



Overview of Cisco Wireless IP Telephony

Cisco Wireless IP Communications solutions deliver fully integrated communications by enabling data, voice, and video to be transmitted over a single wireless network infrastructure using standards-based 802.11 (a, b, and g) protocol. Leveraging the framework provided by Cisco IP hardware and software products, Cisco Wireless IP Communications solutions deliver unparalleled performance and capabilities to address current and emerging communications needs in the enterprise environment. Cisco Wireless IP Communications solutions are designed to optimize feature functionality, reduce configuration and maintenance requirements, and provide interoperability with a wide variety of other applications. Cisco Wireless IP Communications solutions provide this capability while maintaining a high level of availability, quality of service (QoS), and security for your network.

Cisco Wireless IP Communications encompasses the following solutions:

- IP Telephony
- Wireless LAN
- Device Mobility

The following sections in this chapter present an overview of the Cisco IP Telephony solution and its major components:

- [Why Wireless IP Telephony?, page 1-1](#)
- [Architecture Overview, page 1-2](#)

For more information on Wireless LAN and IP Telephony, refer to the design guides for those solutions, available online at

<http://cisco.com/go/srnd>

Why Wireless IP Telephony?

The communications industry, and industry analysts in general, now widely accept and acknowledge that wireless IP networks and applications have become a highly desirable transport medium for enterprise networks. The rapid adoption and migration of vendors to wireless IP as a transport for data and now voice further endorse this medium as a viable network paradigm. The message is clear: the move toward wireless IP is happening now.

Cisco provides a solid wireless IP network solution based on open standards, with an established portfolio of wireless access points (APs) and wireless endpoints to support your transition. The Cisco Wireless IP Telephony solution is the leading wireless network telephony solution for organizations that want to increase productivity and reduce the costs associated with managing and maintaining separate voice endpoints at each physical location. The flexibility and sophisticated

functionality of the Cisco wireless IP network infrastructure provides the framework that permits deployment of wireless phones throughout the enterprise, thus enhancing productivity and increasing enterprise revenues.

Architecture Overview

The Cisco IP Communications solution provides the foundation for next-generation IP networking across a number of network types including LANs, WANs, wireless LANs (WLANs), and Metro-Optical networks. The Cisco IP Communications network architecture not only delivers data, voice, and video over a converged IP network, but it also provides the framework for high availability, quality of service, and security.

The underlying network architecture for the Cisco Wireless IP Telephony solution consists of the following primary components:

- [Cisco Wireless LAN Infrastructure, page 1-2](#)
- [Cisco 7920 Wireless IP Phone, page 1-3](#)
- [Call Processing Agent, page 1-3](#)
- [Security, page 1-3](#)
- [Quality of Service \(QoS\), page 1-4](#)
- [Network Management, page 1-5](#)

Cisco Wireless LAN Infrastructure

The wireless network infrastructure includes access points (APs), antennas, and wireless endpoint devices, including wireless network interface cards (NICs) and wireless phones such as the Cisco 7920 Wireless IP Phone. The infrastructure can support various client types such as hardware phones and software phones.

Like wired LAN networks, 802.11 WLAN networks enable devices to transmit data, voice, and video at data rates up to 54 Mbps. Wireless networks have certain characteristics that make them different from wired networks:

- A WLAN operates as a shared medium, which means that communication on the WLAN is half-duplex and that all devices within a single WLAN share the same wireless connection. Speeds vary as follows, depending on the type of radio you are using:
 - 802.11a = 54 Mbps
 - 802.11b = 11 Mbps
 - 802.11g = 54 Mbps.
- WLAN bandwidth depends on the distance between the WLAN client and a WLAN AP. The farther the distance, the lower the supported data rates.
- Because all WLAN traffic is seen by all other WLAN devices within range, additional security measures must be taken to ensure that traffic is not captured or manipulated by intruders.

Cisco 7920 Wireless IP Phone

The Cisco 7920 Wireless IP Phone extends the Cisco family of IP phones from 10/100 Ethernet to 802.11 WLANs. The Cisco 7920 Wireless IP Phone provides multiple line appearances with functionality similar to existing Cisco 7900 Series IP Phones. In addition, the Cisco 7920 phone provides enhanced WLAN security and Quality of Service (QoS) for operation in 802.11b networks. The Cisco 7920 phone also provides support for XML-based data access and services.

Call Processing Agent

Cisco CallManager is the core call processing software for the Cisco IP Telephony solution. It builds call processing capabilities on top of the Cisco IP network infrastructure. Cisco CallManager software extends enterprise telephony features and capabilities to packet telephony network devices such as IP phones, media processing devices, Voice over IP (VoIP) gateways, and multimedia applications.

You can deploy the call processing capabilities of Cisco CallManager according to one of the following models, depending on the size, geographical distribution, and functional requirements of your enterprise:

- Single-site call processing model
- Multi-site WAN model with centralized call processing
- Multi-site WAN model with distributed call processing
- Clustering over the IP WAN

For more details on these call processing deployment models, refer to the *Cisco IP Telephony Solution Reference Network Design (SRND)* at

<http://cisco.com/go/srnd>

Security

The Cisco Wireless IP Telephony solution addresses security in the following main areas, among others:

- Physical security for restricting physical access to important application servers and network components, including Cisco CallManager servers and APs.
- Network access security to prevent hostile logins or attacks, including encryption and authentication using WEP and Cisco LEAP, and the elimination of rogue APs on the Wireless LAN.
- Security measures for Cisco CallManager, endpoint devices, and various directories and databases, including passwords for the Cisco 7920 Wireless IP Phones and strong password policies for Microsoft Windows and software applications.
- Mechanisms for defining calling privileges for various classes of users through the use of calling search spaces and partitions in Cisco CallManager.
- Careful network design and management to enhance security, including logging of network events (APs, switches, and routers), endpoint events, application software changes, and call detail records.

Quality of Service (QoS)

While Voice over IP (VoIP) technology does convert voice signals into IP data packets and converges them with data traffic, the IP network requirements for voice and data are very different. Data traffic typically has the following characteristics:

- Bursty — Traffic can be sent in large or small bursts, depending on the application.
- Maximum bandwidth consumption — TCP applications attempt to use as much bandwidth as the network will allow.
- Insensitive to packet loss — The retransmission capabilities of TCP enable data applications to continue to work correctly even with a certain amount of packet loss on the network.
- Insensitive to packet delays — Most TCP applications can handle some packet delay without affecting overall performance.

In contrast, voice traffic on an IP network has strict requirements concerning packet loss, delay, and delay variation (also known as jitter). To meet these requirements for voice traffic, the Cisco Wireless IP Telephony solution includes Quality of Service (QoS) features such as traffic classification, queuing, and shaping. In general, voice traffic has the following characteristics:

- Smooth — VoIP packets are sent at consistent intervals with uniform packet sizes.
- Minimal bandwidth consumption — VoIP packets attempt to use only the amount of bandwidth necessary to transmit from end to end. VoIP does not use any windowing to determine data rates.
- Sensitive to packet loss — VoIP traffic is extremely sensitive to packet loss. Excessive loss will degrade overall voice quality.
- Sensitive to delay and jitter — While VoIP can tolerate some amount of delay, excessive delay or excessive delay variation (jitter) will degrade overall voice quality.
- UDP Best Effort — VoIP sends RTP packets using UDP, which does not have a mechanism to retransmit lost packets.

Cisco has defined the following network guidelines for proper VoIP operation:

- Delay — not to exceed 150 ms (one-way)
- Delay variation (jitter) — not to exceed 30 ms
- Packet loss — not to exceed 1%



Note

While isolated testing might show that VoIP calls could operate in a network outside of these guidelines, deploying a VoIP network under those conditions can lead to unpredictable results and poor voice quality. If problems arise in such cases, support from the Cisco Technical Assistance Center (TAC) will be limited.

The QoS components of the Cisco Wireless IP Telephony solution are provided through the rich IP traffic management, queuing, and shaping capabilities of the Cisco IP network infrastructure. Key elements of this infrastructure that enable QoS for IP Telephony include:

- Traffic marking
- Multiple queues
- Priority queuing
- Traffic shaping
- Call admission control

Network Management

The Cisco Wireless IP Telephony network infrastructure offers a number of network management, QoS, and security management tools that support the IP Communications solution. Cisco CallManager offers enhanced software and configuration management tools that leverage the strength and flexibility of IP networks. The Cisco CallManager user interface simplifies the most common subscriber and telephony configuration tasks by building upon legacy telephony administration systems and adding software and web-based applications.

In addition, CiscoWorks2000 includes a number of network management tools to manage the operations, administration, and maintenance of IP Telephony networks. In particular, CiscoWorks IP Telephony Environment Monitor (ITEM) provides a suite of applications and tools that facilitate effective management of both small and large IP Telephony installations based on the Cisco IP Communications network architecture as well as Cisco IOS software. CiscoWorks ITEM provides the following major features:

- Problem-focused fault analysis — Provides timely information about the health of IP Telephony environments.
- Confidence testing and monitoring — Uses synthetic testing to emulate normal day-to-day operations and to validate operational readiness of the IP infrastructure and the Cisco IP Telephony deployment.
- Intelligent integration with existing management infrastructures — Generates intelligent traps that can be forwarded to other event-management systems installed in the network, be sent to email or pager gateways, or be displayed on the Alerts and Activities Display (AAD).
- Evaluation and correlation capabilities — Evaluates the general health of the IP Telephony environment in the monitored network environment.
- Alerts and Activities Display (AAD) — Provides a proactive, web-based operations screen for real-time status and alerting of actual and suspected problems in the underlying IP network as well as in the Cisco IP Telephony implementation.
- ITEM Multi-View — Enables large enterprise customers and managed service providers to partition specific user communities and manage all of them from a single ITEM implementation.

The CiscoWorks Wireless LAN Solution Engine (WLSE) is another network management tool used specifically for monitoring and configuring wireless infrastructure devices. WLSE provides a simplified interface for managing large numbers of wireless APs and bridges, and it provides the following functionality:

- Configuring and upgrading firmware on APs and bridges within the infrastructure
- Reporting on device, client, and security information
- Monitoring of devices for faults, performance conditions, and misconfigurations as well as authentication server responses
- Managing the wireless radio environment to make deployment and expansion easier

For more information on CiscoWorks WLSE, refer to the Cisco AVVID Wireless LAN Design SRND, available at

<http://cisco.com/go/srnd>

In addition to the tools outlined above, both Cisco CallManager and Cisco APs provide detailed logging functionality that enables network administrators to monitor behavior and identify network problems or errors.

