How Cisco India Simplified VoIP and PSTN calls with Logical Partitioning for Cisco Unified Communications Manager

New design allows a single phone line for all calls while reducing costs, simplifying dialing, and maintaining regulatory compliance

Cisco IT Case Study/Unified Communications/Logical Partitioning for Cisco Unified Communications Manager: This case study describes how Cisco India has evolved the deployment and configuration of its Cisco® Unified Communications Manager (Cisco UCM) clusters to support both public switched telephone network (PSTN) and voice over IP (VoIP) calls on a single system while meeting regulatory requirements for call separation. This evolution has given Cisco the benefits of reduced costs from a smaller voice infrastructure and easier system management. Employees also benefit from simpler calling methods. Cisco customers can draw on Cisco IT's real-world experience in this area to help support similar enterprise needs.

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> – **Pranith Neal, unified communications implementation engineer, Cisco IT**

BACKGROUND

Cisco Systems established engineering operations in India in 1996 and has since expanded its presence to include two global development centers and four sales offices, as well as multiple in-country partners for engineering, IT applications, and business process outsourcing.

Cisco had deployed voice over IP (VoIP) services worldwide to reduce telecom expenses by carrying as many voice calls as possible over its internal network. Call routing over the WAN allows Cisco to avoid long-distance toll charges for calls between Cisco offices and to use tail-end hop-off techniques for calls to or from an external phone over the corporate WAN.

However, many of these VoIP routing capabilities are possible only if Cisco can interconnect the public network (PSTN) with the company's internal network. In India, regulatory constraints forbid this interconnection of VoIP and PSTN call routing, which means Cisco can carry only internal calls over its corporate network. All calls received from or sent to an external phone must be handed off to and carried by a local or long-distance service provider over the full length of the connection, with the applicable toll charges.

To conform with India government regulations, Cisco India initially built two networks to separately handle VoIP and PSTN calls. "This meant two phones on every desk, two voice mailboxes for every employee, and two Cisco UCM clusters," says Pranith Neal, a unified communications implementation engineer for Cisco IT. "This dual

EXECUTIVE SUMMARY

BACKGROUND

- Cisco India had evolved its Cisco UCM design to allow VoIP and PSTN calls on a single phone, but with separate lines

CHALLENGE

- Reduce costs and simplify calling by eliminating the second line on employee phones

SOLUTION

- New Logical Partitioning design that allows Cisco UCM to correctly route on-net VoIP and off-net PSTN calls

RESULTS

- Reduced calling and infrastructure costs
- Simpler process for placing calls
- Support for new communication services
- Simpler system management

LESSONS LEARNED

- Some call features are still restricted
- Use Local Route Group feature
- Maintain audit records

NEXT STEPS

- Evaluate Logical Partitioning for use in other countries with similar calling restrictions

infrastructure was expensive for us to deploy and manage because it required twice the equipment and twice the maintenance effort."

To reduce telecom expense, in 2004, Cisco India wanted to merge the physical aspects of the two network infrastructures without merging the calls. The goal was to create a merged network design that would be compliant from a regulatory perspective.

Cisco IT used Call Partition and Calling Search Space features in the Cisco UCM clusters to provide virtual separation of PSTN and VoIP calls. This design allowed Cisco India to   create a single Cisco UCM cluster for handling all calls.

Cisco IT implemented the Cisco UCM cluster convergence at two locations in India.

The convergence of PSTN and VoIP calls on the same Cisco UCM cluster and the same Cisco Unity® voicemail system allowed employees in the Cisco India offices to increase their productivity by using just one phone and one voicemail box.

Cisco IT was also able to reclaim equipment with a value of nearly US$1 million and reuse it for local office expansion. A simpler voice infrastructure also reduced operational costs for Cisco IT

CHALLENGE

Although the physical convergence eliminated the second phone in 2004, Cisco India employees still had two lines configured on their desk phones. "Our challenge was to eliminate the second line on each phone in order to reduce costs and complexity, and allow employees to dial calls without needing to remember access codes," says Neal. Employees needed to remember which line to use for which types of calls, for example, a local external call or long-distance internal call. Additionally, each call type had a specific access code and dialing pattern in order for Cisco UCM to route the call appropriately while minimizing toll charges when possible.

Dual lines also required a very complex set of call-routing patterns. Every site in India had a minimum of 12-15 patterns to control routing of outbound calls for local telephone numbers, mobile numbers, toll-free calls, international calls, etc. This complexity added up to more than 1000 route patterns across the Cisco UCM cluster for India because of the different requirements in the connected offices.(This large number of route patterns is the result of the large number of corporate sites, and the number of Cisco UCM clusters, in the Cisco global network.)

"This many route patterns mean there were many opportunities for human error in typing them, and we had to spend a lot of time finding and fixing these configuration errors," says Divya Sinha, unified communications implementation engineer, Cisco IT. "It was also hard for engineers outside of the India unified communications team to support our system, because the configurations were so different from the standards used elsewhere in Cisco. Now it is a lot easier for anyone within Cisco IT's support team to review and fix operational issues since we follow the corporate standards for call routing patterns."

SOLUTION

Cisco IT created a "Logical Partitioning" design that is now supported on Cisco UCM Release 7.1 or higher. This design identifies where each phone is located using a Geolocation, and routes all calls appropriately, depending on the calling phone location and the phone number being called. The Geolocation information is in the IP packet, and Cisco IT's deployment of Logical Partitioning uses this information to select the proper policy to control communication between each pair of endpoints:

- A VoIP phone and a PSTN gateway
- A PSTN gateway and another PSTN gateway
- An intercluster trunk (for example, Gatekeeper or SIP trunk) and a VoIP phone
- An intercluster trunk (for example, Gatekeeper or SIP trunk)and a PSTN gateway

How Logical Partitioning Works

"To meet regulatory requirements, Logical Partitioning defines which sets of VoIP devices are allowed to communicate with each other," says Chris Hartley, Cisco IT network engineer."For example, phones making off-net calls are only allowed to talk to a PSTN gateway. We had to create four partitions for external calling: for local calls, long-distance calls, international calls, and emergency calls. We also set up two more partitions for on-net calling: within the building and outside the building but on the Cisco network."

Any device can be restricted by the Cisco UCM to communication with one other device or with a specified group of devices for each call type. However, it was not necessary to configure the Logical Partitioning policy logic on the phones or other voice endpoints.

Logical Partitioning also controls which mid-call features, such as conferencing and transfers, can be used on which types of calls. These restrictions supplement the basic call policies defined by the Calling Search Space and Call Partition features in Cisco UCM.

The Logical Partitioning solution uses the following elements:

- **Identifiers:** Logical Partitioning assigns a unique identifier to each device based on its physical location. When one device calls another, Logical Partitioning uses these identifiers to determine whether the call is allowed and what routing is appropriate.
- **Policies:** The Cisco UCM administrator can define policies that determine which interconnections are allowed or denied between any two devices (for example, a VoIP phone and a gateway) in the Cisco UCM system. The configured policies work bidirectionally between the pair of devices. For example, any PSTN number can connect to any other PSTN number via the gateway, but a VoIP phone can connect to the WAN only when the dialed number is on-net.
- **Policy Checking:** Cisco UCM checks the defined policies before allowing features such as transfer, pickup, and unplanned conferences on a particular call. The Cisco UCM offers 18 customizable parameters that for defining call policies .Cisco uses six of these parameters to define location in a way similar to a postal address, with a country, city, and street address for each location. This policy checking also looks at the addresses that are allowed to connect to other addresses in the Cisco UCM policy address list..

Call Routing Patterns

Logical Partitioning allows for a substantial reduction in the number of routing patterns (from more than 1000 to 11) that must be maintained on a Cisco UCM cluster. The large number of routing patterns previously required resulted from the size and complexity of the Cisco global network. Before upgrading the Cisco UCM systems to the Release

7.1 software, the Cisco IT implementation team created the new routing patterns for the Logical Partitioning design. This activity simplified implementation and meant that no firmware upgrade was needed for the phones.

Extension and Device Mobility

Many Cisco employees often work away from their desks: at another Cisco office, at home, or while traveling. In other parts of the world, employees can use the Extension Mobility and Device Mobility features in Cisco UCM to access their configured calling capabilities from a remote hardware phone. However, this mobility was not previously available to Cisco India employees because of the possibility that these features could bypass the PSTN when placing calls.

With Logical Partitioning, Cisco India employees can now use Extension Mobility when they move to another phone in another floor or room within the same building in India, or move to another building on the same campus. When the employee logs into the phone, the Cisco UCM applies the user's profile (which defines phone number, speed dials, and other features) to that phone. However, Cisco UCM still identifies the phone's actual physical location to determine which policies to apply to any calls delivered to that phone. The user experience and policies for dialing and receiving on-net calls are the same as those for their phone at their regular desk.

When the employee is using Extension Mobility in another Cisco office, they can still make on-net calls in the same manner as they would at their desk. However, making off-net calls is a different matter. When an employee is at another Cisco office, the Cisco Unified Communications Manager cannot route a user's off-net call through their home gateway as it would in any other part of the world; it must use the local gateway instead. To solve this issue, off-net calls from Extension Mobility numbers are routed through a receptionist at the visited Cisco office in order to help ensure correct PSTN routing.

When a Cisco India employee wants to work from home, the phone policies and configuration must also comply with regulations on PSTN access. To support this compliance, Cisco IT uses the Device Mobility feature to restrict PSTN access on company hardware phones that employees take from the office for use at home with their Cisco Virtual

PRODUCT LIST

Unified Communications
- Cisco Unified Communications Manager
- Cisco Unity
- Cisco WebEx Connect
- Cisco Unified Presence
- Cisco Unified Communications Interface

Office router. With Device Mobility, Cisco UCM checks the IP address of the phone to identify its Cisco office VPN subnet. When the phone dials a call, Cisco UCM can then recognize and allow on-network internal calls while blocking calls that must be routed over the PSTN.

Logical Partitioning also provides the call routing control necessary to support on-net calling from the Cisco WebEx® Connect and Cisco Unified Personal Communicator softphones. Because employees using these softphones cannot receive calls from the PSTN, Cisco UCM automatically directs incoming PSTN calls to the employee's voicemail box.

RESULTS

The Cisco IT team in India began using the Cisco UCM Release 7.1 upgrade with the Logical Partitioning features in early 2011. The upgrade was first installed in small offices, allowing the Cisco IT team to verify that the new configurations and call routing would work correctly. After this confirmation, the team began to upgrade one new site per week, ending with the Cisco UCM systems that serve the company's Bangalore campus.

The Logical Partitioning design has produced several positive results for Cisco India.

Reduced calling costs."We have seen reduced charges of $1000 per month in a field sales office with 100 users, because employees are no longer sending calls over the PSTN that could have been routed over the internal network. We expect to see savings of $25,000 per week in the Bangalore campus alone," says Neal.

Reduced costs for office space, equipment, and wiring. Because the Extension Mobility feature gives employees flexibility for where they work, Cisco India expects to reduce permanent space assignments and the associated real estate and facilities operations costs. In addition, Logical Partitioning eliminates the cabling, system port, and maintenance expense of a second phone line for each employee.

Simpler process for placing calls."Our employees don't need to remember anymore which line they need to use for which type of call they are making, internal or external, and what access code they need to enter," says Sinha. "Now they just pick up the phone and dial the number."Cisco IT created videos and a wiki with FAQs and other documents to educate employees about the calling changes enabled by Logical Partitioning.

Support for new communications services. Extension Mobility, Device Mobility, support for Cisco WebEx Connect softphones, and accurate user presence information are now possible with the single phone-line design that is enabled by Logical Partitioning. With only one phone line assigned to teach employee, Cisco Unified Presence can now provide correct real-time information about an employee's availability.

Simpler system management. Cisco India reduced its routing patterns from more than 1000 to 11 in the Cisco UCM clusters, which simplifies and provides consistency for call routing. This configuration is also now similar to the standard used in other Cisco UCM clusters, which allows Cisco IT to deliver consistent support worldwide.

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> – **Divya Sinha, unified communications implementation engineer, Cisco IT**

LESSONS LEARNED

Throughout the evolution process, Cisco India learned several lessons about creating a Cisco UCM design that would accomplish both the company's goals for simplicity and cost reduction while maintaining regulatory compliance.

Some call features are still restricted. Because of regulations, Cisco India employees cannot conference or transfer calls between the PSTN and the Cisco internal network. Cisco also cannot take advantage of the cost savings produced by tail-end hop off (TEHO) methods for routing long-distance calls over the corporate network in order to avoid toll charges to or from India.

Use Local Route Group feature. Local Route Groups minimize the number of patterns needed in Cisco UCM and allow for a better experience when an employee uses Extension Mobility within a Cisco building or campus site. Reducing the number of route configurations from 1000 down to 11 has been due to judicious use of these Local Route Groups.

Maintain records for possible regulatory audit. As required by the India Department of Telecom (DOT), Cisco maintains call detail records (CDRs) for six months as well as documentation on the Cisco UCM cluster configurations. This information allows DOT representatives to verify that calls are being routed correctly over the PSTN and the Cisco network.

NEXT STEPS

Cisco IT will evaluate Cisco UCM Logical Partitioning for use in other countries (specifically in the Middle East and in Bangladesh) that have similar regulatory restrictions on the integration of PSTN and VoIP calls.

FOR MORE INFORMATION

For information on Cisco Unified Communications Manager, visit www.cisco.com/go/ucand search for "Logical Partition" in www.cisco.com.

The Cisco on Cisco blog contains posts on unified communications topics: http://blogs.cisco.com/category/ciscoit/

For additional Cisco IT case studies on a variety of business solutions, visit Cisco on Cisco: Inside Cisco IT www.cisco.com/go/ciscoit

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