UNIFIED COMMUNICATIONS

Four Core Solutions (lots of other applications can be added to these):

- CME (Cisco Unified Communications Manager Express)—formerly "Call Manager Express"
- CUCM (Cisco Unified Communications Manager)—formerly CCM (Cisco Call Manager)
- Cisco Unity Connection
- Cisco Unified Communications Manager IM and Presence—very recently CUP (Cisco Unified Presence)

CME

Operates on a router, designed for Generation 2 platforms, but will work with 1800, 2800, etc. assuming proper IOS version / components. With IOS ≥ 15, a PAK (Product Authorization Key) is needed (according to the book; reality on 2800-series routers differs) . Examples of phones per router:

2901	2911	2921	2951	3925	3925 E	3945	3945 E
35	50	100	150	250	400	350	450

And some more recent devices

4321	4331	4351	4431	4451-X
50	100	250	350	450

Key Features

- Call processing
- Configuration—command-line or GUI
- Local Directory Service—Database of users for IPT (IP Telephony) authentication
- CTI (Computer Telephony Integration)—e.g. using Cisco Unified CallConnector to make calls directly from a Microsoft Outlook contact list.
- Trunking to other VoIP systems.
- CUE (Cisco Unity Express) integration—voicemail via router module— *out of scope as of CICD 210-060*

Relationship to Phones—The phones are dumb. SCCP (Skinny Client Connection Protocol) or SIP (Session Initiation Protocol) sends off-hook events and individual digits to the router. The router rings the remote phone. When answered, the router connects the two phones together and gets out of the way. The router is no longer a point of potential failure or bottleneck, unless one of the users wants features like putting the other party on hold.

RTP (Real-time Transport Protocol)—Used for communication directly between two phones once they've been connected by the router.

Voice Gateway—For an outgoing (real-world) call, the CME router knows from its dial-plan that the phone number is external and signals the PSTN over an FXO or T1 interface to make the call. The CME router handles conversion between PSTN and VoIP audio through DSP (Digital Signal Processors) and handles signaling on each of the two "legs" of the call. Router now essential.

ITSP (Internet Telephony Service Provider)—An SIP trunk to the ITSP can take the place of a connection to a traditional telco.

C U C M

Huge Scope—At the CCNP level, Cisco Unified Communications Manager is covered by two exams, CIPT1 & CIPT2). Normally administered through a GUI.

- Audio & Video Telephony
- Runs on an appliance—the underlying OS is hardened & inaccessible

  UCS (cisco Unified Computing System)—Cisco's chosen computer models from other vendors to host Cisco's appliance OS & software like CUCM
- VMWare Virtualization—ESXi can replace the official appliance hardware (memory & disk minimums apply)
- Redundant servers in a cluster replicate both databases (directory numbers, route plans) and real-time data to support active calls. Scalable to 40,000 phones
- Inter-cluster Connections to other clusters (40,000 phones each) or routers for PSTN or legacy PBXs
- DRS (Disaster Recovery System)—built-in feature; backups to secure FTP
- LDAP (Lightweight Directory Access Protocol)—User accounts can be integrated with those unrelated systems

Clusters Divide the Load

- Replication—Static data (directory numbers, route plan, calling permissions) is replicated on all servers in the cluster
- Runtime Data is divided. When a phone communicates with a server, the server tells the others that it "owns" that phone.

ICCS (Intracluster Communication Signaling)—proprietary format between nodes of the cluster on TCP ports 8002-8004.

One-Way Replication—"Publisher" instance of the CUCM IBM Informix database holds the master copy and replicates read-only copies to "subscriber" database instances. Up to 8 subscribers possible. Best practice:

- > 500 phones, reserve the publisher for database maintenance and servicing TFTP requests from booting phones
- > 1,250 phones, move TFTP to a dedicated server

If the Publisher fails, cluster enters "locked configuration" mode.

- No changes to the database (new IP phone, changing route plan, etc.)
- User-facing features continue to function in versions ≥ 5 (forwarding a phone, message-waiting light, do-not-disturb button, etc.) These changes are replicated sideways and back up to the publisher when it returns

The SCCP or SIP relationship between a phone and its primary CUCM server within the cluster is the same as between a phone and a single CME router. The difference is that the phone can have a list of three CUCM servers for failover. By manipulating which phones have which servers in what order, you can effectively load-balance.

NOTE: The primary server is a phone's configuration; and has nothing to do with the publisher role within a cluster. In fact phones will normally be configured with a subscriber as it's primary.

UNITY CONNECTION

Appliance-based voicemail, e-mail, fax, instant messaging, etc. (express was a router card). Originally, the full Unity ran on Windows. Now, Unity Connection is more scalable and preferred.

- Appliance-based, just like CUCM. In fact, UC and CUCM share the same install DVD
- 20,000 mailboxes per server
- Retrieve voicemail from phone, e-mail, web, mobile devices, etc.
- LDAP directory integration for user account authentication and permissions
- Microsoft Exchange Integration—call handling based on your calendar, hear e-mails by phone, etc.
- VPIM (Voice Profile for Internet Mail)—standard to integrate voicemail servers with each other, regardless of their vendor
- Active/Active redundancy doubles as load-balancing—still limited to 20,000 mailboxes total

Integration—Unity connection is set up completely separate from CUCM, which communicates with it via SCCP or SIP.

- Call arrives from PSTN at the voice router. Per dial-plan, it is routed to the CUCM server
- CUCM directs call to appropriate IP phone, using SCCP or SIP
- Unity Connection is just one more phone extension, so if the phone doesn't answer or someone diverts the call to voicemail, CUCM sends the call to the UC extension with the original extension number embedded in the signaling message so UC can use the right box
- After the message is left, UC uses SCCP or SIP to signal the CUCM server to light the MWI (Message Waiting Indicator) extension. CUCM lights the voicemail indicator on the correct phone
- All of these interactions use licensed ports; make sure you have enough
- One UC can support many CME (remote) offices

Voicemail Pilot—name for the phone number of the UC server, used by CUCM for forwarding calls to voicemail.

UNIFIED INSTANT MESSAGING & PRESENCE

Allows you to see if a user is on the phone, unavailable, etc. before calling them. Plus,

- Instant Messaging (IM)—Jabber XCP (eXtensible Communication Platform) standard used for communication between different IM clients
- Logging to support regulatory compliance, even if conversation is encrypted with Transport Layer Security (TLS)

- Interdomain Federation—Integration with WebEx Connect, Google Talk, etc.
- Jabber XCP Extensibility—peer-to-peer file sharing, application sharing, video-conference systems, etc. Integrates with directory services, databases, web portals…
- Secure Messaging—IPSec or TLS
- Usable in standalone IM mode (~75,000 users), integrated with CUCM (~45,000 users), or integrated CUCM and Microsoft Office Communicator (~40,000 users)

Cisco Jabber—Software application with softphone, presence, IM, visual voicemail, employee directory, communication history, video & web conferencing. Looks like an instant messaging chat program with "rooms" or topics with a history so you can see what happened before you joined (persistent chat). LDAP authenticates users. Can see status of users beyond the instant messaging (is their phone on-hook, etc.) Can start voice and video calls (up to HD quality)

VIDEO COMMUNICATION SERVER

3 Categories of video calls:

- Internal to the CUCM cluster—9971 phones (with camera), Jabber, etc.
- TelePresence—specialized equipment, both endpoints and its own call handling
- External—video calls to devices that aren't registered to the CUCM cluster, e.g. at another company. These connections need to hop the firewall.

Video Communication Server (VCS)—handles external video calls to/from devices we don't control. Two ways to deploy:

- VCS Control— self-contained video endpoint call control system. Good if you don't have a CUCM system. Signaling is over a SIP trunk.
- VCS Expressway —Allows an outside caller to signal our CM that they want to make a video call. Firewall traversal is handled by a trusted relationship between an Expressway Edge server in the DMZ (outside the firewall) and an Expressway Core server inside the firewall.

Jabber Guest— Allows a caller, who may not even have video endpoint software installed, to click a web link and establish a call on demand.

TELEPRESENCE MANAGEMENT SUITE

Logistics management for videoconferencing facilities. Benefits:

- Deployment planning for TelePresence endpoints
- Centralized administration of TelePresence endpoints, including real-time conference management and utilization reporting
- Phone book and contact list integration & synchronization
- End-user TelePresence call initiation or scheduling with optional Exchange/Outlook integration