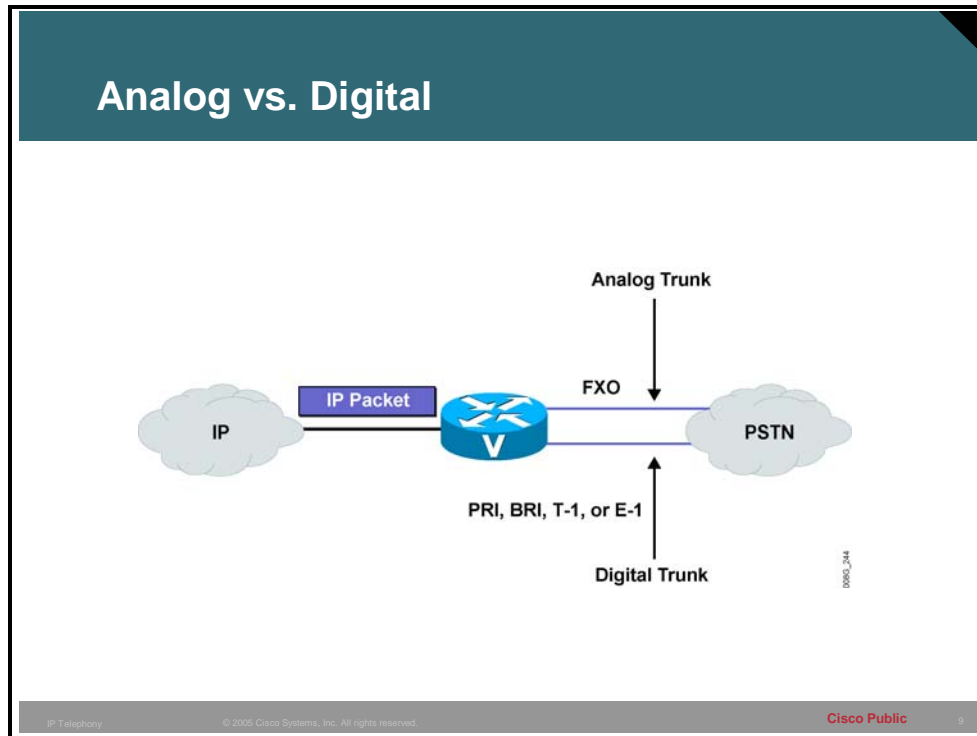


Gateways and Their Roles

Understanding Gateways

This topic describes the role of voice gateways and their application when connecting VoIP to traditional PSTN and telephony equipment.



A gateway is a device that translates one type of signal to a different type of signal. There are different types of gateways, including the voice gateway.

A voice gateway is a router or switch that converts IP voice packets to analog or digital signals that are understood by TDM trunks or stations. Gateways are used in several situations; for example, to connect the PSTN, a PBX, or a key system to a VoIP network.

Example: Analog and Digital Gateways

In the figure, the voice-enabled router examines the incoming IP packet to determine if it is a voice packet and where it is heading. Based on information inside the voice packet, the router translates the digitized signal or voice into the appropriate analog or digital signal to be sent to the PSTN. For a call coming from the PSTN, the gateway interprets the dialed digits and determines the IP destination for this call.

Guidelines for Selecting the Correct Gateway

This topic describes the guidelines for selecting the correct gateway.

Gathering the Requirements

- Is an analog or digital gateway required?
- What is the required capacity of the gateway?
- What type of connection is the gateway going to use? Is Foreign Exchange Office (FXO), FXS, E&M, T1, E1, PRI, or BRI signaling required?
- What signaling protocol is used? H.323, Media Gateway Control Protocol (MGCP), or session initiation protocol (SIP)?
- Is voice compression a part of the design? If so, which type?
- Are direct inward dialing (DID), calling line identification (CLID), modem relay, or fax relay required?
- Is the device acting only as gateway or as gateway and router/LAN switch? Is inline power for IP Phones required?
- Is remote site survivability required?
- To which country is the hardware shipped?

Understanding gateways and being able to select the correct gateway out of numerous gateway options is challenging. Factors to consider include the protocols that are supported, the density and types of interfaces on the gateway, and the features that are required. Knowing the requirements will guide you to the correct solution.

One criterion involves defining the type of site that the gateway supports. Is it a small office/home office (SOHO), branch office, enterprise campus environment, or service provider? Each type of site has its own set of requirements.

The figure lists the questions that you should be asking before selecting a gateway. The answers will help to define the gateway functions and determine if the proposed design meets current requirements and encompasses future growth.

A key step is identifying the number and type of voice interfaces that are necessary and verifying the protocol support. Are supplementary services supported? Which codecs must be supported? Is fax relay necessary? Many of these functions are features of specific Cisco IOS software releases. Identification of the proper IOS software release that is necessary to support the features is critical.

Another key question is whether the gateway is acting as a gateway only or needs to combine the functions of gateway and router within one device. This, too, points to a specific set of hardware and software.

When planning gateways for location in other countries, verify that the device meets the government standards for PSTN connection in that country. Also, if the device supports encryption capabilities, verify the legality of export to the destination country.

Example: Selecting a Gateway

For example, if the requirements are to support Foreign Exchange Station (FXS) and receive and transmit (E&M) connections, as well as T1 PRI from the PBX, then a suitable choice would be a Cisco 3745 Multiservice Access Router with a two-slot voice network module (VNM), 1 FXS voice interface card (VIC), 1 E&M VIC, and a High Density Voice (HDV) module.

Determining Gateway Interconnection Requirements in an Enterprise Environment, Central and Remote Site

This topic describes the guidelines for determining gateway interconnection requirements in an enterprise environment for both central and remote sites.

Enterprise Gateway Considerations— Remote Site			
	Role	Features	Platforms
General	<ul style="list-style-type: none">• Branch office router	<ul style="list-style-type: none">• WAN• QoS• Router• Security	<ul style="list-style-type: none">• 17xx• 26/36/37
Voice Gateway (GW)	<ul style="list-style-type: none">• Standalone GW• Branch office router<ul style="list-style-type: none">– GW– SRST– LAN switch– Optional gatekeeper	<ul style="list-style-type: none">• QoS• Voice interfaces• Voice features• LAN switching• Branch survivability	<ul style="list-style-type: none">• 17XX• VG224• VG248• 26/36/37• Cat 6k
Additional	<ul style="list-style-type: none">• Analog fax/modem GW• Digital fax/modem	<ul style="list-style-type: none">• Fax• Modem	<ul style="list-style-type: none">• Same as voice GWs

As IP telephony services become a standard in the corporate environment, a broad mix of requirements surface in the enterprise environment. The IP telephony deployment typically begins by connecting to the PSTN to manage off-net calls and using a Cisco CallManager infrastructure to manage on-net calls.

Example: Gateway Interconnect Considerations

The table shows examples of questions that you must ask to determine the requirements for gateway interconnections.

Determining Gateway Interconnection Requirements

Question	Reasoning
How do you control the gateways?	You must ensure support for proper call processing, such as Media Gateway Control Protocol (MGCP), session initiation protocol (SIP), or H.323.
Is cost an issue?	Distributed call processing is easier to implement, but costs are higher when deploying intelligent devices at each site.
Is remote site survivability an issue?	Remote site survivability is not an issue with a distributed model unless there is a need for redundancy. This is an issue for a centralized model that must be addressed by providing Survivable Remote Site Telephony (SRST). This means ensuring that the version of Cisco IOS software supports the feature.
Are gatekeepers in the design, and if so, how are the zones structured?	Gatekeepers are normally used in enterprise sites for scalability and manageability. The design must include proper planning for zone configurations.
Are the gateways switches or routers?	This question determines how other features, such as QoS, are implemented. Numerous switches and routers are available that have voice gateway functionality along with other core services. These services include Layer 2 and Layer 3 QoS implementations, inline power, and security features.
Is fax or modem support required?	This requirement means the gateway must be capable of fax and modem relay functions. Another option for the enterprise customer may be to purchase IP telephony services from a service provider. In that case, a decision must be made regarding who manages the gateway and what type of connection is required; for example, SIP, H.323, or MGCP.

Enterprise Gateway Considerations— Central Site

- **Dial plan integration**
- **Voice-mail integration**
- **Gateway for PBX interconnect**
- **Inline power requirements for IP Phones**

IP Telephony

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At the central site, the specific issues that need to be addressed include the following:

- **Dial plan integration:** For consistent reachability, the new dial plan for the IP voice network must integrate with the existing dial plan. It is essential that you have a thorough understanding of how the dial plans interact.
- **Voice-mail integration:** After a voice-mail application is selected, the designer must ensure that all users can seamlessly reach the voice-mail server and that all incoming calls are properly forwarded when the recipient does not answer the telephone. This may mean dedicating gateway connections for an existing voice mail server, or dedicating an entire gateway for the express purpose of voice mail server integration.
- **Gateway for PBX interconnect:** When the IP voice network interconnects PBXs, the designer must determine what type of connection is supported by the PBX and which gateway will support that connection.
- **Inline power requirements for IP Phones:** Beyond the gateway, when the design includes IP Phones, the power requirements must be considered. In many cases, it is desirable to provide inline power to the telephones. A number of devices provide inline power. The decision about inline power requirements is based on capacity and the current power options.

Note	The network administrator should evaluate the need for inline power depending on the network design.
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Determining Gateway Interconnection Requirements in a Service Provider Environment

This topic provides the gateway interconnection requirements in service provider environments.

Service Provider Gateway Considerations

- **Signaling interconnection type**
SS7 supports a high volume of call setup.
- **Carrier-class performance**
Gateways must have redundancy and QoS support.
- **Scalability**
Gateways must support rapid growth.

Service providers must provide a level of service that meets or exceeds PSTN standards. The gateways that service providers implement must provide for reliable, high-volume voice traffic with acceptable levels of latency and jitter. The following functions address those requirements:

- **Signaling interconnection type:** Signaling System 7 (SS7) interconnect supports a high volume of call setup and benefits from redundant interconnect capabilities directly into the PSTN switch network.
- **Carrier-class performance:** Carrier-class performance can be provided through the proper redundant design for high availability in addition to the proper implementation of QoS features to ensure acceptable delay and jitter.
- **Scalability:** Scalability is a critical factor in the service provider arena. Customers who need access should be serviced promptly. Choosing a gateway with capacity for rapid growth is an important design decision. Gateways can scale upward to T3 capabilities for large-scale environments.

Example: Service Provider Requirements

An IP telephony service provider needs to upgrade their existing gateway platforms because of business growth. The service provider sells a managed IP telephony service to small and medium businesses and provides connections to many different low-cost, long-distance carriers for their customers. Their issues are call quality over the IP network, so delay and jitter need to be controlled. Service providers also must consider scalability and the ability to provide differentiated levels of service through QoS. They also need connectivity to SS7 networks of long-distance carriers to reduce costs, and, finally, they need to consider the overall cost of

implementation. SS7 capabilities and a redundant design enable the service provider to deliver a reliable level of service.