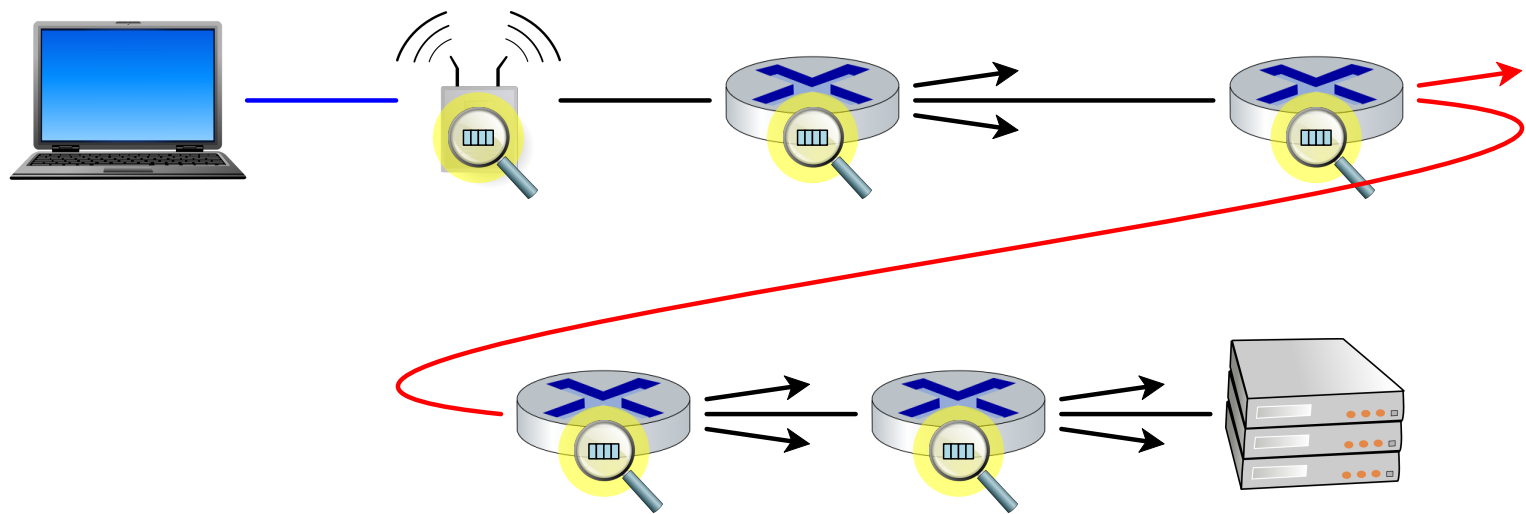
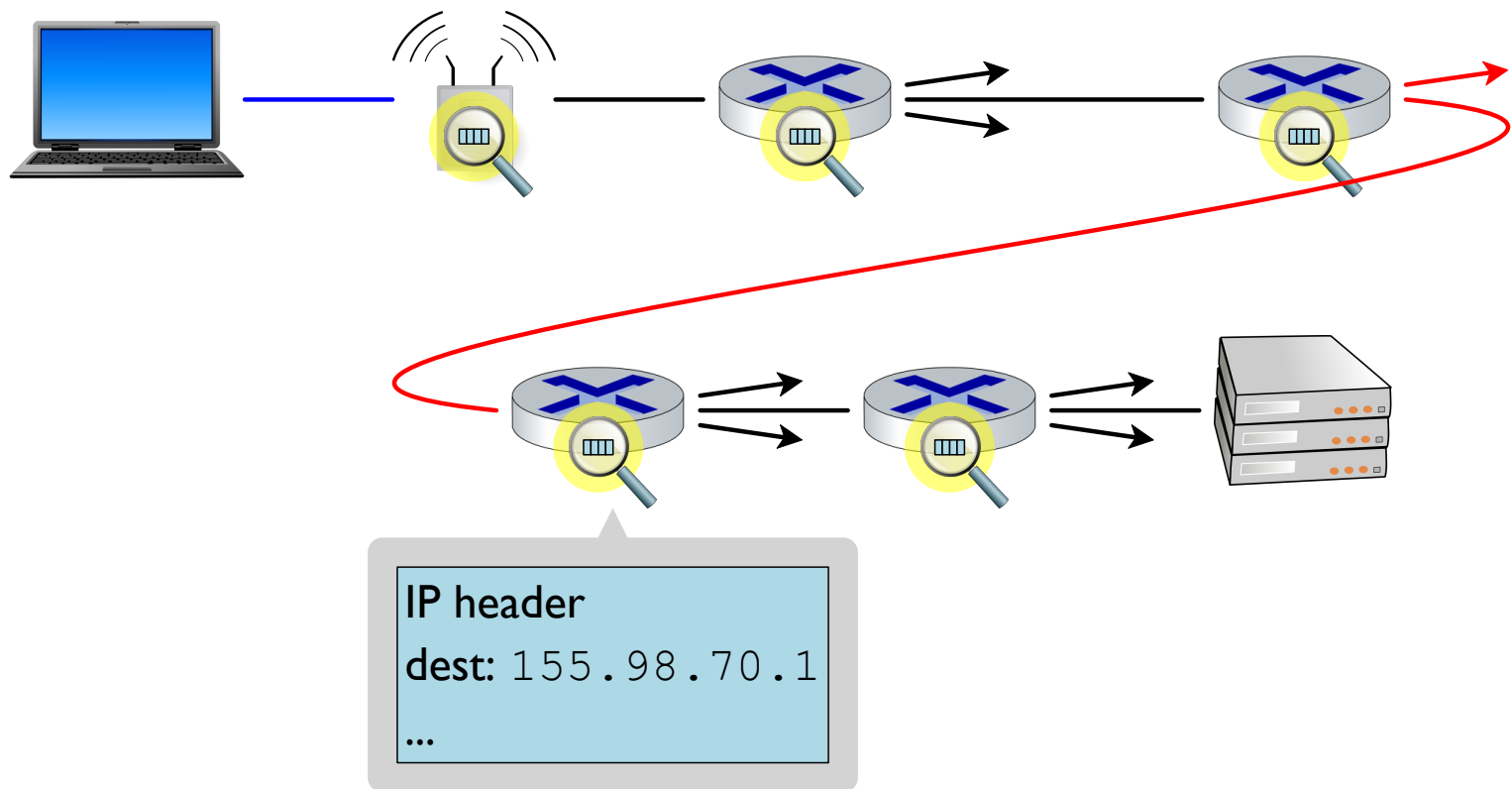


Routing



Routing



Routing

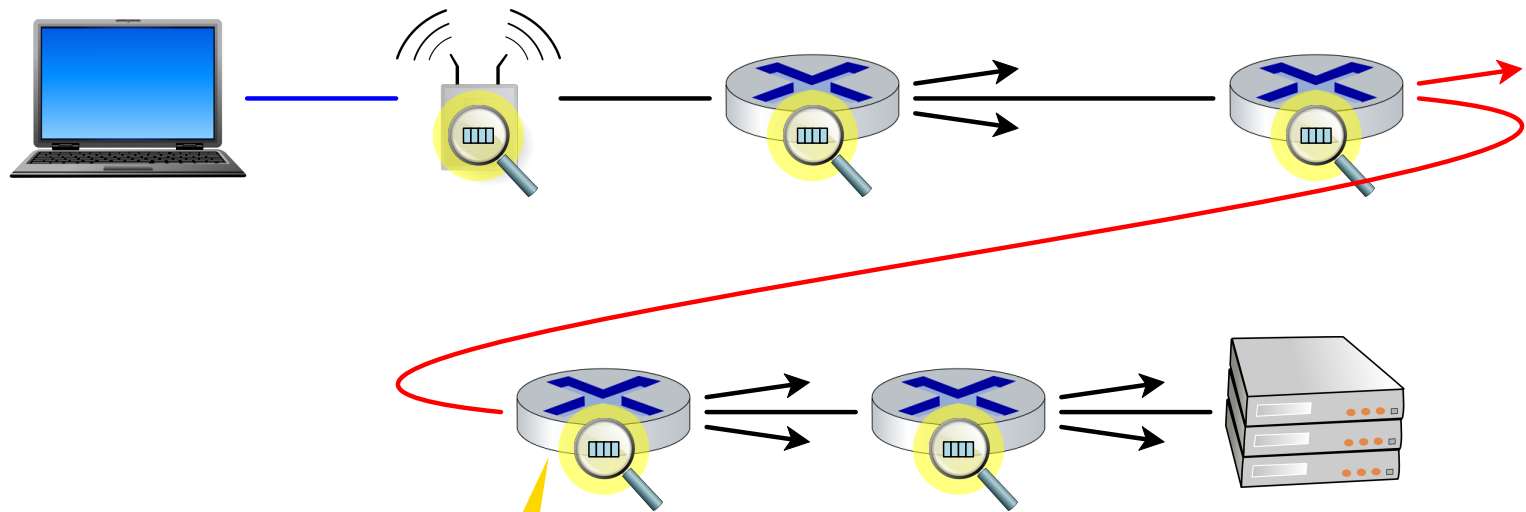


Table mapping every address to an output link?

Routing

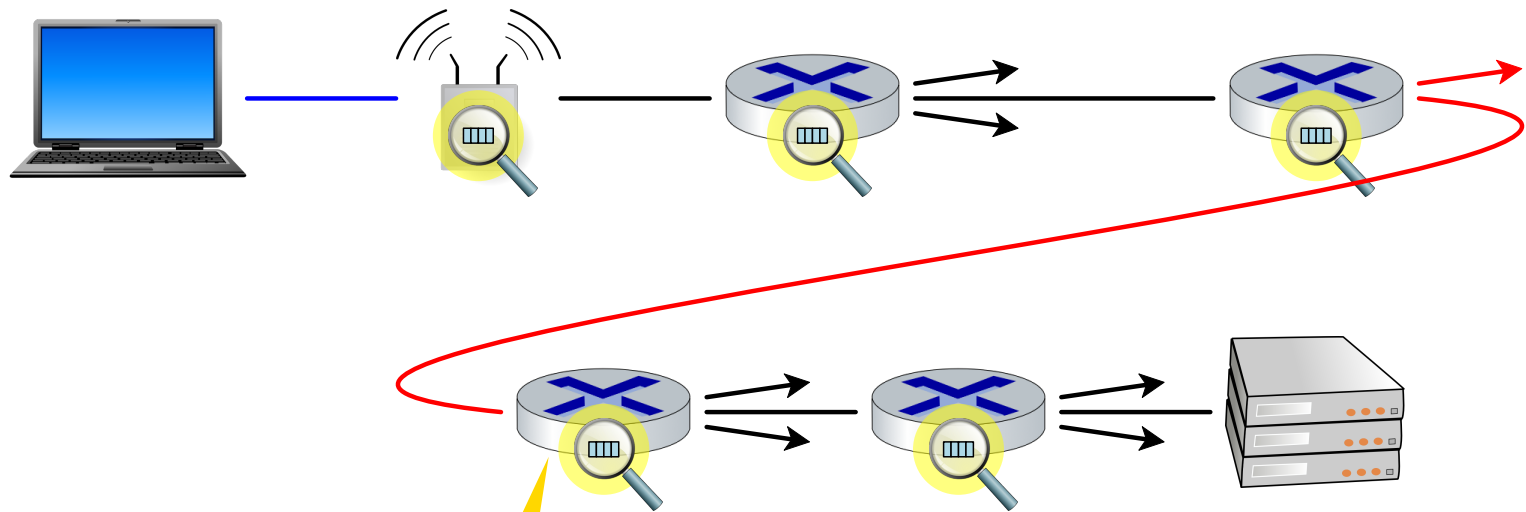


Table mapping every address to an output link?

That would be a ~4GB table

IP Name Structure

An IPv4 address is 32 bits

In hexadecimal form:

00000000 **to** FFFFFFFF

IP Name Structure

An IPv4 address is 32 bits

In hexadecimal form:

00 00 00 00 **to** FF FF FF FF

IP Name Structure

An IPv4 address is 32 bits

In hexadecimal form:

00 00 00 00 **to** FF FF FF FF

In dotted-decimal form:

0 . 0 . 0 . 0 **to** 255 . 255 . 255 . 255

IP Name Structure

Hosts that are physically close tend to have similar IP addresses

<code>thistle.cs.utah.edu</code>	<code>155.98.69.112</code>	my office
<code>shanghai.cs.utah.edu</code>	<code>155.98.69.200</code>	my office
<code>rains.cs.utah.edu</code>	<code>155.98.68.106</code>	my office
<code>thebes.cs.utah.edu</code>	<code>155.98.65.57</code>	SoC
<code>memphis.cs.utah.edu</code>	<code>155.98.65.56</code>	SoC
<code>www.utah.edu</code>	<code>155.98.186.21</code>	UofU
<code>www.cs.utah.edu</code>	<code>141.193.213.11</code>	Wordpress

IP Name Structure

Hosts that are physically close tend to have similar IP addresses

thistle.cs.utah.edu	155.98.69.112	my office
shanghai.cs.utah.edu	155.98.69.200	my office
rains.cs.utah.edu	155.98.68.106	my office
thebes.cs.utah.edu	155.98.65.57	SoC
memphis.cs.utah.edu	155.98.65.56	SoC
www.utah.edu	155.98.186.21	UofU
www.cs.utah.edu	141.193.213.11	Wordpress

Every 155.98.X.X address is on campus here

IP Name Structure

Hosts that are physically close tend to have similar IP addresses

thistle.cs.utah.edu	155.98.69.112	my office
shanghai.cs.utah.edu	155.98.69.200	my office
rains.cs.utah.edu	155.98.68.106	my office
thebes.cs.utah.edu	155.98.65.57	SoC
memphis.cs.utah.edu	155.98.65.56	SoC
www.utah.edu	155.98.186.21	UofU
www.cs.utah.edu	141.193.213.11	Wordpress

Every 155.98.X.X address is on campus here

155.98.0.0/16

IP Name Structure

Hosts that are physically close tend to have similar IP addresses

thistle.cs.utah.edu	155.98.69.112	my office
shanghai.cs.utah.edu	155.98.69.200	my office
rains.cs.utah.edu	155.98.68.106	my office
thebes.cs.utah.edu	155.98.65.57	SoC
memphis.cs.utah.edu	155.98.65.56	SoC
www.utah.edu	155.98.186.21	UofU
www.cs.utah.edu	141.193.213.11	Wordpress

Every 155.98.X.X address is on campus here

IP prefix 155.98.0.0/16

IP Name Structure

Hosts that are physically close tend to have similar IP addresses

thistle.cs.utah.edu	155.98.69.112	my office
shanghai.cs.utah.edu	155.98.69.200	my office
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memphis.cs.utah.edu	155.98.65.56	SoC
www.utah.edu	155.98.186.21	UofU
www.cs.utah.edu	141.193.213.11	Wordpress

Every 155.98.X.X address is on campus here

IP prefix → 155.98.0.0/16 ← **number of bits for prefix**

IP Name Structure

Hosts that are physically close tend to have similar IP addresses

thistle.cs.utah.edu	155.98.69.112	my office
shanghai.cs.utah.edu	155.98.69.200	my office
rains.cs.utah.edu	155.98.68.106	my office
thebes.cs.utah.edu	155.98.65.57	SoC
memphis.cs.utah.edu	155.98.65.56	SoC
www.utah.edu	155.98.186.21	UofU
www.cs.utah.edu	141.193.213.11	Wordpress

155.98.68.X or 155.98.69.X ⇒ SoC untrusted network

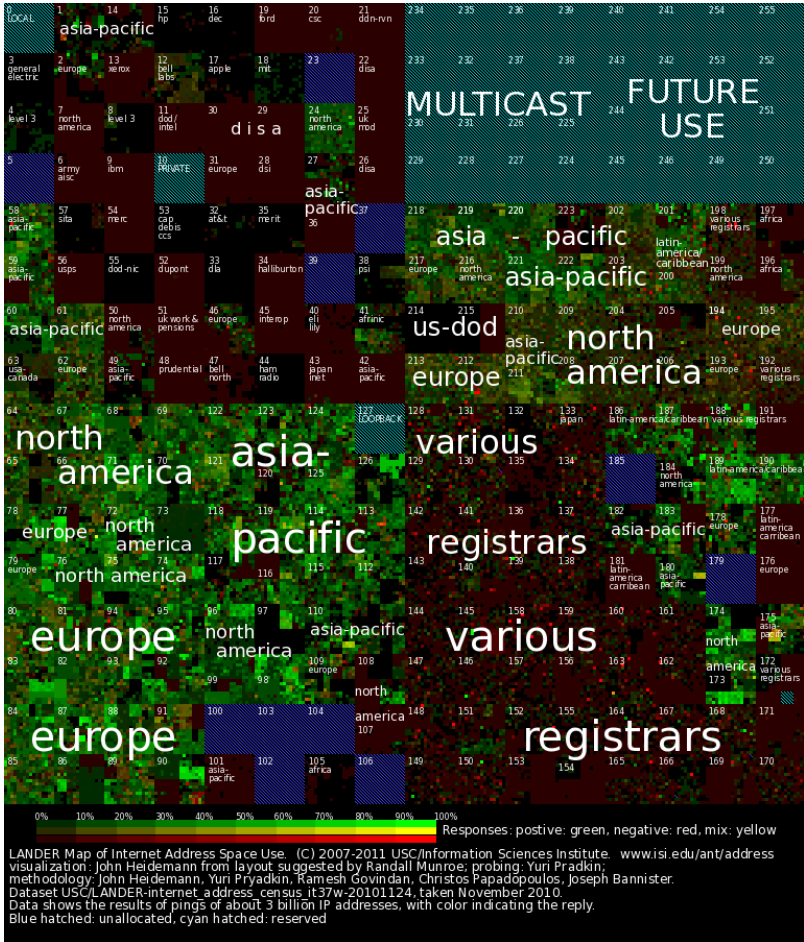
155.98.68.0/23

XKCD Map of the Internet 2006

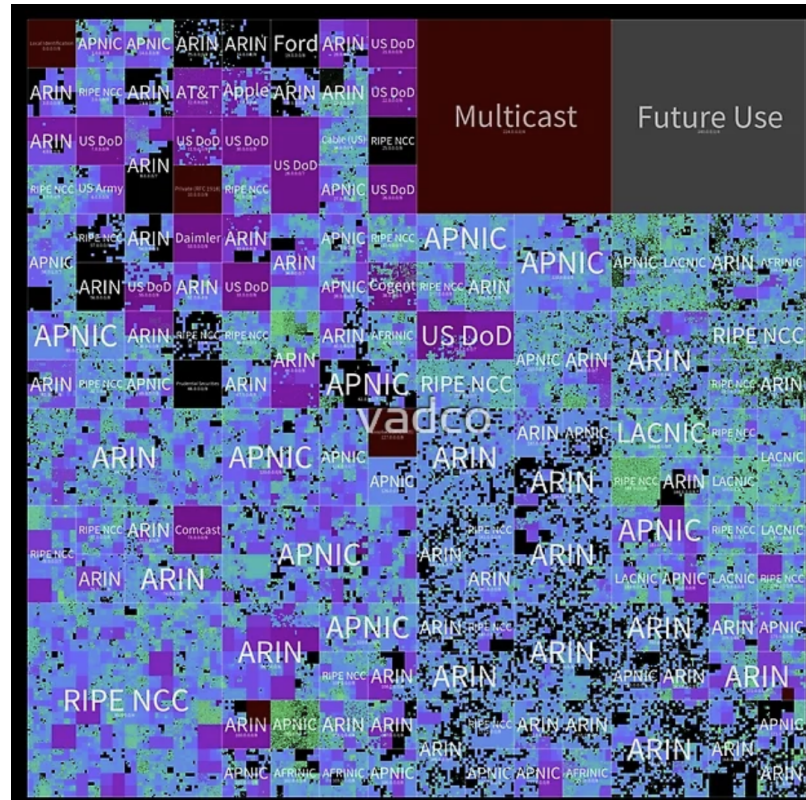
<https://xkcd.com/195/>



Map of the Internet 2010

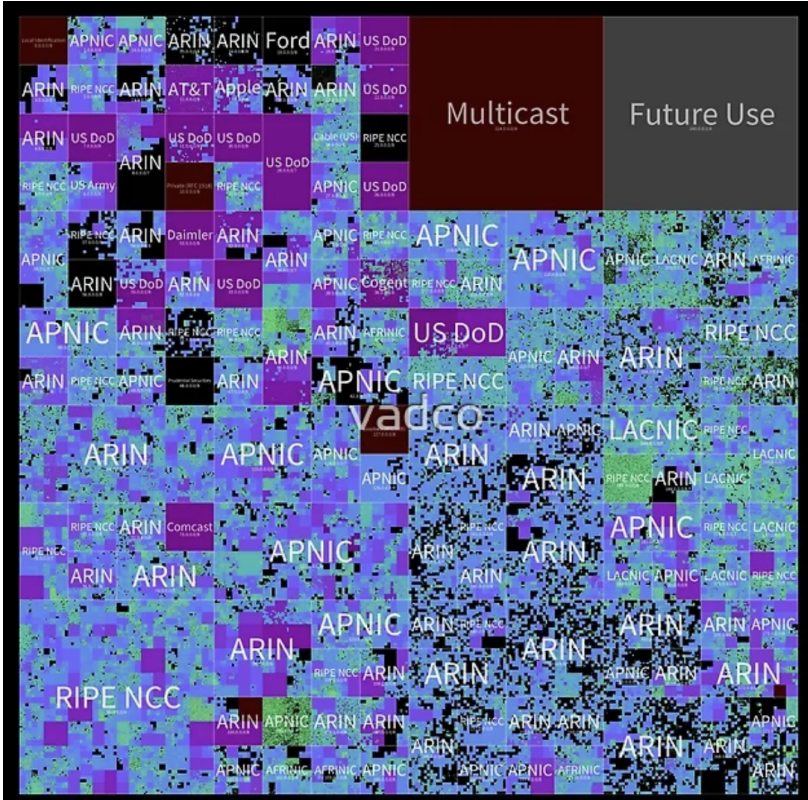


Map of the Internet 2023



<https://www.redbubble.com/>

Map of the Internet 2023



One IP address
~ \$50

<https://www.redbubble.com/>

University of Utah AS17055

IPv4:	128.110.0.0/16	65,536
	128.110.100.0/24	256
	128.110.152.0/22	1,024
	128.110.156.0/24	256
	128.110.216.0/21	2,048
	128.110.96.0/22	1,024
	155.100.0.0/16	65,536
	155.101.0.0/16	65,536
	155.101.66.0/24	256
	155.97.0.0/16	65,536
	155.98.0.0/16	65,536
	155.98.32.0/20	4,096
	155.99.0.0/16	65,536
	155.99.144.0/24	256
	192.5.12.0/24	256
	198.60.30.0/23	512
	199.104.93.0/24	256
	204.99.128.0/24	256
	204.99.160.0/20	4,096

<https://ipinfo.io/AS17055>

University of Utah AS17055

IPv6:

2604:c340::/32 79,228,162,514,264,337,593,543,950,336

Special Addresses

Local network use:

10.0.0.0/8

172.16.0.0/12

192.168.0.0/16

Loopback:

127.0.0.1

Subnet broadcast:

255.255.255.255

Special Addresses

Local network use:

10.0.0.0/8

172.16.0.0/12

192.168.0.0/16

Loopback:

127.0.0.1

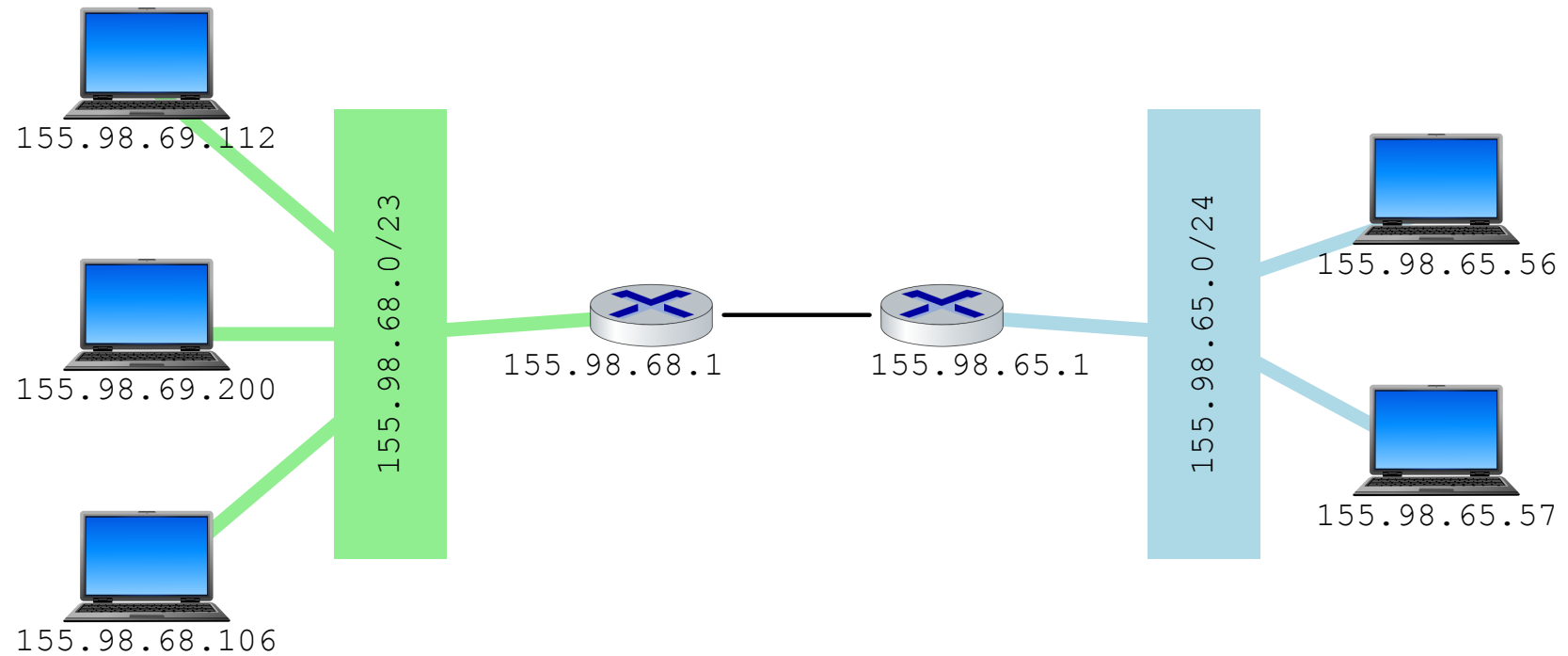
Usually also can use all 1 bits
or all 0 bits after a prefix

Subnet broadcast:

255.255.255.255

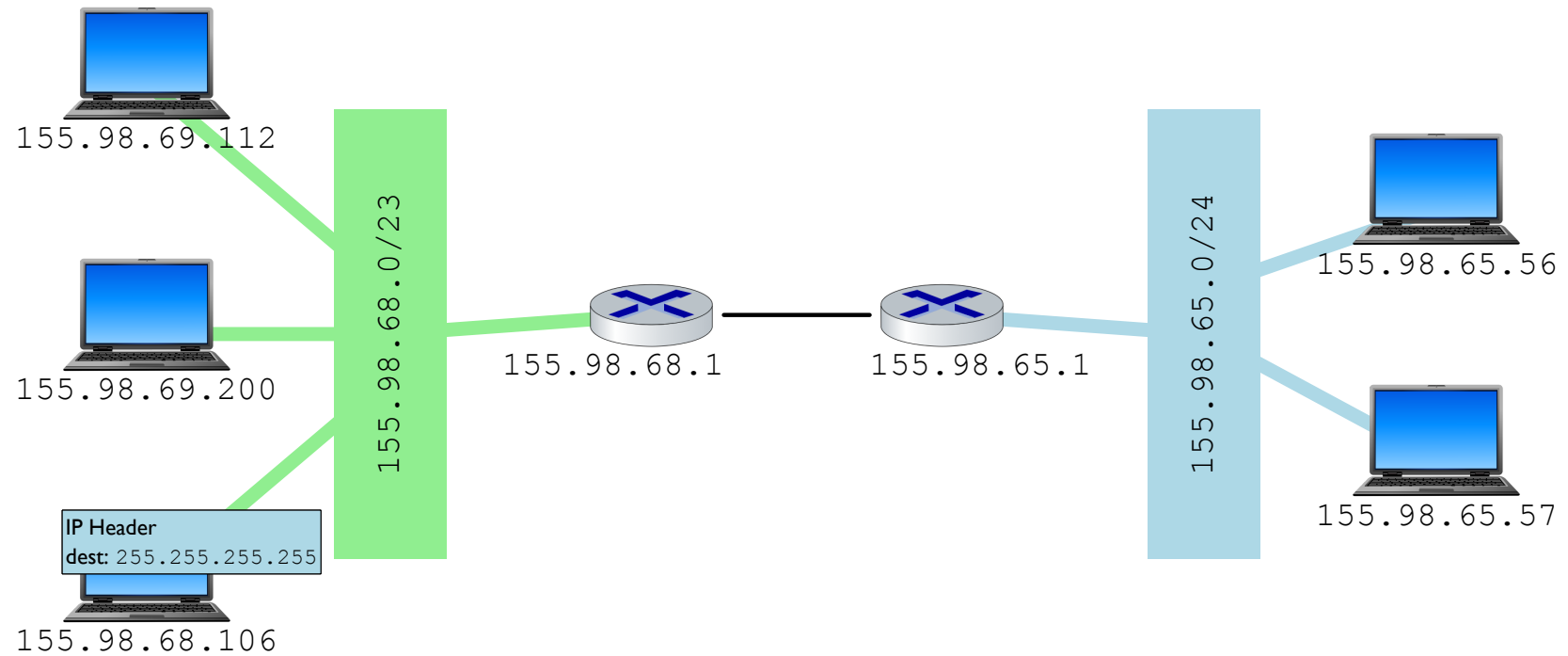
Subnets

A **subnet** is a network small enough that every host sees every other



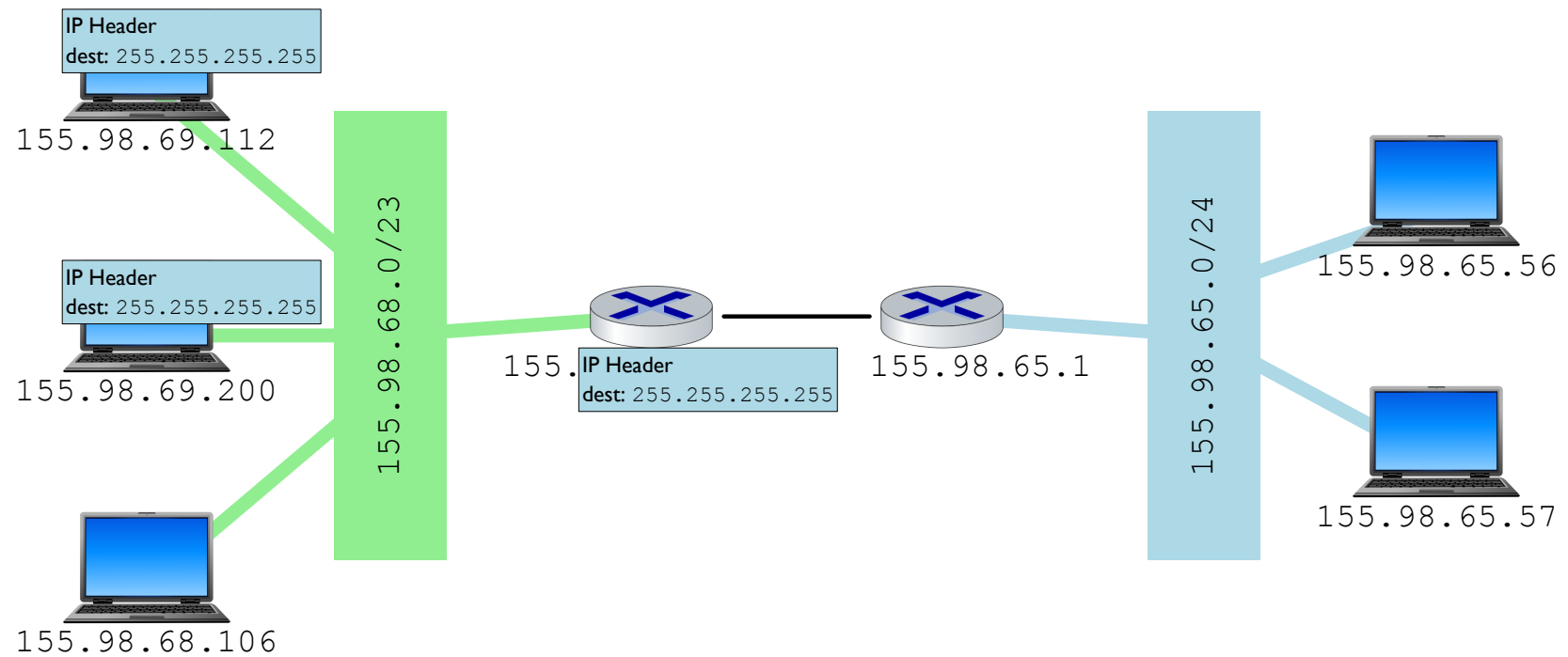
Subnets

A **subnet** is a network small enough that every host sees every other



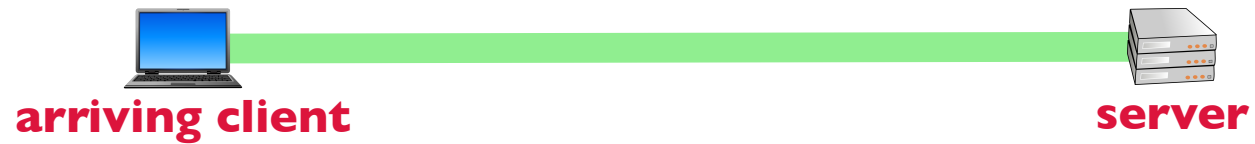
Subnets

A **subnet** is a network small enough that every host sees every other



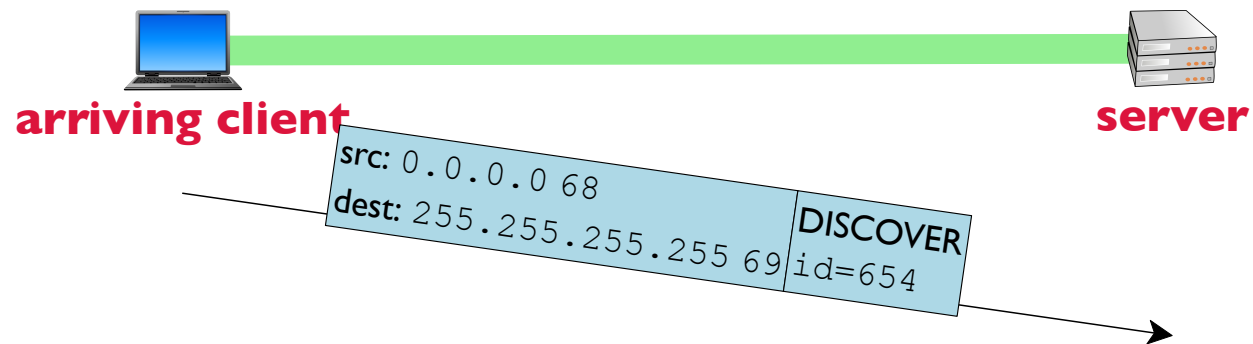
DHCP

DHCP takes advantage of broadcast to configure a host



DHCP

DHCP takes advantage of broadcast to configure a host



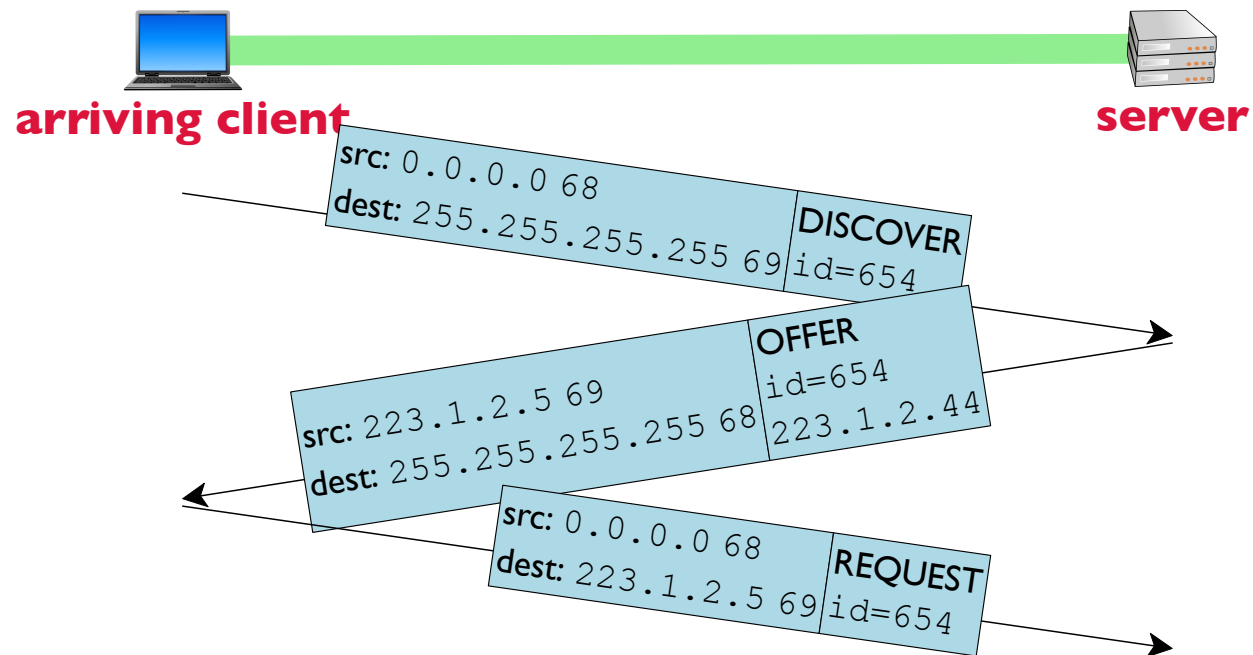
DHCP

DHCP takes advantage of broadcast to configure a host



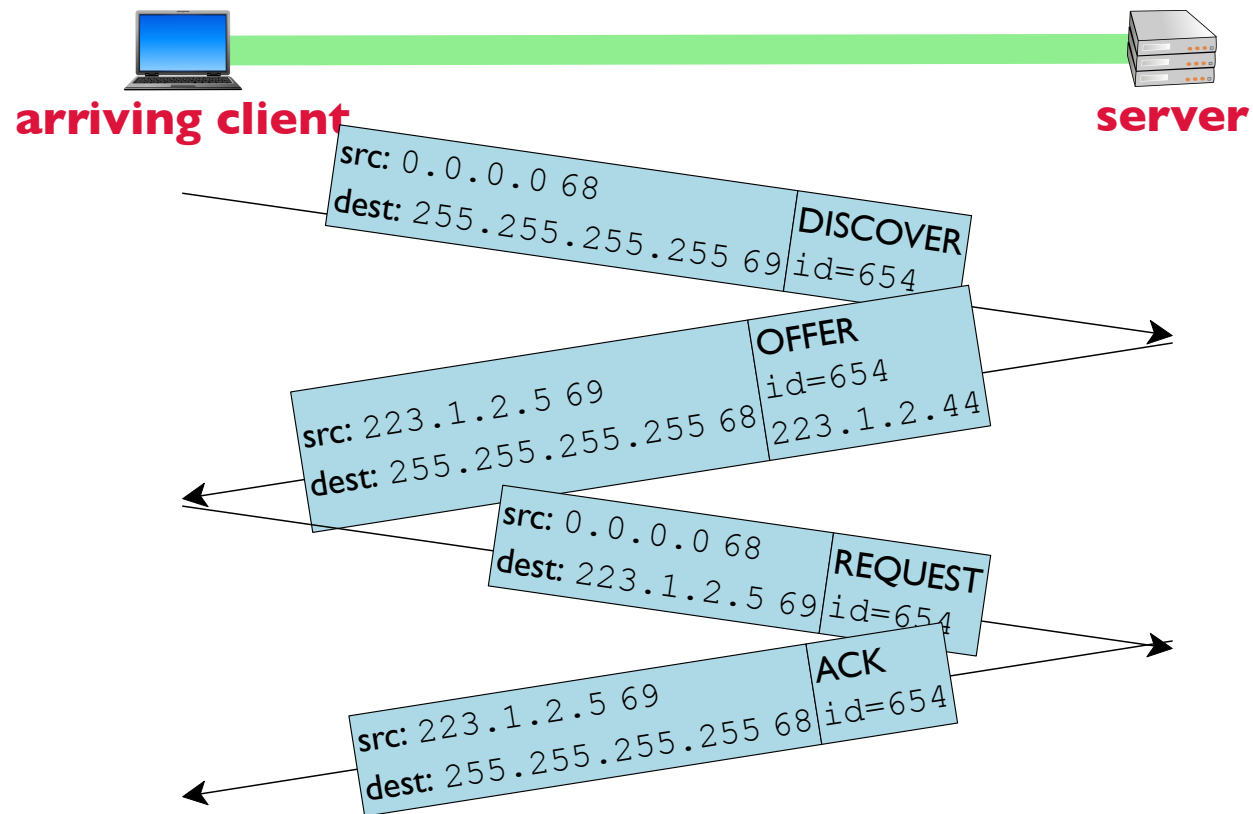
DHCP

DHCP takes advantage of broadcast to configure a host

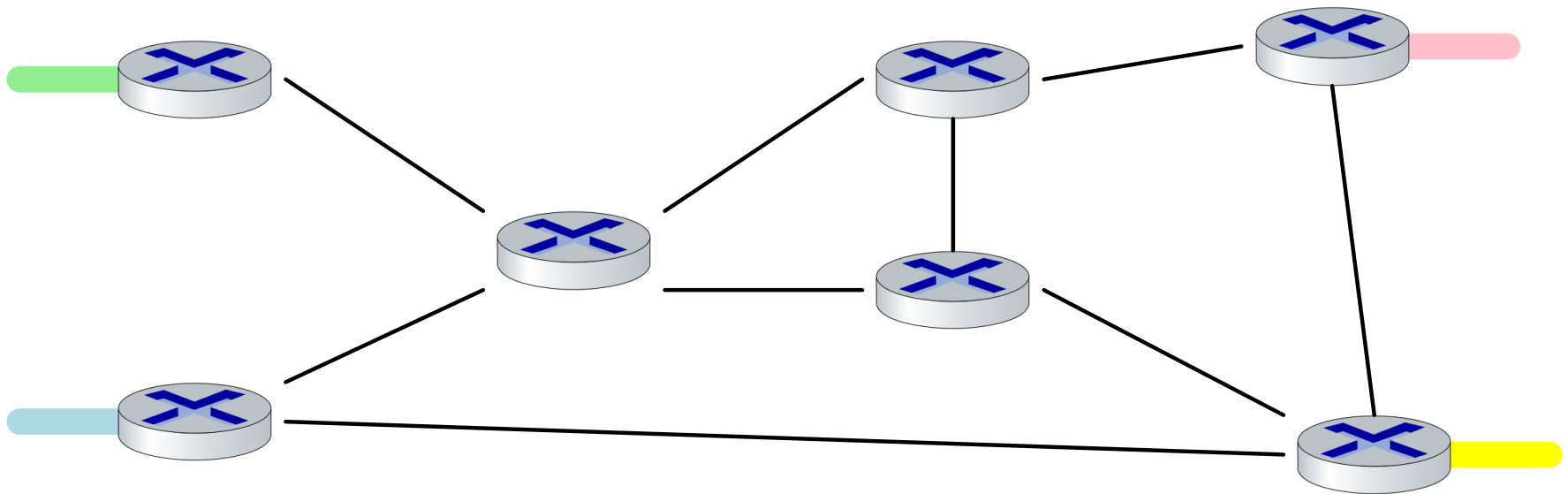


DHCP

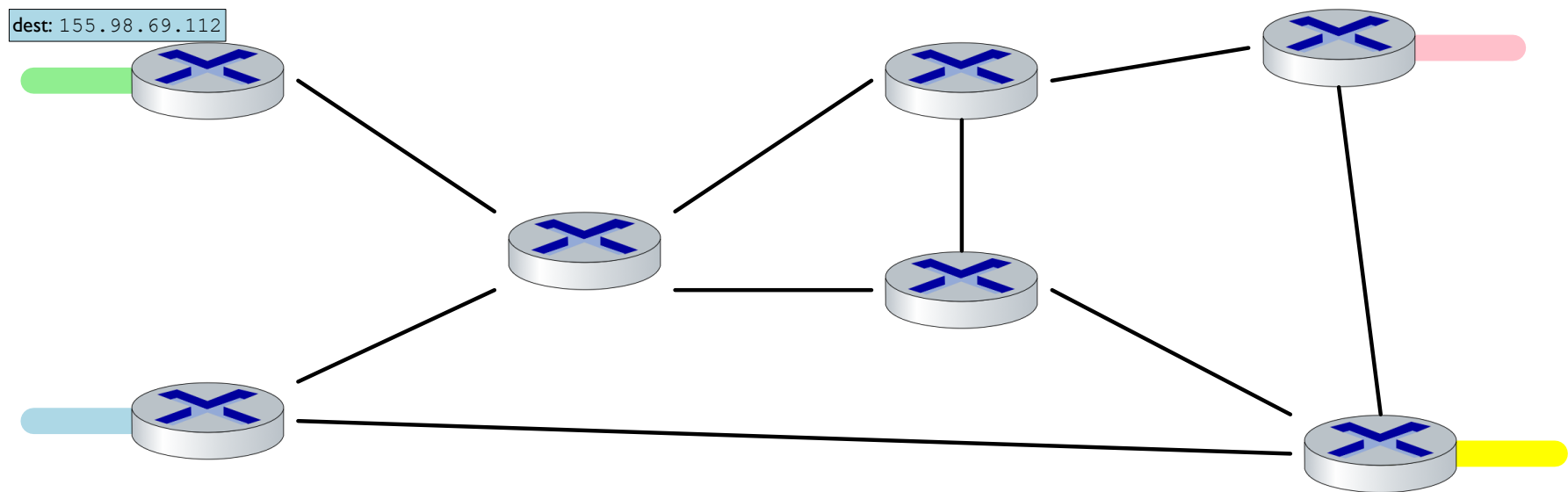
DHCP takes advantage of broadcast to configure a host



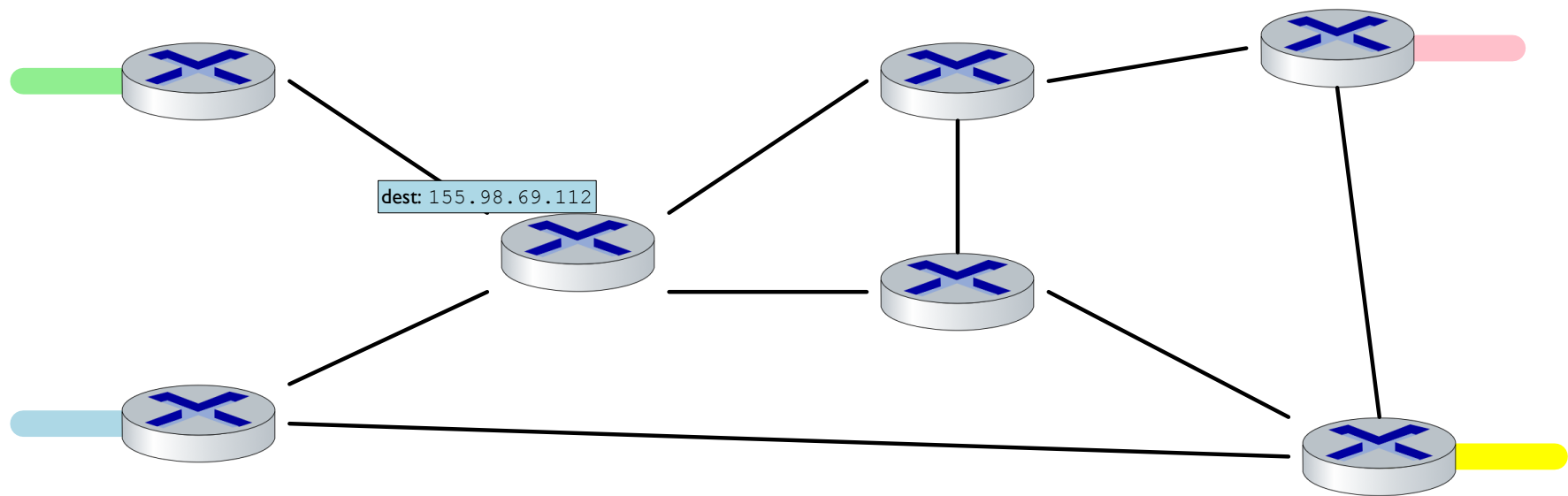
Routing



Routing



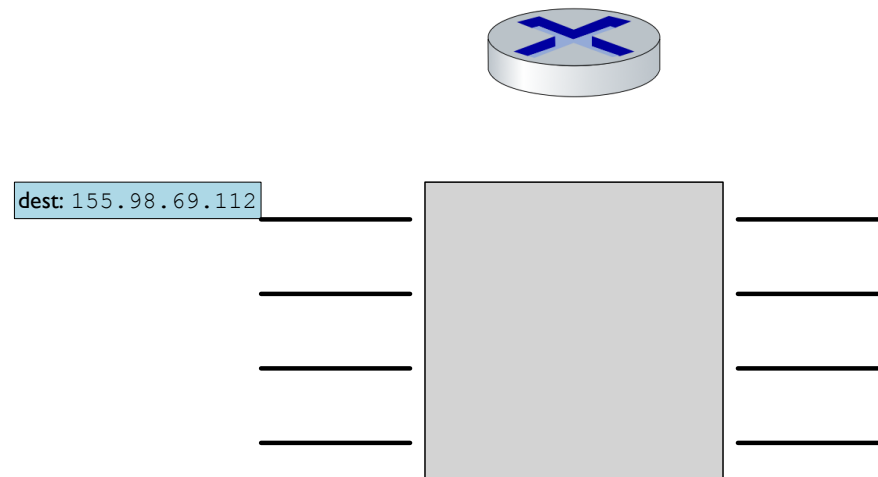
Routing



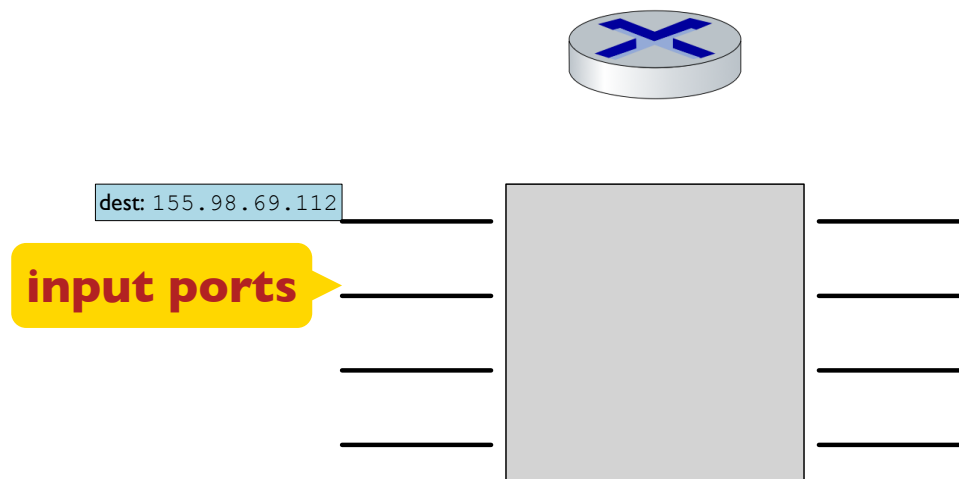
Routing



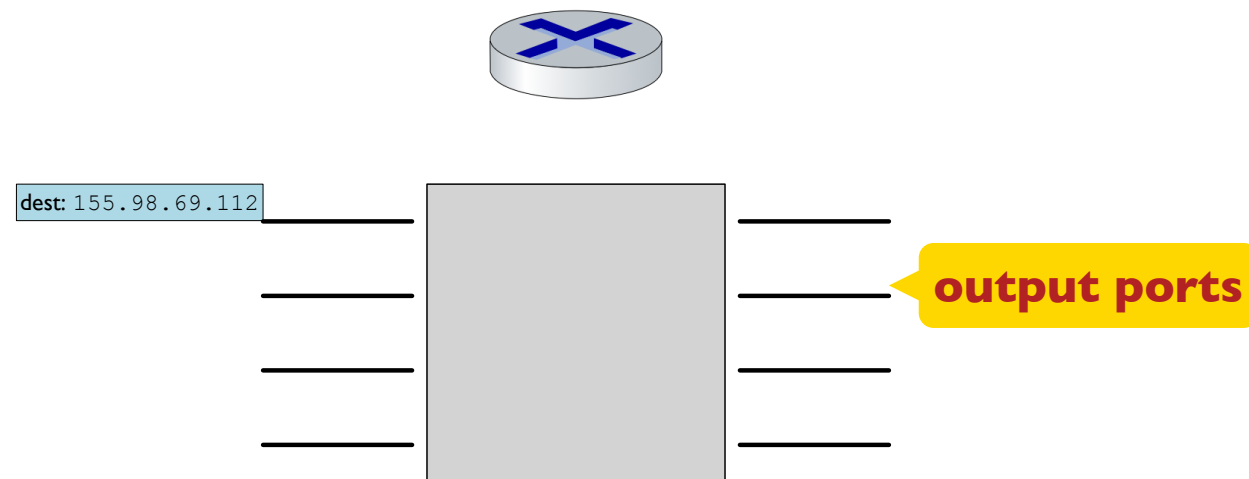
Routing



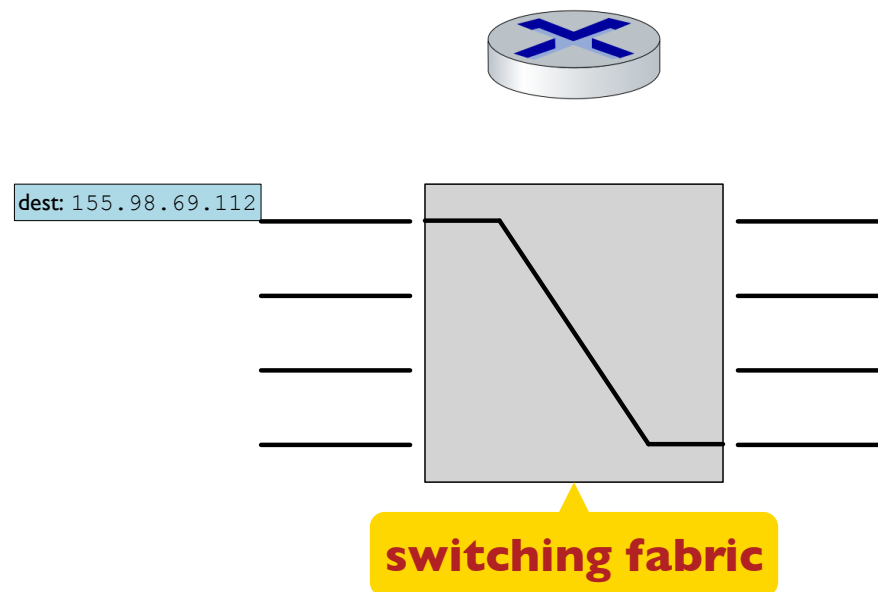
Routing



Routing



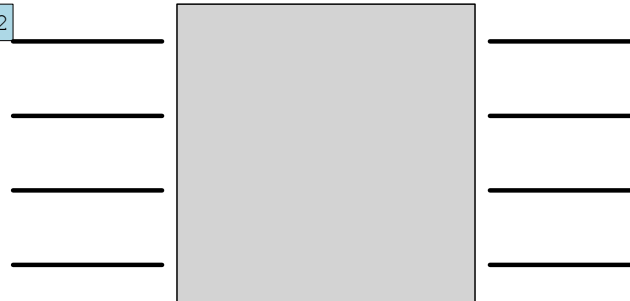
Routing



Routing



dest: 155.98.69.112



155.98.68.0/23 → 4

117.12.0.0/16 → 0

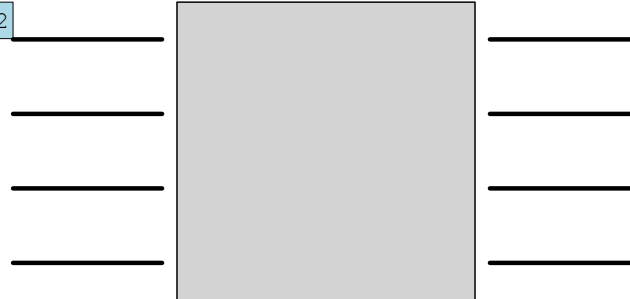
155.0.0.0/8 → 1

...

Routing



dest: 155.98.69.112



Most specific rule applies

155.98.68.0/23 → 4

117.12.0.0/16 → 0

155.0.0.0/8 → 1

...

Routing

