HITACHI
DATA SYSTEMS

Storage Strategies & Architecture

HDS Positioning Paper

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INTRODUCTION

As a global provider of storage solutions and services, HDS consultants see a variety of document styles used to set strategy, define standards, and govern how IT and storage infrastructures are used in the enterprise. Many operational and technical best practices have been observed over the years, and this expertise is worth documenting for future reference.

STRATEGIC DOCUMENTS TO GUIDE STORAGE DECISIONS

HDS observations of best practices in documenting storage strategies and directions has led to our generalization of 3 types of strategy or planning instruments for the storage infrastructure. We use the word instrument loosely, since the output may be a document, presentation, HTML page etc. Not all strategic planning instruments are in a binder in the CIO's office, but are often distributed and available for customers and IT providers to reference.

HDS has found that IT departments that employ a structured approach to strategic planning and IT direction/communication see real benefits, in many areas:

- Better communication with customers, providers, and peer organizations
- Improved consistency in the storage solution kits deployed
- Improved availability since components and solutions are certified before being put into production
- Standardization in services, training, operations with a documented solution
- Behaviors and expectations are set to a defined description of capabilities
- Agility in being able to determine if new requirements or business initiatives will work within the defined architectures

The concept of storage strategy or storage architecture is often intended to define the same communication instrument. Working with global accounts, an observed best practice is the separation of this instrument into 3 distinct sections, strategy, architecture and tasks. HDS has observed that these 3 sections can be chapters in the same document, or kept separate to meet governance and ownership issues.

Storage Strategy

A strategy is a high-level document that defines requirements, strategic intents, and strategic plans for the storage infrastructure. A strategy can be, and is often part of architecture, but is at a higher abstraction compared to storage architecture. The scope of the storage strategy includes all storage systems and subsystems that are used in the data center. The strategy is vendor, platform and topology neutral. Disk storage for Mainframe, UNIX, and Windows is included. Storage strategies can, but may not cover desktop storage. Disk, tape, near-line storage will be included, as well as the networking infrastructure.

Storage Architecture

IBM introduced the IT community to the notion of an architecture in the process of announcing System/360 in 1964. At the time, architecture referred to a decoupling of the way a machine worked from the way it was programmed. Since 1964, the definition of architecture has expanded to encompass similar decoupling in storage, network, database and human interface design. Large enterprises often apply this architectural approach to develop their own enterprise computing strategies as a liberating mechanism: The goal is to decouple software, data and training investments from the "vendor we happen to be using for this activity at the moment."

The purpose of the architecture is to control the development of the information systems infrastructure. It establishes control by helping to:

- Provide managers and staff in the lines of business and support services with an understanding of the information systems they are using
- Provide a mechanism so that the various groups of IT professionals have a consistent view of the information systems infrastructure and the ways in which they work to develop and deliver information systems services based on it
- Ensure that the various development projects being run on behalf of the IT organization do not attempt to make incompatible changes to the infrastructure

In developing a storage architecture, HDS employs a series of methods and styles that are drawn from commercial methodologies, as well as practical working experience. HDS uses a Principle-based architecture approach, that defines governing principles (requirements strategic intents), and then describes the elements in terms of technical, operational and organization alignment.

Technical Architectures are used to define the 'things' that need to be commoditized in the storage infrastructure, such as atomic storage elements like HBA, drivers, switch types and settings, as well as the topology and protocols involved. Most IT groups may need to have technology elements that cover Open Storage, S/390 storage and tape systems. Additional drilling into the architecture framework could provide standards at the connection level (HBA, OS, Volume Manager, Host software), Fabric Level (Cabling, Directors, Topology, Transport) and finally Storage (LUN mapping, RAID groups).

Operations Architectures are used to define the 'how'; best practices and processes in managing and operating the SAN and storage. It is important to develop and deploy operational best practices and procedures around storage architecture to ensure that the right things are being done with the right technology. HDS utilizes the ITIL framework to define and build these operational best practices. The functional categories that belong in the Storage Operations Architecture include:

- Capacity planning
- Storage Area Management
- Security
- Continuity Management
- Availability Management
- Configuration control
- Release management
- Change management
- Incident & problem management
- Service level management
- Financial Management
- Application Management

Organization Architectures are needed to describe the 'who' in the storage infrastructure. Who does what, when and why. Organization roles, responsibilities, span & control (technical and operational boundaries), skill definitions and performance metrics all usually outlined in the organization architecture.

Task Plans

Once the strategic definitions are set, and the architecture is bounded, the IT group can now prioritize action and work efforts to fill holes that may exist, or to satisfy new requirements that come to the IT group. These work efforts take the form of a work plan. Each plan would follow a style defined by the organization, but usually covers:

- Requirements
- Problem definition
- Scope
- Solution design
- Potential risks
- Business or IT benefit analysis
- Budget
- Project plan, milestones
- Project team

	Storage & Strategy Communication Instruments - Comparison		
	Storage Strategy	Storage Architecture	Storage Task Plans
Definition	Strategic IT definitions, goals, vision and direction	Blueprints and technology framework to achieve strategic intents defined in strategy	Detailed action plans to fill the gaps in the architecture, meet short-term business needs
Written by	Business and IT strategists	Trained architects	Subject matter experts
Written for	Business owners, CIO, managers and planners.	Other departments and IT planners to correlate technical standards. Can be shared with vendor for RFI definitions.	Management approval
Language	Business Language, Costs, benefits, business impact strategies	Technical definition, often seen as a reference guide to direct the technical and operational behavior of the storage infrastructure	Problem, solution, benefit statements. Compelling story must be told to secure approval for remedy.
Contents	Vision statements, goals, strategic intents. Direct correlation to IT strategy plans as they apply to the storage infrastructure	Definitions of scope. Chapter on architecture governance. Individual chapters covering disk, tape, management tools, integration to IT operations, staff and organization, best practices, processes, tiers of storage, data lifecycle, protection, DR, security.	Plans of action that describe the problem, solution, benefits, risk and implementation plans for resolution. If multiple tasks exist, prioritization and ROI calculations are made.
Document length	10-20 pages typical	Detailed architecture can be 50-200 pages in length. Summarized versions can be outlined in a few pages	Varies, depending on the project approval process.
Document type	Word document, PPT presentation	Word document, HTML on Internet	Word document, PPT presentation
Update frequency	Every 1-2 years	Every 6-18 months	Annually, depending on the funding cycle. New task plans created when needed to secure funding for the effort
Time to develop	1-2 months	6-12 months	1-2 weeks per task
Plan's Horizon	3-5 years typical	2-3 years typical	3-12 months typical
Ownership	Storage Manager, IT VP	Storage Team's Architect	Operational team, engineering, anyone needing to remedy or proactively plan for solutions
Dependencies	Alignment with IT business plans, company strategies,	Must be aligned with (at a minimum) with network, application, server and security architectures	Storage tasks emerge from gaps or risks in the documented storage strategy
Style/Commercial Methods	Varies with each IT department.	Commercial methodologies include Zachman, Spewak, Meta's EWTA, OpenFramework, TOGAF, MS MOF	Project plans vary for each IT department. Those that use PRINCE for project management adopt a standard project style.

Other References

There was a survey taken at a Storage Networking World where 80% of the 500+ end user attendees admitted that they did not have a storage plan for 12 to18 month out. The lack of SAN/Storage blueprints, roadmaps has been a recurring problem for 1st generation SAN adopters.

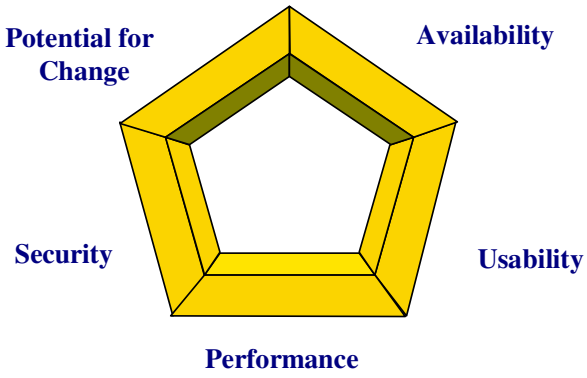
"While trying to keep up with the explosion of digital information, companies have created a clumsy, expensive-to-maintain storage infrastructure. And the problem will only get worse. Today's approach to storage will become increasing untenable, because today's storage architectures:

- Are Wasteful - allocating separate disk arrays for every server
- Are Unmanageable - SANs and storage exist that cannot be managed with the sample people and skills as today's networks
- Are Non-Standard - Years of piecemeal storage investment have yielded a mishmash of Fibre Channel, ESCON and server storage islands" [1]

Qualities of Good Architectures

- Must be understandable, actionable
- Must develop a good definition of the "enterprise"
- Structured, systemic approach
- Aligned IT and business strategies
- Get the right cross section of architects, contributors
- Complete and consistent
- Easy access (less paper/binders), web enabled, easy to view, traverse and query
- Separation of processes, tools, technology, people

The development of a technical plans and product decisions requires considerations for key qualities and attributes that need to be built-in to an architecture plan. These key qualities must be balanced and effective in their governance of technical options and processes, and are summarized as:



Commercial Methodologies for Technical Architectures

- Zachman Framework
- Spewak EAP
- DeBover/Meta Group EWTA
- IBM's Open Blueprint
- OPENframework
- TRC/Perot Systems
- The Open Group Architecture Framework (TOGAF)
- DoD TAFIM

[1] Industry quote from Forrester Research