TOMORROW starts here.
cisco
Cisco live!

Planning and Designing Virtualised Unified Communication Solutions

BRKUCC-2225

Dan Barker

Systems Engineer

Cisco live!

Agenda

- Overview
- Platforms
- Sizing and VM placement
- Storage and Network Design
- VMware features support
- Deploying UC using virtualisation

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Cisco Collaboration

Unified CM

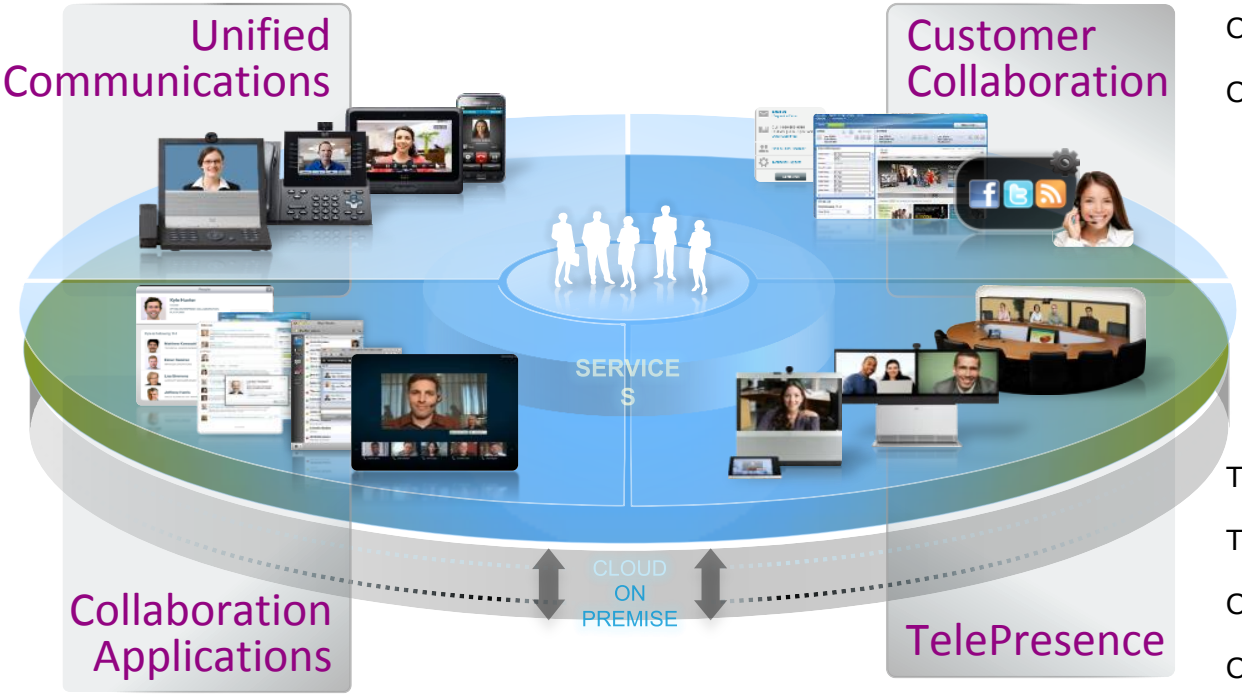
Unity Connection

IM & Presence

Business Edition

Gateways

HCS



Webex

Webex Social

Cisco Jabber

Contact Centre Express

Contact Centre Enterprise

Customer Voice Portal

TelePresence Endpoints

TelePresence infrastructure

Capture, Transform, Share

Cloud Services & solutions

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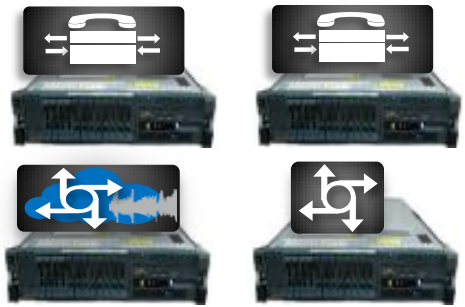
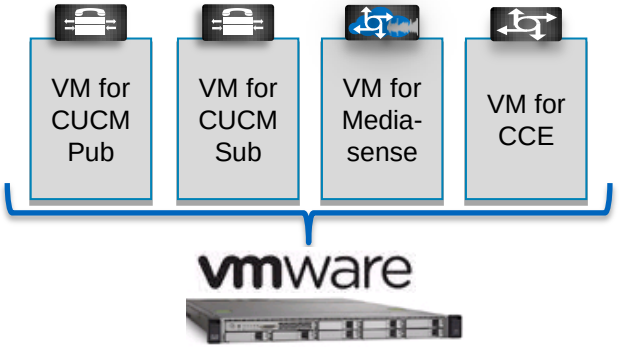
Evolution: Physical to Virtual



Physical Servers



Virtual Servers (VMs) on Physical Server

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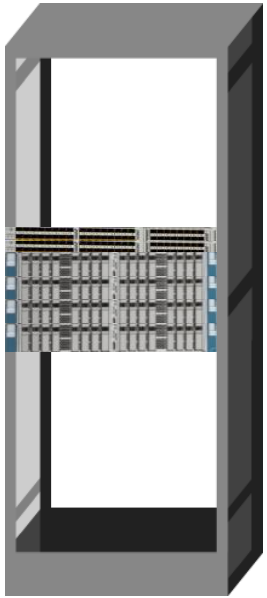
Virtualisation has Benefits…

Non Virtualised

Vs

Virtualised



Lower Cost

More Agile

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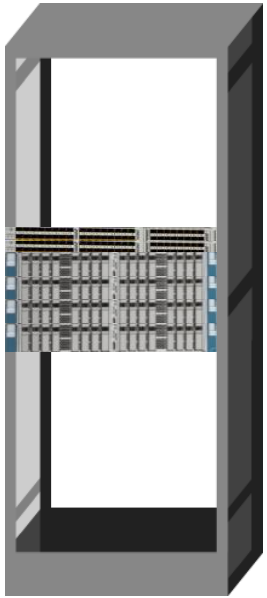
… and Virtualisation will be the only Option

Non Virtualised

Media Convergence Servers (MCS) End of Sale in October 2013

Virtualised



CUCM 10.0(1) is a virtual-only release

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UC Virtualisation “docwiki”

http://www.cisco.com/go/uc-virtualized

Unified Communications in a Virtualized Environment

Go to: Guidelines to Edit UC Virtualization Pages

Contents [hide]

1 Solutions - READ FIRST
2 How To...
3 At a Glance - Cisco Collaboration Virtualization Support
4
- 4.1 Change Tracking and Comments
- 4.2 How to Design
- 4.3 How to Buy
- 4.4 How to Deploy
- 4.5 How to Operate
- 4.6 How to Troubleshoot

5 Links to Older Support Information

Solutions - READ FIRST

If you are deploying virtualized Cisco Collaboration as part of one of the following solution offers, you must visit the link for that solution first before reading further.

- Cisco Business Edition 6000 (BE6000)
- Cisco Business Edition 7000 (BE7000)
- Cisco Hosted Collaboration Solution (HCS)
- Cisco Packaged Contact Center Enterprise (PCCE)

How To...

How to Design	How to Buy	How to Deploy	How to Operate	How to Troubleshoot	Track Changes to this page or Leave a Comment

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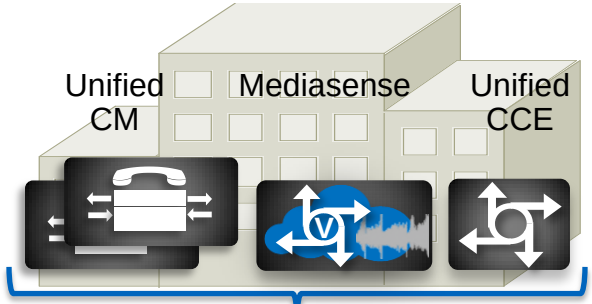
Application Design: Same. Hardware Design: Different



Same Design rules, same HA design
Same UC Deployment Models
Same Software
Typically Same number of “servers”

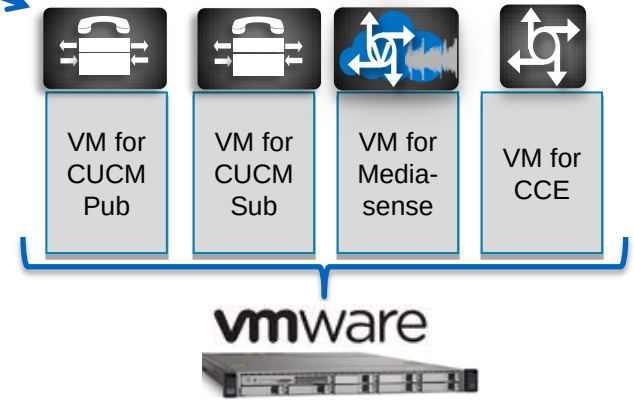
Application Design: Same

Hardware Design: Different

or

physical servers

Version 10 or higher



virtual servers (VMs) on physical server

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Platform Options

Tested Reference Configuration (TRC)

Specs-Based

Any vendor

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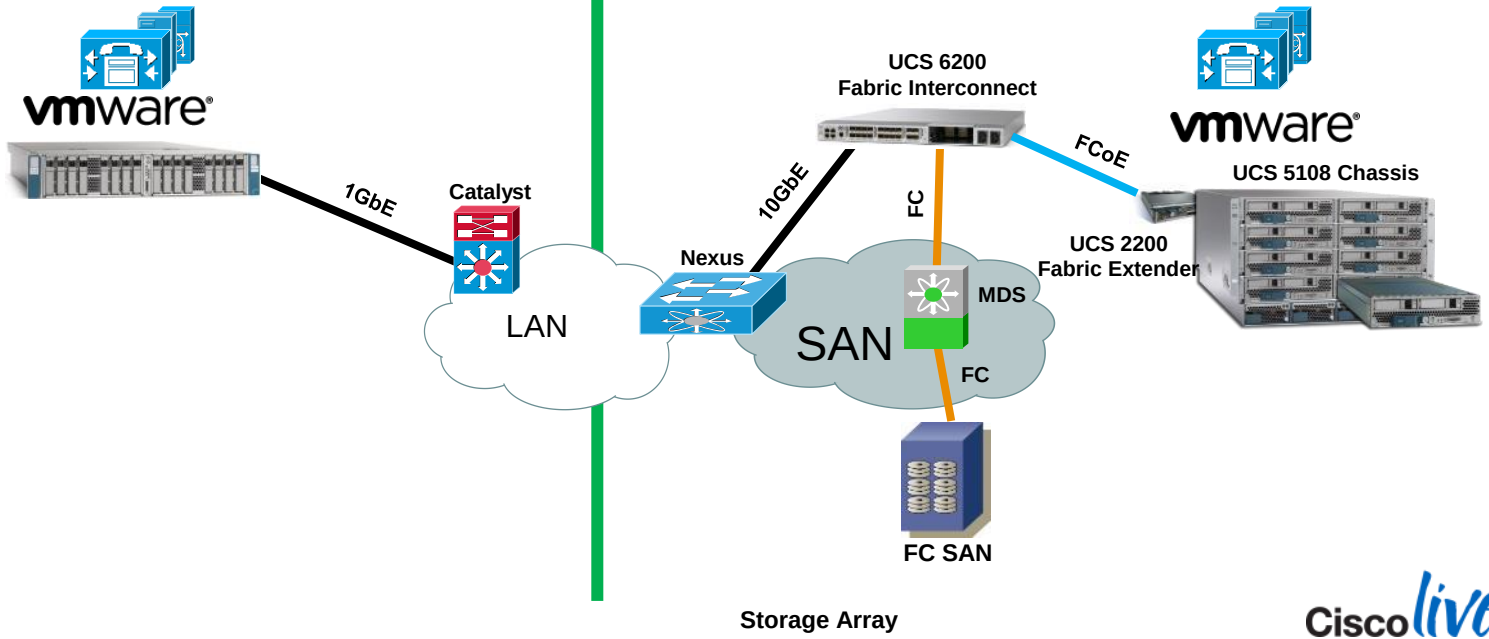
TRC – Cisco UCS Architecture Overview

UCS C-series TRC's (C220, C240, C260)

UCS B-series TRC's (B200, B230, B440)



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Cisco Business Edition 7000 Modular Design for Enterprises

What is it?

- Server preloaded with virtualisation software and Collaboration application software suite
- Single-SKU solution for easy quote and delivery. Just add licensing.
- Scale-out, stackable / modular building block - price-optimised for deployments 1000+ users
- Add server(s) to support more users, devices, applications
- Ideal solution to seed Collaborative services and tools – increase attach for video, contact centre, and conferencing

Who will sell it?

- ACAS/AUC Partners – already experts selling UC on UCS à la carte and BE6000!

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Cisco Business Edition 7000

Preloaded Server Ships Ready-to-Activate

Update for Collaboration System Release 10.0 planned, not yet committed

Release set subject to change

"Cisco Collaboration 9.1 suite"

Prime Collaboration Provisioning 9.5

Unified Communications Manager 9.1(2)
IM & Presence 9.1(2)
Paging Server 8.4

Unity Connection 9.1(2)

VCS X7.2

Emergency Responder 9.0

Unified Contact Centre Express 9.0➔10.0

Cisco UC Virtualisation Hypervisor 5.1 U1

Cisco UCS C240 M3 SFF TRC#2

Preloaded Collaboration Software (unlicensed / licenses sold separately)

- Same suite of apps and versions as BE6000, ready-to-install
- Same preload files as BE6000 except for PCP and VCS
- CUWL/UCL, VCS, PCP licensing sold separately

Preinstalled Virtualisation Software

- Same as BE6000: VMW-VS5-HYP-K9; licensed with v5.1 master serial number, eDelivery-only, ready-to-run

Server Hardware, Preconfigured

-UCS C240 M3, with BIOS, RAID, disk formatting, firmware, drivers, ready-to-go

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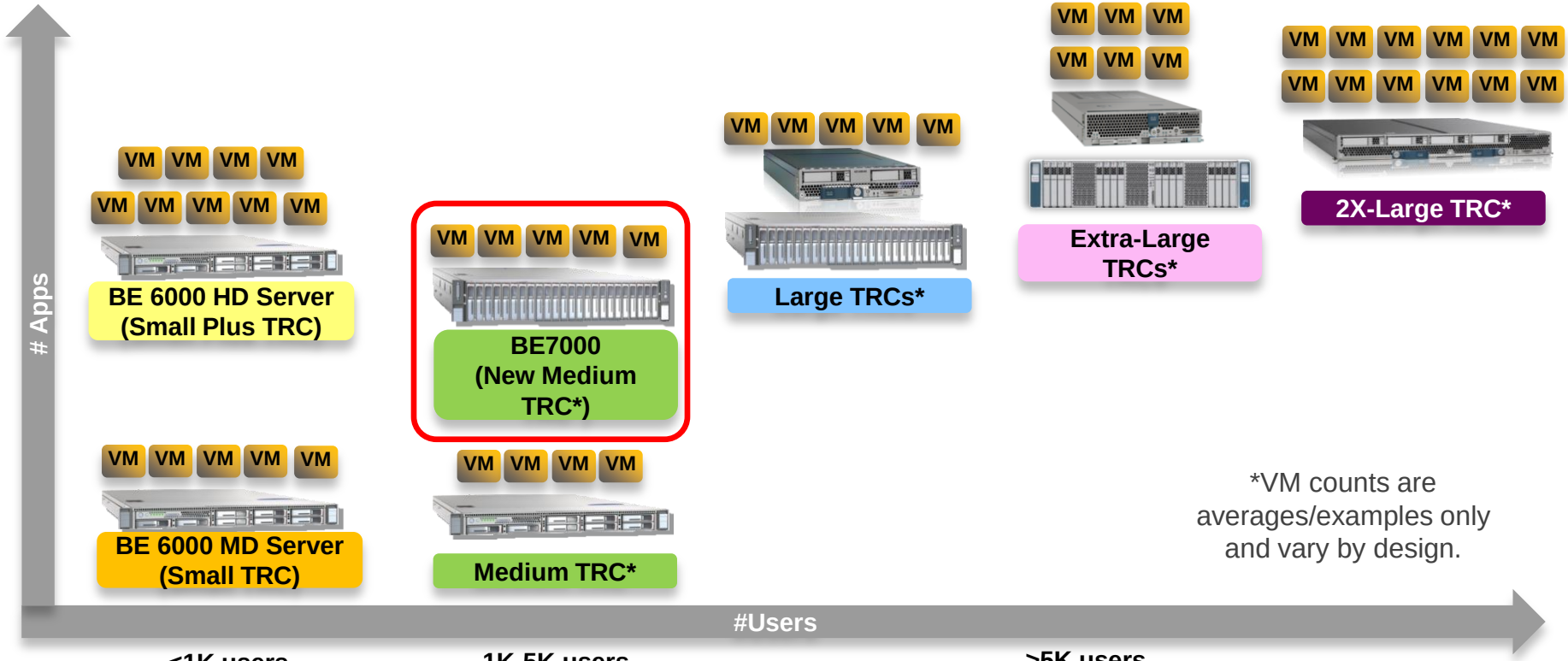
Capacity Comparison



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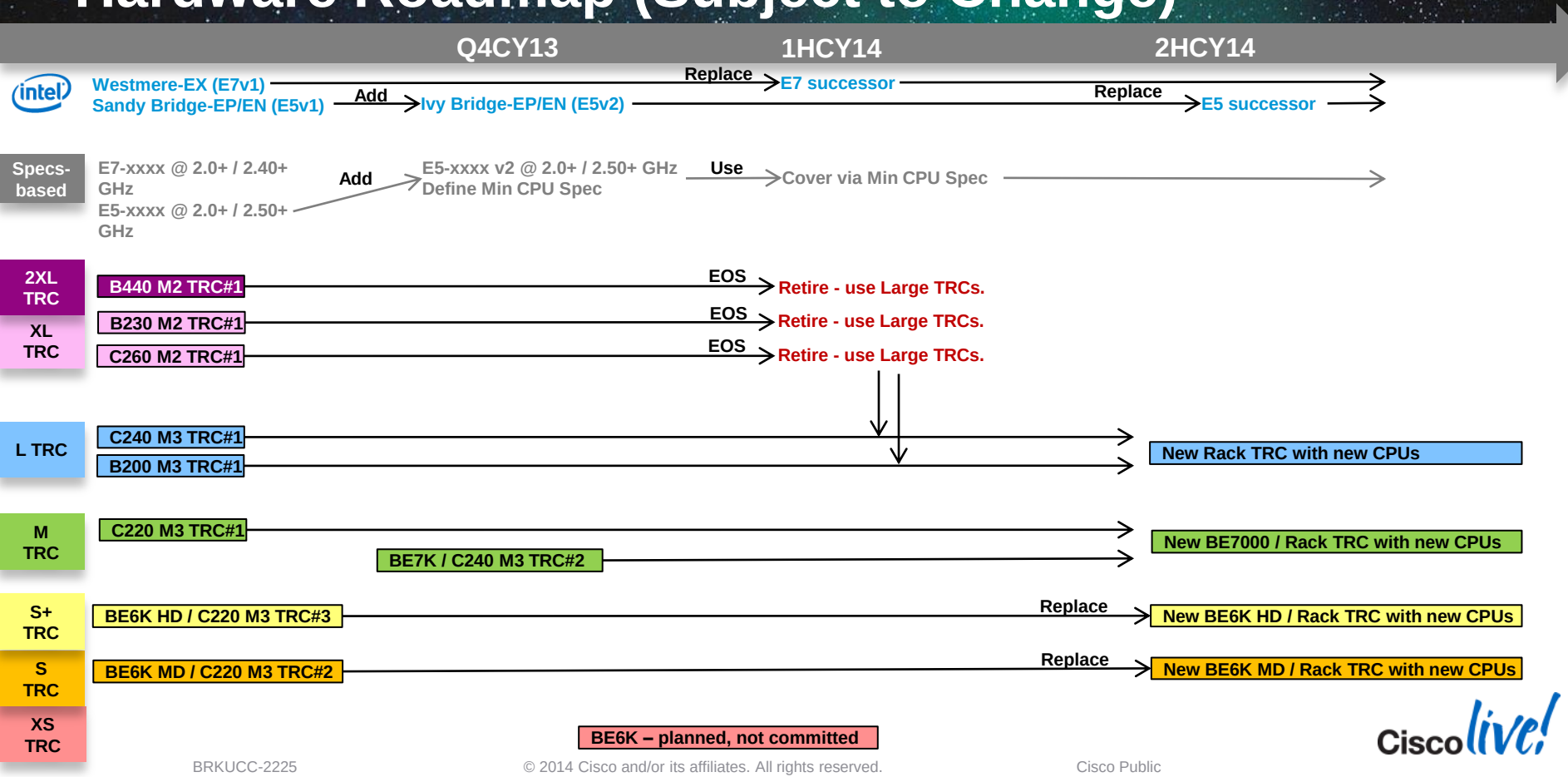
Hardware Roadmap (Subject to Change)



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Cisco Public

TRC – Allowed Deviations

Component		Modifications Allowed?
Server Model/Generation		✖
CPU	Model	✔ Within the same family
	Quantity and # cores	✖
	Speed	✔ Yes, if higher
Physical Memory		✔ Yes, if higher
DAS Storage	Quantity, RAID, technology	✖
	Disk size	✖
	Disk speed	✔ Yes, if higher
Adapters	C-series (NIC Type, vendor, technology)	✖
	C-series (NIC card quantity)	✔ Yes, if higher
	B-series (Mezzanine card)	✔

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Specs-Based – Why? “Flexibility”

Tested Reference Configuration (TRC)

- Business Edition 6000
- Business Edition 7000
- UC on UCS

Specs-Based

- UC on UCS
- 3rd-Party

Any Server

Less — “Choices” Existing Investment Leverage — More

More — “Assurance” “Simplicity” — Less

“Tell me what to do…”

“I know what I’m doing…”

TAC Notes
http://www.cisco.com/en/US/customer/products/ps6884/products_tech_note09186a0080bf23f5.shtml

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Specs-Based – Requirements

TRC		Specs-Based	
Limited Cisco UCS servers	→	Any server	**ANY** Server on VMware HCL
Limited CPUs	→	More CPUs options	Xeon 5600 or 7500 with speed **2.53+** GHz E7-2800/4800/8800 with speed **2.4+** GHz E5-2600/4600 with speed **2.5+** GHz E5-2400/4600 with speed **2.0+** GHz (Restricted UC Performance) E7-2800/4800/8800 with speed **2.0+** GHz (Restricted UC Performance)
Limited DAS & FC/FCoE SAN only	→	Flexible DAS & SAN	Any Storage compatible with Server and VMware E.g. Other DAS configs, FC, FCoE, iSCSI, NFS NAS
Select HBA & 1GbE NIC only	→	Flexible adapters	Any adapters compatible with server and VMware
VMware vCenter™ Optional	→	VMware vCenter™ Required	**vCenter required** (for logs and statistics)

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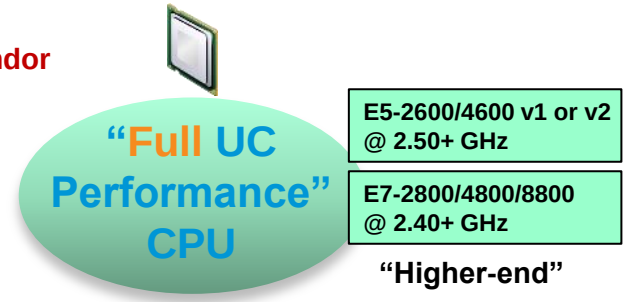
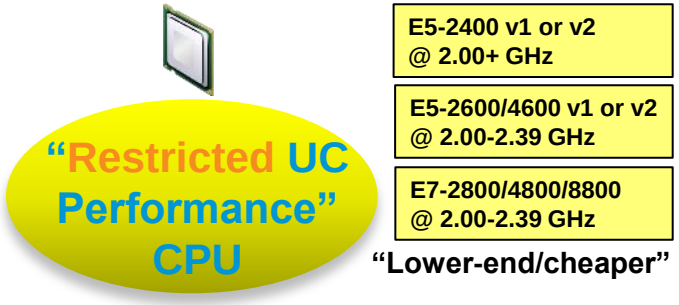
Specs-based: Expanded CPU Support

For Collaboration, all CPUs are NOT created equal

1. Follow rules or no TAC support
2. "Turbo" on CPU doesn't count!
3. YES the CUCM 1K user needs 2 cores
4. Some TRCs use 2.70 GHz or 3.30 GHz
5. CPU vendor/model > Server model/vendor





"Medium/Large" VMs - UCM 2.5K users (1 pcpu of "Full") - UCM 7.5K users - UCM 10K users - Others not used in BE6KUC on UCS	✓		✗
"Small" VMs - UCM 1K users (2 pcpu of "Restr") - Others allowed in Small/Small Plus TRCs	✓ NEW!		✓ NEW!

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What about ISR Blades?

AXP
SRE

Older - no support

UCS Express
√ SREV-910
X Other SREV-9xx

Older - limited support
- CUCM 8.6 controlled release: US DoD only.
- CUC “specs-based” only
- MediaSense 8.5(4)+

UCS E-Series
- E140D/DP M1

Specs-based-only support
- “Restricted UC Perf. CPU” (E5-24xx at 2.00+ GHz)
- Expect low scale (<4 VMs, few 100 users) due to IOPS bottlenecks
- DP: to check if less drive.

Other UCS E-Series
- E160D M1
- E160DP M1
- E140DP M1
- E140S M1

No support in general (except for CUC/specs-based)
- CPU GHz too slow for Specs-based (E5@1.8GHz) or not enough available drives/IOPS
- No TRC until Midmarket does one – see the BE6K PMs.

Uncommitted Roadmap for UCS E-Series
- Plans to provide UCS E-series based TRC
- No TRC until Midmarket packaged offer figured out.
- UCS E-Series M1 vs. M2 roadmap may impact timing

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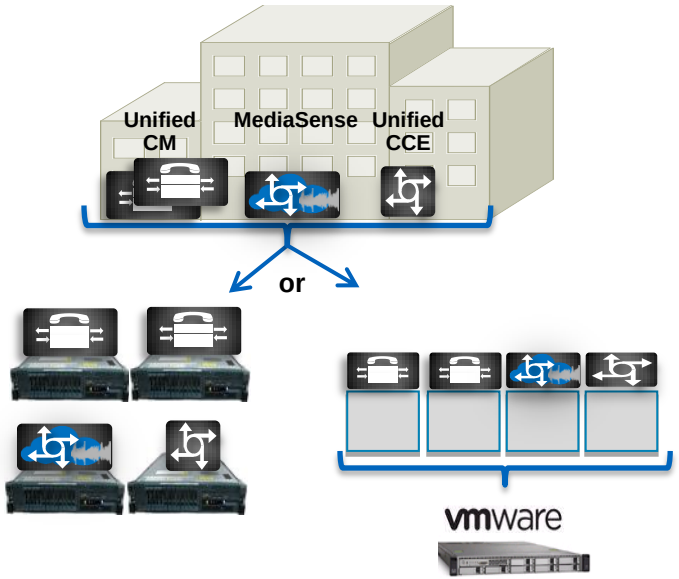
Deployment Sizing



Application Design: Same

Hardware Design: Different

1- Which VM template? How many VMs?

2- How many VMs per server?

3- How to mix apps on a server?

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1- Which VM Template - How many VMs?

Same Application Design:

- Use SRND for design guidance and sizing guidance
- Use UC Sizing Tool to validate Sizing

	With Virtualisation	Previously with MCS servers
Capacity dependency	VM template	MCS server model (Hardware)
	Host performance (full vs. restricted)	
Capacity, scale, redundancy increase	Add virtual machines	Add MCS servers
	Might require additional host	

In general, Number of MCS servers = Number of VMs

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1- Which VM Template - How many VMs?

Same Application Design:

- Use SRND for design guidance and sizing guidance
- Use UC Sizing Tool to validate Sizing

	With Virtualisation
Capacity dependency	VM template
	Host performance (full vs. restricted)
Capacity, scale, redundancy increase	Add virtual machines
	Might require additional host

In general, Number of MCS servers = Number of VMs

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Sizing Validation UC Sizing Tool

Export to PDF | Export to VMPT

MediaSense	VM Template	Quantity
Primary Servers VM Template	cms_9.1_vmv7_v1.0	1
Secondary Servers VM Template		0
Expansion Servers VM Template		0

	vCPU	RAM (GB)	vDisk (GB)	vNI
Total MediaSense VM Resources Needed	7	16	80	1

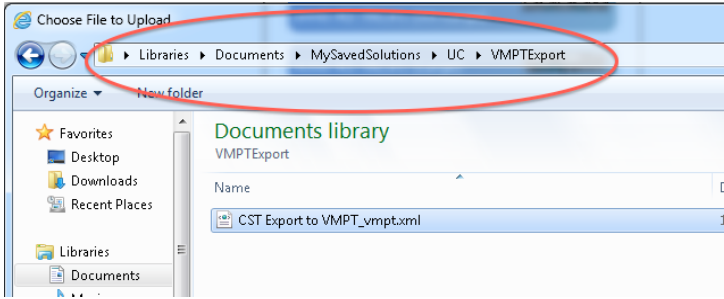
Unified Communications Manager	
Platform: 10,000 users	
Subscribers	2
TFTPs VMs	2
Publisher VMs	1
IM & Presence Service Platform: 15,000 users	2
Capacity Utilization per Call Processing Server	
Call Processing Capacity Utilized per Call Processing Server	25.46%
Memory Capacity Utilized per Call Processing Server	30.87%
Endpoints Capacity Utilized per Call Processing Server	96.00%
CTI Capacity Utilized per Call Processing Server	5.27%

	vCPU	RAM (GB)	vDisk (GB)	vNIC
Total Unified CM VM Resources Needed	28	42	770	7
Total IM & Presence VM Resources Needed	8	12	320	2

Gateways	
Gateway Group 1: Cisco 4451-X	2

Gateways: Total Count	
Cisco 4451-X	2

Unified Communications Manager
Voice Messaging
MediaSense
Management
Gateways
Solution Sizing Summary
eate Bill of Materials
pplication



Available to Partners, Cisco Account Teams, and Cisco Advanced Services

http://tools.cisco.com/cucst

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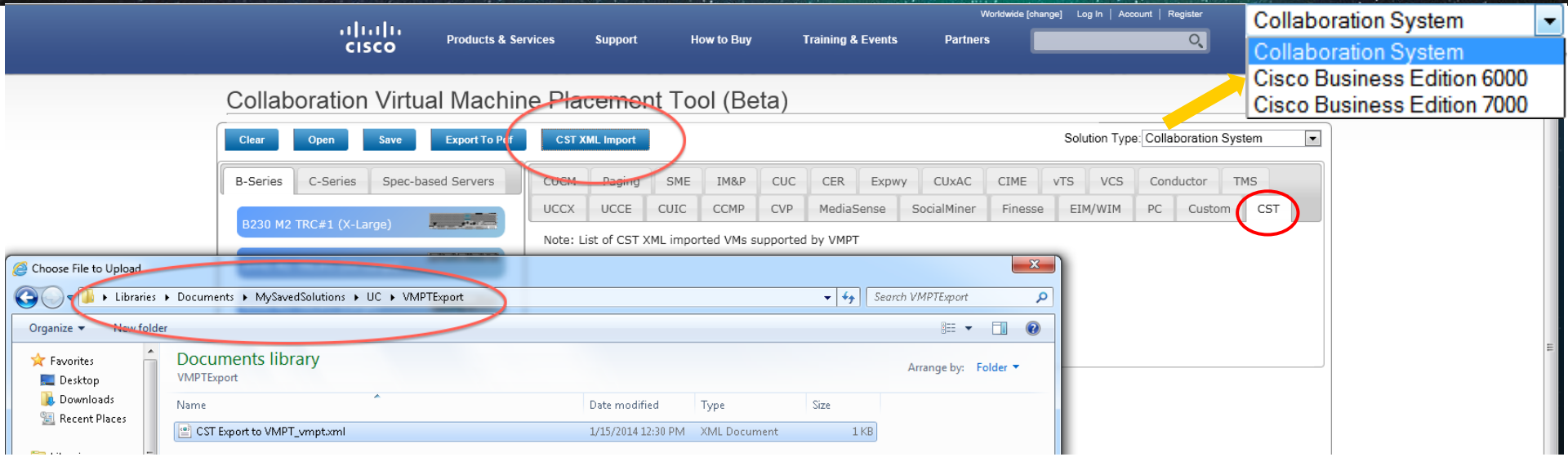
Design: “Collaboration VM Placement Tool (VMPT)”

www.cisco.com/go/vmpt

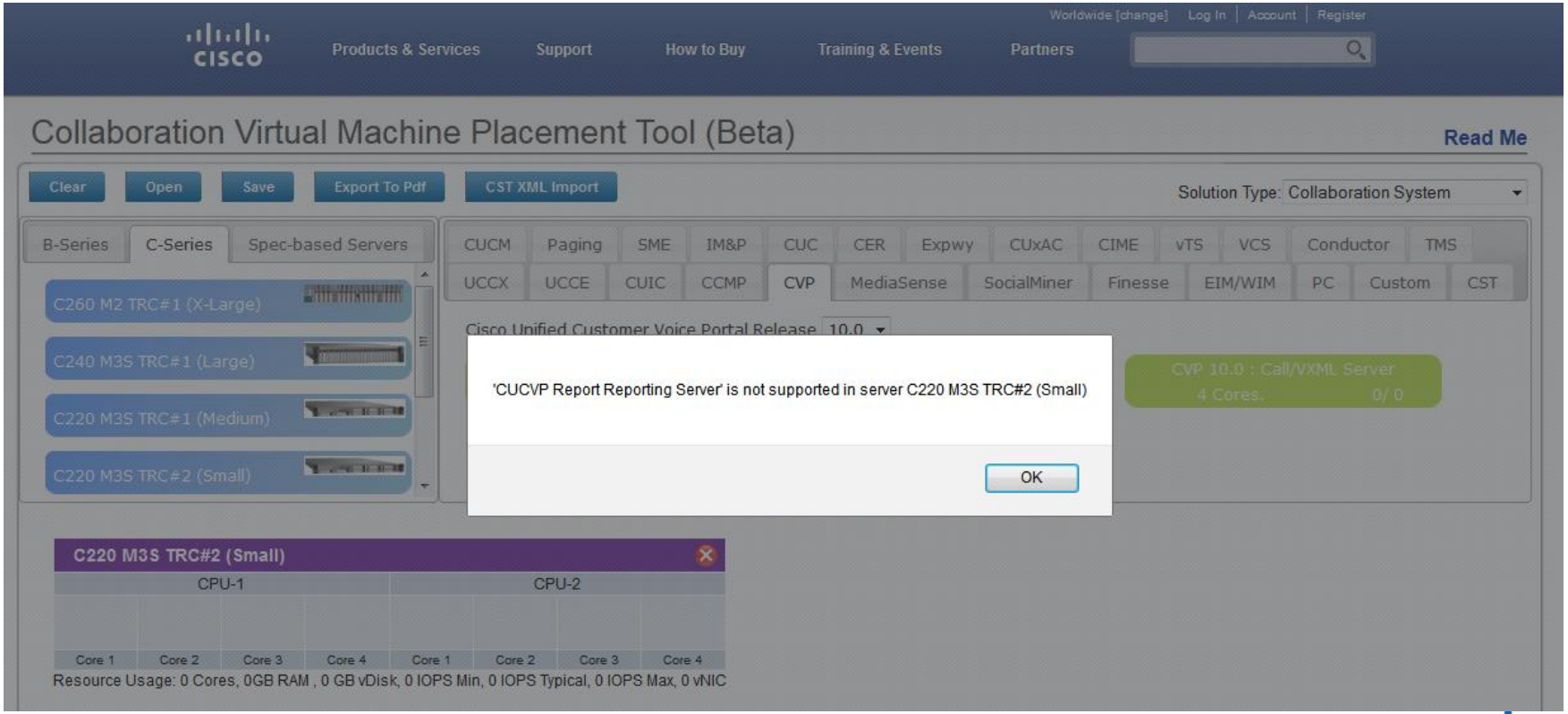


1. Optimised for BE6K, BE7K and UC on UCS DAS TRCs. Future = improve Specs-based support.
2. Implements most rules from www.cisco.com/go/uc-virtualized (still gaps with UCCE for example)
3. Use after SRND or Sizing Tool – XML import.
4. Exports PDF of your design. Manually convert to UCS/VMware SKUs. Exploring future BOM generation.
5. Post roadmap asks here: https://communities.cisco.com/thread/35896

More Info at:
http://docwiki.cisco.com/wiki/Readme_for_Cisco_Collaboration_Virtual_Machine_Placement_Tool

Design: “Collaboration VM Placement Tool (VMPT)”

www.cisco.com/go/vmpt



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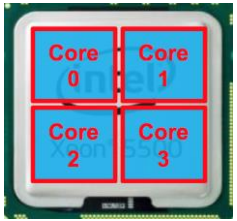
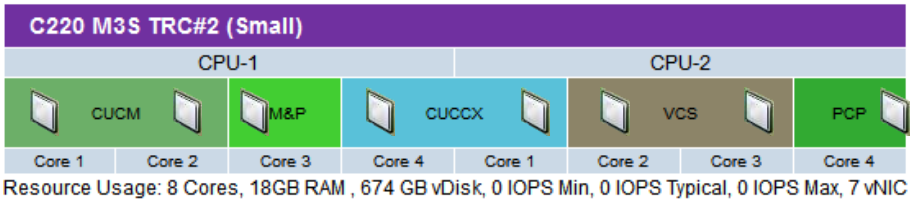
2- How Many VMs can I have on a Server?

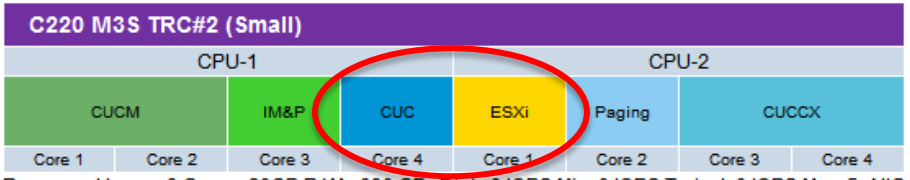
- CPU
  - The sum of the UC applications vCPUs must not exceed the number of physical cores of the server (1:1 mapping between vCPU and physical core, No CPU oversubscription)





Resource Usage: 8 Cores, 18GB RAM , 674 GB vDisk, 0 IOPS Min, 0 IOPS Typical, 0 IOPS Max, 7 vNIC

  - With Cisco Unity Connection only, reserve an additional physical core per server for ESXi



Resource Usage: 8 Cores, 20GB RAM , 690 GB vDisk, 0 IOPS Min, 0 IOPS Typical, 0 IOPS Max, 5 vNIC

- Memory
  - The sum of the UC applications RAM (plus 2/4GB for ESXi) must not exceed the total physical memory of the server (No memory oversubscription)

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3- How to Mix Apps on a Server (Co-Residency)?

None		**None:** No co-res	None Virtualisation Domain
Limited		**Limited:** Co-res with specific applications suite and OVA size	Limited Virtualisation Domain
UC with UC only		**UC with UC Only:** Co-res with Cisco UC applications only (see previous	UC with UC only Virtualisation Domain
Full		**Full:** Co-res among Cisco UC application, Cisco non-UC and 3rd Party applications	Full co-res Virtualisation Domain

3rd Party Apps
(Cisco or Non Cisco)

Examples:
Cisco Nexus v1k
Cisco ISE
Cisco vWLC
VMware vCenter
VMware VSA
Windows AD

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3- How to Mix Apps on a Server (Co-Residency)?

None		**None:** No co-res	**Example:** MeetingPlace
Limited		**Limited:** Co-res with specific applications suite and OVA size	**Examples:** CCE Logger 8.x CCE HDS 8.x
UC with UC only		**UC with UC Only:** Co-res with Cisco UC applications only (see previous	**Examples:** CUCM 8.6(1)- CCX 8.0 CCE Logger 9.x
Full		**Full:** Co-res among Cisco UC application, Cisco non-UC and 3rd Party applications	**Examples:** CUCM 8.6(2)+ CCX 8.5+

3rd Party Apps
(Cisco or Non Cisco)

Examples:
Cisco Nexus v1k
Cisco ISE
Cisco vWLC
VMware vCenter
VMware VSA
Windows AD

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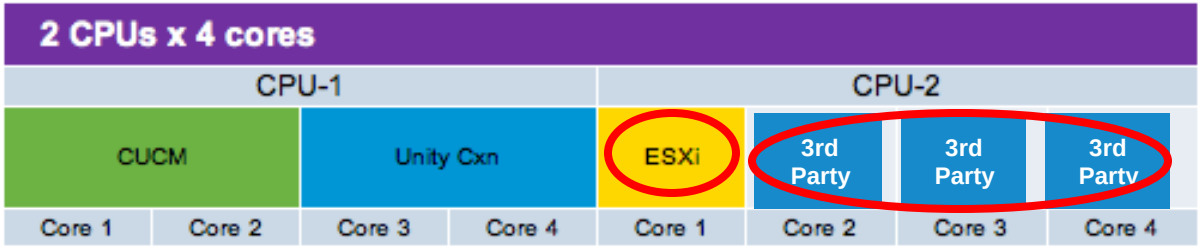
Co-residency with 3rd Party Apps ("Full" Co-residency)

- UC on UCS rules also imposed on 3rd party VMs
  (e.g. no resource oversubscription allowed for 3rd party apps)



- The co-residency rules and categories apply to TRC and Specs-Based
- 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

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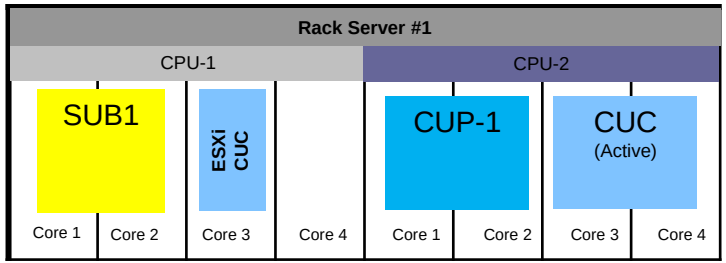
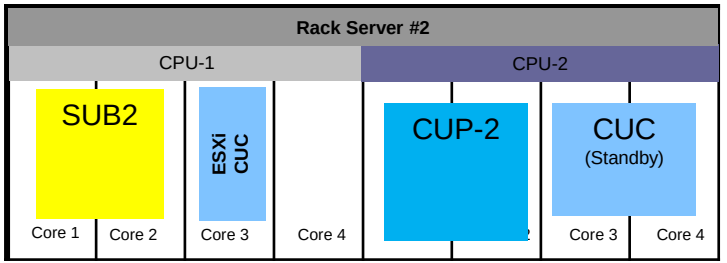
VM Placement
Best Practices

- Not all UC apps are compatible with all ESXi versions.
- Mix different types of nodes on the same host.





- Distribute UC application nodes across UCS blades, chassis and sites to minimize failure impact.
- Plan for future growth, server maintenance, or UC application upgrades possibly requiring more resources.

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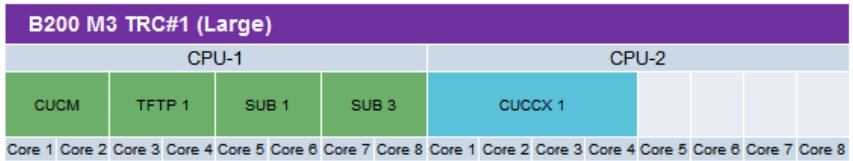
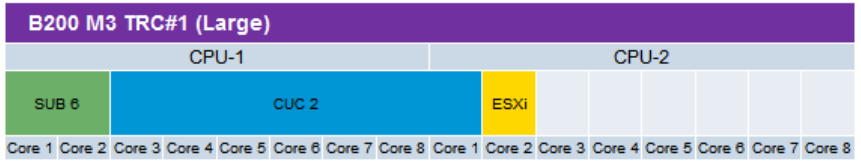
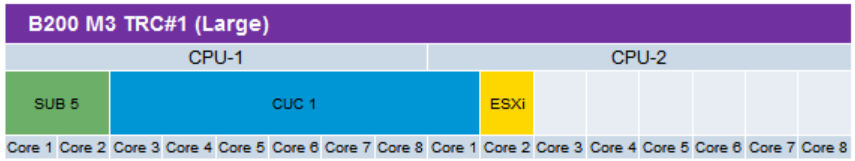
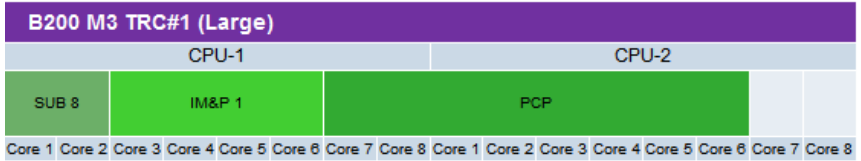
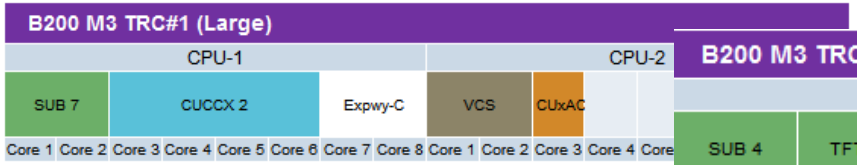
VM Placement – Example

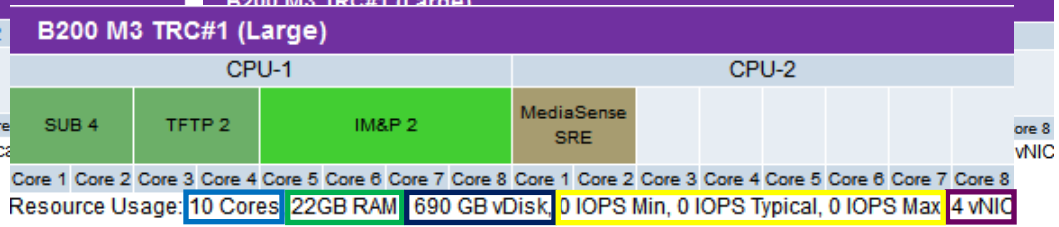












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Agenda

- Overview
- Platforms
- Sizing and VM placement
- **Storage Design**
- VMware features support
- Deploying UC using virtualisation

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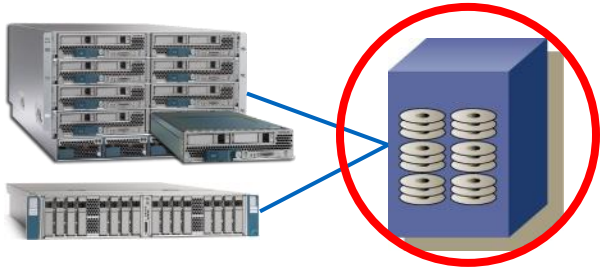
Storage Design Overview

SAN/NAS



TRC	Specs-Based
• Any Vendor compatible with server and VMware • Meet Performance Requirements	
FC / FCoE Only	Flexible Storage Protocol

DAS

TRC	Specs-Based
Fixed BOM Fixed RAID configuration	• Compatible with server and VMware • Meet Performance Requirements
	Flexible Disk/RAID Configuration

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QUIZ: SAN/NAS Performance Requirements

SAN:

1. The Kernel Command Latency has to be 4ms or lower
2. The Physical Device Command Latency has to be 20ms or lower

NAS:

1. The Total Guest Latency has to be 24ms or lower

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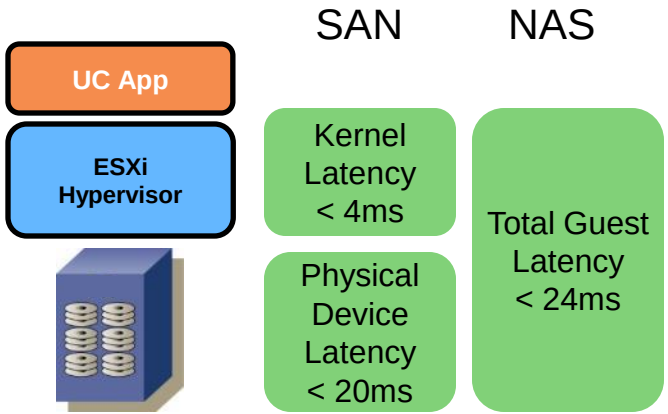
SAN/NAS Performance Requirements

- Performance requirements:
  - SAN
    - Kernel Command Latency < **4 ms**
    - Physical Device Command Latency < **20 ms**
  - NAS:
    - Total Guest Latency < **24 ms**



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IOPS Guidelines: To Help Keep Latency Low

Unified CM

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

Presence

VM Size	Average IOPS
1000 users	~60

Unity Connection

VM size	Average IOPS	Peak IOPS
2 vCPU (5,000 users)	~130	~715
4 vCPU (10,000 users)	~220	~870

Unified CCX

VM Size	Average IOPS	Peak IOPS
2 vCPU (300 agents)	~150	~1500

More details in the docwiki:

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

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Storage Requirements with DAS

	TRC	Specs-based
Disk Characteristics	• Disk Size must be the same. • Disk Speed must be the same or higher. • Disk quantity, technology, form factor, and RAID configuration must match exactly.	Customer's choice as long as: • Compatible with Server model and VMware HCL • Performance and capacity requirements are met (Use BBU or SuperCap)
IOPS calculation needed?	**No** IOPS calculation not needed with DAS TRC, sizing based on CPU/memory/storage capacity). Recommendation: Spread the VM across the volumes	Use TRC as a reference. **Otherwise, yes.**

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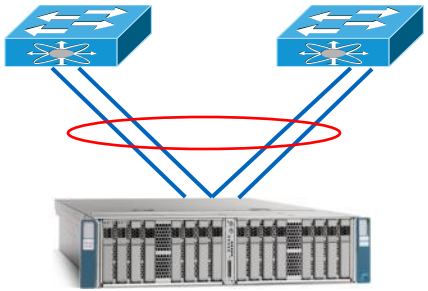
Network Design Overview

- Plan for Redundancy (upstream switch, NIC teaming)
- Determine number of NIC ports required
- QoS considerations with blade servers



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How Many NIC Ports do I Need?

- To determine number of NIC ports required, use Bandwidth Formulas available in the SRNDs.
  - For Unified CM, calculate BW requirements using the Collaboration SRND:
    - Intra-Cluster Communications Services (ICCS)
    - Database Replication
    - Voice Signalling (SIP/SCCP/MGCP)
    - Voice Media (with MoH, SW MTP, SW CFB, etc…)
    - TFTP
- Only account for traffic in/out of the host (not within host).
- With redundancy, need 2x number of ports.
- Network traffic with Cisco UC applications is usually relatively low except for video recording and streaming.

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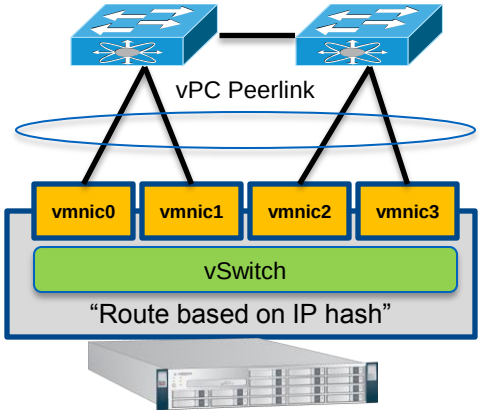
Best Practice:
VMware NIC Teaming for C-series Port Channel

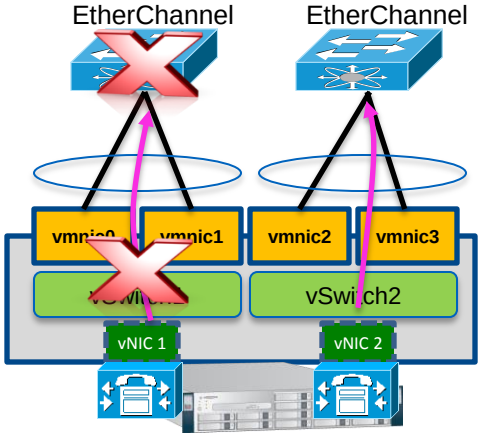
Single virtual Port Channel (vPC)

Virtual Switching System (VSS) / virtual Port Channel (vPC) 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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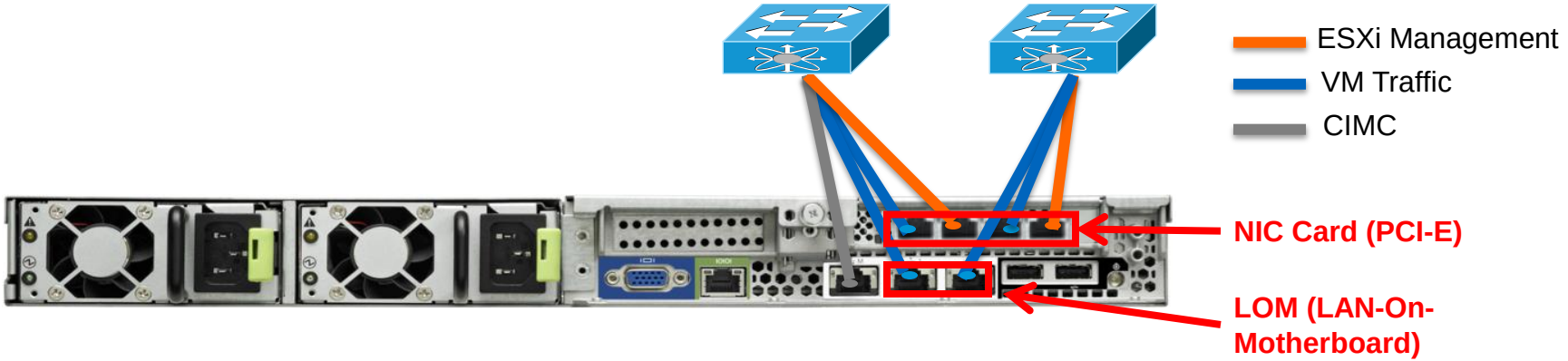
Plan for Network Redundancy – C-series

- With C-series:
  - Connect to at least 2 upstream physical switches
  - Plan for redundancy when LOM or NIC card fails
  - Redundancy for VM traffic is more important than for ESXi Management traffic
  - Use VMware NIC teaming for redundancy and load sharing



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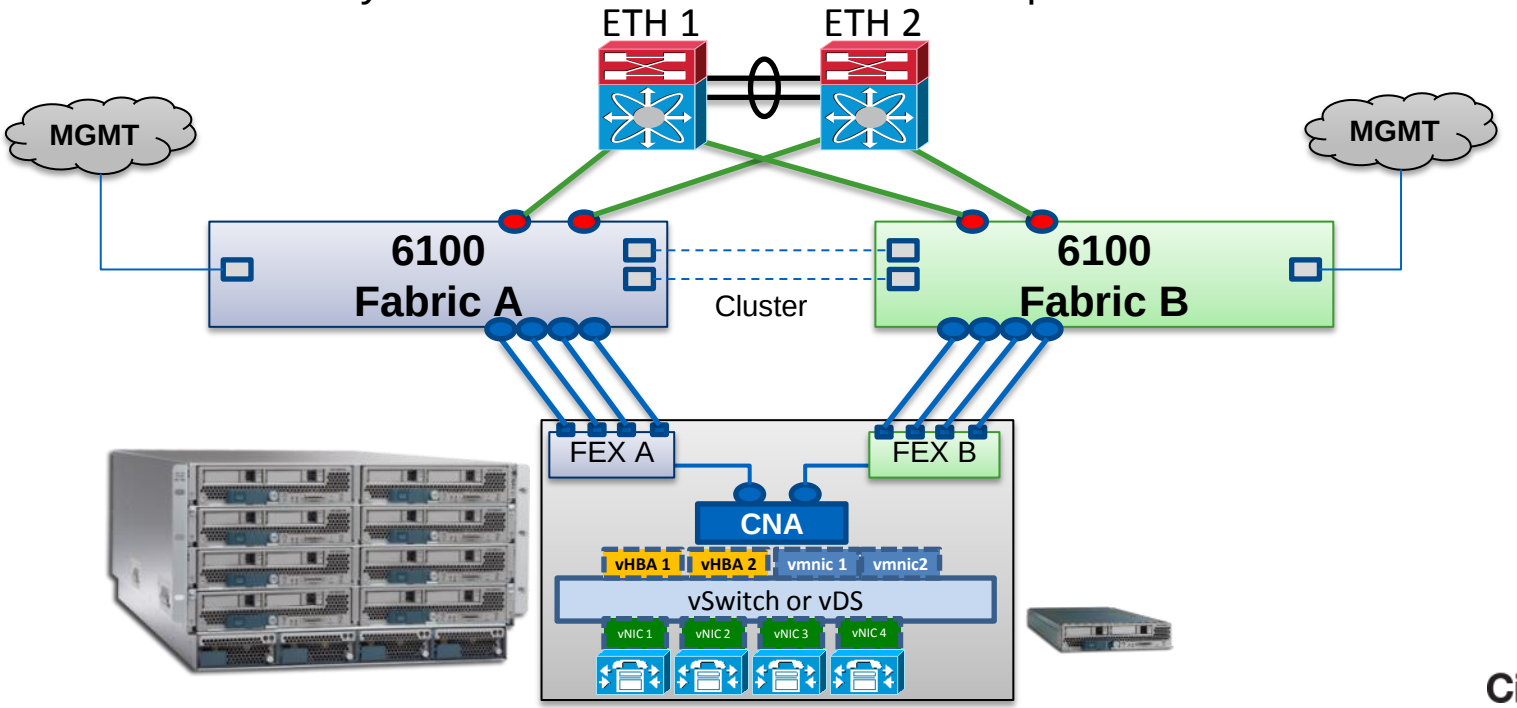
Plan for Network Redundancy – B-series

- With B-series:
  - Plan for redundancy in case a Fabric Interconnect or upstream switch fails



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vCenter required only for Specs-Based

Deploying Virtualised Overview

- Hypervisor: VMware ESXi / vSphere (not ESX)
- ESXi releases: 4.0, 4.1, 5, 5.1, 5.5 (varies with UC application)

Application	ESXi 4.0	ESXi 4.1	ESXi / vSphere 5.0	ESXi / vSphere 5.1	ESXi / vSphere 5.5
CUCM	8.0(2) or later	8.0(2) or later	8.0(2) or later	8.0(2) or later	9.X or later
CUP/Unified IM&P	8.0(2)+, 8.5, 8.6	8.0(2) or later	8.6(1) or later	8.6(4) or later	9.X or later
CUC	8.0(2) or later	8.0(2) or later	8.0(2) or later	8.0(2) or later	9.X or later
CCX	8.0(2) or later	8.0(2) SU2 or later	8.0(2) SU4 or later	8.5(1) SU4 or later	9.X or later

Complete list in the docwiki:
http://docwiki.cisco.com/wiki/Unified_Communications_VMware_Requirements
Moving to on every application page
Example CUCM http://docwiki.cisco.com/wiki/Virtualization_for_Cisco_Unified_Communications_Manager_(CUCM)

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UC Applications VMware Feature Support

Features	vMotion	Storage vMotion	Copy Clone	HA	VMware DRS	Fault Tolerance
CUCM	Y (C)	Y (C)	Y (C)	Y (C)	N	N
CUP / IM & Presence	Y (P)	N	Y (C)	Y (C)	N	N
CUC	Y (P)	N	Y (C)	Y (C)	N	N
CCX	Y (C)	Y (C)	Y (C)	N	N	N

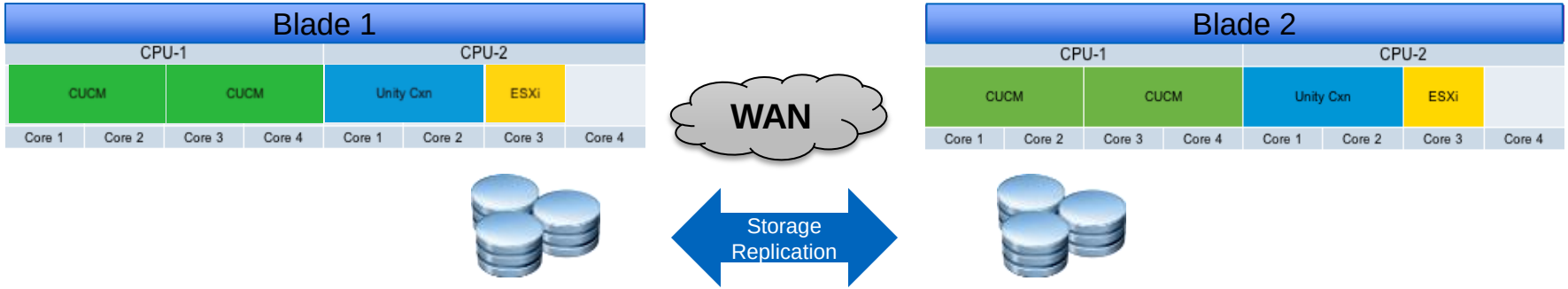
LEGEND:
Y(C) – Supported with Caveats
Y(P) – Partial or Limited
N – Not Supported

- **vMotion**
  - Y(C): supported with Caveat: Can be done with live traffic, but slight risks to impact calls.
  - Y(P): Partial: During maintenance window only.
- **Copy / Clone**
  - Y(C): supported with Caveat: Shutdown VM first
- **VMware Distributed Resource Scheduler (DRS)**
  - Not supported at this time. No real benefits since Oversubscription is not supported

Unified Communications VMware Requirements:

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

Geographic Redundancy
VMware Site Recovery Manager (SRM)



- Allowed
- VMware HA doesn't provide redundancy if issues with VM file system as opposed to the UC app built-in redundancy
- UC VMs have same IP address in both data centres (needs OTV for example)

Best Practice:

Use UC application built-in redundancy (clustering over the WAN)

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Back up Strategies

VMware **Copy** (or also vDR) allowed but VM has to be powered off.

	VMware Copy / Clone	Cisco Disaster Recovery System (DRS)
Backup can be taken when VM is running	No	Yes
Storage footprint	Can be large	Small
Restore time	Short	Longer

Best Practice:

- Always Perform DRS Back Up
- Can also use VMware Copy if need fast restore time (VM has to be powered off)

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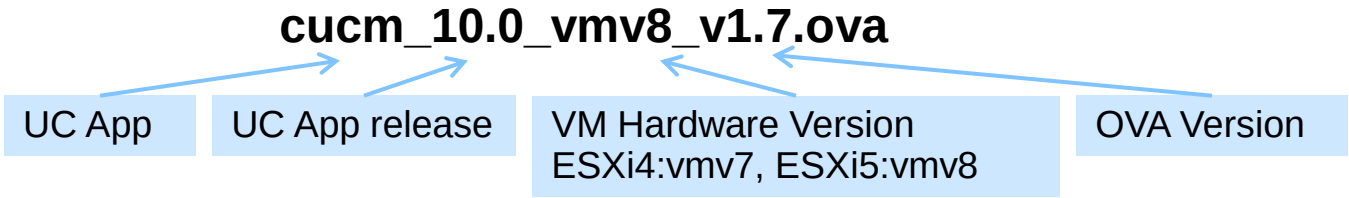
Installing UC App

- Prepare Storage
- Install VMware ESXi
- Create new VM using an OVA
  - Use the OVA available on cisco.com for virtual HW settings and for Disk Alignment
  - Use the the correct version of the UC app



  - When deploying the VM template, select VM size
- Install UC application

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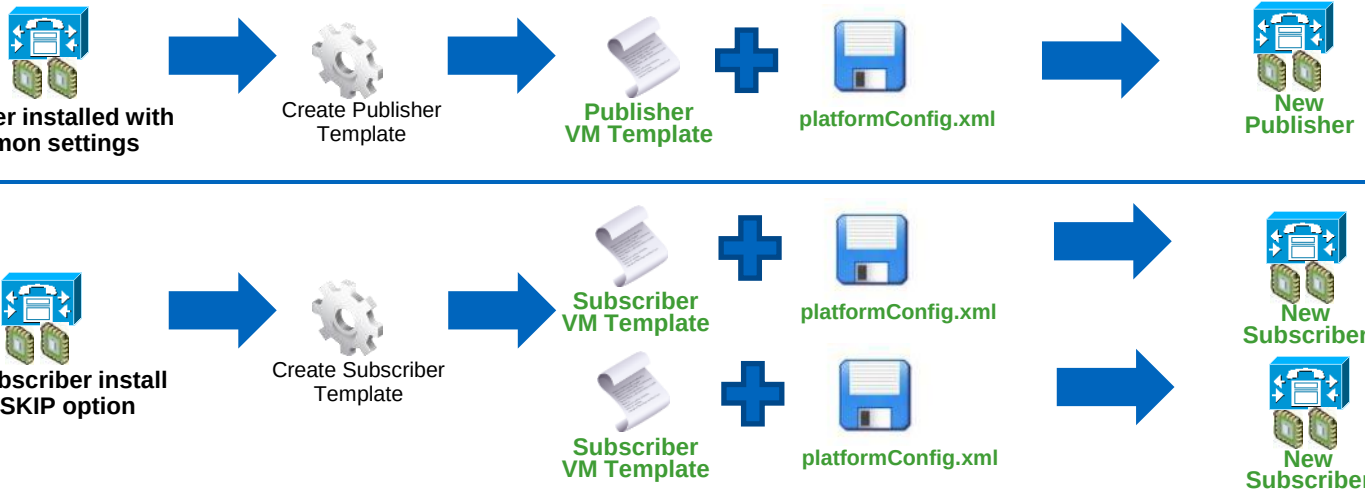
Rapidly Deploy Multiple Clusters

- To rapidly deploy multiple clusters (or nodes)

Answer File Generator

http://www.cisco.com/web/cuc_afg/index.html

"utils config import"



New Identity process:

http://www.cisco.com/en/US/docs/voice_ip_comm/cucm/virtual/servers.html#wp66768

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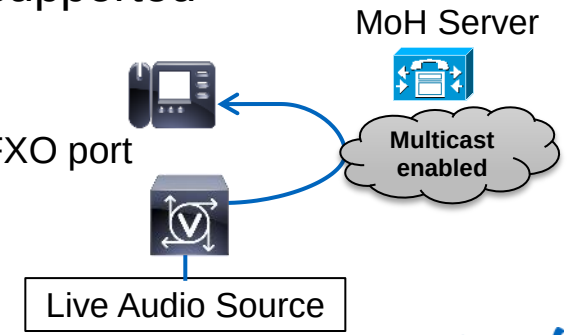
Deployment Models Options

- Again
  - Same design rules with virtualisation
  - Same deployment models
  - Same software
  - Mixing MCS and virtualised servers in the same cluster with CSR 10 no longer supported

- Exception: Services based on USB and Serial Port not supported
  - SMDI for legacy voice mail integration
  - Fixed audio MoH (live audio stream)
    - Workaround: Multicast MoH only using ISR router with an E&M or FXO port



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

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Migrations and Upgrades to 9.1.2

- **Migration to virtual**

CUCM 8.0(1) or earlier

UC Software Upgrade

CUCM 8.0(2) or later

Hardware Migration

CUCM 9.1(2)

- **Bridge Upgrade**

CUCM 6.1(4), 6.1(5)
CUCM 7.1(3), 7.1(5)

Bridge Upgrade

CUCM 8.0(2) or later

Hardware Migration

CUCM 9.1(2)

- **Jump Upgrade**

CUCM 6.1(4), 6.1(5)
CUCM 7.1(3), 7.1(5)

Hardware Migration

CUCM 6.1(4)-6.1(5)
CUCM 7.1(3), 7.1(5)

UC Software Upgrade

CUCM 9.1(2)

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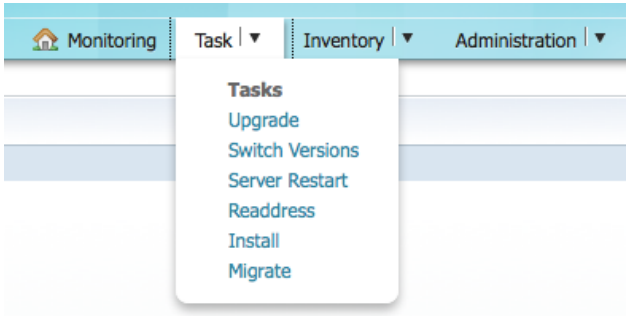
Migrate with Prime Collaboration Deployment

For Upgrade-Migration to CUCM 10.0

NEW ! Available Now



UCM 6.1(5)
MCS 7825H-2.2
Pub + 2 Subs
750 users total

Upgrade & Migration

Virtualised UCM 10.0(1)
VMware vSphere 5.1
UCS C220 M3S TRC#2
Keeping old IP addresses

Version 10 or higher virtual only

Prime Collaboration Deployment

- **Physical to Virtual P2V / Appliance to VM**
  - Manage the migration of physical CUCM clusters (as old as 6.1.5) to virtual VM based servers on 10.0.
- **Migrate Licensing DLU to User (PLM) with grace period**
- **Upgrade virtual version to 10.0.1 with data migration**
- Install cop files (locales or device packs) on a cluster
- Switch versions
- Reboot
- Change IP addresses or hostnames on existing 10.x clusters
- Fresh install a new Unified Communication or IM&P cluster on 10.x
- Steps are customisable (scripts)

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Cisco Public

Summary

- **Perform the Application Design as usual**
  - Deployment Model, High Availability, OVA size, number of VMs…

Cisco Collaboration SRND: www.cisco.com/go/ucsrnd

UC sizing tool: http://tools.cisco.com/cucst

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

- **Perform Hardware Design**
  - Select type of platforms (TRC vs. Specs-based, B vs. C,…)
  - Perform Sizing and VM placement
  - Perform Storage and Network Design
  - Plan on how to deploy UC virtualisation (Installation, Migration, …)

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

VM Placement Tool: tools.cisco.com/ucs

Application Design: Same

Hardware Design: Different

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Q & A

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