Cisco.com

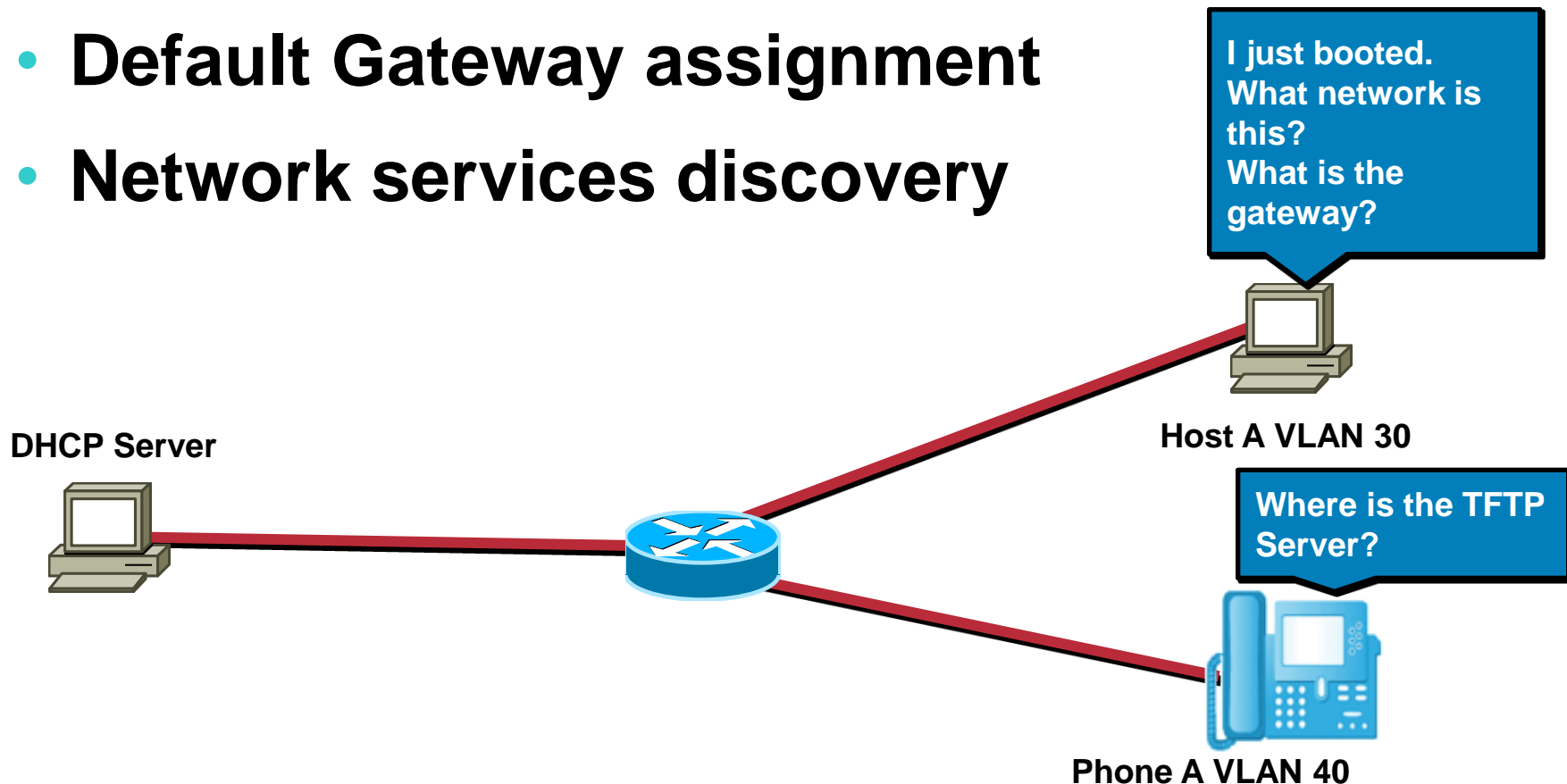# DHCP and NAT

Dynamic Host Configuration Protocol (DHCP)

- **IP address assignment**

- **Default Gateway assignment**

- **Network services discovery**

**I just booted.
What network is this?
What is the gateway?**

Host A VLAN 30

DHCP Server

Where is the TFTP Server?

**Phone A VLAN 40**

DHCP Process

- **Host issues a DHCP discover message to any available server.**

- **Server(s) replies back with DHCP offer message.**

- **Client issues DHCP request using offered IP.**

- **Server replies with DHCP acknowledgement indicating lease time and other options requested by the client.**

DHCP Packet Quick Look

```
▽ Ethernet II, Src: 68:a8:6d:4a:89:10 (68:a8:6d:4a:89:10), Dst: ff:ff:ff:ff:ff:ff (ff:ff:ff:ff:ff:ff)
  ▷ Destination: ff:ff:ff:ff:ff:ff (ff:ff:ff:ff:ff:ff)
  ▷ Source: 68:a8:6d:4a:89:10 (68:a8:6d:4a:89:10)
    Type: IP (0x0800)
▽ Internet Protocol Version 4, Src: 0.0.0.0 (0.0.0.0), Dst: 255.255.255.255 (255.255.255.255)
    Version: 4
    Header length: 20 bytes
  ▷ Differentiated Services Field: 0x00 (DSCP 0x00: Default; ECN: 0x00         (Not ECN-Capable Transport))
    Total Length: 328
    Identification: 0x3cd2 (15570)
  ▷ Flags: 0x00
    Fragment offset: 0
    Time to live: 255
    Protocol: UDP (17)
  ▷ Header checksum: 0x7dd3 [validation disabled]
    Source: 0.0.0.0 (0.0.0.0)
    Destination: 255.255.255.255 (255.255.255.255)
▷ User Datagram Protocol, Src Port: 68 (68), Dst Port: 67 (67)
▷ Bootstrap Protocol
```
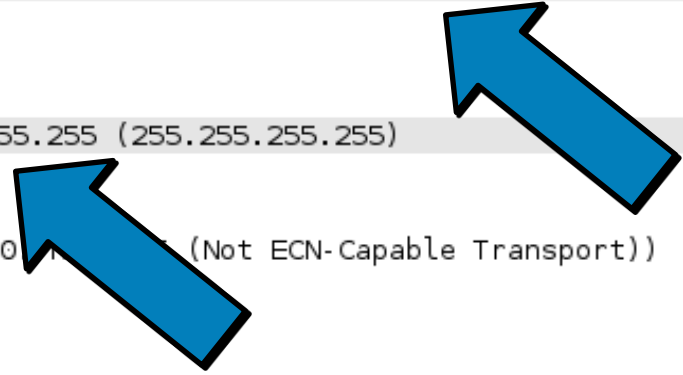
- **Note that destination MAC and IP is all broadcast**

IOS DHCP Configuration Example

- **Create a DHCP pool.**

  ip dhcp pool (pool_name)

- **Assign a network and default router to the pool.**

  network 10.1.1.0 255.255.255.0

  default-router 10.1.1.1

- **Assign additional options if required.**

  dns-server 10.40.1.51

  option 150 ip 10.40.1.99

Infrastructure DHCP Configuration Example

- **Remove any conflicting pool from the router**

  no ip dhcp pool (pool_name)

- **Enter interface configure mode for the required interface and configure broadcast relay.**

  interface vlan 30

  ip helper-address 10.40.1.51

Helpful Commands

- **show ip dhcp binding**

- **clear ip dhcp binding (address or *)**

- **debug ip dhcp server packet**

Network Address Translation (NAT)

- **Address Depletion**

- **Migration/Mergers**

- **Server load sharing**

- **Changing ISP**
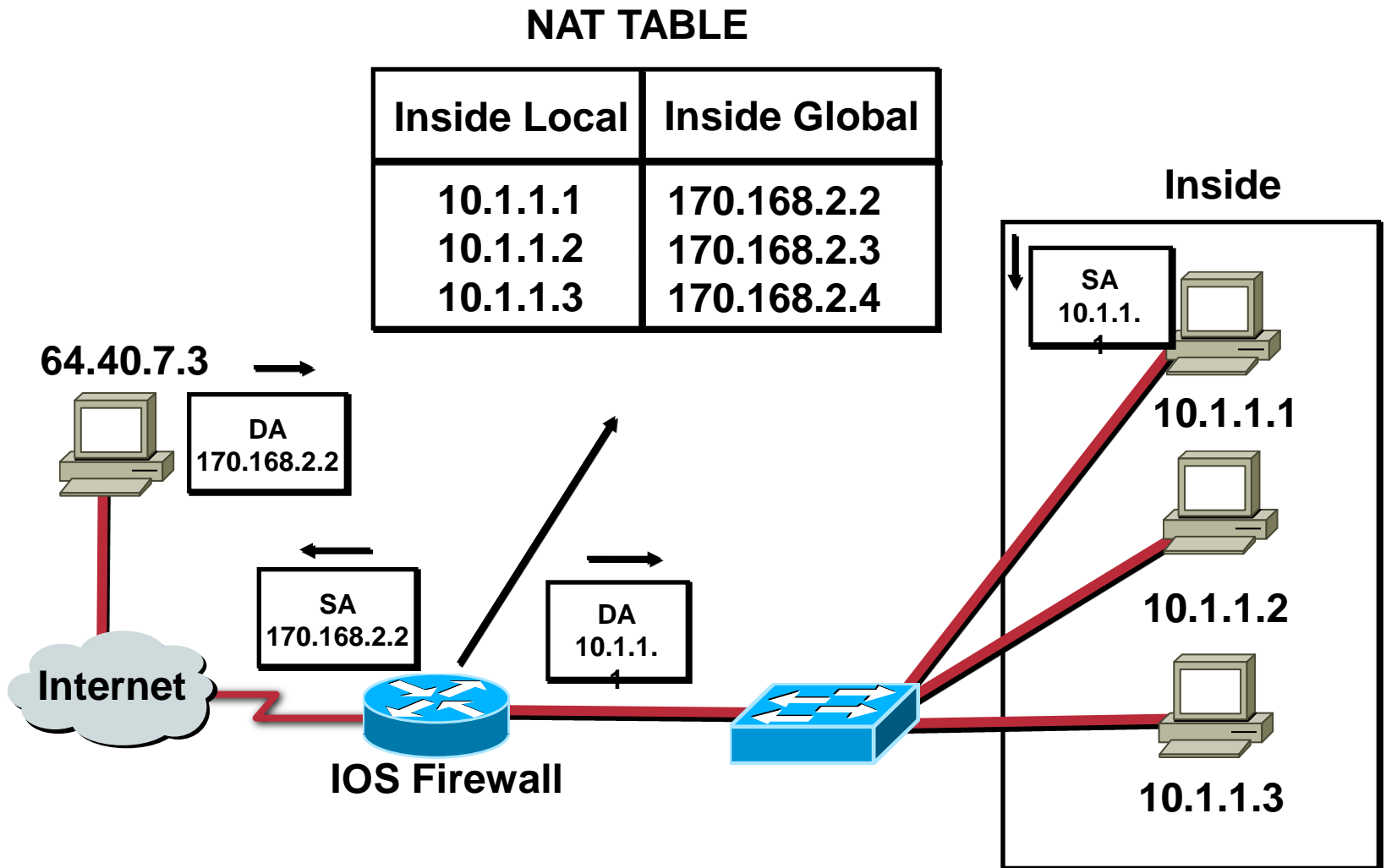
IOS Firewall

Internet
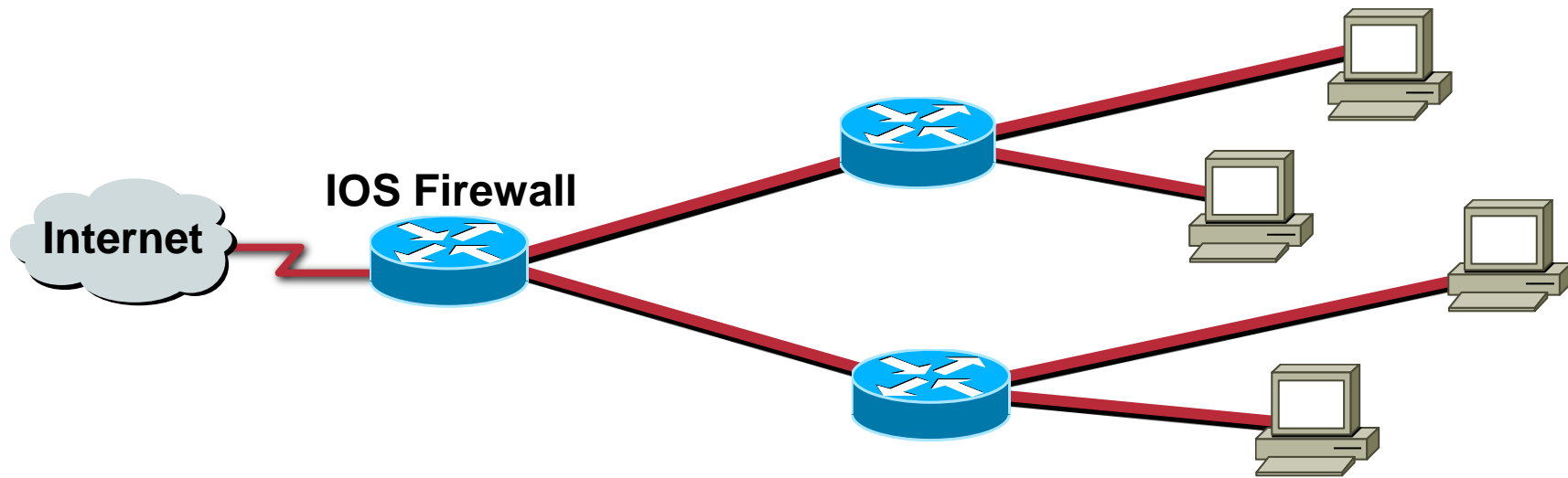
Types of NAT

- **Static NAT – one-to-one mapping between local and global addresses.**

- **Dynamic NAT – many-to-many mapping between local and global addresses by using a pool of real IP addresses.**

- **Overloading (PAT) – many-to-one local to global mapping using a real IP's transport layer ports.**
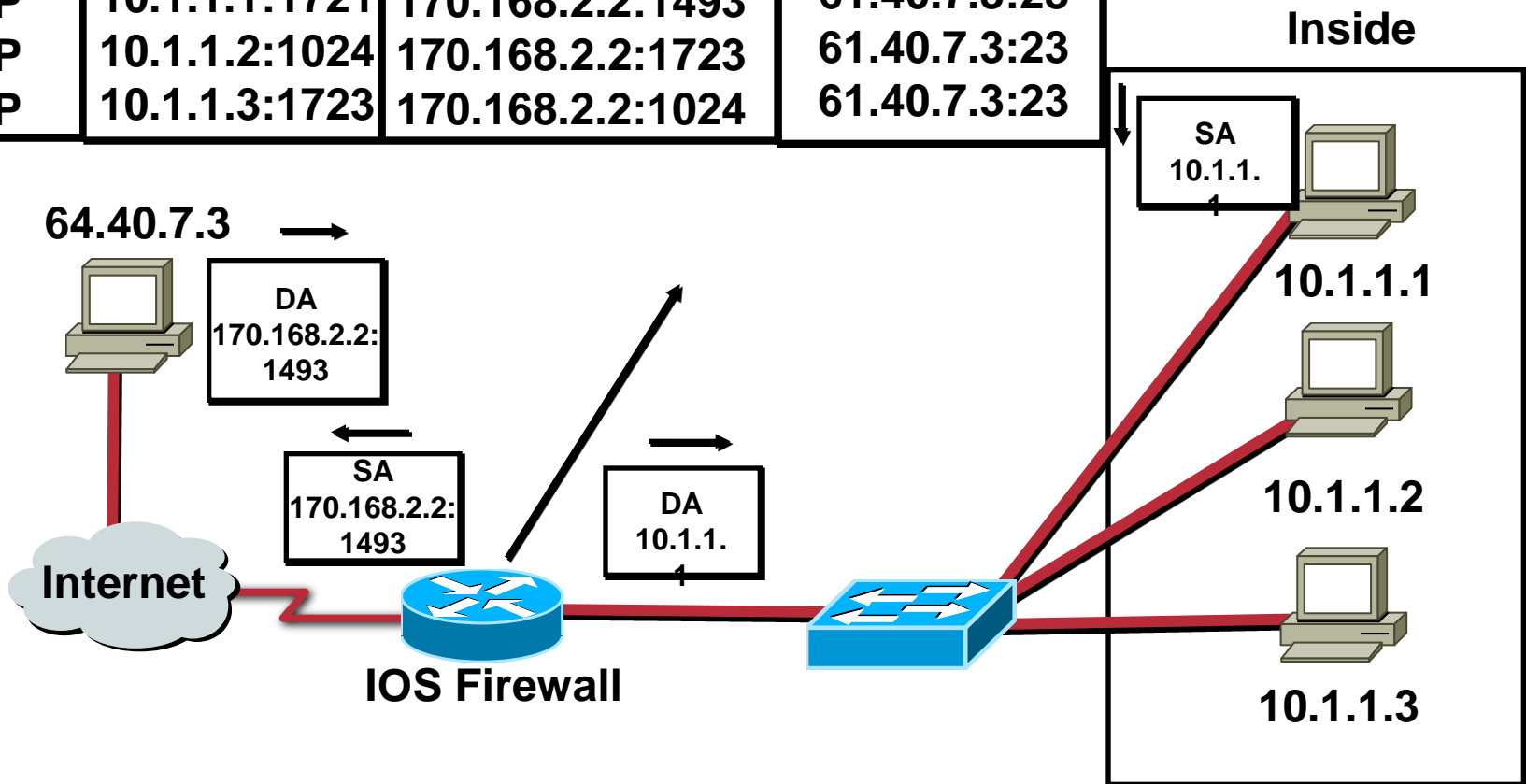
NAT Address Names

- **Inside Local – inside source address before translation.**

- **Outside Local – destination host before translation.**

- **Inside Global – inside host after translation.**

- **Outside Global – outside destination host after translation.**

Dynamic and Static NAT

NAT TABLE

Inside Local	Inside Global
10.1.1.1	170.168.2.2
10.1.1.2	170.168.2.3
10.1.1.3	170.168.2.4

Inside

SA 10.1.1.1

10.1.1.1

64.40.7.3

DA 170.168.2.2

SA 170.168.2.2

DA 10.1.1.1

10.1.1.2

Internet

IOS Firewall

10.1.1.3

Overloading (PAT)

Protocol	Inside Local	Inside Global	Outside Global
TCP TCP TCP	10.1.1.1:1721 10.1.1.2:1024 10.1.1.3:1723	170.168.2.2:1493 170.168.2.2:1723 170.168.2.2:1024	61.40.7.3:23 61.40.7.3:23 61.40.7.3:23

Inside

64.40.7.3

DA
170.168.2.2:
1493

SA
170.168.2.2:
1493

DA
10.1.1.
1

SA
10.1.1.
1

Internet

IOS Firewall

10.1.1.1

10.1.1.2

10.1.1.3

Static NAT config example

- **ip nat inside source static 10.1.1.1 170.46.2.2**

- **interface ethernet0/0**

  ip address 10.1.1.10 255.255.255.0

  ip nat inside

- **interface serial0/0**

  ip address 170.46.2.1 255.255.255.0

  ip nat outside

Internet

S0/0 outside

E0/0 inside
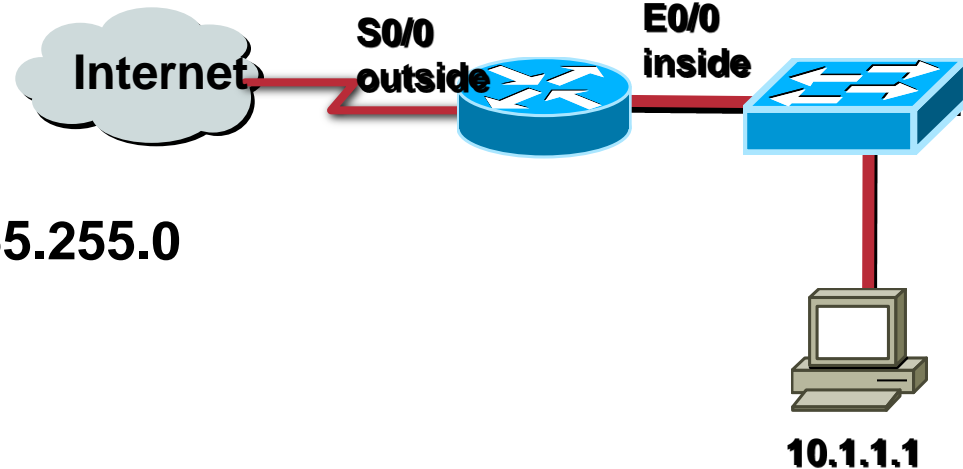
10.1.1.1

Dynamic NAT config example

- **ip nat pool globalnet 170.168.2.2 170.168.2.254 netmask 255.255.255.0**

- **ip nat inside source list 1 pool globalnet**

- **interface ethernet0/0**

    ip address 10.1.1.10 255.255.255.0

    ip nat inside

- **interface serial0/0**

    ip address 170.68.2.1 255.255.255.0

    ip nat outside

- **access-list 1 permit 10.1.1.0 0.0.0.255**

Internet **S0/0 outside** **E0/0 inside**

PAT (overloading) config example

- **ip nat pool globalnet 170.168.2.1 170.168.2.1 netmask 255.255.255.0**

- **ip nat inside source list 1 pool globalnet overload**

- **interface ethernet0/0**

    ip address 10.1.1.10 255.255.255.0

    ip nat inside

- **interface serial0/0**

    ip address 170.68.2.1 255.255.255.0

    ip nat outside

- **access-list 1 permit 10.1.1.0 0.0.0.255**

Internet

**S0/0
outside**

**E0/0
inside**

Miscellaneous

- **Troubleshooting commands**

  show ip nat translation

  clear ip nat translation *

  debug ip nat