通过 Easy IP 与 DHCP 服务器实现按需拨号路由 (DDR)

目录

简介

本文解释是有用的使用Cisco IOS软件Easy IP功能，在一个整个站点连接到为整个远程站点只分配一个IP地址的互联网通过互联网服务提供商处。Easy IP路由器拨号网络接入服务器(NAS)在服务提供商并且协商其自己的WAN IP地址。路由器通过此协商得到的地址然后使用网络地址转换(NAT)与端口地址转换(PAT)为内部的客户端提供外部访问。Easy IP路由器的另一个可选功能将作为动态主机配置协议(DHCP)服务器对LAN在客户端里面。思科小办公室/家庭(SOHO)路由器是常用的在此配置类型。

先决条件

要求

本文档没有任何特定的前提条件。

使用的组件

本文档中的信息基于以下软件和硬件版本：

- Easy IP有四以太网和八BRI接口运行Cisco IOS软件版本12.0(7)的XK2 Router-A Cisco 3620。
- 接入服务器- Cisco AS5300用一以太网、运行Cisco IOS软件版本12.1(7)的一快速以太网和四个信道化T1/PRI端口。

本文档中的信息都是基于特定实验室环境中的设备创建的。本文档中使用的所有设备最初均采用原始（默认）配置。如果您是在真实网络上操作，请确保您在使用任何命令前已经了解其潜在影响。

规则

有关文档规则的详细信息，请参阅 Cisco 技术提示规则。

背景信息

Easy IP 的组成

- 点对点协议(PPP) /IP控制协议(IPCP) ：这在RFC 1332定义 。IPCP提供能力动态地配置在PPP的IP地址。动态地协商其从中央接入服务器或DHCP服务器的自己的已注册广域网接口IP地址的Cisco IOS Easy IP路由器用途PPP/IPCP。
- NAT:起作用一起连接两个或多个网络的路由器。在Easy IP，这些网络之至少一(被选定作为“里面”或“LAN”)访问与必须转换到注册地址的专用地址，在数据包可以转发到另一已注册网络前(被选定作为“外部”或“广域网”)。在Easy IP的上下文内，端口地址转换(PAT)用于转换对单个外部注册的IP地址的所有内部专用地址。
- 对LAN客户端的DHCP ：这是可以是使用的分配IP地址对内部的LAN客户端思科Easy IP路由器的可选功能。能也使用分配IP地址其他方法到客户端例如静态分配或使用DHCP PC服务器。

Easy IP 工作原理逐步说明

1. 如果Easy IP路由器配置作为DHCP服务器， LAN在客户端里面接收从它的一个专用IP地址在电源。如果它同样地没有配置，客户端必须有IP地址分配到他们用某个其他方式。
2. 当LAN在客户端里面生成“触发的”流量(如定义由访问控制列表)时拨号的， Easy IP路由器通过PPP/IPCP拨号并且请求从中心站点的接入服务器的单个注册的IP地址。一旦此联系被建立，其他LAN在客户端里面能使用此电路按照步骤4.说明。
3. 与一个动态全局地址的中心站点接入服务器回复从分配到Easy IP路由器的广域网接口的本地IP地址池。
4. 自动地创建关联广域网接口注册的IP地址与LAN专用IP地址的在客户端和一连接里面对中心站点接入服务器的转换的Easy IP路由器用途PAT做。

对于对Easy IP的更加详细的了解，参考白皮书- Cisco IOS Easy IP。

配置

本部分提供有关如何配置本文档所述功能的信息。

网络图

本文档使用下图所示的网络设置。

配置

本文档使用以下配置：

Easy IP路由器

```
EasyIP#show running-config Building configuration...
Current configuration: ! version 12.0 service timestamps
debug uptime service timestamps log uptime no service
password-encryption ! hostname EasyIP ! username ISP-AS
password 0 ipnegotiate ! --- Username for remote router
(ISP-AS) and shared secret. ! --- Shared secret(used for
CHAP) must be the same on both sides. ip subnet-zero no
ip domain-lookup no ip dhcp conflict logging ! ---
Disable the recording of DHCP address conflicts on the
DHCP server. ip dhcp excluded-address 10.0.0.1 ! ---
Specifies a IP address that the DHCP server should not
assign to clients. ip dhcp pool soho ! --- Configure the
DHCP address pool name and enter DHCP pool configuration
mode. network 10.0.0.0 255.0.0.0 ! --- Specifies the
subnet network number and mask of the DHCP address pool.
default-router 10.0.0.1 ! --- Specifies the IP address
of the default router for a DHCP clients. lease infinite
! --- Specifies the duration of the lease. ! isdn
switch-type basic-5ess isdn voice-call-failure 0 !
interface Ethernet0/0 ip address 10.0.0.1 255.0.0.0 ! --
- IP address for the Ethernet interface. no ip directed-
broadcast ip nat inside ! --- Defines the interface as
internal for network address translation. ! ! Unused
ethernet interfaces omitted for brevity ! interface
BRI1/0 ip address negotiated ! --- Enables PPP/IPCP
negotiation for this interface. no ip directed-broadcast
ip nat outside ! --- Defines the interface as external
for network address translation. encapsulation ppp
dialer idle-timeout 60 ! --- Idle timeout(in seconds)for
this BRI interface. dialer string 97771200 ! ---
Specifies the telephone number required to reach the
central access server. dialer-group 1 ! --- Apply
interesting traffic defined in dialer-list 1. isdn
switch-type basic-5ess ppp authentication chap ! !--
Unused BRI interfaces omitted for brevity. ! ip nat
inside source list 100 interface BRI1/0 overload ! ---
Establishes dynamic source translation (with PAT) for
addresses which are ! --- identified by the access list
100. ip classless ip route 0.0.0.0 0.0.0.0 BRI1/0
permanent ! --- Default route is via BRI1/0. no ip http
server ! access-list 100 permit ip 10.0.0.0
0.255.255.255 any ! --- Defines an access list
permitting those addresses that are to be translated.
dialer-list 1 protocol ip permit ! --- Interesting
traffic is defined by dialer-list1. ! --- This is
applied to BRI1/0 using dialer-group 1. line con 0
transport input none line aux 0 line vty 0 4 login ! end
```

验证

本部分所提供的信息可用于确认您的配置是否正常工作。

显示命令

输出解释器工具支持某些 **show** 命令（只限于注册用户），通过它可以查看 show 命令输出的分析。

- **show ip interface brief** -显示在接口和IP地址配置的接口状态。
- **show interfaces** -为特定接口提供关于接口状态的高级信息。
- **show ip nat statistics** -显示网络地址转换(NAT)统计信息。
- **show ip nat translations** -显示活动NAT转换。
- **show isdn status** -显示每ISDN层状况。验证该ISDN第1层，并且2作用。请参阅本文使用show isdn status命令关于BRI故障排除对更进一步的故障排除信息。
- **show dialer** -显示拨号信息。

show 输出示例

以下show命令输出，被采取，在首次对中心站点接入服务器的Easy IP路由器拨号连接显示前BRI1/0接口启用并且没有IP地址使用IPCP，但是IP地址协商。

```
EasyIP#show ip interface brief Interface IP-Address OK? Method Status Prol Ethernet0/0 10.0.0.1
YES manual up up Ethernet0/1 unassigned YES manual administratively down dow Ethernet0/2
unassigned YES manual administratively down dow Ethernet0/3 unassigned YES manual
administratively down dow BRI1/0 unassigned YES IPCP up up ! -- Interface is Up, but no IP
Address is assigned since it is not connected BRI1/0:1 unassigned YES unset down dow BRI1/0:2
unassigned YES unset down dow ! -- Both B-channels are down BRI1/1 unassigned YES manual
administratively down dow BRI1/1:1 unassigned YES unset administratively down dow BRI1/1:2
unassigned YES unset administratively down dow EasyIP#show interfaces bri1/0 BRI1/0 is up, line
protocol is up (spoofing) Hardware is BRI with integrated NT1 Internet address will be
negotiated using IPCP MTU 1500 bytes, BW 64 Kbit, DLY 20000 usec, reliability 255/255, txload
1/255, rxload 1/255 Encapsulation PPP, loopback not set . . EasyIP#
```

show命令输出，被采取，在Easy IP路由器起动后拨号连接用中心站点接入服务器以下表示BRI1/0接口通过PPP/IPCP接收其IP地址200.1.0.3从中心站点接入服务器。

```
EasyIP#show ip interface brief Interface IP-Address OK? Method Status Prorocol Ethernet0/0
10.0.0.1 YES manual up up Ethernet0/1 unassigned YES manual administratively down dow
Ethernet0/2 unassigned YES manual administratively down dow Ethernet0/3 unassigned YES manual
administratively down dow BRI1/0 200.1.0.3 YES IPCP up up ! -- Int BRI1/0 has a registers IP
address assigned after connection is up BRI1/0:1 unassigned YES unset up up BRI1/0:2 unassigned
YES unset down dow ! -- 1st B-channel (BRI1/0:1) is UP BRI1/1 unassigned YES manual
administratively down dow BRI1/1:1 unassigned YES unset administratively down dow BRI1/1:2
unassigned YES unset administratively down dow EasyIP#show interfaces bri1/0 BRI1/0 is up, line
protocol is up (spoofing) Hardware is BRI with integrated NT1 Internet address is 200.1.0.3/32
MTU 1500 bytes, BW 64 Kbit, DLY 20000 usec, reliability 255/255, txload 1/255, rxload 1/255
Encapsulation PPP, loopback not set . . EasyIP#
```

我们需要证实内部的私有网络主机是否能连接到中心站点接入服务器或没有和NAT功能作用适当地。这可以是实现的通过使用扩展的ping工具。在EasyIP路由器上，请ping中心站点接入服务器的以太网接口并且指定ping的来源作为EasyIP路由器的LAN (私有)地址。这保证数据包由PAT处理，并且LAN的客户端能通信与中心网络。

```
EasyIP#ping Protocol [ip]: Target IP address: 192.168.16.1 ! -- Ethernet interface IP address of
the Central Site Access Server. Repeat count [5]: 10 Datagram size [100]: Timeout in seconds
[2]: Extended commands [n]: y Source address or interface: 10.0.0.1 ! --Ethernet interface IP
address (private) of the Easy IP router. Type of service [0]: Set DF bit in IP header? [no]:
Validate reply data? [no]: Data pattern [0xABCD]: Loose, Strict, Record, Timestamp,
Verbose[none]: Sweep range of sizes [n]: Type escape sequence to abort. Sending 10, 100-byte
ICMP Echos to 192.168.16.1, timeout is 2 seconds: !!!!!!!!!! Success rate is 100 percent
(10/10), round-trip min/avg/max = 32/34/36 ms
```

上述输出显示成功率是100百分比哪些意味着NAT功能优良工作，并且SOHO主机能用中心站点接入服务器通信。我们能从以下获得关于NAT转换的详细信息**显示**命令输出。

```
EasyIP#show ip nat statistics Total active translations: 10 (0 static, 10 dynamic; 10 extended)
Outside interfaces: BRI1/0, BRI1/0:1, BRI1/0:2 Inside interfaces: Ethernet0/0 Hits: 169 Misses:
185 Expired translations: 175 Dynamic mappings: -- Inside Source access-list 100 interface
BRI1/0 refcount 10 EasyIP#show ip nat translations Pro Inside global Inside local Outside local
Outside global icmp 200.1.0.3:32 10.0.0.1:32 192.168.16.1:32 192.168.16.1:32 icmp 200.1.0.3:33
10.0.0.1:33 192.168.16.1:33 192.168.16.1:33 icmp 200.1.0.3:34 10.0.0.1:34 192.168.16.1:34
192.168.16.1:34 icmp 200.1.0.3:35 10.0.0.1:35 192.168.16.1:35 192.168.16.1:35 icmp 200.1.0.3:36
10.0.0.1:36 192.168.16.1:36 192.168.16.1:36 icmp 200.1.0.3:37 10.0.0.1:37 192.168.16.1:37
192.168.16.1:37 icmp 200.1.0.3:38 10.0.0.1:38 192.168.16.1:38 192.168.16.1:38 icmp 200.1.0.3:39
10.0.0.1:39 192.168.16.1:39 192.168.16.1:39 icmp 200.1.0.3:40 10.0.0.1:40 192.168.16.1:40
192.168.16.1:40 icmp 200.1.0.3:41 10.0.0.1:41 192.168.16.1:41 192.168.16.1:41 EasyIP#
```

以下**show isdn status命令**输出显示每ISDN层状况。验证如示例所显示，第1层和第2层是

```
EasyIP#show isdn status Global ISDN Switchtype = basic-5ess ISDN BRI1/0 interface dsl 8,
interface ISDN Switchtype = basic-5ess Layer 1 Status: ACTIVE Layer 2 Status: TEI = 64, Ces = 1,
SAPI = 0, State = MULTIPLE_FRAME_ESTABLISHED Layer 3 Status: 1 Active Layer 3 Call(s) Activated
dsl 8 CCBs = 1 CCB:callid=8098, sapi=0, ces=1, B-chan=1, calltype=DATA The Free Channel Mask:
0x80000002
```

请参阅本文使用show isdn status命令关于BRI故障排除对更进一步的故障排除信息。

以下**show dialer**输出显示拨号由内部的私有网络IP地址启动(example,10.0.0.1)。

```
EasyIP#show dialer BRI1/0 - dialer type = ISDN Dial String Successes Failures Last DNIS Last
status 97771200 23 0 00:02:02 successful Default 0 incoming call(s) have been screened. 0
incoming call(s) rejected for callback. BRI1/0:1 - dialer type = ISDN Idle timer (120 secs),
Fast idle timer (20 secs) Wait for carrier (30 secs), Re-enable (15 secs) Dialer state is data
link layer up Dial reason: ip (s=10.0.0.1, d=192.168.16.1) Time until disconnect 36 secs Current
call connected 00:02:03 Connected to 97771200 (ISP-AS) BRI1/0:2 - dialer type = ISDN Idle timer
(120 secs), Fast idle timer (20 secs) Wait for carrier (30 secs), Re-enable (15 secs) Dialer
state is idle
```

故障排除

debug 命令

注意： 在发出 **debug** 命令之前，请参阅有关 Debug 命令的重要信息。

- **debug ppp协商**提供关于PPP协议协商进程的信息。debug ip nat -提供信息
- **debug ip nat-**提供关于IP网络地址转换(NAT)功能翻译的IP信息包的信息。
- **调试isdn q921-**提供q.921消息数据链路层调试。
- **debug isdn q931** -提供Q.931消息网络层调试。
- **debug dialer** -呼出的提供DDR信息。

调试输出示例

以下**debug ppp协商输出**显示PPP/IPCP协议协商进程。

```
EasyIP#debug ppp negotiation PPP protocol negotiation debugging is on . . 2d07h: BR1/0:1 IPCP: O
CONFREQ [Closed] id 223 len 10 2d07h: BR1/0:1 IPCP: Address 0.0.0.0 (0x030600000000) 2d07h:
BR1/0:1 CDPCP: O CONFREQ [Closed] id 63 len 4 2d07h: BR1/0:1 IPCP: I CONFREQ [REQsent] id 47 len
10 2d07h: BR1/0:1 IPCP: Address 200.1.0.1 (0x0306C8010001) 2d07h: BR1/0:1 IPCP: O CONFACK
[REQsent] id 47 len 10 2d07h: BR1/0:1 IPCP: Address 200.1.0.1 (0x0306C8010001) 2d07h: BR1/0:1
CDPCP: I CONFREQ [REQsent] id 41 Len 4 2d07h: BR1/0:1 CDPCP: O CONFACK [REQsent] id 41 Len 4
2d07h: BR1/0:1 IPCP: I CONFNAK [ACKsent] id 223 Len 10 2d07h: BR1/0:1 IPCP: Address 200.1.0.3
(0x0306C8010003) 2d07h: BR1/0:1 IPCP: O CONFREQ [ACKsent] id 224 Len 10 2d07h: BR1/0:1 IPCP:
Address 200.1.0.3 (0x0306C8010003) 2d07h: BR1/0:1 CDPCP: I CONFACK [ACKsent] id 63 Len 4 2d07h:
BR1/0:1 CDPCP: State is Open 2d07h: BR1/0:1 IPCP: I CONFACK [ACKsent] id 224 Len 10 2d07h:
```

```
BR1/0:1 IPCP: Address 200.1.0.3 (0x0306C8010003) 2d07h: BR1/0:1 IPCP: State is Open 2d07h: BR1/0
IPCP: Install negotiated IP interface address 200.1.0.3 ! -- The EasyIP router will install the
negotiated WAN IP address. 2d07h: BR1/0 IPCP: Install route to 200.1.0.1 ! -- A route to the
Central Site Access Server is installed. 2d07h: %LINEPROTO-5-UPDOWN: Line protocol on Interface
BRI1/0:1, changed state Up 2d07h: %ISDN-6-CONNECT: Interface BRI1/0:1 is now connected to
97771200 ISP-AS EasyIP#
```

debug ip nat输出显示关于IP网络地址转换(NAT)功能翻译的IP信息包的信息。

```
EasyIP#debug ip nat detailed IP NAT detailed debugging is on . . 2d00h: NAT: o: icmp (10.0.0.1,
2015) -> (192.168.16.1, 2015) [909] 2d00h: NAT: i: icmp (10.0.0.1, 2015) -> (192.168.16.1, 2015)
[909] 2d00h: NAT: ipnat_allocate_port: wanted 2015 got 2015 2d00h: NAT*: o: icmp (192.168.16.1,
2015) -> (200.1.0.3, 2015) [909] 2d00h: NAT: o: icmp (10.0.0.1, 2016) -> (192.168.16.1, 2016)
[910] 2d00h: NAT: i: icmp (10.0.0.1, 2016) -> (192.168.16.1, 2016) [910] 2d00h: NAT:
ipnat_allocate_port: wanted 2016 got 2016 2d00h: NAT*: o: icmp (192.168.16.1, 2016) ->
(200.1.0.3, 2016) [910] 2d00h: NAT: o: icmp (10.0.0.1, 2017) -> (192.168.16.1, 2017) [911]
2d00h: NAT: i: icmp (10.0.0.1, 2017) -> (192.168.16.1, 2017) [911] 2d00h: NAT:
ipnat_allocate_port: wanted 2017 got 2017 2d00h: NAT*: o: icmp (192.168.16.1, 2017) ->
(200.1.0.3, 2017) [911] 2d00h: NAT: o: icmp (10.0.0.1, 2018) -> (192.168.16.1, 2018) [912]
2d00h: NAT: i: icmp (10.0.0.1, 2018) -> (192.168.16.1, 2018) [912] . . EasyIP#undebug all All
possible debugging has been turned off
```

相关信息

- 使用 show isdn status 命令用于 BRI 故障排除
- 验证 NAT 的运行和基本的 NAT 故障排除
- NAT 支持页
- 拨号和接入技术支持
- 技术支持和文档 - Cisco Systems