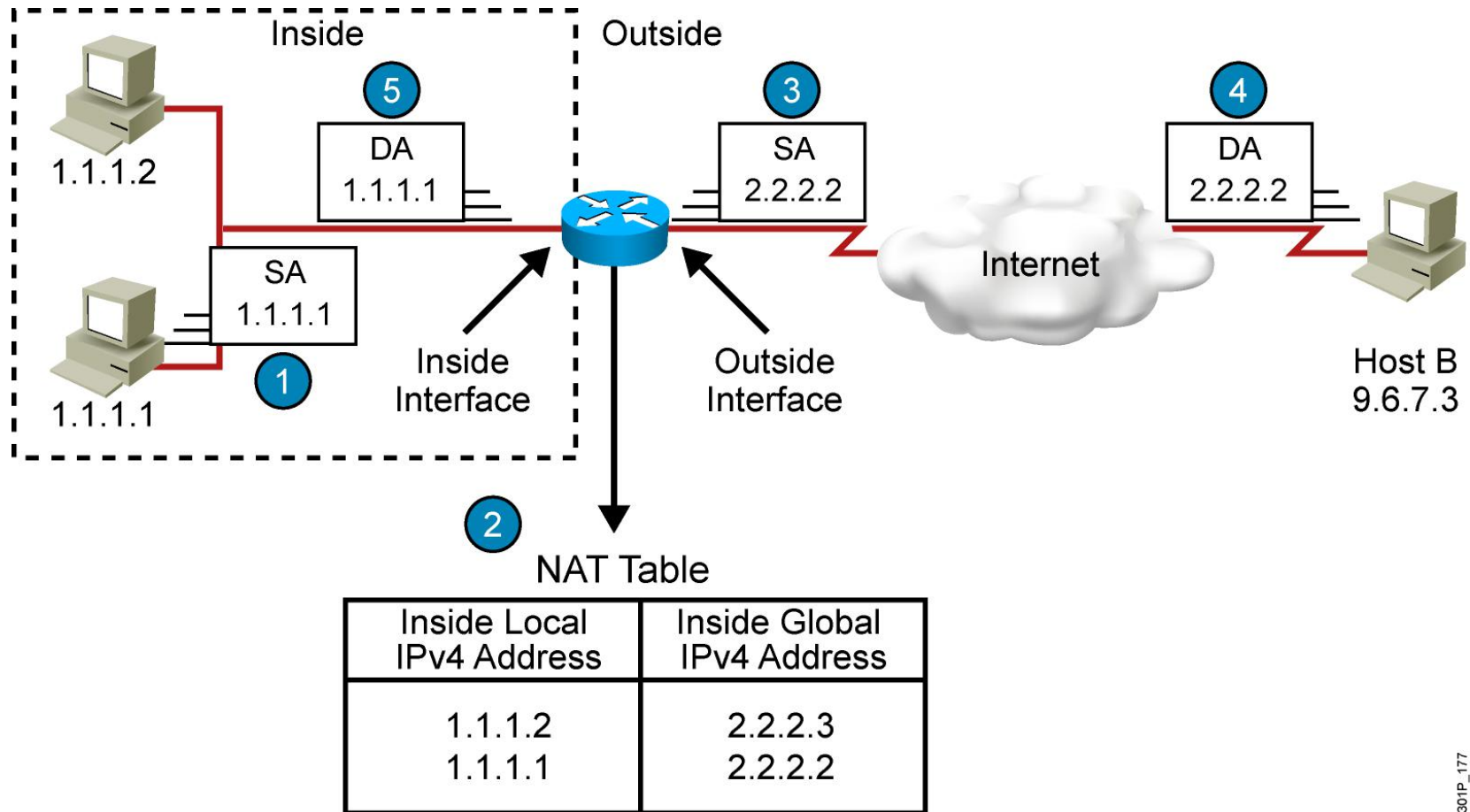


# Scaling the Network with NAT and PAT

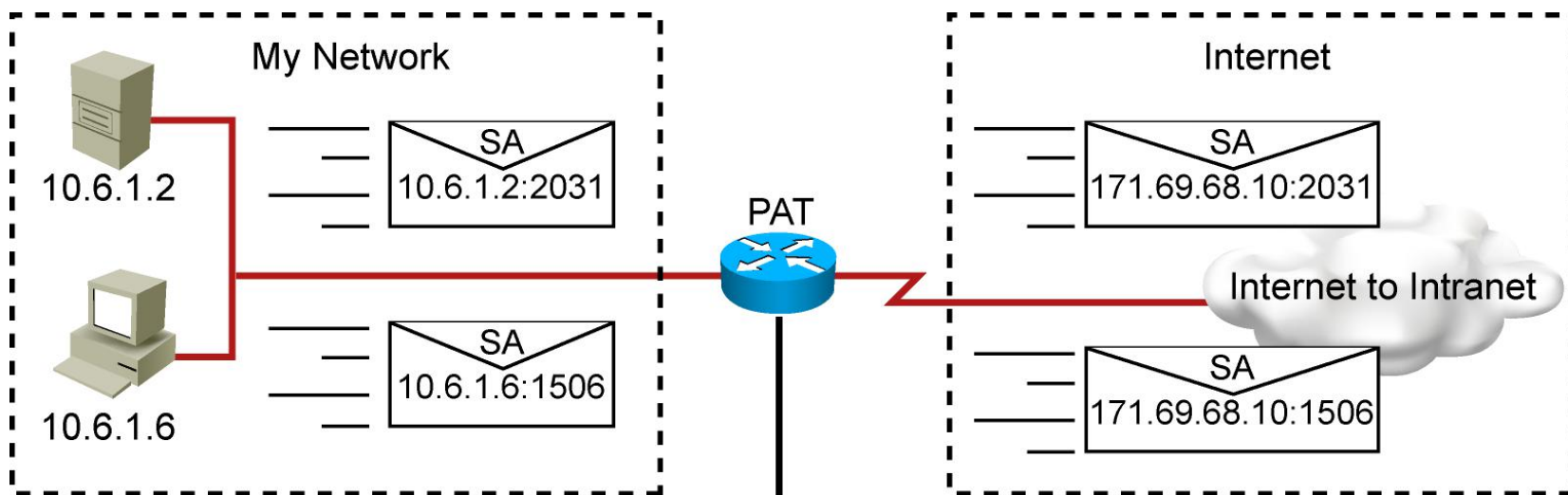


## Address Space Management

# Translating Inside Source Addresses



# Port Address Translation



NAT Table

Inside Local IPv4 Address	Inside Global IPv4 Address
10.6.1.2:2031	171.69.68.10:2031
10.6.1.6:1506	171.69.68.10:1506
10.6.1.6:131	171.69.68.10:2032

# Configuring and Verifying Static Translation

```
RouterX(config)# ip nat inside source static local-ip global-ip
```

- Establishes static translation between an inside local address and an inside global address

```
RouterX(config-if)# ip nat inside
```

- Marks the interface as connected to the inside

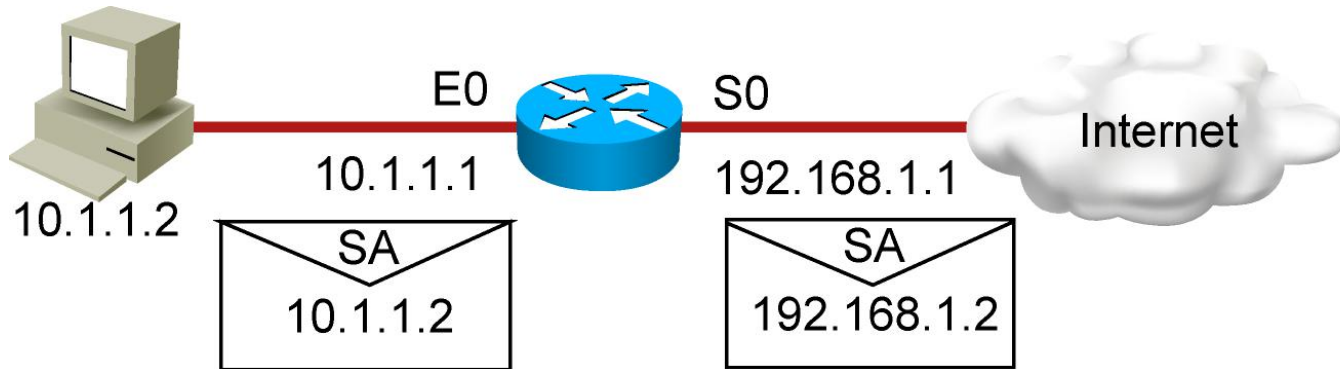
```
RouterX(config-if)# ip nat outside
```

- Marks the interface as connected to the outside

```
RouterX# show ip nat translations
```

- Displays active translations

# Enabling Static NAT Address Mapping Example



```
interface s0
ip address 192.168.1.1 255.255.255.0
ip nat outside
!
interface e0
ip address 10.1.1.1 255.255.255.0
ip nat inside
!
ip nat inside source static 10.1.1.2 192.168.1.2
```

```
RouterX# show ip nat translations
```

Pro	Inside global	Inside local	Outside local	Outside global
---	192.168.1.2	10.1.1.2	---	---

# Configuring and Verifying Dynamic Translation

```
RouterX(config)# ip nat pool name start-ip end-ip  
{netmask netmask | prefix-length prefix-length}
```

- Defines a pool of global addresses to be allocated as needed

```
RouterX(config)# access-list access-list-number permit  
source [source-wildcard]
```

- Defines a standard IP ACL permitting those inside local addresses that are to be translated

```
RouterX(config)# ip nat inside source list  
access-list-number pool name
```

- Establishes dynamic source translation, specifying the ACL that was defined in the previous step

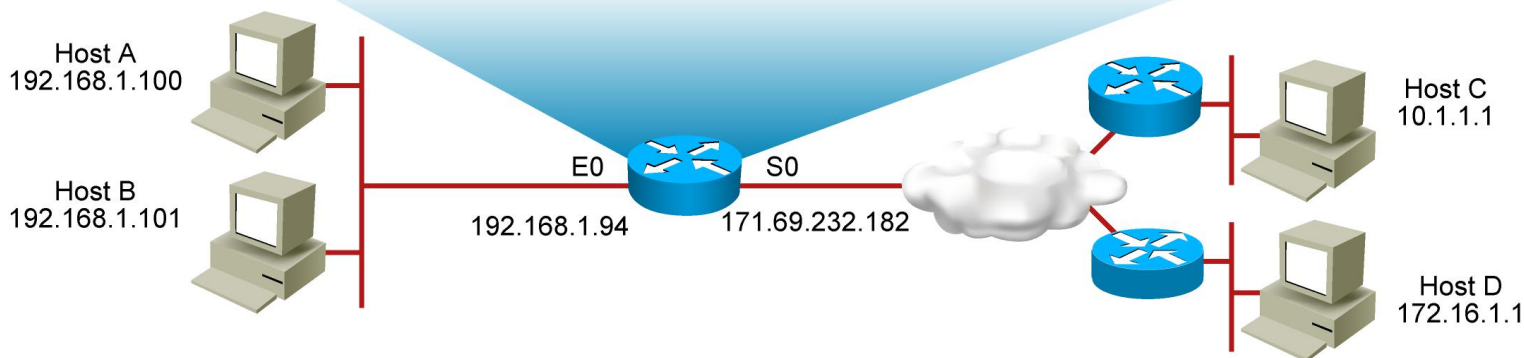
```
RouterX# show ip nat translations
```

- Displays active translations

# Dynamic Address Translation Example

```
ip nat pool net-208 171.69.233.209 171.69.233.222 netmask
255.255.255.240
ip nat inside source list 1 pool net-208
!
interface serial 0
 ip address 171.69.232.182 255.255.255.240
 ip nat outside
!
interface ethernet 0
 ip address 192.168.1.94 255.255.255.0
 ip nat inside
!
access-list 1 permit 192.168.1.0 0.0.0.255
```

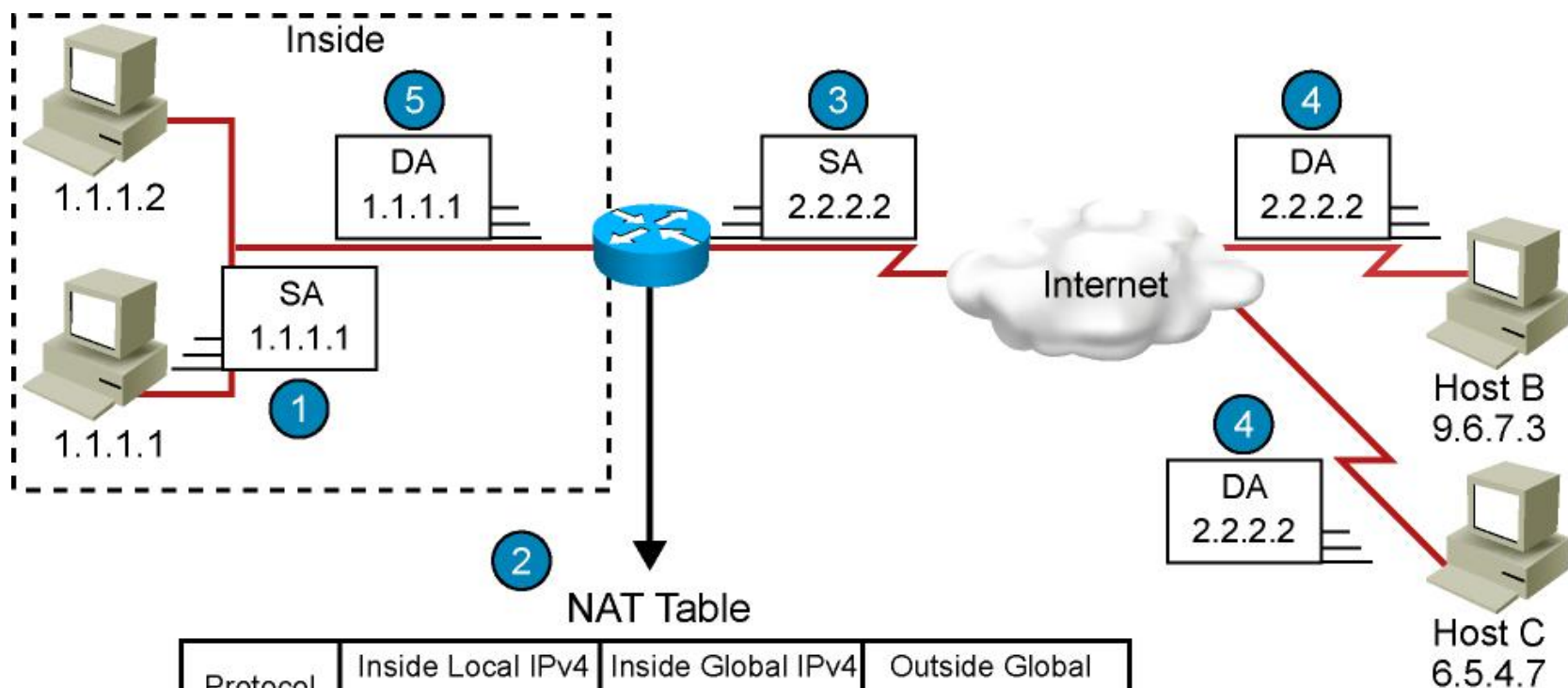
301P\_465



```
RouterX# show ip nat translations
```

Pro	Inside global	Inside local	Outside local	Outside global
---	171.69.233.209	192.168.1.100	---	---
---	171.69.233.210	192.168.1.101	---	---

# Overloading an Inside Global Address



301P\_466

# Configuring Overloading

```
RouterX(config)# access-list access-list-number permit  
source source-wildcard
```

- Defines a standard IP ACL that will permit the inside local addresses that are to be translated

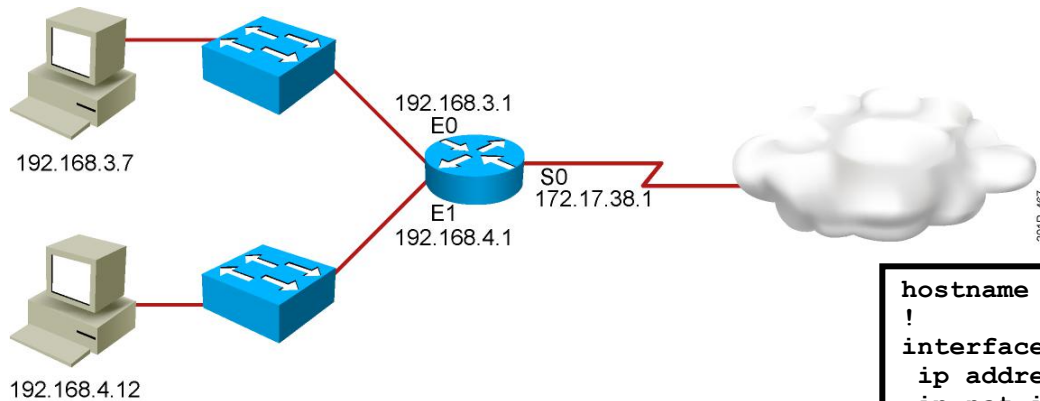
```
RouterX(config)# ip nat inside source list  
access-list-number interface interface overload
```

- Establishes dynamic source translation, specifying the ACL that was defined in the previous step

```
RouterX# show ip nat translations
```

- Displays active translations

# Overloading an Inside Global Address Example



```
hostname RouterX
!
interface Ethernet0
 ip address 192.168.3.1 255.255.255.0
 ip nat inside
!
interface Ethernet1
 ip address 192.168.4.1 255.255.255.0
 ip nat inside
!
interface Serial0
 description To ISP
 ip address 172.17.38.1 255.255.255.0
 ip nat outside
!
ip nat inside source list 1 interface Serial0 overload
!
ip route 0.0.0.0 0.0.0.0 Serial0
!
access-list 1 permit 192.168.3.0 0.0.0.255
access-list 1 permit 192.168.4.0 0.0.0.255
!
```

```
RouterX# show ip nat translations
```

	Pro Inside global	Inside local	Outside local	Outside global
TCP	172.17.38.1:1050	192.168.3.7:1050	10.1.1.1:23	10.1.1.1:23
TCP	172.17.38.1:1776	192.168.4.12:1776	10.2.2.2:25	10.2.2.2:25

# Clearing the NAT Translation Table

```
RouterX# clear ip nat translation *
```

- Clears all dynamic address translation entries

```
RouterX# clear ip nat translation inside global-ip  
local-ip [outside local-ip global-ip]
```

- Clears a simple dynamic translation entry that contains an inside translation or both an inside and outside translation

```
RouterX# clear ip nat translation outside  
local-ip global-ip
```

- Clears a simple dynamic translation entry that contains an outside translation

```
RouterX# clear ip nat translation protocol inside global-ip  
global-port local-ip local-port [outside local-ip  
local-port global-ip global-port]
```

- Clears an extended dynamic translation entry (PAT entry)

# Translation Not Occurring: Translation Not Installed in the Table

Verify that:

- There are no inbound ACLs that are denying the packets entry to the NAT router
- The ACL referenced by the NAT command is permitting all necessary networks
- There are enough addresses in the NAT pool
- The router interfaces are appropriately defined as NAT inside or NAT outside

# Displaying Information with show and debug Commands

```
RouterX# debug ip nat
```

```
NAT: s=192.168.1.95->172.31.233.209, d=172.31.2.132 [6825]  
NAT: s=172.31.2.132, d=172.31.233.209->192.168.1.95 [21852]  
NAT: s=192.168.1.95->172.31.233.209, d=172.31.1.161 [6826]  
NAT*: s=172.31.1.161, d=172.31.233.209->192.168.1.95 [23311]  
NAT*: s=192.168.1.95->172.31.233.209, d=172.31.1.161 [6827]  
NAT*: s=192.168.1.95->172.31.233.209, d=172.31.1.161 [6828]  
NAT*: s=172.31.1.161, d=172.31.233.209->192.168.1.95 [23312]  
NAT*: s=172.31.1.161, d=172.31.233.209->192.168.1.95 [23313]
```

```
RouterX# show ip nat statistics
```

```
Total active translations: 1 (1 static, 0 dynamic; 0 extended)  
Outside interfaces:  
Ethernet0, Serial2  
Inside interfaces:  
Ethernet1  
Hits: 5 Misses: 0  
...
```

