

Cisco IOS NAT-PT for IPv6

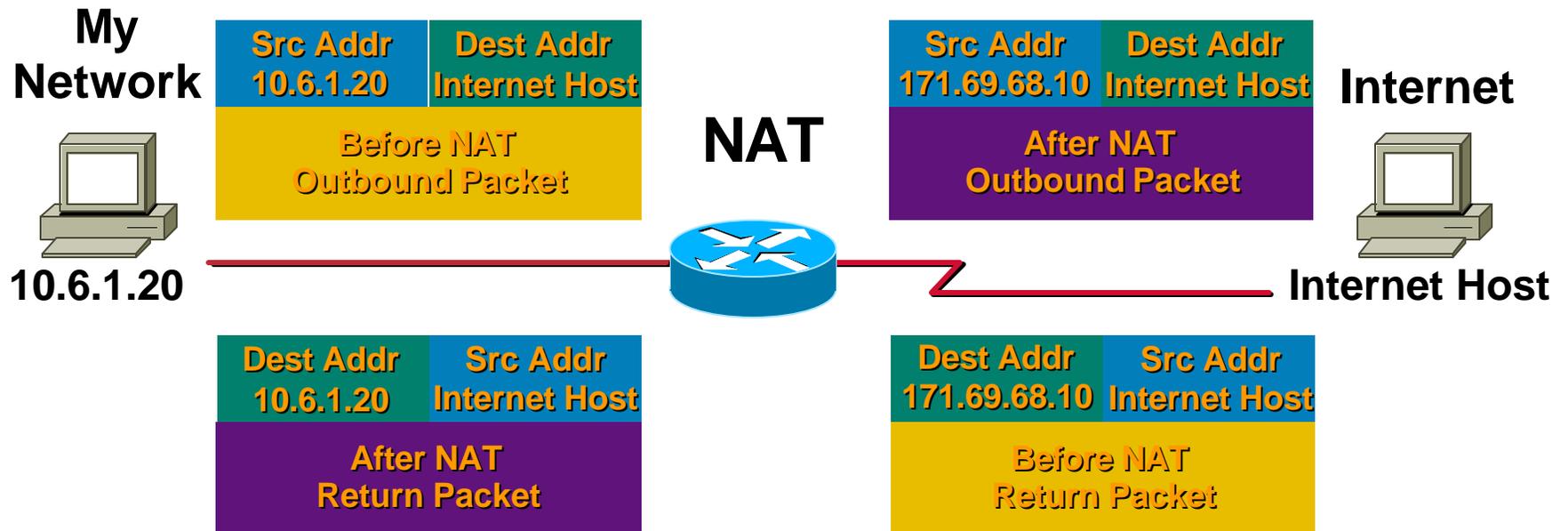
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IPv6-IPv4 Translation Mechanisms

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- **Specified by IETF NGTrans WG**
<http://www.ietf.org/html.charters/ngtrans-charter.html>
- **NAT-PT (RFC 2766)**
- **TCP-UDP Relay (RFC 3142)**
- **BIS (Bump-In-the-Stack) (RFC 2767)**
- **BIA (Bump-In-the-API) (RFC 3338)**
- **DSTM (Dual Stack Transition Mechanism)**
- **SOCKS-based Gateway (RFC 3089)**

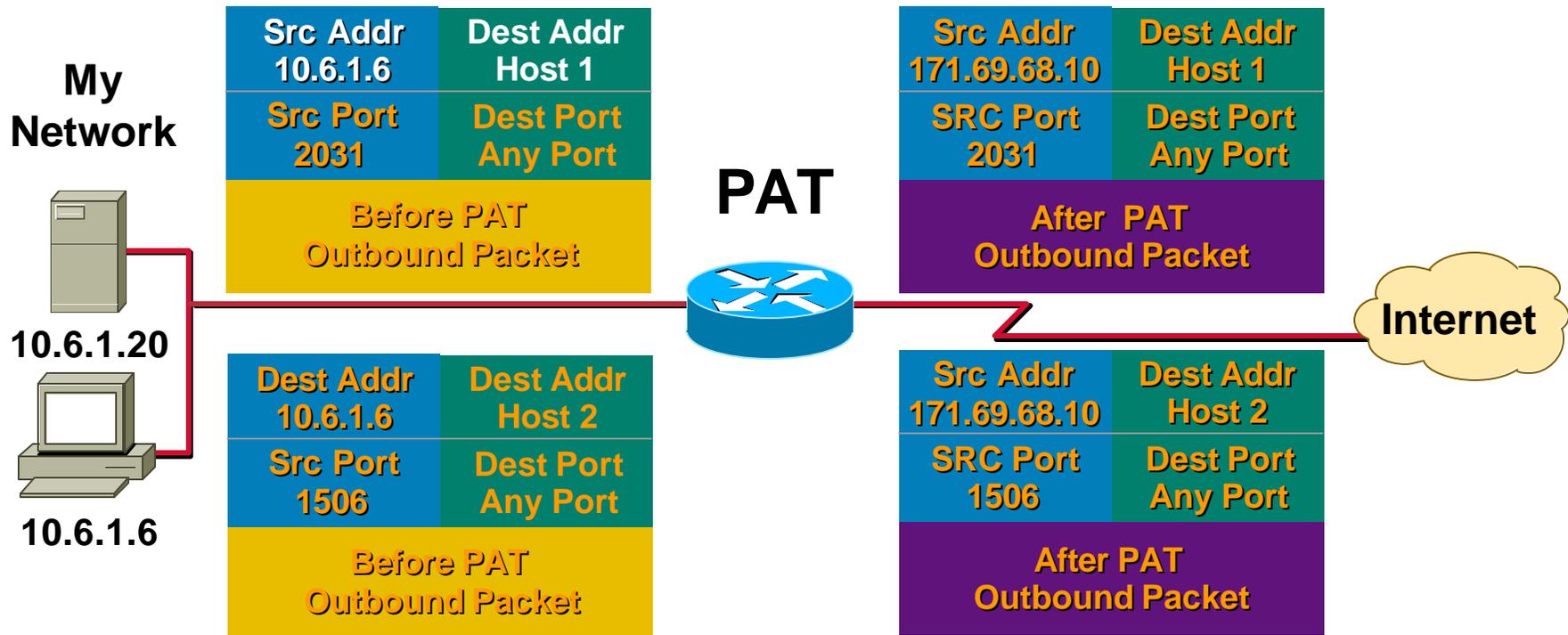
Basic Concept of NAT



NAT changes the IP addresses in the IP header

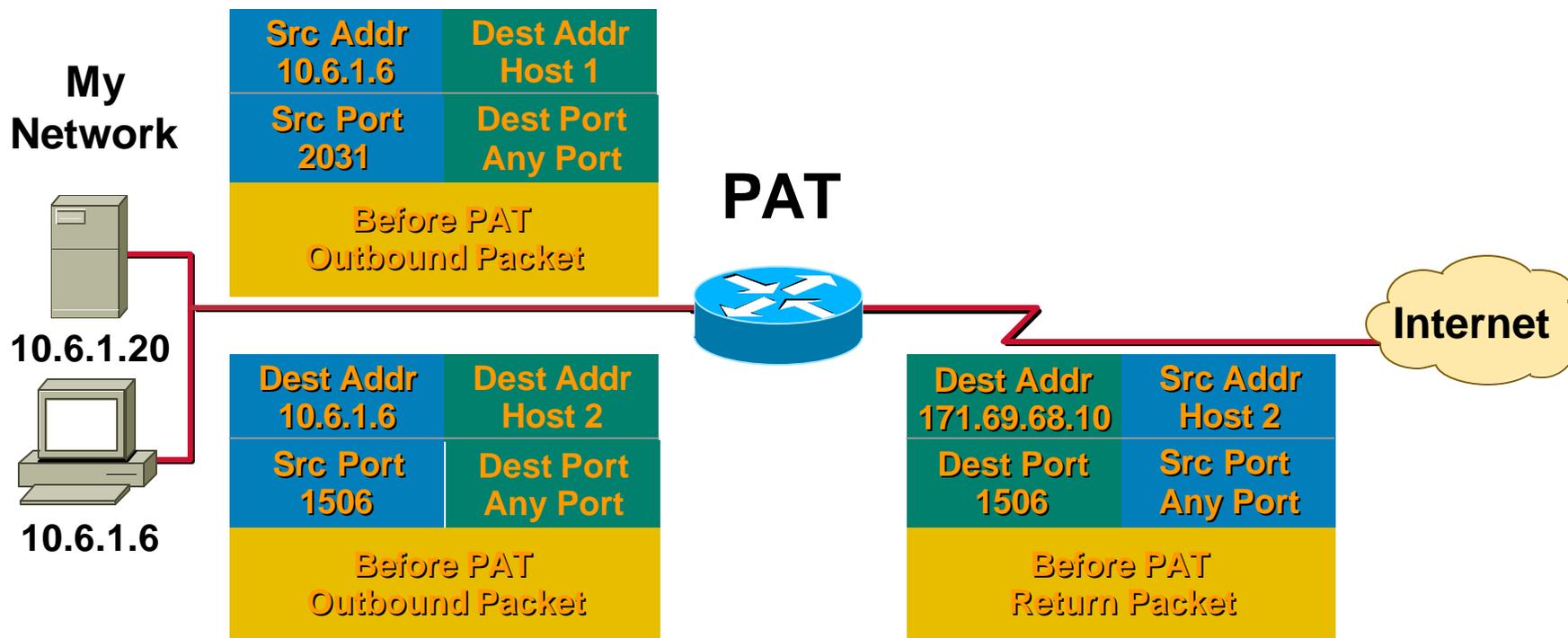
Basic Concept of Port Address Translation

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Port Address Translation (PAT) extends NAT from “one-to-one” to “many-to-one” by associating the source port with each flow

Basic Concept of PAT (Cont)



PAT extends NAT from “one-to-one” to “many-to-one” by associating the source port with each flow

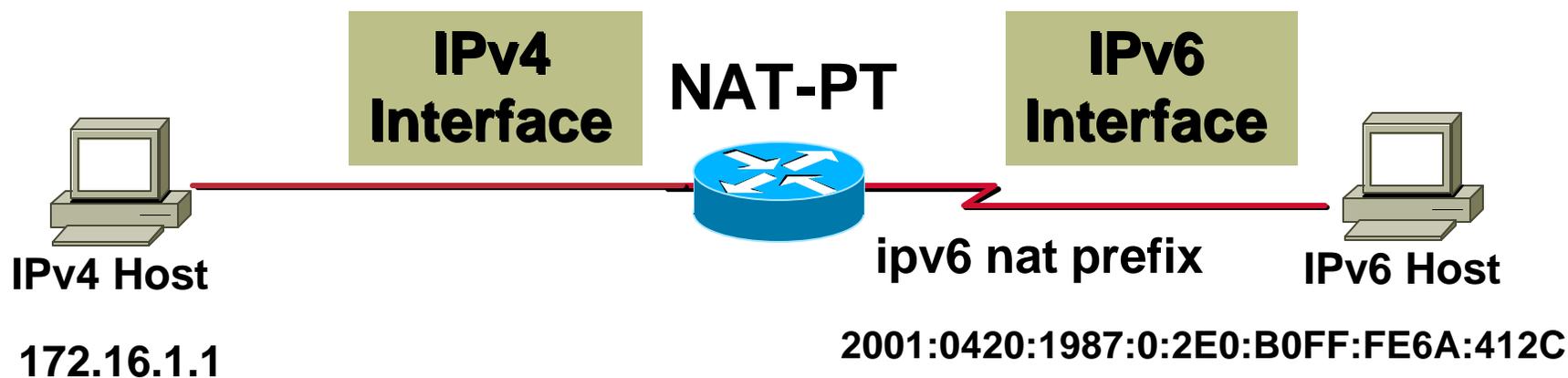
Network Address Translation - Protocol Translation for IPv6

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- **NAT-PT allows native IPv6 hosts and applications to communicate with native IPv4 hosts and applications, and vice versa**
- **Easy-to-use transition and co-existence solution**

NAT-PT Concept

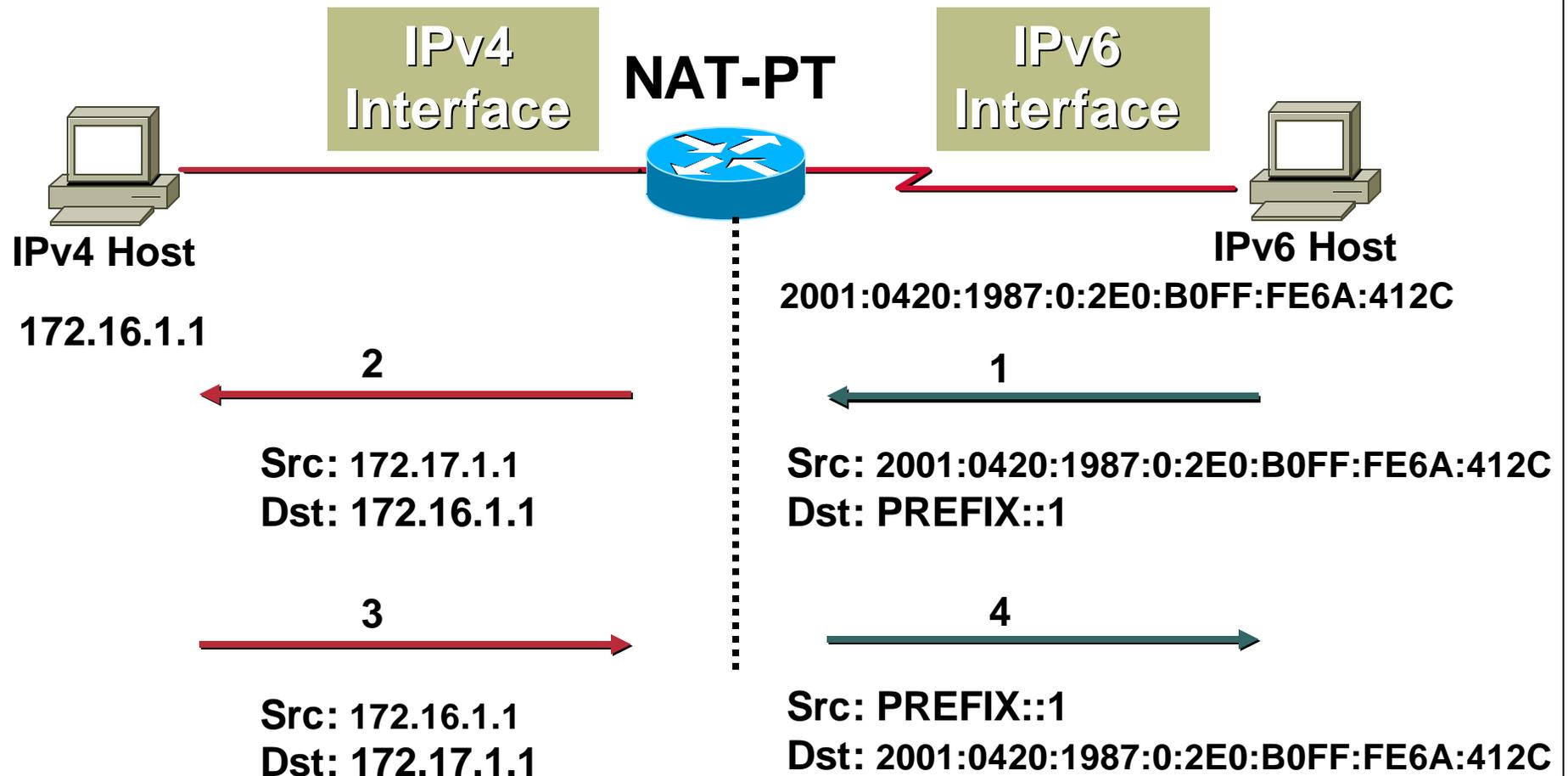
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PREFIX is a 96-bit field that allows routing back to the NAT-PT device

NAT-PT Packet Flow

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Cisco IOS NAT-PT Features

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- **NAT-PT supported since Cisco IOS Software Release 12.2(13)T**
- **IP Header and address translation**
- **Support for ICMP and DNS embedded translation**
- **Auto-aliasing of NAT-PT IPv4 Pool Addresses**
- **Future developments will add more ALG support**
1st implementation does not support FTP ALG

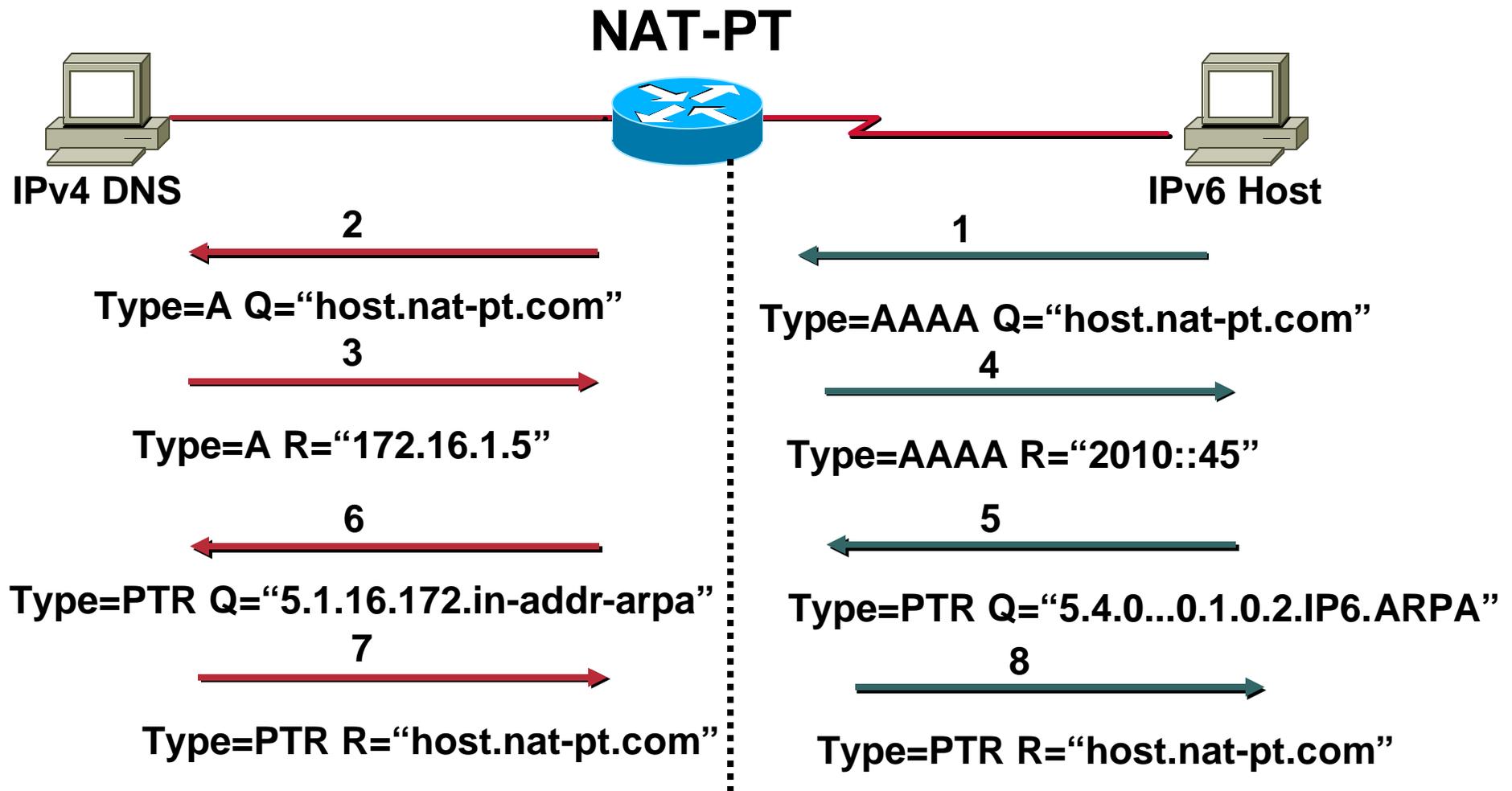
Stateless IP ICMP Translation (SIIT)

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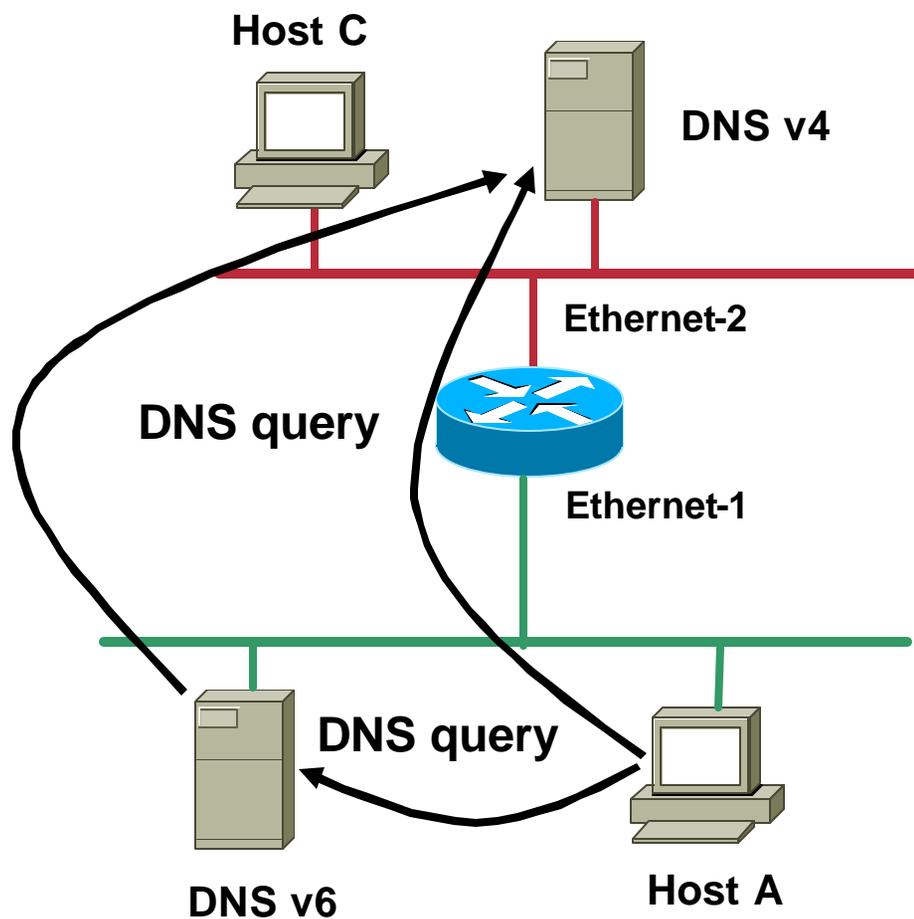
<i>Ipv6 field</i>	<i>IPv4 field</i>	<i>Action</i>
Version = 6	Version = 4	Overwrite
Traffic class	DSCP	Copy
Flow label	N/A	Set to 0
Payload length	Total length	Adjust
Next header	Protocol	Copy
Hop limit	TTL	Copy

DNS Application Layer Gateway

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DNS ALG Address Assignment



TTL value in DNS Resource Record = 0

Configuring NAT-PT

- Enabling NAT-PT on an interface

[no] ipv6 nat

- Configure global/per interface NAT-PT prefix

[no] ipv6 nat prefix <prefix>::/96

- Configuring static address mappings

[no] ipv6 nat v6v4 source <ipv6 address> <ipv4 address>

[no] ipv6 nat v4v6 source <ipv4 address> <ipv6 address>

- Configuring dynamic address mappings

[no] ipv6 nat v6v4 source <list,route-map> <ipv6 list, route-map> pool <v4pool>

**[no] ipv6 nat v6v4 pool <v4pool> <ipv4 addr> <ipv4addr>
prefix-length <n>**

Configuring NAT-PT (Cont)

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- **Configure Translation Entry Limit**

[no] ipv6 nat translation max-entries <n>

- **Debug commands**

debug ipv6 nat

debug ipv6 nat detailed

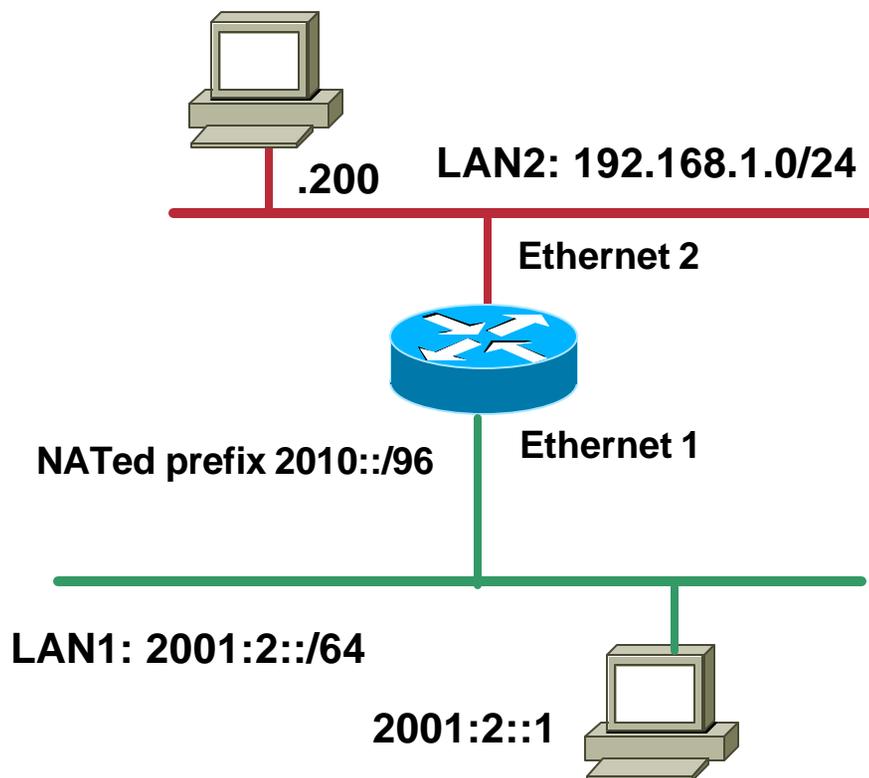
NAT-PT translation timeouts

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- **Dynamic translations time out after 24 hours**
[no] ipv6 nat translation timeout <seconds>
- **Non-DNS UDP translations time out after 5 minutes**
[no] ipv6 nat translation udp-timeout <seconds>
- **DNS translations time out after 1 minute**
[no] ipv6 nat translation dns-timeout <seconds>
- **TCP translations time out after 24 hours, unless a RST or FIN is seen on the stream, in which case it times after 1 minute**
[no] ipv6 nat translation tcp-timeout <seconds>
[no] ipv6 nat translation finrst-timeout <seconds>
[no] ipv6 nat translation icmp-timeout <seconds>

Cisco IOS NAT-PT Configuration Example

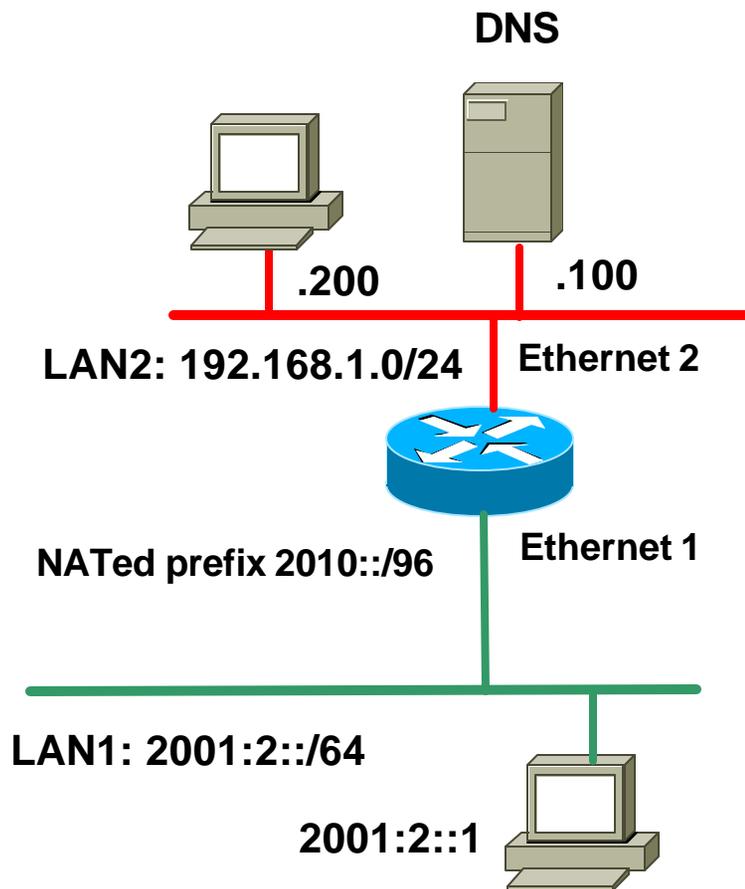
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```
interface Ethernet1
  ipv6 address 2001:2::10/64
  ipv6 nat
!
interface Ethernet2
  ip address 192.168.1.1 255.255.255.0
  ipv6 nat prefix 2010::/96
  ipv6 nat
!
ipv6 nat v6v4 source 2001:2::1 192.168.2.1
ipv6 nat v4v6 source 192.168.1.200 2010::60
!
```

Cisco IOS NAT-PT with DNS ALG Configuration Example

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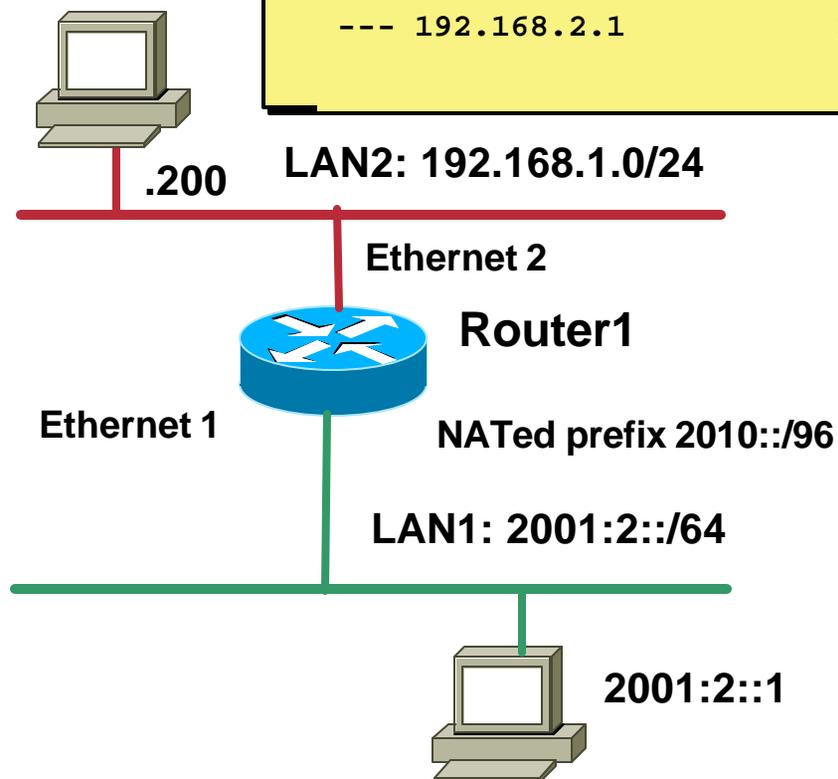


```
interface Ethernet1
  ipv6 address 2001:2::10/64
  ipv6 nat
!
interface Ethernet2
  ip address 192.168.1.1 255.255.255.0
  ipv6 nat prefix 2010::/96
  ipv6 nat
!
ipv6 nat v4v6 source 192.168.1.100 2010:::1
!
ipv6 nat v6v4 source list v6-list pool v4pool1
ipv6 nat v6v4 pool v4pool1 192.168.2.1 192.168.2.10
prefix-length 24
!
ipv6 access-list v6-list
  permit 2001:2::/64 any
```

Cisco IOS NAT-PT Display (1)

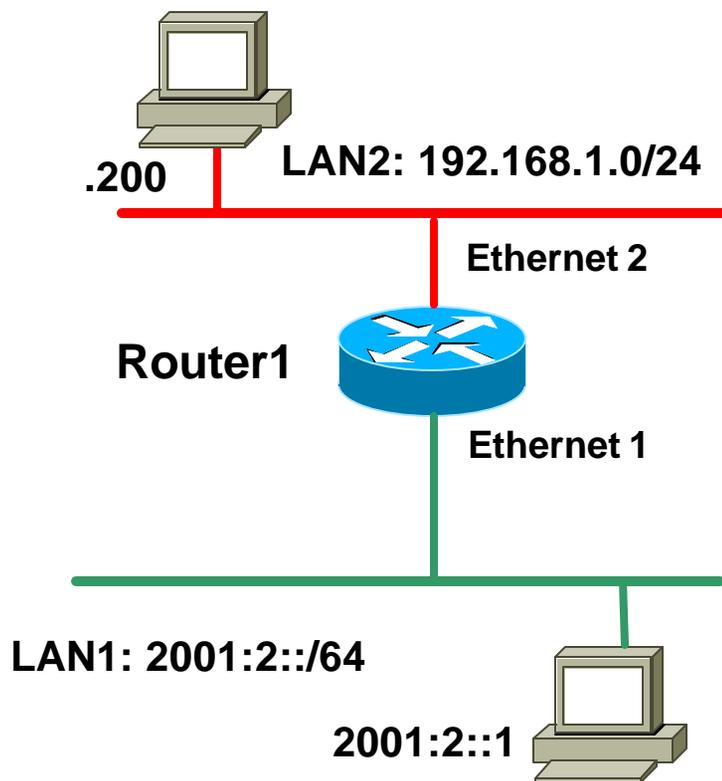
```
Router1 #show ipv6 nat translations
```

Pro IPv4 source	IPv6 source	IPv6 destn	IPv4 destn
---	---	2010::60	192.168.1.200
---	192.168.2.1	2001:2::1	---



Cisco IOS NAT-PT Display (Cont)

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```
Router1#show ipv6 nat statistics
```

```
Total active translations: 15 (2 static, 3 dynamic;  
10 extended)
```

```
NAT-PT interfaces:
```

```
Ethernet1, Ethernet2
```

```
Hits: 10 Misses: 0
```

```
Expired translations: 0
```

NAT-PT points of attention

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- **ALG per application carrying IP addresses**
- **No end-to-end security**
 - No DNSsec**
 - No IPsec because different address realms**

NAT-PT Conclusion

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- **Easy IPv6 / IPv4 co-existence mechanism**
- **Enable applications to cross the protocol barrier**
- **Share most of the benefits/constraints of NAT**

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