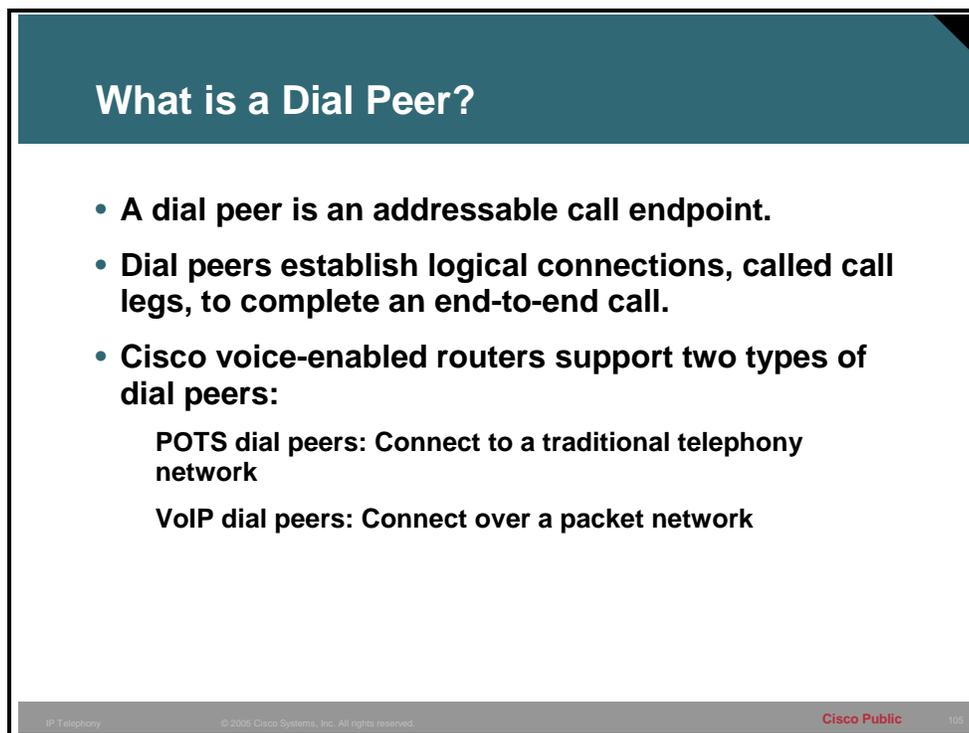


Dial Peers

What is Dial Peer?

This topic describes dial peers and their applications.



What is a Dial Peer?

- **A dial peer is an addressable call endpoint.**
- **Dial peers establish logical connections, called call legs, to complete an end-to-end call.**
- **Cisco voice-enabled routers support two types of dial peers:**
 - POTS dial peers: Connect to a traditional telephony network**
 - VoIP dial peers: Connect over a packet network**

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When a call is placed, an edge device generates dialed digits as a way of signaling where the call should terminate. When these digits enter a router voice port, the router must have a way to decide whether the call can be routed, and where the call can be sent. The router does this by looking through a list of dial peers.

A dial peer is an addressable call endpoint. The address is called a *destination pattern* and is configured in every dial peer. Destination patterns can point to one telephone number only or to a range of telephone numbers. Destination patterns use both explicit digits and wildcard variables to define a telephone number or range of numbers.

The router uses dial peers to establish logical connections. These logical connections, known as call legs, are established in either an inbound or outbound direction.

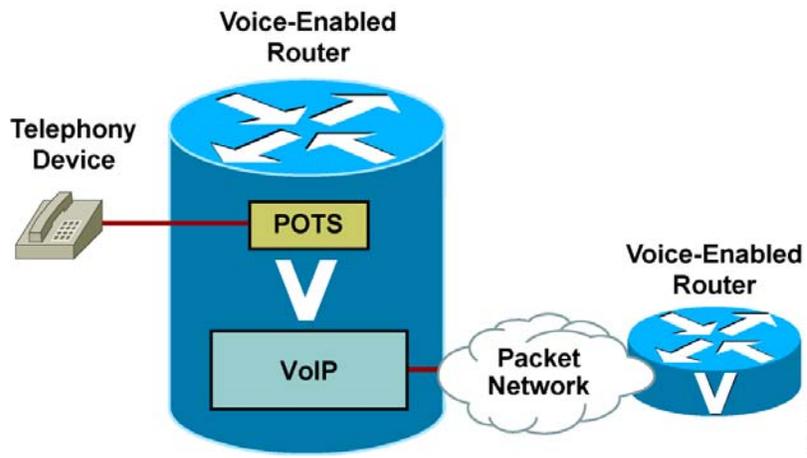
Dial peers define the parameters for the calls that they match. For example, if a call is originating and terminating at the same site, and is not crossing through slow speed WAN links, then the call can cross the local network uncompressed and without special priority. A call that originates locally and crosses the WAN link to a remote site may require compression with a specific codec. In addition, this call may require that voice activity detection (VAD) be turned on, and will need to receive preferential treatment by specifying a higher priority level.

Cisco Systems voice-enabled routers support two types of dial peers:

- **Plain old telephone service (POTS) dial peers:** Connect to a traditional telephony network, such as the public switched telephone network (PSTN) or a PBX, or to a telephony edge device, such as a telephone or fax machine. POTS dial peers perform these functions:
 - Provide an address (telephone number or range of numbers) for the edge network or device
 - Point to the specific voice port that connects the edge network or device

- **Voice over IP (VoIP) dial peers:** Connect over a packet network. VoIP dial peers perform these functions:
 - Provide a destination address (telephone number or range of numbers) for the edge device that is located across the network
 - Associate the destination address with the next hop router or destination router, depending on the technology used

Dial Peer



In the figure, the telephony device connects to the Cisco Systems voice-enabled router POTS dial. The POTS dial peer configuration includes the telephone number of the telephony device and the voice port to which it is attached. The router knows where to forward incoming calls for that telephone number.

The Cisco voice-enabled router VoIP dial peer is connected to the packet network. The VoIP dial peer configuration includes the destination telephone number (or range of numbers) and the next hop or destination voice-enabled router network address.

Follow the steps to place a VoIP call:

How to Place a VoIP Call

Step	Action
1	Configure the source router with a compatible dial peer that specifies the recipient destination address
2	Configure the recipient router with a POTS dial peer that specifies which voice port the router uses to forward the voice call

Plain Old Telephone Service Dial Peers

This topic describes how to configure POTS dial peers.

POTS Dial Peers

Dial Peer 1



Ext. 7777

Configuration for Dial Peer 1 on R1:

```
Router# configure terminal
Router(config)# dial-peer voice 1 pots
Router(config-dialpeer)# destination-pattern 7777
Router(config-dialpeer)# port 1/0/0
Router(config-dialpeer)# end
```

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Before the configuration of Cisco IOS dial peers can begin, the user must have a good understanding of where the edge devices reside, what type of connections need to be made between these devices, and what telephone numbering scheme is applied to the devices.

Follow the steps to configure POTS dial peers:

How to Configure POTS Dial Peers

Step	Action
1	Configure a POTS dial peer at each router or gateway where edge telephony devices connect to the network
2	Use the destination-pattern command in the dial peer to configure the telephone number
3	Use the port command to specify the physical voice port that the POTS telephone is connected to.

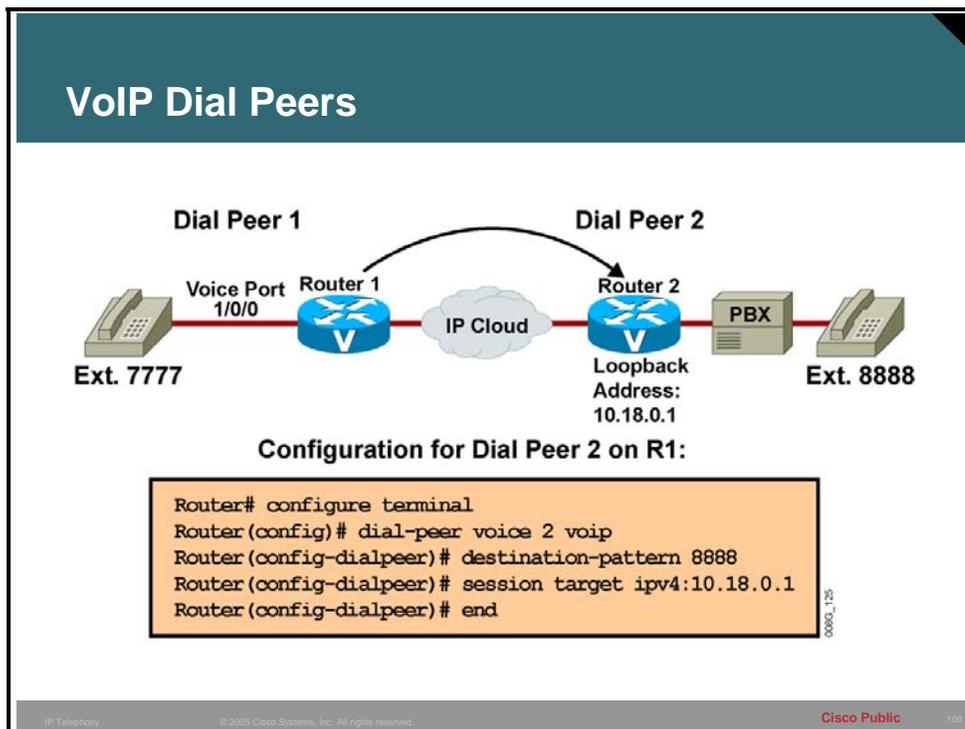
The dial peer type will be specified as POTS because the edge device is directly connected to a voice port and the signaling must be sent from this port to reach the device. There are two basic parameters that need to be specified for the device: the telephone number and the voice port. When a PBX is connecting to the voice port, a range of telephone numbers can be specified.

Example

The figure illustrates proper POTS dial peer configuration on a Cisco voice-enabled router. The **dial-peer voice 1 pots** command notifies the router that dial peer 1 is a POTS dial peer with a tag of 1. The **destination-pattern 7777** command notifies the router that the attached telephony device terminates calls destined for telephone number 7777. The **port 1/0/0** command notifies the router that the telephony device is plugged into module 1, voice interface card (VIC) slot 0, voice port 0.

VoIP Dial Peers

This topic describes how to configure VoIP dial peers.



The administrator must know how to identify the far-end voice-enabled device that will terminate the call. In a small network environment, the device may be the IP address of the remote device. In a large environment, the device may mean pointing to a Cisco CallManager or gatekeeper for address resolution and call admission control (CAC) to complete the call.

You must follow these steps to configure VoIP dial peers:

How to Configure VoIP Dial Peers

Step	Action
1	Configure the path across the network for voice data
2	Specify the dial peer as a VoIP dial peer
4	Use the destination-pattern command to configure a range of numbers reachable by the remote router or gateway
5	Use the session target command to specify an IP address of the terminating router or gateway
6	Use the remote device loopback address as the IP address

The dial peer is specified as a VoIP dial peer, which alerts the router that it must process a call according to the various parameters that are specified in the dial peer. The dial peer must then package it as an IP packet for transport across the network. Specified parameters may include the codec used compression (VAD, for example), or marking the packet for priority service.

The destination-pattern parameter configured for this dial peer is typically a range of numbers that are reachable via the remote router or gateway.

Because this dial peer points to a device across the network, the router needs a destination IP address to put in the IP packet. The session target parameter allows the administrator to specify either an IP address of the terminating router or gateway, or another device; for example, a gatekeeper or Cisco CallManager that can return an IP address of that remote terminating device.

To determine which IP address a dial peer should point to, it is recommended that you use a loopback address. The loopback address is always up on a router, as long as the router is powered on and the interface is not administratively shut down. If an interface IP address is used instead of the loopback, and that interface goes down, the call will fail even if there is an alternate path to the router.

Example

The figure illustrates the proper VoIP dial peer configuration on a Cisco voice-enabled router. The **dial-peer voice 2 voip** command notifies the router that dial peer 2 is a VoIP dial peer with a tag of 2. The **destination-pattern 8888** command notifies the router that this dial peer defines an IP voice path across the network for telephone number 8888. The **session target ipv4:10.18.0.1** command defines the IP address of the router that is connected to the remote telephony device.

Destination-Pattern Options

This topic describes destination-pattern options and the applicable shortcuts.

Destination-Pattern Options

Command Syntax: `destination-pattern [+]` *string* [T]

+	(Optional) Character indicating an E.164 standard number
<i>string</i>	Series of digits that specify the E.164 or private dialing-plan telephone number. Valid entries are the digits 0 through 9, the letters A through D, and the following special characters: <ul style="list-style-type: none">• The asterisk (*) and pound sign (#) that appear on standard touch-tone dial pads• Comma (,) which inserts a pause between digits• Period (.) which matches any single entered digit (this character is used as a wildcard)• Brackets ([]), which indicate a range. A range is a sequence of characters enclosed in the brackets; only numeric characters from 0 to 9 are allowed in the range
T	(Optional) Control character indicating that the destination-pattern value is a variable-length dial string

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The destination pattern associates a telephone number with a given dial peer. The destination pattern also determines the dialed digits that the router collects and forwards to the remote telephony interface, such as a PBX, Cisco CallManager, or the PSTN. You must configure a destination pattern for each POTS and VoIP dial peer that you define on the router.

The destination pattern can indicate a complete telephone number or a partial telephone number with wildcard digits; it can also point to a range of numbers defined in a variety of ways.

Destination-pattern options include:

- **Plus (+):** An optional character that indicates an E.164 standard number. E.164 is the International Telecommunication Union Telecommunication Standardization Sector (ITU-T) recommendation for the international public telecommunication numbering plan. The plus sign in front of a destination-pattern string specifies that the string must conform to Recommendation E.164.
- **String:** A series of digits specifying the E.164 or private dialing-plan telephone number. The examples below show the use of special characters that are often found in destination patterns strings:
 - Asterisk (*) and pound sign (#) appear on standard touch-tone dial pads. These characters may need to be used when passing a call to an automated application that requires these characters to signal the use of a special feature. For example, when

calling an interactive voice response (IVR) system that requires a code for access, the number dialed might be “5551212888#”, which would initially dial the telephone number 5551212 and input a code of 888 followed by the pound key to terminate the IVR input query.

- Comma (,) inserts a one-second pause between digits. The comma can be used, for example, where a 9 is dialed to signal a PBX that the call should be processed by the PSTN. The 9 is followed by a comma to give the PBX time to open a call path to the PSTN, after which the remaining digits will be played out. An example of this string is 9,5551212.
 - Period (.) matches any single entered digit (this character is used as a wildcard). The wildcard is used to specify a group of numbers that may be accessible via a single destination router, gateway, PBX or Cisco Call Manager. Because the period (commonly referred to as a dot), indicates a single digit of 0 to 9, this limits how efficiently ranges of numbers are used. A pattern of “200.” allows for 10 uniquely addressed devices, where a pattern of “20.” can point to 100 devices. If one site has the numbers 2000 through 2049, and another site has the numbers 2050 through 2099, then the bracket notation would be more efficient.
 - Brackets ([]) indicate a range. A range is a sequence of characters that are enclosed in the brackets. Only single numeric characters from 0 to 9 are allowed in the range. In the previous example, the bracket notation could be used to specify exactly which range of numbers is accessible through each dial peer. For example, the first site pattern would be “20[0-4].”, and the second site pattern would be “20[5-9].” The bracket notation offers much more flexibility in how numbers can be assigned.
- **T:** An optional control character indicating that the destination-pattern value is a variable-length dial string. In cases where callers may be dialing local, national or international numbers, the destination pattern must provide for a variable-length dial plan. If a particular voice gateway has access to the PSTN for local calls, and access to a transatlantic connection for international calls, then calls being routed to that gateway will have a varying number of dialed digits. A single dial peer with a destination pattern of “.T” could support the different call types. The interdigit timeout determines when a string of dialed digits is complete. The router continues to collect digits until there is an interdigit pause longer than the configured value, which by default is 10 seconds.

When the calling party finishes entering dialed digits, there is a pause equal to the interdigit timeout value *before* the router processes the call. The calling party can immediately terminate the interdigit timeout by entering the pound (#) character, which is the default termination character. Because the default interdigit timer is set to 10 seconds, users may experience a long call setup delay.

Note Cisco IOS software does not check the validity of the E.164 telephone number; it accepts any series of digits as a valid number.

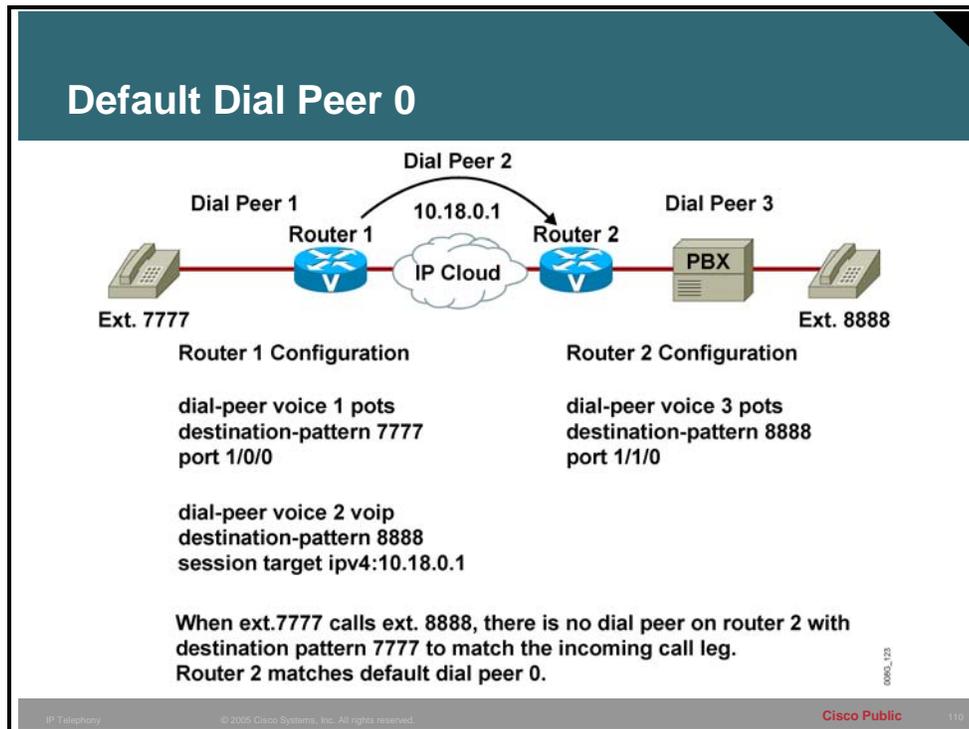
Example

Example: Destination-Pattern Options

Destination Pattern	Matching Telephone Numbers
5551234	<p>Matches one telephone number exactly, 5551234.</p> <p>This is typically used when there is a single device, such as a telephone or fax, connected to a voice port.</p>
555[1-3]...	<p>Matches a seven-digit telephone number where the first three digits are 555, the fourth digit can be a 1, 2, or 3, and the last digits can be any valid digits.</p> <p>This type of destination pattern is used where telephone number ranges are assigned to specific sites. In this example, the destination pattern is used in a small site that does not need more than thirty numbers assigned.</p>
.T	<p>Matches any telephone number that has at least one digit and can vary in length from 1 to 32 digits total.</p> <p>This destination pattern is used for a dial peer that services a variable-length dial plan, such as local, national, and international calls. It can also be used as a default destination pattern so that any calls that do not match a more specific pattern will match this one and can be directed to an operator.</p>

What is the Default Dial Peer?

This topic describes the default dial peer.



When a matching inbound dial peer is not found, the router resorts to the default dial peer.

Note Default dial peers are used for inbound matches only. They are not used to match outbound calls that do not have a dial peer configured.

The default dial peer is referred to as *dial-peer 0*.

Example

In the figure, only one-way dialing is configured. The caller at extension 7777 can call extension 8888 because there is a VoIP dial peer configured on router 1 to route the call across the network. There is no VoIP dial peer configured on router 2 to point calls across the network towards router 1. Therefore, there is no dial peer on router 2 that will match the calling number of extension 7777 on the inbound call leg. If no incoming dial peer matches the calling number, the inbound call leg automatically matches to a default dial peer (POTS or VoIP).

Note There is an exception to the previous statement. Cisco voice and/or dial platforms, such as the AS53xx and AS5800, require that a configured inbound dial peer be matched for incoming POTS calls to be accepted as voice calls. If there is no inbound dial peer match, the call is treated and processed as a dial-up (modem) call.

Dial peer 0 for inbound VoIP peers has the following configuration:

- any codec
- ip precedence 0
- vad enabled
- no rsvp support
- fax-rate service

Dial peer 0 for inbound POTS peers has the following configuration:

- no ivr application

You cannot change the default configuration for dial peer 0. Default dial peer 0 fails to negotiate non-default capabilities or services. When the default dial peer is matched on a VoIP call, the call leg that is set up in the inbound direction uses any supported codec for voice compression, based on the requested codec capability coming from the source router. When a default dial peer is matched, the voice path in one direction may have different parameters than the voice in the return direction. This may cause one side of the connection to report good-quality voice, while the other side reports poor-quality voice. For example, the outbound dial peer has VAD disabled, but the inbound call leg is matched against the default dial peer, which has VAD enabled. In this example, VAD is *on* in one direction and *off* in the return direction.

When the default dial peer is matched on an inbound POTS call leg, there is no default IVR application with the port; as a result, the user gets a dial tone and proceeds with dialed digits.

The use of a catch all dial peer that will match all calls can prevent the use of the default dial peer and send any matches to a default location like the operator or an automated attendant (AA).