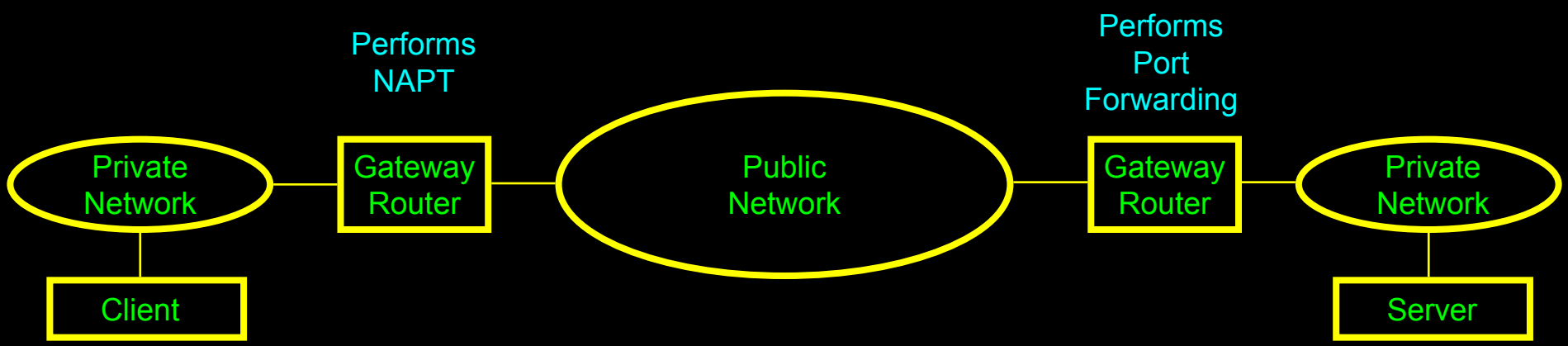
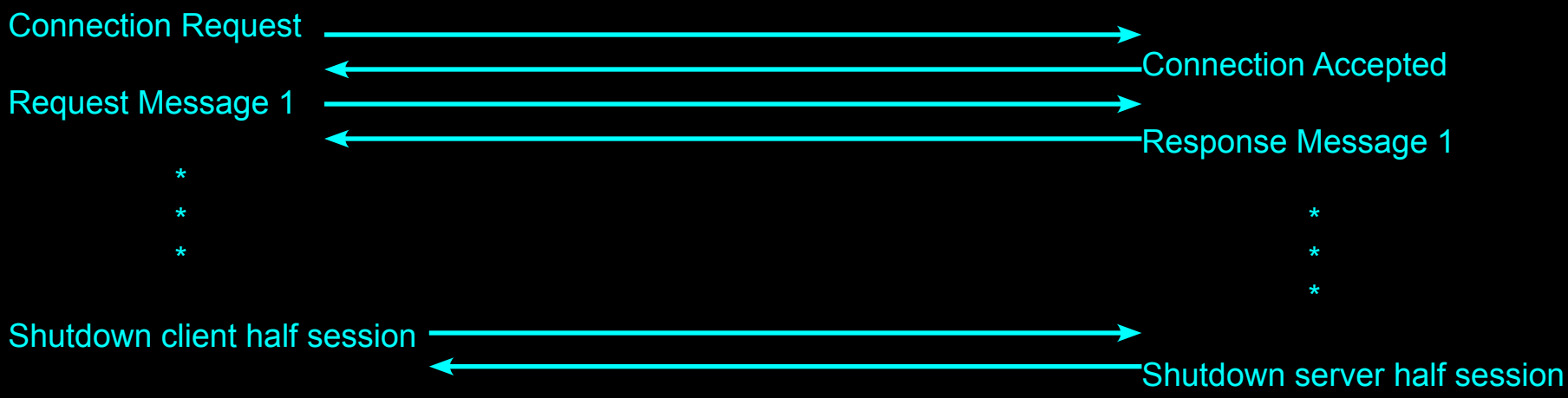
Network Address and Port Translation - NAPT Compared with Port Forwarding





Layers 2, 3, and 4 Addressing Units Contain both a Source and Destination

Data Link Layer Ethernet Header:

Source MAC Address
Destination MAC Address

Network Layer IP Header:

Source IP Address
Destination IP Address

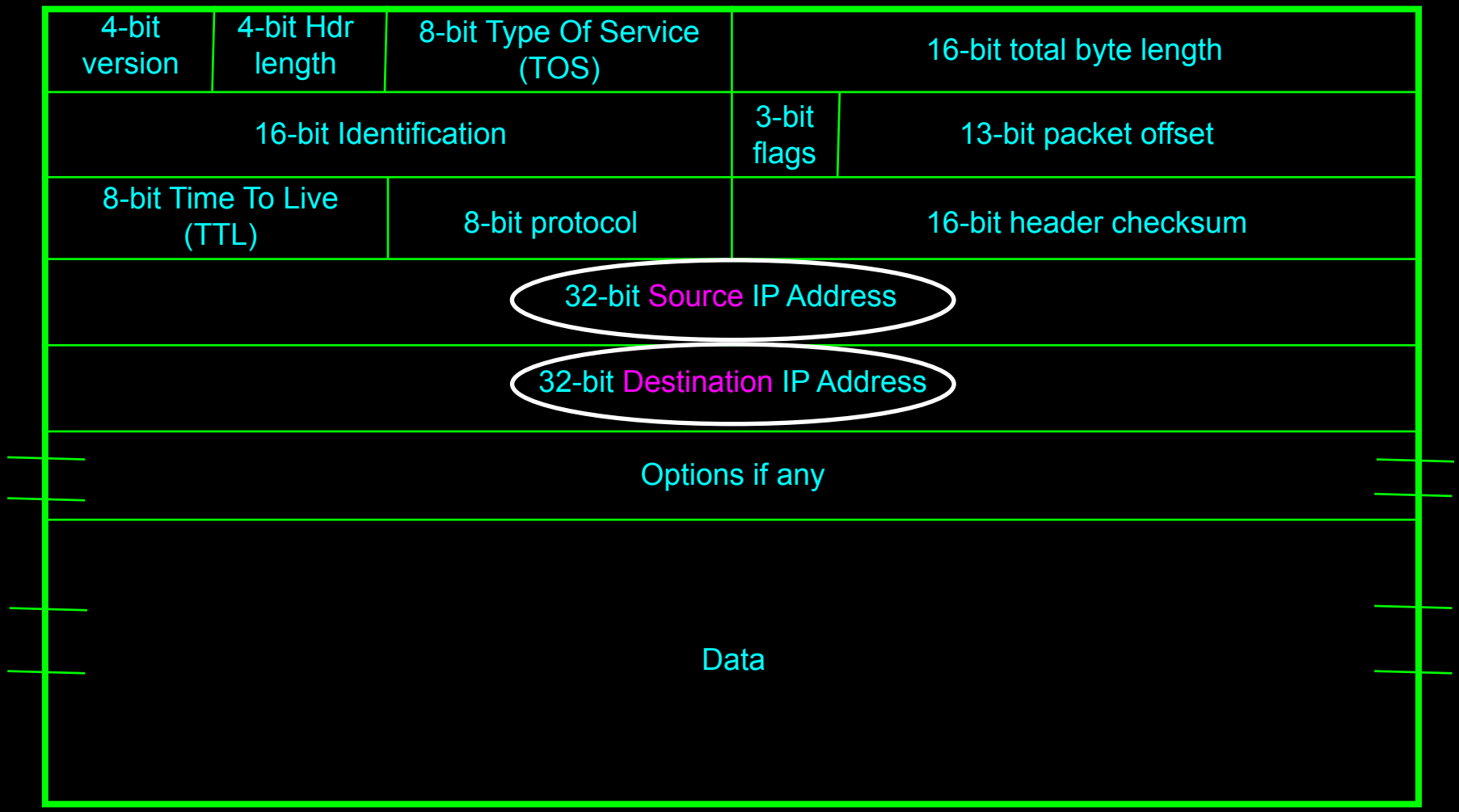
Transport Layer TCP/UDP Header:

Source Service Port Number
Destination Service Port Number

Data Link Layer 2
Ethernet Frame

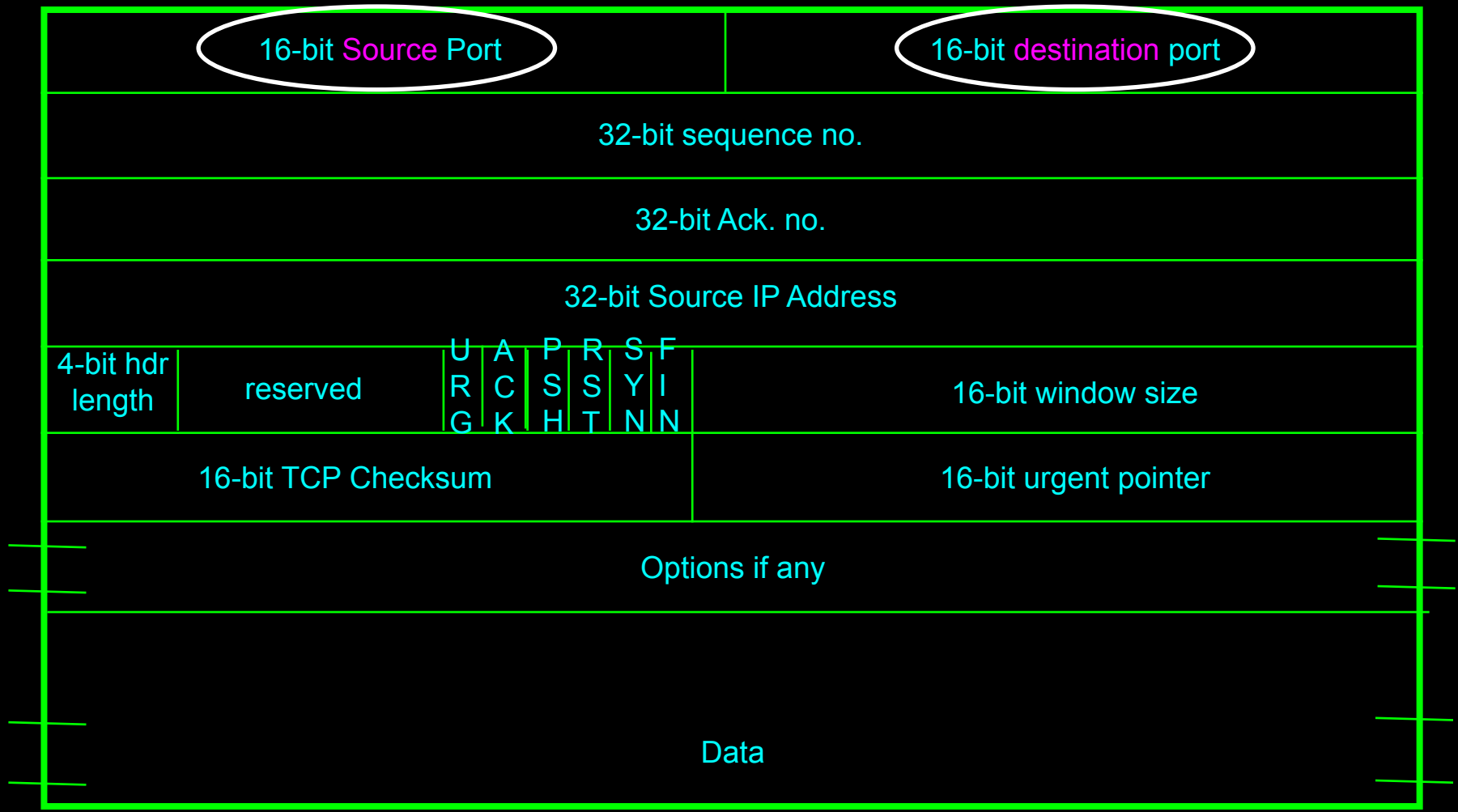
Network Protocol Attributes
Intra- and Inter- Networking Protocols

IP Header Format



Transport Protocol Attributes
Intra- and Inter- Networking Protocols

TCP Header Format



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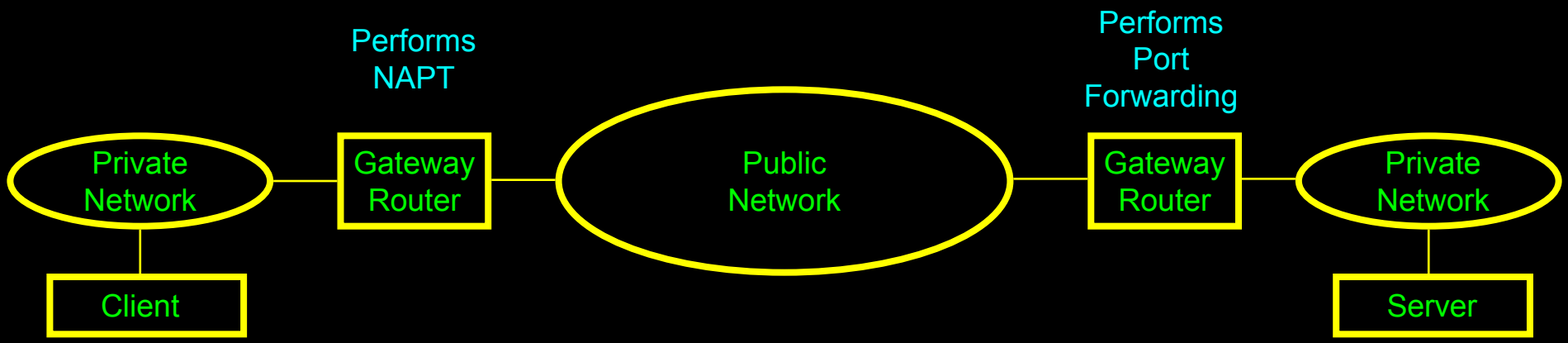
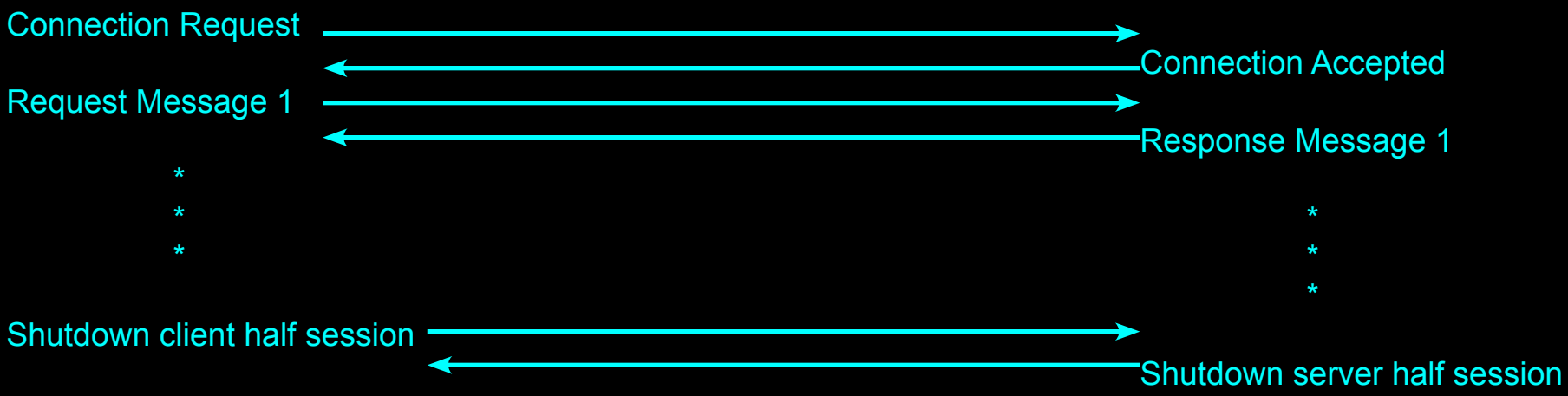




Translates:

Request Source address units

Response Destination address units

Translates:

Request Destination address units

Response Source address units

Example

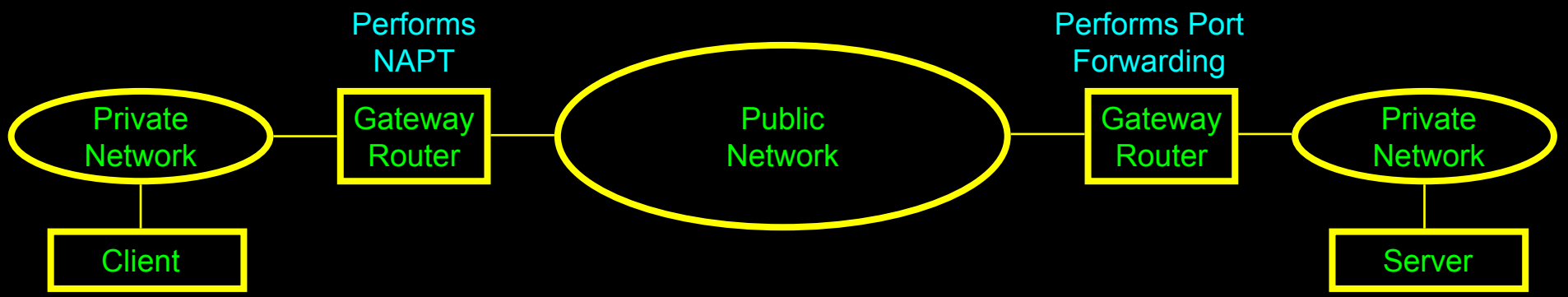
Combined NAPT with Port Forwarding

Given - Client side:

Client private IP	= 192.168.101.4	(example)
Client source port	= 20000	(example)
Client destination port	= 80	(HTTP)
ISP assigned public IP	= 209.152.46.213	(www.pcc.edu)
Gateway assigned port	= 30000	(example)

Given - Server side:

Server private IP	= 10.0.0.4	(example)
Server destination port	= 8080	(example)
ISP assigned public IP	= 206.190.36.45	(www.yahoo.com)



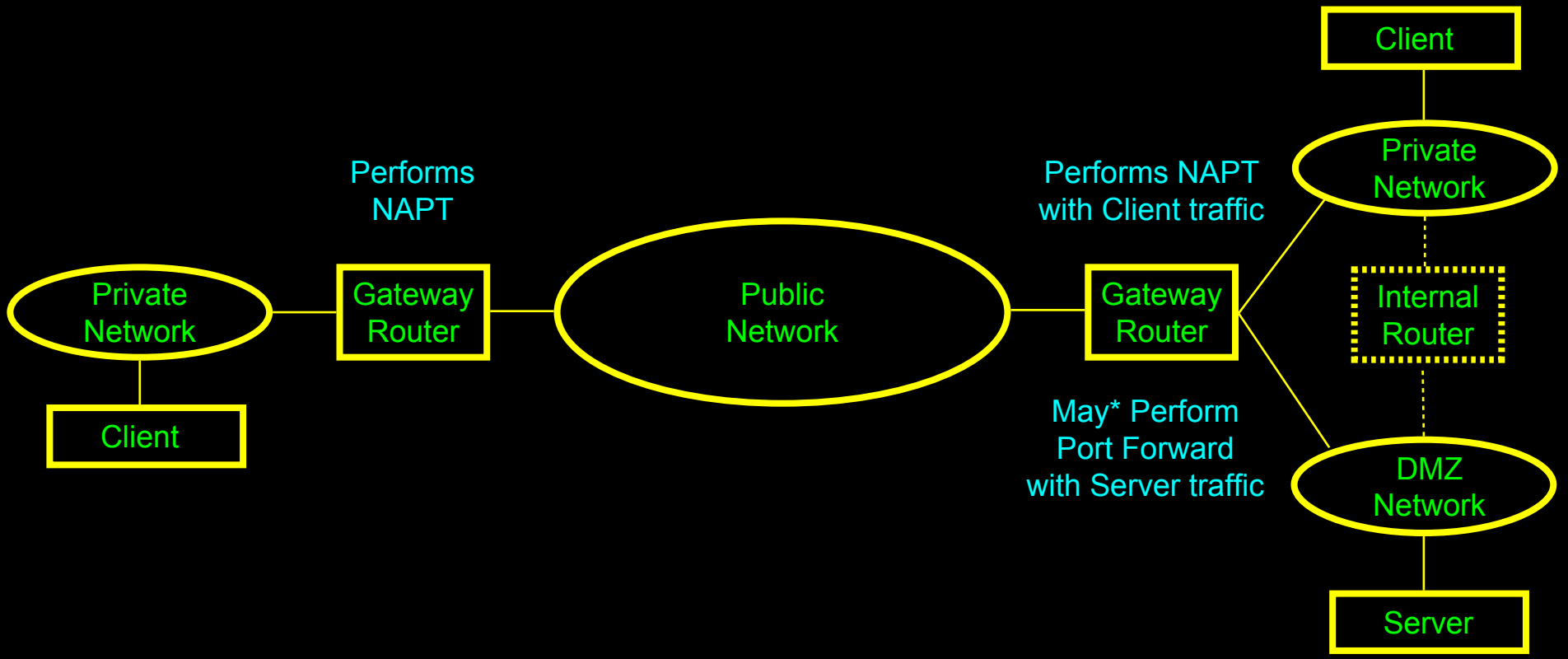
HTTP Request message

	Client's private network		Public Network		Server's private network
Source IP address	192.168.101.4	NAPT →	209.152.46.213		209.152.46.213
Source port	20000	→	30000		30000
Destination IP address	206.190.36.45		206.190.36.45	PF →	10.0.0.4
Destination port	80		80	→	8080

HTTP Response message

Source IP address	206.190.36.45		206.190.36.45	← PF	10.0.0.4
Source port	80		80	←	8080
Destination IP address	192.168.101.4	← NAPT	209.152.46.213		209.152.46.213
Destination port	20000	←	30000		30000

Network Address and Port Translation - NAPT in a DMZ Configuration



* If DMZ using private IP addresses then gateway router is performing a port forward function.

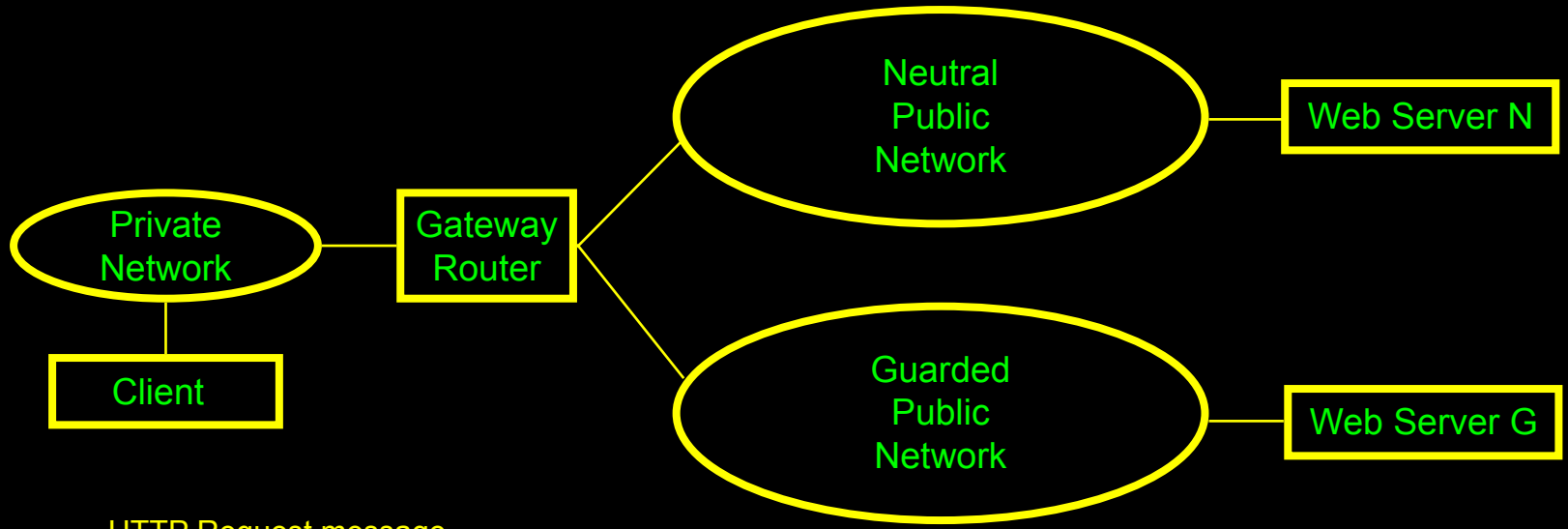
Proxy Server Port Forwarding Example

Given - Client side:

Client private IP	= 192.168.101.4	(example)
Client source port	= 20000	(example)
ISP assigned public IP	= 209.152.46.213	(www.pcc.edu)
Gateway assigned port	= 30000	(example)

Given - Server side:

Web Server N Public IP	= 205.190.36.45	(example)
Web Server N HTTP Port	= 8080	(example)
Web Server G Public IP	= 206.190.36.45	(example)
Web Server G HTTP Port	= 80	(example)



HTTP Request message

	Client's private network		Public Network
Source IP address	192.168.101.4	NAPT →	209.152.46.213
Source port	20000	NAPT →	30000
Destination IP address	206.190.36.45	PF →	205.190.36.45
Destination port	80	PF →	8080

Client believes it interacted with Web Server G when in fact it interacted with Web Server N.

HTTP Response message

Source IP address	206.190.36.45	← PF	205.190.36.45
Source port	80	← PF	8080
Destination IP address	192.168.101.4	← NAPT	209.152.46.213
Destination port	20000	← NAPT	30000