State Data Center
Storage Shared Services
Architecture Project

Technical Forum Notes and Handouts

9/11/07

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1. Message from Architecture Team

The SDC architecture team wants to thank all the customers who came to the Storage Shared Service Architecture Technical Forum on September 11, 2007. We appreciate the candid feedback and remain committed to sharing information about architecture strategy and direction as early as possible with our customers. We ask that customers be patient with our ability to answer detailed questions about how we will deploy specific technology in each agency.

As mentioned at the forum, the SDC intends to introduce architecture concepts by each domain area (server, network, storage, etc). Agency specific technical implementation planning sessions will follow these general introduction sessions as the state rolls out projects for each technology architecture deployment.

You should feel free to contact any member of the architecture team if you have questions about the materials contained in this packet.

Sarah Miller: Business Architect 503-373-0765
Kurtis Danka: Technical Architect 503-373-2043
Claudia Light: Project Manager 503-373-2091

We look forward to continued partnership as we work together to build the future.

2. Technical Forum Notes Q&A

Storage Shared Services Architecture Overview
Technical Forum Notes
Tuesday, September 11, 2007 1:00PM – 2:30PM
State Data Center, Room 104

Presenters:

Kurtis Danka	Technical Architect	503-373-2043
Claudia Light	Project Manager	503-373-2091
Deanna Dyer	Storage Architect	503-373-0225

Storage Architecture Team Members

Michael Rodgers	Distributed Systems Manager
Frank Kuchta	Storage Project Manager
Jan Toepfer	Storage Technician

Attendance: 28
Agencies Represented: 7

Agenda

Introductions/Overview – Kurtis Danka

This is the third in a series of technical forums being held at SDC in regards to the architecture planning efforts to form a shared services environment. This session will cover some general information about the current state of storage systems and projects going on at the SDC and how we are currently leveraging these storage systems.

Sessions have been previously been held for Distributed Systems (Server) and Network Architecture. These forums are an attempt to provide a general overview of the consolidated architecture strategy in regards to each domain area (server, network, storage etc.). Individual Agency planning meetings will also be held to discuss strategies and agency business requirements.

Architecture Project – Claudia Light

The current project is an 18 month – 2 year project that creates a "next-generation" architecture plan to standardized systems at the SDC. The goal is to create a repeatable process for system design.

SDC Consolidation Architecture Project Charter.pdf

The project charter is a high level overview of the entire Consolidation Architecture Project highlighting the project's purpose, goals, scope and customer impact.

Domain Architecture Deliverable Template.pdf
This document is an example of the template that will be completed for each domain area. The document serves as a framework for reporting the domain area's current state, organization, policies, guidelines and targeted standards. This section identifies the standards and future directions that are associated with hardware and software products associated with each domain. Also included is a domain "roadmap" that identifies next steps in the form of initiatives and projects recommended to achieve the overall consolidation goal.

Storage Architecture Overview – Kurtis Danka

Storage Technical Forum Architecture Presentation.ppt
This presentation provides an overview of the current and planned storage architecture at the SDC. It also discusses key features and highlights of the tape environment, and the storage server environment. Including SAN, SAN Boot Architecture and the current Backup environment. The upcoming CISCO SAN infrastructure change project will also be discussed.

Q&A

Q. What is the mechanism for allowing multiple state agencies to access a single partition of the SAN? What is the mechanism for billing multiple agencies for one shared storage partition. Is it possible to split billing on a monthly basis?
A. There have been some preliminary discussions on how this will be architected.
We need to work with the finance committee to develop billing model for these specific scenarios.
Also, Deanna will be working with agencies individually to meet agency specific needs.

Q. How will new requests for storage or shared access be handled?
A. Deanna will be working with agencies individually to meet agency specific needs.

Q. Is there a timeline where we will get everything off agency servers and onto SDC servers?
A. Individual Agency planning sessions will be held to discuss business requirements over the upcoming months. Existing hardware inventory and applications will be analyzed to determine those candidates that will be best for consolidation in the new environment. Over the next 18 months, the SDC will begin consolidation on existing inventory in conjunction with proper planning efforts. It is not expected that all 1200 servers currently residing at SDC will be consolidated during this time. As the shared services environment matures, consolidation projects will be planned and mapped out according to agency needs.

Q. What about newer machines that are still in good shape but need more storage?
A. The new SDC architecture standards call for not purchasing more direct attached storage but upgrading these boxes with HBA cards to allow for SAN connectivity in the centralized storage environment.

Q. What is meant by the "modified Linux kernel" on the Virtual servers?
For virtual servers, we are using VMware ESX. This is a customized Linux kernel specifically for ESX. The SDC did not modify this any further.

Q. What is the intent of using VMware in the new environment?
A. We expect to highly utilize VMware for consolidation purposes. We are also looking at VMware Lab Manager to assist with consolidation efforts in the dev/test environment.

Q. Regarding the Hitachi Disk what happens to the actual disk if it fails?
A. In the event of a disk failure, the vendor will swap the disk out for a new one. Old disks are striped and destroyed. The data layering on each disk is relative to the serial number of the device so the data cannot be recovered in another device. Also, it is not in our best interest to keep the disks as we get credit if we return them.

Q. What is the cost to destroy a disk on site?
A. The cost would be to have spare disks on site.

Q. Can you explain the Tivoli/HSM data aging policy?

A. As data ages, the data can be moved to the lower cost storage tiers. This should be an invisible process to the customer.

Q. Will you be looking for chances to save money for customers?
A. Yes, If we can identify a server that is a good candidate for consolidation we will communicate that with agencies.

Q.Will the bills or reports provide enough information to allow customers to analyze costs?
A. Our goal is to provide agencies with the proper information needed to make informed decisions regarding their costs as well is identify areas for cost reduction.

Q. Will the new workflow processes be reflected in a policy?
A> Yes, the consolidated environment plan will provide the means for solidifying process at the SDC.

Q. How will document imaging needs with extra space requirements be handled?
A. Imaging systems are technically out of scope however if there is a SAN requirement we will work with agencies on a case by case basis.

Q. Who is liable for meeting regulatory requirements regarding data encryption and applications.
A. The SDC will work with agencies to make sure we are in compliance with any federal regulations.

The next Architecture Planning technical forum on October 25th. The topic will be Security.

3. SDC Consolidation Architecture Project Charter

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SDC – Project Charter

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SDC Consolidation Architecture Project

Title	SDC Consolidation Architecture Project
Sponsor	Mark Reyer
Project Mgr	Claudia Light
Purpose & Expected Results	Assess the existing technical architecture at the SDC; determine the desired target architecture; identify, plan and implement the projects to create the production infrastructure for the consolidated architecture, including ongoing architectural governance. This project will also generate a slate of additional projects to be accomplished in the 07-09 biennium.
Project Success Metrics	• A full assessment of software on all computing platforms (iSeries, mainframe, AIX, Windows) will be completed • Architecture methodologies and templates will be defined for inclusion in project planning • Technical principles for the target architecture will be defined • Target Technical Standards and will be defined and communicated • Target policies will be defined and communicated • Domain specific and cross-domain AS-IS and target architectures (platforms, products, services, organizational structure, and staffing) will be identified and documented • Foundational elements of the target architecture will be implemented and an action plan for follow-on projects for migration to that target architecture will be defined • Architecture touch points will be mapped to SDC processes and architecture roles will be integrated into existing and new SDC processes • Define, track & report consolidation metrics that will result from architecture
Cost Justification	Standardization, consolidation and automation are three of the strategies that will be applied to the SDC Consolidation Architecture to reduce overall operational costs. Potential savings will be identified throughout this project. Initial costs for this project are staff related. They depend on the size of the team chosen to work on this project. Hardware and software costs for this project will depend on the foundation elements of the target architecture chosen for implementation.
Alignment*	The project and the target architecture are intended to provide consolidation and shared services that will help the SDC meet the goal of providing the same or better service at a reduced cost

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SDC – Project Charter

SDC Consolidation Architecture Project

Scope*	This project will look at technical and process architecture in the following domains: • Distributed Systems • Storage • Network/Security/Voice Services • Enterprise (iSeries, zSeries, pSeries) • Plans and Controls (Business Controls & Customer Services) • Operations and Customer Support Center
Customer Impact	This project will have minimum customer impact from a technology service delivery perspective, during its execution. SDC staff removed from their current duties to participate on the architecture team may be back filled to maintain workload consistency. This project will be worked internally at the SDC until the target architecture design is ready to be communicated. However, if customers want to volunteer technical, project coordination, or process analyst resources to work on this project, they would be most welcome. The outcome of this project will require customer participation when migrating to these target architecture. This will be part of the follow-on projects.
Key Stakeholders	SDC Sponsor – Mark Reyer Project Steering Committee - SDC Management Team SDC Architect – Kurtis Danka SDC Strategic Project Program Manager – Sarah Miller Architecture Team – SDC Technical Team Leads SDC Project Managers for Technical Domain Areas SDC Customers

Expected Duration& High Level Milestones	Expected duration of this project is ?? • Initial Strategies and Action Plan (shows how we got here and what is in progress now) • Completed product assessment by domain • SDC Architecture principles document • SDC architecture policies • SDC technical standards • Domain Architecture Document (shows AS-IS, domain specific governance, target, and roadmap) • Architecture touch points in SDC processes map • Cross-Domain Target and Roadmap document • Customer Road show to market target architecture and roadmap • Consolidated list of Architecture Projects with anticipated schedules • Consolidated list of services and processes to change or be created • Lab for conducting proofs-of-concept and small-scale testing • Target architecture foundation environment (ready for customers to migrate to) • Functional Configuration Management Data Base for use by SDC processes • Chartered Architecture Review Board • Architecture templates for use in SDC projects • Updated strategies and action plan • SDC consolidation metrics defined
Funding Source	Funding will come from CNIC COP funds if still available and applicable, remainder will come from SDC operating funds

4. Domain Architecture Deliverable Template

<Domain> Architecture

"As Is" <Domain> Environment

What does this domain provide to the environment and the customer base?

[Enter Content Here]

Current <Domain> Platform

What can be said of the current architecture of the domain? Provide an overview statement of the hardware and software elements of the domain. Include general statements of interoperability and connectivity between elements in the domain. Include a conceptual diagram of the domain to illustrate content and connectivity if appropriate at this level.

[Enter Content Here]

<Name of First Domain Platform Element>

Describe specific features of this element. What products and technologies are involved in this area? Include a conceptual diagram at this level if more appropriate than at the domain-wide level. Include information on connectivity, interoperability, and security features associated with this element. Include tables or text that demonstrate the magnitude of this element in the environment.

Examples of an element include: SAN, Windows Servers, z/890 mainframe – Anything that makes sense to the domain. Put each category of elements under a separate section at this level

[Enter Content Here}

Current <Domain> Services and Processes

What can be said of the current services provided by this domain both externally to customers and internally to SDC staff? What can be said of the processes associated with providing these services? Provide an overview statement of the key services and processes. Are there bottlenecks and failing processes? Are the services adequate? Are there areas that are begging for improvement?

[Enter Content Here]

<Name of first key service or process>

Describe the service or process. What functions are automated, and which are manual? What tools are used as part of the process? Is production of the service or execution of the process completely under the control of the domain area, or does it cross-domains? How well are hand-offs handled? How frequently is the service or process used? Have there been any changes in this frequency? If possible, include a process diagram or outline of the steps in the process

In this context, a process is how you get the work done. A service is what you offer to external and internal customers. Example of a service include: Storage Hosting, Application Hosting, and Network

Connectivity. Examples of a process include: storage allocation, licensed-product installation, adding new network nodes. Put each key service or process under a separate section at this level.

[Enter Content Here]

Current <Domain> Organization and Staffing

What can be said of the current organization and staff environment in which this domain exists? Are there issues with the workload? Does the staff have time to be responsive to other areas, or are there bottlenecks? Does the staff function as a productive team or more like independent workers? How well does the staff understand the purpose of their function in the bigger picture? Is there significant turnover? Is it a good place to work? Are there any environmental hazards associated with this domain?

[Enter Content Here]

<Domain> Governance

This section identifies the principles, policies, guidelines, standards, and management directions for this domain. These documents provide the direction and guidance for taking the "As Is" environment to the target environment.

If formal policies, guidelines, and standards exist, reference them and summarize their function.

<Domain> Principles

In this context, principles are generalized statements that can be used as a basis for reasoning or conduct. They do not have the same level of accountability as policies, but they provide expression of what is of value to the organization. The list should be brief and succinct so that it can be easily remembered during the planning process.

The SDC target <domain> architecture is based on the following principles:

- <Principle 1>
- <Principle 2>
- (etc.)

<Domain> Policies and Guidelines

Identify the formal DAS or SDC policies and guidelines that directly affect this domain. If there are informal polices and guidelines that need to be formalized indicate what these are. For both formal and informal materials, identify the key elements that need to be considered during target architecture design.

The following formally documented policies and guidelines exist for this domain:

- <Document name 1> – <Description of the key elements of the policy or guideline
- <Document name 2> – <Description of the key elements of the policy or guideline
- (etc)

The following concepts need to be formalized as SDC or DAS policies or guidelines for this domain:

- <Concept name 1> – <Description of the key elements of the policy or guideline
- <Concept name 2> – <Description of the key elements of the policy or guideline
- (etc)

<Domain> Standards

This section identifies the standards and future directions that are associated with hardware and software products associated with this domain.

Key <Domain> Standards

Identify the key standards for this domain. The standards could refer to interfaces and protocols, or to specific products. The key standards are the ones that will influence planning of the target architecture. If standards documents exist elsewhere, reference them here and identify the key elements that need to be taken into consideration.

[Enter Content Here]

Target <Domain> Environment

What does the target domain provide to the environment and the customer base? How does this differ from the AS IS domain?

[Enter Content Here]

Target <Domain> Platform

What can be said of the target architecture of the domain? Provide an overview statement of how the target hardware and software elements of the domain differ from the AS IS domain. Include general statements of interoperability and connectivity between elements in the domain. Include a conceptual diagram of the domain to illustrate content and connectivity if appropriate at this level.

[Enter Content Here]

<Name of First Domain Platform Element>

Describe specific features of this element in the target domain. What products and technologies are involved in this area? Include a conceptual diagram at this level if more appropriate than at the domain-wide level. Include information on connectivity, interoperability, and security features associated with this element. If an element will be phased out of the architecture, discuss what will take its place

Put each category of elements under a separate section at this level

[Enter Content Here}

<Domain> Product Directions

Identify the planned direction for software and hardware associated with this domain. Add rows as needed. Meaning of categories:

- *Obsolete – product is virtually unsupported. There will be no patching or upgrades. SDC will work with applications development areas to resolve problems on a time and materials basis*
- *Transitional – support for product will be phased out. Critical patches will be applied until the end of support.*

- *Strategic – product is fully supported by the SDC according to the associated term sheet. Patches and upgrades are applied as needed.*
- *Research – product is identified as on the list for researching as a potential strategic product.*

The following table illustrates the direction for hardware and software in the target environment for the <domain name> domain.

Product (existing or proposed)	**Obsolete**	**Transitional**	**Strategic**	**Research**
Hardware				
Operating System				
Enterprise Infrastructure Application				

Target <Domain> Services and Processes

How will the target services and processes differ from the AS IS services and processes? What new services and processes are envisioned? Who will use those services and processes? Provide an overview statement of the key services and processes in the target environment. How are bottlenecks and failing processes in the AS IS environment addressed?

[Enter Content Here]

<Name of first key service > Operational Characteristics

Describe the target service or process. What functions are automated, and which are manual in the target environment? What tools will be used as part of the process? How will the process flow differ in the target environment? What changes to hand-offs are expected? If possible, include a high-level process diagram or outline of the steps in the process.

[Enter Descriptive Content Here]

Fill out table for each key service in the target environment. Identify the tools to be used to provide the service. Identify ITIL and other processes involved in delivery of the service. Identify the skills needed to produce the service. Note whether additional training or staff are needed to provide those skills. Identify what has to be implemented to achieve the target environment. Many of the implementation items will already be known initiatives. Include estimated time to implement and planned time frame for these. Provide best guesses for the rest.

Tools:	<name of each product used to provide the service>

	Gaps: <identify tools or tools types needing to be acquired>
Processes:	<name of each process> Gaps: <identify processes that need to be created>
Skills:	<name of each skill area needed to provide the service> Gaps: <identify skills that are insufficient currently and how long it will take to attain that skill. Will the skill be acquired through training or staff acquisition?>
What to Implement	<name each project or major task involved in getting to the target service and its underlying processes. Identify any known durations and time frames for these tasks and projects>

Target <DOMAIN> Organization and Staffing

What can be said of the organization and staff environment in the target domain? Are there organizational changes recommended? How will work to get to the target environment impact the staff's workload? What needs to be adjusted to get there? Is staff augmentation feasible, will new positions be needed, or staff freed up to do other things? How will the target environment impact the culture in the organization and group? What organizational and personal change management work will need to be done?

[Enter Content Here]

<Domain> Roadmap

Recommended Initiatives and Projects

Identify the major work efforts needed to achieve the target environment. Explain why this work is needed to achieve the target. Identify the known or anticipated time frame for this work.

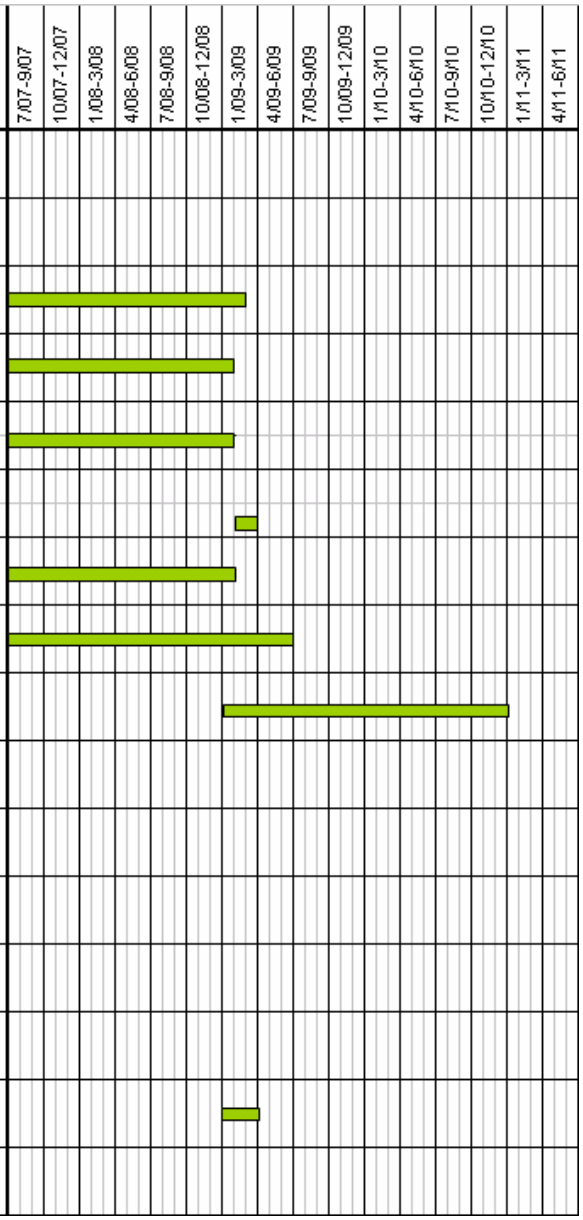
Initiative or Project	**Rationale**	**Expected duration**
<name of initiative or project>	<How will this effort help achieve the target environment? How will this make the situation better?>	<expected timeframe for effort>

<Domain> Proposed Sequence and Schedule

Provide a visual roadmap of the high-level schedule of initiatives and projects needed to achieve the target environment.

(example)

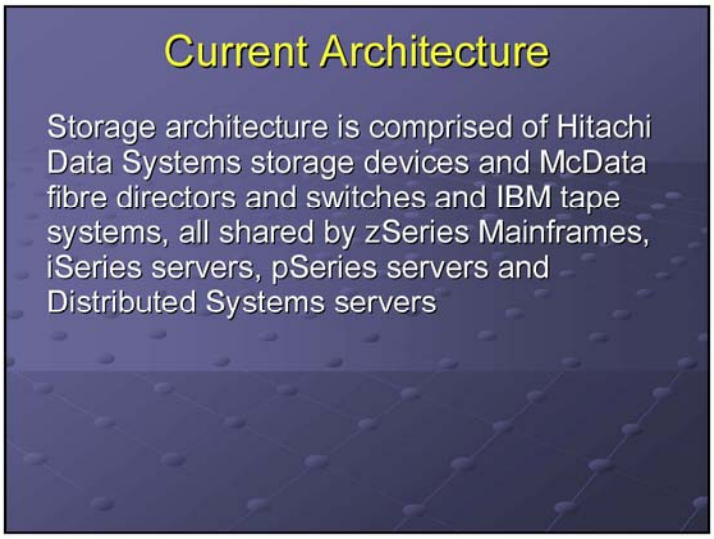
Initiative or Project	Expected Duration
Burns Archive Center Transition	2/6/07 – 7/3/07
Storage Hardware Architecture Capacity Review and Assessment Project	1/8/07 – 3/9/07
Enterprise Storage Management Project	7/2/07 – 2/29/08
HSSM and Virtualization Tools Implementation	7/2/07 – 1/31/08
Storage Staff training	3 mo during 7/2/07 – 1/31/08
	1 mo during 1/2/08 – 2/29/08
Hierarchical Storage Management Implementation Project	7/2/07 – 1/31/08
Storage Management Tool Rollout to Customers	7/2/07 – 6/30/08
BRMS project	1/2/08 – 6/30/08
Enterprise Monitoring Project	??
Monitoring content integration	12 mo
Enterprise Backup Project	??
Remaining Agency Storage Consolidations	??
Capacity Reporting Process Implementation	??
Availability Management Process Implementation	1/2/08 – 3/31/08
Mainframe tools standardization	??



Projected Customer Impact

This section is intended to open dialogue with the customers on what these changes mean to them. Identify anticipated impact on Customers to achieve the target environment. Will they need to allocate resources to participate in projects? Will they need to change products they are using currently? Will they have new services available?

5. Storage Technical Forum Architecture Presentation



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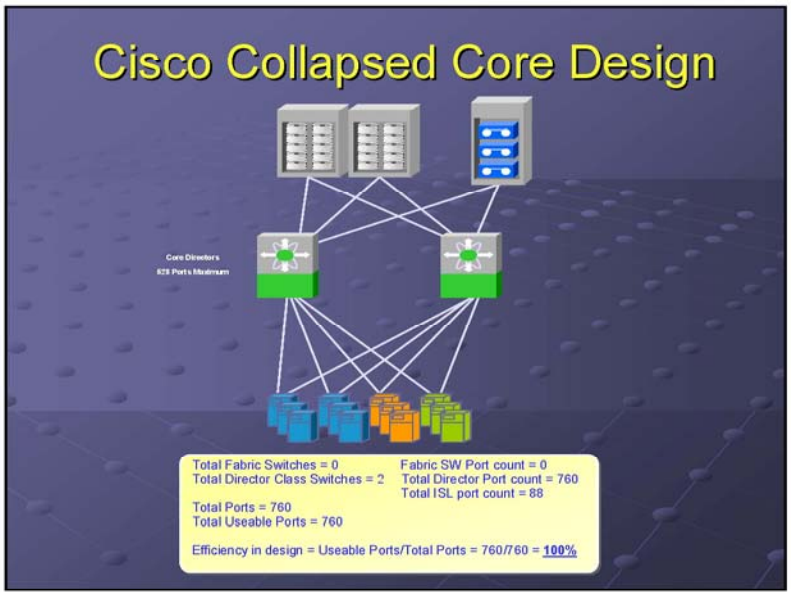
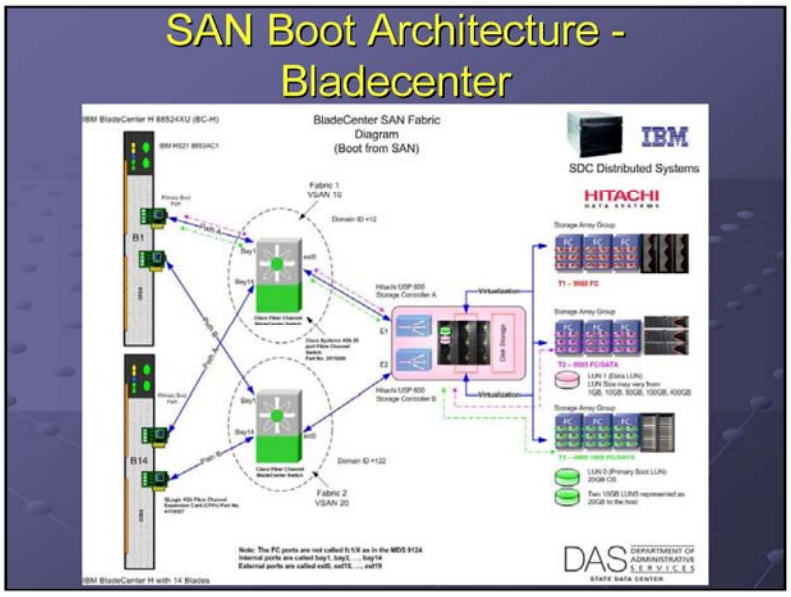
Cisco Collapsed Core Design



SAN Redundancy

- Isolated Storage Controllers on Hitachi
- Every server has
  - A/B path (fabric) to SAN (2 SANS)
  - 2 HBA's (each connected to isolated fabric)
  - Dual Path Management Software
- 6 power supplies in storage subsystems
- Redundant Power Boundaries
- Redundant Cache & Shared Memory
- Redundant Internal Data Paths
- SAN Internally Clustered
- RAID Disk / Automatically 'spares' disk


SAN Boot Architecture - Bladecenter
BladeCenter SAN Fabric Diagram (Boot from SAN)
IBM
SDC Distributed Systems
HITACHI
Fabric 1 VSAN 10
Fabric 2 VSAN 20
B1
B14
Hitachi USP 600 Storage Controller A
Hitachi USP 600 Storage Controller B
Virtualization
Disk Storage
Storage Array Group
DAS
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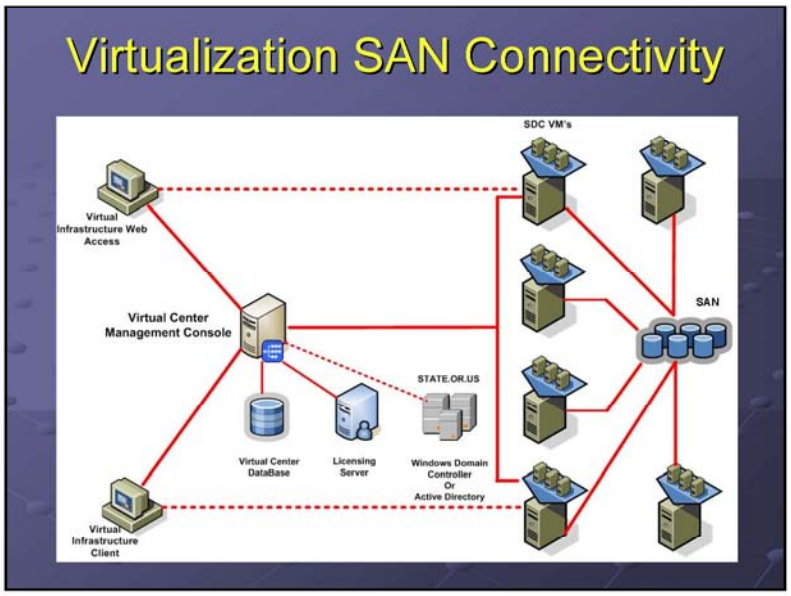
Virtualization SAN Connectivity
SDC VM's
Virtual Infrastructure Web Access
Virtual Center Management Console
SAN
STATE.OR.US
Virtual Center DataBase
Licensing Server
Windows Domain Controller Or Active Directory
Virtual Infrastructure Client

Centralized Backup Management

- IBM Tivoli Storage Manager (TSM)
- Enterprise-class, common backup solution across multiple platforms
- IBM Tivoli Hierarchical Storage Management HSM (Policy based data movement in tiered storage)
- Supports Windows, Linux, Novell, AIX, HPUX, Solaris operating systems
- Open file agents including DB2, Oracle, Exchange, SQL,

Current Backup Situation

- 12 distinct products/methods used to manage backups across all environments.
- Storage is not centrally managed/provisioned efficiently which creates inefficient use of technical staff support time and backup system capacity.
- Numerous locally attached storage volumes underutilized.
- Backups lacking classification/retention requirements and policies creating substantial storage waste.
- Currently lack historical usage data for projecting future capacity needs/costs.

Backup and Recovery Features

- Collocation of tapes to a group of client servers, single server, or file system (volume).
- Offsite copying for disaster recovery purposes.
- Tape utilization through reclamation and migration.
- Restartable backup and restore for interrupted operations.
- Journal-based backups to expedite the process and minimize processing overhead.
- Nondisruptive online image backup and restore.
- Rapid recovery by creating backup sets that consolidate files onto portable media.
- Automated backup schedules.

Projected Project Timelines

** Estimated completion date dependant on detailed implementation plan.*