

# Storage Technology Course from EMC

## *Course Outline / Syllabus*

The Storage Technology Foundations course provides a comprehensive introduction to Data Storage technology fundamentals. The selection of the course topics is based on the wide use, acceptance and adoption of these technologies by industry. Course participants will gain knowledge of the core logical and physical components that make up a Storage Systems Infrastructure. Throughout the course, students will be exposed to the following themes:

- The explosion in demand from businesses for highly available and secure access to data.
- The Storage systems and infrastructure architectures and solutions available to support business needs.
- The complexities and challenges in managing storage infrastructures.

Upon successful completion of the course, students should be able to:

- Describe storage technology solutions such as Storage Area Networks (SAN), Network Attached Storage (NAS), and Content Addressed Storage (CAS).
- Understand and articulate the technologies and solutions available to support an IT Infrastructure including Business Continuity, Information Availability, Local and Remote Replication, Backup and Recovery and Disaster Recovery needs of businesses.
- Understand the key tasks in successfully managing and monitoring a data storage infrastructure

The course consists of the following sections and modules within. The approximate time allocated to each Section is shown in parentheses.

### **Section 1 - The Complexity of Information Management ( 1 hour )**

#### *Module 1.1 - Meeting Today's Data Storage Needs*

- Define the challenges in data storage and the importance of data.

#### *Module 1.2 – Data Center Infrastructure*

- List the core elements of a data center including, applications, databases, servers/operating systems, networks (LAN/SAN), storage arrays.
- Describe how these core elements are integrated and show an application example.

### **Section 2 - Storage Systems Architecture ( 8 hours )**

#### *Module 2.1 – The Host Environment*

- List the hardware and software components of the host environment such as CPU, Memory, bus, I/O devices, Registers, L1/L2 cache, file systems, volume management, Host Bus Adapters.

#### *Module 2.2 – Connectivity*

- Describe the physical and logical components of a connectivity environment.
- Define the key protocols and concepts including; Bus technology, PCI, IDE/ATA, SCSI, and Fibre Channel.

#### *Module 2.3 – Physical Disks*

# Storage Technology Course from EMC

## Course Outline / Syllabus

- Describe the major physical components of a disk drive and functionality including platters, spindle, motor, actuator arm, R/W heads, assembly, drive controller.
- Define the physical structure of disk including sectors, tracks and cylinders.
- Define the access characteristics for disk drives and performance implications for factors such as rotation, positioning and transfer rates.
- Define the partitioning of physical drives using zoned bit recording.

### Module 2.4 – RAID Arrays

- Define the concept of RAID for data protection.
- Review and understand the common RAID levels, including RAID 0, RAID 1, RAID 3, RAID 4, RAID 5, RAID 0+1, RAID 1+0, Hot Spares.

AN APPLIED LEARNING ACTIVITY- STUDENT COMPLETES A RAID CASE STUDY

### Module 2.5 – Disk Storage Systems

- List the benefits of and components of an intelligent storage system.
- Compare and contrast integrated and modular storage systems.
- Explain how a storage system handles I/O flow.
- Describe the logical elements of an intelligent storage system.
- Define the Cache Structure and data flow through cache.

AN APPLIED LEARNING ACTIVITY– STUDENT COMPLETES A DATA FLOW EXERCISE

## Section 3 - Introduction to Networked Storage ( 10 hours )

### Module 3.1 – Direct Attached Storage

- Describe the benefits of a DAS based storage strategy and the physical elements in DAS.
- Define the connectivity options for DAS and distinguish between IDE, ATA and SCSI protocols.
- Describe the I/O flow in a DAS environment.

### Module 3.2 - Network Attached Storage

- Define NAS and difference between NAS devices and general purpose file servers.
- Describe the NAS device components and file services protocols used ( NFS and CIFS )connectivity options for NAS.
- Describe the I/O flow in a NAS environment.
- List NAS management considerations for performance, storage capacity, back up.
- Provide NAS examples and solutions to technology problems.

### Module 3.3 – Storage Area Networks

- Provide an overview of the physical and logical elements of a SAN.
- Define SAN components including, Host Bus Adapter, Fiber Optic cabling, FC Switch, Disk Array, Management SW.
- Define Fibre Channel and connectivity layer including FC ports, World Wide Names, FC Addressing, FC log-in process and Fabric topologies.
- List SAN management considerations such as zoning and LUN masking, security, capacity and performance management.

AN APPLIED LEARNING ACTIVITY– STUDENT COMPLETES SAN CASE STUDY

### Module 3.4 – IP SAN

- Define IP SAN topologies including iSCSI, FC/IP, iFCP.

# Storage Technology Course from EMC

## Course Outline / Syllabus

- Describe the differences between FC/IP and iFCP.
- Module 3.5 – Content Addressable Storage (CAS)*
- Describe the benefits of a CAS based storage strategy.
  - Provide an overview of the physical and logical elements of CAS.
  - Define the connectivity options for CAS.
  - Define the I/O flow in a CAS environment.

### Section 4 – Information Availability ( 10 hours )

#### *Module 4.1 – Business Continuity Overview*

- List reasons for planned and unplanned outages and describe the impact of downtime. Differentiate between Business Continuity (BC) and Disaster Recovery (DR).
- Define Information Availability and its importance to the business.
- Define Recovery Time Objective, Recovery Point Objective.

#### *Module 4.2 – Back Up and Recovery*

- Define planning requirements for Back Up and Recovery.
- Define Back Up and Recovery Strategies.
- Define how a backup works, plus the business and data decisions for back ups.
- Describe LAN and SAN backup methods and Back Up for databases.

AN APPLIED LEARNING ACTIVITY – STUDENT COMPLETES A BACKUP & RECOVERY CASE STUDY

#### *Module 4.3 – Business Continuity Local*

- Describe potential areas of information vulnerability within a data center.
- List the local information availability technologies within the data center.
- Identify the appropriate local information availability technology based on criteria.

AN APPLIED LEARNING ACTIVITY – STUDENT COMPLETES REPLICATION CASE STUDIES 1 & 2

#### *Module 4.4 – Business Continuity Remote*

- Describe potential areas of information vulnerability between local and remote data centers.
- List the remote information availability technologies between local and remote data centers.
- Identify the appropriate remote information availability technology based on criteria.

AN APPLIED LEARNING ACTIVITY – STUDENT COMPLETES REMOTE REPLICATION CASE STUDY

### Section 5 – Managing and Monitoring ( 8 hours )

#### *Module 5.1 – Monitoring In the Data Center*

- Define the areas to monitor for an information management infrastructure.
- List the issues for availability, scalability and alerting
- Define capacity monitoring, performance monitoring, security monitoring.

#### *Module 5.2 – Managing In the Data Center*

- Describe individual task components that need to be performed in the data center in order to achieve overall data center objectives.
- List the issues for capacity management, availability management, performance management, security management,

# Storage Technology Course from EMC

## *Course Outline / Syllabus*

- Explain the concept of Information Life Cycle Management.

### **Section 6 – Security and Virtualization ( 3 hours )**

#### *Module 6.1 – Securing the Storage Infrastructure*

- Define storage security.
- List the critical security attributes for information systems.
- Describe the elements of a shared storage model and security extensions.
- Define storage security domains.
- List and analyze the common threats in each domain.

#### *Module 6.1 – Securing the Storage Infrastructure*

- Identify different virtualization technologies.
- Describe block-level and file level virtualization technologies and processes.