

#### **Host A**

IP Address: 10.10.10.10/24

DG: 10.10.10.1

MAC: 1111.2222.3333

IP Address: 10.10.100.1 MAC: 8888.9999.AAAA

## **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

MAC: 3333.4444.5555

#### www.flackbox.com

IP Address: 10.10.12.10/24

DG: 10.10.12.1





Receiver

Sender

Layer	Name	Includes
7		
6		
5		
4		
3		
2		
1		





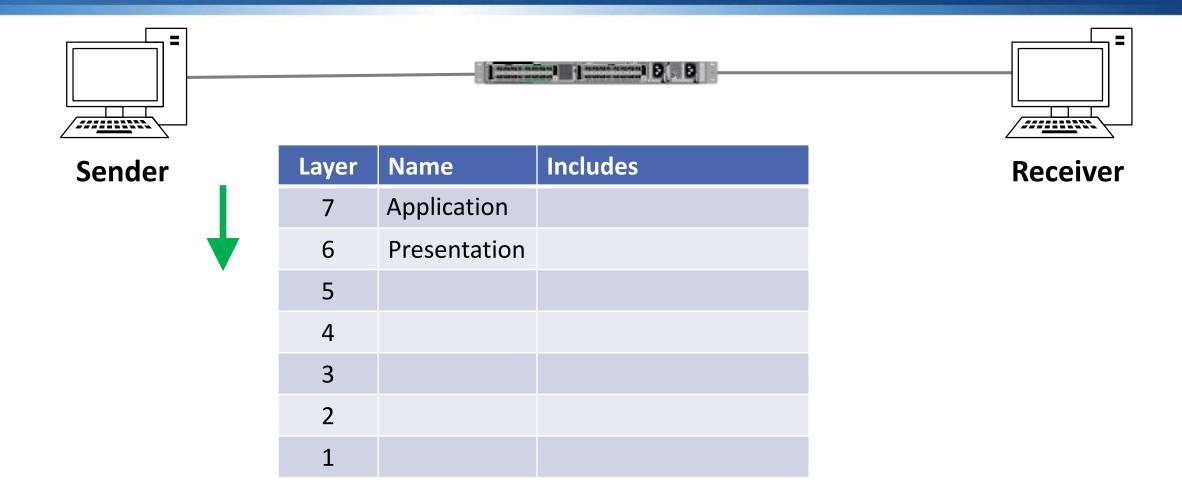
Sender



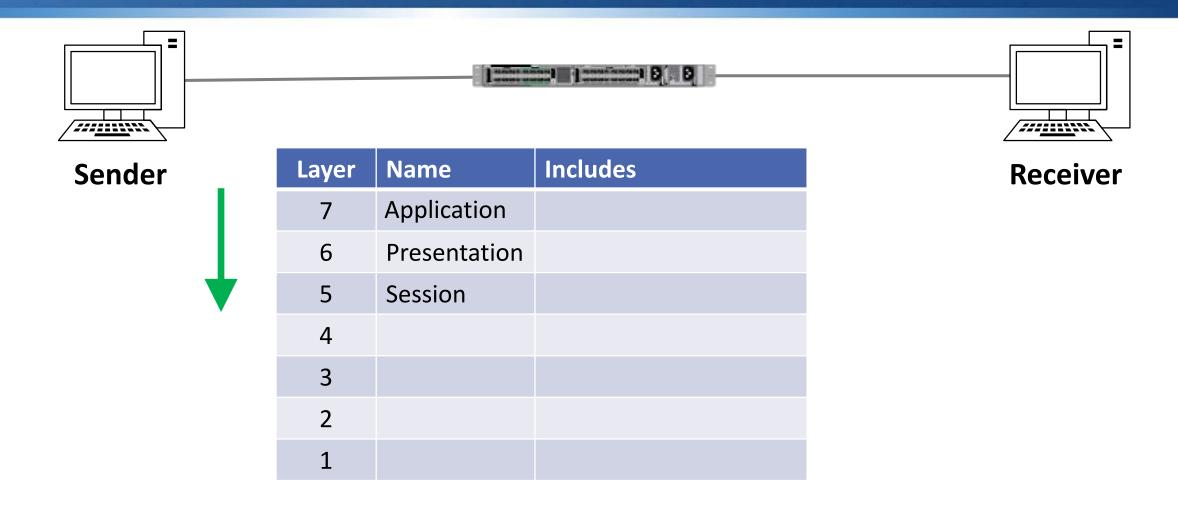
Layer	Name	Includes
7	Application	
6		
5		
4		
3		
2		
1		



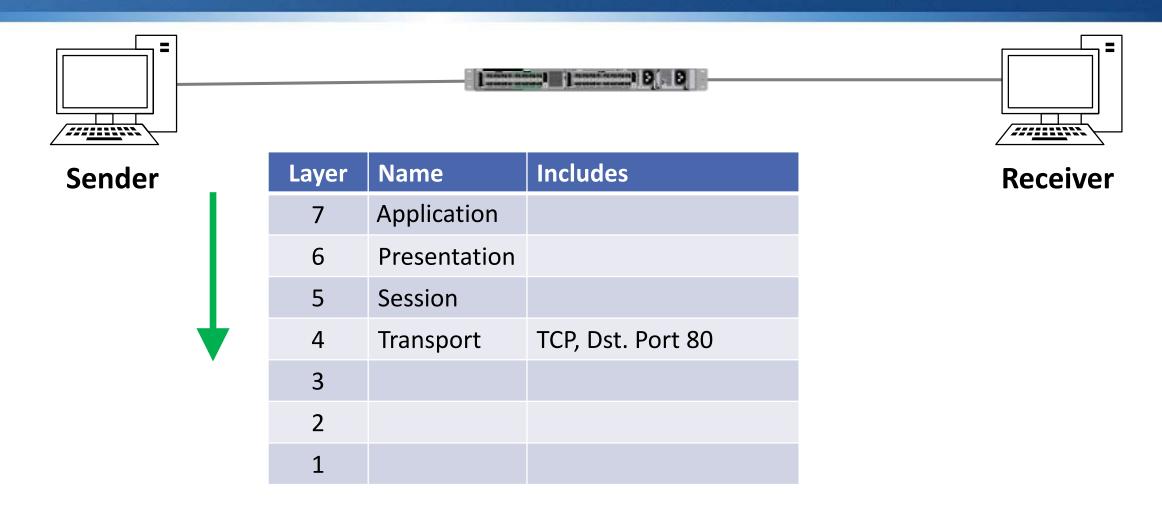
Receiver



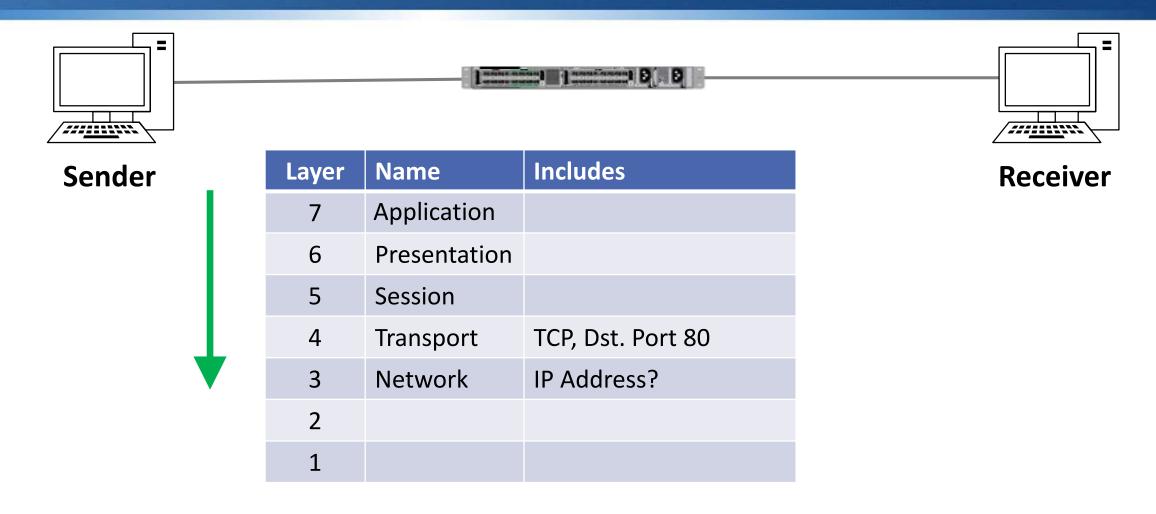














**L3** 

L4

- Host A (10.10.10.10/24) wants to send a packet to the FQDN www.flackbox.com, but it doesn't know the destination IP address
- It will hold the packet and send a DNS request to its DNS server at 10.10.100.10
- Host A compares its IP address and subnet mask to the destination address of the DNS server and sees it is on a different subnet, so the DNS request needs to be sent via its default gateway
- Host A will hold the DNS request and send a broadcast ARP request for its default gateway at 10.10.10.1





#### **Host A**

IP Address: 10.10.10.10/24

DG: 10.10.10.1

DNS: 10.10.100.1

MAC: 1111.2222.3333

ARP Request from 10.10.10.10 'I'm looking for 10.10.10.1, What's your MAC address?'
Src MAC: 1111.2222.3333

**Dst MAC: FFFF.FFFF.** 

IP Address: 10.10.100.1 MAC: 8888.9999.AAAA

### **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

MAC: 3333.4444.5555

#### www.flackbox.com

IP Address: 10.10.12.10/24

DG: 10.10.12.1

- The ARP request will be received by Switch 1
- Switch 1 will add an entry in its MAC address table mapping Host A's MAC address 1111.2222.3333 to Port 1
- Switch 1 will flood the broadcast traffic out all ports apart from the one it was received on





#### **Host A**

IP Address: 10.10.10.10/24

DG: 10.10.10.1

MAC: 1111.2222.3333

DNS: 10.10.100.1

**ARP Request from 10.10.10.10** 'I'm looking for 10.10.10.1, What's your MAC address?'

Src MAC: 1111.2222.3333

**Dst MAC: FFFF.FFFF.** 

IP Address: 10.10.100.1 MAC: 8888.9999.AAAA

#### **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

MAC: 3333.4444.5555

#### www.flackbox.com

IP Address: 10.10.12.10/24

DG: 10.10.12.1

- The ARP request will hit Router A's interface 10.10.10.1
- Router A will process the ARP request and see it is for itself
- Router A will send a unicast ARP reply to Host A
- Router A will add an entry for Host A mapping IP address 10.10.10.10 to MAC address 1111.2222.3333 to its ARP cache





#### **Host A**

IP Address: 10.10.10.10/24

DG: 10.10.10.1

DNS: 10.10.100.1

MAC: 1111.2222.3333

ARP Reply 'I'm 10.10.10.1, Here's my MAC address'

Src MAC: 4444.5555.6666

**Dst MAC: 1111.2222.3333** 

IP Address: 10.10.100.1 MAC: 8888.9999.AAAA

## **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

MAC: 3333.4444.5555

#### www.flackbox.com

IP Address: 10.10.12.10/24

DG: 10.10.12.1

- Switch 1 will add an entry in its MAC address table mapping Router A's MAC address 4444.5555.6666 to Port 2
- Switch 1 will send the ARP reply out only Port 1 which Host A is plugged into (which it already has in its MAC address table)





#### Host A

IP Address: 10.10.10.10/24

DG: 10.10.10.1

DNS: 10.10.100.1

MAC: 1111.2222.3333

ARP Reply 'I'm 10.10.10.1, Here's my MAC address' Src MAC: 4444.5555.6666

Dst MAC: 1111.2222.3333

IP Address: 10.10.100.1 MAC: 8888.9999.AAAA

## **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

MAC: 3333.4444.5555

#### www.flackbox.com

IP Address: 10.10.12.10/24

DG: 10.10.12.1

- Host A will add an entry for Router A mapping IP address 10.10.10.1 to MAC address 4444.5555.6666 to its ARP cache
- It will use this whenever it needs to send traffic to another IP subnet
- Host A will send the DNS request for www.flackbox.com





#### **Host A**

IP Address: 10.10.10.10/24

DG: 10.10.10.1

DNS: 10.10.100.1

MAC: 1111.2222.3333

#### **DNS Request**

'Tell me the IP address of

www.flackbox.com'

Src MAC: 1111.2222.3333

Dst MAC: 4444.5555.6666

Src IP: 10.10.10.10

Dst IP: 10.10.100.10

IP Address: 10.10.100.1 MAC: 8888.9999.AAAA

## **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

MAC: 3333.4444.5555

## www.flackbox.com

IP Address: 10.10.12.10/24

DG: 10.10.12.1

Switch 1 will send the DNS request out only Port 2 which Router A is plugged into (which it already has in its MAC address table)





#### **Host A**

IP Address: 10.10.10.10/24

DG: 10.10.10.1

DNS: 10.10.100.1

MAC: 1111.2222.3333

#### **DNS Request**

'Tell me the IP address of

www.flackbox.com'

Src MAC: 1111.2222.3333

Dst MAC: 4444.5555.6666

Src IP: 10.10.10.10

Dst IP: 10.10.100.10

IP Address: 10.10.100.1 MAC: 8888.9999.AAAA

## **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

MAC: 3333.4444.5555

#### www.flackbox.com

IP Address: 10.10.12.10/24

DG: 10.10.12.1

- Router A will receive the DNS request packet and see that the destination IP address is 10.10.100.10
- Router A has an interface in the subnet 10.10.100.0/24, so it knows the destination should be available out that port
- It doesn't know the MAC address of 10.10.100.10 so it will hold the DNS request packet and send an ARP request out of the 10.10.100.1 interface



IP Address: 10.10.10.1 MAC: 4444.5555.6666 IP Address: 10.10.11.1 MAC: 5555.6666.7777 IP Address: 10.10.11.2 MAC: 6666.7777.8888 IP Address: 10.10.12.1 MAC: 7777.8888.9999









#### **Host A**

IP Address: 10.10.10.10/24

DG: 10.10.10.1

DNS: 10.10.100.1

MAC: 1111.2222.3333

IP Address: 10.10.100.1

MAC: 8888.9999.AAAA

DG: 10.10.12.1

MAC: 2222.3333.4444

www.flackbox.com

IP Address: 10.10.12.10/24



## **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

MAC: 3333.4444.5555

ARP Request from 10.10.100.1 'I'm looking for 10.10.100.10, What's your MAC address?'

Src MAC: 8888.9999.AAAA

**Dst MAC: FFFF.FFF** 

- The ARP request will be received by Switch 3
- Switch 3 will add an entry in its MAC address table mapping Router A's MAC address 8888.9999.AAAA to Port 1
- Switch 3 will flood the broadcast traffic out all ports apart from the one it was received on



IP Address: 10.10.10.1 MAC: 4444.5555.6666 IP Address: 10.10.11.1 MAC: 5555.6666.7777 IP Address: 10.10.11.2 MAC: 6666.7777.8888 IP Address: 10.10.12.1 MAC: 7777.8888.9999

•









#### **Host A**

IP Address: 10.10.10.10/24

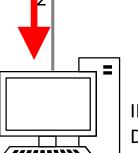
DG: 10.10.10.1

DNS: 10.10.100.1

MAC: 1111.2222.3333

IP Address: 10.10.100.1

MAC: 8888.9999.AAAA



#### **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

MAC: 3333.4444.5555

ARP Request from 10.10.100.1 'I'm looking for 10.10.100.10, What's your MAC address?'

Src MAC: 8888.9999.AAAA

**Dst MAC: FFFF.FFFF.** 

## www.flackbox.com

IP Address: 10.10.12.10/24

DG: 10.10.12.1

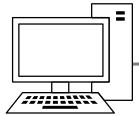
- The ARP request will hit the DNS Server's interface 10.10.100.10
- The DNS Server will process the ARP request and see it is for itself
- The DNS Server will send a unicast ARP reply to Router A
- The DNS Server will add an entry for Router A mapping IP address 10.10.100.1 to MAC address 8888.9999.AAAA to its ARP cache
- It will use this whenever it needs to send traffic to another IP subnet



IP Address: 10.10.10.1

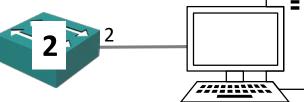
MAC: 4444.5555.6666

IP Address: 10.10.11.1 MAC: 5555.6666.7777 IP Address: 10.10.11.2 MAC: 6666.7777.8888 IP Address: 10.10.12.1 MAC: 7777.8888.9999









#### **Host A**

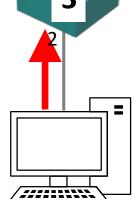
IP Address: 10.10.10.10/24

DG: 10.10.10.1

DNS: 10.10.100.1

MAC: 1111.2222.3333

IP Address: 10.10.100.1 MAC: 8888.9999.AAAA



## **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

MAC: 3333.4444.5555

**ARP Reply** 

'l'm 10.10.100.10,

Here's my MAC address'

Src MAC: 3333.4444.5555

Dst MAC: 8888.9999.AAAA

### www.flackbox.com

IP Address: 10.10.12.10/24

DG: 10.10.12.1

- Switch 3 will add an entry in its MAC address table mapping the DNS Server's MAC address 3333.4444.5555 to Port 2
- Switch 3 will send the ARP reply out only Port 1 which Router A is plugged into (which it already has in its MAC address table)

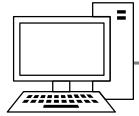




IP Address: 10.10.11.1 MAC: 5555.6666.7777

IP Address: 10.10.11.2 MAC: 6666.7777.8888

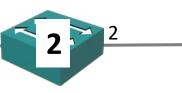
IP Address: 10.10.12.1 MAC: 7777.8888.9999













IP Address: 10.10.10.10/24

DG: 10.10.10.1

DNS: 10.10.100.1

MAC: 1111.2222.3333

IP Address: 10.10.100.1 MAC: 8888.9999.AAAA











### **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

MAC: 3333.4444.5555

**ARP Reply** 

'l'm 10.10.100.10,

Here's my MAC address'

Src MAC: 3333.4444.5555

Dst MAC: 8888.9999.AAAA

## www.flackbox.com

IP Address: 10.10.12.10/24

DG: 10.10.12.1

- Router A will add an entry for the DNS Server mapping IP address 10.10.100.10 to MAC address 3333.4444.5555 to its ARP cache
- Router A will send the DNS request it was holding to the DNS Server



- The source and destination MAC addresses of a packet are updated hop by hop, the source and destination IP addresses always remain unchanged end to end
- The source and destination MAC addresses will be updated to come from Router A and go to the DNS Server
- The source and destination IP addresses are still Host A 10.10.10.10 and the DNS Server 10.10.100.10





IP Address: 10.10.10.1

MAC: 4444.5555.6666

IP Address: 10.10.11.1 MAC: 5555.6666.7777

IP Address: 10.10.11.2

MAC: 6666.7777.8888

IP Address: 10.10.12.1 MAC: 7777.8888.9999











#### **Host A**

IP Address: 10.10.10.10/24

DG: 10.10.10.1

DNS: 10.10.100.1

MAC: 1111.2222.3333

IP Address: 10.10.100.1 MAC: 8888.9999.AAAA











## **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

MAC: 3333.4444.5555

#### **DNS Request**

'Tell me the IP address of

www.flackbox.com'

Src MAC: 8888.9999.AAAA

Dst MAC: 3333.4444.5555

Src IP: 10.10.10.10

Dst IP: 10.10.100.10

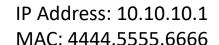
# www.flackbox.com

IP Address: 10.10.12.10/24

DG: 10.10.12.1

Switch 3 will send the ARP reply out only Port 2 which the DNS Server is plugged into (which it already has in its MAC address table)





IP Address: 10.10.11.1 MAC: 5555.6666.7777

IP Address: 10.10.11.2 MAC: 6666.7777.8888

IP Address: 10.10.12.1 MAC: 7777.8888.9999











#### **Host A**

IP Address: 10.10.10.10/24

DG: 10.10.10.1

MAC: 1111.2222.3333

DNS: 10.10.100.1

#### **DNS Request**

'Tell me the IP address of

www.flackbox.com'

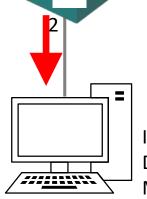
Src MAC: 8888.9999.AAAA

Dst MAC: 3333.4444.5555

Src IP: 10.10.10.10

Dst IP: 10.10.100.10

IP Address: 10.10.100.1 MAC: 8888.9999.AAAA



#### **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

MAC: 3333.4444.5555

### www.flackbox.com

IP Address: 10.10.12.10/24

DG: 10.10.12.1

The DNS Server will receive the DNS request packet and see that the destination is itself







	1

Layer	Name	Includes
7	Application	
6	Presentation	
5	Session	
4	Transport	
3	Network	
2	Data-Link	
1	Physical	





L3

L4

L5

L6

L7







me	Includes	Receiver
al:aa#:a.a		

Layer	Ivaille	illelades
7	Application	
6	Presentation	
5	Session	
4	Transport	
3	Network	
2	Data-Link	Dst: 3333.4444.5555
1	Physical	
	7 6 5 4 3	7 Application 6 Presentation 5 Session 4 Transport 3 Network 2 Data-Link





L2

L3

L4

L5

L6

L7





Layer	Name	Includes
7	Application	
6	Presentation	
5	Session	
4	Transport	
3	Network	Dst: 10.10.100.10
2	Data-Link	Dst: 3333.4444.5555
1	Physical	













Layer	Name	Includes
7	Application	
6	Presentation	
5	Session	
4	Transport	UDP Port 53
3	Network	Dst: 10.10.100.10
2	Data-Link	Dst: 3333.4444.5555
1	Physical	











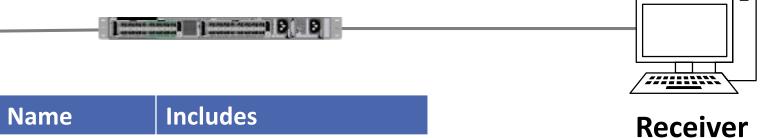
Name	Includes
Application	
Presentation	
Session	
Transport	UDP Port 53
Network	Dst: 10.10.100.10
Data-Link	Dst: 3333.4444.5555
Physical	
	Application Presentation Session Transport Network Data-Link











Layer	Name	Includes
7	Application	
6	Presentation	
5	Session	
4	Transport	UDP Port 53
3	Network	Dst: 10.10.100.10
2	Data-Link	Dst: 3333.4444.5555
1	Physical	









Layer	Name	Includes
7	Application	
6	Presentation	
5	Session	
4	Transport	UDP Port 53
3	Network	Dst: 10.10.100.10
2	Data-Link	Dst: 3333.4444.5555
1	Physical	



Receiver

- The DNS Server will look in its DNS database and see an Address record for www.flackbox.com at 10.10.12.10
- It will send this information to Host A in a DNS response
- It knows to send the response to 10.10.10.10 from the source IP address in the DNS request
- It knows to send it via Router A because the destination is in another subnet
- It already has Router A's MAC address in its ARP cache



IP Address: 10.10.10.1 MAC: 4444.5555.6666

IP Address: 10.10.11.1 MAC: 5555.6666.7777

IP Address: 10.10.11.2 MAC: 6666.7777.8888

IP Address: 10.10.12.1 MAC: 7777.8888.9999











www.flackbox.com

MAC: 2222.3333.4444

DG: 10.10.12.1

IP Address: 10.10.12.10/24

#### **Host A**

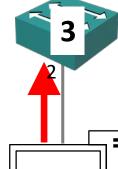
IP Address: 10.10.10.10/24

DG: 10.10.10.1

DNS: 10.10.100.1

MAC: 1111.2222.3333

IP Address: 10.10.100.1 MAC: 8888.9999.AAAA



MAC: 3333.4444.5555

DNS Reply: www.flackbox.com

is at 10.10.12.10

Src MAC: 3333.4444.5555

Dst MAC: 8888.9999.AAAA

Src IP: 10.10.100.10

Dst IP: 10.10.10.10

### **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

Switch 3 will receive the DNS response and send it out only Port 1 which Router A is plugged into (which it already has in its MAC address table)



IP Address: 10.10.10.1 MAC: 4444.5555.6666

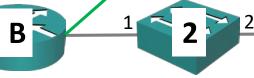
IP Address: 10.10.11.1 MAC: 5555.6666.7777

IP Address: 10.10.11.2 MAC: 6666.7777.8888 IP Address: 10.10.12.1 MAC: 7777.8888.9999









#### **Host A**

IP Address: 10.10.10.10/24

DG: 10.10.10.1

DNS: 10.10.100.1

MAC: 1111.2222.3333

DNS Reply: www.flackbox.com

is at 10.10.12.10

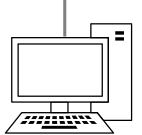
Src MAC: 3333.4444.5555

Dst MAC: 8888.9999.AAAA

Src IP: 10.10.100.10

Dst IP: 10.10.10.10

IP Address: 10.10.100.1 MAC: 8888.9999.AAAA



#### **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

MAC: 3333.4444.5555

#### www.flackbox.com

IP Address: 10.10.12.10/24

DG: 10.10.12.1

- Router A will receive the DNS response packet and see that the destination IP address is 10.10.10.10
- Router A has an interface in the subnet 10.10.10.0/24, so it knows the destination is available out that port
- Router A already has the MAC address for 10.10.10.10 in its ARP cache





#### **Host A**

IP Address: 10.10.10.10/24

DG: 10.10.10.1

DNS: 10.10.100.1

MAC: 1111.2222.3333

DNS Reply: www.flackbox.com

is at 10.10.12.10

Src MAC: 4444.5555.6666

Dst MAC: 1111.2222.3333

Src IP: 10.10.100.10

Dst IP: 10.10.10.10

IP Address: 10.10.100.1 MAC: 8888.9999.AAAA

#### **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

MAC: 3333.4444.5555

#### www.flackbox.com

IP Address: 10.10.12.10/24

DG: 10.10.12.1

Switch 1 will receive the DNS response and send it out only Port 1 which Host A is plugged into (which it already has in its MAC address table)





#### **Host A**

IP Address: 10.10.10.10/24

DG: 10.10.10.1

DNS: 10.10.100.1

MAC: 1111.2222.3333

DNS Reply: www.flackbox.com

is at 10.10.12.10

Src MAC: 4444.5555.6666

Dst MAC: 1111.2222.3333

Src IP: 10.10.100.10

Dst IP: 10.10.10.10

IP Address: 10.10.100.1 MAC: 8888.9999.AAAA

#### **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

MAC: 3333.4444.5555

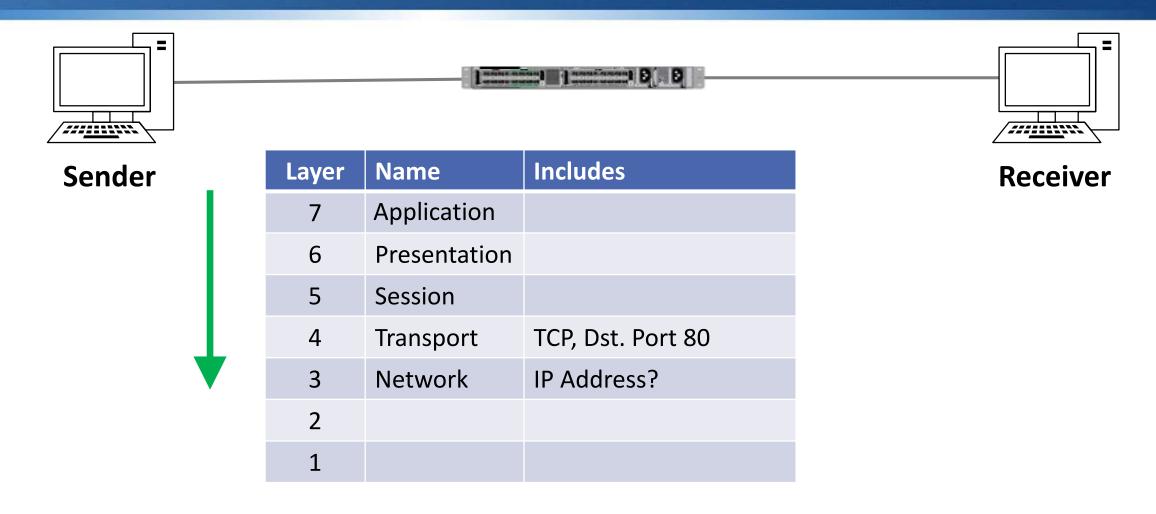
#### www.flackbox.com

IP Address: 10.10.12.10/24

DG: 10.10.12.1

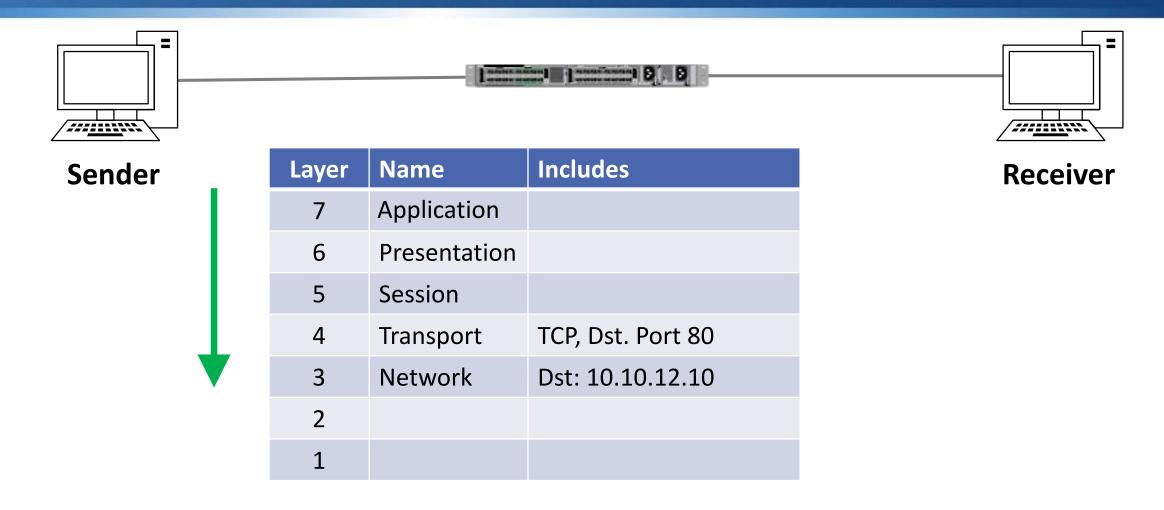
- Host A learns that www.flackbox.com is available at 10.10.12.10
- It can now update the packet it was waiting to send to www.flackbox.com with that destination IP address
- Host A sees that www.flackbox.com is not on its own subnet so it knows any packets it sends there must go via its default gateway







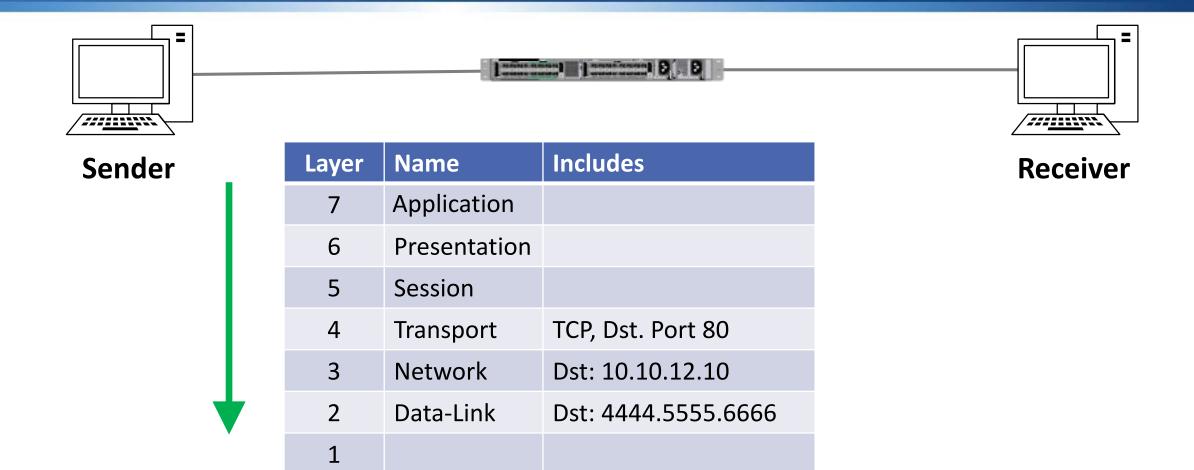
**L3** 



L4



**L3** 





L2

L3

L4

L5

L6



Sender

Layer	Name	Includes
7	Application	
6	Presentation	
5	Session	
4	Transport	TCP, Dst. Port 80
3	Network	Dst: 10.10.12.10
2	Data-Link	Dst: 4444.5555.6666
1	Physical	

Receiver



L3

L4

5

L6



#### **Host A**

IP Address: 10.10.10.10/24

DG: 10.10.10.1

DNS: 10.10.100.1

MAC: 1111.2222.3333

#### **HTTP Get Request**

Src MAC: 1111.2222.3333

Dst MAC: 4444.5555.6666

Src IP: 10.10.10.10

Dst IP: 10.10.12.10

IP Address: 10.10.100.1 MAC: 8888.9999.AAAA

#### **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

MAC: 3333.4444.5555

#### www.flackbox.com

IP Address: 10.10.12.10/24

DG: 10.10.12.1

Switch 1 will send the packet to Router A which it already has in its MAC address table





#### **Host A**

IP Address: 10.10.10.10/24

DG: 10.10.10.1

DNS: 10.10.100.1

MAC: 1111.2222.3333

#### **HTTP Get Request**

Src MAC: 1111.2222.3333

Dst MAC: 4444.5555.6666

Src IP: 10.10.10.10

Dst IP: 10.10.12.10

IP Address: 10.10.100.1 MAC: 8888.9999.AAAA

#### **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

MAC: 3333.4444.5555

#### www.flackbox.com

IP Address: 10.10.12.10/24

DG: 10.10.12.1

- Router A will receive the packet with destination IP address 10.10.12.10
- Router A does not have any interfaces in the 10.10.12.0/24 subnet
- In this case it will need a route to get there
- The route can be either statically configured by an administrator or learned dynamically through a routing protocol



- In this example the administrator has configured a static route for 10.10.12.0/24 with the next hop address 10.10.11.2
- Router A has an Ethernet interface in the 10.10.11.0 subnet
- It doesn't know the MAC address for the next hop address 10.10.11.2 yet
- It will hold the HTTP packet and send an ARP request for 10.10.11.2





#### **Host A**

IP Address: 10.10.10.10/24

DG: 10.10.10.1

DNS: 10.10.100.1

MAC: 1111.2222.3333

ARP Request from 10.10.11.1 'I'm looking for 10.10.11.2, What's your MAC address?' Src MAC: 5555.6666.7777

**Dst MAC: FFFF.FFFF.** 

IP Address: 10.10.100.1 MAC: 8888.9999.AAAA

#### **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

MAC: 3333.4444.5555

#### www.flackbox.com

IP Address: 10.10.12.10/24

DG: 10.10.12.1

- The ARP request will hit Router B's interface 10.10.11.2
- Router B will process the ARP request and see it is for itself
- Router B will send a unicast ARP reply to Router A
- Router B will add an entry for Router A mapping IP address 10.10.11.1 to MAC address 5555.6666.7777 to its ARP cache





#### **Host A**

IP Address: 10.10.10.10/24

DG: 10.10.10.1

DNS: 10.10.100.1

MAC: 1111.2222.3333

ARP Reply 'I'm 10.10.11.2, Here's my MAC address'

Src MAC: 6666.7777.8888

Dst MAC: 5555.6666.7777

IP Address: 10.10.100.1 MAC: 8888.9999.AAAA

### **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

MAC: 3333.4444.5555

#### www.flackbox.com

IP Address: 10.10.12.10/24

DG: 10.10.12.1

Router A will forward the HTTP packet it was holding to Router B





#### **Host A**

IP Address: 10.10.10.10/24

DG: 10.10.10.1

DNS: 10.10.100.1

MAC: 1111.2222.3333

#### **HTTP Get Request**

Src MAC: 5555.6666.7777

Dst MAC: 6666.7777.8888

Src IP: 10.10.10.10

Dst IP: 10.10.12.10

### MAC: 8888.9999.AAAA

#### **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

MAC: 3333.4444.5555

#### www.flackbox.com

IP Address: 10.10.12.10/24

DG: 10.10.12.1

- Router B will receive the HTTP packet and see that the destination IP address is 10.10.12.10
- Router B has an interface in the subnet 10.10.12.0/24, so it knows the destination should be available out that port
- It doesn't know the MAC address of 10.10.12.10 so it will hold the HTTP packet and send an ARP request out of the 10.10.12.1 interface





#### **Host A**

IP Address: 10.10.10.10/24

DG: 10.10.10.1

DNS: 10.10.100.1

MAC: 1111.2222.3333

ARP Request from 10.10.12.1 'I'm looking for 10.10.12.10, What's your MAC address?' Src MAC: 7777.8888.9999

**Dst MAC: FFFF.FFFF.** 

IP Address: 10.10.100.1 MAC: 8888.9999.AAAA

#### **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

MAC: 3333.4444.5555

#### www.flackbox.com

IP Address: 10.10.12.10/24

DG: 10.10.12.1

- The ARP request will be received by Switch 2
- Switch 2 will add an entry in its MAC address table mapping Router B's MAC address 7777.8888.9999 to Port 1
- Switch 2 will flood the broadcast traffic out all ports apart from the one it was received on



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IP Address: 10.10.10.1

MAC: 4444.5555.6666

IP Address: 10.10.11.1 MAC: 5555.6666.7777 IP Address: 10.10.11.2

MAC: 6666.7777.8888

IP Address: 10.10.12.1 MAC: 7777.8888.9999

#### **Host A**

IP Address: 10.10.10.10/24

DG: 10.10.10.1

DNS: 10.10.100.1

MAC: 1111.2222.3333

IP Address: 10.10.100.1

MAC: 8888.9999.AAAA

# IP DO

### **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

MAC: 3333.4444.5555

ARP Request from 10.10.12.1

'I'm looking for 10.10.12.10,

What's your MAC address?'

Src MAC: 7777.8888.9999

**Dst MAC: FFFF.FFFF** 

#### www.flackbox.com

IP Address: 10.10.12.10/24

DG: 10.10.12.1

- The ARP request will hit the Web Server's interface 10.10.12.10
- The Web Server will process the ARP request and see it is for itself
- The Web Server will send a unicast ARP reply to Router B
- The Web Server will add an entry for Router B mapping IP address 10.10.12.1 to MAC address 7777.8888.9999 to its ARP cache
- It will use this whenever it needs to send traffic to another IP subnet





#### **Host A**

IP Address: 10.10.10.10/24

DG: 10.10.10.1

DNS: 10.10.100.1

MAC: 1111.2222.3333

ARP Reply 'I'm 10.10.12.10, Here's my MAC address' Src MAC: 2222.3333.4444

Dst MAC: 7777.8888.9999

MAC: 8888.9999.AAAA

#### **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

MAC: 3333.4444.5555

#### www.flackbox.com

IP Address: 10.10.12.10/24

DG: 10.10.12.1

- Switch 2 will add an entry in its MAC address table mapping the Web Server's MAC address 2222.3333.4444 to Port 2
- Switch 2 will send the ARP reply out only Port 1 which Router B is plugged into (which it already has in its MAC address table)





#### **Host A**

IP Address: 10.10.10.10/24

DG: 10.10.10.1

DNS: 10.10.100.1

MAC: 1111.2222.3333

ARP Reply 'I'm 10.10.12.10, Here's my MAC address'

Src MAC: 2222.3333.4444

Dst MAC: 7777.8888.9999

IP Address: 10.10.100.1 MAC: 8888.9999.AAAA

#### **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

MAC: 3333.4444.5555

#### www.flackbox.com

IP Address: 10.10.12.10/24

DG: 10.10.12.1

- Router B will add an entry for the Web Server mapping IP address 10.10.12.10 to MAC address 2222.3333.4444 to its ARP cache
- Router B will send the HTTP request it was holding to the Web Server





#### **Host A**

IP Address: 10.10.10.10/24

DG: 10.10.10.1

DNS: 10.10.100.1

MAC: 1111.2222.3333

### **HTTP Get Request**

Src MAC: 7777.8888.9999

Dst MAC: 2222.3333.4444

Src IP: 10.10.10.10

Dst IP: 10.10.12.10

IP Address: 10.10.100.1 MAC: 8888.9999.AAAA

### **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

MAC: 3333.4444.5555

### www.flackbox.com

IP Address: 10.10.12.10/24

DG: 10.10.12.1

Switch 2 will send the HTTP request out only Port 2 which the Web Server is plugged into (which it already has in its MAC address table)





#### **Host A**

IP Address: 10.10.10.10/24

DG: 10.10.10.1

DNS: 10.10.100.1

MAC: 1111.2222.3333

### **HTTP Get Request**

Src MAC: 7777.8888.9999

Dst MAC: 2222.3333.4444

Src IP: 10.10.10.10

Dst IP: 10.10.12.10

MAC: 8888.9999.AAAA

### **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

MAC: 3333.4444.5555

### www.flackbox.com

IP Address: 10.10.12.10/24

DG: 10.10.12.1





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Layer	Name	Includes
7	Application	
6	Presentation	
5	Session	
4	Transport	
3	Network	
2	Data-Link	
1	Physical	





L3

L4

L5

L6

L7







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KΔ	ceiv	Δr
116	CCIV	CI

Layer	Name	Includes
7	Application	
6	Presentation	
5	Session	
4	Transport	
3	Network	
2	Data-Link	Dst: 2222.3333.4444
1	Physical	







Sender

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Includes	Receiver

Layer	Name	includes
7	Application	
6	Presentation	
5	Session	
4	Transport	
3	Network	Dst: 10.10.12.10
2	Data-Link	Dst: 2222.3333.4444
1	Physical	







Sender



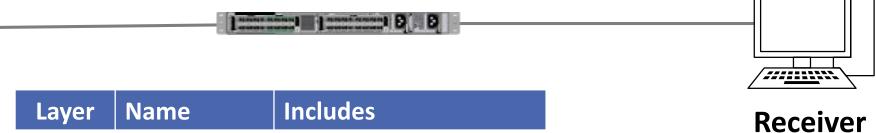
es es	Receiver
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Layer	Name	Includes
7	Application	
6	Presentation	
5	Session	
4	Transport	TCP Port 80
3	Network	Dst: 10.10.12.10
2	Data-Link	Dst: 2222.3333.4444
1	Physical	









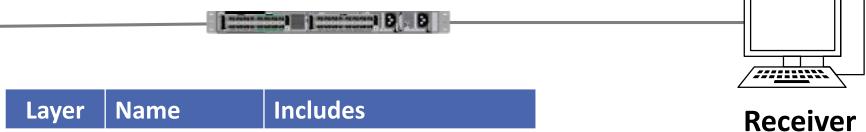
Layer	Name	Includes
7	Application	
6	Presentation	
5	Session	
4	Transport	TCP Port 80
3	Network	Dst: 10.10.12.10
2	Data-Link	Dst: 2222.3333.4444
1	Physical	









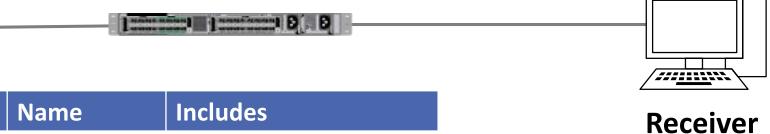


Layer	Name	Includes
7	Application	
6	Presentation	
5	Session	
4	Transport	TCP Port 80
3	Network	Dst: 10.10.12.10
2	Data-Link	Dst: 2222.3333.4444
1	Physical	









Layer	Name	Includes
7	Application	
6	Presentation	
5	Session	
4	Transport	TCP Port 80
3	Network	Dst: 10.10.12.10
2	Data-Link	Dst: 2222.3333.4444
1	Physical	



The ARP and MAC addresses tables are already built so subsequent packets in either direction will flow without any need for ARP requests or switch flooding





#### **Host A**

IP Address: 10.10.10.10/24

DG: 10.10.10.1

DNS: 10.10.100.1

MAC: 1111.2222.3333

### **HTTP Get Request**

Src MAC: 1111.2222.3333

Dst MAC: 4444.5555.6666

Src IP: 10.10.10.10

Dst IP: 10.10.12.10

IP Address: 10.10.100.1 MAC: 8888.9999.AAAA

### **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

MAC: 3333.4444.5555

### www.flackbox.com

IP Address: 10.10.12.10/24

DG: 10.10.12.1



#### **Host A**

IP Address: 10.10.10.10/24

DG: 10.10.10.1

DNS: 10.10.100.1

MAC: 1111.2222.3333

### **HTTP Get Request**

Src MAC: 5555.6666.7777

Dst MAC: 6666.7777.8888

Src IP: 10.10.10.10

Dst IP: 10.10.12.10

MAC: 8888.9999.AAAA

### **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

MAC: 3333.4444.5555

### www.flackbox.com

IP Address: 10.10.12.10/24

DG: 10.10.12.1



#### **Host A**

IP Address: 10.10.10.10/24

DG: 10.10.10.1

DNS: 10.10.100.1

MAC: 1111.2222.3333

### **HTTP Get Request**

Src MAC: 7777.8888.9999

Dst MAC: 2222.3333.4444

Src IP: 10.10.10.10

Dst IP: 10.10.12.10

MAC: 8888.9999.AAAA

### **DNS Server**

IP Address: 10.10.100.10/24

DG: 10.10.100.1

MAC: 3333.4444.5555

### www.flackbox.com

IP Address: 10.10.12.10/24

DG: 10.10.12.1