Information Storage and Management - Strategies and Solutions

Evaluator Group Education Series

Course Overview

Data has value. For companies and organizations, data is the lifeblood for operation. The data is used in processing required to yield information, make decisions, conduct business, and produce results. Data also has value when further analysis yields immediate, important actions to take and for longer term strategic decisions.

Storing, managing, and accessing information is the most critical purpose for information technology professionals and technologists who deliver those capabilities. This importance has created a discipline for information storage and management. The discipline continues to see technology advances and changes in demands resulting in a continuous learning curve for practitioners.

This education course will cover the strategies and directions for managing information and explain the technologies used. How the technologies are delivered as solutions by vendor companies must be understood to make informed decisions. Ultimately, the decisions must have a sound economic basis and the methods to approach an economic analysis will be explained as well.

Section 1: Strategic Direction for Storing and Managing Information

What is necessary to store and manage information to meet the changing demands on Information Technology? This is not a tactical question but a strategic one. Meeting demands in a five to seven-year horizon requires an understanding of demands, technology and developments, and solutions to craft a strategy and from it make informed tactical decisions. This section will look at the long-term strategy and the current and ongoing demands.

Section 2: Trends and Developments

New solutions and technologies continue to be offered by vendors and promoted as a transformative change in the industry. Some are significant while others may not have the significance their promoters put forth in their messages. This section will look at the technology and trends and explain the significance without the hype associated. A clear view of
the trends and developments enable decisions that contribute to the long-term strategy and not a detour that may be less than effective.

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**Section 3: IT Transformation with Hybrid Multi-Cloud Infrastructure**

Enterprise IT organizations are in the process of deploying a Hybrid Multi-Cloud Infrastructure as part of their IT transformation strategy. Some are just now planning but others may be working on a new infrastructure after an earlier attempt. The goals for the Hybrid Multi-Cloud Infrastructure include:

- Changing the way IT does services delivery to be more like a public cloud provider where resources can be assigned dynamically and their clients can self-manage their selected environment.
- Allow deployment of cloud native applications that work either in the public cloud or as an on-premises Hybrid Multi-Cloud Infrastructure.
- Enable Continuous Integration / Continuous Deployment (CI/CD) operation practices, perceived to be a transformation for IT.
- Deploy a container-native environment for optimization and support for a virtual machine environment.

For enterprises planning to deploy private and hybrid clouds, there are many different solutions available and different approaches to deliver services with use of both public and private clouds. The different options and their characteristics can be confusing with an overwhelming amount of information available. There are solutions that are more complete, delivered as pre-packaged (in-a-box) products with installation and support. Offerings and value are discussed in this section.

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**Section 4: IT Optimization**

Besides deploying a Hybrid Multi-Cloud Infrastructure, enterprises also need to optimize their current IT environment for all the applications/workloads that will remain in that environment. The optimizations in progress generally include a transition to all-flash storage systems with NVMe devices, an NVMe over Fabric upgrade to the existing physical network, and automation of operational processes. This section will review the optimization changes for traditional IT.

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**Section 5: Information Management**
There are many different points for management of information. This section will explain what those management elements are and how they are related. Managing information encompasses many tools with overarching Multi-Cloud Data Management developing as the most complete approach for managing data that is spread across public clouds and on premises. This includes Data Protection and the mechanisms to protect and make data available with the recovery of data in case of failures. Part of overall Enterprise Data Management is about moving data to different types of storage (at different cost and performance characteristics) based on the business value of data. Archiving is the term commonly used to describe moving data that has become inactive over time. Covered in Multi-Cloud Data Management will be:

- Data protection and recovery – solutions for data protection
  - Data protection systems and scale-out data protection systems
  - Data protection software
- Copy Data Management
- Business continuity solutions
- Replication
- Snapshots
- Tiering to cloud / object storage
- Moving data between and from clouds
- Archiving

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**Section 6: Information Storage Technologies**

Developing a strategy for employing solutions for Information Storage and Management requires an understanding of underlying storage technologies. This section will delve into the technologies to create a common level of understanding for employing solutions. Included in this technology explanation are:

- Data access methodology – block, file, and object
- Storage systems architectures
- Storage Virtualization
- Solid state storage – Flash and Storage Class Memory
- Storage networking technologies including NVMe and RDMA over fabrics
- Data reduction technologies – deduplication and compression
- Error correction
- Storage for Containers
- Use of Data Lakes and the differences from Data Warehouses
Section 7: Information Storage Solutions from Vendors

In providing block, file, and object access to storage systems, the major storage vendors have multiple solutions, some that are specific to a type of usage and some that provide multiple access types. Additionally, many of the vendors provide solutions that support access for special purposes such as a data protection target. Evaluator Group has Product Briefs describing the products and Evaluator Group opinion of how the products meet customer requirements on the Evaluator Group website. Also available on the website are Product Analyses for a deeper understanding of solutions and matrices that compare product characteristics. In this section, products offered as solutions by significant vendors will be covered, showing the different solutions with an overview of each product and Evaluator Group review.

Different storage technology elements are being integrated to provide solutions for storing and protecting information. Driven by improving the time to deployment, these integrations provide alternatives to the more traditional storage systems available and can be building blocks for cloud environments. This section will examine the different types of integrations including definitions of characteristics and the vendor product offerings. HyperConverged Infrastructure, Converged Infrastructure, and the overall representations of Software Defined Storage are included in these discussions. The movement from current systems to Dynamic Infrastructure environments and evolving Composable Systems is covered as well.

Section 8: Understanding Performance and Value

This section will explain testing of products to understand their real value. Performance and cost relationship examples will be shown. The types of standardized tests available will be discussed along with an explanation of what they really test.

Section 9: Economic Considerations in IT
Managing information requires an understanding of the financial considerations of different approaches and solutions. In this section, several topics that will be presented to illustrate the methods to make informed evaluations with the economics applied with the perspective that data has a potentially long lifespan. Included will be specific examples used in decisions to be made.

Additionally, the financial considerations for justifying infrastructure and solutions for enterprises will be discussed. The considerations ultimately must show economic value and be presented in a complete fashion.

Section 10: Consumption-Based Pricing and STaaS

Switching to an OPEX driven cost model has value for many IT operations. Vendors have different types of offerings that provide Storage as a Service. This section will review what the goals for STaaS are and the different offerings available as well as the financial offering including consumption-based charging.

Section 11: New Workloads for IT

Analyzing large amounts of data in near real-time to arrive at new insights has become very popular with the abundance of newly captured data, much of it from machine to machine. A new discipline has arisen from this with massive amounts of storage and processors used by data scientists. Areas such as marketing and sales have been the most visible proponents but many others exist. This section will explain the use of High Performance Computing in the Enterprise and how this has become a business critical operation. The storage implications are massive with new approaches including parallel file systems and GPUs. Goals of the HPC in the Enterprise are faster decisions through Machine Learning (ML) and Artificial Intelligence (AI). AI and ML represent new workloads to be addressed now and in the future for IT. The result is potentially a massive amount of new data that must be stored and managed – so much so that existing methods are no longer practical. Additionally, many of the deployments will focus on edge to core strategies, which introduces new concepts and problems for IT. This section will give a background on these workloads and issues for IT.