ATTACHMENT 5

King County Office of
INFORMATION RESOURCE
MANAGEMENT

Understanding the Complexity of Data Center Relocation Planning (Developed for Council Staff)

September 2006

OIRM/ITSO

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Introduction

This document is being developed for Council staff to help understand the complexity of relocating the Data Center in Seattle Municipal Tower (SMT). OIRM/ITSO personnel are not experts on Data Center relocation and the associated planning to do so. We have gathered as much information as we could to put this document together but we are depending on the expertise of a consultant skilled in data center relocation planning to validate and complete the information shared here.

A data center move only happens once every 15-20 years thus it is not a core competency of the OIRM/ITSO business. Our data center is a county-wide data center with complexities that far exceed a small data closet. The data center houses the County's critical infrastructure components such as e-mail, network control monitoring, the telecommunications hub and administration, applications and servers for all agencies..

Developing the 'right' requirements, getting the necessary sponsors, and having the "right" schedule and budget are key to moving something as complex as a data center.

According to the Uptime Institute, "As with many once-in-a-career projects, the most serious pitfalls occur in the very beginning before management knows enough to clearly define the project's life-cycle objectives. As a result, an alarming number of multimillion-dollar data centers recently built, or currently in design or construction, have insufficient capabilities or flexibilities to achieve a fifteen-year useful life. In fact, most of these data centers will become functionally obsolete within the next five years."

The primary reason for this is the lack of sufficient planning.

Overview

The King County Primary Data Center is located in the Seattle Municipal Tower on approximately 6,400 sq ft of raised floor and 5,170 sq ft of ancillary support space. The lease for this space expires in March 2008. The equipment in this data center along with the server rooms in the Wells Fargo and Exchange Buildings must be moved to a new location when the tenants move to the New County Office Building.

The primary data center houses:

- Approximately 299 servers in the data center
- About 760 ancillary pieces of equipment (monitors, keyboards, power supplies etc.)
- Over 70 equipment racks combining the data center and tenant racks
- Legato backup system.
- Over 200 miles of cable
- One IBM mainframe and supporting peripheral equipment
- Approximately 1,000 IBM mainframe tapes
- 3 Primes machines used by Transit for scheduling bus routes

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- Telecom equipment consisting of 1 PBX and 2 AVT servers
- There are over 900 different network connections (includes firewalls, routers, I-Net equipment, intrusion detection etc.)
- Over 100 fiber channel, high speed data, Storage Area Networks (SANs) connections including external connections to other agencies within King County, Qwest, Electric Lightwave, I-Net and the Inter-Governmental Network (IGN).
- Approximately 9 high count fiber connections to the City of Seattle (SMT), Westin Building, Seattle Police Justice Center, City Hall, I-Net cable connection, King Street Center, King County Courthouse and UASI video conference.

The server rooms in the Wells Fargo and Exchange buildings include approximately 170 servers

Customer Profiles

Agencies or external entities that will be impacted by the Data Center move:

- Assessments
- Budget Office
- Children's Hospital
- City of Seattle
- Council
- DAJD
- DCHS
- District Court
- DJA
- DNRP
- Elections
- Electric Lightwave
- Executive
- FBOD
- ITS
- OEM
- OIRM
- Prosecuting Attorney
- Public Health
- Qwest
- RELS
- Seattle Art Museum
- Sheriff's office
- State of Washington
- Transit
- Various libraries and municipalities

Some examples of critical applications and services running in the data center:

- Email system (Exchange)
- Local Access Networks (Active Directory)

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- Payroll system (PeopleSoft)
- Electronic court and jail records (BARS, JILS, eSuperform)
- King county's data entry system (Unibase) etc.
- I-Net core connections (supports not just King County, but suburban cities, libraries, Children's Hospital, Seattle Art Museum, other municipal agencies)
- Web infrastructure for all of King County
- Smartcard
- Accounts payable
- Accounts receivable
- Taxes
- Assessments

Interdependencies

There are many interdependencies that need to be considered when moving equipment.
Hardware interdependencies:
DAJD, DCHS, DES, DJA, Executive, ITS, Prosecuting Attorney, Public Health, FBOD all have applications that use the Enterprise SQL Server 'Eagle'. There are 15 agencies in King County and nine of them use this server. OIRM/ITSO will need to coordinate with all of these agencies in order to move this one machine. There are many more servers like this machine which service multiple agencies. In fact, every agency and business listed above depends on the mainframe as there are over 149 applications currently running on it.

Software and application interdependencies:
As an example, the Justice Information Lookup Service (JILS) application is used by various agencies through out the county as well as many law enforcement agencies. This application provides various information, more notably prisoner profile (e.g., date of birth, race,, arrest charges, bail, and mug shot). This application has been identified as a critical application by the Inter-Agency OIRM Business Continuity program and is considered to have no downtime tolerance, meaning, this application needs to be running all the time. The JILS application uses eight other applications to function. These applications reside on several different machines as well as the mainframe. Careful coordination and planning would need to occur to ensure that all of the servers and mainframe connections are moved accordingly to not disrupt service.

Technical Design and Planning Considerations

The increasing miniaturization of servers, and the rapid adoption of blade servers, is putting tremendous amounts of computing power in smaller spaces. While this allows organizations to use their floor space more efficiently, it also puts concentrated loads on electrical and cooling systems. These technologies can draw electrical loads that can easily outstrip the existing infrastructure, as well as inject large quantities of heat into the

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data center. These issues also can have a cascading effect on fire suppression systems, storage areas and backup power generation.[1]

Technical complexities that need to be taken into consideration are:

- *Power* – how will power be distributed, including UPS, backup diesel generation, power distribution units (PDUs) and intermediate distribution units.

- *Water proofing and drainage* - determining where to add water sensors on the floors or ceiling and if there are wet walls to those as well, so that you get at least as early a detection as possible of the presence of water.

- *Heating, ventilation and air conditioning (HVAC) systems* – the single greatest issue is maintaining adequate cooling and air movement. Design considerations may include rooftop units and distributed units that provide localized air cooling or spot cooling, chilled water systems, and raised floor for airflow. A poor design could lead to air conditioning units fighting against each other for power or shutting off because they are too close to one another. This would create hot spots which could lead to hardware failures.

- *Dual Power Supplies and Redundancy* – design considerations for building in redundancy for cooling, power and communications is necessary. Operations personnel also need to also consider dual electrical grid service and dual communication connectivity.

- *Security systems and Fire protection systems* – local and central monitoring including detection and abatement systems that most likely will combine pre-action wet systems interconnected with dry systems (such as FM 200 and Inergen) for sensitive areas, such as disk storage areas. It is necessary to ensure that you video monitoring and sensors are installed for the secure infrastructure; doors, panels, firewalls. Not firewalls as in network firewalls but one hour burn walls in between floors and different things like that are considered security components also. (Norview 399)

- *Floor types and loads* – there are design considerations involved when using a raised floor. Some standards are 12 inches for less than 1,000 square feet. 12 to 18 inches for 1,000 to 5,000 square feet; 18 to 24 inches for 5,000 to 10,000 square feet and 24 inches for more than 10,000 square feet. The more airflow that you can get the better. This also helps in cable pulling and certain infrastructure that you have to put in underneath the floor.. Other issues are floor loading or floor capacities depending on what floor the data center resides on. It is important to think about future requirements and plan for them.

- *Need logical design as well as physical* – a data center design is not just from a physical standpoint, (e.g., building layout, UPS sizing, HVAC sizing). Additional

[1] Brian Koma, Data Center Institute

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considerations are from an architecture design of how to install the equipment across the network. (Norview 399)

- *Move strategies* – The data center move will take approximately four to six months from the time the planning is completed to the lease of parallel systems to the physical move, testing and cutover. The new facility must be fully operational with facility and network infrastructure in place so that a sequential move of systems can occur over time to minimize disruption to customers. In addition, during the move, OIRM/ITSO will be operating two data center facilities. This will require specific planning and management of production, staffing, and supplies, etc.

- *Maintaining availability* - Transition is the most effective and efficient manner while mitigating risk to availability, reliability and service. . It is important to minimize non-scheduled system or application outages and maximize user and application transparency. .

Other planning considerations

- Lead times:
  - King County's procurement processes and contract negotiations historically have been long lead time issues.
  - Historically network requirements have been difficult to fulfill because of extended lead time for delivery of circuits from Telco's. Delivery times have shortened in recent years but the proliferation of service providers means there is generally a longer time spent in negotiating with vendors.
  - Lead timing on large orders such as HVAC units, generators, etc. may be long, and that is time after the contract is signed. Currently the Goat Hill Office Building project has discovered that there is a 18 month lead time for a generator.
  -

- *Server and Maintenance contracts* - Contracts exist with various vendors such as Qwest, Verizon, etc that need to be renegotiated for re- termination of T-1 lines that will be moved to a new location..

- *Commissioning* - a complex but necessary undertaking prior to moving any production equipment on site - to assure reliability and redundancy failover mechanisms actually work as designed

- *Business Continuity implications* - Offsite media storage and the impact of the project to Business Recovery

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- *Potential impact on existing staff* - The staffing requirement during the transition periods is under review.

In summary, the combination of the possible design choices as it pertains to the equipment as well as operating functions will take a good amount of expertise and time to develop. Firms that do data center design, build, commissioning and IT equipment moves are typically specialized businesses and the complexity of the overall project needs to be planned into the schedule.

Also, because the County either connects to, or provides services for, so many external cities and organizations, the move planning will have to incorporate coordination with those entities as well.

Potential Planning Tasks

Per Brian Koma from the Data Center Institute – Activities that need to occur for a successful Data Center move are:

1. Conduct comprehensive IT inventory
   - Know what you have and where you have it
   - Identify leased/purchased equipment and maintenance contracts
   - Identify hidden or under utilized systems

2. Design environment
   - Need to create a logical design - networks, servers, applications and databases, information, security, redundancy
   - Need to create a physical design – need detailed specifications for:
     - Rack space
     - Raised floor
     - Cooling capacity
     - Storage devices
     - UPS requirements
     - Network infrastructure
     - Tape/media storage
     - Fire suppression
     - Physical security needs
     - Electrical and cooling, racks, and physical space needed for future growth

3. Move Planning
   - Communication planning
     - Start a task force
       - Engage members to socialize the plan with key constituents
     - Conduct formal meetings with the business units
     - Explain potential impacts and contingency plans

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        - Level set expectations before move
- Create a detailed physical move plan
    - Sequencing
    - Mirrors and back ups of critical data
    - Data lock downs
    - De-install/installations plans
    - Testing

The document included below "Going Back to The Future With Data Center Moves and Consolidations", *Brian Koma, Data Center Institute*, is a good example of the importance and robustness of taking on a move as complex as a data center.

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Implications

Potential impacts if not planned well:

- impact to many county operations
- extended outages during move
- hardware failure which may require a configuration of a new machine
- application corruption which may require a complete restore from backup
- loss of email
- electrical or network problems
- not enough space for all of the equipment
- network is not powerful enough
- not enough power all the equipment
- hot spots
- not flexible
- not scalable

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Data Center Planning Cost Breakdown

The example below depicts the cost estimated by IBM to plan the move of the City of Seattle's Data Center. Aside from the size of the City's data center being considerably smaller, these figures were generated in May, 2001.

IBM Proposal for CoS Data Center Physical Relocation and Relocation Planning

Tasks	Rate	Hours	Total	Notes
- Attend meetings, assist CoS in developing a Relocation Plan, perform pre-relocation activities, project management and provide RS/6000, AIX, ADSM.TSM technical skills	$228	804	$183,312	City of Seattle moved approximately 47 pieces of equipment, one Command Center, 1,000 tapes and miscellaneous desks, chairs, cabinets and tables
- Cable labeling, de-installation, reinstallation, diagnostic testing	$200	268	$53,600	
- Provide spare cabling			$780	
- Perform the physical move of equipment and tapes			$18,160	
TOTAL			$255,852	

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IBM Proposal for King County to move Data Center and 3 server rooms to 1130 Rainier Ave

Tasks		
		King County's move was for approximately 500 NT and Unix servers and one small mainframe with associated peripherals; an existing 6,400 sq ft raised floor data center to an anticipated 6,000-10,000 sq ft raised floor data center
- Project Management		
- Develop and Validate Facilities Requirements	$177,418	
- Infrastructure assessment, relocation alternatives and recommendations	$177,417	Two installments - $177,418 and $177,417 for a fixed price of $354,835.
- Peer Review Consulting	$20,000	
- Travel and living expenses	$1,700	
TOTAL	$376,535	

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