



Cisco Unified Communications Store Employee Dashboard Design and Implementation Guide

Cisco Validated Design

July 19, 2008

This guide describes how to implement the Cisco Unified Communications Store Employee Dashboard solution using the IPcelerate IPsession product and the Cisco Unified Communication technologies. Using multiple retail reference architectures, it validates proof-of-concept via interoperability testing. This enables a retailer to expedite implementation of the Cisco Unified Communications Store Employee Dashboard within their environment.

The Cisco Unified Communications Store Employee Dashboard target audience is sales engineers that have retail accounts interested in using an IP telephony environment or expanding the utility of their existing IP telephony investment. It is assumed that administrators of the Cisco Unified Communications Store Employee Dashboard have experience with installation and acceptance of the products covered by this network design. In addition, it is assumed that the administrators understand the procedures required to upgrade and troubleshoot networks at a basic level.

Other users of this guide include the following groups:

- Retail customers with technical networking/telephony background and experience
- System administrators who are familiar with the fundamentals of IP telephony
- Sales engineers responsible for supporting retail accounts

Cisco Unified Communications Store Employee Dashboard—Solution Overview

The Cisco Unified Communications Store Employee Dashboard solution from IPcelerate and Cisco is a suite of IP-based applications developed to improve employee productivity and facilitate inter-store communications. These IPcelerate applications integrate data and voice capabilities, and are presented in a simple to use single dashboard-view accessible from Cisco IP-enabled phones. The following are the Cisco Unified Communications Store Employee Dashboard solution core components:



Americas Headquarters:

Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA

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- IPsession Server Appliance
- Cisco Unified Communication Manager
- 7970 IP Phones

This solution was validated using Cisco Intelligent Retail Network architectures as the foundation representing an actual retailer.

Solution Description

Using Cisco's Unified Communications and IPcelerate's IPsession Server, retailers can transform the IP Phone into an employee terminal-device that provides a cost effective way to perform daily store operations procedures (such as time card clocking, shift/staff management, and task management) and a means for corporate/business owners to directly communicate to store employees on the sales floor without having to be relayed by store management.

Some of the solution's features include:

- Time Capture System—Enables store employee to record daily attendance punches from any store phone.
- Store Reminder System—Tracks each store's functional tasks and sends out an employee reminder or manager alert if a task is not performed on time.
- Dial-Out Shift Notifications—Assists in finding replacement shift coverage by available employees when required, automatically. This application can be used for an immediate shift or future shifts.
- Daily Deposit tracking—Provides the means for entering and communicating daily bank deposit to company management.
- Messaging and Alerting—Allows for audible and text messages for events such as employee recognition, immediate event notification, and meeting reminders.

The Cisco Unified Communications Store Employee Dashboard solution facilitates closer collaboration between remote stores and management through pre-programmed conferencing features. This solution is part of the Cisco Unified Communications for Retail suite of IP communications and collaboration tools, designed to accelerate the flow of information to transform the store experience. Now, growing businesses can take full advantage of network technology to help cut costs, enable new applications and services, and improve organizational efficiency.

Target Market

Target customers for Cisco Unified Communications Store Employee Dashboard solution include retailers who are considering migrating to IP telephony or with existing IP telephony. Users of this guide includes corporate managers, corporate finance, and corporate VPs responsible for retail store operations.

Solution Benefits

The Cisco Unified Communications Store Employee Dashboard solution facilitates many benefits to the retailer and employees. Benefits to the retailer include:

- Affordable end devices for flexible placement throughout the store.

- Reduction in time spent by store management on operational tasks such as:
 - Providing and managing scheduling information to store employees (including scheduled meal breaks, zone coverage).
 - Managing time-off requests by store employees.
 - Placing multiple outbound calls to fill shifts (for example, for employees sick calls)

Benefits to the store employee include:

- Increased accessibility to receive daily store operational information and personal scheduling information.
- Improved method for requesting time-off and receiving confirmation of request status.
- Consistent communication of corporate policy and promotional messaging to associates, regardless of shift time.
- Delivery of vendor-driven promotional and training content.
- Faster response to security-safety threats.

Scope of the Solution

The validation of the solution performed by Cisco and IPcelerate (as described in [Testing, page 35](#)) demonstrate a proof-of-concept implementation of specific services using IPcelerate IPsession within a Cisco IP telephony environment. IPcelerate IPsession is a feature-rich product with many capabilities beyond the subset of the features that comprise the Cisco Unified Communications Store Employee Dashboard solution. Implementation of the solution requires a full implementation of IPsession. IPsession enables end users to invoke various communication features from the user interface on Cisco IP phones that are base features of IPsession but were not tested within the scope of this solution. These include:

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- | | |
|-------------------------------------|-----------------------------|
| • Buddy Status | • Intercom Whisper |
| • Call Block | • Internal 911 Alert |
| • Call Tag | • IP Phone Presence |
| • Cisco IP Phone Panic Button Alert | • Location Enforcer |
| • Dashboard | • Multi-Line Join |
| • DBBackup | • My Status |
| • Dial Out | • Paging |
| • DND Call Forward All | • Photo Album |
| • DND Intercom | • PIN-Based Paging |
| • DND Paging | • Pre-Programmed Conference |
| • Do Not Disturb | • Pre-Recorded/Audio Paging |
| • Facilities Scheduler | • Pre-Scheduled Conference |
| • Forced Account Codes | • Pre-Scheduled Paging |
| • Hoot-N-Holler | • Streaming Audio |
| • Intercom | • Text Paging |
| • Intercom Text Reply | • Text-To-Speech Paging |
| | • Timecard |
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For more information on these features, refer to the IPcelerate's website:

<http://www.ipcelerate.com/ipsession.html>

Wireless is a major component of the Intelligent Retail Network reference architecture. However, no wireless components were tested in this release of the Cisco Unified Communications Store Employee Dashboard solution.

Survivable Remote Site Telephony (SRST) functionality (for example, HSRP, IPsession redundancy, WAN failures, etc) was not tested. The deployment method is a centralized server; IPsession services will not be available if a WAN failure occurs.

IPsession uses SOAP and CTI protocols for XML messaging. The Cisco Unified Communication Manager cluster should have sufficient processing resources to handle the SOAP/CTI messaging. Consult the IPcelerate/Cisco account teams for recommendations of product sizing when designing and piloting the Cisco Unified Communications Store Employee Dashboard solution for a specific retailer.

The Cisco Unified Communications Store Employee Dashboard solution was deployed and tested within three retail network environments: small, medium, and large stores. These three store models were constructed using the Cisco Intelligent Retail Network reference architectures. Each store model has varying degrees of redundancy and resiliency. The Cisco Unified Communications Store Employee Dashboard solution was tested at the Cisco lab in San Jose, CA.

The Cisco Unified Communications Store Employee Dashboard solution is a Cisco Validated Design, level 1 (CVD1), and as such, scale performance testing is not within the scope of this document.

For more information, see the following URL:

http://www.cisco.com/en/US/netsol/ns741/networking_solutions_program_home.html.

IPsession Retail Application

IPsession Retail Application is an upgrade and customized version of IPSession (version 5.0) used to manage various real time activities such as Time Card, Shift Management, Daily Deposit and Task Alerts. The intelligent mechanisms control many activities automatically (for example, when the daily deposit is not completed at the scheduled time, an alert is sent to the respective store).

This section provides a short description of the features in the IPsession Retail application.

Employees

Employees are grouped into the following categories:

- **Employees**—Application access.
- **Store Managers**—Manage single store and store specific information.
- **Area Managers**—Access to all stores.
- **Directors**—Access to all applications, manage, and administrate the system.

Stores

The Retail IPsession application allows multiple store scenarios. One IPsession server can accommodate multiple stores.

Shifts

Shifts are created for stores to allocate employees to a shift.

Timecard and Shift Management

Timecard and Shift Management provides shift allocation for employees, managing shifts, shift planner, clocking in and clocking out, shift coverage notification and shift reporting. It also provides time-off requests and approvals. The application performs clerical and accounting processing so that employees can focus on store specific activities.

Tasks Alerts

The Task Alert feature is a daily task reminder. Each task alert is sent to the store phones throughout the day as scheduled. This ensures that the employees do not forget to complete a task at a certain time on a daily basis, allowing employees to focus on better customer service. Task alert appears on Cisco IP phones as a text message along with an audible message.

Daily Deposit

Daily Deposits sends a notification to the store to enter their daily deposits. Once it is inserted, reports can be generated on daily, weekly, and monthly basis.

Administration Interface

All the retail specific applications are grouped under “IPsession Retail Store” application in the IPsession web interface. All the features are grouped under the retail specific applications.

Cisco Unified Communications Store Employee Dashboard Solution Architecture

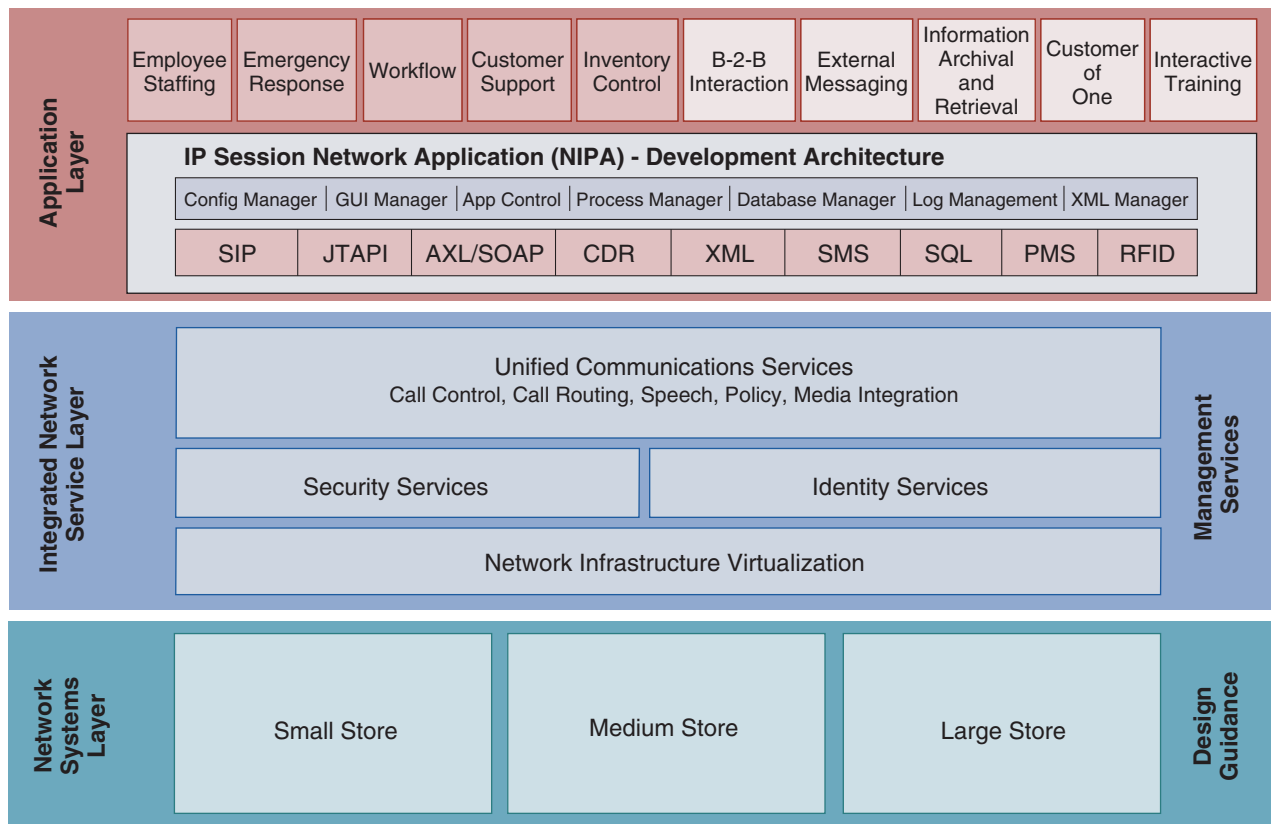
The Cisco Unified Communications Store Employee Dashboard solution architecture is a blending of Cisco's and IPcelerate's framework architectures; SONA and NIPA.

Intelligent Retail Network and the SONA Framework

The framework for the Cisco Unified Communications Store Employee Dashboard solution is based on the Cisco Service-Oriented Network Architecture (SONA), as shown in [Figure 1](#). Using a SONA framework, the Intelligent Retail Network (IRN) reference architectures serve as the foundation of the network systems layer. These network architectures exhibit best practices for retail networks and provide the robust foundation for the higher-level services and applications. For more information about IRN, see the following URL:

<http://www.cisco.com/web/strategy/retail/irn.html>.

Figure 1 Cisco Unified Communications Store Employee Dashboard Solution Framework



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Application Layer

Business and collaboration applications connect users and business processes to the infrastructure. The application layer of the framework includes the combined business and collaboration applications from Cisco and IPcelerate.

The Cisco Unified Communications suite enables collaboration through XML-based applications such as IPcelerate's IPsession. These applications are enhanced through the Cisco 7970 Series color IP phones, which have touch-screen enabled displays. IPcelerate IPsession integrates with a Cisco Unified Communications IP telephony system to provide the following capabilities:

- **Time Capture System**—Enables store employee to record daily attendance punches from any store phone.
- **Store Reminder System**—Tracks each store's functional tasks and sends out an employee reminder or manager alert if a task is not performed on-time.
- **Dial Out Shift Notifications**—Automatically assists in finding replacement shift coverage when required.
- **Daily Deposit tracking**—Provides the means for entering and communicating daily bank deposit to company management.

Using the Cisco Unified Communications Store Employee Dashboard solution, retailers can transform the IP phone into an employee terminal device that provides a cost effective way to perform daily store operations procedures (for example, time card clocking, shift/staff management, and task management) and a means for corporate/business owners to directly communicate to store employees on the sales floor without having to be relayed by store management. Application services are the connection from the applications to the shared services of the integrated network services layer.

Integrated Network Services Layer

The integrated Network Services Layer is where filtering, caching, and protocol optimization interact with applications or application middleware services to optimize the performance from the network to the end user. Process control is simplified by using common infrastructure services such as collaboration, security, and identity. These are key advantages that aid in operational reporting and security policy enforcements. Fewer services that are shared across more intelligent devices increases the operational efficiency of the whole system.

- **Voice and collaboration services**—Are created by adding the voice IOS service to the store routers, and adding Cisco Unified Communication Manager and application servers to the data center.
- **Network virtualization**—Can be viewed by the use of Cisco Integrated Services Routers (ISRs), which virtualize store security appliances, routers, switches, and voice and application services into intelligent IT appliances that are centrally managed and monitored.
- **Security services**—Are used extensively in the IRN architectures. These services are a combination of in-store security services shared across multiple physical devices, central management in the data center, and virtual access to the security control plane from anywhere in the retail network.
- **Identity services**—are used to ensure that access to each application is allowed only for authenticated and authorized management users. A central Microsoft Active Directory enhances secure identity services to both Cisco and IPcelerate suites.

**Note**

For more information about securing IRN architectures, refer to the *PCI Solution for Retail Design and Implementation Guide* at the following URL: http://www.cisco.com/web/strategy/retail/pci_imp.html. This guide describes services that can be used to provide a secure posture for the Cisco Unified Communications Store Employee Dashboard solution.

The integrated network services layer provides services that are distributed across the infrastructure layer.

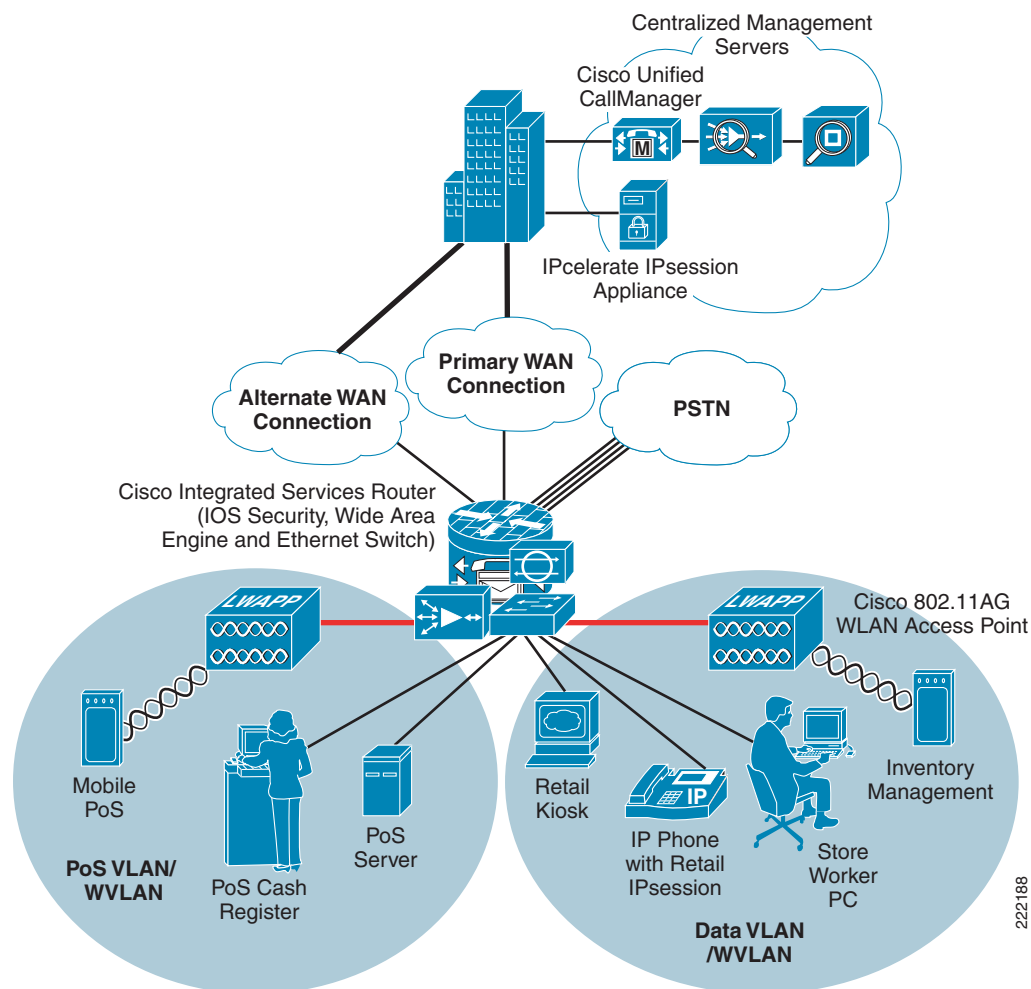
Intelligent Retail Network Store Architectures and the Infrastructure Layer

Small Store

The small store reference architecture (see [Figure 2](#)) is a powerful platform for running an enterprise retail business that requires simplicity and a compact form factor. This combination appeals to many different retail formats that can include the following:

- Mall-based retail stores
- Quick-serve restaurants
- Convenience stores
- Specialty shops
- Discount retailers who prefer network simplicity over other factors

This network architecture is widely used, and consolidates many services into fewer infrastructure components. The small store also supports a variety of retail business application models because an integrated Ethernet switch supports high-speed LAN services.

Figure 2 Small Store Network Design

Primary Design Requirements

Primary design requirements are as follows:

- Store size averages between 2000 to 6000 square feet
- Fewer than 25 devices requiring network connectivity
- Single router and integrated Ethernet switch
- Preference for integrated services within fewer network components because of physical space requirements

Advantages

Advantages are as follows:

- Lower cost per store
- Fewer parts to spare
- Fewer software images to maintain
- Lower equipment maintenance costs

Limitations

Limitations are as follows:

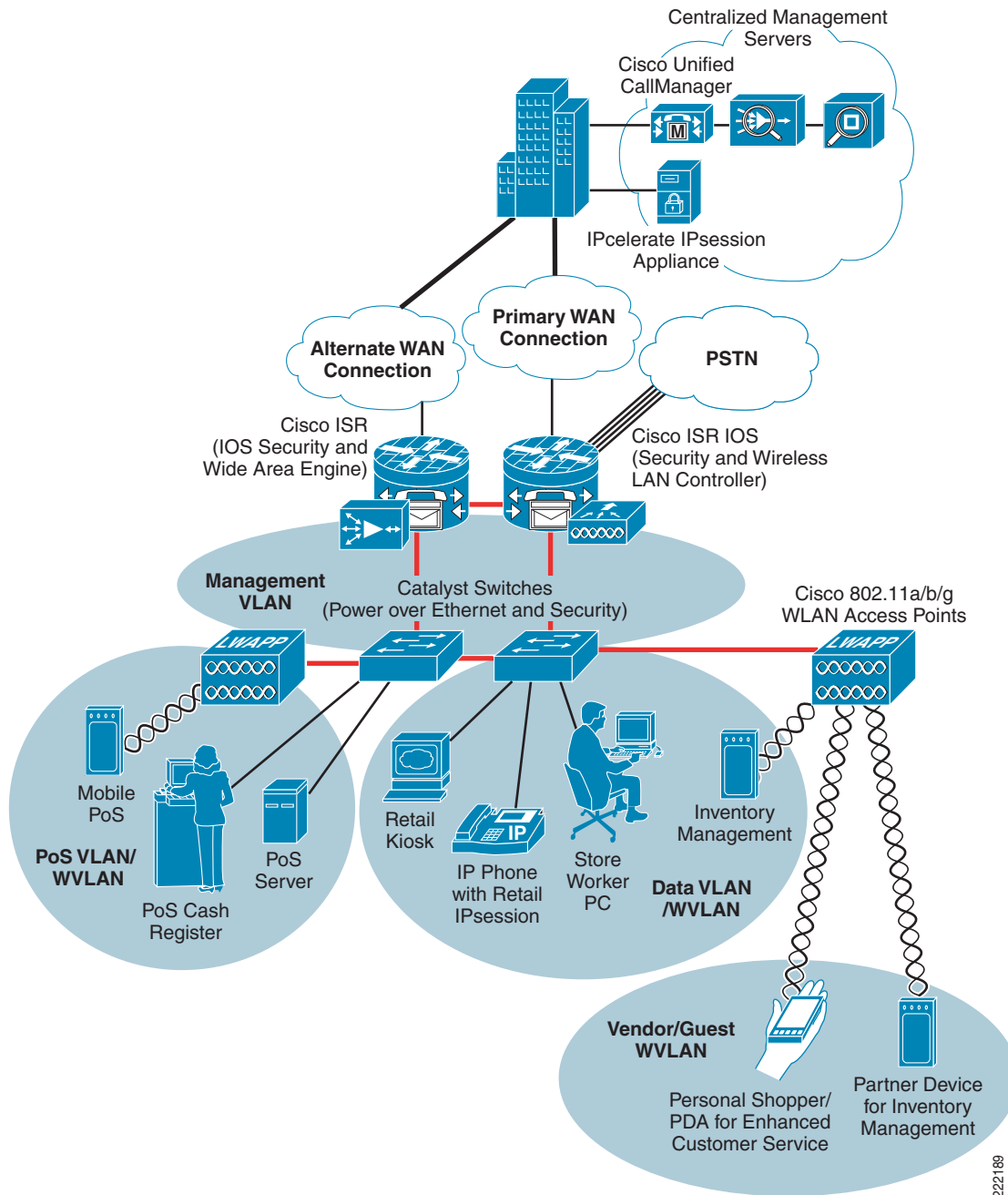
- Decreased levels of network resilience
- Greater potential downtime because of single points of failure

Medium Store

The medium retail store reference architecture (see [Figure 3](#)) is designed for enterprise retailers who require network resilience and increased levels of application availability over the small store architecture and its simple, single-threaded approach. As more mission-critical applications and services converge onto the IP infrastructure, network uptime and application availability are more important. The dual-router and dual-LAN switch design of the medium store supports these requirements. Each of the ISR routers can run Cisco IOS security services and other store communication services simultaneously. Each of the ISR routers is connected to a dedicated WAN connection. Hot-Standby Routing Protocol (HSRP) is used to ensure network resilience in the event that the network connection fails.

The access layer of the network offers enhanced levels of flexibility and more access ports compared to the small store. The distributed Cisco Catalyst switches can support a combination of larger physical buildings or a larger number of endpoints than the small store.

Figure 3 **Medium Store Network Design**



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Primary Design Requirements

Primary design requirements are as follows:

- Store size averages between 6,000 to 18,000 square feet
- Physical size of store is smaller than a large store, so a distribution layer of network switches is not required
- Number of devices connecting to the network averages between 25 and 100 devices

Advantages

Advantages are as follows:

- More adaptive access layer with support for a greater number of endpoints and more diverse building requirements (multiple floors, sub-areas, and so on)
- Multiple routers for primary and backup network requirements
- Improved network resilience through parallel device design
- Improved network and application availability through parallel paths

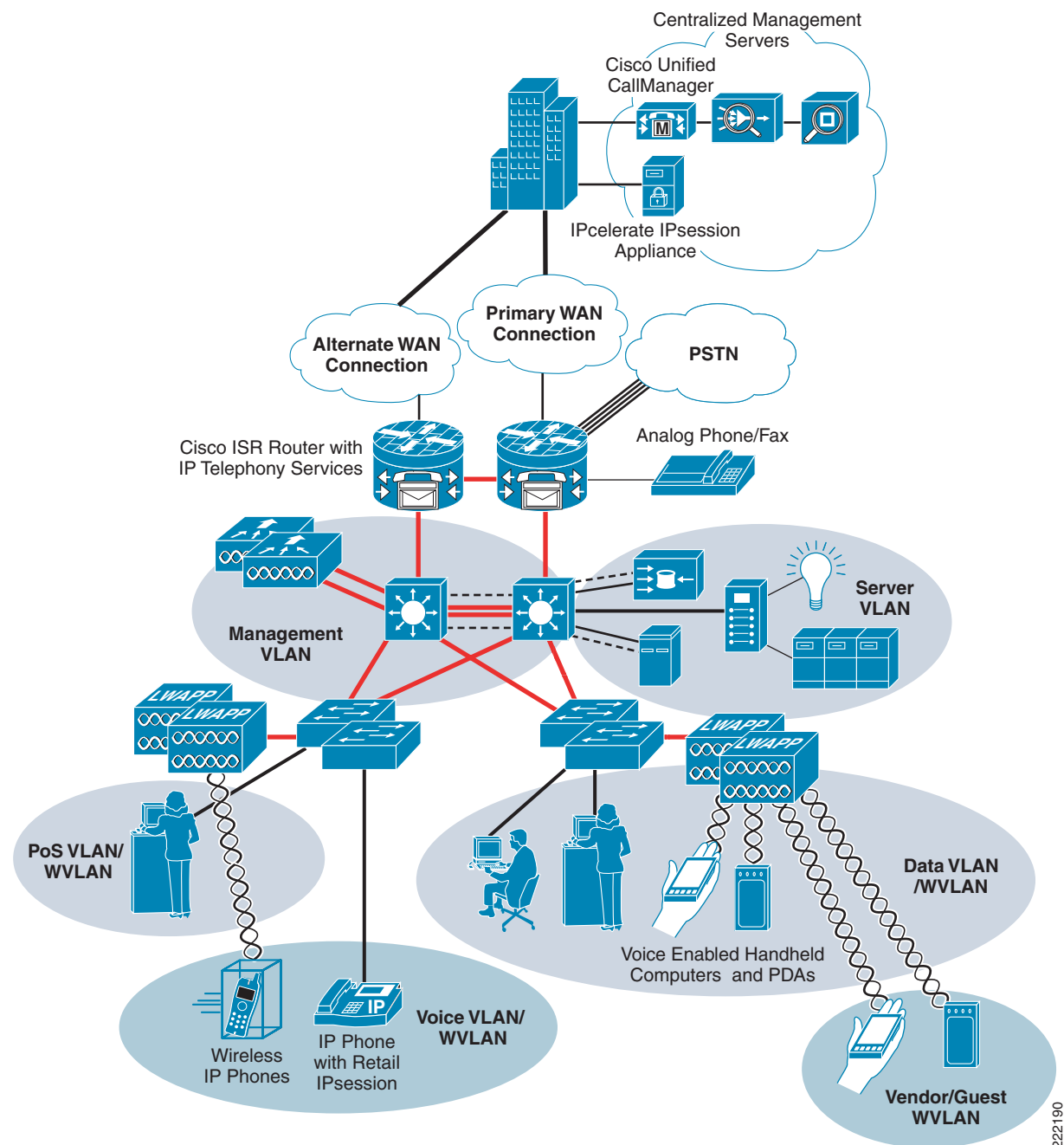
Limitations

The limitation is of this architecture is that there is no distribution layer between core layer (the ISR) and the access layer switches.

Large Store

The large retail store reference architecture (see [Figure 4](#)) takes some of the elements of Cisco campus network architecture recommendations and adapts them to a large retail store environment. Network traffic can be segmented (logically and physically) to meet business requirements. The distribution layer of the large store architecture improves LAN performance while offering enhanced physical media connections. A larger number of endpoints can be added to the network to meet business requirements. This type of architecture is widely used by large-format retailers globally. Dual routers and distribution layer media flexibility improves network serviceability because the network is highly available and scales to support the large retail store requirements. Routine maintenance and upgrades can be scheduled and performed more frequently, or during normal business hours, through this parallel path design.

Figure 4 **Large Store Network Design**



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Primary Design Requirements

Primary design requirements are as follows:

- Store size averages between 15,000 to 150,000 square feet
- More than 100 devices per store requiring network connectivity
- Multiple routers for primary and backup network requirements
- Preference for a combination of network services distributed within the store to meet resilience and application availability requirements
- Three-tier network architecture within the store; distribution layer switches are used between the central network services core and the access layer connecting to the network endpoints (point-of-sale, wireless APs, servers, etc.)

Advantages

Advantages are as follows:

- Highest network resilience based on highly available design
- Port density and fiber density for large retail locations
- Increase segmentation of traffic
- Scalable to accommodate shifting requirements in large retail stores

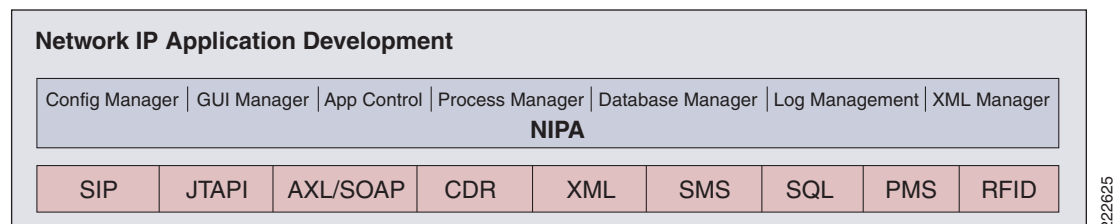
Limitations

The limitation of this architecture is higher cost because of network resilience based on highly available design.

IPsession Architecture Framework

The Network IP Application (NIPA) Framework, shown in [Figure 5](#), provides a basic set of abstractions and Application Programming Interfaces (APIs) to enable the management of a suite of IP communications applications. The NIPA Framework is used by all components of the IPsession suite of capabilities, as well as other XML-based applications for Cisco's IP Communication solution.

Figure 5 *IPsession NIPA Framework*



[Figure 5](#) illustrates the interfaces to applications and the Cisco IP Communications environment. Not only does the NIPA Framework provide a foundation for the capabilities developed by IPcelerate, Inc., the foundation can also be leveraged by other companies to easily integrate their own capabilities to the IPsession server. Linking Cisco IP Phones with other IT investments already deployed in an organization

increases the value of IP communications. The NIPA Framework allows organizations to link an IP communications environment with time-and-labor systems, databases (SQL, Oracle, and SAP), CRM applications, RFID technologies, physical security systems, HVAC systems, web services, and more.

Cisco Unified Communications Store Employee Dashboard Solution—Components and Services

Solution Components

The following components are required to implement the Cisco Unified Communications Store Employee Dashboard solution:

- **IPsession Retail Application**—This is an upgrade and customized version of IPsession (version 5.0). It is the customized solutions for Cisco retail store to manage various real-time activities like time card, shift management, daily deposit, task alerts to accelerate day-to-day business processes, and focus more on customer satisfaction. Its intelligent mechanism controls many activities automatically (for example, when daily deposit is not entered by the scheduled time, it will send the alert to the appropriate store representative).
- **Cisco Unified Communication Manager**—This is the core call-processing software for Cisco IP Telephony. It builds call processing capabilities on top of the Cisco IP network infrastructure. Cisco Unified Communication Manager software extends enterprise telephony features and capabilities to packet telephony network devices such as IP phones, media processing devices, voice gateways, and multimedia applications.
- **7970 IP Phone**—IP phones have all the functions expected from a telephone, as well as more advanced features including the ability to access XML-based applications.

Hardware/Software

[Table 1](#) lists the hardware/software products installed for the Cisco Unified Communications Store Employee Dashboard solution.

Table 1 *Hardware/Software Installed*

Solution Component	Software Version	Solution Location
IPcelerate IPsession 200 Appliance	5.0	Data Center
Cisco Unified Communication Manager	5.1.2.1000-11	Data center
Cisco 7970G IP Phone	SCCP70.8-2-2SR2S	All stores
Optimization Component	Software Version	Solution Location
CiscoSecure Access Control Server	4.1(3) Build 12	Data center
Cisco ISR 3845	12.4.9T–Adv IP Services	Large store
Cisco ISR 3825	12.4.9T–Adv IP Services	Medium store
Cisco ISR 2821	12.4.9T–Adv IP Services	Small store
Catalyst 4500	12.2(20)EW 3	Large store

Table 1 **Hardware/Software Installed (continued)**

Catalyst 3750G	12.2.25-SEE2-IP Services + Web-based Dev Mgr	Large and medium store
Microsoft Products	Software Version	Solution Location
MS Active Directory on Windows 2003 Server	5.2.3790.3959	Windows 2003 Server in data center
Internet Explorer 6	6.0.2900.2180 with SP2	XP SP2 desktop in data center
Internet Explorer 7	7.0.5730.11CO	Windows 2003 Server in data center
Microsoft Windows 2003 Server Standard Edition SP2	5.2 R2 Build 3790.srv03_sp2_gdr.070304-2240	Solution servers

Services and Functionality

Table 2 lists the services that were enabled to optimize IPsession within the Cisco network environment

Table 2 **Services Enabled**

Cisco Feature	Platform/Software Release
QoS	ISR 2821, 3825 and 3845 IOS 12.4.9T
Multicast	ISR 2821, 3825 and 3845 IOS 12.4.9T

Limitations and Caveats

This solution does not introduce any additional known caveats or limitations to existing product documentation.

Designing the Cisco Unified Communications Store Employee Dashboard Solution

The Cisco Unified Communications Store Employee Dashboard solution provides a proof-of-concept implementation of IPsession within a Cisco Unified Communication Manager and VoIP network. The small, medium, and large Intelligent Retail Network reference architectures provide a “real world” retail contextual backdrop for this solution. Each IRN store is centrally connected to a data center with traditional data center services such as DNS and NTP, as well as Cisco Unified Communication Manager and the IPsession Appliance. This is a cost-effective implementation that leverages a highly available data center staffed with trained personnel and minimizes the number of additional servers required throughout the network.

A number of servers and workstations were implemented as VMware Server virtual machines. This allowed greater flexibility within the lab environment and aligns with industry trending towards greater virtualization. Dedicated hardware and increased resources may be required for more consistent performance in larger implementations.

**Note**

When designing the Cisco Unified Communications Store Employee Dashboard solution, special consideration must be made to retailers that have existing Unified Communication deployment. IPsession uses SOAP and CTI protocols for XML messaging. The Cisco Unified Communication Manager cluster should have sufficient processing resources to handle the SOAP/CTI messaging. Consult IPcelerate/Cisco account teams for recommendations of product sizing when designing and piloting the Cisco Unified Communications Store Employee Dashboard for a specific retailer.

IPcelerate

This section provides guidance around the IPsession application features.

Employees

Employees need to be created in the IPsession Retail Application. Three unique forms of identification exist for all people that interact with this application:

- Existing Retailer Organizational ID—This is the existing value that a retailer uses to identify its employees before the solution was introduced.
- USER ID—An alphanumeric value that is associated with employee to login to the appliance web interface. It is recommended that the user ID match the existing retailer organizational ID to reduce management overhead.
- EMPLOYEE ID—A numerical value that is associated with the employee to sign on to the phone. This numbers only identification simplifies the sign on process of the phone.

**Note**

IPcelerate enabled the phone employee login entry numerical so that it would be easier to enter via the phone’s interface. The user would not have to scroll through the keys for the correct alphabet digit on the initial form selection.

Employees are assigned to a store as a primary workplace.

Stores

Each store has a store manager and a group of employees. Employees work on shifts in a store. A list of IP phones are assigned to the stores. Task alerts are sent to the store phones. All store specific events or notifications are sent to the store manager's cell phone or desk phone.

Shifts

Shifts are created for stores to allocate employees to a shift.

Timecard and Shift Management

Shift Management is the application for managing the shifts and Timecard allows employees to clock-in and clock-out. There are two types of the shift process;

- **Assigned Shift**—Shifts must be created prior to the employee assignment. Shifts must be allocated to the employee by managers prior to the employee's ability to clock-in.
- **Unassigned Shift**—Employees can clock-in on an ad-hoc basis, if that shift is not already allocated. This requires manager approval after the employee signs in and will not be reported to payroll report unless it is approved by the manager.

Timecard and Shift Management is accessible from both the IPsession web interface and Cisco IP phone services interface.

Tasks Alerts

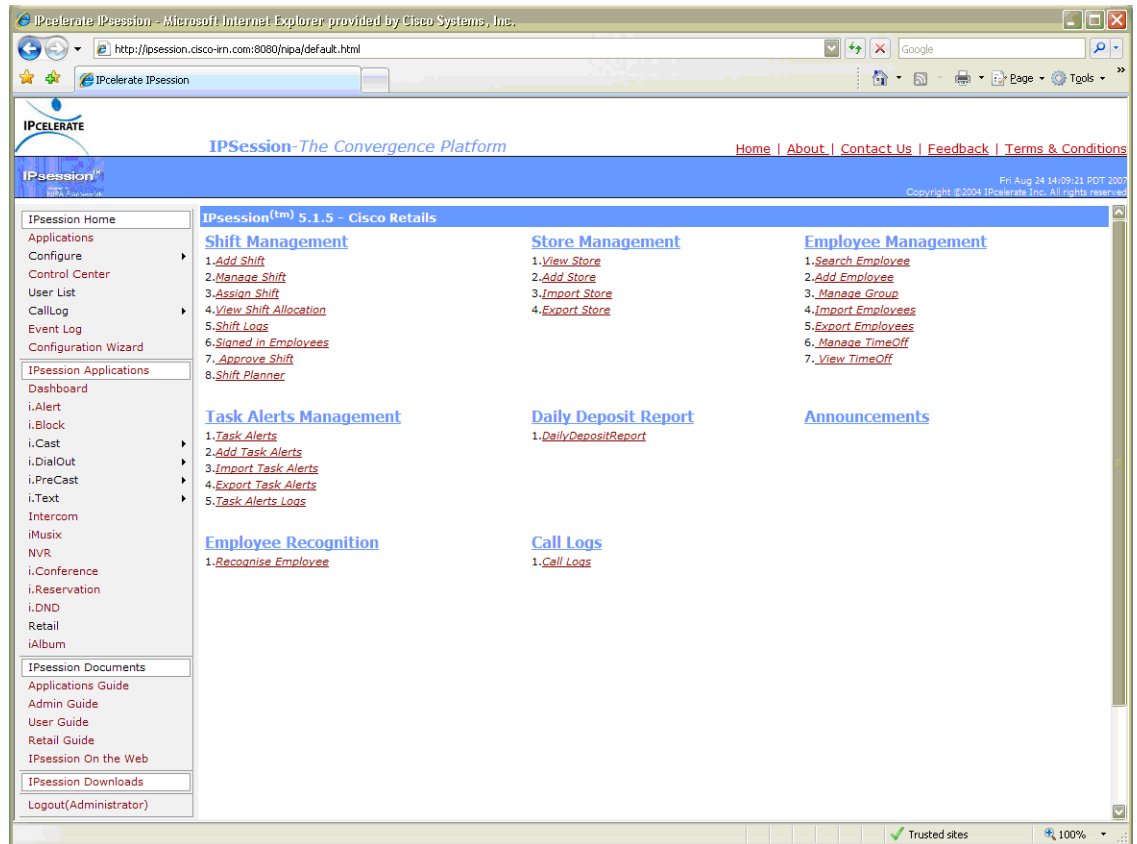
Once a task alert is displayed on the store phone, employees have to acknowledge the tasks by entering their employee ID. If a task alert goes unacknowledged for five minutes (configurable time setting), it will resend the task alert in combination with escalation to the manager. The escalation is sent to the store manager on his cellular phone. If it is still not acknowledged, it performs a final escalation to a globally configured user ID.

Daily Deposit

The Daily Deposit function sends a daily notification to the store phones to enter their daily deposits. The time of the notification is configurable. Reports can be generated on daily, weekly, and monthly basis.

Administration Interface

All the retail specific features are grouped under "IPsession Retail" application in the IPsession web interface. All the features are grouped under the retail specific applications. Navigate through the links for configuration and administration purposes as shown in [Figure 6](#).

Figure 6 **Retail Applications**

Cisco

The Cisco Unified Communications Store Employee Dashboard solution consists of an IPcelerate IPsession appliance and Cisco Unified Communication Manager and IP phones. To facilitate the testing of this solution, additional Cisco components were used to provide a retail network infrastructure context. A simulated retailer was created, complete with a data center and three stores: small, medium, and large. This environment provided the services and enhancements described in the following sections that contributed to the performance, security, and management of the solution.

Intelligent Retail Network

The small, medium, and large stores were built to the specifications of the IP telephony designations of the Intelligent Retail Network reference architectures. Each store consists of access routing, switching, and security services. For additional information on the Intelligent Retail Network, see the following URL: <http://www.cisco.com/web/strategy/retail/irn.html>.

Unified Communications

The following components were used:

- Cisco Unified Communication Manager

The Unified Communications implementation was a default installation of Cisco Unified Communication Manager 5.1. It is assumed that an actual retailer would implement a clustered implementation of Cisco Unified Communication Manager. For additional guidance on installing the Cisco Unified Communications, see the following URL:

http://www.cisco.com/en/US/products/sw/voicesw/ps556/prod_installation_guide09186a0080792e5e.html.

- VoIP phones

The solution used G7.29a as the compression protocol for phone calls over the WAN, and Skinny Call Control Protocol (SCCP) as the telephony control protocol. SCCP is required because the firmware image is smaller than the SIP firmware image. Multicast audio streamed to the phones for Task Alert used G7.11 protocol. Current phones lack sufficient memory to support XML applications in the larger SIP image.

Quality of Service

The Cisco Unified Communications Store Employee Dashboard solution can potentially be a disruptive technology if not provisioned correctly because the application and media is bandwidth consumptive (see [Performance](#), page 37).

Using quality-of-service (QoS) protects the retailer's enterprise POS, voice, and media traffic from being disturbed by other forms of consumptive traffic. The following configurations were used consistently across the small, medium and large stores.

QoS in this solution is implemented as Class-Based Weighted Fair Queueing (CBWFQ) with priority express forwarding for the voice traffic (see [Table 3](#)). Policy maps are used to classify traffic inbound on LAN interfaces and to queue traffic outbound on WAN interfaces. Common performance issues today are often the result of misbehaving applications generating excessive traffic. By properly classifying and queuing network traffic, performance can be greatly improved. Through the use of QoS and multicast, retailers can remain extremely conservative on their WAN bandwidth provisioning.

The method of QoS used in the testing lab was based on the *Cisco Enterprise Quality of Service* reference design. For more information on QoS, see the following URL:
www.cisco.com/univercd/cc/td/doc/solution/esm/qossrnd.pdf

Table 3 *Cisco Enterprise Quality of Service*

QoS Baseline Model	Description
Voice	Voice in Low Latency Queue - Priority
Interactive-Video	Video conferencing in Low Latency Queue - Priority
Streaming-Video	IPTV Streaming Video
Call-Signaling	Bandwidth guaranteed for Call-Signaling
IP Routing	Routing bandwidth guarantee
Network-Management	Network Management bandwidth guarantee
Mission-Critical Data	Identified Mission Critical Data (i.e., POS, timeclock, etc.)
Transactional Data	Transactional Data Applications (i.e., IPsession , Remote desktop, etc.)

Table 3 **Cisco Enterprise Quality of Service (continued)**

Bulk Data	General background transfer traffic (i.e., File Transfers, E-mail, TFTP, etc.)
Best-Effort	All other traffic not identified
Scavenger	Undesired traffic (i.e., point-to-point file sharing, napster, etc.)

Task Alert Multicast Audio Message

The Cisco Unified Communications Store Employee Dashboard solution uses several types of communication. Multicast is used to send audio messaging. Task Alert message uses roughly 92 kbps of WAN bandwidth. See [Quality of Service Implementation, page 31](#) and [Multicast Implementation, page 33](#) for optimization services that mitigate the traffic impact of the solution.

For example, assume a retailer wants to deploy the Cisco Unified Communications Store Employee Dashboard solution within its stores. The retailer has 100 stores with 10 phones in each store. Without multicast enabled, 1000 audio streams (100x10) would be sent from the central IPsession appliance. With multicast enabled, the central IPsession appliance multicasts a single audio stream to each store router (100 audio streams total in this example) and allows the local store router to replicate the streams to the phones. This avoids taxing the valuable WAN bandwidth.

Multicast is a complex topic with varying degrees of design concerns for individual retailers. This document provides configuration examples that were used to provide multicast functionality within the lab. For additional multicast design guidance, see the following URL:

http://www.cisco.com/en/US/tech/tk828/tech_design_guides_list.html

Security

Security is an integral component of all retail networks requiring adherence to industry regulations such as the Sarbanes-Oxley Act of 2002 (SOX) and Payment Card Industry (PCI). Additional retail-focused security recommendations are located the *PCI Solution for Retail Design and Implementation Guide* at the following URL:

<http://www.cisco.com/web/strategy/retail/pci.html>

Segmentation for security purposes occurs in all locations. Within each store, retail traffic is segmented by type (such as point-of-sale, wireless, voice, and so on), and assigned an appropriate VLAN. The store ISR protects these segments with integrated Cisco IOS security features, such as packet filtering, stateful inspection firewall, NAT, IPS, and other services, applied as appropriate. Within the data center, segmentation and firewalling is implemented between data center services such as IPsession Directory, Cisco Unified Communication Manager, DNS, NTP, and so on. Management of network devices is secured using Access Control Server and Active Directory.

This guide identifies the ports and protocols used by IP telephony with Cisco Unified Communication Manager and the IPcelerate IPsession application. These services can then be accommodated in specific implementations as needed.

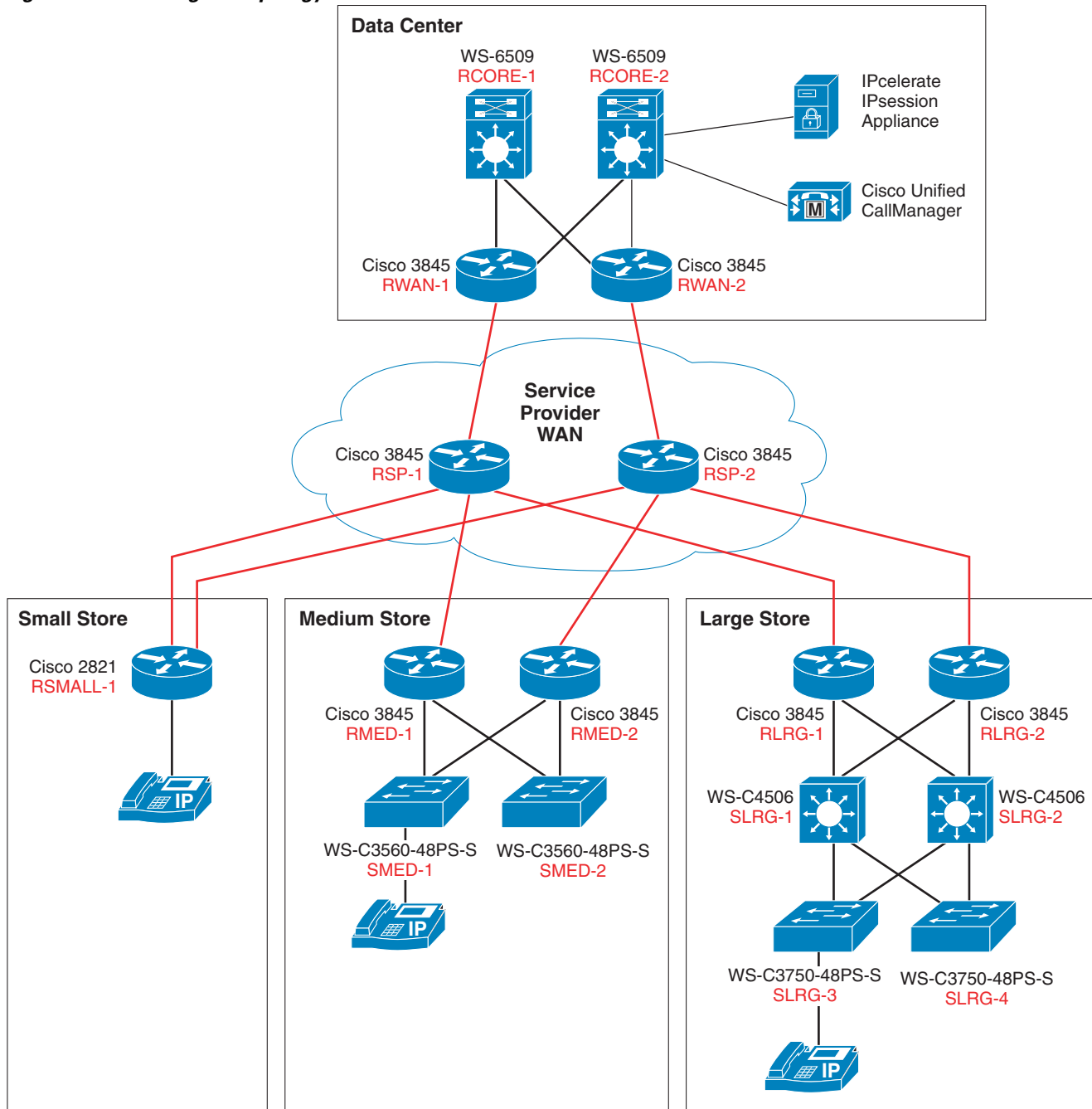
Implementing and Configuring the Solution

The Cisco Unified Communications Store Employee Dashboard solution was implemented and validated as a proof-of-concept. Testing involved the validation of functionality using 7970 Cisco IP phones within a centralized Cisco Unified Communication Manager 5.1.2 environment. An IPcelerate IPsession appliance with an IPsession Retail image was centrally located in the data center. The goal of the testing was to articulate the functionality of the Retail module features of IPsession.

Topology

The small, medium, and large Intelligent Retail Network reference architectures provide a “real world” retail contextual backdrop for this solution. Each IRN store was centrally connected to a data center with traditional data center services such as domain name service (DNS) and Network Time Protocol (NTP), as well as Cisco Unified Communication Manager and the IPsession Appliance. The logical topology of the validation lab is represented in [Figure 7](#). For specific places in the network details, see [Appendix B—Network Diagrams, page 46](#).

Figure 7 **Logical Topology**



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Testing Tools

Table 4 lists and describes the testing tools used.

Table 4 **Testing Tools**

Testing Tool	Function
IPerf	IPerf is a traffic generation utility. It was used to create both multicast UDP traffic as well as session-based TCP traffic simulating an FTP file transfer and web traffic stream.
Ethereal	Network traffic analyzer

Configuration Task Lists

IPcelerate IPsession Configuration

The following are considerations for configuring the IPsession retail solution. It is recommended the configuration be performed in the following sequence:

- Server Configuration
- Store Configuration
- Employee Configuration

The following are parameters for each area:

Server Configuration

Retail Configuration Parameters

This section provides the IPsession Retail specific configuration parameters. From IPsession web interface, select **Configure->IPsession Retail Store** to set the parameters. Set the appropriate values for these parameters as displayed in Table 5. For IPsession Server configuration refer to IPsession manual.

Table 5 **IPcelerate Configuration**

Parameter	Description
Vendor Name	Name of the franchisee; for example, Cisco Retail.
Application Name	Name of the combined application; for example, IPsession Retail. This will appear in the web and phone interface.
Daily Deposit Text Ring	Select a ring tone that will be played when the daily deposit reminder is sent to the phone.
Notify When Deposit Entered	Set to TRUE, if a alert will be sent to the managers.
Perform Daily Deposit At	Time when daily deposit reminder will be delivered.
Daily Deposit Escalate Interval	Time interval after which a second reminder is delivered.
Task Alert Escalate Interval (First Time)	Time interval after which the task is escalated to the store manager.

Table 5 *IPcelerate Configuration (continued)*

Task Alert Escalate Interval (Second Time)	Time interval from first in escalation when it will further be escalated.
Task Escalate first escalate Tone	Select a ring tone when the task will be escalated for the first time.
Task Escalate second escalate Tone	Select a ring tone when task will be escalated for second time.
Task Escalate User id	Select a user id who will receive the <i>Task</i> second escalation messages.
Timecard Escalate Interval	An interval after which an employee do not sign in.
Notify Timecard threshold To	When an employee exceeds the weekly maximum allowed shift duration, send an escalation to call to this user.
Inbound Call Time	Time duration for an inbound external call after which it should be terminated.
Outbound Call Time	Time duration for an outbound external call after which it should be terminated.
Enable In/Out bound Call	True—Enable the feature to disconnect external call after it reaches certain duration.
Call Termination Alert tone	When the call terminated this ring tone is played prior to the termination of the call.
Maximum time limit for sign in	How long an employee can sign in after the shift has been started.
Maximum Shift Extension Duration	Maximum hours an employee can enter for shift extension request.
Prior Shift Sign in Limit	When an employee can sign in a shift before it's schedule time.
Maximum UnAssigned Shift Duration	When an employee chooses to sign in a shift he cannot request more than this time to sign in an unassigned shift.
Minimum Shift Duration	When shifts are created from the web interface, it can not be less than this time.
No. Of Weeks For Payroll Report	Payroll report is calculated based on the number of weeks.
Shift Coverage for Employees	When shift coverage is initiated it sends the request to the employees based on this configuration. It sends the shift coverage request to store managers and area directors irrespective of this configuration.
Select the Day to Start on Week	Weekly start date for payroll report if this is not Sunday.

Stores

Create stores using the Administration Screen. The fields shown in [Table 6](#) need to be filled-in.

Table 6 *Store Parameters*

Parameter	Description
Store Name	Name of the store.
Add1	Street or road name.
Add2	Suite or floor number.
City	City name.
State	State name.
Country	Select the country. Currently it is set to United State only.
Zip Code	Zip code for the store.
Tel No	Telephone number of the store.
Fax No.	Fax number of the store.
Email Addr	Email address of the store.
Store Manager	Select a store manager for this store.

These stores can also be imported via an Excel spreadsheet. Refer to the *IPcelerate's Retail Administration Guide* for correct procedures.

Employees

In preparation for the employees being created, it is recommended that the following employees' information is listed on an Excel spreadsheet:

- First Name
- Last Name
- Store to assign to
- Logon ID (for example, Adam Johnson could be AJohnson)
- PIN Number (for example, last five numbers of social security number or company employee number)

Table 7 *Configuration Parameters*

Parameter	Description
Employee ID	Employee identification number. It has to be unique for each employee.
First Name	Enter first name of the employee.
Last Name	Last name of the employees.
Login	User ID of the employee. User ID should be unique in IPsession server. If there are already existing employees with the same ID, it will overwrite all the information.
Password	Password of the employee. It will be required to login on the web interface.
Retype Password	Enter the password again.

Table 7 Configuration Parameters (continued)

Gender	Male or Female.
Add1	Street or road name of the employees residential address.
Add2	Additional address information.
City	Employee's city of residence.
State	Employee's state of residence.
Zipcode	Employee's zip code of residence.
Country	Select the country. Currently it is set to United State only.
Tel (R)	Employee's home phone number.
Mobile	Employee's mobile phone number.
Email	Employee's Email address, if any.
Allocate Store	Select the store where the employee will work primarily.

These employees can also be imported via an Excel spreadsheet. Refer to the *IPcelerate's Retail Administration Guide* for correct procedures.

Cisco Unified Communication Manager Server

Cisco Unified Communication Manager was installed using the current implementation guide available at the following URL:

http://www.cisco.com/en/US/products/sw/voicesw/ps556/prod_installation_guide09186a0080792e5e.html.

The following steps outline the setup of Cisco Unified Communication Manager:

-
- | | |
|---------------|--|
| Step 1 | Installed Cisco Unified Communication Manager server 5.1.1.3000 and added service pack 5.1.2.1000 using MCS7845-H server. |
| Step 2 | Created small, medium, and large device pools representing each store location. |
| Step 3 | Added gateway routers and endpoint ports for small, medium, and large store routers. |
| Step 4 | Added phones and assigned appropriate dial plan, partitions, translations, locations, and SRST settings |
| Step 5 | Verified SNMP settings for read-only access. |
| Step 6 | Added new Cisco Unified Communication Manager phone service for the IPcelerate IPsession Directory Service: LS IPsession. |
| Step 7 | Service URL: http://IPcelerate.cisco-irn.com:8080/nipa/NIPAXML.jsp?d=#DEVICENAME# |
-

Existing Resources

The following resources were existing: Microsoft Active Directory Domain controller server

Implementation Guidance

The IPsession Server is a complex product with many configuration options. IPcelerate professional services are required to properly install and integrate this solution.

IPsession Retail Applications FAQs

Dialout

- Q.** How many calls can the i.DialOut application make simultaneously?
- A.** The number of simultaneous calls is directly proportional to the number of CTI ports created for that application. The number of simultaneous calls does not have to equal the number of CTI ports created, but it should not exceed the number of the number of CTI ports.
- Q.** Can I create a new, or not use, the header message for the i.DialOut message?
- A.** You can create a new message using the i.NVR application to be used as a new header file. A header file must be used so a silent, short audio file can be created to use as a header for this scenario.

Task Alert

- Q.** How many devices can receive Alerts?
- A.** The only devices that can receive alerts are the IPsession licensed devices, however there is not a limit of licensed devices that can receive alerts. If a device configured to receive alerts triggers an alert, that device does not then receive its own alert.
- Q.** Can the displayed information be modified to show different fields of information?
- A.** Adding additional fields is not supported with the Task Alert application. Using the provided templates administrators can supply the information per each phone.

Announcements

- Q.** What format can the audio file be saved as?
- A.** The audio files recorded through the i.NVR application are saved only in a .au file format. The names of the files may be modified but the file type may not.
- Q.** Can the i.NVR directory number be dialed from an external number?
- A.** The i.NVR CTI port can be configured with a DID DN which will allow external incoming calls to initiate this application. If the DN is known, it can be reached from the Unity messaging system if available.

Timecard

- Q.** Can a user clock in from any phone or does it have to be a specific phone?
- A.** A user can clock into any phone that has the service subscribed to this phone. Users also do not have to clock out using the same phone that they initially clocked in on.

Troubleshooting

Dialout

Problem The application calls a phone but it drops quickly before anyone has time to answer.

Solution Make sure that the CTI ports created allow for the type of call being made (locally, internally, and long distance) by verifying the Calling Search Space, Partition, and other like parameters.

Problem The header message and/or media file is not being played.

Solution Verify the file type of the message not being played. Dial-out only supports **.au** files to be used.

Solution Verify that the Max Call Duration is set high enough for the entire message to be played.

Task Alert

Problem One or more phones do not receive the alert.

Solution Verify that in the user profile that the MAC address and DN associated to that users profile matches the phone they are using.

Solution Verify that the users phone is licensed by IPsession (associated to the IPsession CTI user in Call Manager).

Announcements

Problem The Employee ID entered is being rejected.

Solution The Employee IDs that are being used must be unique from user to user, verify that the Employee ID being entered is unique.

Solution The Employee ID must be followed by the '#' key to continue.

Problem The phone number the message is being sent to is not receiving the message.

Solution The phone number entered through the i.NVR application must be entered in exactly how you would dial it from an IP phone, this includes any digits needed to gain outside access and any long distance codes

Solution Verify that the number being dialed is not being blocked (i.e. International and long distance numbers.)

Timecard

Problem Cannot clock in.

Solution Verify that the IP phone is subscribed to the Employee Dashboard service.

Solution Verify that the login credentials used are accurate.

Solution Verify that employee is associated to any one of stores.

Solution Verify that employee groups are associated to employee.

Cisco Services Configuration

Quality of Service Implementation

The Unified Communication Media Display solution can potentially be a disruptive technology if not provisioned correctly because the application and media is bandwidth consumptive (See Performance Section).

The use of QoS protects the retailer's enterprise POS, voice, and media traffic from being disturbed by other forms of consumptive traffic. The following configurations were used consistently across the small, medium, and large stores:

```
ip access-list extended MISSION-CRITICAL-SERVERS
remark ---POS Applications---
permit ip 192.168.52.0 0.0.0.255 any
permit ip any 192.168.52.0 0.0.0.255
ip access-list extended TRANSACTIONAL-DATA-APPS
remark ---IPcelerate Application---
permit ip host 192.168.46.92 any
permit ip 225.3.15.0 0.0.0.255 any
permit ip any host 192.168.46.92
permit ip any 239.192.0.0 0.0.0.255
permit ip any host 239.255.255.250
remark ---Remote Desktop---
permit tcp any any eq 3389
permit tcp any eq 3389 any
ip access-list extended BULK-DATA-APPS
    remark ---File Transfer---
    permit tcp any eq ftp any
    permit tcp any eq ftp-data any
    permit tcp any any eq ftp
    permit tcp any any eq ftp-data
    remark ---E-mail traffic---
    permit tcp any any eq smtp
    permit tcp any any eq pop3
    permit tcp any any eq 143
    permit tcp any eq smtp any
    permit tcp any eq pop3 any
    permit tcp any eq 143 any
    remark ---other EDM app protocols---
    permit tcp any any range 3460 3466
    permit tcp any range 3460 3466 any
    remark ---messaging services---
    permit tcp any any eq 2980
    permit tcp any eq 2980 any
    remark ---Microsoft file services---
    permit tcp any any range 137 139
    permit tcp any range 137 139 any
ip access-list extended NET-MGMT-APPS
remark - Router user Authentication - Identifies TACACS Control traffic
permit tcp any any eq tacacs
permit tcp any eq tacacs any

class-map match-all VOICE
match ip dscp ef                ! IP Phones mark Voice to EF
class-map match-all INTERACTIVE-VIDEO
match ip dscp af41 af42         ! Recommended markings for IP/VC
class-map match-any CALL-SIGNALING
match ip dscp cs3              ! Call-Signaling marking
```

```

class-map match-all ROUTING
match ip dscp cs6          ! Routers mark Routing traffic to CS6
class-map match-all NET-MGMT
match ip dscp cs2          ! Recommended marking for Network Management
class-map match-all MISSION-CRITICAL-DATA
match ip dscp 25           ! Interim marking for Mission-Critical Data
class-map match-all TRANSACTIONAL-DATA
match ip dscp af21 af22    ! Recommended markings for Transactional Data
class-map match-all BULK-DATA
match ip dscp af11 af12    ! Recommended markings for Bulk Data
class-map match-all SCAVENGER
match ip dscp cs1          ! Recommended marking for Scavenger traffic

class-map match-all BRANCH-MISSION-CRITICAL
match access-group name MISSION-CRITICAL-SERVERS

class-map match-any BRANCH-BULK-DATA
match protocol tftp        ! Identifies TFTP traffic - Retailers
match protocol nfs         ! Identifies NFS traffic - Retailers
match access-group name BULK-DATA-APPS ! ACL to reference

class-map match-any BRANCH-TRANSACTIONAL-DATA ! Must use "match-any"
match protocol citrix      ! Identifies Citrix traffic
match protocol ldap        ! Identifies LDAP traffic
match protocol telnet      ! Identifies Telnet traffic
match protocol sqlnet      ! Identifies Oracle SQL*NET traffic
match protocol http url "*SalesReport*" ! Identifies "SalesReport" URLs
match access-group name TRANSACTIONAL-DATA-APPS ! Other Apps

class-map match-any BRANCH-NET-MGMT
match protocol snmp        ! Identifies SNMP traffic
match protocol syslog      ! Identifies Syslog traffic
match protocol dns         ! Identifies DNS traffic
match protocol icmp        ! Identifies ICMP traffic
match protocol ssh         ! Identifies SSH traffic
match access-group name NET-MGMT-APPS ! Other Network Management Apps

class-map match-any BRANCH-SCAVENGER
match protocol napster     ! Identifies Napster traffic
match protocol gnutella    ! Identifies Gnutella traffic
match protocol fasttrack   ! Identifies KaZaa (v1) traffic
match protocol kazaa2      ! Identifies KaZaa (v2) traffic
!
policy-map BRANCH-LAN-EDGE-IN
class BRANCH-MISSION-CRITICAL
set ip dscp 25
class BRANCH-TRANSACTIONAL-DATA
set ip dscp af21 ! Transactional Data apps are marked to DSCP AF21
class BRANCH-NET-MGMT
set ip dscp cs2 ! Network Management apps are marked to DSCP CS2
class BRANCH-BULK-DATA
set ip dscp af11 ! Bulk data apps are marked to AF11
class BRANCH-SCAVENGER
set ip dscp cs1 ! Scavenger apps are marked to DSCP CS1

policy-map BRANCH-WAN-EDGE
class VOICE
priority percent 18 ! Voice gets 552 kbps of LLQ
class INTERACTIVE-VIDEO
priority percent 15 ! 384 kbps IP/VC needs 460 kbps of LLQ
class CALL-SIGNALING
bandwidth percent 5 ! Minimal BW guarantee for Call-Signaling
class ROUTING
bandwidth percent 3 ! Routing class gets 3% explicit BW guarantee

```



```

class NET-MGMT
bandwidth percent 2 ! Net-Mgmt class gets 2% explicit BW guarantee
class MISSION-CRITICAL-DATA
bandwidth percent 15 ! Mission-Critical class gets min 15% BW guarantee
random-detect ! Enables WRED on Mission-Critical Data class
class TRANSACTIONAL-DATA
bandwidth percent 12 ! Transactional-Data class gets min 12% BW guarantee
random-detect dscp-based ! Enables DSCP-WRED on Transactional-Data class
class BULK-DATA
bandwidth percent 4 ! Bulk Data class gets 4% BW guarantee
random-detect dscp-based ! Enables DSCP-WRED on Bulk-Data class
class SCAVENGER
bandwidth percent 1 ! Scavenger class is throttled
class class-default
bandwidth percent 25 ! Default class gets min 25% BW guarantee
random-detect ! Enables WRED on the default class

policy-map BRANCH-LAN-EDGE-OUT
class class-default

interface Serial0/0/1:0
description T1 to SERVICE PROVIDER
frame-relay traffic-shaping
max-reserved-bandwidth 100 ! overrides the default 75% BW limit

interface Serial0/0/1:0.1 point-to-point
description PVC CONNECTION TO DATACENTER
frame-relay interface-dlci 201
class fr_qos

map-class frame-relay fr_qos
frame-relay fragment 160
frame-relay traffic-rate 1536000 1536000
frame-relay adaptive-shaping becn
service-policy output BRANCH-WAN-EDGE

interface VlanXX
description POS
no service-policy input set_priority
service-policy output BRANCH-LAN-EDGE-OUT
service-policy input BRANCH-LAN-EDGE-IN

```

Multicast Implementation

Enabling multicast across the enterprise allows retailers to minimize the impact of bandwidth-consuming applications such as IPsession. The multicast service allows IPsession to send a multicast stream to the desired stores rather than unicasting an audio stream to each individual phone at each individual store.

1. Multicast routing was enabled across all routers using the following:

ip multicast-routing *Enables the router to route multicast traffic*

2. All routers were configured to use the loopback 0 interface of RCORE-1 as the PIM rendezvous point because it is centrally located, configured on a highly available chassis, and loopback interfaces do not fail. PIM Sparse-Dense mode was selected for its flexibility in supporting multicast applications. Every router had the following statement configured.

ip pim rp-address 192.168.1.10 *192.168.1.10 is the loopback 0 interface of RCORE-1*

3. IP PIM Sparse-Dense Mode was used to enable interfaces that were needed to participate in the multicast domain.

```
!
interface Vlan45
  description VOICE SERVICES
  ip pim sparse-dense-mode Enables interface to receive/send multicast traffic
!
```

On the WAN interfaces of the WAN-facing routers, a multicast filter was applied to protect the enterprise from rogue multicast applications consuming valuable WAN bandwidth.

```
!
ip access-list standard BlockMLocal
  permit 225.3.15.0 0.0.0.255 Creates a standard access list that only permits the multicast addressing allowed for the IPsession Appliance.
```

```
interface Serial1/0.1 point-to-point
ip pim sparse-dense-mode
ip multicast boundary BlockMLocal Filters unauthorized multicast traffic from traversing the WAN. This statement stops bi directional traffic and needs to be applied on both sides of the WAN connection.
!
```

Refer to [Appendix A—Configurations, page 39](#) for more configurations.

Security

[Table 8](#) lists the ports and protocols used by the Cisco Unified Communications Store Employee Dashboard solution.

Table 8 **Traffic Flows**

Source Device	Source port	Destination Device	Destination Port	Protocol	Comments
Web client users	<HIGH>	IPsession Server data center	8080	TCP	Web client interface
IPsession Server data center	<HIGH>	Phones	80	TCP	IPsession Server to phones
Phones	<HIGH>	IPsession Server data center	8080	TCP	Phones to IPsession Server
IPsession Server data center	<HIGH>	Active Directory	389	TCP	Server performing an LDAP lookup
	<HIGH>	Phones	<HIGH>	UDP	IPsession sending unicast audio stream
	<HIGH>	Active Directory	53	UDP	DNS lookup

Table 8 **Traffic Flows (continued)**

Phones	68	255.255.255.255	67	UDP	DHCP request for services
	<HIGH>	Cisco Unified Communication Manager	69 (high)	UDP	Check phone load file
	<HIGH>	Cisco Unified Communication Manager	6970	TCP	Register with Cisco Unified Communication Manager
	<HIGH>	Cisco Unified Communication Manager	2000	TCP	Register with Cisco Unified Communication Manager-Skinny
	<HIGH>	Cisco Unified Communication Manager	8080	TCP	Check services, directory
	ICMP	IPsession Server data center	ICMP	ICMP	Destination port unreachable

Testing

Test Plan

The testing of the Cisco Unified Communications Store Employee Dashboard solution included the creation of several users representing store employees, managers, directors and administrators. Using the existing Retail store architectures, three stores were created in the IPsession application. The small, medium, and large stores were assigned unique store numbers, 1100, 1200 and 1300 respectively. These items represent a real-world retail environment that was used to perform the application feature tests described below.

Testing Steps

The testing of the Cisco Unified Communications Store Employee Dashboard solution was divided into sequential steps. The following list comprises the tests that were performed:

- Create store schedule from manager PC.
- Create store schedule from IP Phone.
- Employee time-off requests appear and employee cannot be scheduled.
- Export schedule to Excel spreadsheet.
- Employee clocks in/out at scheduled time for shift from IP Phone.
- Employee clocks in late or does not clock in at all for scheduled shift from IP Phone. System notifies store supervisor.
- Employee clocks in for non-assigned shift from IP Phone. Logged in system for manager approval.
- Store manager approves/rejects non-assigned shift clock in.

- Employee requests time off from IP Phone.
- Store manager approves/rejects time off request.
- Store employee is notified of approval/rejection of time-off request.
- Store director records announcement message.
- Employee listens to announcement message of the day.
- Store manager schedules task alert from web interface.
- Employee receives task alert at scheduled time from IP Phone.
- Employee confirms completion of task.
- Employee fails to confirm completion of task and store manager is notified of non-completion of task.
- District supervisor notified of a non-completed task.
- Store manager requests shift to be filled. System calls out to local stores and/or employees with automated message.
- Available store and/or employee receives message containing shift information and is instructed to contact requesting store manager if shift can be filled.
- Store supervisor enters daily deposit total into IP Phone.
- District supervisor retrieves daily deposit report from system.

Test Results

All of the tests were completed satisfactorily. The following items were noted when building the test environment and executing the prescribed tests:

1. Cannot delete stores or rename them via the Management interface. To remove/rename a store, obtain a script from IPcelerate or edit the database directly.
2. A space should not be used when creating the store name; this caused an improper display of store names to select from when searching on the phone.
3. Users can only identify themselves to the application with their employee ID number. The use of passwords or a PIN number is not available at this time. This could be perceived as a poor security practice. The design intention with this feature of the application, use of only employee ID number, was for user convenience. This has been reported as being sufficient for current customers. IPcelerate supports development of an ID/PIN arrangement, if needed.
4. When submitting a blank shift name, the subsequent shift selections listed on phones for managers are by ID number instead of using the friendlier shift name. IPcelerate intends to modify this search result in a future revision.
5. Automated escalation and shift request calls are created using text to speech. The mechanical voice is difficult to understand in noisy environments. There are no configuration settings to modify this behavior or selected voice.
6. You must create a default dashboard and assign it in the server configuration or no menu will be displayed when accessing phone services.
7. Phones need to be assigned to stores for automated services to function properly; the included procedures do not clearly outline these steps.

8. There was no confirmation after creating the message of the day (MoD) announcement. The system disconnects when you press # upon completion of your recording, but the message records and executes correctly.
9. On the Employee Dashboard screen, the MoD is listed as “Announcements”, not “Message of the Day”.
10. District supervisor notification of non-completed tasks requires configuring the login name (not the Employee ID) of the person to be notified. This occurs in the retail module configuration section and only one ID is configurable for the entire enterprise.

Performance

Network bandwidth utilization for task alert and clock-in for a single phone are depicted in [Figure 8](#) and [Figure 9](#), respectively.

Figure 8 Task Alert with Multicast Audio Stream

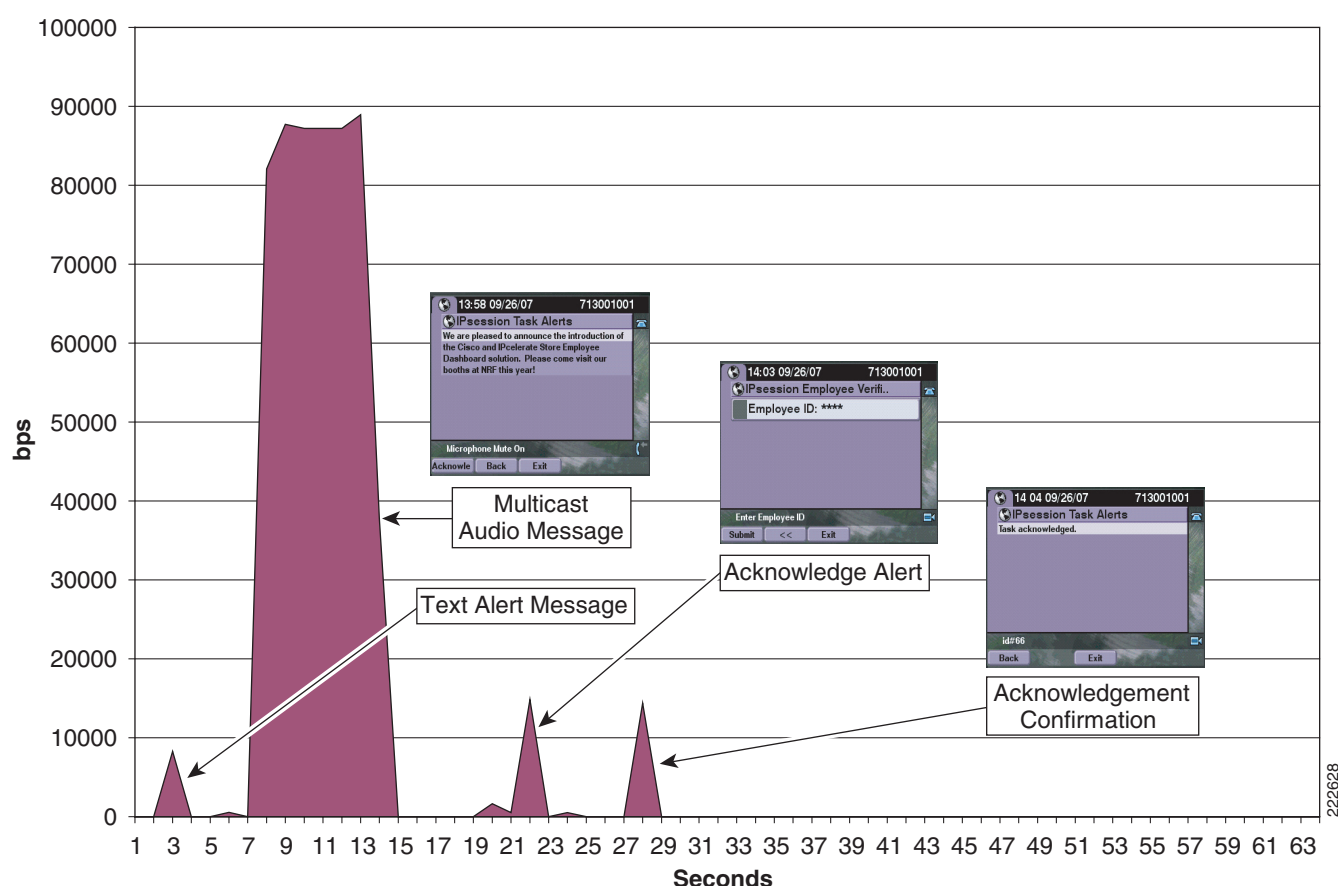
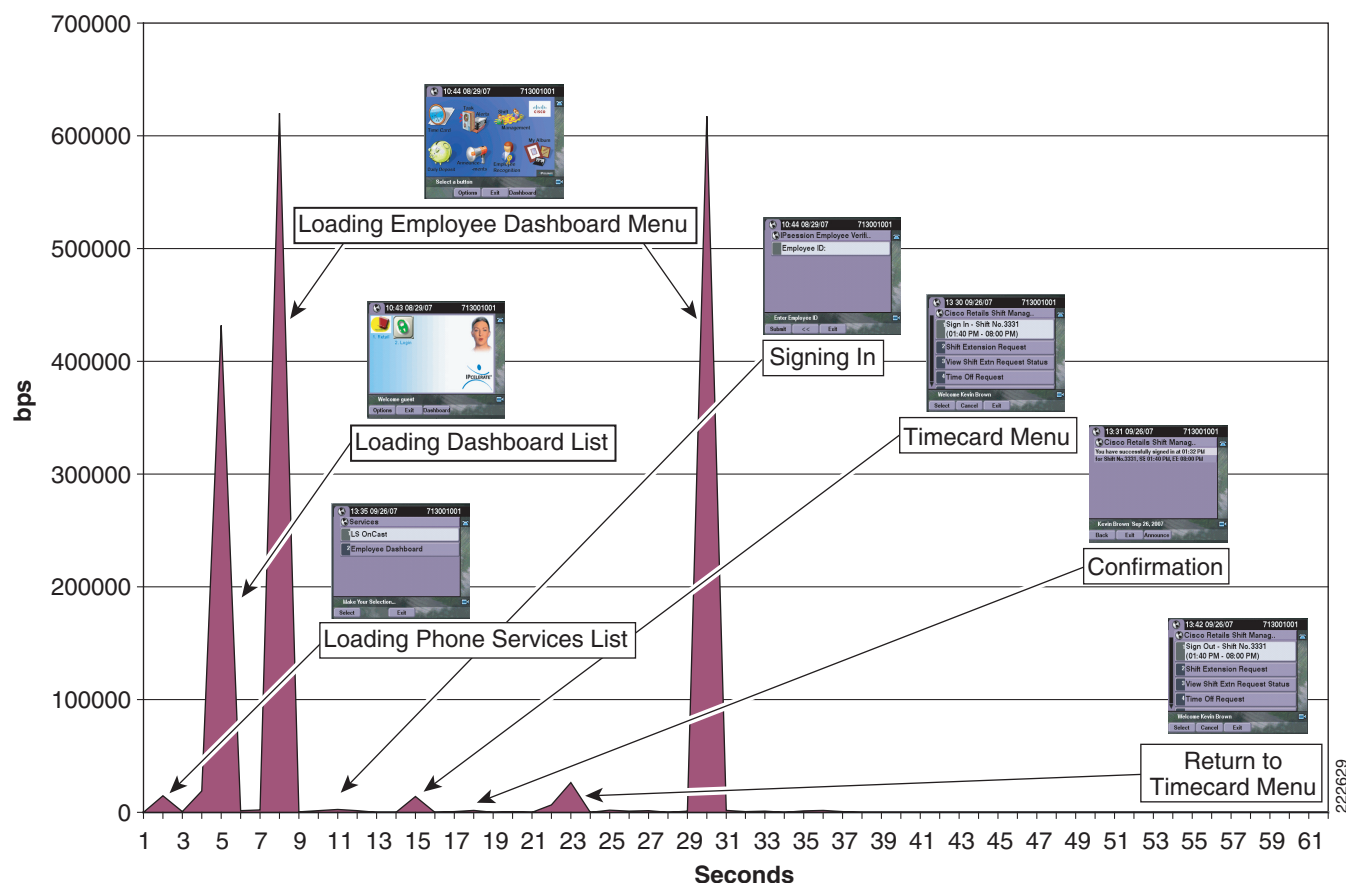


Figure 9 *Clock-In from Single Phone*

Summary and Recommendations

The Cisco Unified Communications Store Employee Dashboard solution successfully performed as a distributed common interface for employees and management to document daily attendance, schedule vacation, track store functional tasks and escalations, collect and report daily deposit information, and automate shift coverage requests to other stores.

Traditional monochromatic displays are often difficult to interpret, but this application is simple and intuitive. The lab testers found, in contrast, that the application icons were easily readable and user friendly due to the color displays. The touch screen interface made accessing and using the application straight forward.

When using the phone interface, employees and managers could only identify themselves with their employee ID number. The application's internal user database supports passwords and PINs, but could not be used by the phone interface. This is a poor security practice and could allow a malicious employee to manipulate other manager/employee information because employee IDs are often standardized or accessible in existing company documentation. IPcelerate would support development of an ID/PIN arrangement if needed. The PC-based web user interface authenticates users through user IDs and passwords, which is a better security practice.

The automated calls and task escalations were performed using a mechanical text-to-speech voice that was hard to understand in noisy environments. A substantial amount of bandwidth is consumed when listening to announcements and automated calls because the IPsession application uses the G.711 codec. A deployment model leveraging QoS/multicast is critical to the successful implementation across a retail network.

The IPcelerate IPsession application used in the Cisco Unified Communications Store Employee Dashboard solution demonstrates the additional value that can be achieved with an IP phone deployment in contrast to traditional PBX systems.

Appendix A—Configurations

QoS

All STORES

```
ip access-list extended MISSION-CRITICAL-SERVERS
remark ---POS Applications---
permit ip any 192.168.52.0 0.0.0.255

ip access-list extended TRANSACTIONAL-DATA-APPS
remark ---IPcelerate Application---
permit ip host 192.168.46.92 any
permit ip 225.3.15.0 0.0.0.255 any
permit ip any host 192.168.46.92
permit ip any 239.192.0.0 0.0.0.255
permit ip any host 239.255.255.250
ip access-list extended BULK-DATA-APPS
    remark ---File Transfer---
    permit tcp any any eq ftp
    permit tcp any any eq ftp-data
    remark ---E-mail traffic---
    permit tcp any any eq smtp
    permit tcp any any eq pop3
    permit tcp any any eq 143
    remark ---other EDM app protocols---
    permit tcp any any range 3460 3466
    permit tcp any range 3460 3466 any
    remark ---messaging services---
    permit tcp any any eq 2980
    permit tcp any eq 2980 any
    remark ---Microsoft file services---
    permit tcp any any range 137 139
    permit tcp any range 137 139 any

ip access-list extended NET-MGMT-APPS
remark - Router user Authentication - Identifies TACACS Control traffic
permit tcp any any eq tacacs
permit tcp any eq tacacs any

class-map match-all VOICE
match ip dscp ef                ! IP Phones mark Voice to EF
class-map match-all INTERACTIVE-VIDEO
match ip dscp af41 af42        ! Recommended markings for IP/VC
class-map match-any CALL-SIGNALING
```

```

match ip dscp cs3                ! Call-Signaling marking
class-map match-all ROUTING
match ip dscp cs6                ! Routers mark Routing traffic to CS6
class-map match-all NET-MGMT
match ip dscp cs2                ! Recommended marking for Network Management
class-map match-all MISSION-CRITICAL-DATA
match ip dscp 25                 ! Interim marking for Mission-Critical Data
class-map match-all TRANSACTIONAL-DATA
match ip dscp af21 af22          ! Recommended markings for Transactional Data
class-map match-all BULK-DATA
match ip dscp af11 af12          ! Recommended markings for Bulk Data
class-map match-all SCAVENGER
match ip dscp cs1                ! Recommended marking for Scavenger traffic

class-map match-all BRANCH-MISSION-CRITICAL
match access-group name MISSION-CRITICAL-SERVERS

class-map match-any BRANCH-BULK-DATA
match protocol tftp              ! Identifies TFTP traffic - Retailers
match protocol nfs               ! Identifies NFS traffic - Retailers
match access-group name BULK-DATA-APPS ! ACL to reference

class-map match-any BRANCH-TRANSACTIONAL-DATA! Must use "match-any"
match protocol citrix            ! Identifies Citrix traffic
match protocol ldap              ! Identifies LDAP traffic
match protocol telnet            ! Identifies Telnet traffic
match protocol sqlnet            ! Identifies Oracle SQL*NET traffic
match protocol http url "*SalesReport*" ! Identifies "SalesReport" URLs
match access-group name TRANSACTIONAL-DATA-APPS ! Other Apps

class-map match-any BRANCH-NET-MGMT
match protocol snmp              ! Identifies SNMP traffic
match protocol syslog            ! Identifies Syslog traffic
match protocol dns               ! Identifies DNS traffic
match protocol icmp              ! Identifies ICMP traffic
match protocol ssh               ! Identifies SSH traffic
match access-group name NET-MGMT-APPS ! Other Network Management Apps

class-map match-any BRANCH-SCAVENGER
match protocol napster           ! Identifies Napster traffic
match protocol gnutella          ! Identifies Gnutella traffic
match protocol fasttrack         ! Identifies KaZaa (v1) traffic
match protocol kazaa2            ! Identifies KaZaa (v2) traffic
!
policy-map BRANCH-LAN-EDGE-IN
class BRANCH-MISSION-CRITICAL
set ip dscp 25
class BRANCH-TRANSACTIONAL-DATA
set ip dscp af21 ! Transactional Data apps are marked to DSCP AF21
class BRANCH-NET-MGMT
set ip dscp cs2 ! Network Management apps are marked to DSCP CS2
class BRANCH-BULK-DATA
set ip dscp af11 ! Bulk data apps are marked to AF11
class BRANCH-SCAVENGER
set ip dscp cs1 ! Scavenger apps are marked to DSCP CS1

policy-map BRANCH-WAN-EDGE
class VOICE
priority percent 18 ! Voice gets 552 kbps of LLQ
class INTERACTIVE-VIDEO
priority percent 15 ! 384 kbps IP/VC needs 460 kbps of LLQ
class CALL-SIGNALING
bandwidth percent 5 ! Minimal BW guarantee for Call-Signaling
class ROUTING

```



```

bandwidth percent 3 ! Routing class gets 3% explicit BW guarantee
class NET-MGMT
bandwidth percent 2 ! Net-Mgmt class gets 2% explicit BW guarantee
class MISSION-CRITICAL-DATA
bandwidth percent 15 ! Mission-Critical class gets min 15% BW guarantee
random-detect ! Enables WRED on Mission-Critical Data class
class TRANSACTIONAL-DATA
bandwidth percent 12 ! Transactional-Data class gets min 12% BW guarantee
random-detect dscp-based ! Enables DSCP-WRED on Transactional-Data class
class BULK-DATA
bandwidth percent 4 ! Bulk Data class gets 4% BW guarantee
random-detect dscp-based ! Enables DSCP-WRED on Bulk-Data class
class SCAVENGER
bandwidth percent 1 ! Scavenger class is throttled
class class-default
bandwidth percent 25 ! Default class gets min 25% BW guarantee
random-detect ! Enables WRED on the default class

policy-map BRANCH-LAN-EDGE-OUT
class class-default

!
map-class frame-relay fr_qos
  frame-relay fragment 160
  frame-relay traffic-rate 1536000 1536000
  frame-relay adaptive-shaping becn
  service-policy output BRANCH-WAN-EDGE
!

interface FastEthernet x.x
description DATA LAN interfaces NOT VOICE
service-policy input BRANCH-LAN-EDGE-IN ! Marks Data on ingress

interface serial 0/0.x
description T1 to Datacenter
max-reserved-bandwidth 100 ! overrides the default 75% BW limit
service-policy output BRANCH-WAN-EDGE

```

Multicast

Data Center

RCORE-1

```

ip multicast-routing
ip pim bidir-enable
!
interface Loopback0
  ip pim sparse-dense-mode
!
interface Vlan42
  description
  ip pim sparse-dense-mode
!
interface Vlan45
  description Voice Services
  ip pim sparse-dense-mode

```

```

!
interface Vlan46
  description
ip pim sparse-dense-mode
!
interface Vlan101
  description
  ip pim sparse-dense-mode
!
interface Vlan104
  description
  ip pim sparse-dense-mode

ip pim bidir-enable
ip pim rp-address 192.168.1.10

RCORE-2

ip multicast-routing
!
interface Vlan102
  description
  ip pim sparse-dense-mode

!
interface Vlan103
  description
  ip pim sparse-dense-mode
!
ip pim rp-address 192.168.1.10

No active Sources on Core 2

```

WAN Routers

RWAN-1

```

ip multicast-routing

interface GigabitEthernet0/0
ip pim sparse-dense-mode
!
interface GigabitEthernet0/1
ip pim sparse-dense-mode

interface Serial1/0.1 point-to-point
ip pim sparse-dense-mode
ip multicast boundary BlockMLocal
!!
interface Serial1/0.2 point-to-point
ip pim sparse-dense-mode
ip multicast boundary BlockMLocal
!
interface Serial1/0.3 point-to-point

<none>

ip pim rp-address 192.168.1.10

ip access-list standard BlockMLocal
permit 225.3.15.0 0.0.0.255

```

RWAN-2

```

ip multicast-routing

interface GigabitEthernet0/0
ip pim sparse-dense-mode
!
interface GigabitEthernet0/1
ip pim sparse-dense-mode

interface Serial1/0.1 point-to-point
ip pim sparse-dense-mode
ip multicast boundary BlockMLocal
!!
interface Serial1/0.2 point-to-point
ip pim sparse-dense-mode
ip multicast boundary BlockMLocal
!
interface Serial1/0.3 point-to-point

<none>

ip pim rp-address 192.168.1.10

ip access-list standard BlockMLocal
permit 225.3.15.0 0.0.0.255

```

Small Store

RSMALL-1

```

ip multicast-routing
!
interface Serial0/0/0:0.1 point-to-point
description RSMALL-1 CONNECTION RSP-1
ip pim sparse-dense-mode
ip multicast boundary BlockMLocal
!
interface Serial0/0/1:0.1 point-to-point
description RSMALL-1 CONNECTION RSP-2
ip pim sparse-dense-mode
ip multicast boundary BlockMLocal
!
interface Vlan11
description POS
ip pim sparse-dense-mode
!
interface Vlan13
description VOICE
ip pim sparse-dense-mode
!

ip pim rp-address 192.168.1.10

ip access-list standard BlockMLocal
permit 225.3.15.0 0.0.0.255

```

Medium Store

RMED-1

```

ip multicast-routing
!
interface GigabitEthernet0/0.11
  description POS
  ip pim sparse-dense-mode
!
interface GigabitEthernet0/0.13
  description VOICE
  ip pim sparse-dense-mode
!
interface GigabitEthernet0/0.102
  description ROUTER LINK TO RMED2 VIA SMED2
  ip pim sparse-dense-mode
!
interface GigabitEthernet0/1.101
  description ROUTER LINK TO RMED-2
  ip pim sparse-dense-mode
!
interface Serial0/0/0:0.1 point-to-point
  description CONNECTION TO RWAN-1
  ip pim sparse-dense-mode
  ip multicast boundary BlockMLocal
!
interface Vlan13
  description VOICE
  ip pim sparse-dense-mode
!

ip pim rp-address 192.168.1.10

ip access-list standard BlockMLocal
  permit 225.3.15.0 0.0.0.255

```

RMED-2

```

ip multicast-routing
!
interface GigabitEthernet0/0.11
  description POS
  ip pim sparse-dense-mode
!
interface GigabitEthernet0/0.13
  description VOICE
  ip pim sparse-dense-mode
!
interface GigabitEthernet0/0.102
  description ROUTER LINK TO RMED2 VIA SMED2
  ip pim sparse-dense-mode
!

interface GigabitEthernet0/1.101
  description ROUTER LINK TO RMED1 VIA SMED2
  ip pim sparse-dense-mode
!
interface Serial0/0/0:0.1 point-to-point

```

```
description CONNECTION TO RWAN-1
ip pim sparse-dense-mode
ip multicast boundary BlockMLocal
!
interface Vlan13
description VOICE
ip pim sparse-dense-mode
!

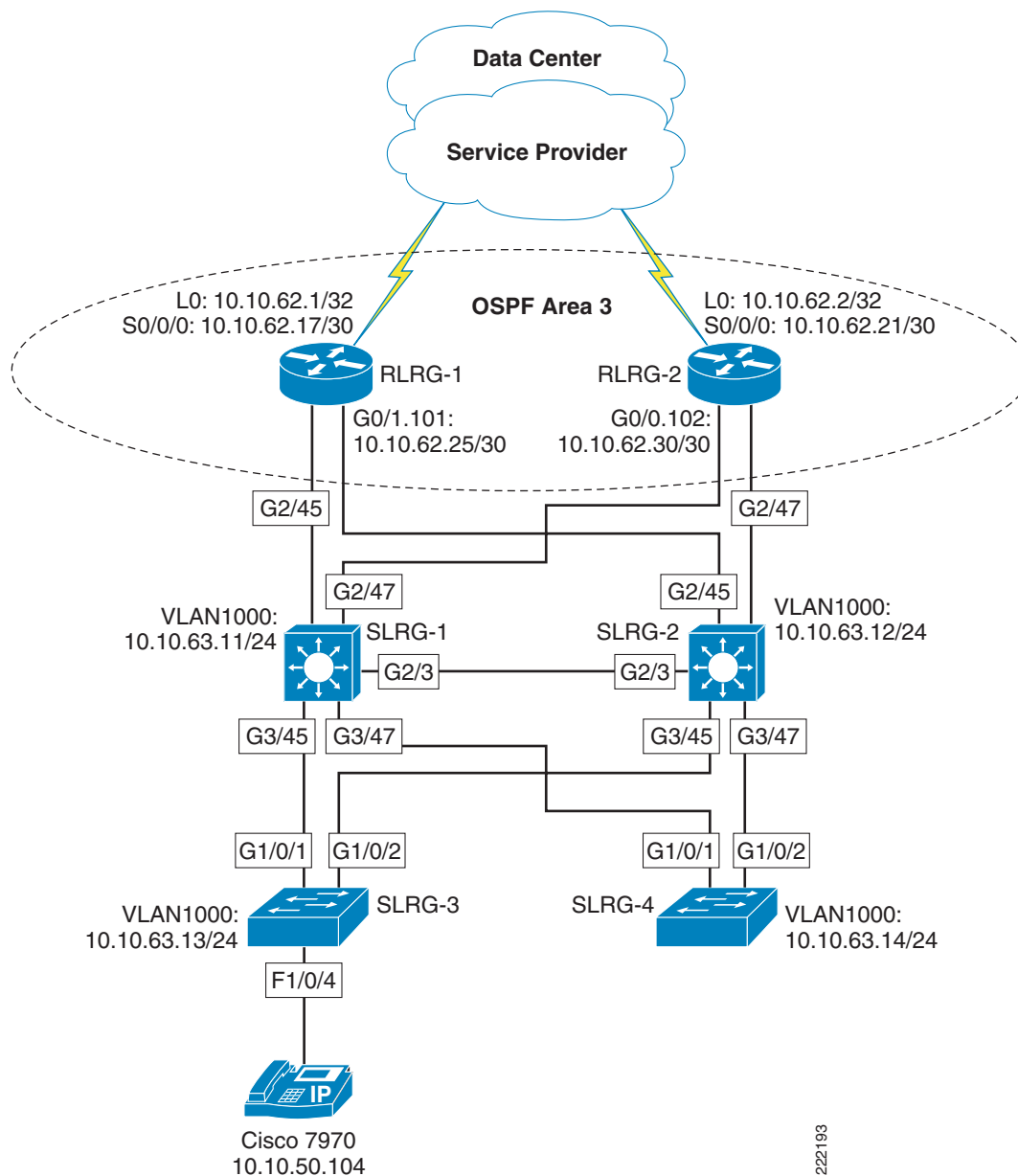
ip pim rp-address 192.168.1.10

ip access-list standard BlockMLocal
permit 225.3.15.0 0.0.0.255
```

Appendix B—Network Diagrams

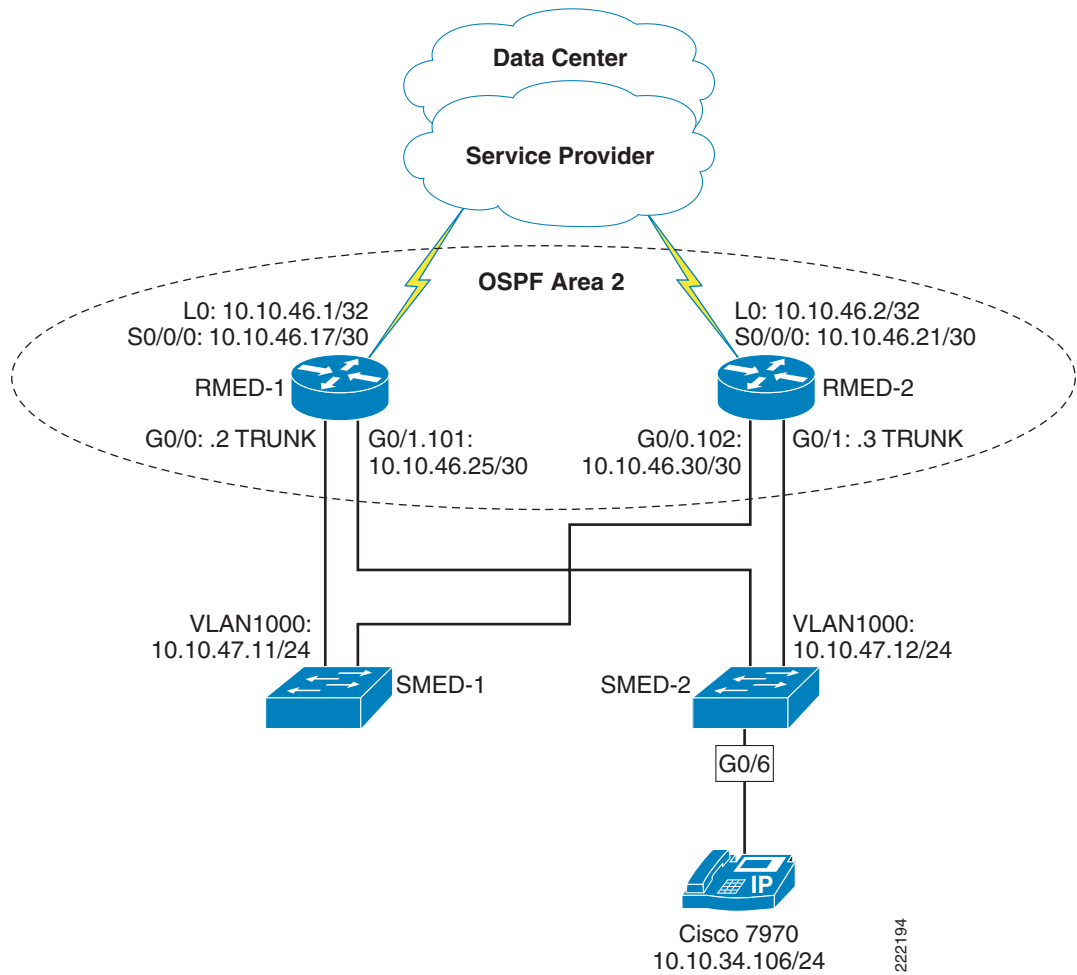
Large Store

Figure 10 Large Store Topology



Medium Store

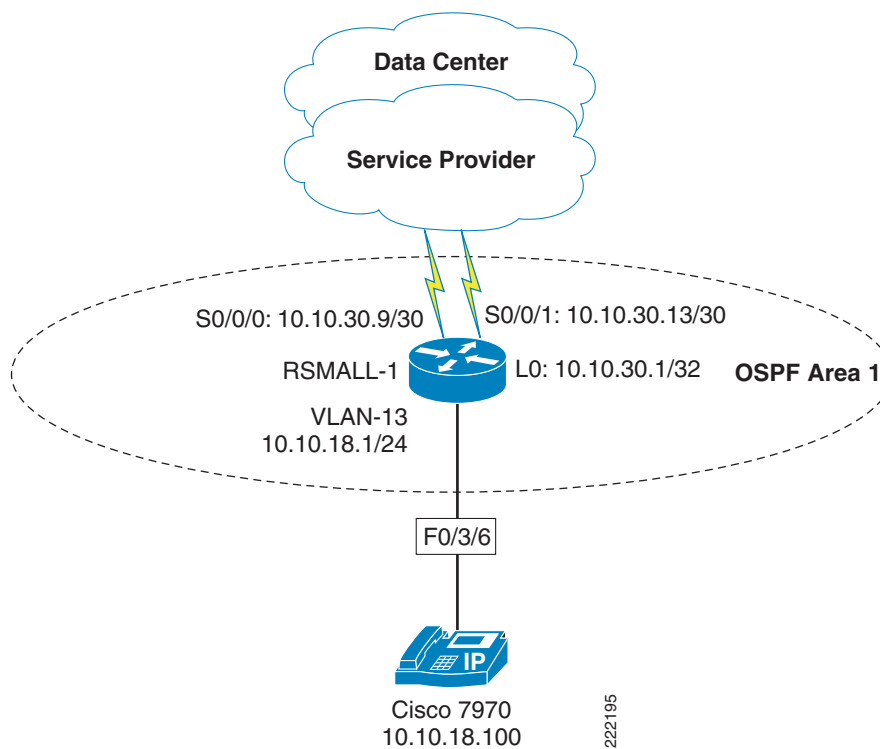
Figure 11 *Medium Store Topology*



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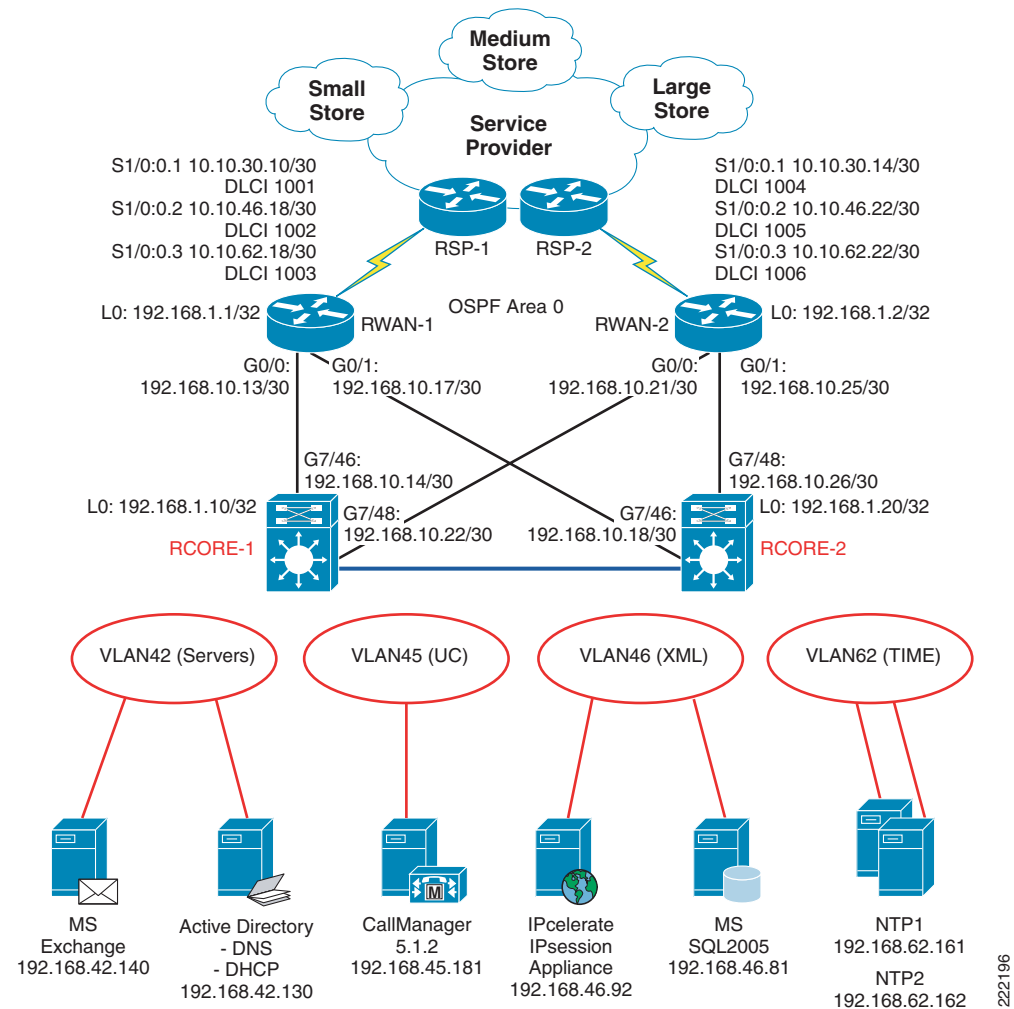
Small Store

Figure 12 **Small Store Topology**



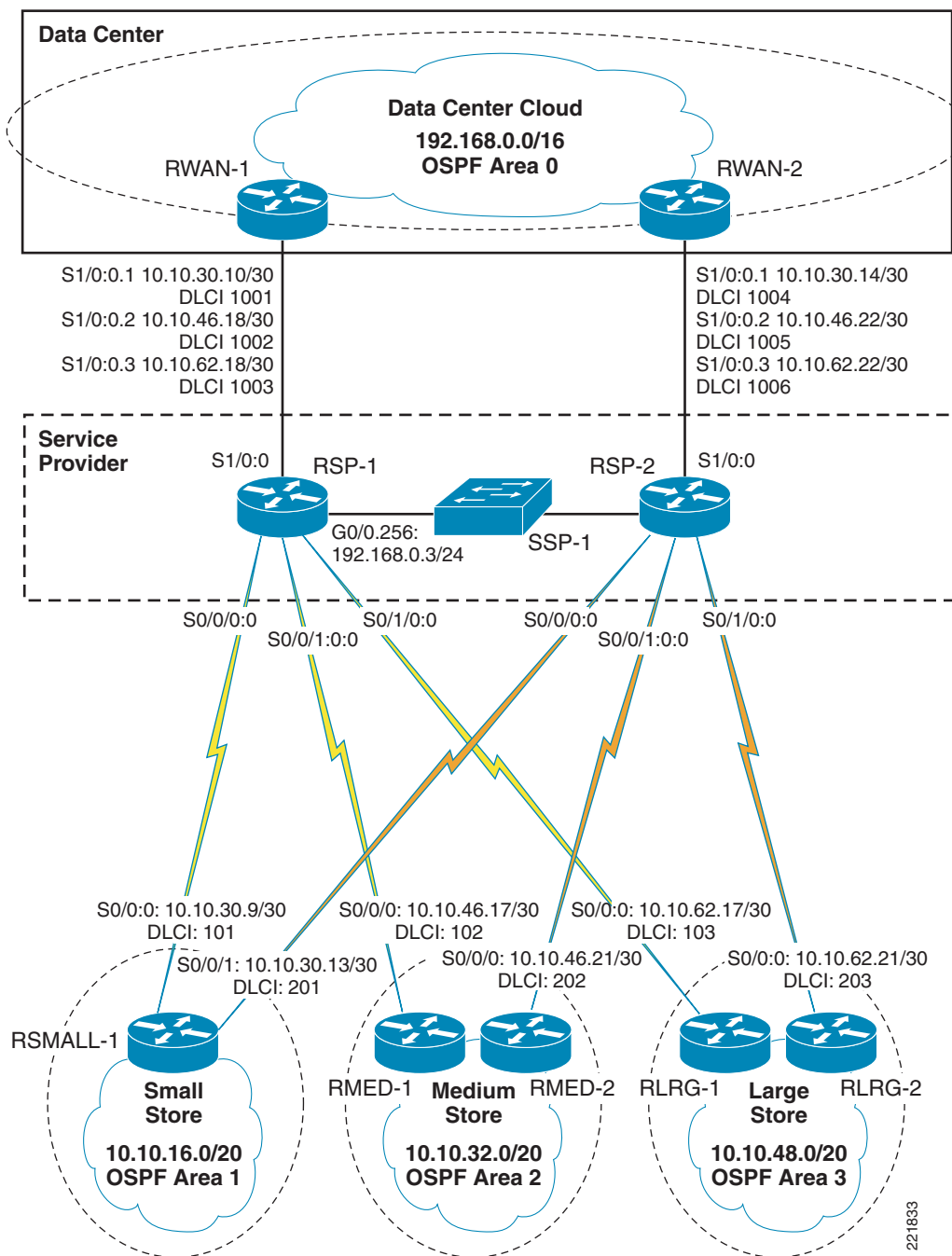
Data Center

Figure 13 Data Center Topology



Service Provider

Figure 14 Service Provider Topology



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