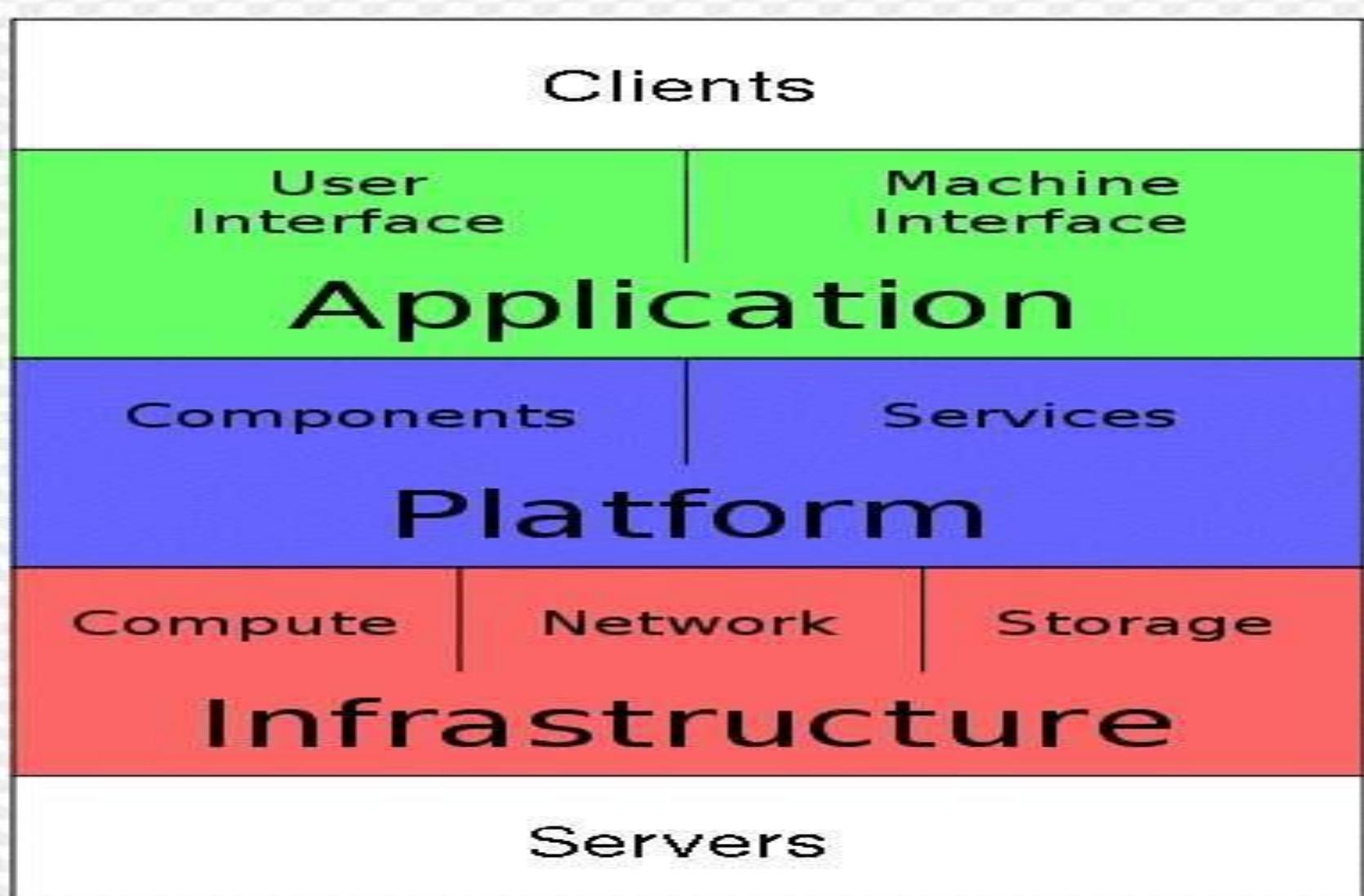


Hardverska infrastruktura – virtualizovano okruženje

Hardverska infrastruktura u Cloud okruženju

Katalog servisa



Cloud Computing Stack

Hardverska infrastruktura - virtualizovano okruženje

IT infrastruktura

- Serverska infrastruktura
- Operativni sistemi (Fizički/Virtualni)
- Storage infrastruktura
- Mrežna infrastruktura (SAN i LAN)
- Aplikacije i servisi
- Bezbednost podataka

DC (Data Center) infrastruktura

- Elektro-energetska infrastruktura
- Infrastruktura za održavanje ambijentalnih uslova (temperatura i vlažnost vazduha u DC)
- Protivpožarni sistemi
- Fizička bezbednost

Hardverska infrastruktura - virtualizovano okruženje

IT infrastruktura

Osnovne odlike servera:

- Ugradjene pouzdane komponente (osnovna poloča, memorije, kondenzatori...)
- Predviđen za rad 7 x 24
- Redundantnost komponenti
- HOT SWAP – diskovi (u slučaju kvara / nova instalacija)
- Višestruko napajanje
- Multiprocesorski rad
- RAID – fizički
- Podrška za SAN komponente, MPIO
- Serverski operativni sistemi
- Više mrežnih kartica

Hardverska infrastruktura - virtualizovano okruženje

IT infrastruktura

- Serverska infrastruktura



Tower server



Rack mounted server



Šasija sa Blade serverima

- Koji tip servera odabratи ?

Hardverska infrastruktura - virtualizovano okruženje

IT infrastruktura

- Serverska infrastruktura



2 x 460W PS



1 Port FC



2 Port FC



2 Port Eth.



4 Port Eth.



Mgmt Port
iLO
iDRAC
BMC

- Kabliranje po jednom serveru: 2 x PS + 2 x FC + 4 x Eth. + 1 Mgmt

Hardverska infrastruktura - virtualizovano okruženje

Osnovne komponente blade sistema

- Blade šasija
- Blade serveri (procesori, memorije, hard diskovi, mezanin kartice)
- Ulazno / izlazni moduli (Ethernet, Fibre channel, SAS, FLEX)
- Menadžment moduli (AMM, Onboard administrator)



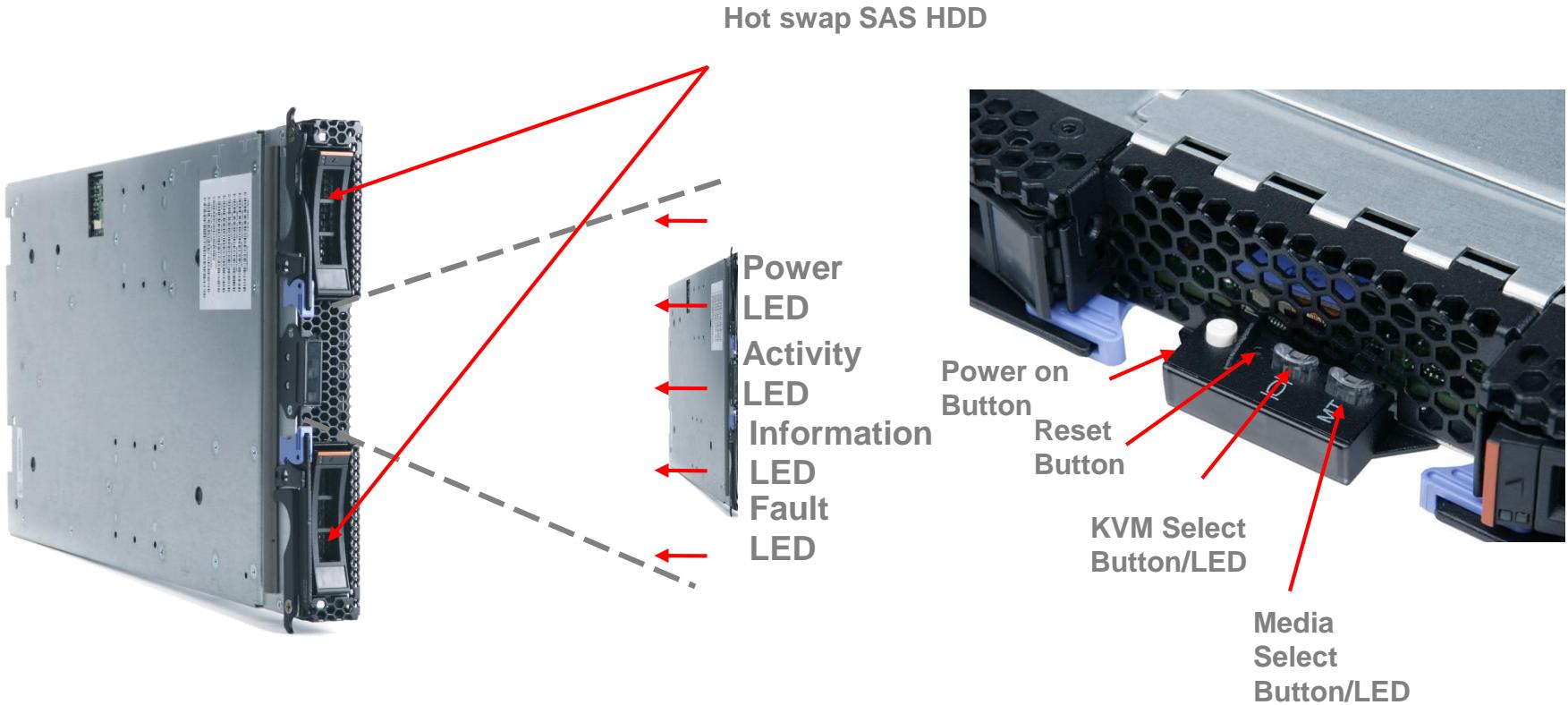
IBM H šasija (9U)



HP šasija C7000 (10U)

Hardverska infrastruktura u Cloud okruženju

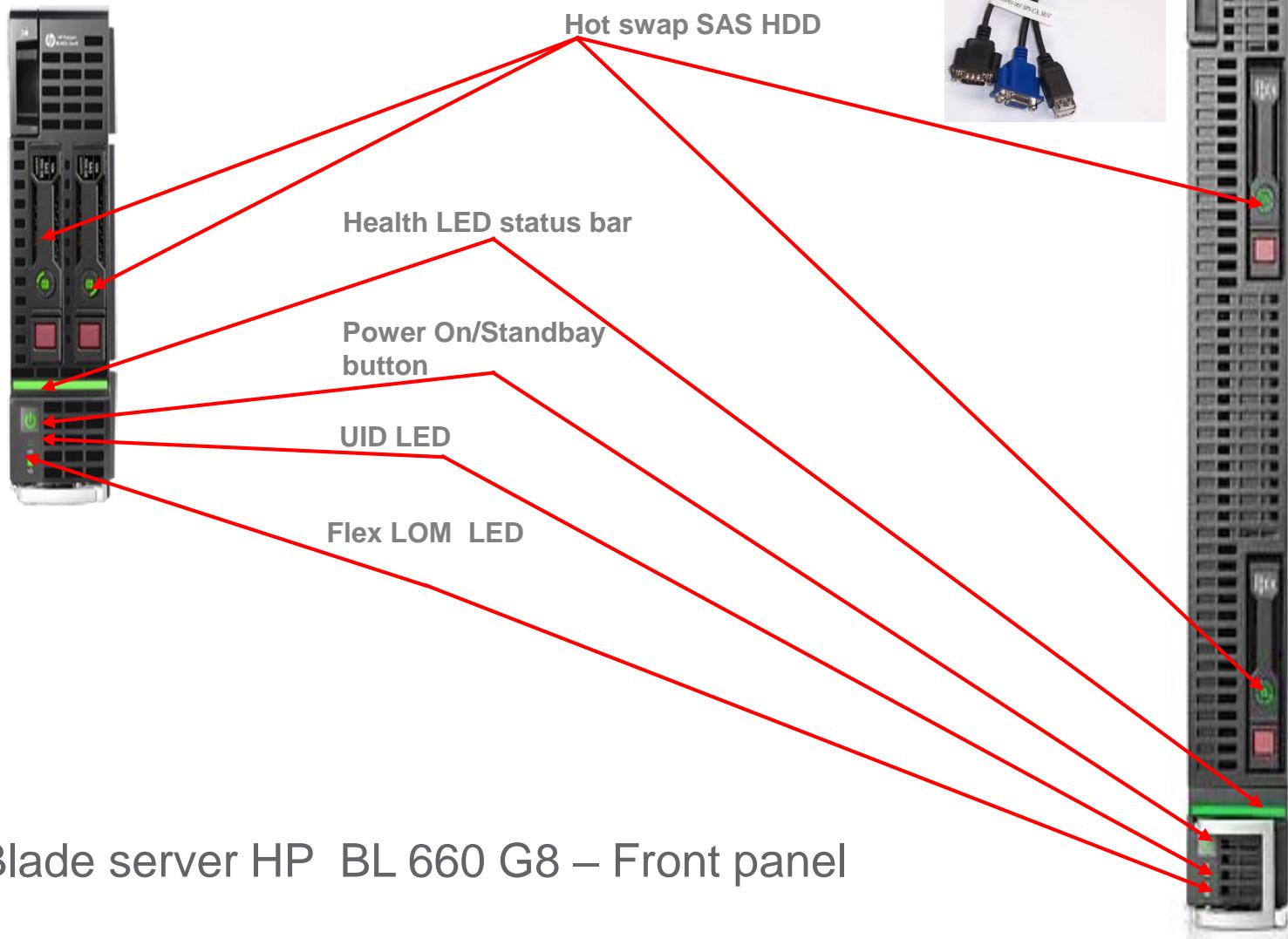
Blade server IBM HS23 – Front panel



Hardverska infrastruktura - virtualizovano okruženje

HP SUV cable

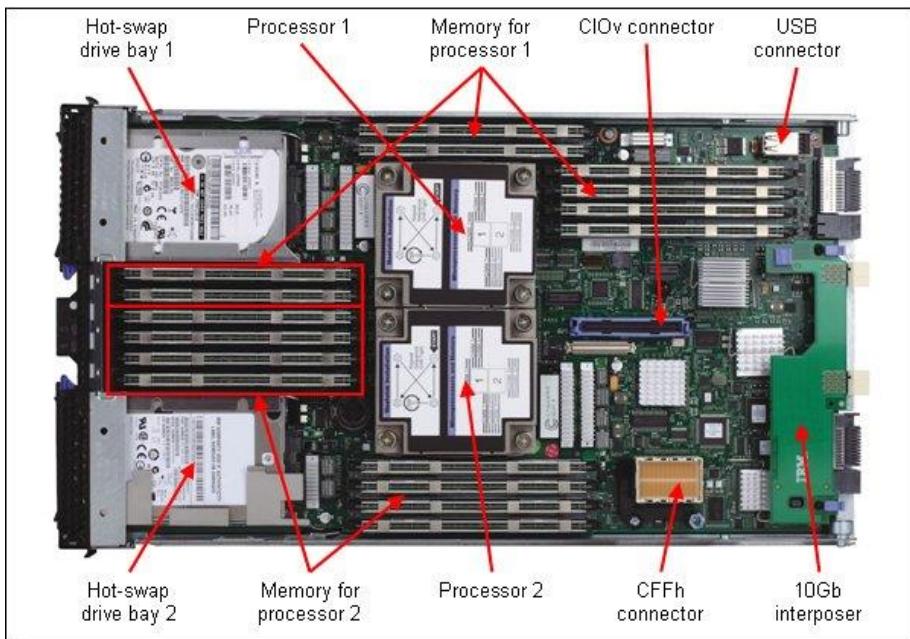
Blade server HP BL 420 G8 – Front panel



Blade server HP BL 660 G8 – Front panel

Hardverska infrastruktura u Cloud okruženju

Blade server IBM HS23



Dual-Socket platform

Intel® Xeon® Processor E5-2600 Series

8C & 6C & 4C CPUs

One CPU standard

2013 Nova serija procesora E5-2600v2 10C 12C

Intel® QuickPath Technology

16 x DIMM sockets DDR3

Up to **512 GB** memory (x32 GB modules)

SAS LSI 2004 Controller

Two Hot Swap drive bays (SAS, SATA or Solid State)

Support for RAID option with battery-backed cache

CIOv and CFFh expansion card support

2014 Nova serija procesora E5-2600v3 14C 16C 18C !!!

DDR4 memorije

Podržano u IBM Flex System i HP BL460c Gen 9

Hardverska infrastruktura –virtualizovano okruženje

Blade server HP BL 420c G8

Dual-Socket platform

Intel® Xeon® Processor E5-2400 i E5-2400v2 Series

10 ,8C & 6C & 4C CPUs

One CPU standard

Intel® QuickPath Technology

12 x DIMM sockets DDR3

Up to **384 GB** memory (x32 GB modules)

HP Smart P220i Controller

Two Hot Swap drive bays (SAS, SATA or Solid State)

Support for RAID option with battery-backed cache

Flex LOM adapter 2P (x1) support

Mezanin card (2x) support

Blade server BL 660cG8

Quad-Socket platform

Intel® Xeon® Processor E5-4600 Series

8C & 6C & 4C CPUs

2013 Nova serija procesora E5-4600v2 10C 12C

Two CPU standard

Intel® QuickPath Technology

32 x DIMM sockets DDR3

Up to **1 TB** memory (x32 GB modules)

HP Smart P220i Controller

Two Hot Swap drive bays (SAS, SATA or Solid State)

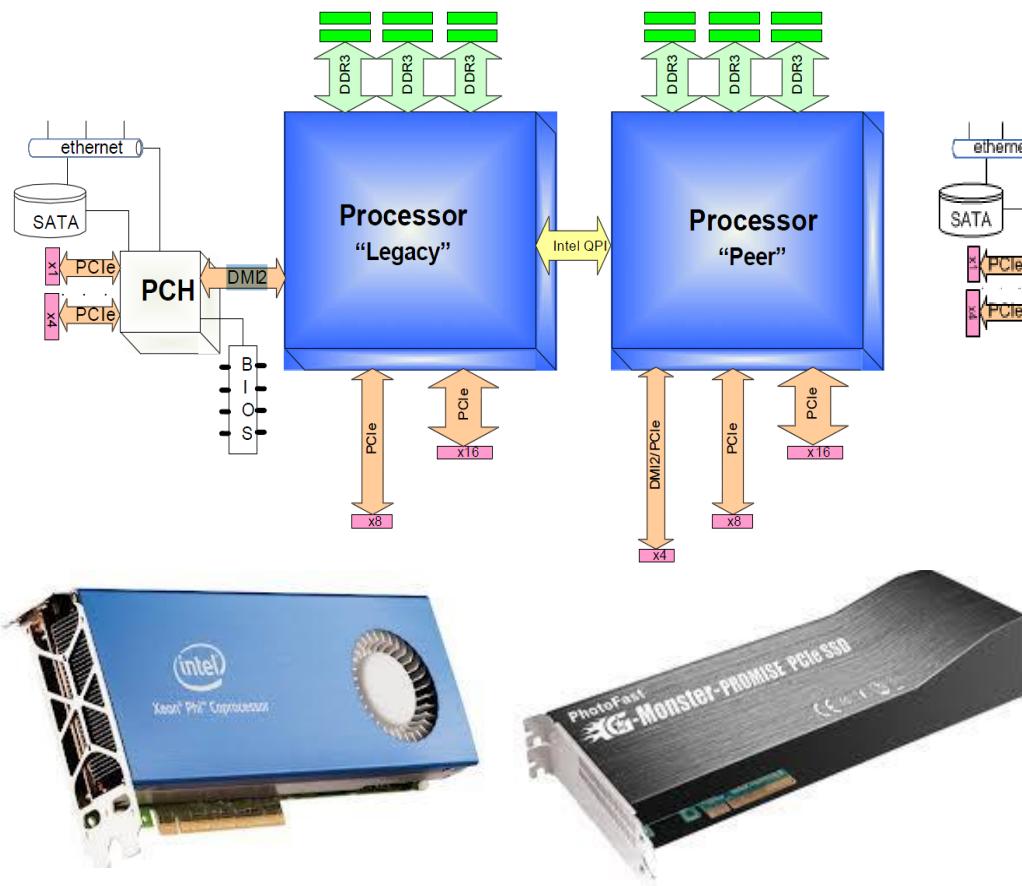
Support for RAID option with battery-backed cache

Flex LOM adapters 2P (x2)

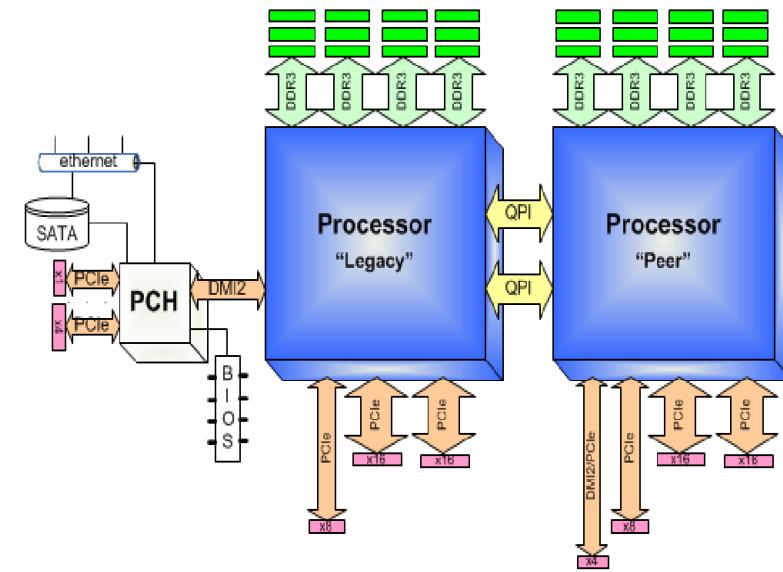
Mezanin card (x3) support

Hardverska infrastruktura u Cloud okruženju

Intel E5-2400 procesori



Intel E5-2600 procesori



Koprocesori Intel Phi (60 core 240HT)
SSD diskovi

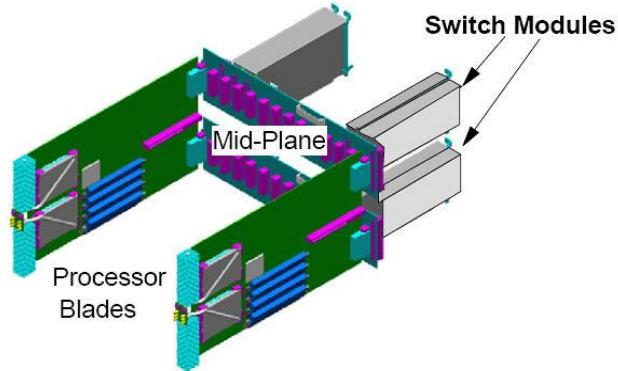
Hardverska infrastruktura u Cloud okruženju

Prikaz IBM H šasije

Izgled H šasije – prednja strana



Logički Prikaz IBM H šasije



Izgled H šasije – zadnja strana



- Kabliranje po jednoj šasiji : 6 x PS + 2 x FC + 4 x Eth. + 1 Mgmt
- Kabliranje po jednom serveru: 2 x PS + 2 x FC + 4 x Eth. + 1 Mgmt

Hardverska infrastruktura u Cloud okruženju

Prikaz I/O modula



Nortel 2/3 Layer 20 port GbE Switch



Qlogic 20-port & 10-port SAN Switch Module

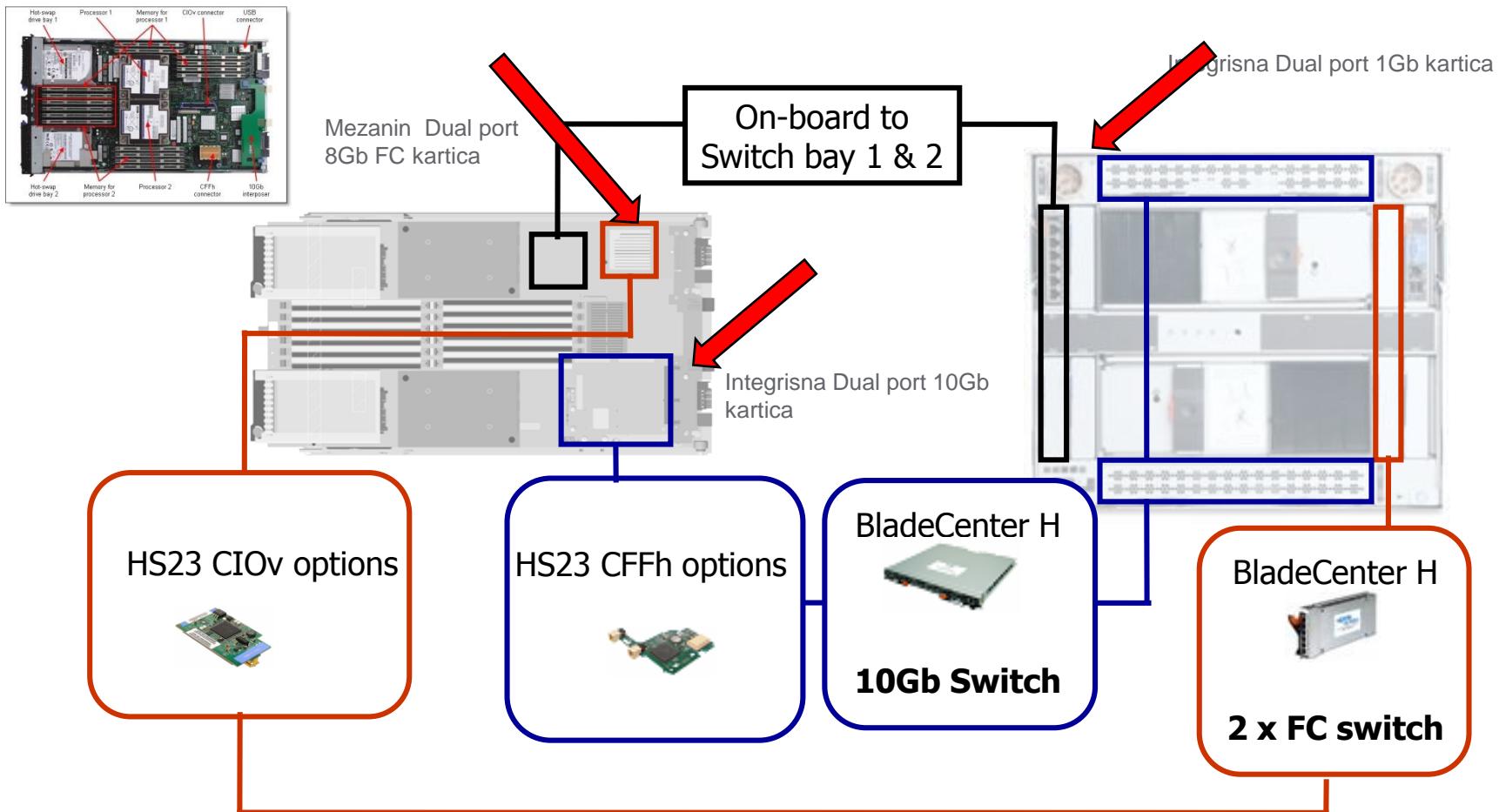


HP Virtual connect Flex fabric10Gb/24p

Hardverska infrastruktura u Cloud okruženju

Mapiranje integrisanih i portova sa dodatnih kartica prema I/O modulima (IBM HS23)

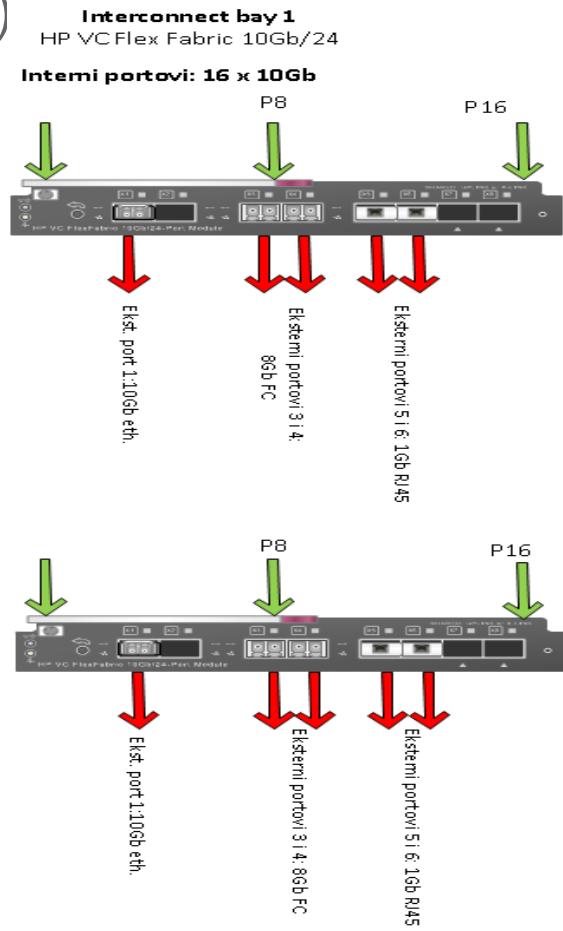
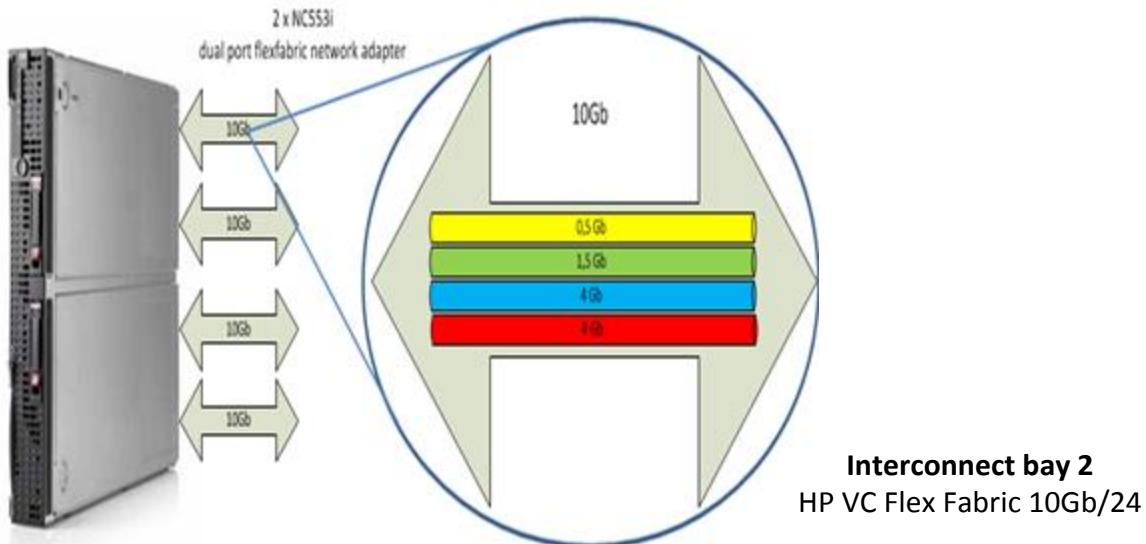
- Tradicionalna infrastruktura (tip porta na odgovarajući I/O switch)



Hardverska infrastruktura –virtualizovano okruženje

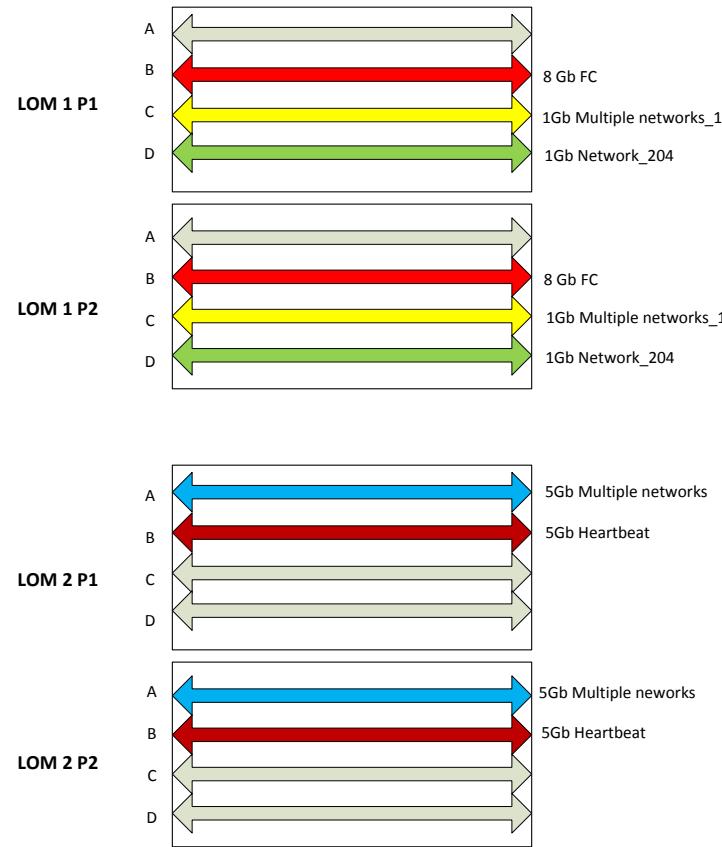
- Konvergentna infrastruktura (Flex 10 tehnologija)

Preko istog porta prolaze i Eth. i FCoE protokoli



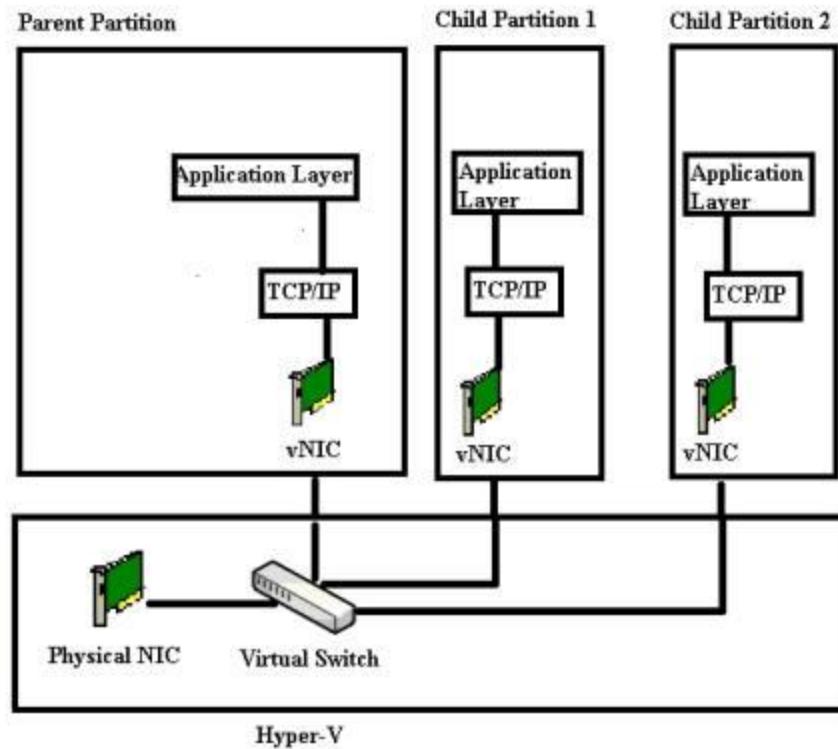
Hardverska infrastruktura –virtualizovano okruženje

HP Flex Fabric 10Gb 2P 554 FLB FIO Card -teaming Timovane kartice su iste boje



Hardverska infrastruktura - virtualizovano okruženje

HyperV – mrežna virtualizacija



HP Flex fabric 10Gb 2p 554 FLB Adapter

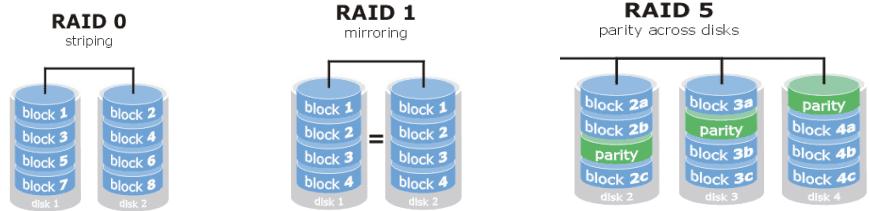
- Svaki port virtualizuje u 4 porta
- 2 Adaptera x 2 porta x 4 vporta
- 4 porta mogu biti dodeljena FC konekciji

Hardverska infrastruktura - virtualizované okruženie

Pojmovi

- **RAID**

Redundant array of independent disk



- **Storage**

- **HA**

High availability - Visoka dostupnost



- **SAN**

Storage array network

- **NAS**

Network attached storage

- **LAN**

Local array network

- **FC protocol**

Fibre channel protocol

- **SAS**

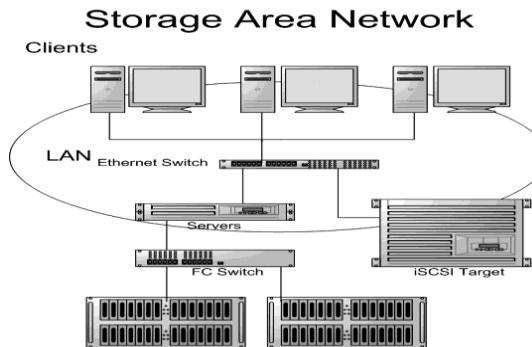
Serial attached SCSI (Small Computer System interface)

- **SATA**

Serial ATA

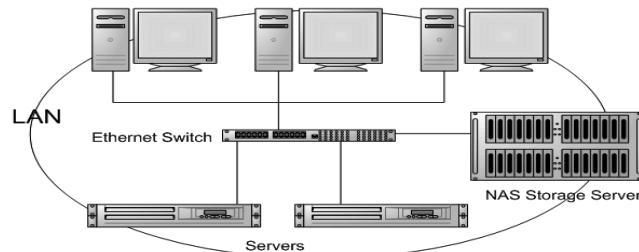
- **FCoE**

Fibre channel over Ethernet



Network Attached Storage

Clients



Hardverska infrastruktura - virtualizovano okruženje

IT infrastruktura

- Storage infrastruktura



Fibre channel switch



Fibre channel
Host bus adapter



LC-LC FC
Cable



SFP
Transceiver

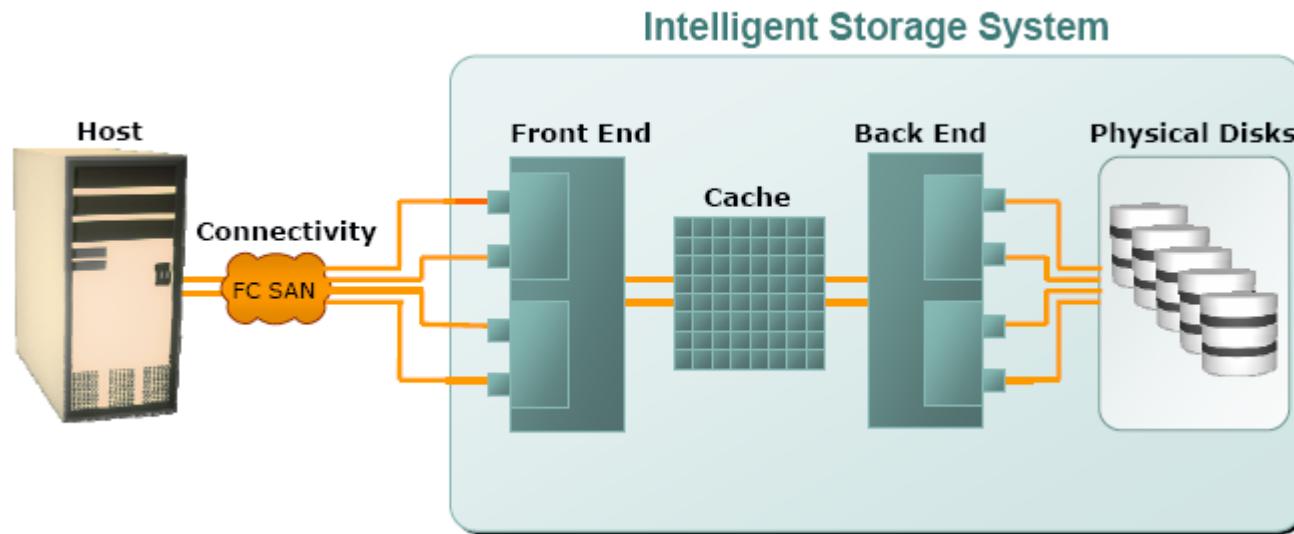
Hardverska infrastruktura - virtualizovano okruženje

Storage sistemi

Osnovne komponente

- Front End - Kontroler (2 - 8 ; 2 -16 QC Xeon, ASIC procesor)
- Cashe memorija (24 - 64GB „midrange“ ; do 760GB „high end“ storage sistemi)
- Back End - Kućište za diskove (do 18 „midrange“; do 48 „high end“storage sistemi)
- Fizički diskovi (SSD, SAS (10k, 15k), SAS NL 7k2,

Odabir tipa, broja diskova i njihov način povezivanja – Koristan prostor + PERFORMANSE SISTEMA



Hardverska infrastruktura - virtualizovano okruženje

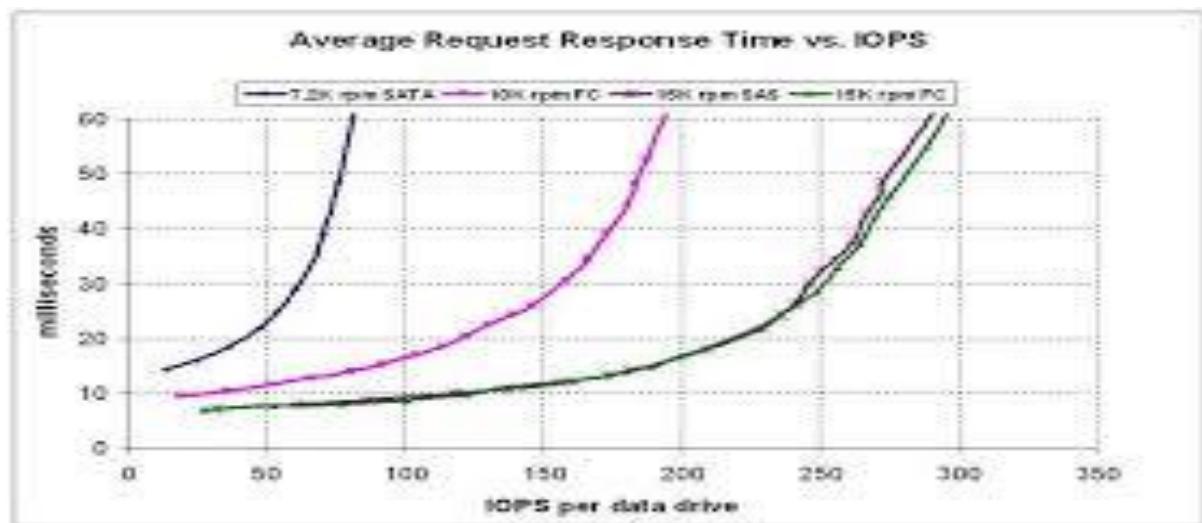
Storage sistemi

- Fizički diskovi (SSD, SAS (10k, 15k), SAS NL 7k2,

Odabir tipa, broja diskova i njihov način povezivanja – Koristan prostor + PERFORMANSE SISTEMA



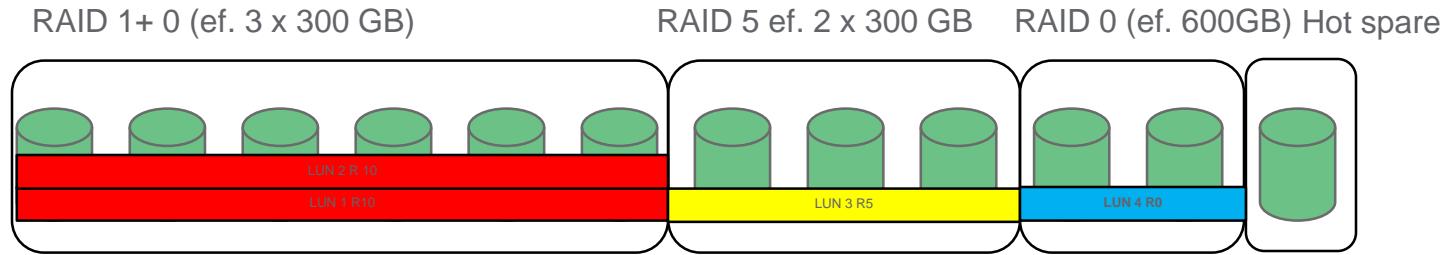
RPM/Minute	5400	7200	10000	15000
RP/Second	90	120	166	250
Time per rot.(ms)	11.1	8.3	6	4



Hardverska infrastruktura - virtualizovano okruženje

Storage sistemi

Tradicionalni storage sistemi 12 x 300GB SAS 15k

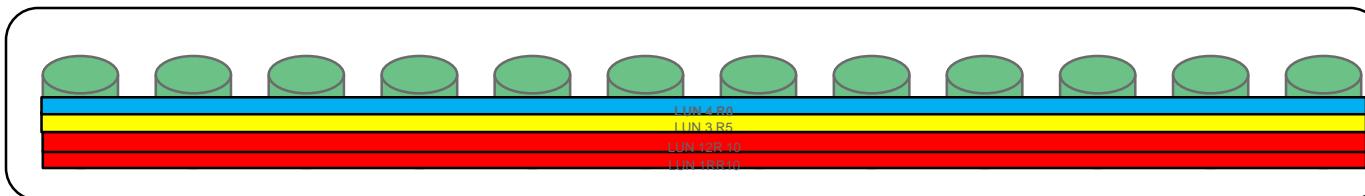


- Serverima se dodeljuju LUNovi (mapiranje, eksport, prezentacija)
- Serveri ih “vide” kao svoje lokalne diskove
- Spora rekonstrukcija (rebuild) pokvarenog diska
- Različito opterećenje diskova
- Različita zauzetost diskova

Hardverska infrastruktura u Cloud okruženju

Storage sistemi

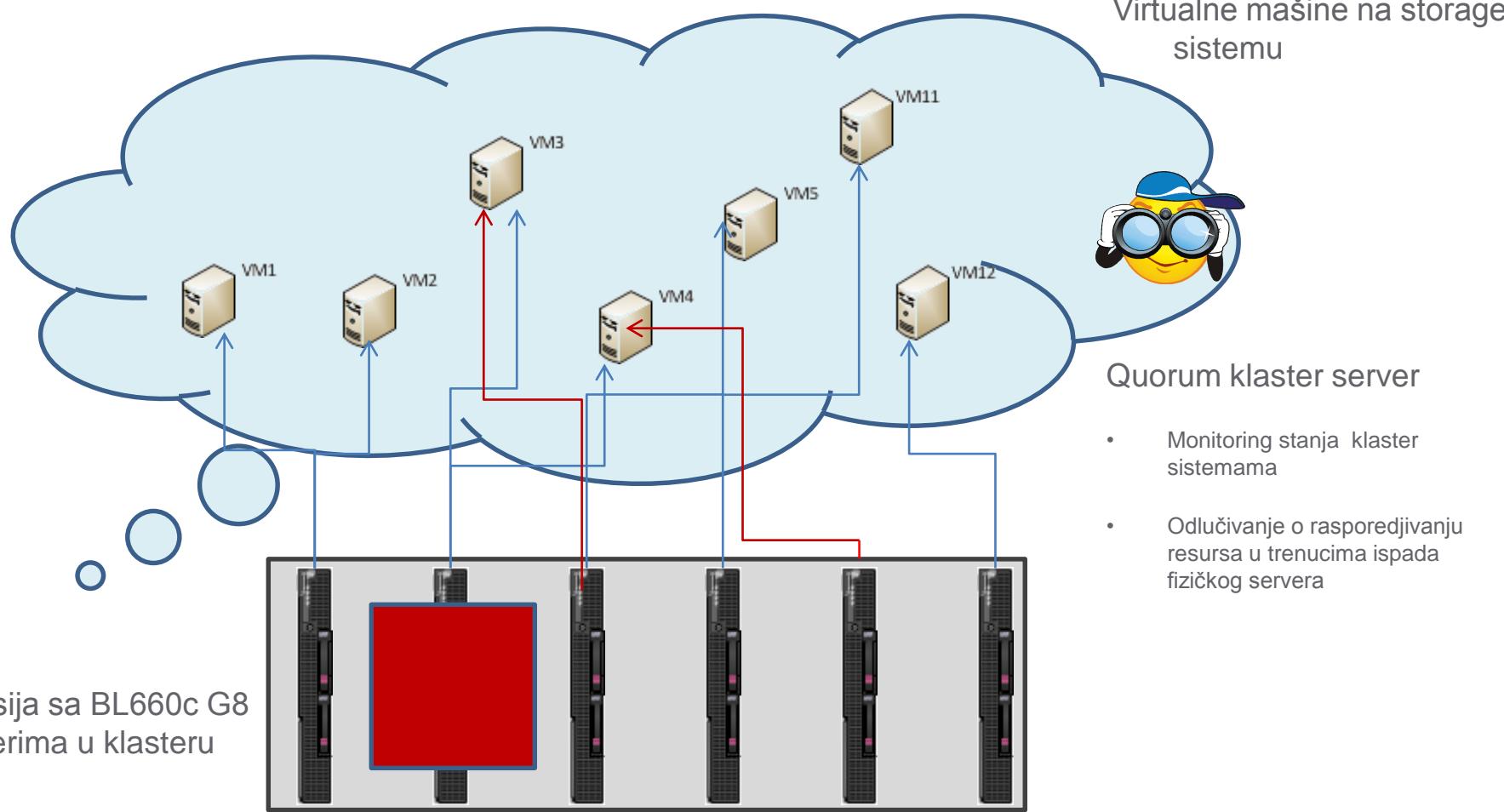
Virtualizovani (interna virtualizacija) storage sistemi 12 x 300GB SAS 15k



- Gubi se pojam diska, postoji samo prostor
- Nije potrebno detaljno planiranje resursa
- Svi diskovi su ravnomerno opterećeni (zauzetost, IOPS)
- On line konverzija jednog tipa RAID-a u drugi tip na, isti ili drugi tip diskova
- Brza rekonstrukcija pokvarenog diska / hot spare je prostor na svim diskovima
- Virtualni domeni
- Adaptivna optimizacija (limitiranje IOPS-a po LUN-u, automatsko korišćenje brzih diskova...)

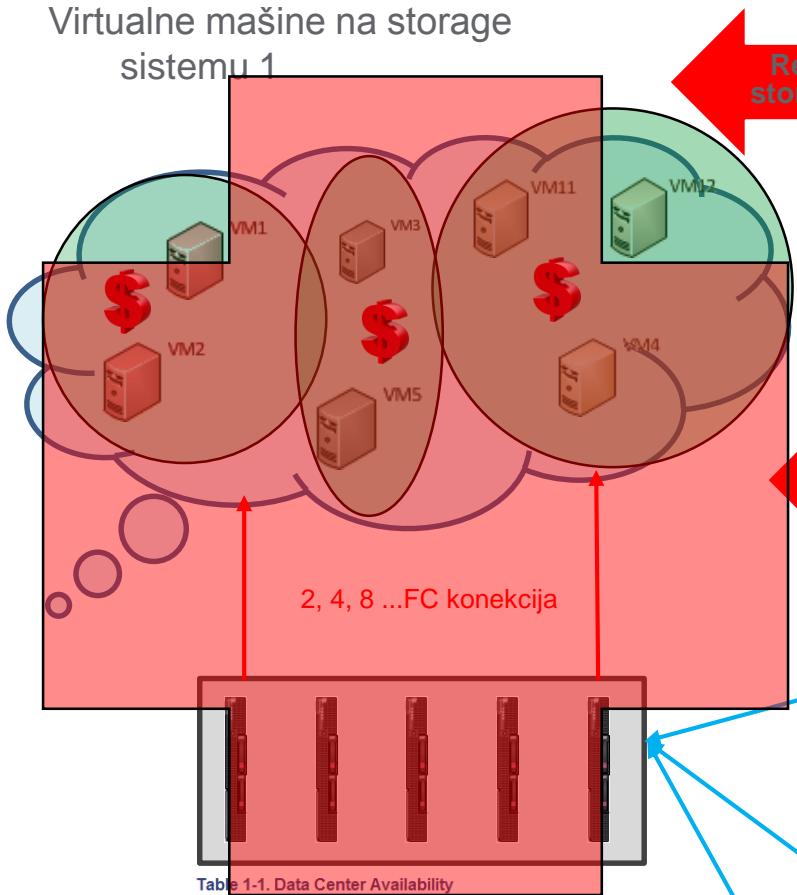
Hardverska infrastruktura – virtualizovano okruženje

Visoka dostupnost virtualnih mašina u klasteru fizičkih mašina



Hardverska infrastruktura u Cloud okruženju

Virtualne mašine na storage
sistemu 1



Virtualne mašine na storage
sistemu 2

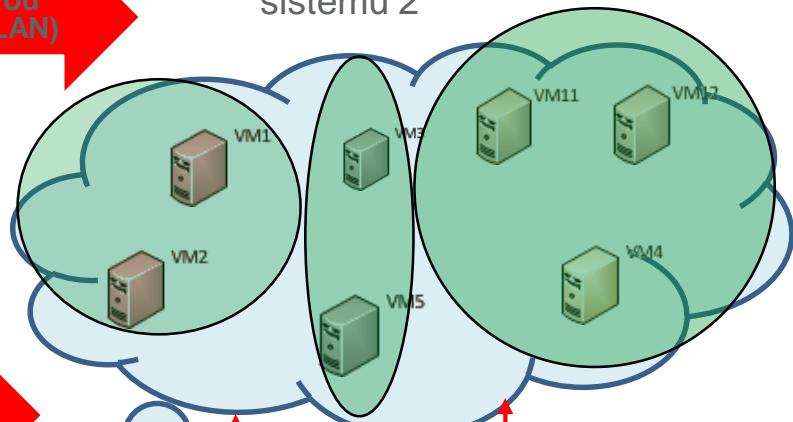


Table 1-1. Data Center Availability

Level of Availability	Percent	Downtime per Year
Six Nines	99.9999	32 seconds
Five Nines	99.999	5 minutes, 15 seconds
Four Nines	99.99	52 minutes, 36 seconds
Three Nines	99.9	8 hours, 46 minutes
Two Nines	99	3 days, 15 hours, 40 minutes

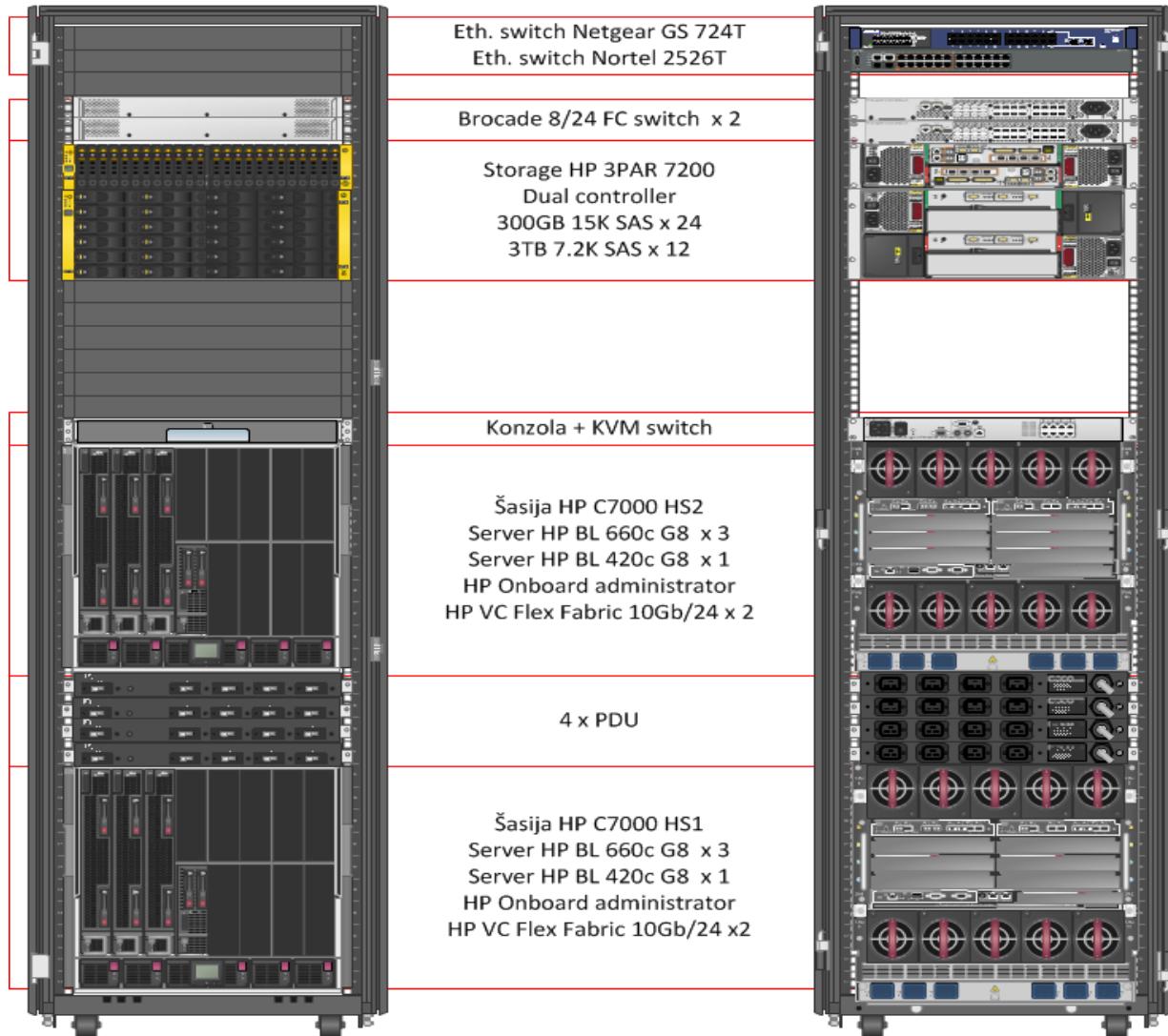
Blade šasija 1 sa BL660c G8 serverima u klasteru

Blade šasija 2 sa BL660c G8 serverima u klasteru

Hardverska infrastruktura – virtualizovano okruženje

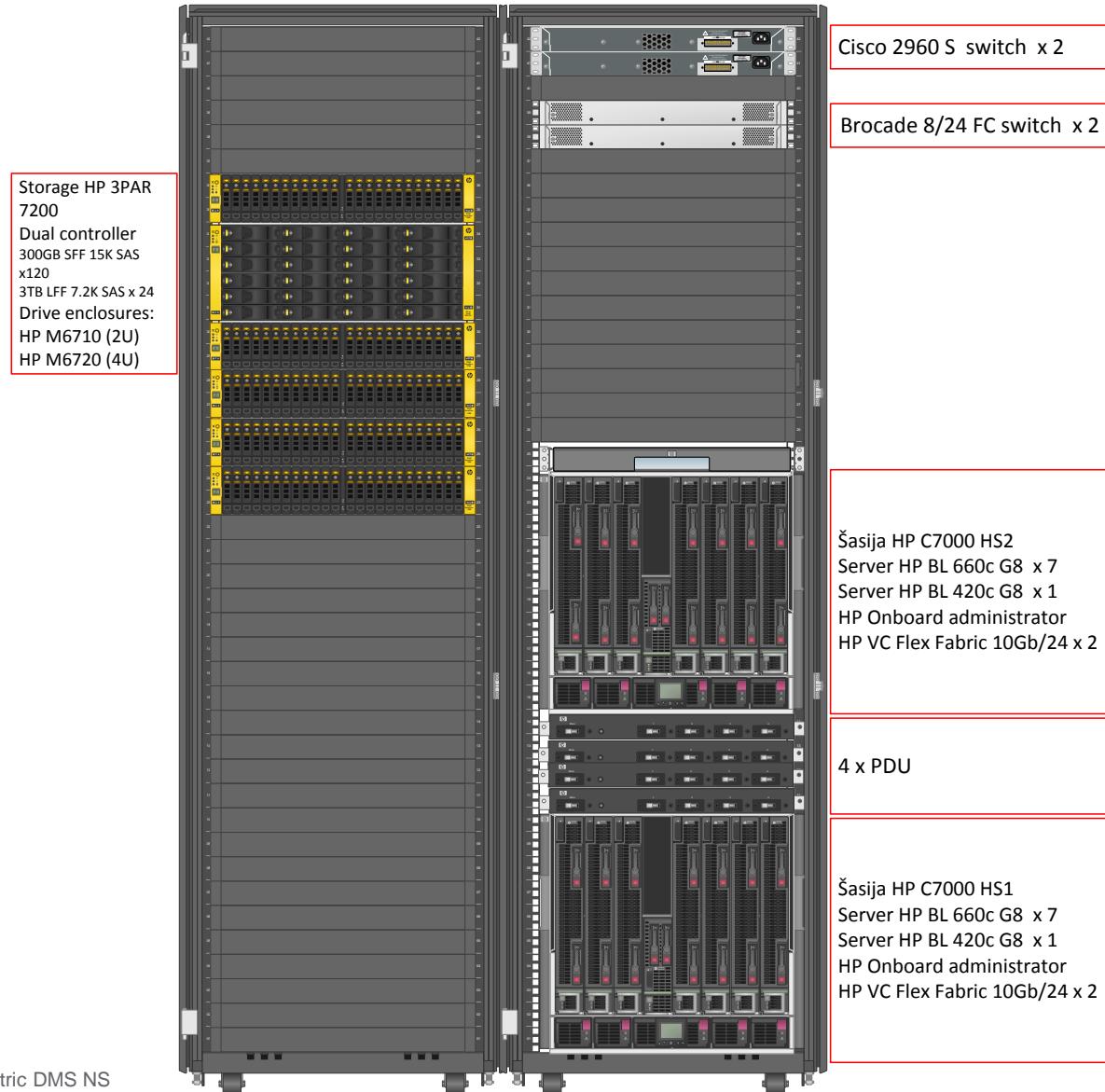
Schneider Electric DMS NS – virtualizacija testnih sistema Faza 1

HP 642 1075mm Pallet Intelligent Rack
SN:GB43220087



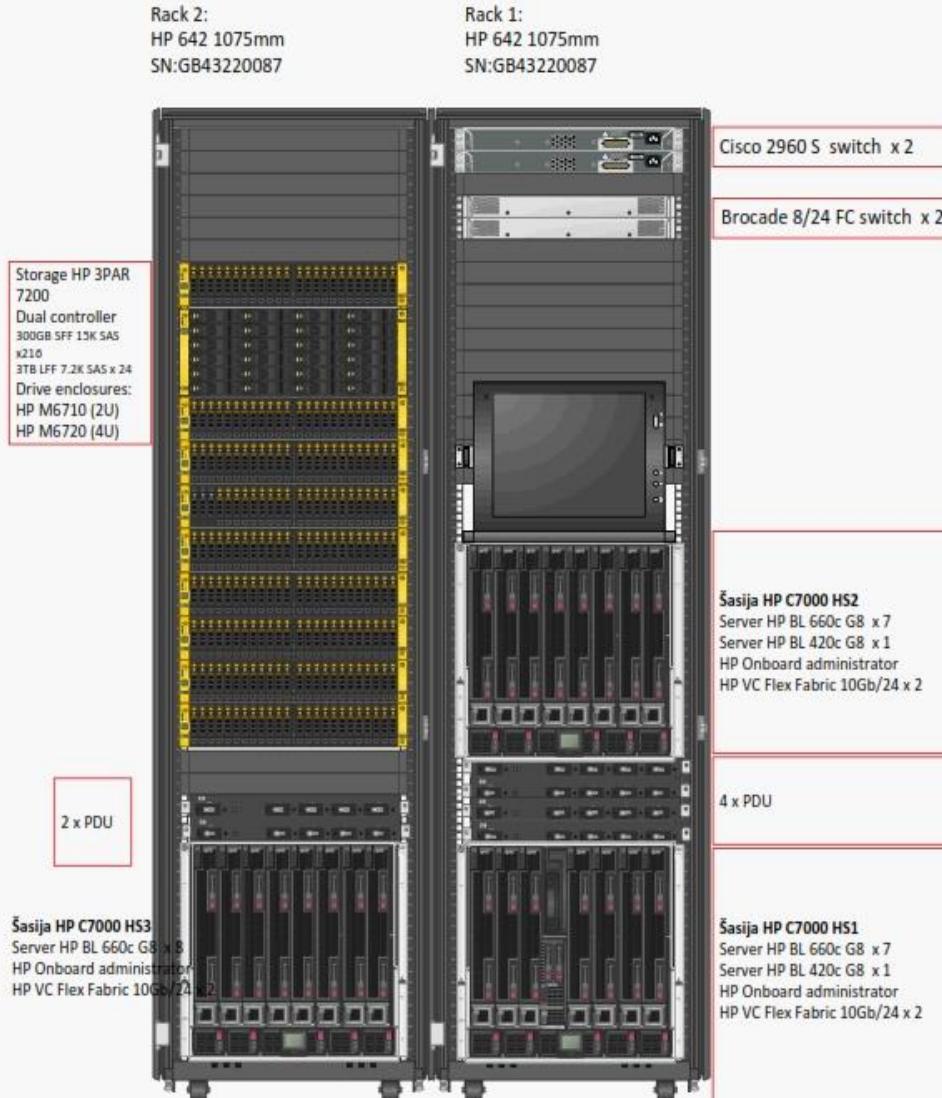
Hardverska infrastruktura – virtualizovano okruženje

Schneider Electric DMS NS – virtualizacija testnih sistema Faza 2



Hardverska infrastruktura – virtualizovano okruženje

Schneider Electric DMS NS – virtualizacija testnih sistema Faza 3
HP Blade test sistem - pogled od napred



Hardverska infrastruktura - virtualizovano okruženje

HP On Board administrator – Menadžment konzola -iLO

Screenshot of the HP BladeSystem Onboard Administrator interface showing Device Bay Information for ProLiant BL660c Gen8 (Bay 1). The interface includes a navigation menu, system status, and detailed hardware configuration tables.

Device Bay Information - ProLiant BL660c Gen8 (Bay 1)

Number	Serial Number	UUID	BIOS Asset Tag	Server Name	ROM Version
	CZ3325HKB6	31393736-3831-5A43-3333-3235484B4236		HS1HV1	I32.03/01/2013

Server NIC Information

Device ID
FLEX Adapter 1: HP FlexFabric 10Gb 2-port 554FLB Adapter
Ethernet FlexNIC (NIC 1) LOM1.1-a 00:17:A4:77:00:02
FCoE FlexBA LOM1.1-b 00:06:08:00:00:C2:62:00
Ethernet FlexNIC (NIC 5) LOM1.1-c 00:17:A4:77:00:04
Ethernet FlexNIC (NIC 7) LOM1.1-d 00:17:A4:77:00:12
Ethernet FlexNIC (NIC 2) LOM1.2-a 00:17:A4:77:00:04
FCoE FlexBA LOM1.2-b 00:06:08:00:00:C2:62:02
Ethernet FlexNIC (NIC 6) LOM1.2-c 00:17:A4:77:00:0C
Ethernet FlexNIC (NIC 8) LOM1.2-d 00:17:A4:77:00:14
FLEX Adapter 2: HP FlexFabric 10Gb 2-port 554FLB Adapter
Ethernet FlexNIC (NIC 9) LOM2.1-a 00:17:A4:77:00:06
Ethernet FlexNIC (NIC 11) LOM2.1-b 00:17:A4:77:00:0E
Ethernet FlexNIC (NIC 13) LOM2.1-c 00:17:A4:77:00:16
Ethernet FlexNIC (NIC 15) LOM2.1-d 00:17:A4:77:00:1A
Ethernet FlexNIC (NIC 10) LOM2.2-a 00:17:A4:77:00:08
Ethernet FlexNIC (NIC 12) LOM2.2-b 00:17:A4:77:00:10
Ethernet FlexNIC (NIC 14) LOM2.2-c 00:17:A4:77:00:18
Ethernet FlexNIC (NIC 16) LOM2.2-d 00:17:A4:77:00:1C

Management Processor

iLO	D8 9D:67:65 EE:30
-----	-------------------

Mezzanine Card Information

Mezzanine Slot	Mezzanine Device	Mezzanine Device Port	Device ID
The server does not contain any mezzanine cards			

CPU and Memory Information

CPU 1	Intel(R) Xeon(R) CPU E5-4620 0 @ 2.20GHz (8 Cores)
CPU 2	Intel(R) Xeon(R) CPU E5-4620 0 @ 2.20GHz (8 Cores)
CPU 3	Intel(R) Xeon(R) CPU E5-4620 0 @ 2.20GHz (8 Cores)
CPU 4	Intel(R) Xeon(R) CPU E5-4620 0 @ 2.20GHz (8 Cores)
Memory	524288 MB

Enclosure Information

The rack view diagram illustrates the physical layout of the server bays and drives within the ProLiant BL660c Gen8 chassis. It shows the front and rear panels with various ports and components.

Hardverska infrastruktura - virtualizovano okruženje

HP 3PAR storage - Menadžment konzola

The screenshot shows the HP 3PAR Management Console interface. The left sidebar contains navigation links for Storage Systems, Virtual Volumes, CPGs, VLUNs, Templates, Domains, and Common Actions. The main area displays two tables: 'Provisioning : Storage Systems : 3par-toma : Virtual Volumes : Exported' and 'Virtual Volume Details: HS1HV2_NL_2TB_RAID1'. The first table lists 14 objects, including various RAID configurations and volumes. The second table provides detailed information for the selected volume, including its physical components and usage statistics. A bottom pane shows a log of recent alerts.

Provisioning : Storage Systems : 3par-toma : Virtual Volumes : Exported

Name	Domain	Set	State	Type	Provisioning	RAID	Virtual Size (GB)	Reserved User Size (GB)	Reserved User Size (% Virtual)	Reserved Copy Size (GB)	Reserved Copy Size (% Virtual)	Exported To
HS1HV1_NL_2TB_RAID1	--	--	Normal	Base	Thin	RAID 1	2,048.000	677.375	33%	--	--	HS1HV1
HS1HV2_NL_2TB_RAID1	--	--	Normal	Base	Thin	RAID 1	2,048.000	1,371.750	66%	--	--	HS1HV2
HS1HV3_NL_2TB_RAID1	--	--	Normal	Base	Thin	RAID 1	2,048.000	1,261.375	61%	--	--	HS1HV3
HS2HV2_NL_2TB_RAID1	--	--	Normal	Base	Thin	RAID 1	2,048.000	1,019.250	49%	--	--	HS2HV2
HS2HV3_NL_2TB_RAID1	--	--	Normal	Base	Thin	RAID 1	2,048.000	525.125	25%	--	--	HS2HV3
HS2HV3_FC_726GB_RAIDS	--	--	Normal	Base	Thin	RAID 5	726.000	293.250	40%	--	--	HS2HV3
HS1HV2_FC_726GB_RAIDS	--	--	Normal	Base	Thin	RAID 5	726.000	377.000	51%	--	--	HS1HV2
HS1HV1_FC_726GB_RAIDS	--	--	Normal	Base	Thin	RAID 5	726.000	175.500	24%	--	--	HS1HV1
HS1HV3_FC_726GB_RAIDS	--	--	Normal	Base	Thin	RAID 5	726.000	395.000	54%	--	--	HS1HV3
HS2HV1_FC_726GB_RAIDS	--	--	Normal	Base	Thin	RAID 5	726.000	407.375	56%	--	--	HS2HV1
HS2HV2_FC_726GB_RAIDS	--	--	Normal	Base	Thin	RAID 5	726.000	302.500	41%	--	--	HS2HV2
HS1HV4_NL_500GB_RAID1	--	--	Normal	Base	Thin	RAID 1	500.000	57.000	11%	--	--	HS1HV4
HS2HV4_NL_500GB_RAID1	--	--	Normal	Base	Thin	RAID 1	500.000	0.500	0%	--	--	HS2HV4
HS2HV1_NL_2TB_RAID1	--	--	Normal	Base	Thin	RAID 1	2,048.000	1,065.125	52%	--	--	HS2HV1

Virtual Volume Details: HS1HV2_NL_2TB_RAID1

Name	Domain	State	Device Type	Device RPM (K)	RAID	Total Capacity (GB)	Used Capacity (GB)	Raw Capacity (GB)	Write Through	Mapped to VV	Usage	Owner
tp-2-sa-0.0	--	Normal	FC	15	RAID 1	8.000	2.938	24.000	No	Yes	CPG Admin	0/1
tp-2-sa-0.1	--	Normal	FC	15	RAID 1	8.000	2.938	24.000	No	Yes	CPG Admin	1/0
tp-2-sd-0.0	--	Normal	NL	7	RAID 1	256.000	256.000	512.000	No	Yes	CPG Data	0/1
tp-2-sd-0.1	--	Normal	NL	7	RAID 1	246.000	245.500	492.000	No	Yes	CPG Data	0/1
tp-2-sd-0.2	--	Normal	NL	7	RAID 1	256.000	255.875	512.000	No	Yes	CPG Data	1/0
tp-2-sd-0.3	--	Normal	NL	7	RAID 1	246.000	243.750	492.000	No	Yes	CPG Data	1/0
tp-2-sd-0.4	--	Normal	NL	7	RAID 1	384.000	379.875	768.000	No	Yes	CPG Data	0/1
tp-2-sd-0.5	--	Normal	NL	7	RAID 1	252.000	251.000	504.000	No	Yes	CPG Data	0/1
tp-2-sd-0.6	--	Normal	NL	7	RAID 1	384.000	381.500	768.000	No	Yes	CPG Data	1/0
tp-2-sd-0.7	--	Normal	NL	7	RAID 1	252.000	250.625	504.000	No	Yes	CPG Data	1/0
tp-2-sd-0.8	--	Normal	NL	7	RAID 1	246.000	245.250	492.000	No	Yes	CPG Data	0/1
tp-2-sd-0.9	--	Normal	NL	7	RAID 1	252.000	252.000	504.000	No	Yes	CPG Data	0/1
tp-2-sd-0.10	--	Normal	NL	7	RAID 1	208.000	208.000	416.000	No	Yes	CPG Data	0/1
tp-2-sd-0.11	--	Normal	NL	7	RAID 1	252.000	251.875	504.000	No	Yes	CPG Data	1/0
tp-2-sd-0.12	--	Normal	NL	7	RAID 1	246.000	244.625	492.000	No	Yes	CPG Data	1/0

New Alerts

System	Severity	ID	Time	Message
3par-toma	Minor	72	Sep 19, 2013 01:01:55 CEST	Task 3007 (type 'scheduled_task', name 'AO1_daily') has failed (Task Failed). Please see task status for details.
3par-toma	Info	44	Oct 1, 2013 09:59:17 CEST	Total FC raw space usage at 4051G (above 50% of total 6528G)
3par-toma	Minor	73	Sep 19, 2013 12:56:09 CEST	Task 3033 (type 'system_task', name 'check_slow_disk') has failed (Marking task 3033 failed due to node down.). Please see task status for details.
3par-toma	Minor	74	Sep 20, 2013 01:00:36 CEST	Task 3062 (type 'scheduled_task', name 'AO1_daily') has failed (Task Failed). Please see task status for details.
3par-toma	Minor	75	Sep 21, 2013 01:00:29 CEST	Task 3115 (type 'scheduled_task', name 'AO1_daily') has failed (Task Failed). Please see task status for details.

Connected to 192.168.225.20



Hardverska infrastruktura - virtualizovano okruženje

HP FC switch – Menadžment konzola

The screenshot shows the HP swd77 Web Tools interface. The main window displays a summary of the switch's status, including temperature, power, fan, and beacon indicators. A legend for Admin Domains (AD0) is shown. The left sidebar provides navigation through tasks like Zone Admin, Switch Admin, Port Admin, and Admin Domain. The Fabric Tree shows a single switch named swd77 under the Fabric category.

The central part of the interface is the "Switch View" which shows a physical image of the HP FC switch with its various ports and components. Below it, the "Switch Events, Information" section shows the last updated time and a detailed view of the switch's configuration.

A large modal dialog box titled "swd77 - Port Administration" is open, focusing on Port 0. It includes tabs for General, SFP, and Port Statistics. The General tab displays detailed information about the port, such as its WWN (20:01:00:27:f8:a2), media type (sw), and protocol (FC). It also lists allowed port types (E-Port, F-Port, L-Port), speed (N8), and QoS status. The "Device Details" sub-dialog is also visible, providing more specific details about the port's connection to a device, including its device name and node WWN.

At the bottom of the interface, there are status messages: "Number of switches: 1", "Refreshed: 3:38:25 PM", and "Free Professional Management Tool | 192.168.20.84 | AD0 | User: admin | Role: admin". The taskbar at the bottom shows various open applications including Windows, Opera, Mozilla, Skype, HP 3PA, Adobe, HP Pro, Paint, and others.

Hardverska infrastruktura - virtualizovano okruženje

System centre Virtual Machine manager

The screenshot shows the System Centre Virtual Machine Manager interface. The title bar reads "Administrator - S2HV3-DC.ibm.internal - Virtual Machine Manager (Evaluation Version - 75 days remaining)". The ribbon menu has tabs for Home, Folder, Host, Server Tools, Overview, VMs (which is selected), Services, VM Networks, and PowerShell.

The left sidebar navigation pane includes sections for VMs and Services, Tenants, Clouds, Testing, VM Networks, Storage, All Hosts, and a detailed list of hosts from S1 to s3hv13. A "VMs and Services" section at the bottom contains icons for Fabric, Library, Jobs, and Settings, with the "Settings" option checked.

The main content area displays a table titled "VMs (8)" listing the following virtual machines:

Name	Status	Virtual Machine St...	Availability Set Name	Host	Cloud	Job Status	Owner	User Role	CPU Average	Service	Operating System
Z3XOS	Running	Running		s2hv11					0 %		64-bit edition of Wind...
Z3RTSSIM	Running	Running		s2hv11		Completed			0 %		64-bit edition of Wind...
Z3DMSDES	Running	Running		s2hv11		Completed			0 %		64-bit edition of Wind...
Z3DES	Stopped	Stopped		s2hv11					0 %		Unknown
Z3OASRTS1	Running	Running		s2hv11					0 %		64-bit edition of Wind...
Z3DMSRTS1	Running	Running		s2hv11					0 %		64-bit edition of Wind...
Z3RTSONL	Stopped	Stopped		s2hv11					0 %		Unknown
Z3OASYS	Stopped	Stopped		s2hv11					0 %		Unknown

The status bar at the bottom right shows the time as 1:49 PM and the date as 10/11/2013.

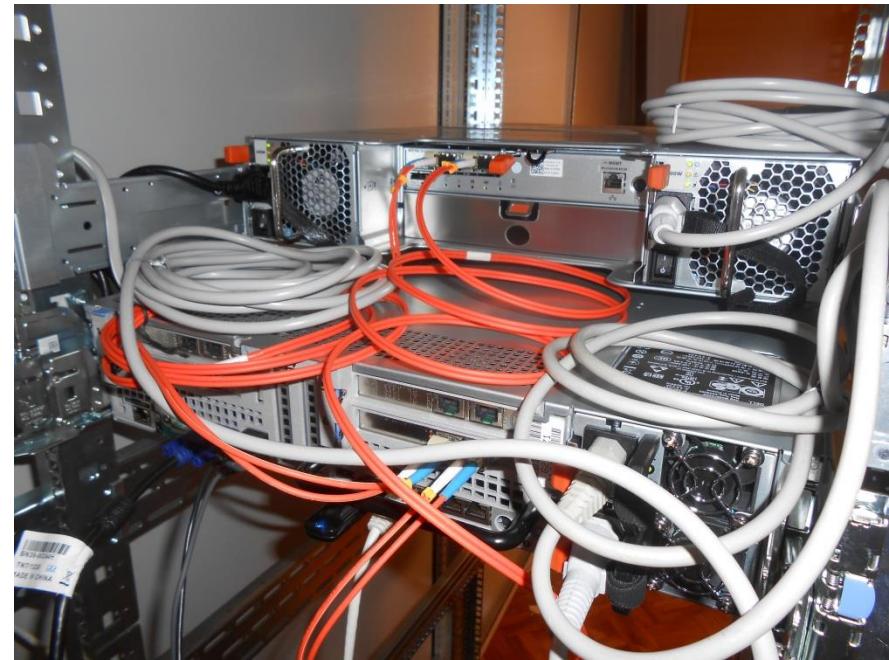
Hardverska infrastruktura - virtualizovano okruženje

Hardverska infrastruktura – Projekat Fortum

Testni sistem (Švedska,Karlšstad januar 2014)



DELL – Front (2RU)
1RU=4.445cm
Server :
Power Edge R815
4 x AMD 6272
128GB

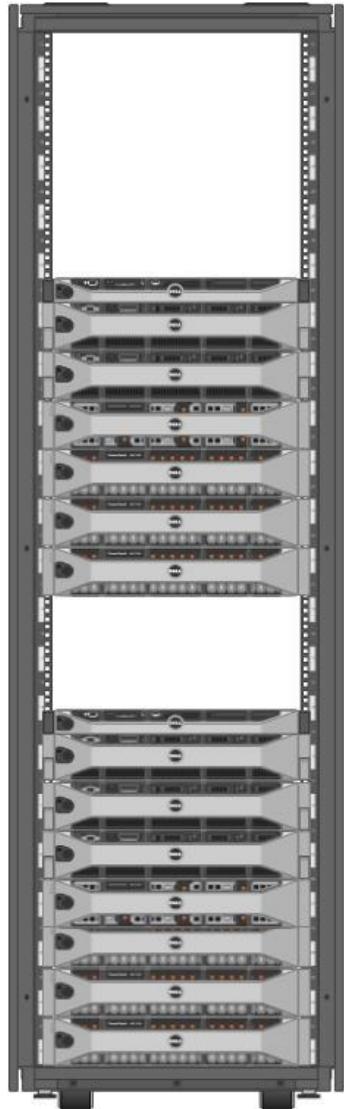


DELL – Back
Storage
MD3600F 4 x 600GB
15k SAS LFF

Hardverska infrastruktura - virtualizovano okruženje

Hardverska infrastruktura – Projekat Fortum

Produkcioni sistem (Novi Sad, avgust/novembar 2014)



DC Dell PowerEdge R320 Intel E5-2403/4GB

Host servers:

2 x Dell Power Edge R815 4 x AMD Opteron 6344 (16 core) /128GB

SAN2:

1 x Dell PowerVault MD3600f Dual Controller FC 8Gb
12 x 600GB 15k 3.5" SAS

3 x Expansion Dell PowerVault MD1200 12 x 600GB 15k
3.5" SAS Dual Contr. 8Gb FC

DC Dell PowerEdge R320 Intel E5-2403/4GB

Host servers:

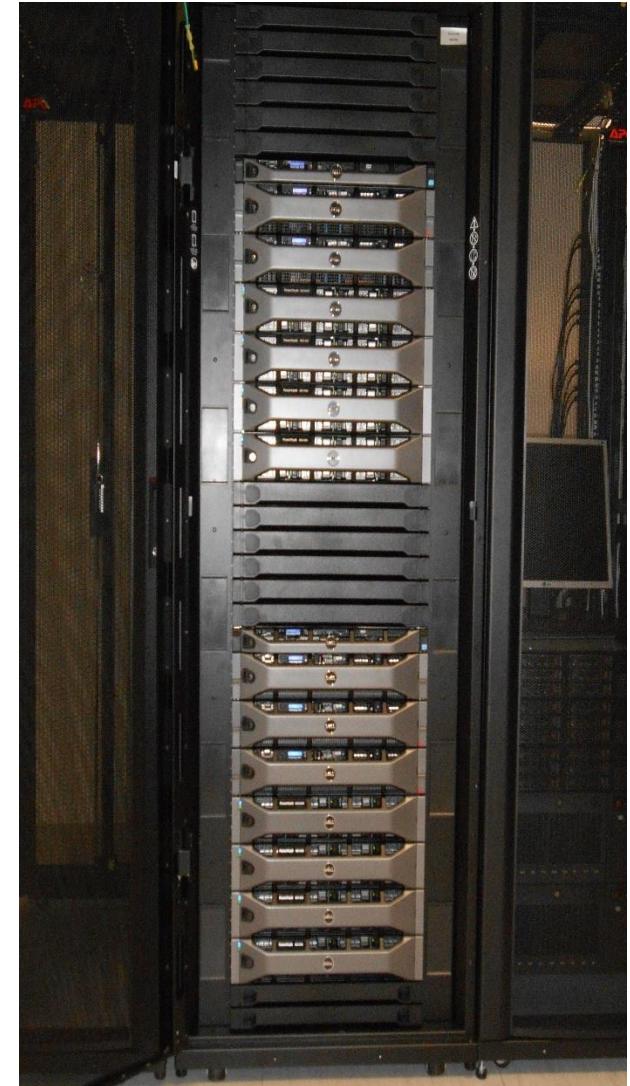
2 x Dell Power Edge R815 4 x AMD Opteron 6344 (16 core) /128GB

1 x Dell Power Edge R815 4 x AMD Opteron 6272 (12 core) /160GB

SAN1:

1 x Dell PowerVault MD3600f Dual Controller FC 8Gb
12 x 600GB 15k 3.5" SAS

3 x Expansion Dell PowerVault MD1200 12 x 600GB 15k
3.5" SAS Dual Contr. 8Gb FC



Hardverska infrastruktura - virtualizovano okruženje

Hardverska infrastruktura – Projekat Fortum

Produkcioni sistem (Novi Sad, novembar 2014)

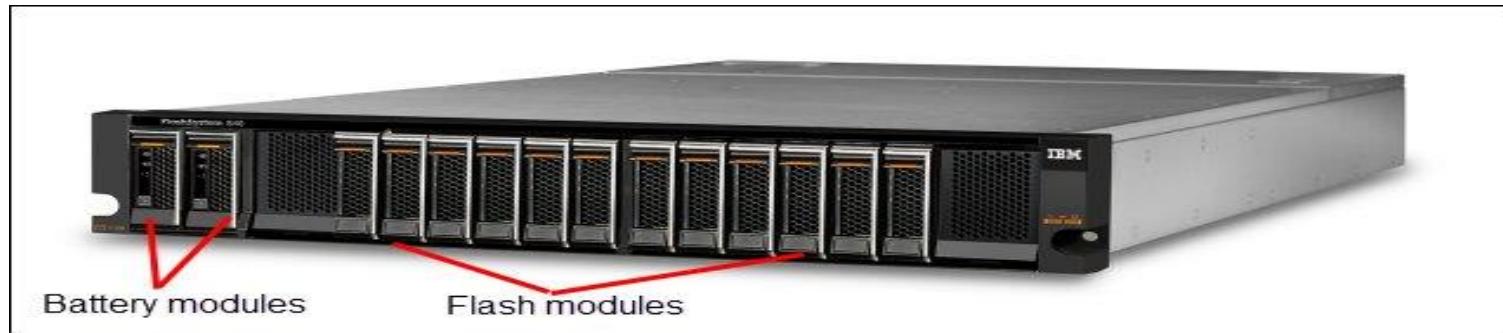


Hardverska infrastruktura - virtualizovano okruženje

Hardverska infrastruktura – Trendovi

Storage technology

IBM Flash System 840

 A photograph of the IBM Flash System 840 storage unit. The unit is a long, rectangular server rack with a black front panel featuring multiple drive bays. Two red arrows point from the text labels below to specific components: one arrow points to the two small black modules on the far left labeled 'Battery modules', and another arrow points to the twelve larger black modules in the center labeled 'Flash modules'.	
Maximum capacity	For RAID 0, the maximum capacity is 48 TB. For RAID 5, the maximum capacity is 40 TB.
Read IOPS	1,100,000.
Write IOPS	600,000.
Read latency	135 µs.
Write latency	90 µs.
Flash module quantity	Up to 12 flash modules in increments of 2, 4, 6, 8, 10, or 12. These modules can be either 1 TB, 2 TB, or 4 TB and cannot be intermixed.

Hardverska infrastruktura - virtualizovano okruženje

Hardverska infrastruktura – Trendovi

Storage technology

IBM eXFlash DDR3 Storage DIMMs



- IBM eXFlash 200GB DDR3 Storage DIMM
- IBM eXFlash 400GB DDR3 Storage DIMM
- Ograničenje po tipu servera i tipu CPU
- Ograničenje po broju modula u jednom serveru
- SLC/MLC/eMLC/TLC
- **DRAM > NAND flash > Spinning Disk > Tape**

Hardverska infrastruktura - virtualizovano okruženje

Hardverska infrastruktura – Trendovi

Storage technology

Table of Storage Technologies and Key Metrics - source Violin Memory

Technologies	Capacity (GB)	Latency (µS)	IOPs	Cost / IOPs (\$)	Cost / GB (\$)
Capacity HDDs	2,500	12,000	600	13.3	3
Performance HDDs	700	7000	1,200	16.6	28
Flash SSDs	700	200	500	140	100
Flash SSDs (read only)	700	45	50,000	1.4	100
DRAM SSDs	250	3	200,000	0.5	400

Hardverska infrastruktura - virtualizovano okruženje

Hardverska infrastruktura – Trendovi

Blade technology

HP Moonshot 1500 Chassis



- Format 4.3 U
- Moonshot Switches (1Gb/10Gb)
- Moonshot Uplink modules(4x10Gb/ 6x10Gb)
- Proliant Server Cartridges (Intel, AMD, X-Gene, TI Keystone II, SSD/SFF, 1/4CPU, do 64GB)



Hardverska infrastruktura - virtualizovano okruženje

Hardverska infrastruktura – Poslovi koji nas očekuju u naredna dva meseca

1. FAT za projekat Meralco Filipini
 - Hardver: Cisco USC Blade sistem
2. FAT za projekat Fortum Finska
 - Hardver: DELL Rack serveri + DELL storag
3. Upgrade IBM sistema
 - Hardver: Storage IBM Storwize V7000
4. Rezultati tendera za projekat Trefor - Danska
 - Hardver: HP rack mounted server + HP MSA Storage

Hardverska infrastruktura u Cloud okruženju





Thank You

miroslav.vojnovic@schneider-electric-dms.com