup recommends a consolidated strategic vision as detailed below:

Concept

The vast majority of IT services are services that can be provided on a commodity basis in a reliable, centralized fashion. Whether a service is provided in-house, in-state, or via cloud should be determined by cost, reliability, performance, and security. Reliability, performance and security all have a direct correlation with costs including hardware, software, and soft costs like FTE. Security is also a function of policy for the individual data elements. Commodity services delivered via centralized mechanisms should have lower costs, and agency costs should be reduced as a result.

Consolidation Goals

Reduce IT costs and provide enhanced IT Services.

- Reduce costs by sharing when possible or minimally using common IT infrastructure and common IT services.
- Reduce energy costs by reducing duplicative equipment and data centers.
- Reduce complexity and administrative overhead costs by implementing common services and infrastructure.
- Leverage the investment in the Enterprise Data Centers to improve the security, disaster recovery and continuity of operations for all state agencies.
- A consolidation goal should be to provide an estimate of cost savings as a result of SMDC migration for each ITSD service. An itemized breakdown of cost reductions should be developed and shared which should be correlated back to ITSD rates.

Issues/Problems

- Multiple agency data centers with sunk-cost investments in duplicative hardware and infrastructure such as generators, SANS, racks, and UPS equipment as well as server hardwared from other vendors – differing lifecycles.
- Control of systems and systems infrastructure.
- Differences in need and capabilities between centralized Helena model and branch office model.
- Differences in need and capabilities among agencies
- Moving service to the SMDC may place additional demands on local and/or Helena WAN network services.
- Lack of an Enterprise Architecture – identifying risks and mitigation strategies
- Performance benchmarks are yet to be identified for all services and applications anticipated to migrate to the SMDC.
- Security issues not currently a part of the SMDC focus (between MDT and DOJ for example). Existing services/exchanges within distributed environments have secure domains, keystores, digital certificates and SSL requirements that would need to be explored.
- Distributed environments and applications also interact with federal and local entities that DOA and ITSD may not have accumulated pertinent information about to adequately support a subsumed server and/or application.
- Differences in systems level software and associated contractual agreements
- Conflicting priorities

    - Should problems arise (how will they be handled)
    - Version levels and migration plans
    - Protocols
- Shared network complexities
- Isolation from other sis actually good
    - Run away processes – impact across the enterprise
    - Viruses (i.e. blaster disaster)

Implementation Timeline

Phase 1

Move first wave of agencies, refine services, and address datacenter issues after Mitchell move complete.

1) Move selected agency servers and other IT equipment to the SMDC
   Criteria for selecting initial agencies
    - Cost avoidance
        - Attrition moves with hardware replacement cycles
        - Eliminate need for pending environmental upgrades in agency data centers (e.g., fire suppression, enhanced air conditioning, security monitoring, etc..)
        - Eliminate or reduce need for additional IT hardware or infrastructure (e.g. additional SAN, new racks, new network connections).
    - Agency readiness
        - Wholesale moves for agency volunteers – racks of servers
        - Agency-determined needs
        - Server management
        - Security
        - Disaster recovery
    - Internal virtualization accomplished
2) Improve ITSD offerings of managed and private cloud IT services to increase cost savings and service attractiveness. Provide private cloud services to agencies where control of data and systems still resides with the agency IT organization.
3) Examine cost effectiveness for external cloud service offerings for non-critical non-sensitive data hosting like GIS.
4) Examine GSD's power/space rates to link, to the extent possible, the power consumption costs of data centers to agency budgets. (e.g. Examine apply a FMM type rate model to the power portion of GSD rates).
5) Examine Branch Office issues
    a. Examine issues of consolidated offices in remote sites
    b. Examine issues of Branch office file and print.
    c. Examine issues of network aggregation at the city level for remote sites. (E.g. Missoula – aggregation all connections to a site in Missoula and then carry back to Helena. Aggregation site could be used for server consolidation).
    d. Examine Branch Office user expectations in regards to Line of Business (LOB) and critical applications. What LOB applications are centralized and dependent on wide area network connections?
6) Examine desktop virtualization for those well connected Helena locations.

Phase 2

Examine IT budget model and continue to move agencies to SMDC.

1) Examine using FMM modeling for agency IT budgets to examine true costs of ownership – FY14/15 or FY16/17 budget cycle.
2) Conduct a "post-mortem" to determine challenges and demonstrate advantages related to consolidation of IT resources. The goal should be a road map to facilitate remaining agencies moving to the SMDC.
3) Branch Office
    a. Examine network bandwidth improvement to branch offices.
    b. Examine desktop virtualization in the branch office environment.

Phase 3

Examine and implement IT budget model and savings statewide

1) Examine overall statewide IT spending for areas of duplication where private or public cloud services could provide cost savings. (Example – three different agencies are running separate grant management tools)
2) Branch Office
    a. Examine shared branch services model built on virtualization and commodity services. Example would be Palmer complex in Missoula – build state centers of services where cost effective.