



**Hewlett Packard
Enterprise**

Мрежови системи за съхраняване на данни

Former name:

“Managing HP StorageWorks Enterprise Virtual Array”

**Elitsa Vlaykova
Tsvetan Papazov**

2016@SU FMI

Курс	Мрежови системи за съхраняване на данни
HP Course	Managing HP StorageWorks Enterprise Virtual Array
Програма	
Лектори	Елица Влайкова, Цветан Папазов
Време	сряда, 18 – 22 ч.
Място	зала 018 - ФМИ
Брой места	10

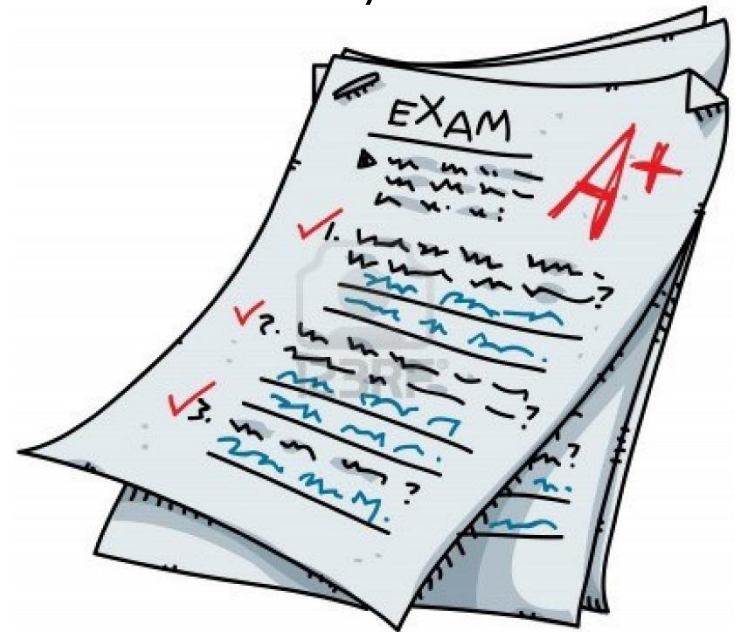
Course Content

Lesson #	Lesson title	Section	Primary Lector	Secondary Lector	DATE
0	Introduction	n/a	Tsvetan Papazov	Elitsa Vlaykova	12/10/2016
1	SAN Fundamentals Part1	1	Tsvetan Papazov	Stoyan Kovachev	19/10/2016
2	SAN Fundamentals Part2		Stoyan Kovachev	Tsvetan Papazov	26/10/2016
3	SAN Fundamentals Part3		Tsvetan Papazov	Stoyan Kovachev	02/11/2016
4	SAN switches and Fabrics		Stoyan Kovachev	Tsvetan Papazov	09/11/2016
5	Storage Fundamentals Part1	2	Elitsa Vlaykova	Rosen Deliverski	16/11/2016
6	Storage Fundamentals Part2		Rosen Deliverski	Elitsa Vlaykova	23/11/2016
7	NAS and Storage		Ivan Andreev	Elitsa Vlaykova	30/11/2016
8	High Availability and resiliency		Elitsa Vlaykova	Rosen Deliverski	07/12/2016
9	HPE 3PAR StoreServ	3	Deyan Ignatov	Elitsa Vlaykova	14/12/2016
10	HPE 3PAR StoreServ Features		Deyan Ignatov	Elitsa Vlaykova	21/12/2016
11	Visit at "EG TS Global Lab" and HPE MSA		Tsvetan Papazov	Elitsa Vlaykova	04/01/2017
12	HPE XP7 and EMC VNX architecture and Block Storage	4	Deyan Ignatov	Ivan Andreev	11/01/2017
13	NAS: EMC VNX and NetApp		Ivan Andreev	Deyan Ignatov	18/01/2017
14	Final exam	n/a	Elitsa Vlaykova	Tsvetan Papazov	??/01/2017

Tests and exam

Two way evaluation:

- 1) Tests after each completed course section.
- 2) Final exam during the winter session;



Course objectives

- After completing this course, you should be able to:
 - Introduction to the DAS, NAS and SAN
 - Explain disk connectivity options and disk technologies
 - Identify storage area network (SAN) host components and technologies
 - Introduction to iSCSI
 - Explain storage high availability
 - Defining the Storage Technology
 - Explain hard drive types, interconnect technologies, and RAID levels.
 - Describe the Fibre Channel architecture, characteristics, and operation, including naming and addressing.
 - Describe a switch topology with fabric operation and zoning concepts
 - Explain the architecture and features of some of the leading storage arrays, such as **HPE 3PAR, MSA, XP7, EMC VNX, NetApp**;
 - Describe SAN switches hardware and features



Section 0: Introduction

- **Lesson 0:**
 - Course introduction
 - Objectives
 - Schedule
 - Lectors introduction
 - Sections and agenda



Section 1:

SAN Fundamentals

- Lesson 1:

- Defining the Storage Technology
- Introduction to the DAS, NAS and SAN

- Lesson 2:

- SAN components
- Fibre Channel basic
- SAN Topologies
- Fibre Channel Architecture

- Lesson 3:

- Storage area network hosts
- Fibre Channel advanced features
- Fibre Channel over Ethernet

- Lesson 4:

- FC switches hardware
- Fabric addressing
- Fabric services
- VSANs & LSANs



Section 2: (1/2)

Storage Fundamentals

- **Lesson 5:**

- SAN/NAS/DAS specifics
- Hardware overview of disk physical components
- RAID levels, nested RAID, RAID groups
- MB/TB/TiB/GiB, base 2, base 10

- **Lesson 6:**

- Protocols (SCSI, SAS, FC, iSCSI, CIFS, NFS, host based LVM, FTP, SCP)
- LUNs overview/partition comparison
- LUN masking, host mapping
- Host types Thin/thick provisioning
- Logical disk grouping



Section 2: (2/2)

NAS and Block Storage, High Availability and resiliency

- **Lesson 7:**

- HPE portfolio overview
- Storage Array components
- Write/read cache hit/miss
- File level access/block level access
- Storage tiering
- NAS quotes
- Replication overview & types

- **Lesson 8:**

- Redundant storage hardware
- Storage multi node clusters
- Active/active and active/passive configurations
- ALUA (asymmetric Logical Unit Access)



Section 3: (1/2)

HP 3PAR StoreServ overview and features;

- **Lesson 9:**

- HPE 3PAR portfolio & history
- Hardware overview
- Logical structure
- Management components

- **Lesson 10:**

- Remote copy, volume copy, snapshots 3PAR tasks
- AO, DO, QoS
- Persistent features
- Demo



Section 3: (2/2)

HPE XP7 and HPE MSA;



• Lesson 11:

HPE MSA Storage:

- P2000 Series – Product Family
- Hardware overview
- Management interfaces
- Array Installation
- Back End and Cabling
- Host Connectivity
- Management interfaces
- Software and Upgrades

• **HPE XP7:**

- Product overview
- Hardware components
- Connectivity options
- Management interfaces
- Logical storage organization
- Features
- System performance and availability

Section 4:

EMC VNX architecture and Block Storage, NAS VNX and NetApp

- **Lesson 12:**

EMC VNX architecture and Block Storage:

- Architecture
- Block provisioning and Management
- Host integration
- Local & Remote protection

- **Lesson 13:**

NAS-EMC VNX, NetApp:

- VNX NAS fundamentals
- NAS local protection
- NetApp Architecture and fundamentals



Course materials:



The formal course docs repository*:
<http://rsmt.it.fmi.uni-sofia.bg/HPstorage/>

** During the interim period, files may be distributed via e-mail, in order to avoid possible delays.*



Lectors Contacts





Welcome

to the enterprise storage!



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