IP Telephony Management
How Cisco IT Manages Global IP Telephony

A Cisco on Cisco Case Study: Inside Cisco IT
Overview

- **Challenge**  
  Design, implement, and maintain a highly available, reliable, and resilient converged voice and data network

- **Solution**  
  Focus on the areas of voice quality, availability, change management, security, monitoring, and support

- **Results**  
  Cisco® IP telephony supports 55,000 employees and contractors with target availability of 99.999 percent

- **Next Steps**  
  Continue to evolve and expand Cisco IP telephony deployment through new processes and procedures, and through the introduction of new applications that simplify operations and increase productivity
Challenge - Quality, Availability, Support

- Deliver voice quality and availability equal to or better than what users were accustomed to with traditional PBX/TDM telephony
- Build redundancies into the network well beyond those found in traditional standalone voice and data networks
- Create robust change management processes and standard practices
Challenge - Quality, Availability, Support

- Ensure proper segmentation of voice and data packets on the same physical network as well as prevent data network security threats from affecting voice services
- Shift from the traditional, reactive mindset of monitoring PBX-based voice to a proactive mindset where problems are identified before they affect service
- Create new, effective support models and procedures in this new, converged environment
Solution - Voice Quality

- Perform a Voice over IP (VoIP) audit to identify network readiness for voice
- Establish separate Virtual LANs (VLANs) for voice
- Trust priority traffic, rewrite other non-latency-sensitive data traffic to zero, and provide priority queuing at the WAN edge for voice and voice signaling traffic
- Ensure consistent Call Admission Control (CAC) bandwidth parameters across the IP telephony infrastructure
- Test codecs, both in a lab environment and with a pilot group of users and steering committee, to ensure that the voice quality requirements of end users are met
Voice and Data VLANs

Floor 1
- Primary VLAN 110
  - VVID=110
  - VLAN=10
- VLAN=11

Floor 2
- Primary VLAN 10
  - VVID=111
- VLAN=12
- VLAN=13

Cisco® Catalyst® 6500 Series Switch – Layer 3 routing
Cisco Catalyst 6500 Series Switch – Layer 2 voice and data switching
IP phone
Solution - Availability

- Centralize Cisco® CallManager clusters into regional hub sites, minimizing the number of clusters to greatly simplify management and maintain resilience
- Provide diverse routing for voice gateways with multiple paths out of each cluster
- Equip core, distribution, and access switches with high availability features
- Provide redundant core and distribution routers throughout the network
Solution - Availability (Contd.)

- Build redundancy into WAN routes through Hot Standby Routing Protocol (HSRP)
- Reduce the number of Cisco CallManagers in the network by supporting Survivable Remote Site Telephony (SRST) features in local site routers
- Evaluate unique business requirements, based on a cost-benefit analysis, to ensure having a proper disaster recovery plan in place
High Availability Architecture

High Availability Layers
- Network core redundancy
- HSRP between core routers
- Distribution layer redundancy
- Fiber redundancy on diverse paths
- Building router redundancy
- HSRP between building routers
- Fiber diverse paths from switch to router
- Multiple cables from desk to switch

Cisco Building

Network Node

Cisco® Catalyst® 6500 Series Switch – Layer 3 routing
Cisco Catalyst 6500 Series Switch – Layer 2 voice and data switching

Gigabit Ethernet over Fiber
Ethernet over cable
IP phone
Solution - Change Management

- Hold change management meetings regularly and frequently to review all changes that could affect client services
- Integrate voice and data teams into a single change management review board
- Create detailed process for change management requests and continually evaluate and revise policies as needed
Solution - Change Management (Contd.)

- Create e-mail alias that includes all IT personnel who interact with the voice and data network, enabling personnel to review all change requests affecting the voice network worldwide.
- Adopt a policy that no changes affecting voice services can be performed before 9:00 p.m. local time.
- Establish standard configurations globally for LANs, WAN, and change management procedures.
Solution - Security

- Run antivirus software on all Cisco® CallManagers, automatically update as new DAT files are released by the support team, and generate compliance reports daily to identify hosts that have failed to download the latest DAT file.

- Run Cisco Security Agent, a threat protection software client, on all Cisco CallManagers.

- Implement standard Internet access controls such as firewalls, DMZ, and intrusion detection systems (IDSs), and deploy strong authentication mechanisms for remote access VPN users.
Solution - Security (Contd.)

- Require standard OS and application set for antivirus protection on all PCs and use automated desktop management software to allow for responsive remediation of infected devices.

- Require RFC1918 space for all labs, use a proxy server to access the Internet, provide virus filtering at the edge using Cisco Application and Content Networking System (ACNS) Software, and limit traffic that can be sourced from a lab through access control lists (ACLs).
Solution - Monitoring

- Create monitoring procedures with standardized monitoring policies for all network resources, continually measure availability on these devices, and send e-mail and pager notification within five minutes when established thresholds have been reached.

- Continually monitor for network resource availability through ping tests using an internally developed SNMP monitoring system.

- Monitor voice gateway utilization and trunk availability on a regular basis to allow proper bandwidth provisioning.
Solution - Monitoring (Contd.)

- Periodically run application checks on Cisco® CallManagers to monitor dial tone availability and that Trivial File Transfer Protocol (TFTP) downloads for IP phones are available.

- Monitor configuration backups for Cisco CallManagers, voice gateways, and LAN/WAN devices through automated daily reports that verify configuration compliance, and manually audit all connectivity, topology, network maps, and configurations at least once every six months.

- Run Perl script weekly to verify redundant paths.
Solution - Support

- Provide escalation path for support teams consisting of subject matter experts in voice, LAN, and WAN, and enforce escalations through proper channels
- Form steering committee prior to any implementation, which includes clients, and create specific training plans for each implementation
- Develop comprehensive implementation and support documentation, and store in easy-to-get-to online location
Solution - Support (Contd.)

- Execute OS patches and upgrades through remote administration tools such as Virtual Network Computing (VNC) and Remote Insight Board (RIB)

- Use change management process for all Cisco® CallManager application patches and upgrades, and preserve current software image by powering down the CallManager and removing the redundant drive prior to a major application upgrade
Solution - Support (Contd.)

- Review effects on telephony infrastructure from other device upgrades such as LANs, WANs, voice gateways, and phones
- Use Cisco® multilevel administration access to provide multiple levels of security to Cisco CallManager administration
- A project manager and project champion at the senior management level are important during deployment and throughout the operational phase
- In a mixed voice and data traffic environment, it is important to have a team with strong cross-functional skills to address all the issues that may arise
Results - Delivering Quality and Availability

- Currently, Cisco® deployment of Cisco IP telephony supports about 55,000 employees and contractors at approximately 300 sites globally.

- Cisco IT’s target for Cisco IP telephony availability is 99.999 percent.
Next Steps - Evolve and Expand

- Add integrated telephony and video capabilities to the converged network
- Continually improve the disaster recovery plan
- Converge voice and data traffic over the WAN where it is economically feasible
- Implement new applications to increase productivity
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