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Cisco Unified
Communications:
Unifying
Communications
Infrastructure

Cisco Unified Communications: Unifying Communications Infrastructure

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Introduction

The communications devices of today are physically disparate systems with many technical intricacies. There are great advantages to using these devices, yet they do not represent a cohesive collaboration system that has the intelligence or power to meet the challenge for business to deliver higher-quality products, with a lower time to market, at competitive costs. As product life cycles become shorter and shorter, business is forced to transform itself on a dime. The communications devices of today can become downright frustrating to use at times. Technology should solve a problem or provide an avenue that will lead to productivity gains and innovation. When technology is purchased for the sake of having the latest technology, the business suffers. The systems of today must be joined cohesively to ease the proliferation of new empowering technology. Management can easily align this one unified system to the business core values, while delivering on the commitment to provide one system that meets all of the company's communications needs.

Cisco's unified communications vision combines individual systems with different communications capabilities into a cohesive, powerful communications ecosystem. The ecosystem is the enabling factor in allowing a business to revolutionize itself overnight. The power of the system is not the system itself, but the human capabilities that are enabled from the utilization of the system. Human collaboration has the power to transform, unified communications is the enabler.

Unified Communications Systems

Powerful business leaders are continuously faced with a similar challenge: How do I reinvent the corporate culture and business processes of yesterday? Unified communications systems provide the communications necessary to deal with changing market conditions in a stealthy fashion, allowing corporations to adapt to these conditions in an instant. Open communications systems have the power to revolutionize and level the playing field, enabling the communication of innovative ideas from any level of the organization. The needs of the current communications systems can now be addressed in innovative ways that unlock opportunity and growth to the business. New systems should address the challenges of yesterday in unique, innovative ways that allow mobility, flexibility, and empowerment. The Internet age has proved that paradigms have the ability to shift overnight. Unified communications have the power to remove geographic, time, hierarchical, political, and language barriers.

Business leaders have a responsibility to the organization to unlock what is possible in an organization. Human beings have the innate desire to rise to their highest level of possibility. The tools used have the potential to provide this level of empowerment. The information age is now behind us. The tools of the information age must now be aligned to unlock areas of possibility that provide for transformation.

The transformation provided by the age of the human network will maximize human potential to address the challenges of today, and tomorrow, in unique ways. Unified Communications removes geographical boundaries while providing the social networking tools required to collaborate on important business challenges. Cisco's unified communications system will breathe inspiration, innovation, and personalization into organizations.

Cisco Call Manager

Cisco Call Manager is the underpinning of the unified communications infrastructure. Call Manager's primary responsibility is that of call routing. Since the underlying protocol is based on the Internet Protocol (IP), geographical boundaries no longer apply to the deployment of this voice system. Branch locations and small-office, home-office (SOHO) workers can be distributed throughout the world using the headquarters for all call setup and call teardown activity. The return on investment (ROI) related to such a deployment is greatly accelerated because there is no longer a need for smaller PBXs or key systems deployed at remote sites. As long as there is IP reach ability from the IP phone to the Call Manager, phone calls can be made. Device may also be connected to the Internet as long as they have secure VPN tunnels to reach the internal Call Manager. Call routing over the Internet has profound implications. Companies can now employ distributed work forces, unhindered by geographic boundaries. Teleworkers will be given internal phone numbers that relate to direct inward dialing (DID) blocks registered to the closest office. The teleworker phenomenon has the ability to greatly reduce real estate costs associated with each worker. Teleworkers benefit from reduction of transportation costs and being able to spend more quality time with family and friends.

Remote offices with sizes up to 720 users do not require the use of a local call processing capabilities (Call Manager), Survivable Remote Site Telephony (SRST) is employed in branch routers to provide an IOS based call processing backup to the call manager during a wide area network (WAN) link outage or any other loss of connectivity to the Cisco Call Manager. During normal operations, all call control (signaling) traffic will traverse the WAN links. The remote office will use a small amount of WAN bandwidth when setting up and tearing down calls.

Companies that want local call processing capabilities at all times can utilize Call Manager Express (CME). CME represents call processing functionality embedded in a routing or switching platform. There is no reliance on a call manager system, but CME may be integrated with Call Manager over an IP infrastructure using the ITU H.323 gateway protocol. CME also addresses the office in a box market with the introduction of power over Ethernet (PoE) interfaces and Unity Express (UE) voice mail capabilities. One router can provide WAN routing, LAN PoE connectivity, public switched telephone networks (PSTN) gateway functionality, CME call processing, and UE voice mail. UE can be used stand alone in the CME router, but it can also be networked with centralized Call Manager and Unity voice mail resources.

Cisco Call Manager ties traditional systems and circuits into an IP-based infrastructure using gateway devices. Gateway devices are responsible for translating the protocols and applications used in the PSTN to those used in the voice over IP (VoIP) world. Gateway interfaces come in traditional analog (FXO/FXS) and digital (T1/E1) flavors that are widely deployed today. Most of the traditional signaling mechanisms supported today are supported by these interfaces. These include, but are not limited to, the following:

- Loop Start
- Ground Start
- Channel Associated Signaling (CAS)

- Q.931
- Q.SIG
- Non-facility Associated Signaling (NFAS)

Gateway devices and Call Managers are not limited to geographical boundaries. A properly designed system would easily provide the scalability, redundancy and fault tolerance that highly available networks require. The unified communications approach relates very closely to the Internet model that the Department of Defense designed. The Cisco Call Manager server clustering approach represents a highly available network model that can meet disaster recovery requirements when aligned with the proper underlying quality of service (QoS)-enabled infrastructure. QoS is the glue of the network that guarantees the quality level necessary for real-time communications, such as voice and video.

Computer Telephony Integration

Call Manager has a variety of computer telephony integration (CTI) applications. A CTI application is software that has the ability to perform telephony functions through a graphical user interface (GUI). IP Communicator is a software based phone device that looks identical to Cisco's flagship 7970 and 7971 color LCD phones with the ability to control up to 8 line appearances. Mobile users can now make calls from anywhere in the world as if they were in the office on the telephone in their office. Cisco also sells wireless LAN (WLAN) phones that allow enterprise workers to place and receive calls wherever they may be in the internal network. This technology is perfect for medical professionals that can not use cellular communications due to cellular's ability to interrupt operations on critical medical components. WLAN devices are allowed in these types of environments. Environments that rely on cellular communications for mobile users can also benefit greatly by reduced usage of expensive cellular services.

The attendant console application is used to manage calls into the organization. The operator will use the attendant console application on their desktop in tandem with a Cisco IP phone to manage high volumes of calls coming into an organizational unit. IP Manager Assistant (IPMA) is a client-server application that allows administrative assistants to assist in the routing of calls to managers who receive very high call volumes. This application provides call routing information, but also has the ability to perform intercom functionality between the administrative assistant and the manager.

Geographical Routing

Geographical routing is a great benefit of having distributed gateway devices connected by one IP infrastructure. If a user in New York City picks up a phone and dials an international phone number associated with Dubai, the phone call could be routed over the IP infrastructure to a remote gateway in Dubai. The call would then be routed in Dubai as a local phone call to reduce expensive international toll costs. Geographical routing is sometimes referred to as toll bypass and tail-end hop off (TEHO). PSTN toll charges in North America have reached such low levels, a cost-benefit analysis (CBA) should be performed to gauge the cost savings against the engineering that it would cost to deploy and maintain such a system. The ROI model based on this analysis will determine if, and to what extent, geographical routing should be deployed in the system. Geographical routing could lead to large savings for International calls, but there would be a much lower benefit to performing this operation throughout the continental United States.

Mobility

The mobility offered by Cisco Call Manager will greatly reduce the costs and downtime associated with moves, adds, and changes in a traditional PBX environment. Users can unplug their phones, move to a different

Ethernet port on the Local Area Network (LAN) and plug their phone in at the new location. IP Communicator and the 7920/7921 WLAN phones were built with mobility in mind. When there is an emergency at a location, emergency services are normally dispatched as a result of someone dialing 911. The emergency services are dispatched from the public safety answering point (PSAP), but the 911 center requires accurate Caller ID information (automatic number identification-ANI) to properly route the emergency vehicles. Sending a Caller ID that is accurately mapped to the physical location of a user can be challenging in a VoIP environment where users can be plugged in anywhere in the network. The Cisco Emergency Responder server addresses this need by mapping a phone registration to a physical location through the network. To perform this operation, the simple network management protocol (SNMP) is leveraged in tandem with the address resolution protocol (ARP) caches of the routers and the media access control (MAC) tables in the switches. If each port on the data network switch is mapped to physical areas of the building where the cabling terminates, an emergency line identification number (ELIN) can be mapped to that geography. The Cisco Emergency Responder server would then manipulate the true ANI to a calling number that is mapped in the PSAP automatic location identification (ALI) database where the emergency is occurring. Call Manager versions 4.2, 5.1, and later, have the ability to map subnets to device pools. Each subnet can be associated to an area of the network to provide the PSAP with accurate ANI information. This mechanism does not provide a solution for roaming wireless devices that maintain the same IP subnet regardless of where they are connected in the network. Cisco Emergency Responder is the best solution for mobile IP telephony users that will be making calls from a variety of different locations.

Mobility Manager

Mobility Manager is an application server that will allow integration between cellular network carriers and IP telephony environments. Users of the system can accept a phone call on their cellular phone and then hand the call off to their Cisco voice over IP (VoIP) phone at their desk through the use of a hand off feature. Calls can also be handed off in the opposite direction, from the IP phone to a cellular phone. This allows great flexibility in managing calls for users on the go. The productivity enhancements are great as well. Instead of staying at their desk on a call, a user can hand off a call to their cell phone. The system also offers simultaneous ring functionality which will enable single number reach ability (SNR). A call offered to the IP telephony system will simultaneously ring up to 4 other devices allowing the user the flexibility of picking up a call from their cell phone. SNR will provide one unified voice mail box and simplify the phone numbers that customers and suppliers will need to memorize.

When a called party is not available in a phone system, the calling party is normally routed to the recipient's voice mail system. Call Manager integrates with an intelligent system that aligns the groupware schedule of the recipient with credentials the recipient has mandated for the routing of calls. The groupware application determines the recipient's location based on their schedule and will attempt to route the call to one of many devices that the called party has made available based on the time of day, type of meeting, calling party, and at which phone number the call was received. If an important potential customer calls or there is a family emergency, most people would want to receive the call regardless of where they are or what they're doing. Cisco Personal Assistant and Cisco Unity Connections have the ability to tie into the Unified Communications product portfolio and provide this follow-me/find-me functionality. This functionality could be critical to an organization that wants to make their important clients feel like important clients.

Voice Mail

Voice mail has revolutionized the way we communicate. In today's busy business market, it's very hard to communicate on a one-to-one basis in person or on the phone. Many communications are done by leaving voice

mails. Cisco Unity is a unified messaging platform that is capable of integrating with the existing messaging infrastructure and a Cisco Fax Server to provide a unified inbox. The E-Mail client is now a centralized communications repository where users can listen to their voice mails or read faxes, in addition to checking E-Mail. Mobile workers can now receive new fax and voice mail messages as E-Mails in their PDAs. The system could also notify the user, on a choice of many different devices, that they have new E-Mail. Most telephony devices will immediately prompt the user for their credentials on the voice messaging platform, so they can immediately access the communication that has been left for them.

Depending on the customer's needs, Cisco sells three tiers of the Unity product: Unity Express, Unity Connection, and Unity. Unity Express offers a small branch office with up to 100 hours of voice mail only storage. Unity Connections offers the ability to do both voicemail and integrated messaging. Integrated messaging is different from unified messaging due to Cisco Unity's tight integration with IBM Lotus Domino and Microsoft Exchange.

Media Applications

Unified communications has recently met many rich media applications that provide convergence between voice, video, and data applications onto one infrastructure. Cisco promotes the AVVID model (Architecture for Voice, Video over Integrated Data infrastructures), which provides convergence through one highly-available, redundant, quality of service enabled infrastructure. Rich media involves a variety of voice, video, and data integrated conferencing capabilities.

VT Advantage is the USB-based Cisco video client hardware and software solution that enables video calling capabilities at the desktop. The VT Advantage solution is very low cost and provides little impact to the call processing and licensing to the Call Manager server. VT Advantage is a real time one-to-one video conferencing solution. The IP phone is leveraged to provide a reliable, high-quality audio channel, while the VT Advantage software and camera provide the video channel. VT Advantage ties into the existing dial plan, allowing a video call to be made in the exact way as a typical phone call. Video has the capability to revolutionize how we communicate. In a conversation, parties change their pace based on physical cues given by the receiver of the communication. Video will provide a bridge to a more personal communication that voice communications currently lack.

Audio conferencing capabilities have increased that ability for large teams to interact. Cisco's IPVC-3500 series line of H.323 multi-point conference units (MCU) allows video conferencing of three or more parties. Three or more video parties will be able to have a video conference together. The video parties will not be limited to the VT Advantage application users. Third-party video conference units can be tied into a Call Manager environment through the use of a router running IOS code that allows H.323 gatekeeper functionality. Video participants may also dial into the IPVC platform through ISDN links.

Cisco TelePresence is a solution that delivers ultra-high-definition life-sized video at 720p and 1080p resolutions, and spatial audio over an IP cloud. It is estimated that 55% of communications are not audible. Body language is a key element of face-to-face communications. Body language is accurately conveyed with the Cisco Telepresence solution. This could greatly reduce the costs and the loss of family involvement associated with frequent business travel.

Meeting Place and Meeting Place Express are audio, video, and data application conferencing that allow organizations to leverage instant messaging, data sharing, while also interacting via audio and video

conferencing. The Meeting Place administrator has a great amount of flexibility in managing the conference communication. The administrator has an application which shows the line state of each participant. The line state information helps identify offending parties injecting music on hold into a conference. The offending party can be removed from the conference so there is no loss of productivity for the remaining conference participants. This is a persistent problem with conferencing technologies.

IP Contact Center (IPCC) is not a replacement of a call center environment, but an extension of the call center that will allow call centers to interoperate over chat sessions and other data sharing applications. IP contact center has extensive scripting capabilities that provides a platform for very intelligent services such as skills based routing and time of day call routing amongst call centers around the world. Call center agents can be chosen based on a set of rules that takes customer provided information and internal processes into consideration. An agents experience level and availability will determine call handling. Important customers are not only guaranteed over lower priority customers, they may also be connected to agents with more experience.

Cisco Call Manger 5.0 introduced session-initiation protocol (SIP) line-side support for the 7900 series IP phones, as well as, 3rd party SIP phones. SIP adds capabilities to the Cisco call manager that will indicate the availability of a user. The presence functionality is very similar to what we have grown accustomed to in instant messengers. Presence information requires the use of a Cisco unified presence server (CUPS) in the environment. Presence indicators will be reflected in the speed dials and directories of the SIP enabled phones.

The Cisco Unified Personal Communicator (CUPC) is a software-based voice, video, and data application that indicates availability through presence information available from the CUPS. The application has similar capabilities as IP Communicator with added conferencing capabilities. Audio and video conferences can be started without dropping the existing call. Web conferences can also be started where users can start a presentation and share other data elements.

Cisco has recently acquired a software vendor (Orative) that makes presence enabled applications for cellular PDA devices that ties IP telephony environment with cellular. The acquisition of Orative ties in very closely with cellular mobility and should lead to some very interesting applications.

Summary

Cisco's unified communications system does not represent a replacement for a telephone and voice mail system. Unified communications goal is to provide one common infrastructure that aligns disparate communications systems over an IP infrastructure. The unified communications approach aligns the following technologies:

- Enterprise voice and voicemail systems
- Cellular voice and voicemail systems
- Single Number reachability
- Video telephony
- Audio conferencing
- Video conferencing
- Instant Messaging
- Call center environments

Flexibility, functionality, and simplicity are paramount values involved in a deployment to a unified communications infrastructure. Unified communications will transform the way we conduct business in the future. The technology involved will allow collaboration without the geographical boundaries that have hindered communications in the past. Cisco's unified communications will transform the way human beings communicate, interact, and collaborate.

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About the Author

Dennis Hartmann is a Global Knowledge contract instructor who provides consulting services through his company, White Pine Communications. Dennis Hartmann was first exposed to Cisco Call Manager in the 2.0 time frame while working at a Fortune 500 financial company. He has been providing training and consulting services around Call Manager since 2001 (Call Manager 3.0).

Dennis has been working in the field of voice and data communications for over ten years. During that time, he has earned various certifications: CCIE# 15651, CCVP, CCSI, CCIP, CCNP, CCDP, IP Telephony Express Specialist, Unified Communications Specialist, IP Telephony Design Specialist, Optical Qualified Specialist, and MCSE.

Dennis has authored a Cisco Press book titled METRO and was a technical reviewer of the CIPT 4.1 Cisco Press book. Dennis is currently working on Cisco Press' CIPT 3rd edition. Dennis has authored both courseware and labs for Cisco internal and Global Knowledge training classes. Dennis holds a BA degree from Pace University and has been in the communications business since 1996.