Report on

Montana's Data Center

October 2011

Executive Summary

The State of Montana data center system provides one of the most reliable, powerful, and secure storage systems for governmental data in the nation. Spread across the state at three different sites, the data center system ensures that citizens have access to their government through electronic means. The efficiencies realized by using the data center can provide the State of Montana substantial monetary and non-monetary savings.

This report contains:

1. An overview of the State of Montana data center system
2. The benefits of using the State of Montana data center system
3. The process for parts of government to move from existing facilities into the data center

Identity of the Data Centers

Data Center Overview

Under MITA, the Department of Administration's State Information Technology Division (SITSD) has two duties with regards to infrastructure:

1) operation of a telecommunications network
2) operation of a "central computer center" or data center

In 2007, SITSD proposed and the Legislature funded the building of a new data center spread over two different sites: one in Helena and one in eastern Montana. In addition, SITSD has improved its capacity at the Federal Reserve Bank facility. As a result, the State's current data center incorporates three sites working together, much like a football team:

- State of Montana Data Center, Primary Site - SMDC (Offense): To win a game, a team has to put points on the board. SMDC is the high-powered offense that allows the government to serve the citizens of Montana in manner that is:
  - Quick (centrally-located and close to most major parts of government)
  - Efficient (architecture for cost savings and energy efficiency)
  - Adaptable (plenty of room for expansion)

  SMDC has been designed to work in Helena. It incorporates seismic mitigation features, takes advantage of the climate, and offers high-speed access to Helena offices.

- Miles City Data Center, Disaster Recovery Site - MCDC (Defense): The heart of any good team is a good defense. MCDC is the defense against any problems that hit the state's IT systems. If there is catastrophic failure, MCDC has been designed to take over state computing needs. It is:
  - Strong (designed to take the load of the SMDC)
  - Secure (in a physically secure facility)
  - Stable (access to two national power grids, plus independent power generation).

  MCDC is a "warm" facility – it does not take over immediately but can do so when asked. For this reason, the disaster recovery servers as well as redundancy for key state systems will be housed at MCDC.

- Federal Reserve Bank, Back-up Site – FRB (Special Teams): Special circumstances call for special teams. FRB steps in as the facility for in-town backups of the SMDC and off-site storage.
  - Safe (located in the same building that holds Montana's cash supply)
  - Adjustable (can fulfill a variety of needs)
  - Responsive (location allows fast access of data by the State of Montana)

  FRB is a "warm" facility like MCDC but may receive additional upgrades to make it a "hot" facility. Under this system, FRB would immediately take over for a failure at the SMDC.

In this system, the State of Montana does not have three data centers, anymore than any football team has three teams inside of it. The State of Montana has one data center spread over 300 miles. The advantage to such a situation cannot be underestimated.

- For example, if the SMDC was in New Orleans when Hurricane Katrina struck, the MCDC would have been in Houston, TX – unaffected by the storm

Additionally, the State of Montana can sell excess capacity in the data center to other states and organizations, bringing money back into the state.

Strategic Goals

During the 2007 session, the Legislature emphasized some basic characteristics of the new data center: reliability, cooperation, and cost efficiency. SITSD measures its own success against these characteristics.

1) Reliability

   The State of Montana data centers were built to provide a robust central computer presence even in the event of catastrophic failures. Governor Schweitzer and legislators recognized that the old system, keeping a computer presence in the basement of a building, hampered the state's capabilities and did not provide reliability.

   With the new data center system, SITSD continues to build on the idea of reliability by adding capacity at all three facilities. By the end of the next biennium, the State will have the primary site at SMDC, a backup site at FRB, and a disaster recovery site at MCDC.

   Key Performance Indicator of reliability: Uptime Percentage
   Uptime is a measure of the availability of a data center. It is normally expressed as a percentage of total possible time available. A higher uptime percentage indicates greater reliability. The SMDC has not been completely down in the last year.

2) Cost Efficiency

   Governor Schweitzer and the legislature have been insistent that the money invested in IT be used in an "organized, cost-effective, and deliberative manner" (MITA, 2001). The investment in the data centers follows this mandate. The building of the data centers has been driven by the goal of providing cost-saving information technology to the State of Montana. The installation of an energy saving Kyoto wheel at the SMDC was one step in this direction. Making FRB a local backup site to save on data transport costs was another. SITSD will continue to find ways to bring the total cost of operations down while maintaining reliability.

Every part of state government that moves into the data centers brings further cost savings to the state as a whole. No data center in Montana contains more cost savings measures than the SMDC. Parts of state government that choose to run their own Helena data centers cost the state money.

Key Performance Indicator: Data Center Power Usage Effectiveness (PUE)
PUE is a measure of how well a data center uses power. Ideally the PUE should be 1.0. However, costs of other equipment- especially cooling – drive the PUE ratio above 1.0. In the case of many data centers this is over 2.0, meaning that facility draws twice as much power as it actually uses to run servers. The SMDC currently runs at 1.05 PUE during the winter months.

Benefits of the Montana Data Center System

Monetary Benefits

Northwest Energy (NEW) offers an incentive program whereby participants are monetarily rewarded for saving energy. Why NWE would offer incentive money for what ultimately decreases the service they provide? The answer is rooted in fixed infrastructure. NWE is "buying back" some of the energy capacity over a long term so that it can sell it at a higher rate and/or provide more service to other customers without investing in more infrastructure. Under this business model, energy efficiency measures achieve the same benefit as adding more power lines but isn't capital intensive. NWE's Business Partnership program provides a mechanism to leverage infrastructure. To incentivize energy conservation the utility pays their customers for their participation; however over the long term of the calculated energy savings they are able to make this up in providing additional services because their customer base is always expanding.

Overview of Participating/Non-Participating Agencies

	Est. NW Energy Incentive	Est. Annual Cooling Savings per year	PLANNED MOVE DATE
PARTICIPATING			
SITSD	$375,000	$73,683	Complete
Livestock			Complete
Board of Crime Control			Complete
Commerce/BOI			Complete
Teachers Ret. System	$31,000	$7,500	Complete
Corrections	$12,852	$14,948	Complete
Health and Human Serv.	$158,856	$38,211	Oct 2011
Labor and Industry	$55,495	$13,349	Oct 2011
Transportation	$105,800	$25,449	Dec 2011
Environmental Quality	$35,371	$8,508	Dec 2011
Revenue	$37,951	$9,129	TBA
GOV*			
Commerce	$54,028	$12,996	TBA
Total	$866,353	$203,773	
NON-PARTICIPATING			
Fish Wildlife Parks	$27,342	$6,577	Tentative
Leg/SOS	$5,700	$25,449	
Agriculture	$3,029	$729	
OPI	$5,700	$6,718	
Judicial	$35,179	$8,462	
DNRC	$1,790	$431	
State Library		$6,577	
Total	$78,740	$54,943	
GRAND TOTAL	$945,093	$258,716	

*Shared server room with Leg and SOS. Server room must be decommissioned before savings will be realized

Average Server Service Option Price (annual)

So what does server hosting cost? The following list is based on the "median" agency and cost estimates supported by various research organizations for running agency hosted vs. STISD hosted servers in virtualized and non virtualized environments. "Hard" costs or costs that are realized include hardware, software, power, storage, and disposal. Personnel, downtime, floor space, and indirect costs are examples of "soft" costs or those costs that may or may not be realized. In the end, each agency's actual cost to self host or move to the data center will vary based on a number of factors unique to their agency.

	Hardware	Software	IT Staff - Sys Admin	System Refresh	HW/SW Maintain	Power*	Storage and Backup	Floor Space	Disposal	Downtime	Indirect Costs	Total
Run by Agency	$896	$800	$14,857	$424	$1,696	$780	$26	$107	$27	$36,656	$11,254	$67,522
Agency Virtualized	$1,825	$438	$495	$29	$114	$26	$26	$4	$1	$36,656	$7,923	$47,536
Co-Located	$896	$800	$14,857	$424	$1,696	$0	$26	$7,320	$27	$18,328	$8,875	$53,248
Co-Located Virtualized	$1,825	$438	$495	$29	$114	$0	$26	$244	$1	$18,328	$4,300	$25,799
Virtualized with other Agencies	$2,468	$0	$0	$0	$0	$0	$508	$0	$0	$12,219**	$3,039	$18,234

*Calculations are supported by industry research organizations

**Number may be reduced when FRB is a live backup for the SMDC

Definitions

Run by Agency –	A single server in an agency data center
Agency Virtualized –	A single physical server running multiple software-based servers in an agency data center (Cost of one software-based server)
Co-Located –	A single server run by an agency in the SMDC
Co-Located Virtualized –	A single physical server running multiple software-based servers run by an agency in the SMDC (Cost of one software-based server)
Virtualized with other Agencies –	A single physical server running multiple software-based servers run by SITSD in the SMDC (Cost of one software-based server)

Non- Computable Benefits

Cost Avoidance

A significant agency data center operating cost is investment in cooling equipment and the utilities to run the equipment. Computers age and new equipment must be bought. With the Helena data center, the State of Montana can decommission old equipment at the end of life rather than replacing it. This option represents a significant cost savings for the State as the replacement cycle applies to only one facility, rather than each agency or branch.

For example, the Department of Environmental Quality will avoid replacing its water cooling system for its data center by moving into the SMDC. Additionally, it will save the cost of running water from the city mains 24 hours a day as required by the old equipment.

Security

The State of Montana designed all three of the facilities be secure. The SMDC and the MCDC were built to the highest data center standards. They have security features to ensure that no unauthorized personnel access the facility. Both are monitored 24x7x365 by the Enterprise Operations Center. All people who have access are required to undergo background checks. The FRB facility is located in the building that manages the Montana's money supply. Armed guards are on duty 24 hours a day and all personnel must undergo security checks. Additionally, STISD employs four full-time personnel to monitor cyber attacks on the state systems.

With few exceptions, no part of the Montana government has such protection for its servers and IT equipment.

Disaster Recovery / Continuity of Government and Continuity of Operations

MCDC is the disaster recovery center for the state of Montana. Located over 300 miles away from the seat of government, it resides well outside the impact range of most disasters that would strike Helena. MCDC also takes advantage of Miles City's location between the Eastern and Western US power grids. In addition to battery and generator backup, the MCDC may tap into either grid ensuring yet another level of redundancy.

Few states have the disaster recovery ability that the MCDC gives Montana. Some states have even inquired about using the MCDC for their disaster recovery needs.

Future Cost Savings

As costs for power and equipment go up, the cost savings realized by the data center system will go up as well. IT industry trends show that the more equipment organizations can co-locate in energy efficient space – like the SMDC – the greater the cost savings.

If the State of Montana operates as a single entity with respect to server equipment, it will maximize cost efficiencies.

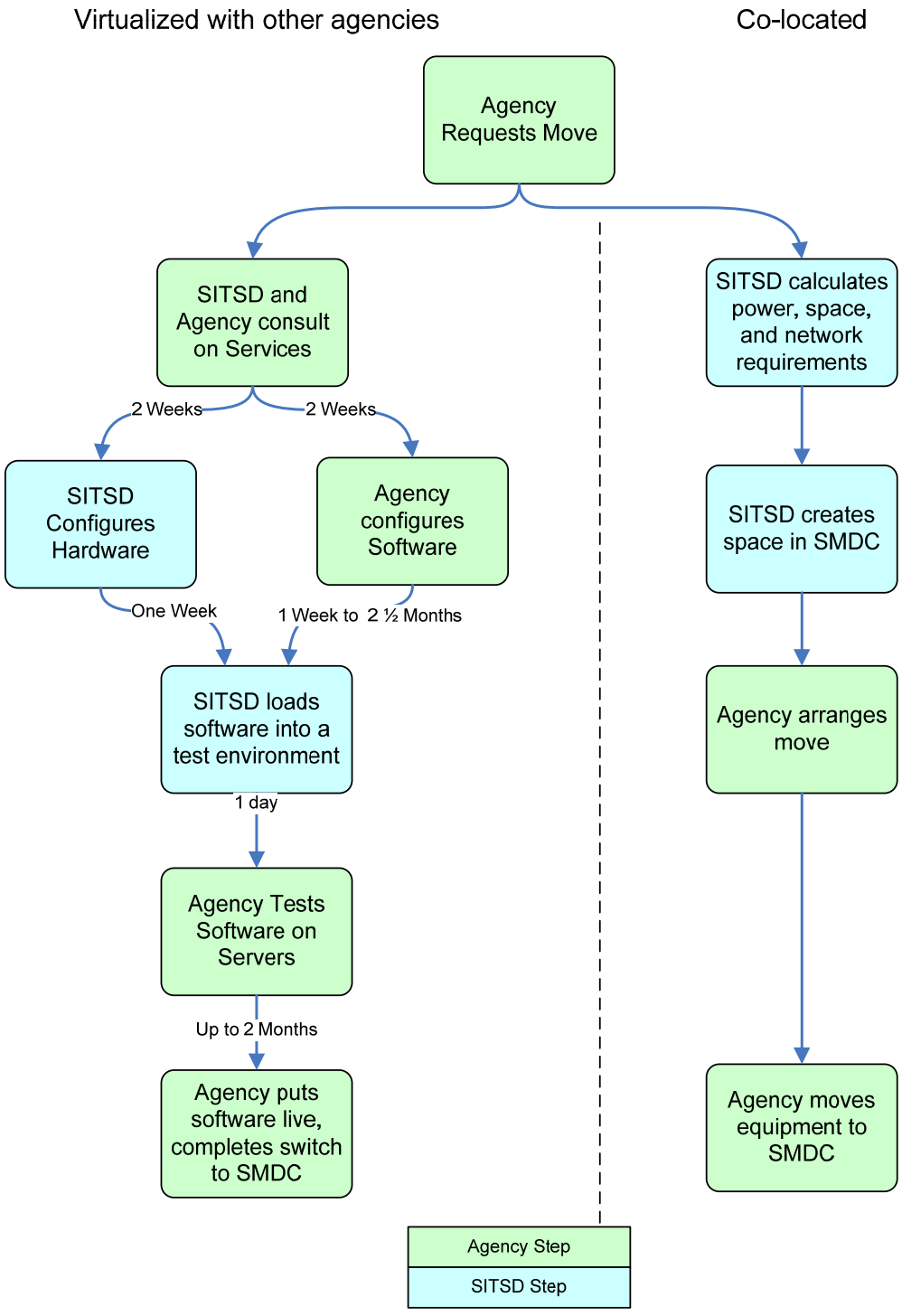
Comparison with Other States

State	Data Center Consolidation	Savings	Comments	Legislated
Alabama				
Alaska				
Arizona	Voluntary		177 Agencies and Commissions.	
Arkansas				
California		$1.5 Billion/5 years (2009)	GRP (Governor's Reorganization Plan plans to consolidate software contracts, networks, servers and data centers across the state. (2009)	
Colorado	In Progress	$24 million in cost avoidance (2009)	Two sites in Denver/Possible on in the South of the State.	X
Delaware				
Florida	In Progress - Complete 2019	1.6 Million/year for 3 large agencies	35 Agencies. Mandated by Legislature including schedule for consolidation.	X
Georgia			Outsourced to IBM	
Hawaii				
Idaho	No Plans	NA	Decentralized. 40 Agencies without IT Dept. All large agencies are self-sufficient.	
Illinois				
Indiana	Complete	$7 Million/year	Legislation Backed by an Executive Order from Governor	X
Iowa	In Progress	$18 Million	Legislation Backed by Executive Order from Governor	X
Kansas	Under Consideration	$350 Million/10 years	Legislature mandated a study of consolidation of all IT.	
Kentucky	Under Consideration		IT Governance mainly through Executive Order	
Louisiana				
Maine				
Maryland				
Massachusetts	In Progress		Executive Order impacting only Executive Branch	
Michigan	Complete	$9.5 Million in Cost Avoidance - $19.1 Million/8 years	Executive Order impacting only Executive Branch	

Minnesota	In Progress		Part of a State wide consolidation of IT legislated in 2011	X
Mississippi				
Missouri				
Nebraska				
Nevada				
New Hampshire				
New Jersey				
New Mexico				
New York				
North Carolina	Under Consideration		Legislature Mandated Review in 2004. Purchasing Consolidation since that point	
North Dakota				
Ohio				
Oklahoma	In Progress		Legislature passed and Governor signed legislation in May 2011.	X
Oregon	Complete		Considered to be a "botched" consolidation due to lack of capacity	
Pennsylvania				
Rhode Island				
South Carolina	Voluntary (Mainframe Yes)		Waiting on Legislature to mandate Need to have data center up to the task. Need to have a DR datacenter as well	X
South Dakota	Complete		Centralized in 1996	
Tennessee				
Texas	In progress		Outsourced to IBM originally, but has gone out for rebid	X
Utah	Complete	$4 Million/year	Empowered by 2005 consolidation legislation. Was able to consolidate in 1 year.	X
Vermont				
Virginia				
Washington	In Progress			
West Virginia				
Wisconsin				
Wyoming	In Progress		Two Data Center. Governor not approving new server purchases without going into data center. New legislation pending. 2009 effort failed.	

Moving into the Data Center

Overview of the Process



Virtualized with other agencies option

Total Length of Time: Between 1 and 5 Months
Challenges/Difficulties:

1) Agencies must take the time to configure their current software to work on the system. For complicated programs this could take additional time.

Costs: Costs are almost entirely "soft" – the HR costs for agencies to configure their software to the new servers.

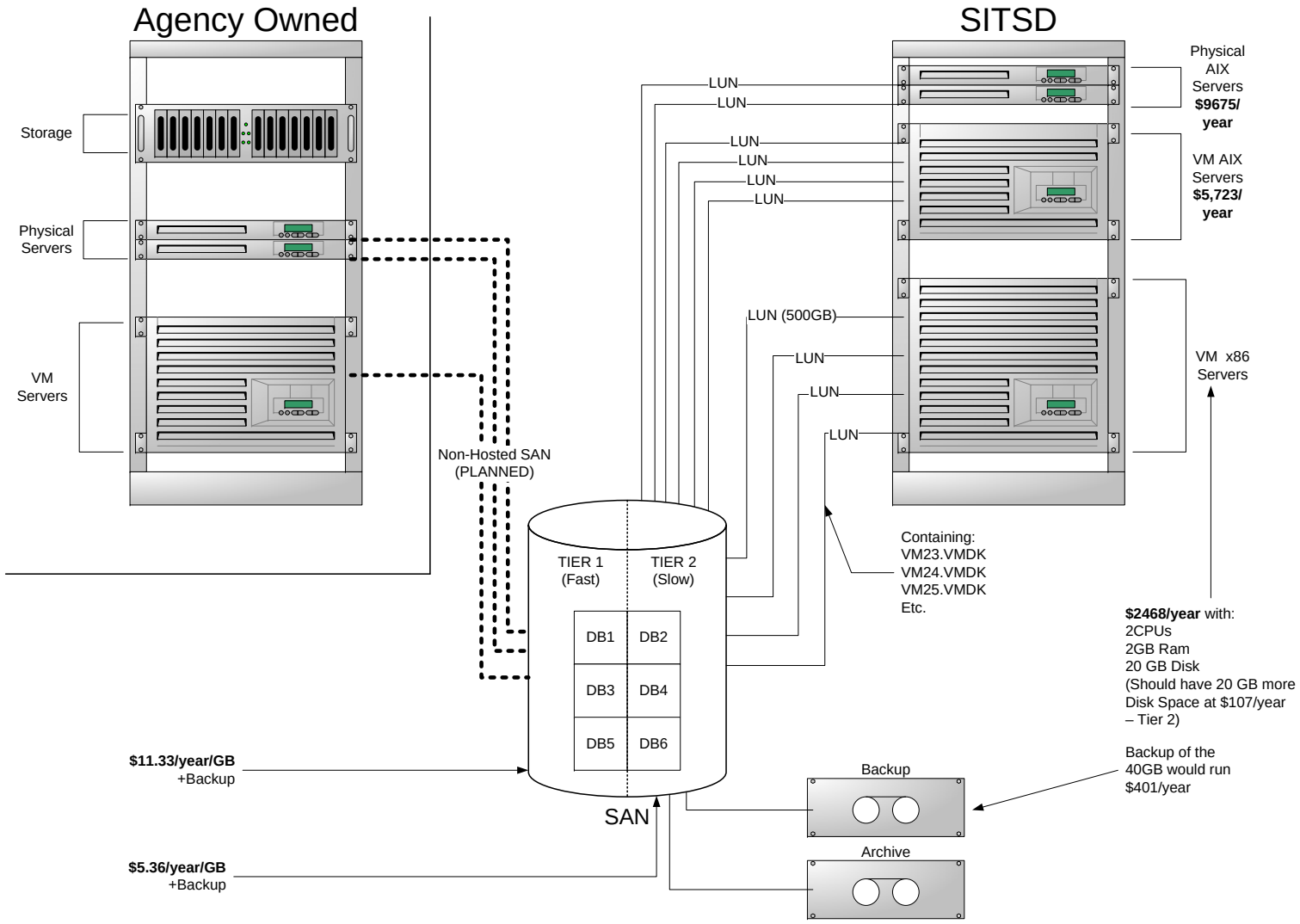
Co-Located (Agency Equipment)

Total Length of Time**:** Between 1 and 2 months
Challenges/Difficulties:

1) The equipment has to be physically transported to the SMDC. This involves unplugging the equipment, packing it for transport, moving it, unpacking it, and then reassembling it in the SMDC. This exposes the equipment to risk of damage. Additionally, the physical move, done properly, is a cash outlay.
2) Agencies have a greater downtime – while the equipment is being moved it is unavailable.

Costs: SITSD paid $24,526 to move 119 pieces of equipment from the Mitchell Building to the data center. SITSD has the most computer equipment and no agency should exceed this amount.

Diagram of Data Center Connections



Case Study: Department of Corrections move to the SMDC by John Daugherty

On Saturday September 17th we moved all of our equipment to the new data center. We took the systems down at 10 AM and had everything installed and turned on by 1 PM. Everything was tested and functional by 2 PM. We had hoped we could do the move with no downtime at all but we did not have the necessary equipment to perform such a migration.

What will it cost us?

The cost for the floor space we are using at the data center will be $610 per month; we will also have an increase of $9.52 for each device network connection. I don't have the final port count but have been estimating approx. 30 at the start. We will remove some of the equipment and connections after a few scheduled upgrades are completed.

What is the benefit?

The State of Montana Data Center is a 7.2 million dollar facility that was built with multiple levels of redundancy as well as a high level of energy efficiency.

Our equipment is housed in a rack with an ISO Base, Seismic Isolation Platform that exceeds seismic zone 4 requirements for protection. This means that in the event of an earthquake our equipment will be protected and continue to operate and will communicate as long as there is not a network outage.

The facility has redundant power coming into the building from two different paths and into two different electrical rooms. Each of our devices are powered from both of these circuits so if one goes down the other circuit will continue to power our devices. In the event both circuits are lost there is a backup generator that can keep us operating indefinitely. (as long as the fuel supply does not run out)

There are redundant data circuits coming into the building from two different locations as well. The odds of both data circuits being cut or interrupted is very small and provides us with a higher level of service than we have in our current location.

The building is built to Department of Defense standards for a data center, there are two sally ports between the main entrance and the where our equipment is stored. (they refer to them as man traps). No one is allowed unescorted access into the building unless they have passed a fingerprint background check and require access. Our equipment is in a locked cabinet that prevents anyone other than our staff and designated DOA SITSD staff from gaining access and there are cameras that monitor the entire center.

In our current location, it the cooling costs are $1 for every $1 of electricity that our equipment uses. In the new location, the cost will be .04 to .1 in cooling costs for every $1 in electricity that our equipment uses. DEQ has been monitoring our systems and energy usage here and has estimated that our current electrical costs for cooling at $14,948 per year. General Services Division will see this reduction, plus the reduction in our equipment electrical uses now that we have moved out. Additionally, GSD will decommission the cooling equipment, backup power supplies and will no longer have to pay for someone to monitor, inspect, and maintain that equipment which should result in further cost savings.

It is estimated that energy savings to the state from the 12 agencies that plan on moving in (including DOA SITSD) will be $203,773. And while energy is built into our rent so we will not see a direct savings it may offset future rent increases.

Will SITSD take over support of our equipment?

No, we will still maintain it like we always have.

Will it take longer to support equipment now that it is further away?

We don't believe so. We do almost all of our support and maintenance remotely and do not anticipate the need for frequent trips to the data center once we have everything configured.