

# Configuring Easy IP

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The Easy IP (Phase 1) feature combines Network Address Translation (NAT) and PPP/Internet Protocol Control Protocol (IPCP). This feature enables a Cisco router to automatically negotiate its own registered WAN interface IP address from a central server and to enable all remote hosts to access the global Internet using this single registered IP address. Because Easy IP (Phase 1) uses existing port-level multiplexed NAT functionality within the Cisco IOS software, IP addresses on the remote LAN are invisible to the Internet.

For a complete description of the Easy IP commands in this chapter, refer to the *Dial Solutions Command Reference*. To locate documentation of other commands that appear in this chapter, use the command reference master index or search online.

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**Note** Simple translations, either static or dynamic, are not supported in non-Plus Cisco IOS software images. In order to enable dynamic or static simple translation along with Easy IP (Phase 1), you need to obtain the full NAT Plus Cisco IOS software image.

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## Benefits

Easy IP (Phase 1) provides the following benefits:

- Reduced Internet access costs through the use of dynamically allocated IP addresses
- Simplified router configuration and IP address management
- Conserved registered IP addresses
- Dynamic IP address allocation for remote workstations
- Remote LAN IP address privacy

## List of Terms

**PPP/Internet Protocol Control Protocol (IPCP)**—Defined in RFC 1332, this protocol provides the ability to dynamically configure IP addresses over Point-to-Point Protocol (PPP). A Cisco IOS Easy IP (Phase 1) router uses PPP/IPCP to dynamically negotiate its own registered WAN interface IP address from a central access server or Dynamic Host Configuration Protocol (DHCP) server.

**Network Address Translation (NAT)**—Operates on a router that connects two or more networks together. In Easy IP (Phase 1), at least one of these networks (designated as “inside” or “LAN”) is addressed with private addresses that must be converted into a registered address before packets can

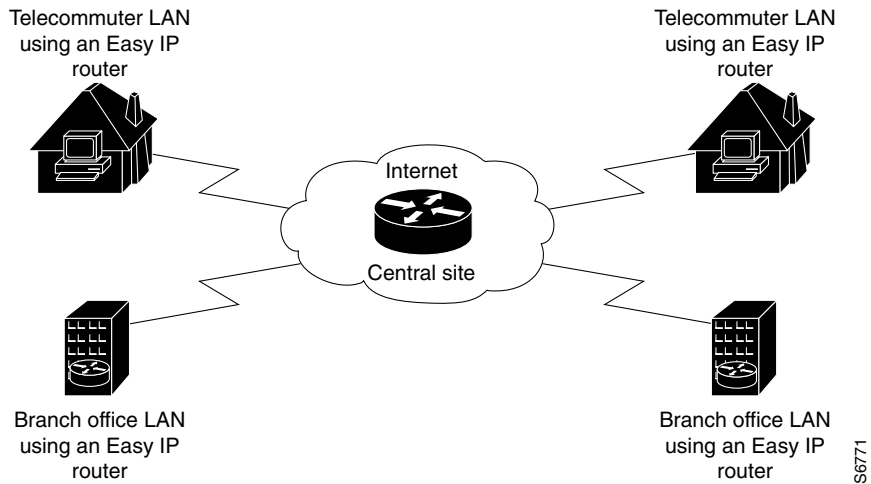
be forwarded to the other registered network (designated as “outside” or “WAN”). Within the context of Easy IP (Phase 1), port-level multiplexed NAT is used to translate all internal private addresses to a single outside registered IP address.

## How Easy IP Works

Easy IP (Phase 1) assumes that all clients have statically configured IP addresses. The PPP/IPCP address negotiation functionality in Easy IP is used to assign an IP address from a central device (PPP/IPCP option 3—“IP Address”) to the Easy IP router.

Figure 318 shows a typical scenario for using the Easy IP feature.

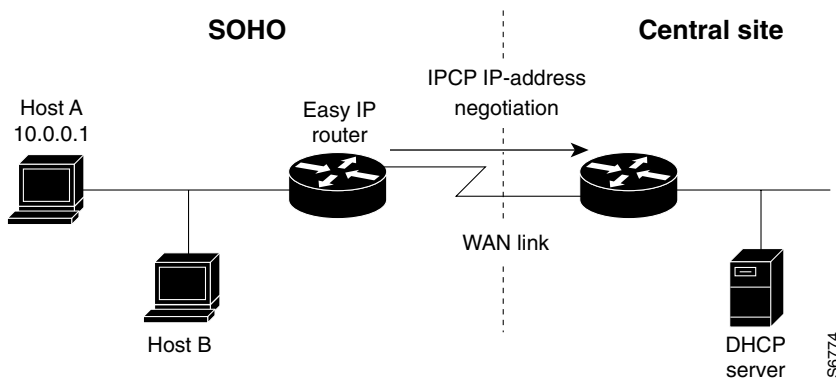
**Figure 318 Telecommuter and Branch Office LANs Using Easy IP**



Steps 1 through 4 illustrate how Easy IP (Phase 1) works.

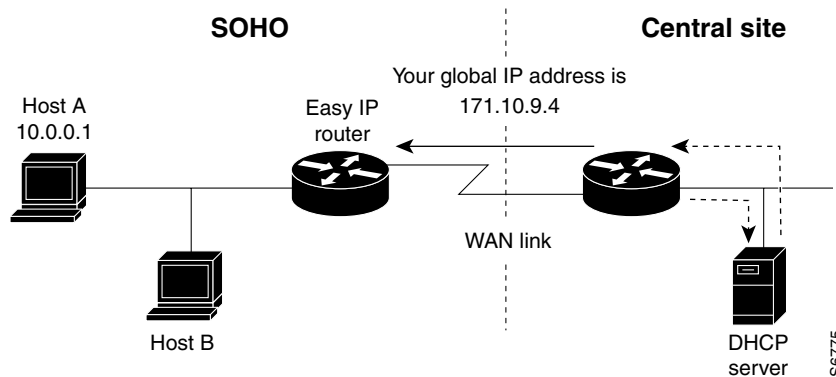
**Step 1** When a SOHO host generates “interesting” traffic (as defined by access control lists) for dialup (first-time only), the Easy IP router requests a single registered IP address from the central site’s access server via PPP/IPCP. See Figure 319.

**Figure 319 Easy IP Router Requests a Dynamic Global IP Address**



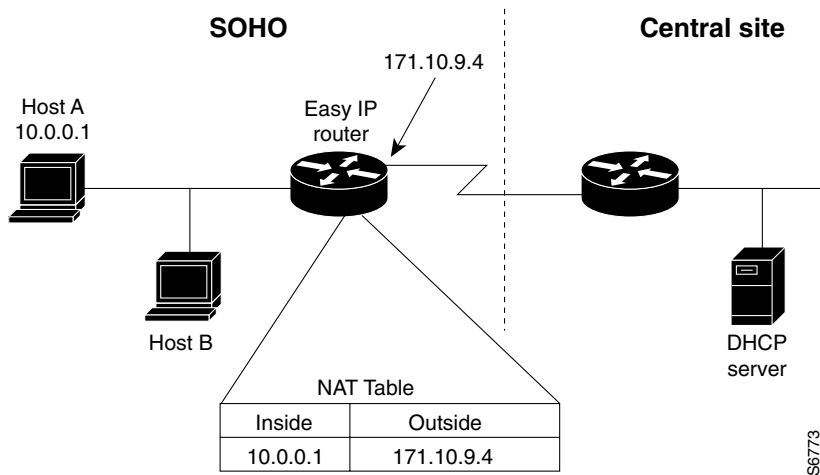
**Step 2** The central site router replies with a dynamic global address from a local DHCP IP address pool. See Figure 320.

**Figure 320 Dynamic Global IP Address Delivered to the Easy IP Router**



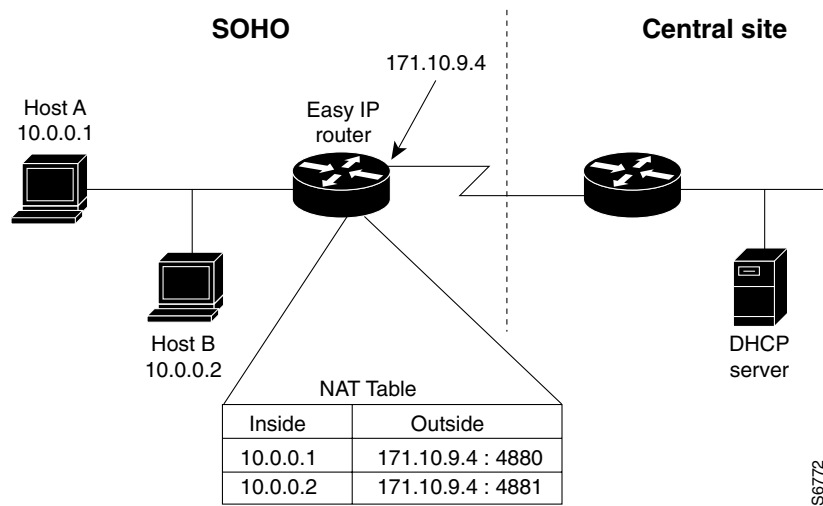
**Step 3** The Easy IP router uses port-level NAT functionality to automatically create a translation that associates the WAN interface's registered IP address with the client's private IP address. See Figure 321.

**Figure 321 Port-Level NAT Functionality Used for IP Address Translation**



**Step 4** The remote hosts contain multiple static IP addresses while the Easy IP router obtains a single registered IP address using PPP/PCP. The Easy IP router then creates port-level multiplexed NAT translations between these addresses so that each remote host address (inside private address) is translated to a single external address assigned to the Easy IP router. This many-to-one address translation is also called port-level multiplexing or port address translation (PAT). Note that the NAT port-level multiplexing function can be used to conserve global addresses by allowing the remote routers to use one global address for many local addresses. See Figure 322.

**Figure 322 Multiple Private Internal IP Addresses are Bound to a Single Global IP Address**



## Prerequisites

Complete the following tasks before using Easy IP (Phase 1):

- Configure the Integrated Services Digital Network (ISDN) switch type and service provider identifier (SPID) (if using ISDN).
- Configure the static route from LAN to WAN interface.

For information about configuring ISDN switch types, refer to the “Setting Up ISDN Basic Rate Service” chapter earlier in this book. For information about configuring static routes, refer to the “Configuring IP Services” chapter in the *Network Protocols Configuration Guide, Part 1*. For information about NAT, refer to the “Configuring Network Address Translation” chapter in this book.

## Configuration Task List

In its most simple configuration, an Easy IP (Phase 1) router or access server will have a single LAN interface and a single WAN interface. Based on this model, you must complete the following tasks to use Easy IP (Phase 1):

- Define the NAT Pool
- Configure the LAN Interface
- Define NAT for the LAN Interface
- Configure the WAN Interface
- Enable PPP/IPCP Negotiation
- Define NAT for the Dialer Interface
- Configure the Dialer Interface

For configuration examples, refer to the section “Examples” later in this chapter.

## Define the NAT Pool

The first step in enabling Easy IP (Phase 1) is to create a pool of internal IP addresses to be translated. To define the NAT pool, perform the following tasks in global configuration mode:

Step	Command	Purpose
1	<b>access-list</b> <i>access-list-number</i> <b>permit</b> <i>source</i> [ <i>source-wildcard</i> ]	Define a standard access list permitting those addresses that are to be translated.
2	<b>ip nat inside source list</b> <i>access-list-number</i> <b>interface</b> <i>dialer-name</i> <b>overload</b>	Establish dynamic source translation, identifying the access list defined in the prior step.

For information about configuring NAT, refer to the chapter “Configuring Network Address Translation” in this book. For information about creating access lists, refer to the chapter “Configuring IP Services” in the *Network Protocols Configuration Guide, Part 1*.

## Configure the LAN Interface

To configure the LAN interface, perform the following tasks in interface configuration mode:

Step	Command	Purpose
1	<b>interface</b> <i>type number</i>	Select a specific LAN interface.
2	<b>ip address</b> <i>address mask</i>	Define the IP address and subnet mask for this interface.

For information about assigning IP addresses and subnet masks to network interfaces, refer to the “Configuring IP Services” chapter in the *Network Protocols Configuration Guide, Part 1*.

## Define NAT for the LAN Interface

To ensure that the LAN interface is connected to the inside network (and therefore subject to NAT), perform the following task in interface configuration mode:

Command	Purpose
<b>ip nat inside</b>	Define the interface as internal for network address translation.

For information about configuring NAT, refer to the chapter “Configuring Network Address Translation” in this book.

## Configure the WAN Interface

To configure the WAN interface, perform the following tasks in interface configuration mode:

Step	Command	Purpose
1	<b>interface</b> <i>type number</i>	Select the WAN interface.
2	<b>no ip address</b>	Remove any associated IP address from this interface.
3	<b>encapsulation ppp</b>	Select PPP as the encapsulation method for this interface.
4	<b>dialer pool-member</b> <i>number</i>	Bind the WAN interface to the dialer interface.

## Enable PPP/IPCP Negotiation

To enable PPP/IPCP negotiation on the dialer interface, perform the following tasks in interface configuration mode:

Step	Command	Purpose
1	<b>interface</b> <i>dialer-name</i>	Select the dialer interface.
2	<b>ip address negotiated</b>	Enable PPP/IPCP negotiation for this interface.

## Define NAT for the Dialer Interface

To define that the dialer interface is connected to the outside network, perform the following tasks in interface configuration mode:

Step	Command	Purpose
1	<b>interface</b> <i>dialer-name</i>	Select the dialer interface.
2	<b>ip nat outside</b>	Define the interface as external for network address translation.

For information about configuring NAT, refer to the chapter “Configuring Network Address Translation” in this book.

## Configure the Dialer Interface

To configure the dialer interface information, perform the following tasks in interface configuration mode:

Step	Command	Purpose
1	<b>interface</b> <i>dialer-name</i>	Select the dialer interface.
2	<b>dialer wait-for-carrier-time</b> <i>seconds</i>	Specify for a dialer interface the length of time the interface waits for a carrier before timing out.
3	<b>dialer hold-queue</b> <i>packets</i>	Create a dialer hold queue and specify the number of packets to be held in it.
4	<b>dialer remote-name</b> <i>username</i>	Specify the remote router CHAP authentication name.
5	<b>dialer idle-timeout</b> <i>seconds</i>	Specify the amount of idle time that can pass before calls to the central access server are disconnected.
6	<b>dialer string</b> <i>dialer-string</i>	Specify the telephone number required to reach the central access server.
7	<b>dialer pool</b> <i>number</i>	Specify the dialing pool to use.
8	<b>dialer-group</b> <i>group-number</i>	Assign the dialer interface to a dialer group.

## Examples

The following example shows how to configure BRI interface 0 (shown as interface bri0) to obtain its IP address via PPP/IPCP address negotiation:

```

! The following command defines the NAT pool.
ip nat inside source list 101 interface dialer1 overload
!
! The following commands define the ISDN switch type.
isdn switch type vn3
isdn tei-negotiation first-call
!
!The following commands define the LAN address and subnet mask.
interface ethernet0
 ip address 10.0.0.4 255.0.0.0

!The following command defines ethernet0 as internal for NAT.
 ip nat inside
!
!The following commands binds the physical interface to the dialer1 interface.
interface bri0
 no ip address
 encapsulation ppp
 dialer pool-member 1
!
interface dialer1
!
!The following command enables PPP/IPCP negotiation for this interface.
 ip address negotiated
 encapsulation ppp
!
!The following command defines dialer1 interface as external for NAT.
 ip nat outside
 dialer remote-name dallas
 dialer idle-timeout 180
!
!The following command defines the dialer string for central access server.
 dialer string 4159991234
 dialer pool 1
 dialer-group 1
!
!The following commands define the static route to the WAN interface.
ip route 0.0.0.0 0.0.0.0 dialer1
access-list 101 permit ip 10.0.0.0 0.255.255.255 any
dialer-list 1 protocol ip list 101

```

The following example shows how to configure an asynchronous interface (interface async1) to obtain its IP address via PPP/IPCP address negotiation:

```

! This command defines the NAT pool.
ip nat inside source list 101 interface dialer 1 overload
!
!The following commands define the LAN IP address and subnet mask.
interface ethernet0
 ip address 10.0.0.4 255.0.0.0
!
!The following command defines ethernet0 as internal for NAT.
 ip nat inside
!
!The following commands bind the physical dialer1 interface.
interface async1
 no ip address
 encapsulation ppp
 async mode dedicated
 dialer pool-member 1

```

## Examples

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```
!  
interface dialer1  
!  
!The following command enables PPP/IPCP negotiation for this interface.  
ip address negotiated  
encapsulation ppp  
!  
!The following command defines dialer1 interface as external for NAT.  
ip nat outside  
dialer wait-for-carrier-time 30  
dialer hold-queue 10  
dialer remote-name dallas  
dialer idle-timeout 180  
!  
!The following command defines the dialer string for central access server.  
dialer string 4159991234  
dialer pool 1  
dialer-group 1  
!  
!The following commands define the static route to the WAN interface.  
ip route 0.0.0.0 0.0.0.0 dialer1  
access-list 101 permit ip 10.0.0.0 0.255.255.255 any  
dialer-list 1 protocol ip list 101
```