IT 609
Network and System Administration

Network Address Translation (NAT)

Thursday November 04, 2021

NAT

NAT - Network Address Translation

1) A means of using a single public Internet address to provide access to many hosts on a private network
2) A way of hiding a private network from public access

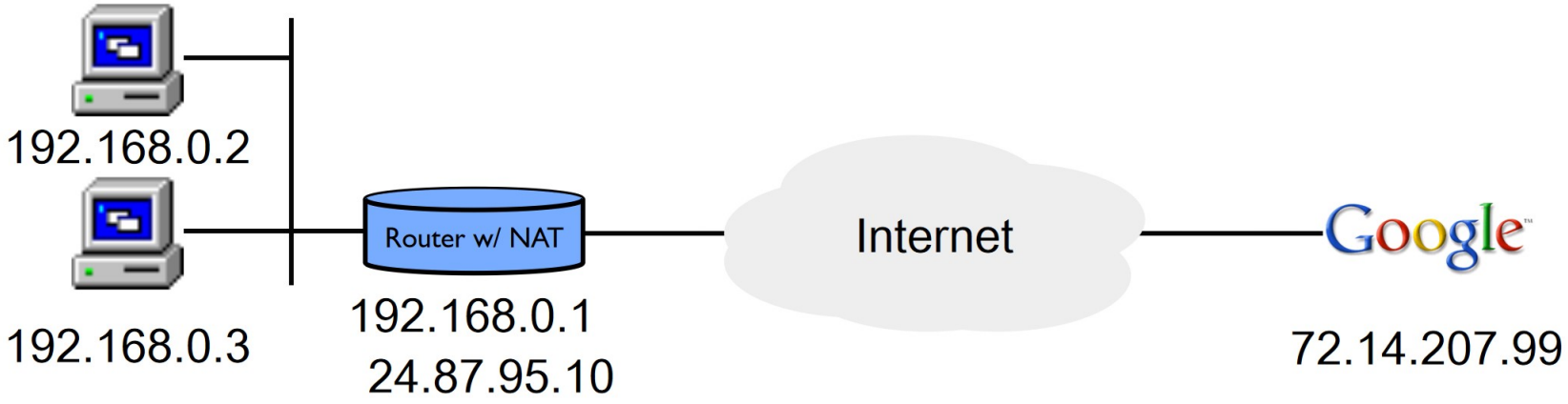
NAT is commonly built-in to SOHO routers

DHCP hands out private IP addresses

Router bridges the connection between the network

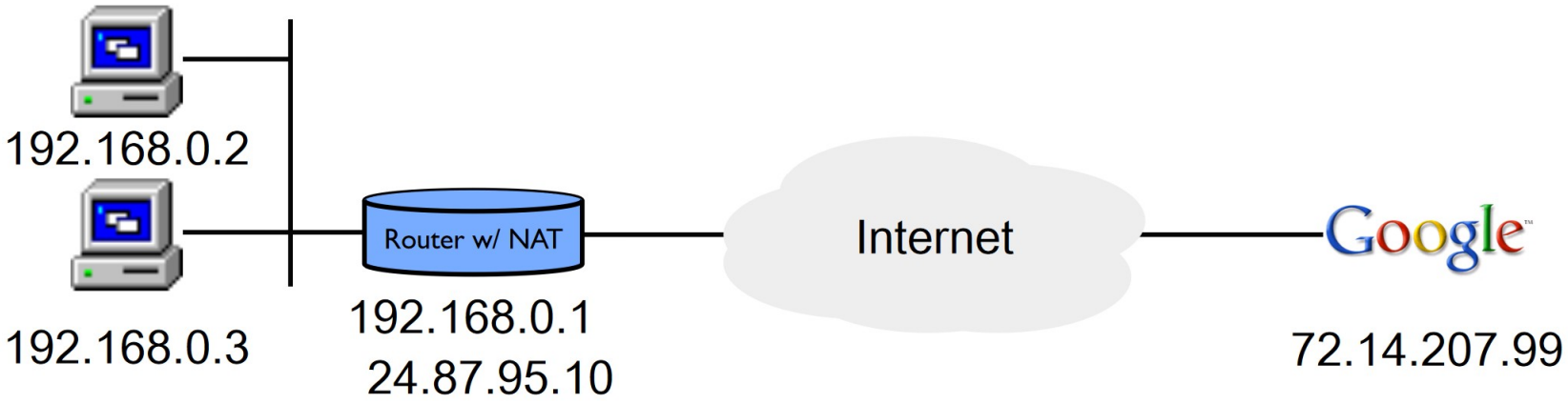
NAT translates network source/destination info

NAT - Example



Open http://google.com

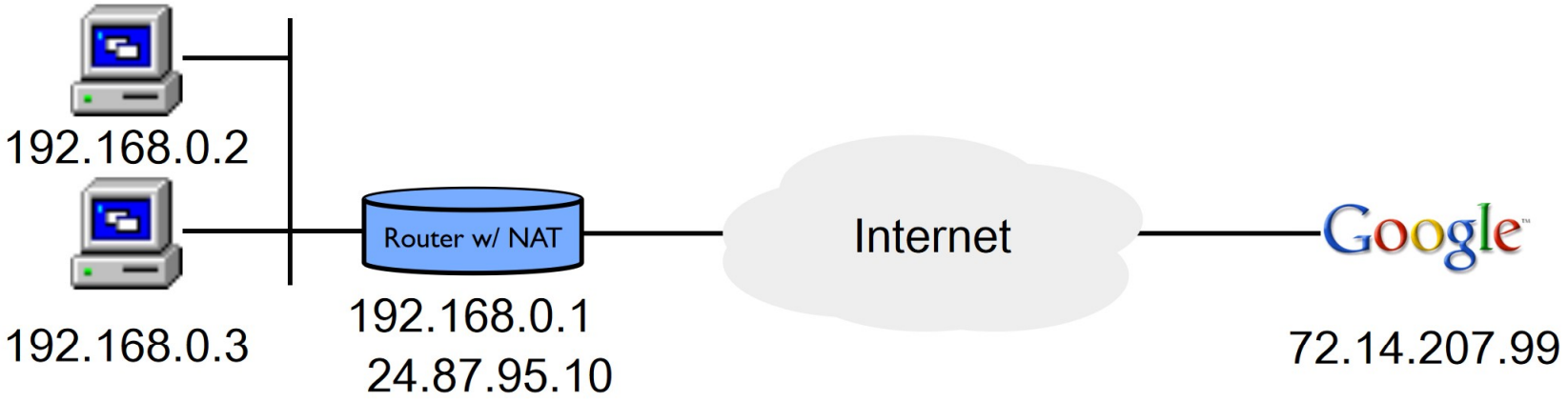
NAT - Example



Open http://google.com

IP to non-local network

NAT - Example



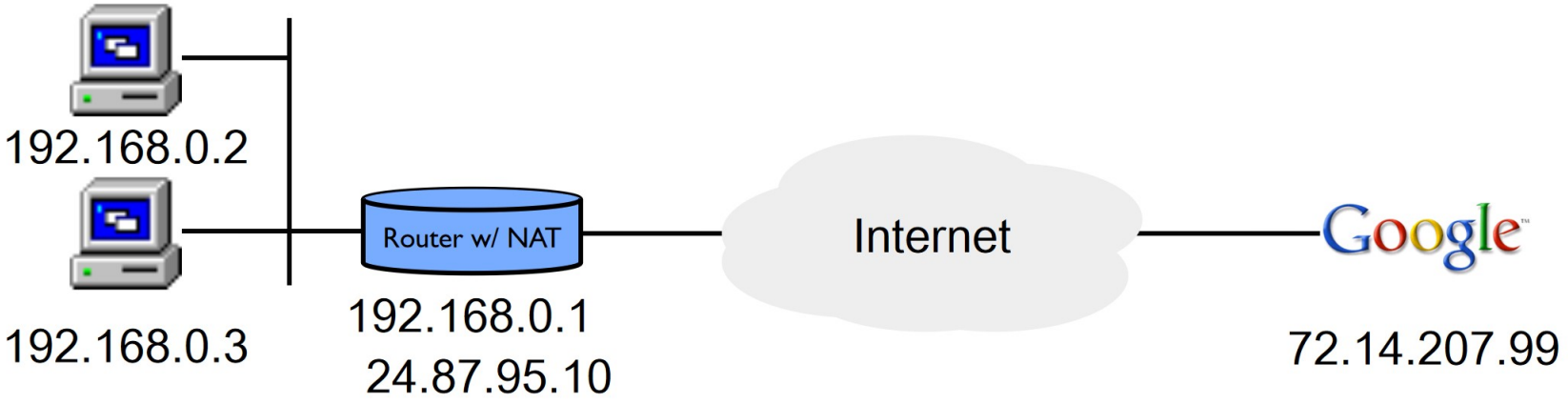
Open http://google.com

IP to non-local network

Send to router via Ethernet

192.168.0.3:25001 to 72.14.207.99:80

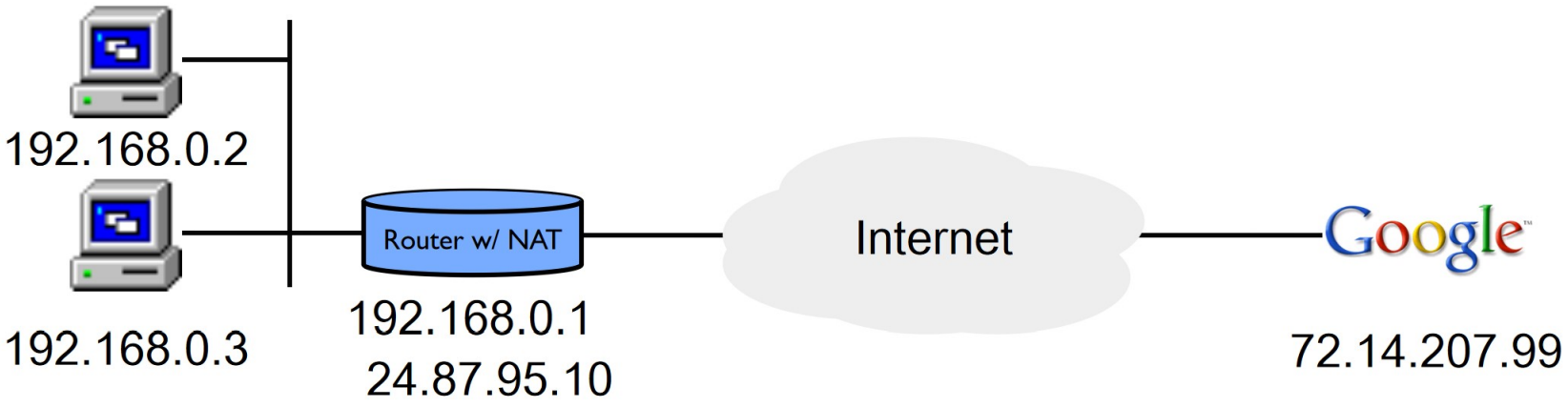
NAT - Example



Open http://google.com

Router receives
192.168.0.3:25001 to 72.14.207.99:80

NAT - Example

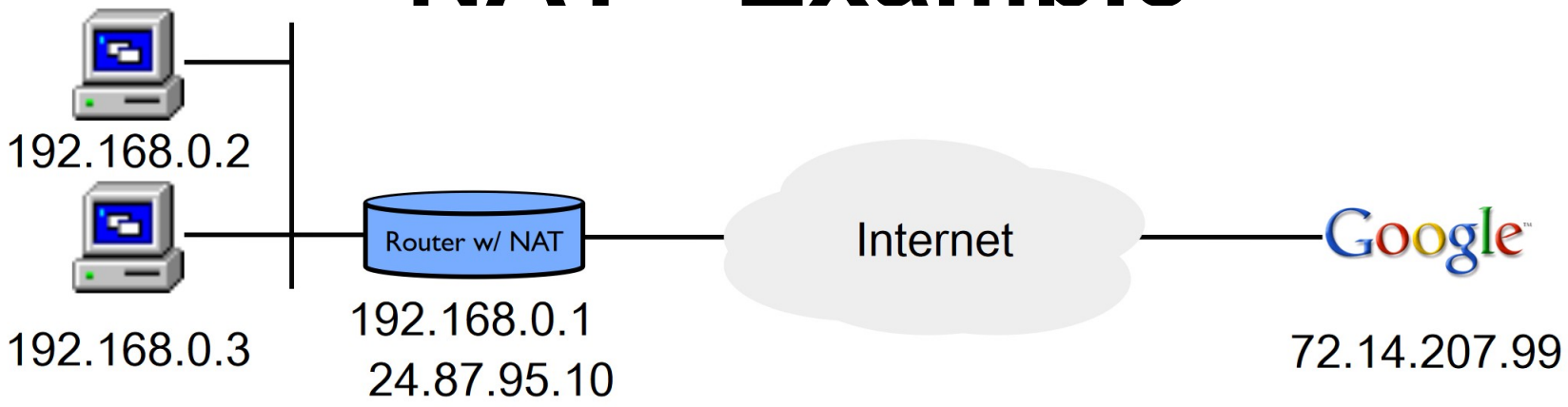


Open http://google.com

Router receives
192.168.0.3:25001 to 72.14.207.99:80

IP	Local Port	Internet Port
192.168.0.2	14645	6000

NAT - Example

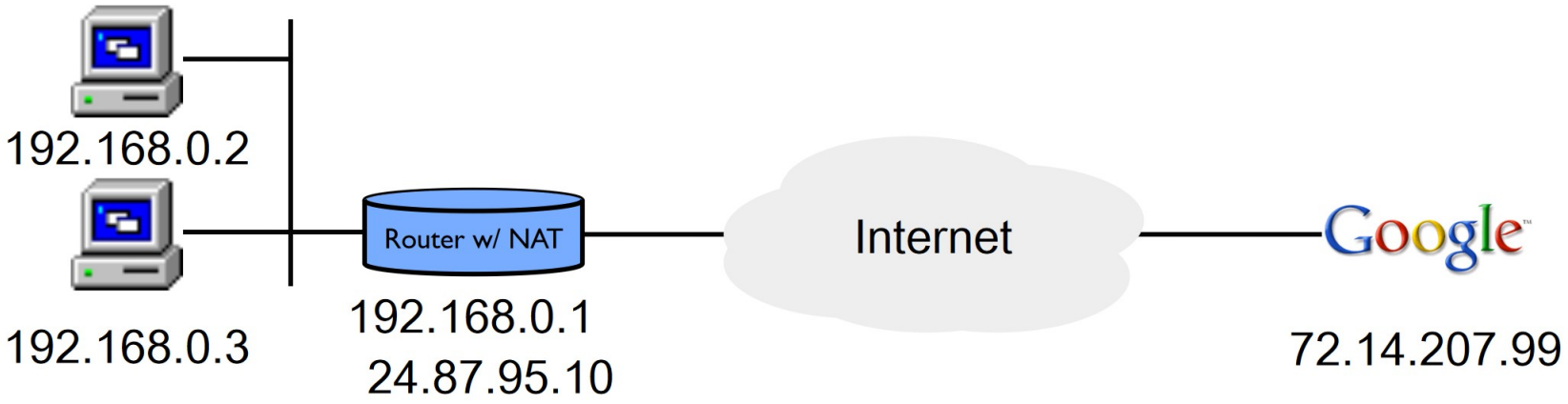


Open http://google.com

Router receives
192.168.0.3:25001 to 72.14.207.99:80
converts to
24.87.95.10:6001 to 72.14.207.99:80
records in table & sends via Internet

IP	Local Port	Internet Port
192.168.0.2	14645	6000
192.168.0.3	25001	6001

NAT - Example

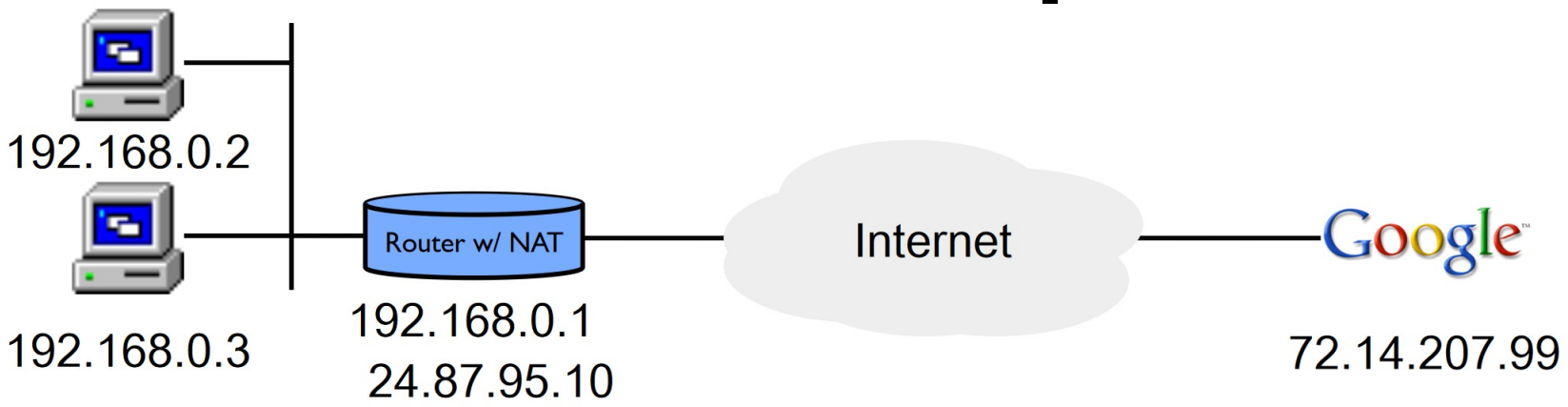


Open http://google.com

HTTP server receives
24.87.95.10:6001 to 72.14.207.99:80
responds
72.14.207.99:80 to 24.87.95.10:6001

IP	Local Port	Internet Port
192.168.0.2	14645	6000
192.168.0.3	25001	6001

NAT - Example

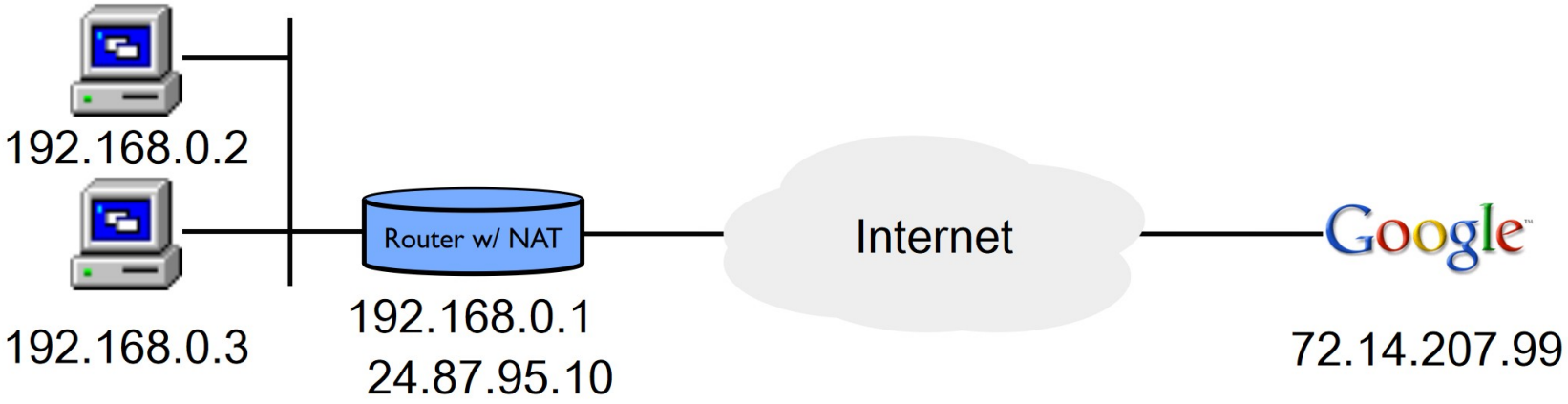


Open http://google.com

Router receives
72.14.207.99:80 to 24.87.95.10:6001

IP	Local Port	Internet Port
192.168.0.2	14645	6000
192.168.0.3	25001	6001

NAT - Example

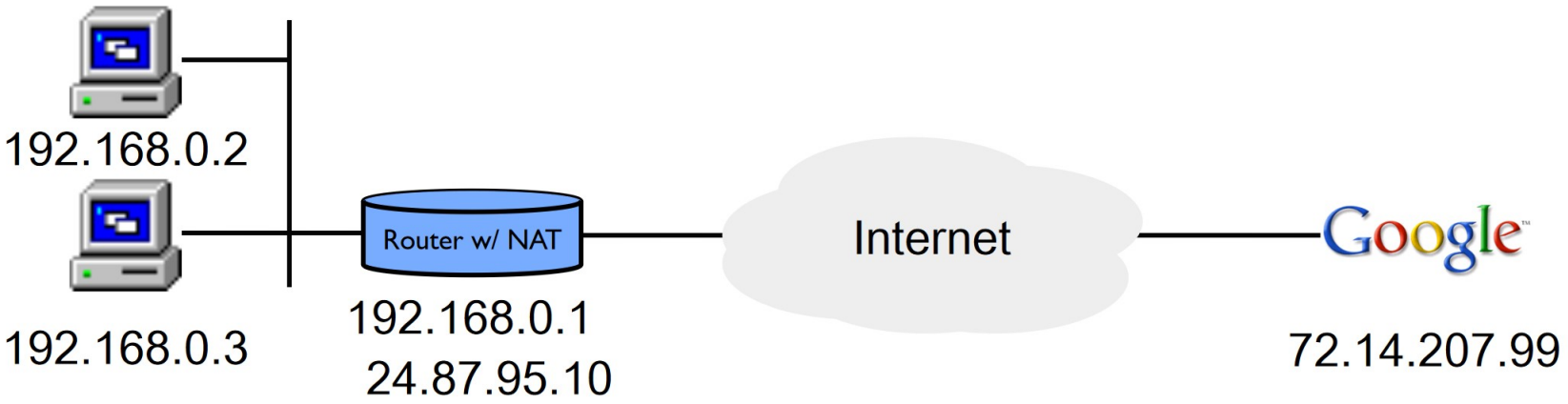


Open http://google.com

Router receives
72.14.207.99:80 to 24.87.95.10:6001

IP	Local Port	Internet Port
192.168.0.2	14645	6000
192.168.0.3	25001	6001

NAT – Example

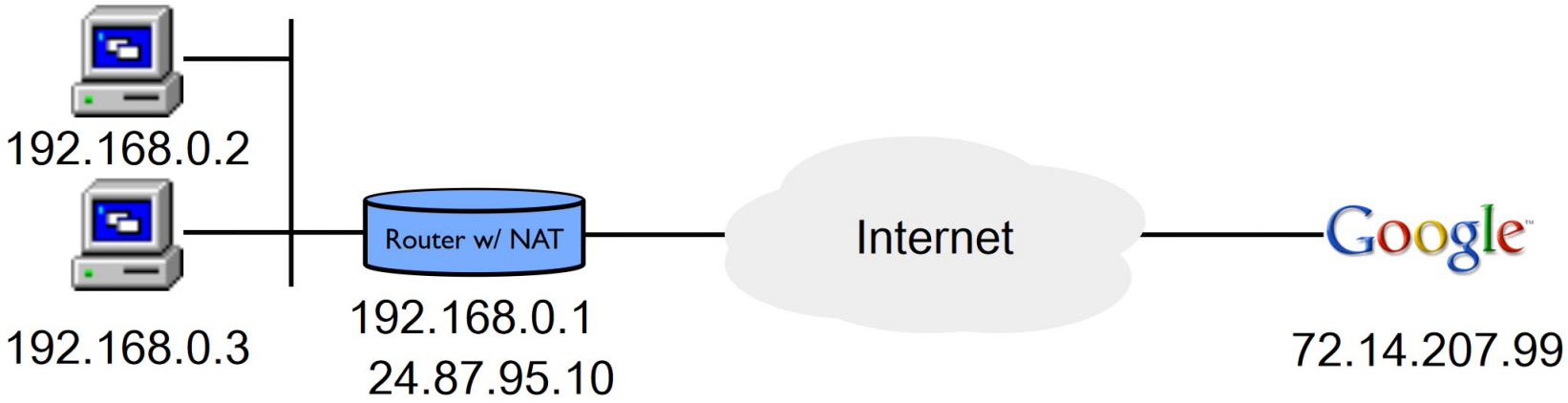


Open http://google.com

Router receives
72.14.207.99:80 to 24.87.95.10:6001
using the table, converts to
72.14.207.99:80 to 192.168.0.3:25001
sends via Ethernet

IP	Local Port	Internet Port
192.168.0.2	14645	6000
192.168.0.3	25001	6001

NAT - Example



Open http://google.com

IP	Local Port	Internet Port
192.168.0.2	14645	6000
192.168.0.3	25001	6001

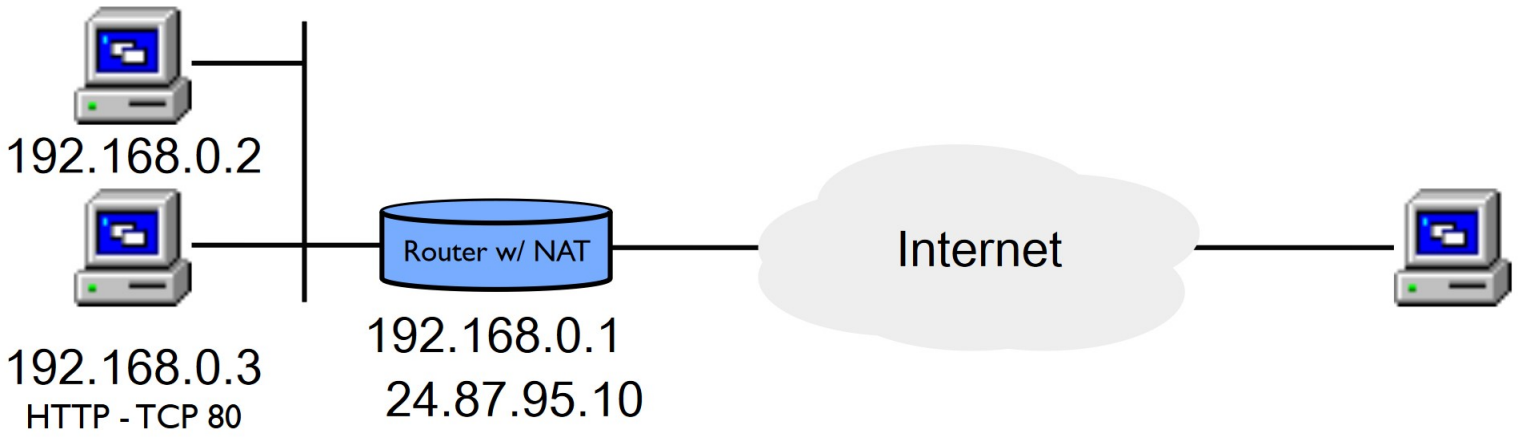
NAT Pluses/Minuses

Pluses	Minuses
Fewer IP addresses used	Breaks end-to-end connection model
Obscures the internal network	Cannot access private network from outside
Simple to setup	Can break when used with encryption (IPsec)
Works fine for outgoing communications	Not a complete security solution

Port Forwarding & Triggering

- Port Forwarding
  - Allowing incoming traffic on certain ports to automatically be NAT'ed to a particular private machine
  - Lets external devices access machines on the private network
- Port Triggering
  - Outgoing traffic on a given port opens a set of different incoming ports back to that private host
  - No always open access
  - Allows for more complex scenarios

Port Forwarding



IP	Local Port	Internet Port
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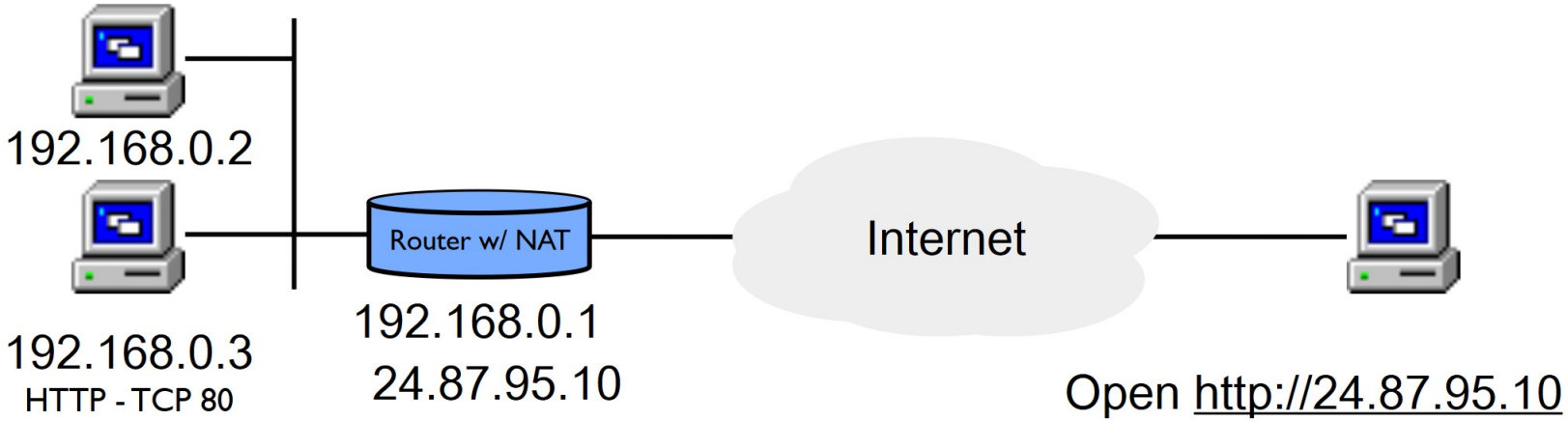
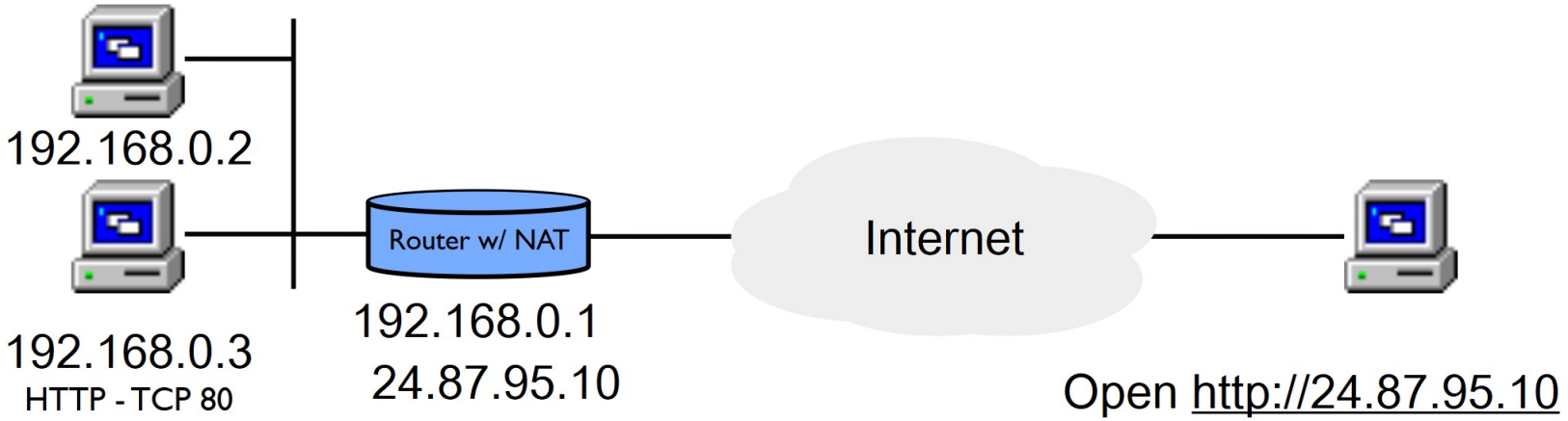
192.168.0.3	25001	6001

Port Forwarding



IP	Local Port	Internet Port
192.168.0.2	14645	6000
192.168.0.3	25001	6001

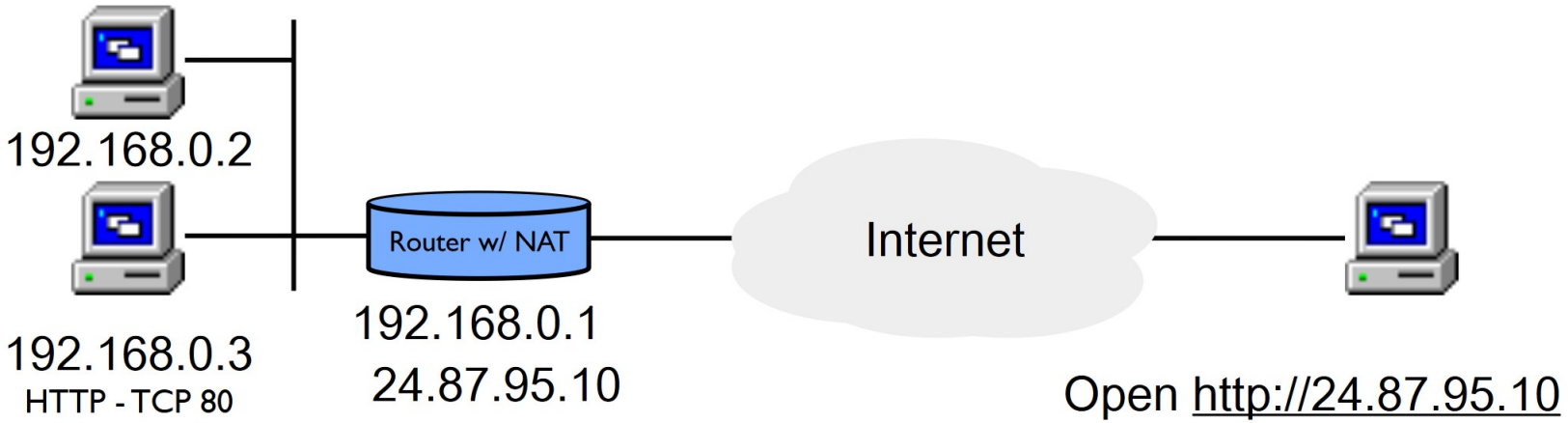
Port Forwarding



Router receives request to 24.87.95.10:80

IP	Local Port	Internet Port
192.168.0.2	14645	6000
192.168.0.3	25001	6001

Port Forwarding

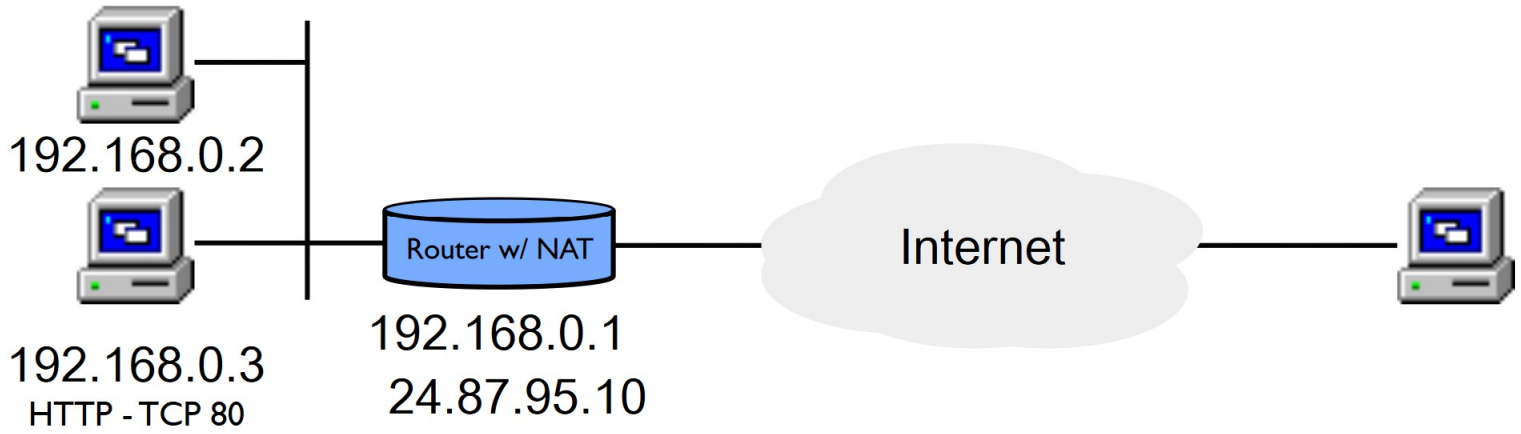


Router receives request to 24.87.95.10:80

Router will not forward

IP	Local Port	Internet Port
192.168.0.2	14645	6000
192.168.0.3	25001	6001

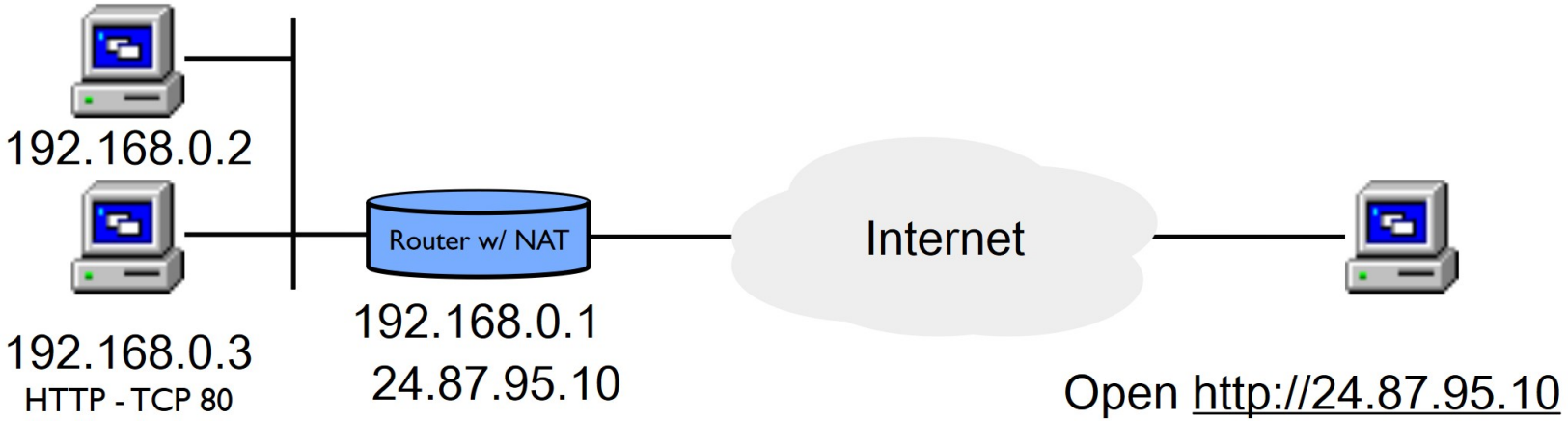
Port Forwarding



IP	Local Port	Internet Port
192.168.0.2	14645	6000
192.168.0.3	25001	6001
192.168.0.3	80	80

Port forwarding setup

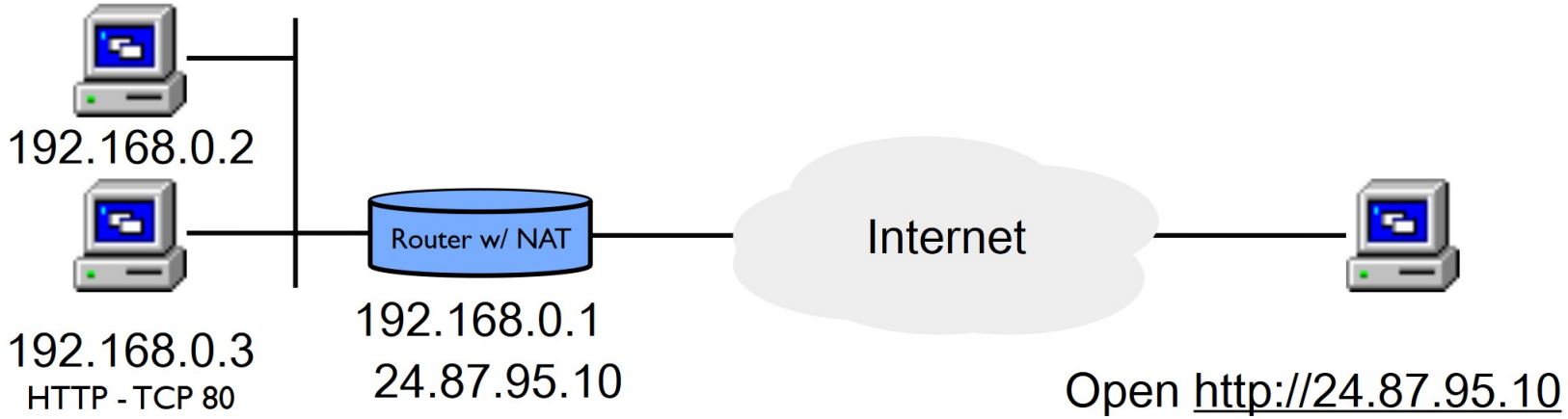
Port Forwarding



IP	Local Port	Internet Port
192.168.0.2	14645	6000
192.168.0.3	25001	6001
192.168.0.3	80	80

Port forwarding setup

Port Forwarding

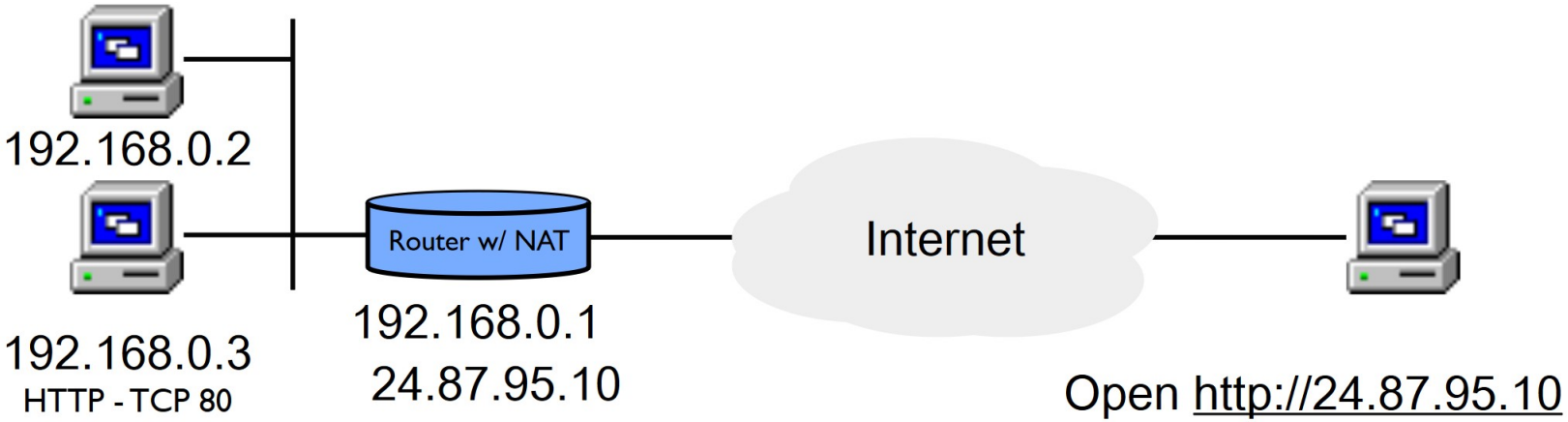


Router receives request to 24.87.95.10:80

IP	Local Port	Internet Port
192.168.0.2	14645	6000
192.168.0.3	25001	6001
192.168.0.3	80	80

Port forwarding setup

Port Forwarding

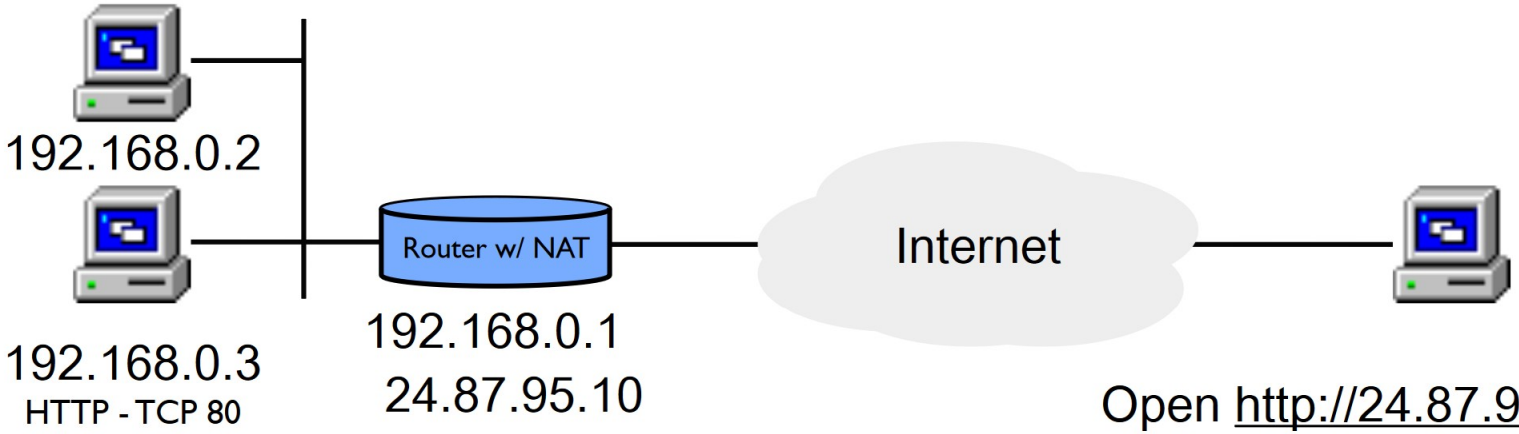


Router receives request to 24.87.95.10:80

IP	Local Port	Internet Port
192.168.0.2	14645	6000
192.168.0.3	25001	6001
192.168.0.3	80	80

Port forwarding setup

Port Forwarding



Server gets request

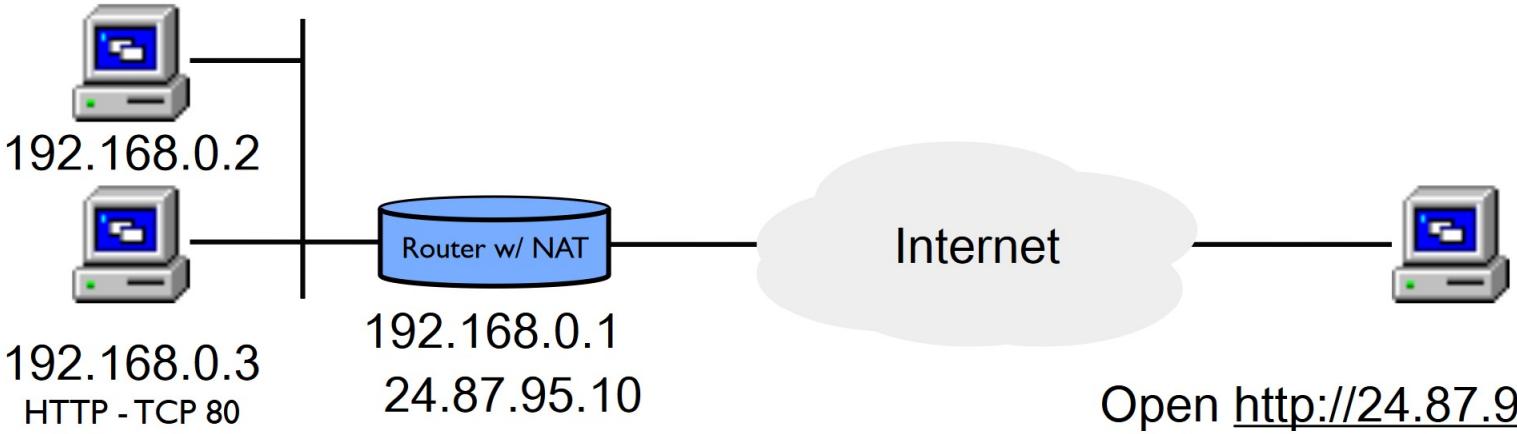
Router receives request to 24.87.95.10:80

Router converts to 192.168.0.3:80 and forwards via LAN

IP	Local Port	Internet Port
192.168.0.2	14645	6000
192.168.0.3	25001	6001
192.168.0.3	80	80

Port forwarding setup

Port Forwarding



Server gets request

Router receives request to 24.87.95.10:80

Router converts to 192.168.0.3:80 and forwards via LAN

IP	Local Port	Internet Port
192.168.0.2	14645	6000
192.168.0.3	25001	6001
192.168.0.3	80	80

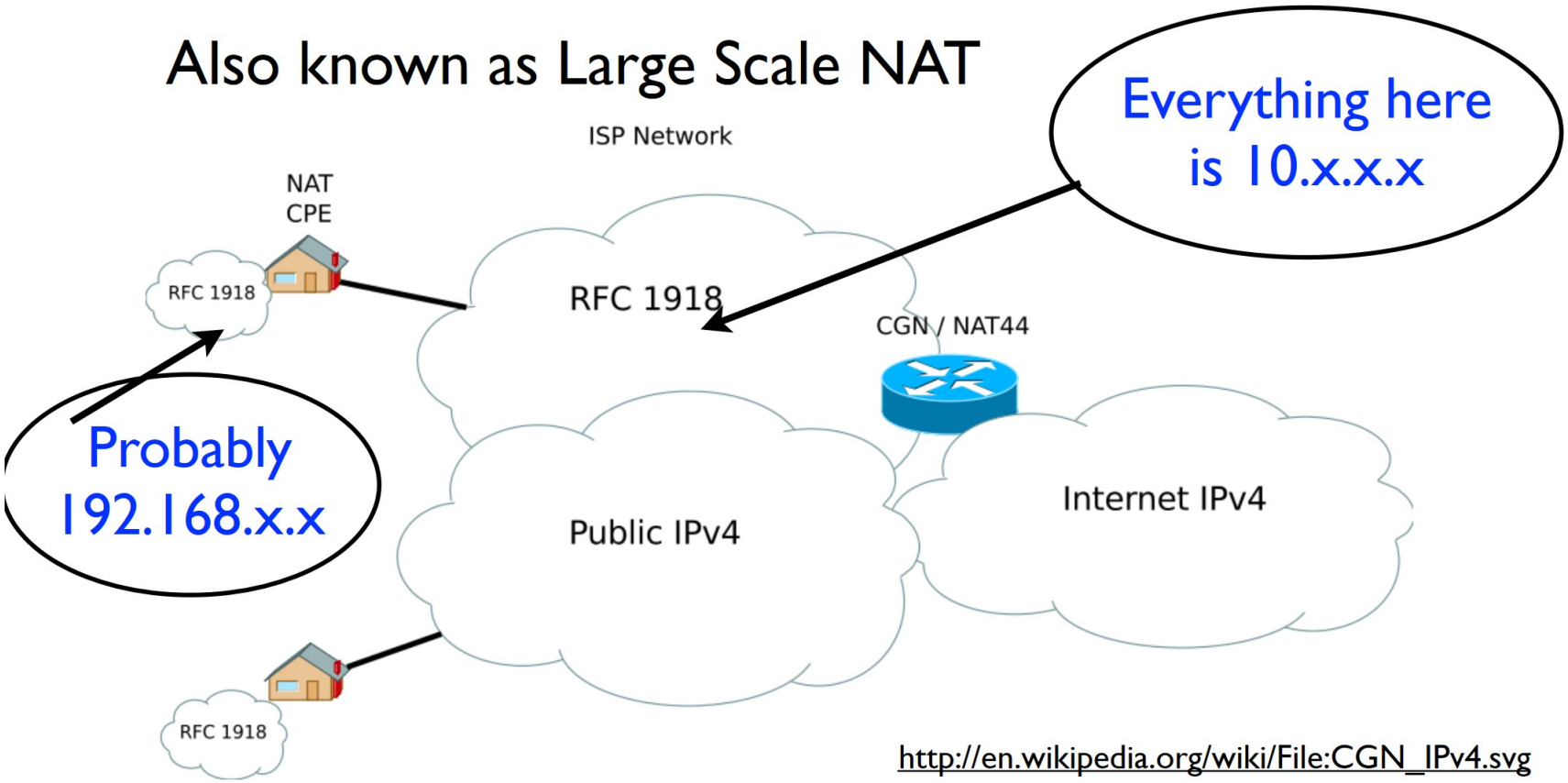
Port forwarding setup

Carrier-grade NAT

A possible approach to IPv4 address exhaustion

Also a way to bridge to IPv6

Also known as Large Scale NAT



http://en.wikipedia.org/wiki/File:CGN_IPv4.svg