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Planning and Designing Virtual Unified Communications Solutions

BRKUCC-2225

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Housekeeping

- Please don't forget to complete session evaluation
- Please switch off your mobile phones
- Q/A Policy
  - Questions may be asked during the session
  - Due to time limit, flow and respecting every one’s interest, some questions might be deferred towards the end

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Agenda

- Platforms

  Tested Reference Configurations and Specs-Based Hardware Support
- Deployment Models and HA
- Sizing
- LAN & SAN Best Practices
- Migration

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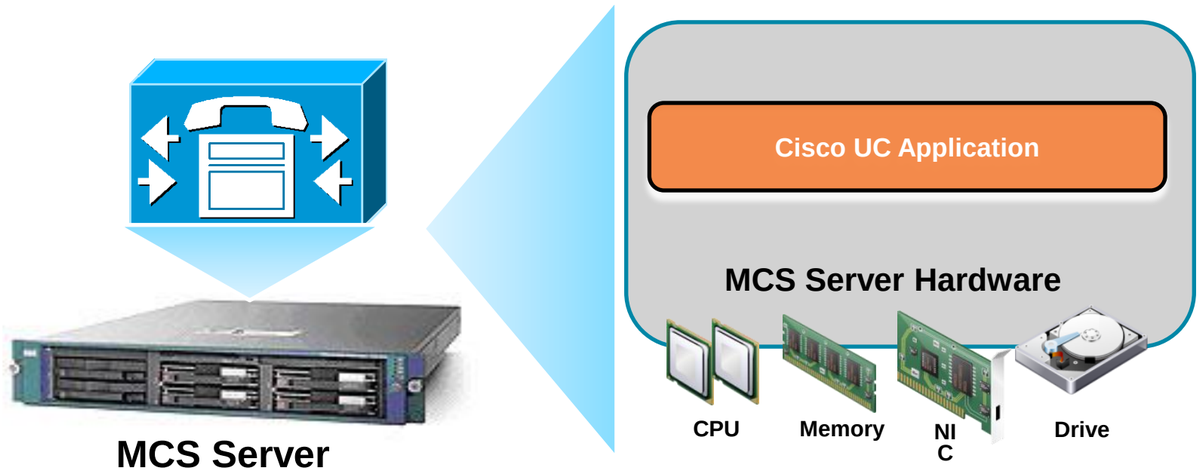
Appliance Model with MCS servers



- Server with specific hardware components

  CPU, memory, network card and hard drive
- UC application has dedicated access to hardware components

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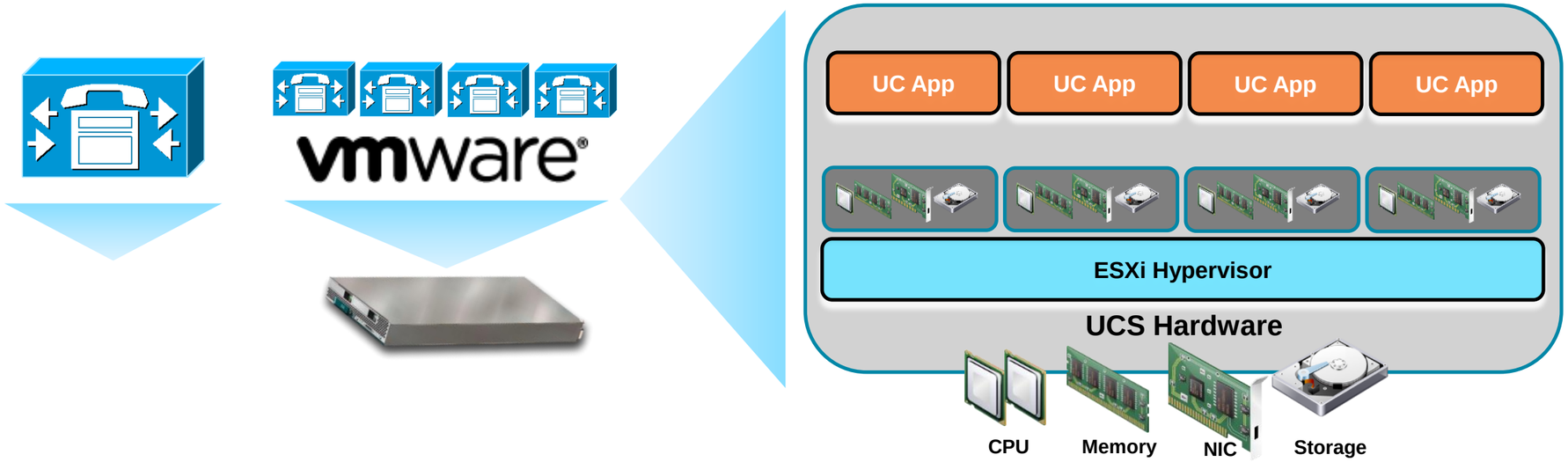
Architectural Shift : Virtualisation with VMware



- UCS with specific hardware components
  CPU, memory, network card and storage
- VMware ESXi 4.x or 5.0 running on top of dedicated UCS server
- UC application running as a virtual machine (VM) on ESXi hypervisor
- UC application has shared access to hardware components

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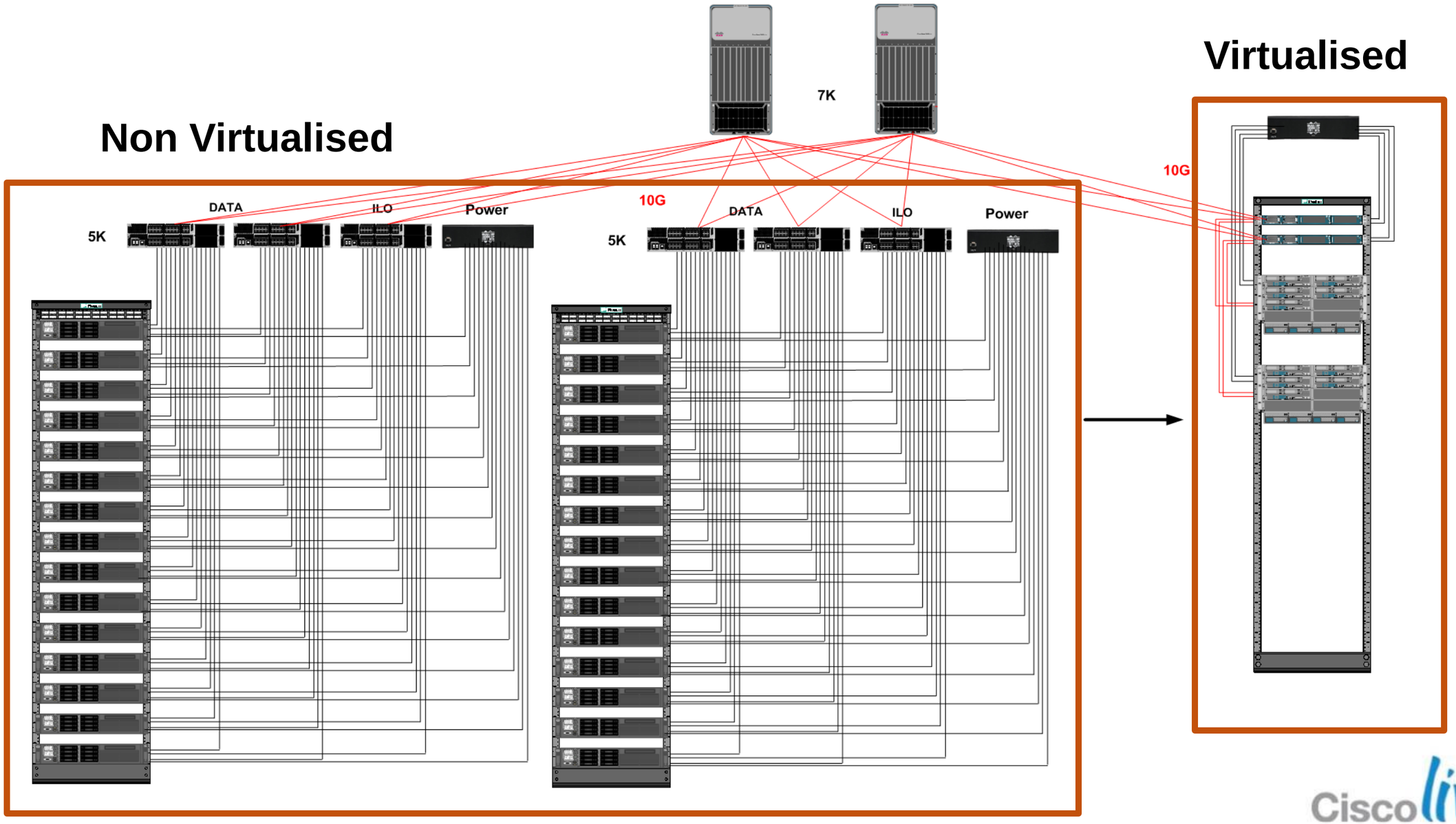
MCS appliance vs Virtualised



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Platforms

Tested Reference Configurations and Specs-based

Platform Options

1 **Tested Reference Configuration (TRC)**

B200, B230, B440

C210, C260

C200

2 **Specs-Based**

(Subset of UC applications)

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Tested Reference Configurations (TRCs)

- Based on specific Hardware Configurations
- Tested and documented by Cisco
- Performance Guaranteed
- For customers who want a packaged solution from Cisco with guaranteed performance

GUARANTEE

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Tested Reference Configurations (TRCs)

Configurations not Restricted by TRC

- TRC do not restrict:
  - SAN vendor
    Any storage vendor could be used as long as the requirements are met (IOPS, latency)
  - Configuration settings for BIOS, firmware, drivers, RAID options (use UCS best practices)
  - Configuration settings or patch recommendations for VMware (use UCS and VMware best practices)
  - Configuration settings for QoS parameters, virtual-to-physical network mapping
  - FI model (6100 or 6200), FEX (2100 or 2200), upstream switch, etc…

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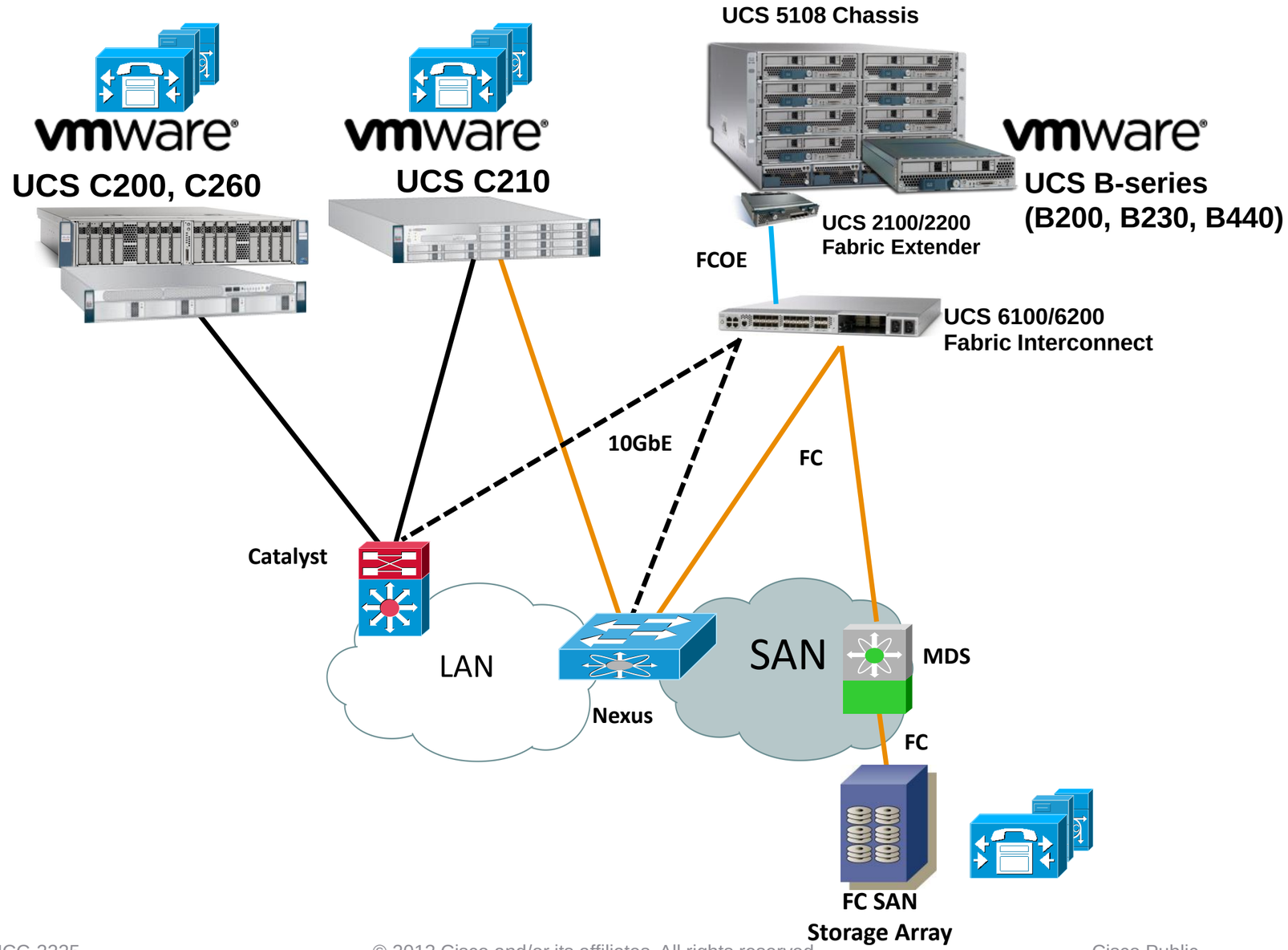
LAN and SAN options with TRCs



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TRCs

Server Model	TRC	CPU	RAM	ESXi Storage	VMs Storage
C200 M2	TRC #1	2 x E5506 (4 cores/socket)	24 GB	DAS	DAS
C210 M2	TRC #1	2 x E5640 (4 cores/socket)	48 GB	DAS	DAS
	TRC #2	2 x E5640 (4 cores/socket)	48 GB	DAS	FC SAN
	TRC #3	2 x E5640 (4 cores/socket)	48 GB	FC SAN	FC SAN
NEW! C260 M2	TRC #1	2 x E7-2870 (10 cores/socket)	128 GB	DAS	DAS
B200 M2	TRC #1	2 x E5640 (4 cores/socket)	48 GB	FC SAN	FC SAN
	TRC #2	2 x E5640 (4 cores/socket)	48 GB	DAS	FC SAN
NEW! B230 M2	TRC #1	2 x E7-2870 (10 cores/socket)	128 GB	FC SAN	FC SAN
NEW! B440 M2	TRC #1	4 x E7-4870 (10 cores/socket)	256 GB	FC SAN	FC SAN

Details in the docwiki: http://docwiki.cisco.com/wiki/Tested_Reference_Configurations_(TRC)

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Details on the latest TRCs

Server Model	TRC	CPU	RAM	Adapter	Storage
C260 M2	TRC #1	2 x E7-2870 2.4 GHz 20 cores total	128 GB	Cisco VIC	DAS 16 disks 2 RAID Groups: - RAID 5 (8 disks) for UC apps only - RAID 5 (8 disks for UC apps and ESXi)
B230 M2	TRC #1	2 x E7-2870 2.4 GHz 20 cores total	128 GB	Cisco VIC	FC SAN
B440 M2	TRC #1	4 x E7-4870 2.4 GHz 40 cores total	256 GB	Cisco VIC	FC SAN

Details in the docwiki:

http://docwiki.cisco.com/wiki/Tested_Reference_Configurations_(TRC)

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Tested Reference Configurations (TRCs)

Deviation from TRC

Specification	Description
Server Model/Generation	Must match exactly
CPU quantity, model, and # cores	Must match exactly
Physical Memory	Must be the same or higher
DAS	Quantity, RAID, technology must match Size and speed might be higher
Off-box Storage	FC only
Adapters	C-series: NIC, HBA, type must match exactly B-series: Flexibility with Mezzanine card

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Specifications-Based Hardware Support

Benefits

- Offers platform flexibility beyond the TRCs

Platforms

Any Cisco, HP and IBM hardware on VMware HCL
(Dell support not planned)

CPU

Any Xeon 5600 or 7500 with speed 2.53+ GHz

E7-2800/E7-4800/E7-8800 with speed 2.4+ GHz NEW!

Storage

Any Storage protocols/systems on VMware HCL e.g. Other DAS configs, FCoE, NFS, iSCSI (NFS and iSCSI requires 10Gbps adapter)

Adapter

Any adapters on VMware HCL

- vCenter required (for logs and statistics) VMware vCenter™

Details in the docwiki:

http://docwiki.cisco.com/wiki/Specification-Based_Hardware_Support

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Specification-Based Hardware Support

Important Considerations and Performance

- Cisco supports UC applications only, not performance of the platform
- Cisco cannot provide performance numbers
- Use TRC for guidance when building a Specs-based solution
- Cisco is not responsible for performance problems when the problem can be resolved for example by migrating or powering off some of the other VMs on the server or by using a faster hardware
- Customers who needs some guidance on their hardware performance or configuration should not use Specs-based

Only for customers with Extensive Virtualisation Experience

Details in the docwiki:

http://docwiki.cisco.com/wiki/Specification-Based_Hardware_Support

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Specification-Based Hardware Support

Examples

Platforms	Specifications	Comments
UCS-SP4-UC-B200	CPU: 2 x X5650 (6 cores/socket)	Specs-based (CPU mismatch)
UCSC-C210M2-VCD3	CPU: 2 x X5650 (6 cores/socket) DAS (16 drives)	Specs-based (CPU, # disks… mismatch)
UCSC-C200M2-SFF	CPU: 2 x E5649 (6 cores/socket) DAS (8 drives)	Specs-based (CPU, # disks, RAID controller… mismatch)

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Specification-Based Hardware Support

UC Applications Support

UC Applications	Specs-based Xeon 56xx/75xx	Specs-based Xeon E7
Unified CM	8.0(2)+	8.0(2)+
Unity Connection	8.0(2)+	8.0(2)+
Unified Presence	8.6(1)+	8.6(4)+
Contact Centre Express	8.5(1)+	8.5(1)+

Details in the docwiki:

http://docwiki.cisco.com/wiki/Unified_Communications_Virtualization_Supported_Applications

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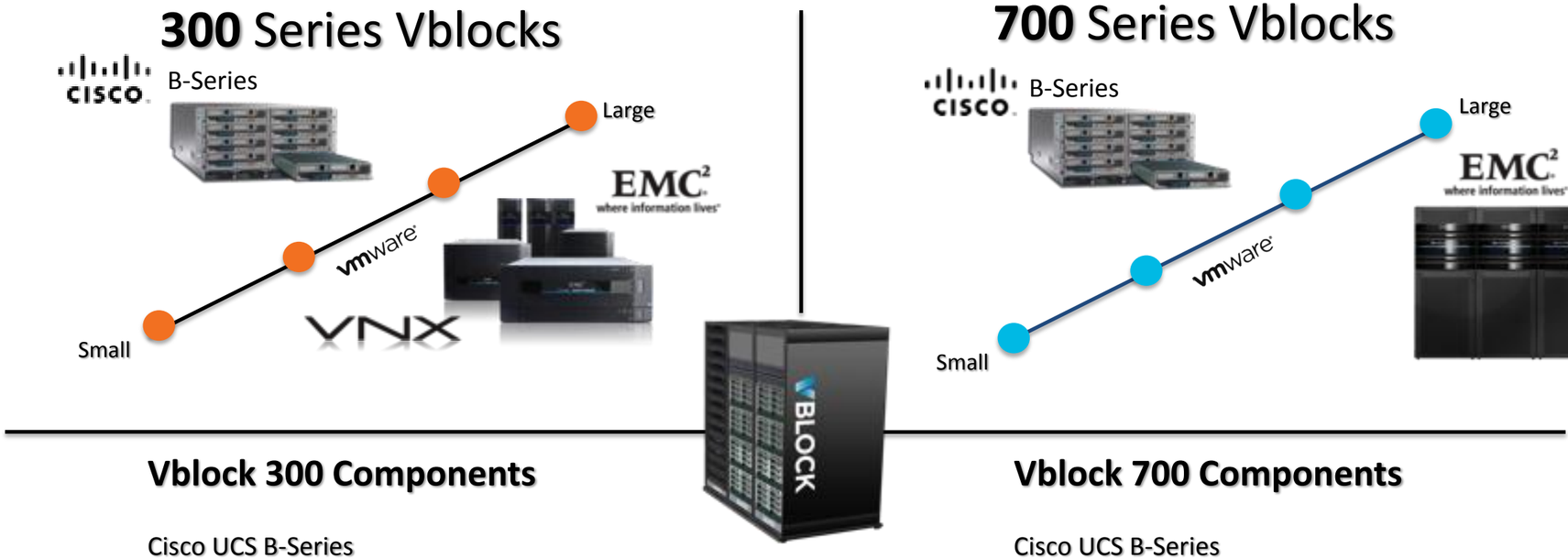
VCE and vBlock Support

- VCE is the Virtual Computing Environment coalition
  - Partnership between Cisco, EMC and VMWare to accelerate the move to virtual computing
  - Provides compute resources, infrastructure, storage and support services for rapid deployment



Vblock 300 Components

Cisco UCS B-Series
EMC VNX Unified Storage
Cisco Nexus 5548
Cisco MDS 9148
Nexus 1000v

Vblock 700 Components

Cisco UCS B-Series
EMC VMAX Storage
Cisco Nexus 5548
Cisco MDS 9148
Nexus 1000v

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Vblock UCS Blade Options

Blade type	Processors	Memory	Mezzanines	Width
B200 M2	Two 3.33GHz X5680 (12 cores)	96GB	One M81KR	Half
B200 M2	Two 2.66GHz E5640 (8 cores)	96GB	One M81KR	Half
B200 M2	Two 2.93GHz X5670 (12 cores)	48GB	One M81KR	Half
B200 M2 (UC blade)	Two 2.66GHz E5640 (8 cores)	48GB	One M81KR	Half
B230 M1	Two 2.26GHz X6550 (16 cores)	256GB	One M81KR	Half
B230 M1	Two 2.00GHz X6550 (16 cores)	128GB	One M81KR	Half
B250 M1	Two 2.93GHz X5670 (12 cores)	192GB	Two M81KR	Full
B250 M1	Two 3.33GHz X5680 (12 cores)	384GB	Two M81KR	Full
B440 M1	Four 2.00GHz X7550 (32 cores)	128GB	Two M81KR (might be limited in some Vblock platforms)	Full
B440 M1	Four 2.26GHz X7560 (32 cores)	256GB	Two M81KR	Full

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Quiz

1. I am new to virtualisation. Should I use TRCs?

   Answer: YES

1. Is NFS-based storage supported?

   Answer: Yes, with Specs-based

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Deployment Models and HA

UC Deployment Models

- **All** UC Deployment Models are supported
  - No change in the current deployment models
  - Base deployment model – Single Site, Multi Site with Centralised Call Processing, etc. are not changing
  - Clustering over WAN
  - Megacluster (from 8.5)
- **NO** software checks for design rules
  - No rules or restrictions are in place in UC Apps to check if you are running the primary and sub on the same blade
- Mixed/Hybrid Cluster supported
- Services based on USB and Serial Port not supported (e.g. Live audio MOH using USB)

More details in the UC SRND: www.cisco.com/go/ucsrnd

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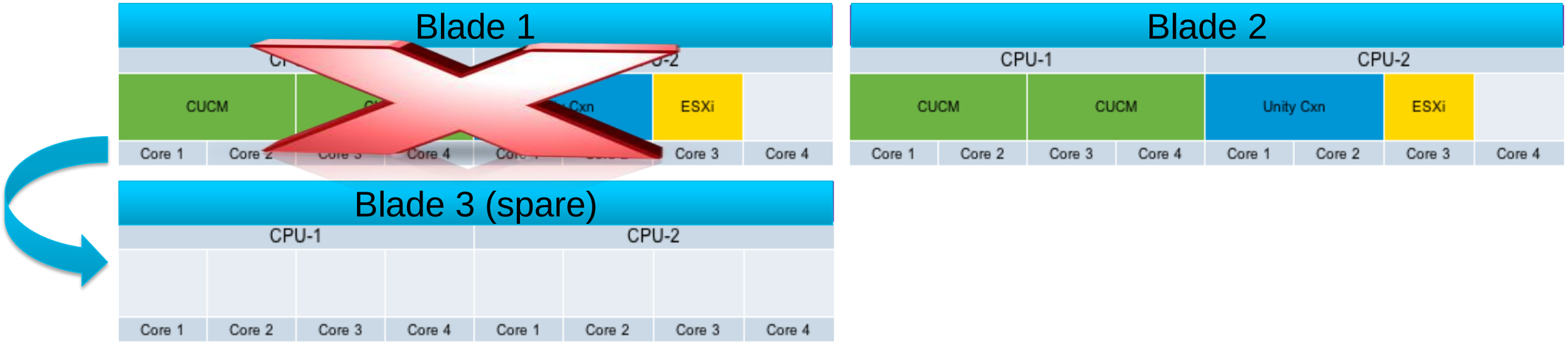
VMware Redundancy

VMware HA

- VMware HA automatically restarts VMs in case of server failure



- Spare unused servers have to be available
- Failover must not result in an unsupported deployment model (e.g. no vCPU or memory oversubscription)
- VMware HA doesn't provide redundancy in case VM filesystem is corrupted
  But UC app built-in redundancy (eg. primary/subscriber) covers this
- VM will be restarted on spare hardware, which can take some time
  Built-in redundancy faster

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Other VMware Redundancy Features

- **Site Recovery Manager (SRM)**
  - Allows replication to another site, manages and test recovery plans
  - SAN mirroring between sites
  - VMware HA doesn't provide redundancy if issues with VM filesystem as opposed to the UC app built-in redundancy
- **Fault Tolerance (FT)**
  - Not supported at this time
  - Only works with VMs with 1 vCPU
  - Costly (a lot of spare hardware required, more than with VMware HA)
  - VMware FT doesn't provide redundancy if the UC app crashes (both VMs would crash)
  - Instead of FT, use UC built-in redundancy and VMware HA (or boot VM manually on other server)
- **Dynamic Resource Scheduler (DRS)**
  - Not supported at this time
  - No real benefits since Oversubscription is not supported

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Back-Up Strategies

1. **UC application built-in Back-Up Utility**
   - Disaster Recovery System (DRS) for most UC applications
   - Backup can be performed while UC application is running
   - Small storage footprint
2. **Full VM Backup**
   - VM copy is supported for some UC applications, but the UC applications has to be **shut down**
   - Could also use VMware Data Recovery (vDR) but the UC application has to be **shut down**
   - Requires more storage than Disaster Recovery System
   - Fast to restore

Best Practice: Always perform a DRS Back-Up

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vMotion Support

UC Applications	vMotion Support
Unified CM	Yes *
Unity Connection	Partial
Unified Presence	Partial
Contact Centre Express	Yes *

- “Yes *” : vMotion supported, even with live traffic. During live traffic, small risk of calls being impacted
- “Partial”: in maintenance mode only

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Quiz

1. With virtualisation, do I still need CUCM backup subscribers?

   Answer: YES

1. Can I mix MCS platforms and UCS platforms in the same CUCM cluster?

   Answer: Yes

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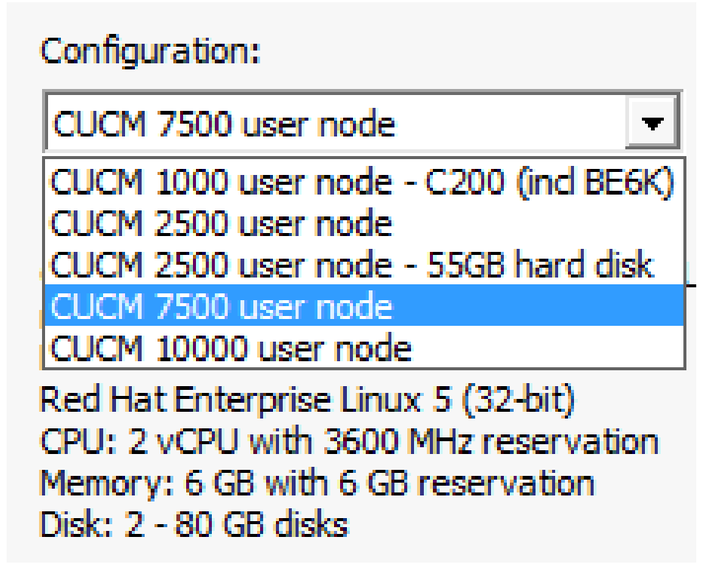
Sizing

Virtual Machine Sizing



- Virtual Machine virtual hardware defined by an VM template
  - vCPU, vRAM, vDisk, vNICs
- Capacity
  - An VM template is associated with a specific capacity
  - The capacity associated to an template typically matches the one with a MCS server
- VM templates are packaged in a OVA file
- There are usually different VM template per release. For example:
  - `CUCM_8.0_vmv7_v2.1.ova`
  - `CUCM_8.5_vmv7_v2.1.ova`
  - `CUCM_8.6_vmv7_v1.5.ova`
  - Includes product, product version, VMware hardware version, template version

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unified communications
SIZING TOOL

New Solution | My Solutions | Documentation & Training | FAQs | Support

Deployment Model | Endpoints | Traffic Mix | Dial Plan | Applications | Media | Output

Unified Communications Manager | Output

Output		Defaults	Help
Platform	VM – UCM_7500	MCS-7845-H3	?
Server Type	B200 M2	B200 M2	?
Maximum Desired Unified CM Call Processing Server Pairs per Cluster	4 server pairs	4 server pairs	?

Utilization	IPT VMs
Call Processing Capacity Utilized per Call Processing VM	35%
Memory Capacity Utilized per Call Processing VM	18.99%
Endpoints Capacity Utilized per Call Processing VM	80%
CTI Capacity Utilized per Call Processing VM	0%

Server	
Estimated min number of clusters	1
Publisher Servers	1
TFTPs VMs	2
Minimal Number of Unified CM Call Processing VMs Pairs	1
Total Number of VMs (minimal)	**5**

	vCPUs	RAM (GB)	vDisk (GB)	vNICs
Total CUCM VM Resources Needed on	10	30	800	5

Now, off-line version also available NEW!

http://tools.cisco.com/cucst

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Examples of Supported VM Configurations (OVAs)

Product	Scale (users)	vCPU	vRAM (GB)	vDisk (GB)	Notes
Unified CM 8.6	10,000	4	6	2 x 80	Not for C200/BE6k
	7,500	2	6	2 x 80	Not for C200/BE6k
	2,500	1	4	1 x 80 or 1x55GB	Not for C200/BE6k
	1,000	2	4	1 x 80	For C200/BE6k only
Unity Connection 8.6	20,000	7	8	2 x 300/500	Not for C200/BE6k
	10,000	4	6	2 x 146/300/500	Not for C200/BE6k
	5,000	2	6	1 x 200	Supports C200/BE6k
	1,000	1	4	1 x 160	Supports C200/BE6k
Unified Presence 8.6(1)	5,000	4	6	2 x80	Not for C200/BE6k
	1,000	1	2	1 x 80	Supports C200/BE6k
Unified CCX 8.5	400 agents	4	8	2 x 146	Not for C200/BE6k
	300 agents	2	4	2 x 146	Not for C200/BE6k
	100 agents	2	4	1 x 146	Supports C200/BE6k

http://docwiki.cisco.com/wiki/Unified_Communications_Virtualization_Downloads_(including_OVA/OVF_Templates)

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CUCM OVA

Device Capacity Comparison

CUCM OVA
1k OVA (2vCPU)
2.5k OVA (1vCPU)
7.5k OVA (2vCPU)
10k OVA (4vCPU)

- The 7.5k-user OVA provides support for the highest number of devices per vCPU
- The 10k-user OVA useful for large deployment when minimising the number of nodes is critical.
  For example, deployment with 40k devices can fit in a single cluster with the 10k-user OVA

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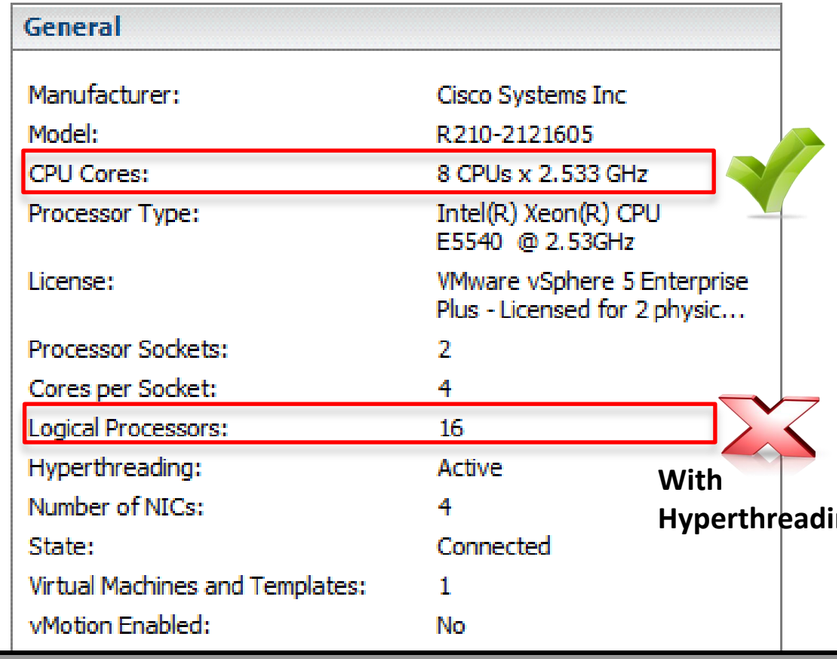
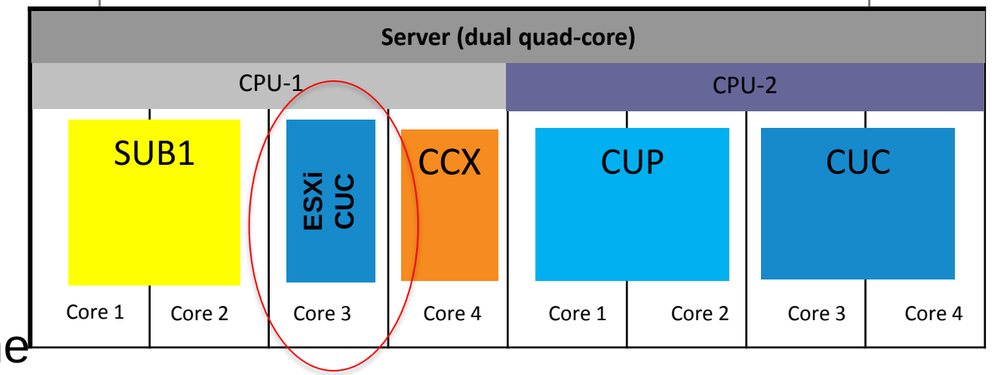
Virtual Machine Placement

Rules

- CPU
  - The sum of the UC applications vCPUs must not exceed the number of physical core
  - Additional logical cores with Hyperthreading should NOT be accounted for
  - Note: With Cisco Unity Connection only, reserve a physical core per server for ESXi
- Memory
  - The sum of the UC applications RAM (plus 2GB for ESXi) must not exceed the total physical memory of the server
- Storage
  - The storage from all vDisks must not exceed the physical disk space





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VM Placement – Co-residency

Co-residency Types

1. None
2. Limited
3. UC with UC only

   Notes: Nexus 1kv, vCenter are NOT considered as a UC application

4. Full

Full co-residency

UC applications in this category can be co-resident with 3rd party applications

Co-residency rules are the same for TRCs or Specs-based

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VM Placement – Co-residency

Full Co-residency (with 3rd party VMs)

- UC on UCS rules also imposed on 3rd party VMs (e.g. no resource oversubscription)
- Cisco cannot guarantee the VMs will never starved for resources. If this occurs, Cisco could require to power off or relocated all 3rd party applications
- TAC TechNote:

  http://www.cisco.com/en/US/products/ps6884/products_tech_note09186a0080bbd913.shtml

More info in the docwiki:

http://docwiki.cisco.com/wiki/Unified_Communications_Virtualization_Sizing_Guidelines#Application_Co-residency_Support_Policy

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VM Placement – Co-residency

UC Applications Support

UC Applications	Co-residency Support
Unified CM	8.0(2) to 8.6(1): UC with UC only 8.6(2)+: Full
Unity Connection	8.0(2) to 8.6(1): UC with UC only 8.6(2)+: Full
Unified Presence	8.0(2) to 8.5: UC with UC only 8.6(1)+: Full
Unified Contact Centre Express	8.0(x): UC with UC only 8.5(x): Full

More info in the docwiki:

http://docwiki.cisco.com/wiki/Unified_Communications_Virtualization_Sizing_Guidelines

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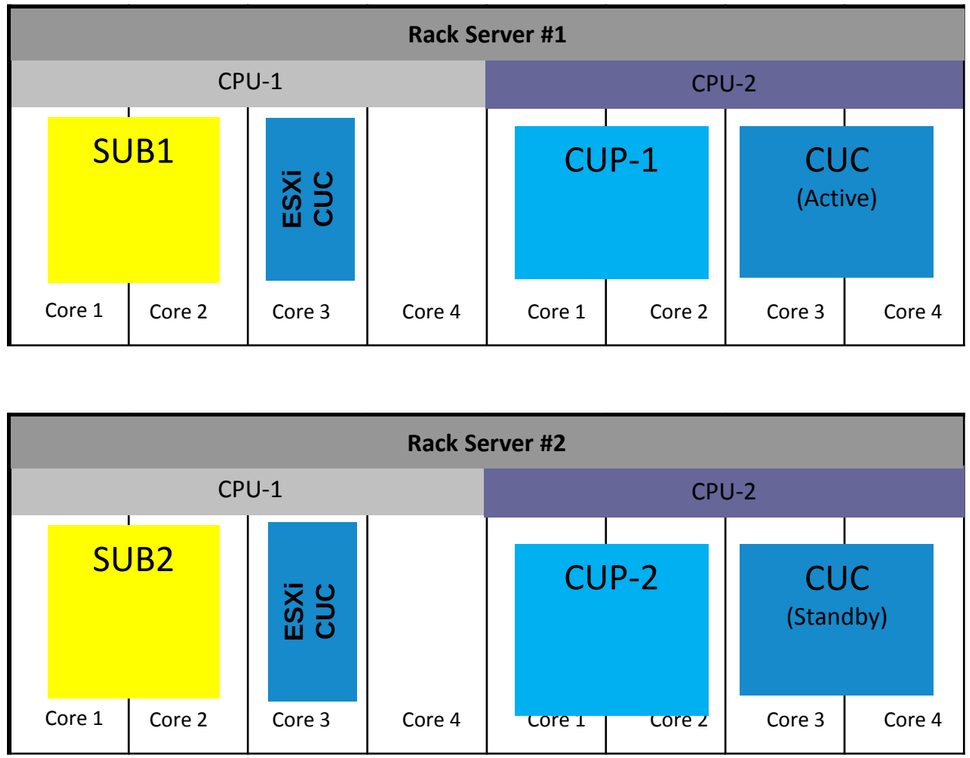
VM Placement

Best Practices

- Distribute UC application nodes across UCS blades, chassis and sites to minimise failure impact
- On same blade, mix Subscribers with TFTP/MoH instead of only Subscribers



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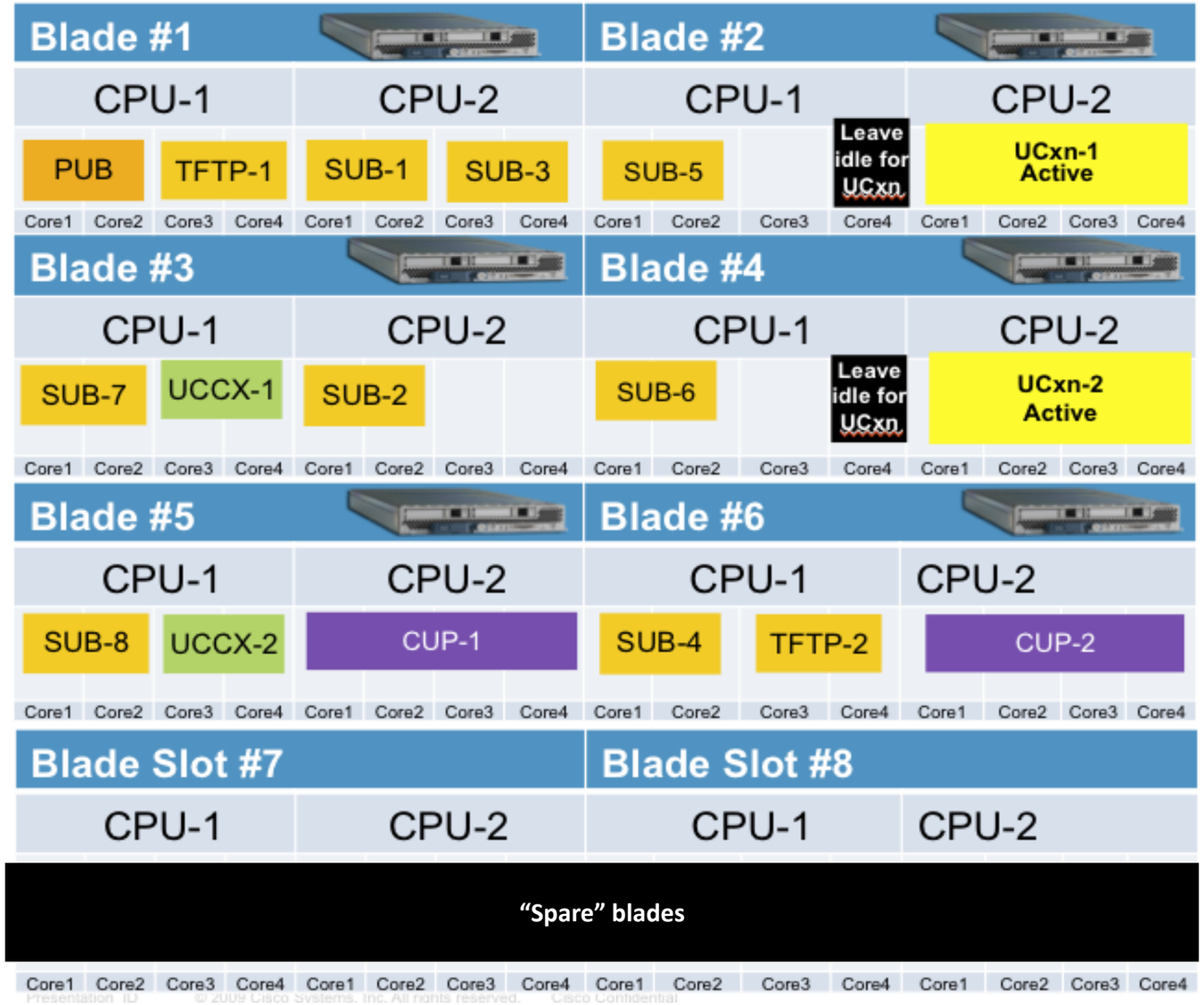
VM Placement – Example



CUCM VM OVAs

Messaging VM OVAs

Presence VM OVAs

Contact Centre VM OVAs

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Quiz

1. Is oversubscription supported with UC applications?

   Answer: No

2. With Hyperthreading enabled, can I count the additional logical processors?

   Answer: No

1. With CUCM 8.6(2)+, can I install CUCM and vCenter on the same server?

   Answer: Yes (CUCM full co-residency starting from 8.6(2))

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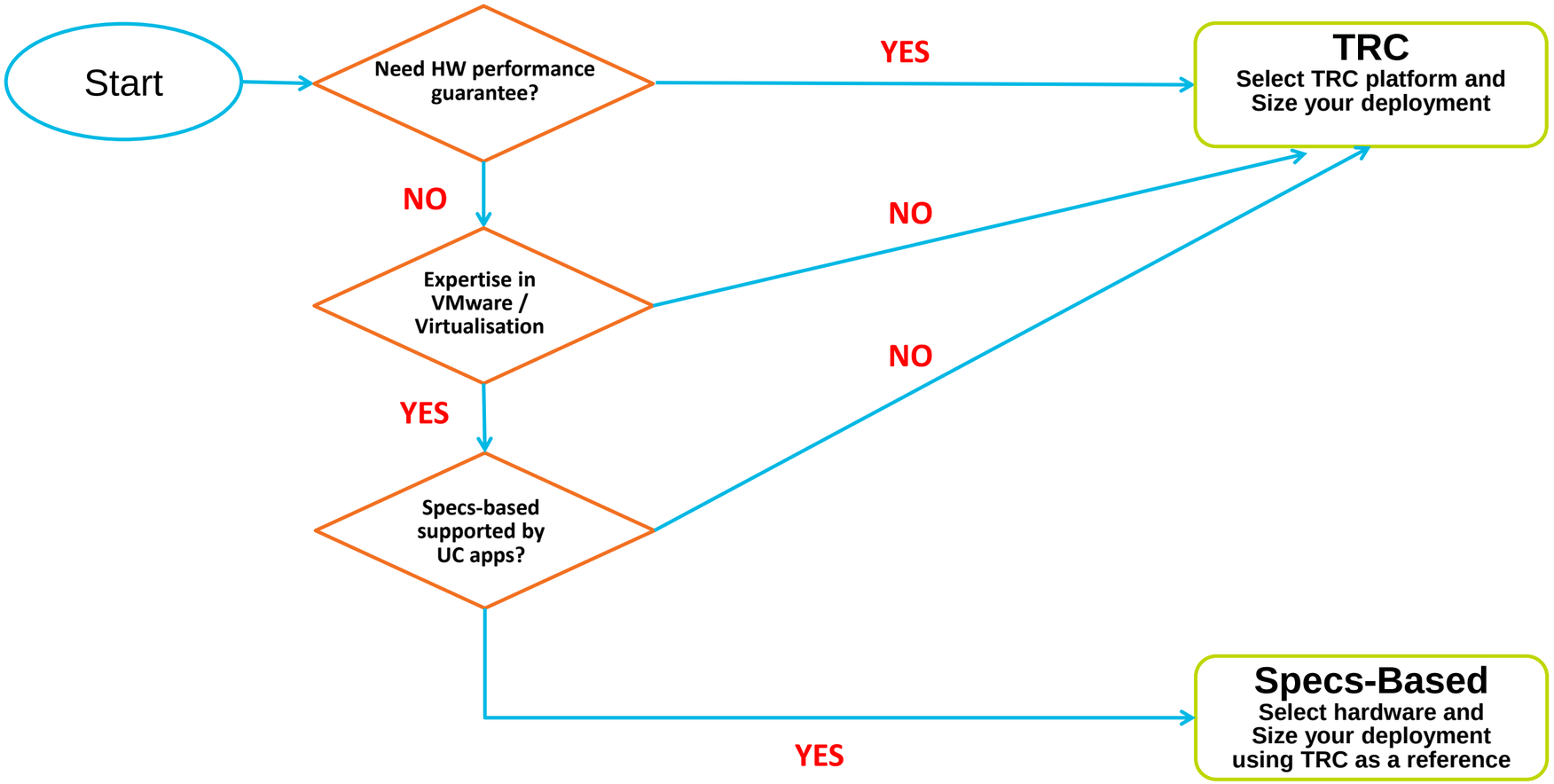
UC Server Selection

TRC vs Specs Based

Platform Decision Tree



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Hardware Selection Guide

B-series vs C-series

	B-Series	C-Series
Storage	SAN Only	SAN or DAS
Typical Type of customer	DC-centric	UC-centric Not ready for blades or shared storage. Lower operational readiness for virtualisation.
Typical Type of deployment	DC-centric Typically UC + other biz apps/VXI	UC-centric Typically UC only
Optimum deployment size	Bigger	Smaller
Optimum geographic spread	Centralised	Distributed or Centralised
Cost of entry	Higher	Lower
Costs at scale	Lower	Higher
Partner Requirements	Higher	Lower
Vblock Available?	Yes	Not currently
What HW does TRC cover?	Just the blade Not UCS 2100/5100/6x00	“Whole box” Compute+Network+Storage

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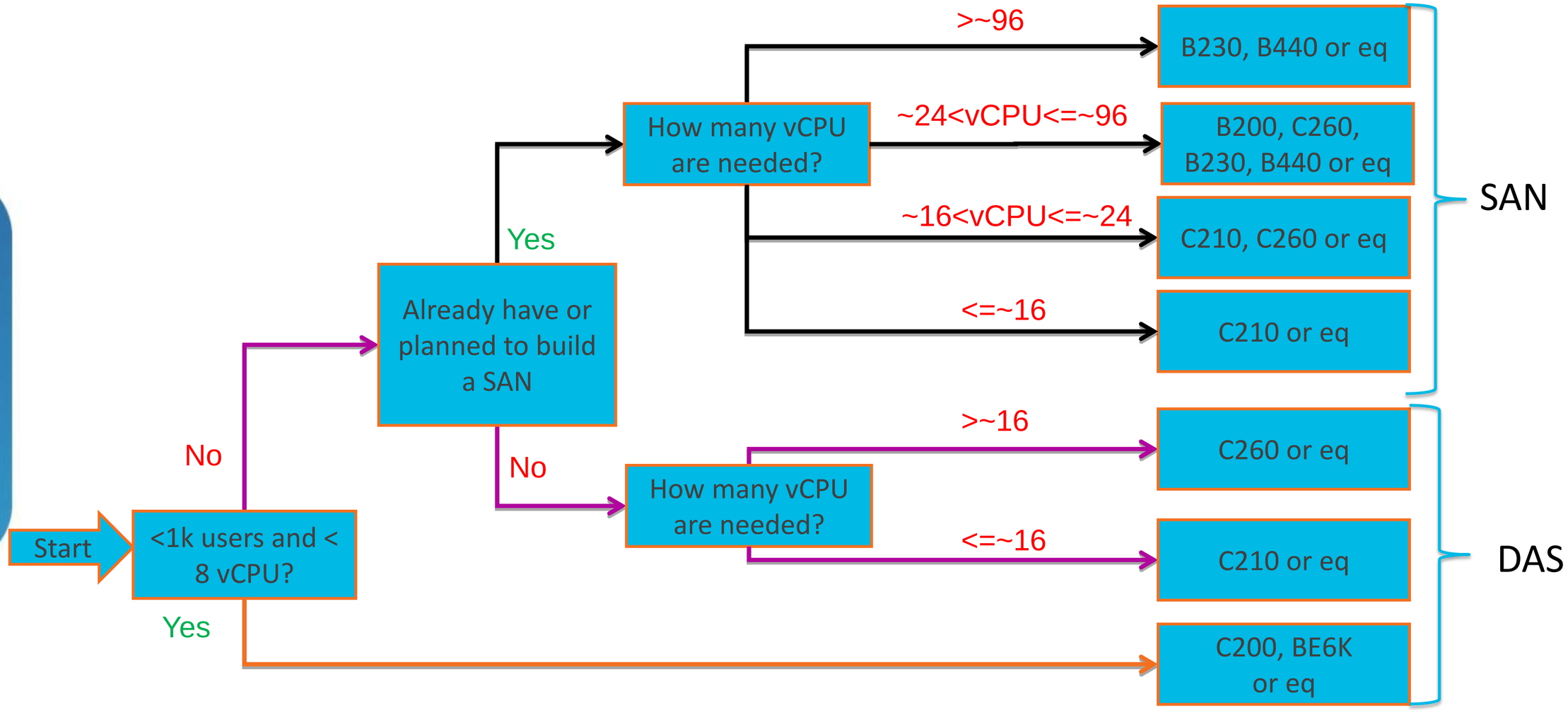
Hardware Selection Guide

Suggestion for New Deployment



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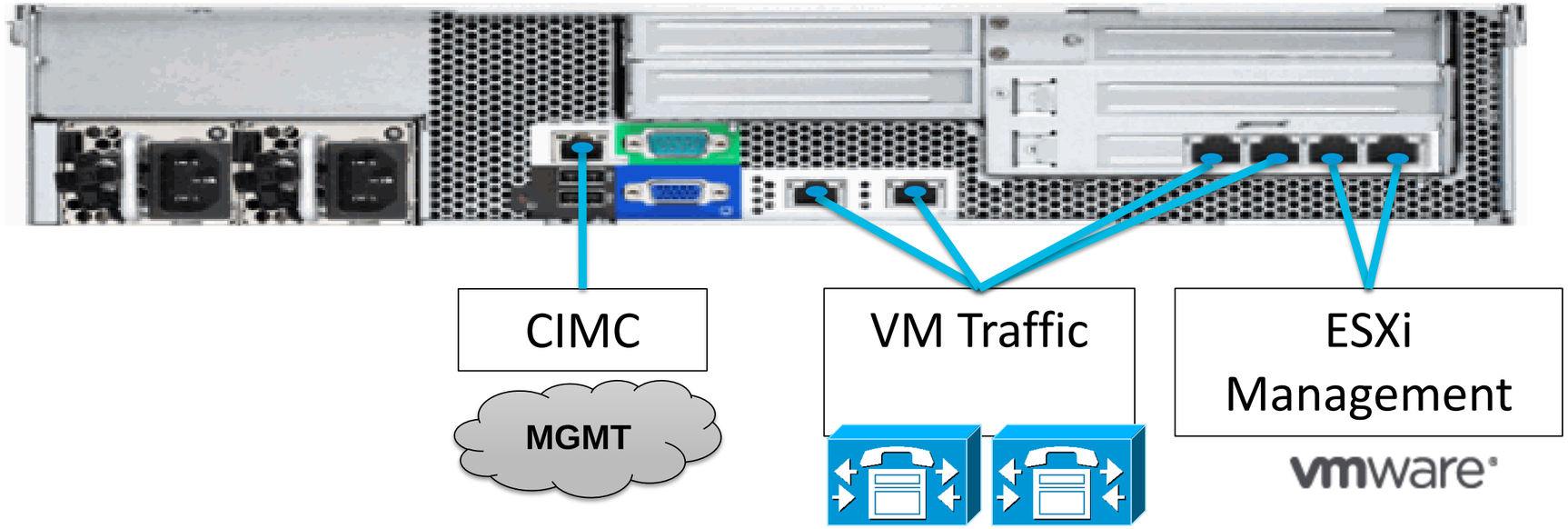
LAN & SAN Best Practices

Cisco UCS C210/C260 Networking Ports

Best Practices



- Tested Reference Configurations (TRC) for the C210/C260 have:
  - 2 built-in Gigabit Ethernet ports (LOM, LAN on Motherboard)
  - 1 PCI express card with four additional Gigabit Ethernet ports
- Best Practice
  - Use 2 GE ports from the Motherboard and 2 GE ports from the PCIe card for the VM traffic. Configure them with NIC teaming.
  - Use 2 GE ports from the PCIe card for ESXi Management

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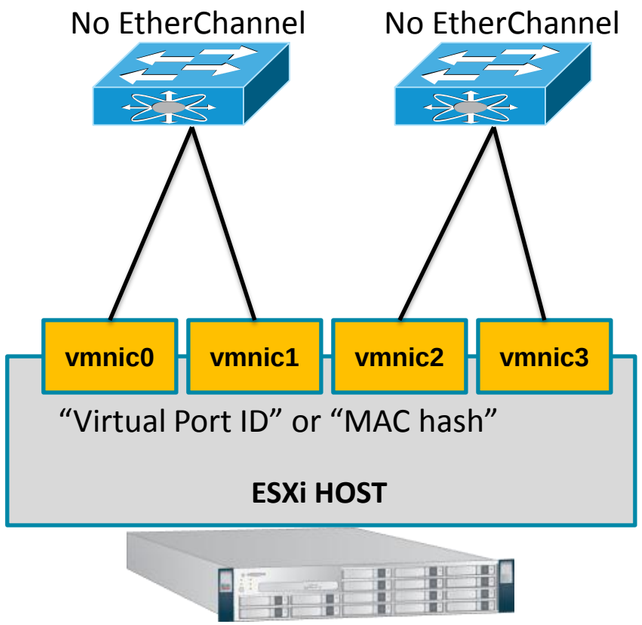
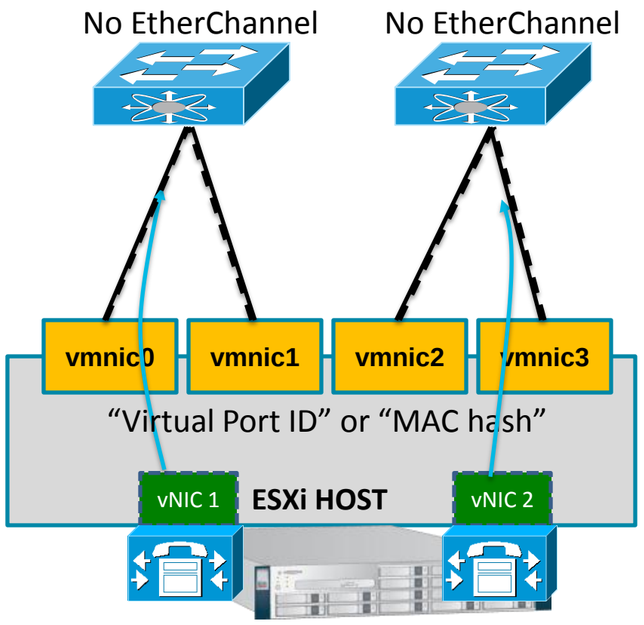
VMware NIC Teaming for C-series

No Port Channel

All ports active



Active Ports with Standby Ports



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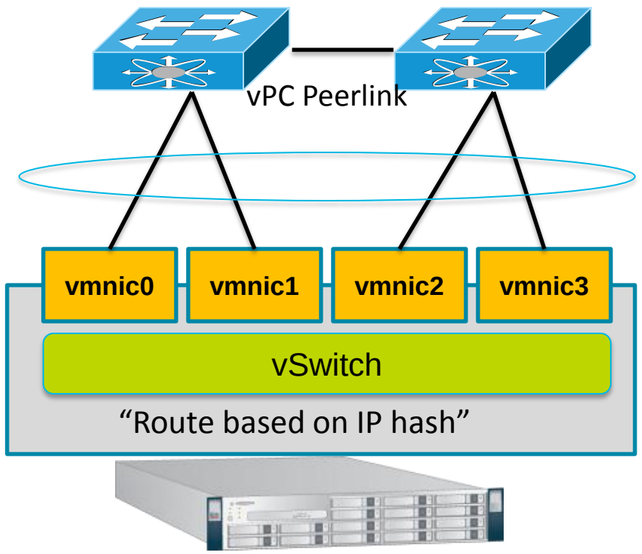
VMware NIC Teaming for C-series

Port Channel

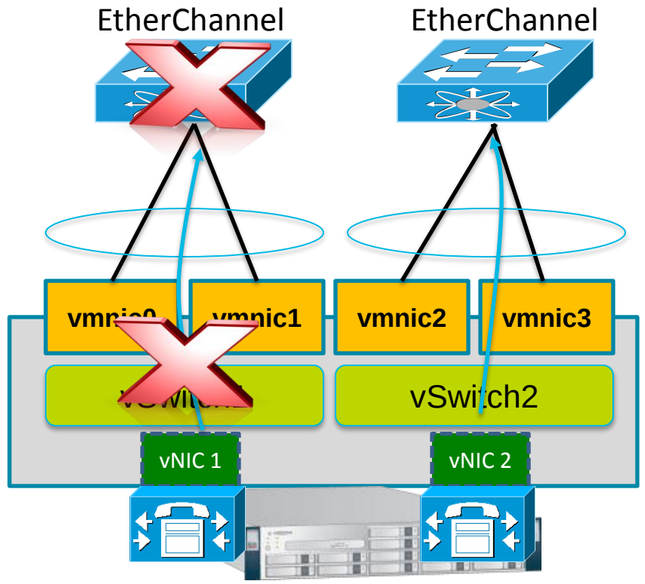
Single virtual Port Channel (vPC)

Virtual Switching System (VSS) / virtual Port Channel (vPC) / cross-stack required



Two Port Channel (no vPC)

VSS/vPC not required but…
No physical switch redundancy since most UC applications have only one vNIC



http://kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=1004048
http://www.cisco.com/application/pdf/en/us/guest/netsol/ns304/c649/ccmigration_09186a00807a15d0.pdf
http://www.cisco.com/en/US/prod/collateral/switches/ps9441/ps9402/white_paper_c11-623265.html

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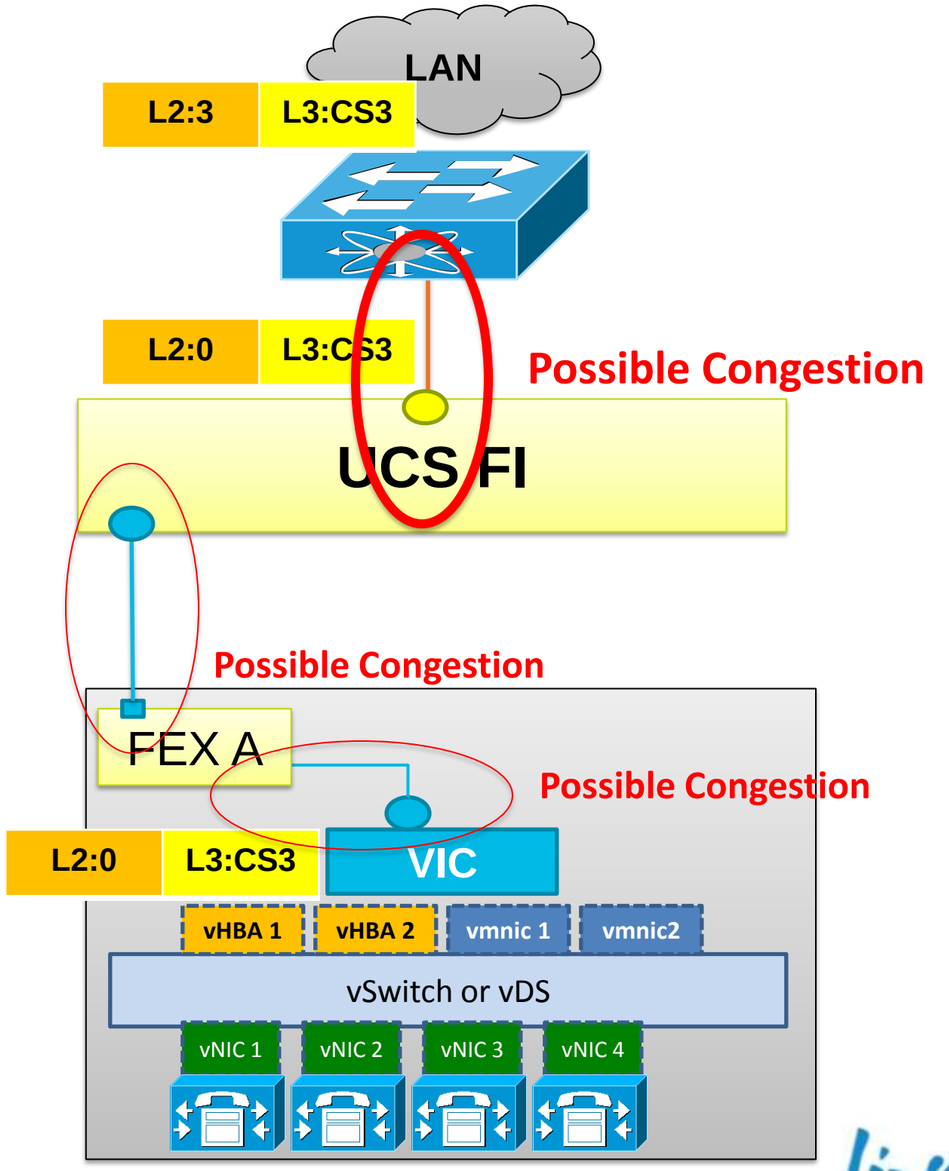
UC applications QoS with Cisco UCS B-series

Congestion scenario

- With UCS, QoS done at layer 2
  Layer 3 markings (DSCP) not examined nor mapped to Layer 2 markings (CoS)

- If there is congestion between the ESXi host and the physical switch, high priority packets (e.g CS3 or EF) are not prioritised over lower priority packets



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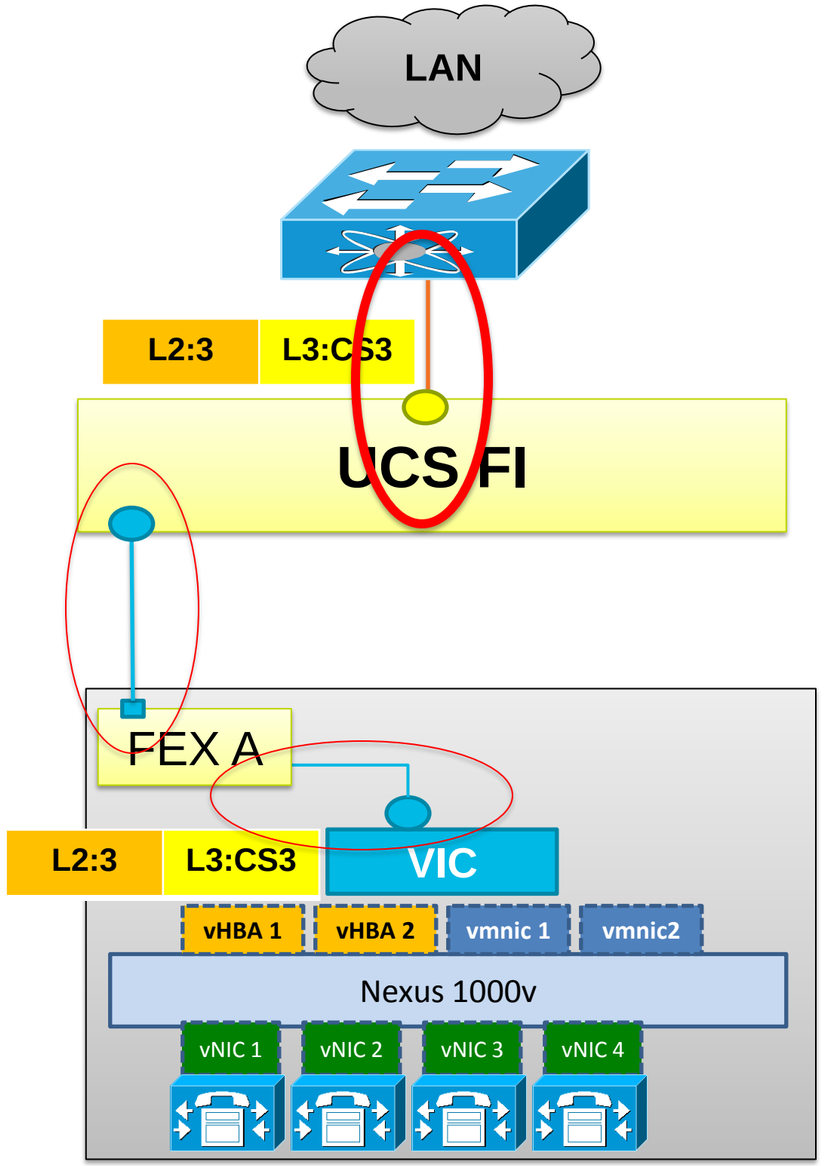
UC applications QoS with Cisco UCS B-series

Best Practice: Nexus 1000v

- Nexus 1000v can map DSCP to CoS
- UCS can prioritise based on CoS

➔ Best practice: Nexus 1000v for end-to-end QoS



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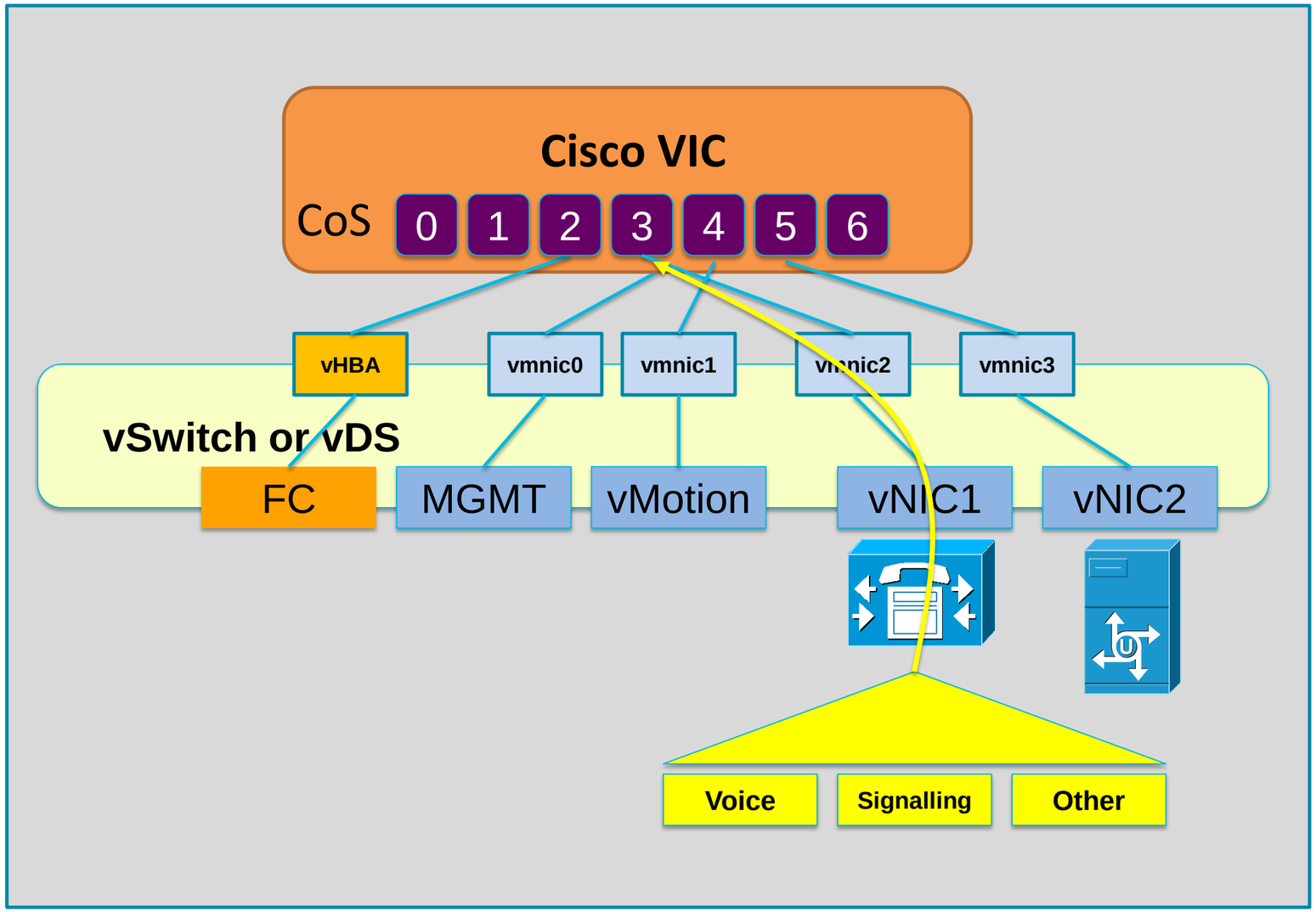
UC applications QoS with Cisco UCS B-series

Cisco VIC



- All traffic from a VM have the same CoS value
- Nexus 1000v is still the preferred solution for end-to-end QoS

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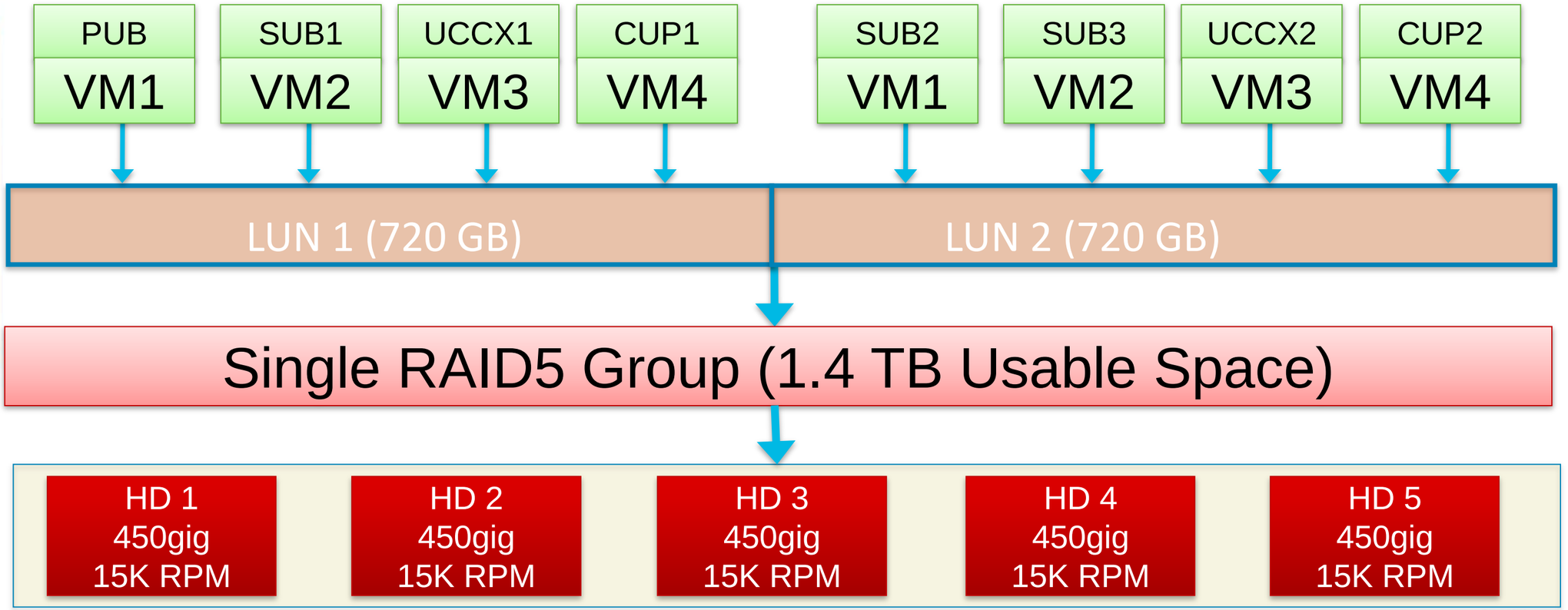
SAN Array LUN Best Practices / Guidelines

HDD Recommendation	FC class (e.g 450 GB 15K, 300 GB 15K) ~ 180 IOPS
LUN Size Restriction	Must never be greater than 2 TB
UC VM App Per LUN	Between 4 & 8 (different UC apps require different space requirement based on OVA
LUN Size Recommendation	Between 500 GB & 1.5 TB



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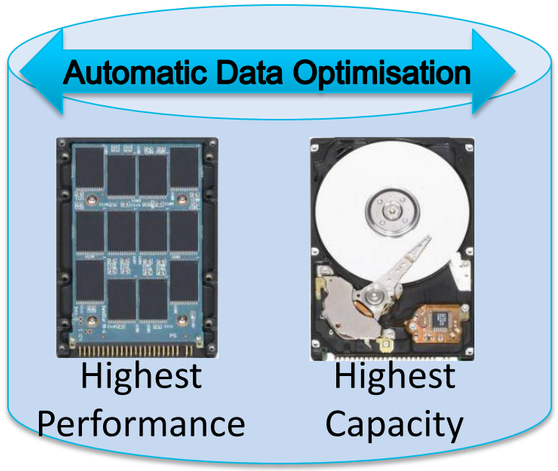
Tiered Storage

Overview



- Tiered Storage

  Definition: Assignment of different categories of data to different types of storage media to increase performance and reduce cost

  EMC FAST (Fully Automated Storage Tiering):
  Continuously monitors and identifies the activity level of data blocks in the virtual disk
  Automatically moves active data to SSDs and cold data to high capacity lower-cost tier

- SSD cache

  Continuously ensures that the hottest data is served from high-performance Flash SSD

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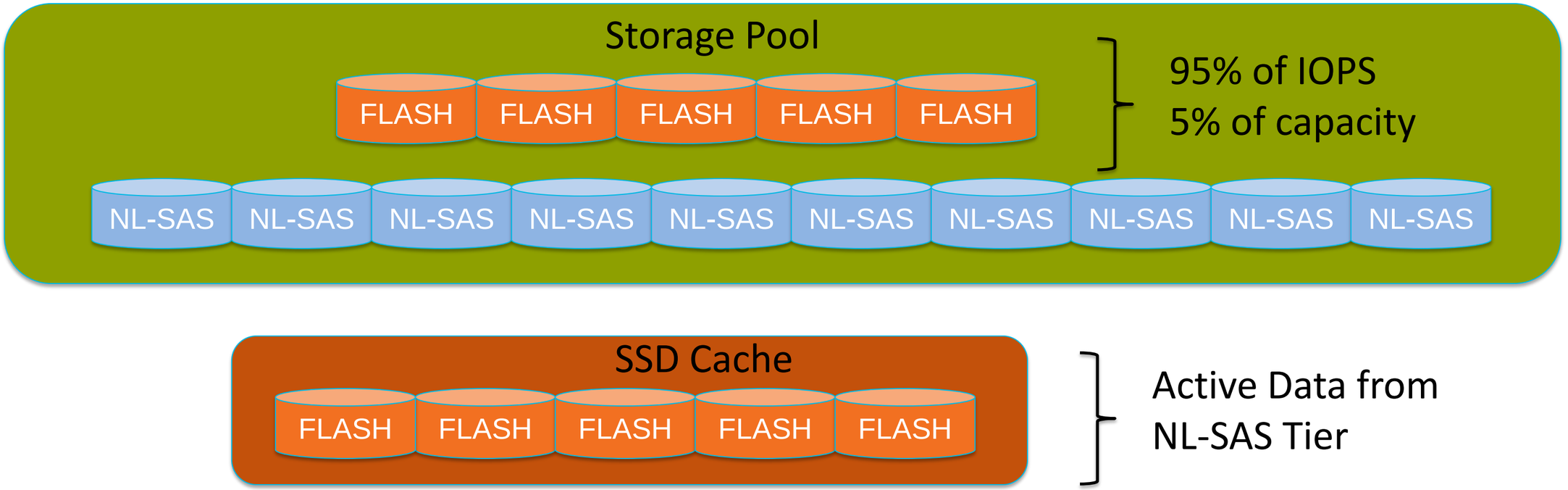
Tiered Storage

Best Practice



- Use NL-SAS drives (2 TB, 7.2k RPM) for capacity and SSD drives (200 GB) for performance
- RAID 5 (4+1) for SSD drives and NL-SAS drives

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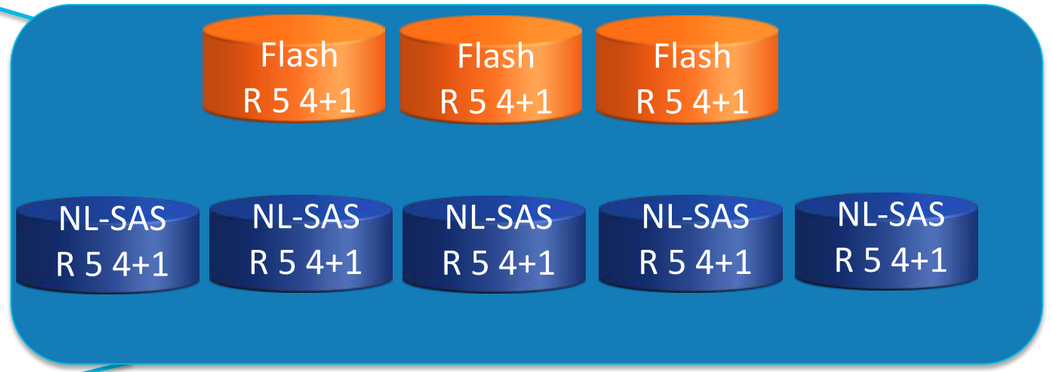
Tiered Storage

Efficiency

Traditional Single Tier
300GB SAS

125 disks

With VNX – Tiered Storage
200GB Flash
2TB NL-SAS



70% drop in disk count

40 disks

Optimal Performance

Lowest Cost

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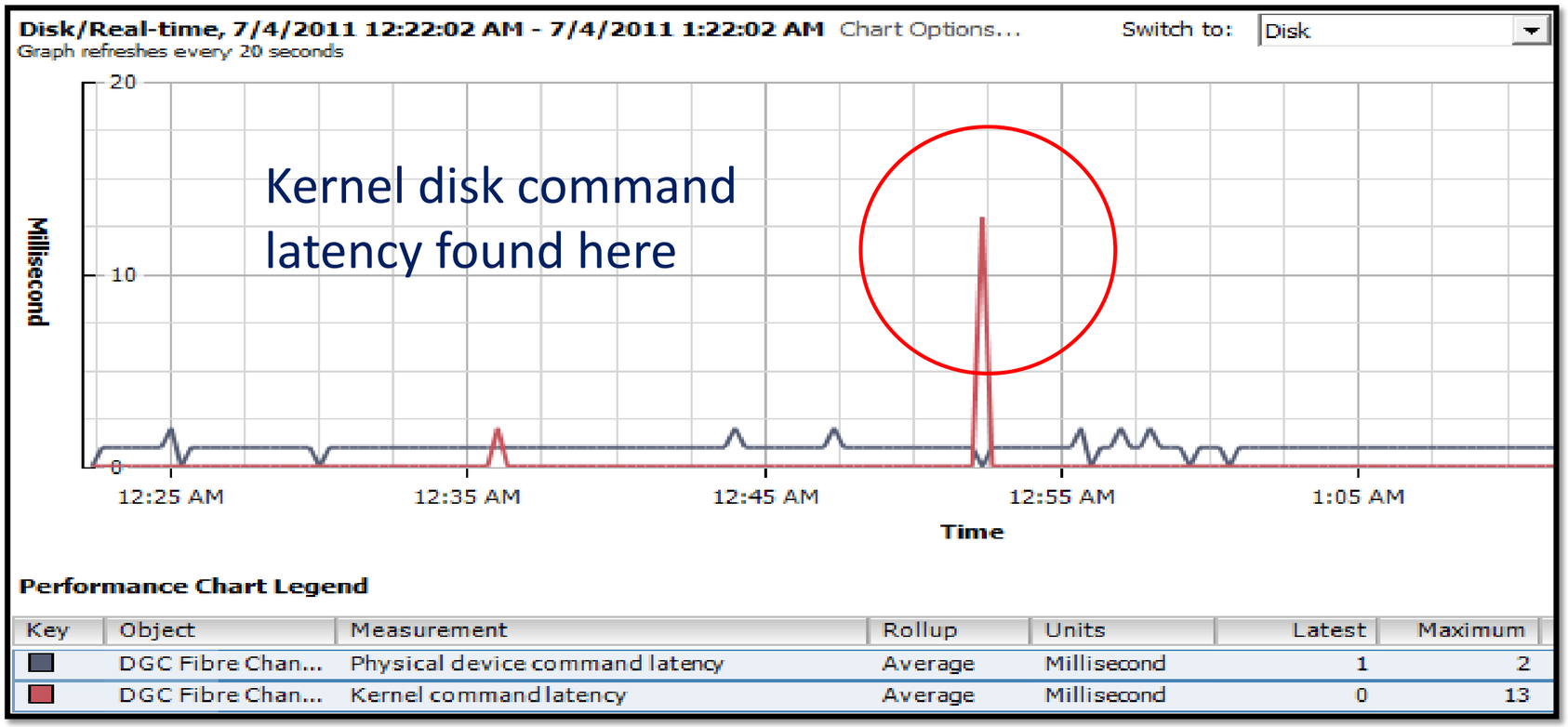
Storage Network Latency Guidelines

- Kernel Command Latency
  - time vmkernel took to process SCSI command < 2-3 msec
- Physical Device Command Latency
  - time physical storage devices took to complete SCSI command < 15-20 msec



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IOPS Guidelines

Unified CM

BHCA	IOPS
10K	~35
25K	~50
50K	~100
CUCM upgrades generate 800 to 1200 IOPS in addition to steady state IOPS	

Unity Connection

IOPS Type	2 vCPU	4 vCPU
Avg per VM	~130	~220
Peak spike per VM	~720	~870

Unified CCX

IOPS Type	2 vCPU
Avg per VM	~150
Peak spike per VM	~1500

More details in the docwiki:

http://docwiki.cisco.com/wiki/Storage_System_Performance_Specifications

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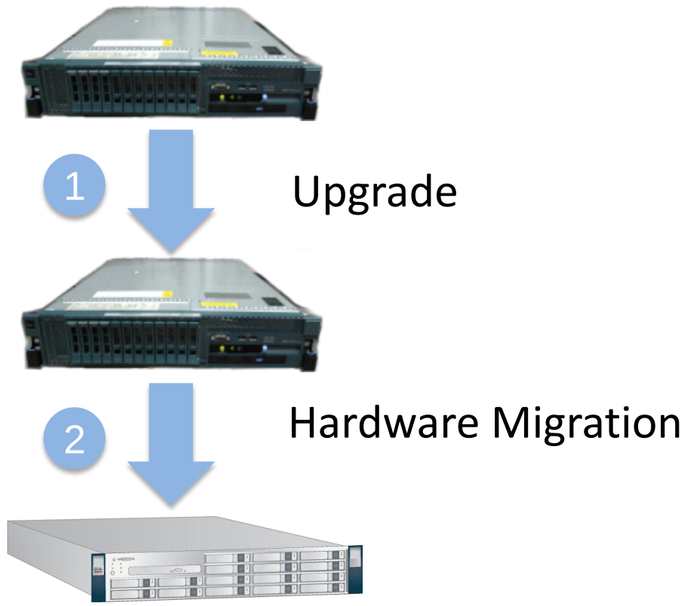
Migration and Upgrade

Migration to UCS

Overview

2 steps

1. **Upgrade**
   Perform upgrade if current release does not support Virtualisation (for example, 8.0(2)+ required with CUCM, CUC, CUP)
2. **Hardware migration**
   Follow the Hardware Replacement procedure (DRS backup, Install using the same UC release, DRS restore)



Replacing a Single Server or Cluster for Cisco Unified Communications Manager:

http://www.cisco.com/en/US/docs/voice_ip_comm/cucm/install/8_6_1/cluster/clstr861.html

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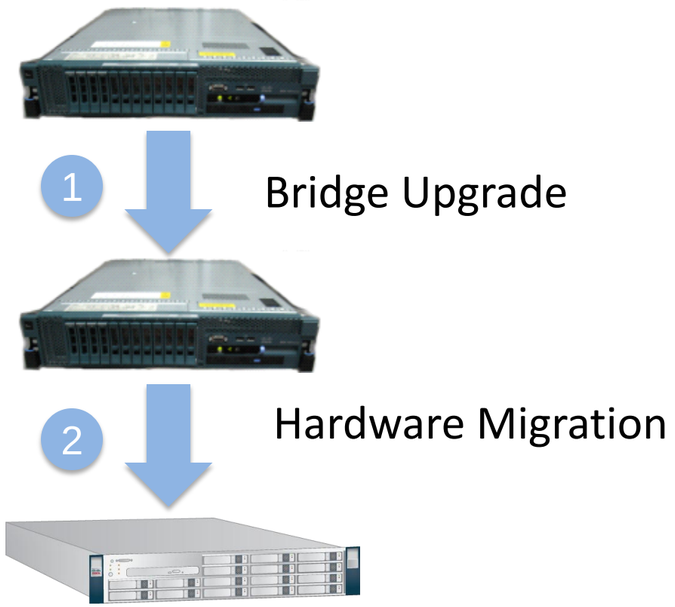
Migration to UCS

Bridge Upgrade

- Bridge upgrade for old MCS hardware which might not support a UC release supported for Virtualisation
- With Bridge Upgrade, the old hardware can be used for the upgrade, but the UC application will be shut down after the upgrade. Only possible operation after the upgrade is DRS backup. Therefore, downtime during migration
- Example:

  MCS-7845H3.0/MCS-7845H1: Bridge Upgrade to CUCM 8.0.(2)-8.6(x)
  www.cisco.com/go/swonly

- Note:
  Very Old MCS hardware may not support Bridged Upgrade, e.g. MCS-7845H2.4 with CUCM 8.0(2), then have to use temporary hardware for intermediate upgrade



For more info, refer to BRKUCC-1903:
Migration and Co-Existence Strategy for UC or Collaboration Applications on UCS

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Key Takeaways

- Difference between TRC and Specs-based
- Same Deployment Models and UC application level HA
  Added functionalities with VMware
- Sizing
  - Size and number of VMs
  - Placement on UCS server
- Best Practices for Networking and Storage

Docwiki www.cisco.com/go/uc-virtualized

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Final Thoughts

- Get hands-on experience with the Walk-in Labs located in World of Solutions
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