

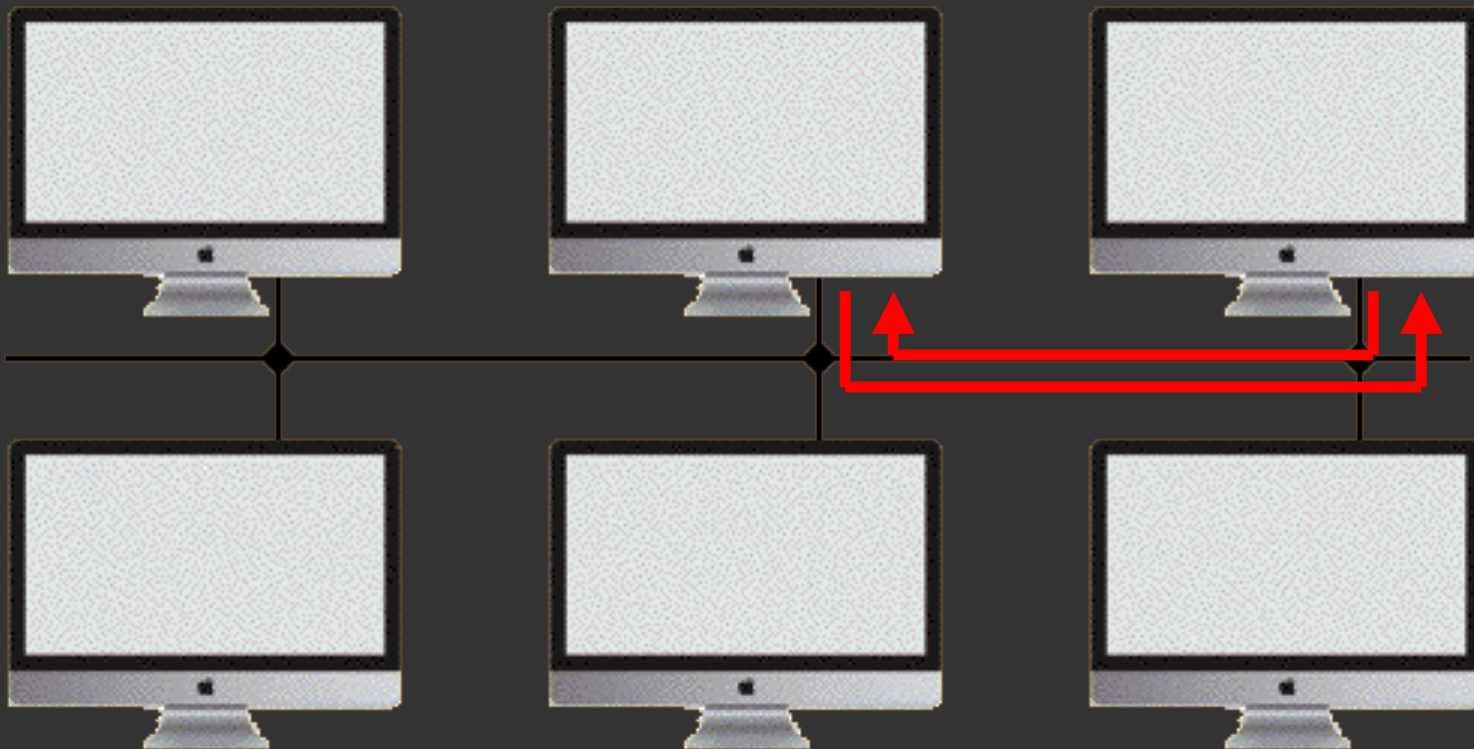
Tech Moment

Packets

By Tom Thorpe

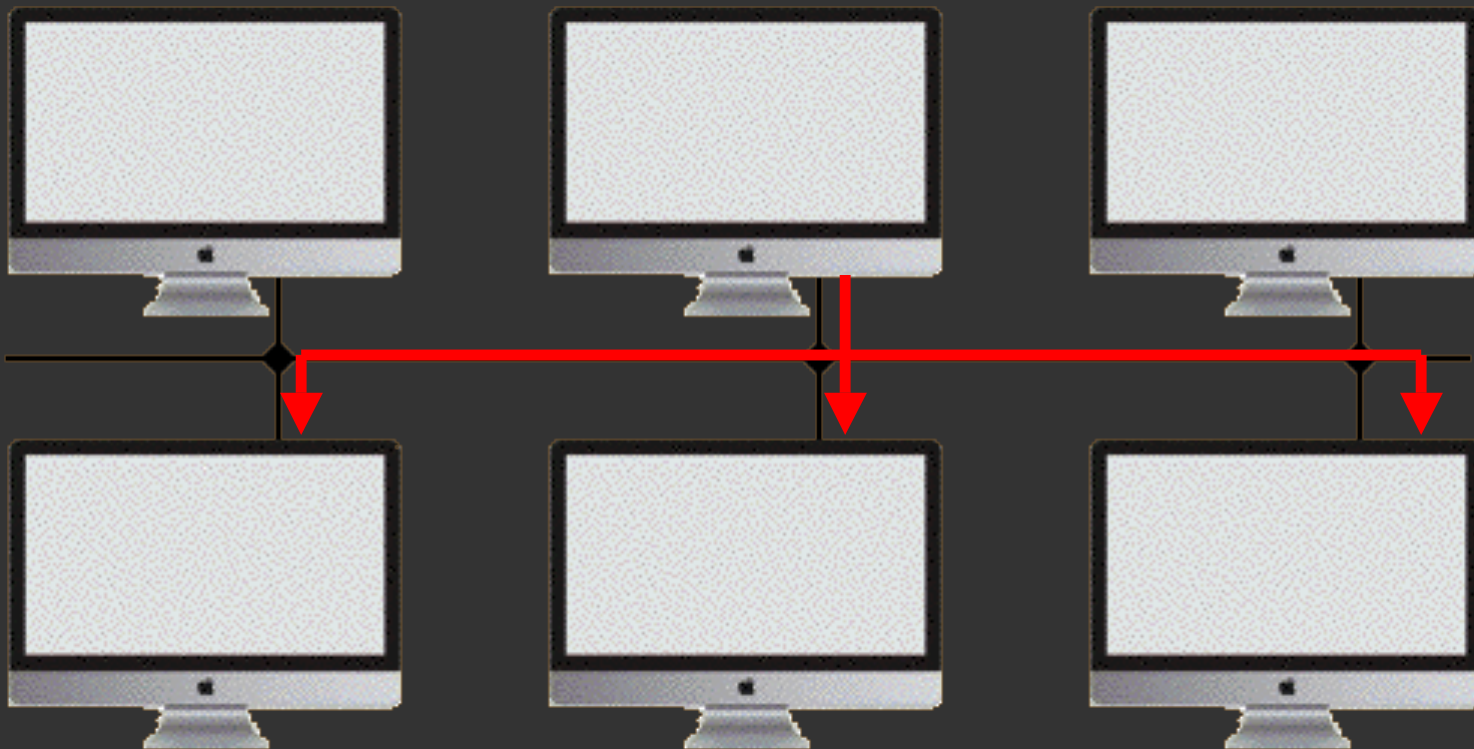
Unicast

- Most common
- Normally a single sender and a single receiver
- IP addresses 0.0.0.0 through 223.255.255.255



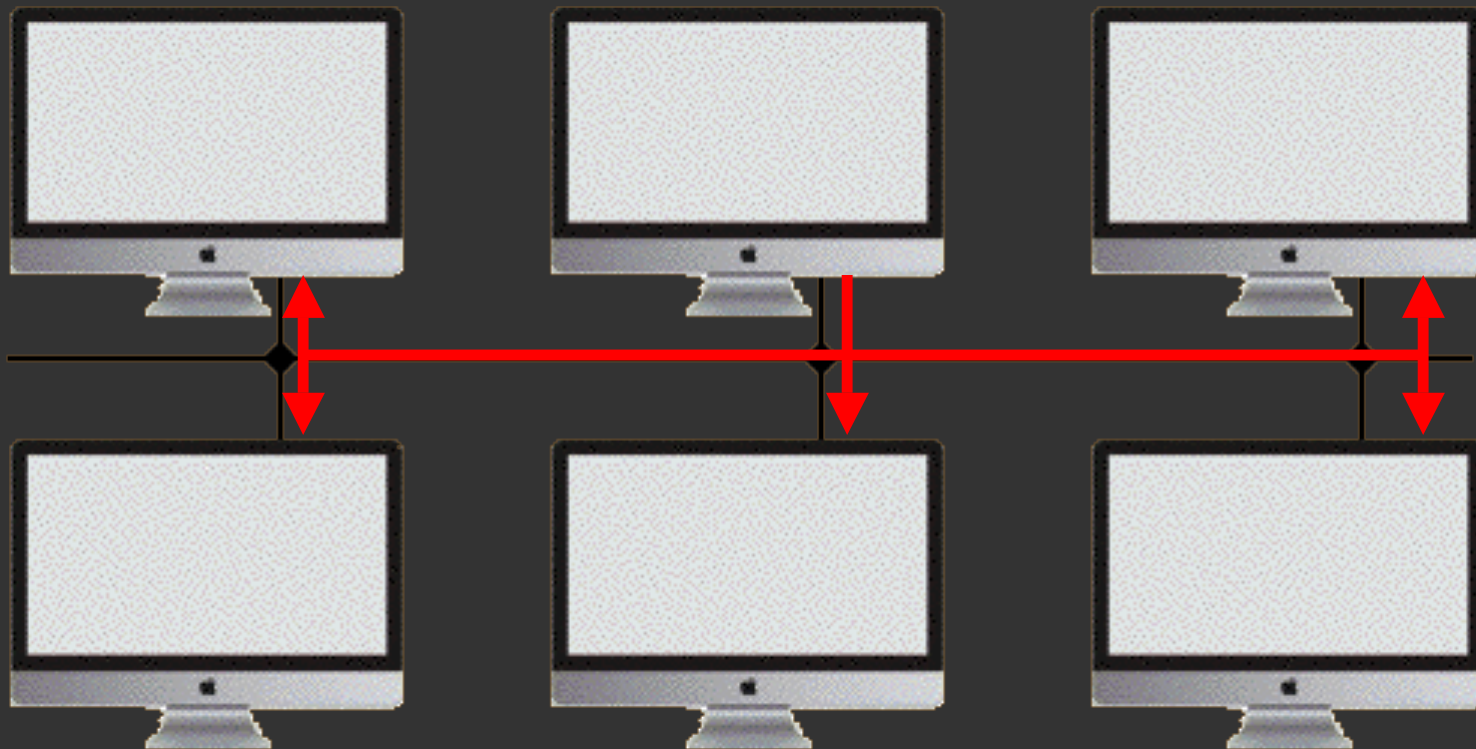
Multicast

- A multicast is associated with a group of interested receivers
- IP addresses 224.0.0.0 through 239.255.255.255



Broadcast

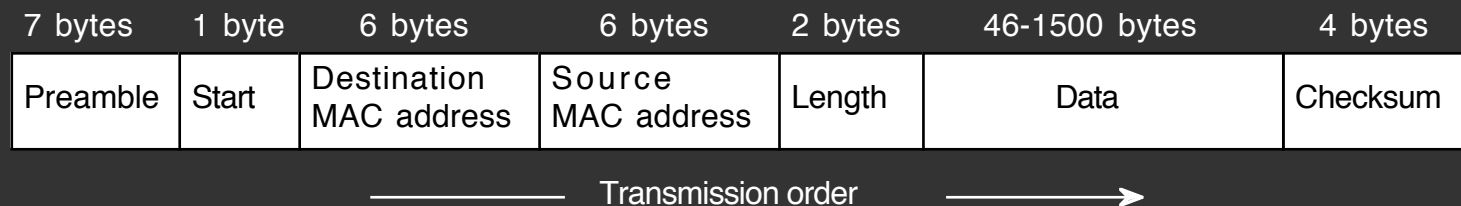
- The sender sends once to all possible destinations
- All receivers receive a copy of it



A network packet is a formatted chunk of data transmitted over a network

- Fixed or variable length
 - Fixed length are used mainly for control and status
 - Variable length are usually when data is inserted
- Checksum at the end to verify it made it ok
- If more data is involved than will fit
 - Break into packet sized chunks and send sequentially

Ethernet frame



Internet packet types are defined in "RFC's"
(Request For Comment)

- Free documents, widely available
- Readable

Some important packet types in the Internet
Protocol suite

- TCP = Transmission Control Protocol RFC 793
- UDP = User Datagram Protocol RFC 768
- ICMP = Internet Control Msg Protocol RFC 792

TCP = Transmission Control Protocol

- Used to send data with verified receipt
- Receipt means only one person can receive the data
- 65,495 bytes maximum length

Example: Just about everything on the internet

UDP = User Datagram Protocol

- Used to send data without receipt
- Data can go to more than one recipient

Examples: Network time, multiplayer games

ICMP = Internet Control Message Protocol

- There are about a dozen control messages
 - Most are for network administrators
 - Some are for troubleshooting

PING

- Most useful
- On any Mac computer running OS X:
 - Open Applications/Utilities/Terminal
 - Type "ping xxx"
 where xxx is a domain name or IP address
 - If you get a response it will tell you how long it took to send a packet there and get a reply
 - If you don't get a response then they can't be reached
 (or you're dealing with idiots at the other end)
 - Control-C to stop
 - or
 - Open Applications/Utilities/Network Utility
 - Select the "Ping" tab

```
$ ping sbamug.com
PING sbamug.com (208.113.154.40): 56 data bytes
64 bytes from 208.113.154.40: icmp_seq=0 ttl=47 time=85.517 ms
64 bytes from 208.113.154.40: icmp_seq=1 ttl=47 time=80.849 ms
64 bytes from 208.113.154.40: icmp_seq=2 ttl=47 time=82.236 ms
64 bytes from 208.113.154.40: icmp_seq=3 ttl=47 time=83.742 ms
```

```
$ ping 208.113.154.40
PING 208.113.154.40 (208.113.154.40): 56 data bytes
64 bytes from 208.113.154.40: icmp_seq=0 ttl=47 time=83.159 ms
64 bytes from 208.113.154.40: icmp_seq=1 ttl=47 time=80.930 ms
64 bytes from 208.113.154.40: icmp_seq=2 ttl=47 time=82.871 ms
64 bytes from 208.113.154.40: icmp_seq=3 ttl=47 time=81.221 ms
```

- It takes a little over 80 ms to get from my computer to sbamug.com and back

Traceroute

- Neat diagnostic tool based on ping
- Tells how a packet travels down the internet
- On any Mac computer running OS X:
 - Open Applications/Utilities/Terminal
 - Type `traceroute xxx`
where `xxx` is a domain name or IP address
 - or
 - Open Applications/Utilities/Network Utility
 - Select the “Traceroute” tab

```
$ traceroute -I sbamug.com
```

```
traceroute to sbamug.com (208.113.154.40), 64 hops max, 60 byte packets
```

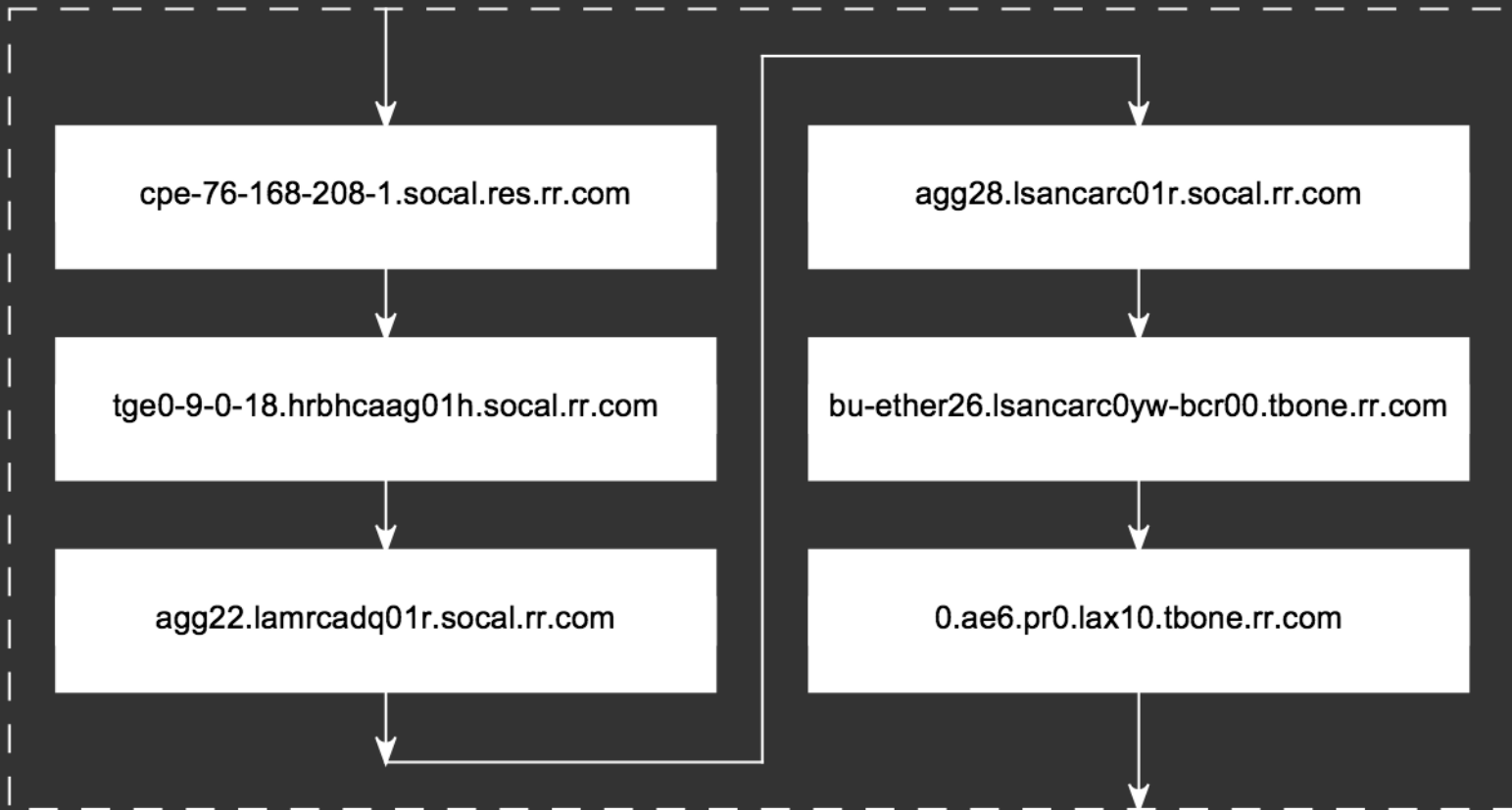
```
 1 12.0.0.100 (12.0.0.100)  2.354 ms  1.435 ms  1.355 ms
 2 cpe-76-168-208-1.socal.res.rr.com (76.168.208.1)  12.229 ms  11.679 ms  9.679 ms
 3 tge0-9-0-18.hrbhcaag01h.socal.rr.com (76.167.30.145)  31.332 ms *  10.324 ms
 4 agg22.lamrcadq01r.socal.rr.com (72.129.9.86)  23.020 ms  16.069 ms  13.629 ms
 5 agg28.lsancarc01r.socal.rr.com (72.129.9.0)  19.705 ms  17.953 ms  19.570 ms
 6 bu-ether26.lsancarc0yw-bcr00.tbone.rr.com (66.109.6.212)  19.608 ms  25.522 ms  21.017 ms
 7 0.ae6.pr0.lax10.tbone.rr.com (66.109.9.24)  20.079 ms  15.090 ms  16.877 ms
 8 te0-0-0-29.ccr23.lax05.atlas.cogentco.com (154.54.10.249)  15.539 ms  18.644 ms  15.059 ms
 9 be2179.ccr22.lax01.atlas.cogentco.com (154.54.41.81)  20.153 ms  16.816 ms  18.068 ms
10 be2066.ccr22.iah01.atlas.cogentco.com (154.54.7.53)  52.834 ms  49.712 ms  50.688 ms
11 be2173.ccr42.atl01.atlas.cogentco.com (154.54.29.117)  64.824 ms  66.274 ms  67.205 ms
12 be2169.ccr22.dca01.atlas.cogentco.com (154.54.31.98)  77.842 ms  75.201 ms  76.580 ms
13 be2177.ccr41.iad02.atlas.cogentco.com (154.54.41.205)  76.941 ms  78.822 ms  76.653 ms
14 te0-0-0-0.agr11.iad02.atlas.cogentco.com (154.54.44.198)  80.999 ms  77.483 ms  76.934 ms
15 te0-0-2-0.nr11.b037327-0.iad02.atlas.cogentco.com (154.24.15.62)  81.020 ms  76.888 ms  79.292 ms
16 38.122.62.254 (38.122.62.254)  80.741 ms  75.733 ms  76.575 ms
17 ip-208-113-156-8.dreamhost.com (208.113.156.8)  77.857 ms  81.907 ms  83.211 ms
18 ip-208-113-156-14.dreamhost.com (208.113.156.14)  83.823 ms  81.762 ms  86.616 ms
19 apache2-igloo.greenville.dreamhost.com (208.113.154.40)  91.247 ms  80.490 ms  83.630 ms
```

My house

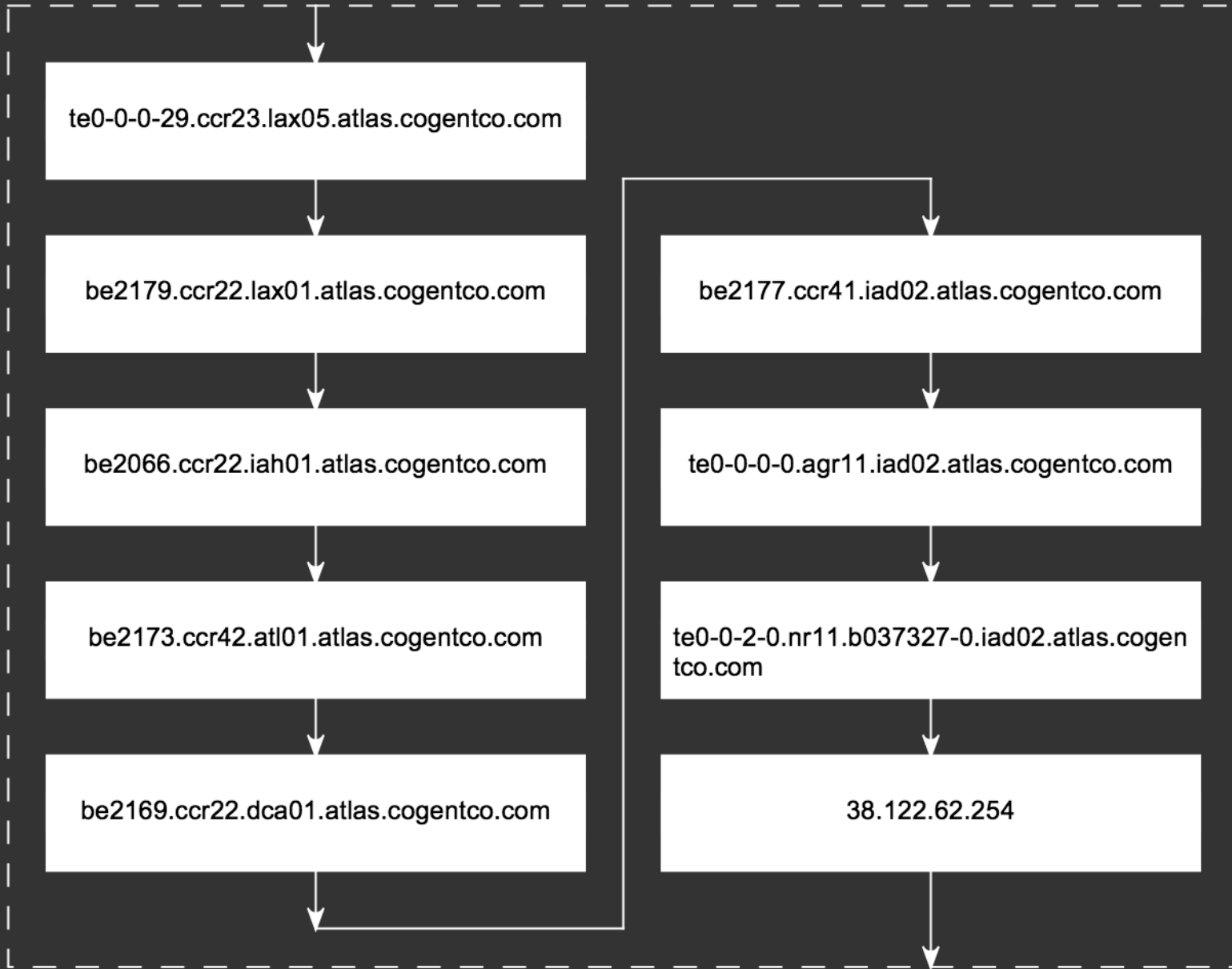


12.0.0.100

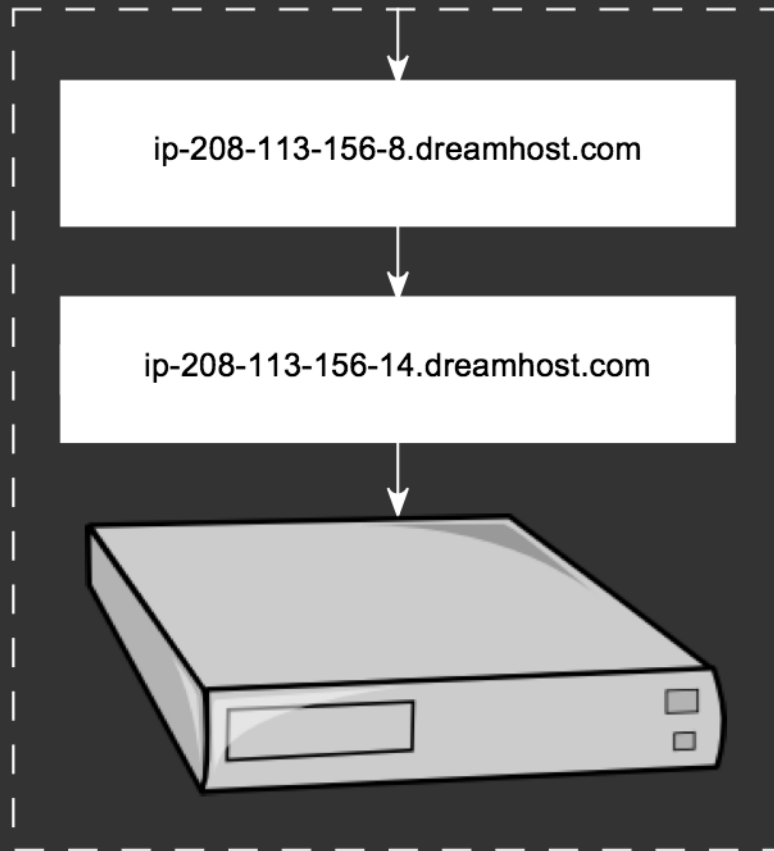
Time Warner Cable



Cogent Co.



DreamHost.com



18 intermediate stops!

Summary

- TCP packets move data between two points
- UDP packets can go to more than one destination
- Use `ping` to see if you have a connection
- `traceroute` shows your packets routing

From my house to
BONUS !
sbamug.com

My house



12.0.0.100

My house



Time Warner Cable

cpe-76-168-208-1.socal.res.rr.com
Hermosa Beach, CA

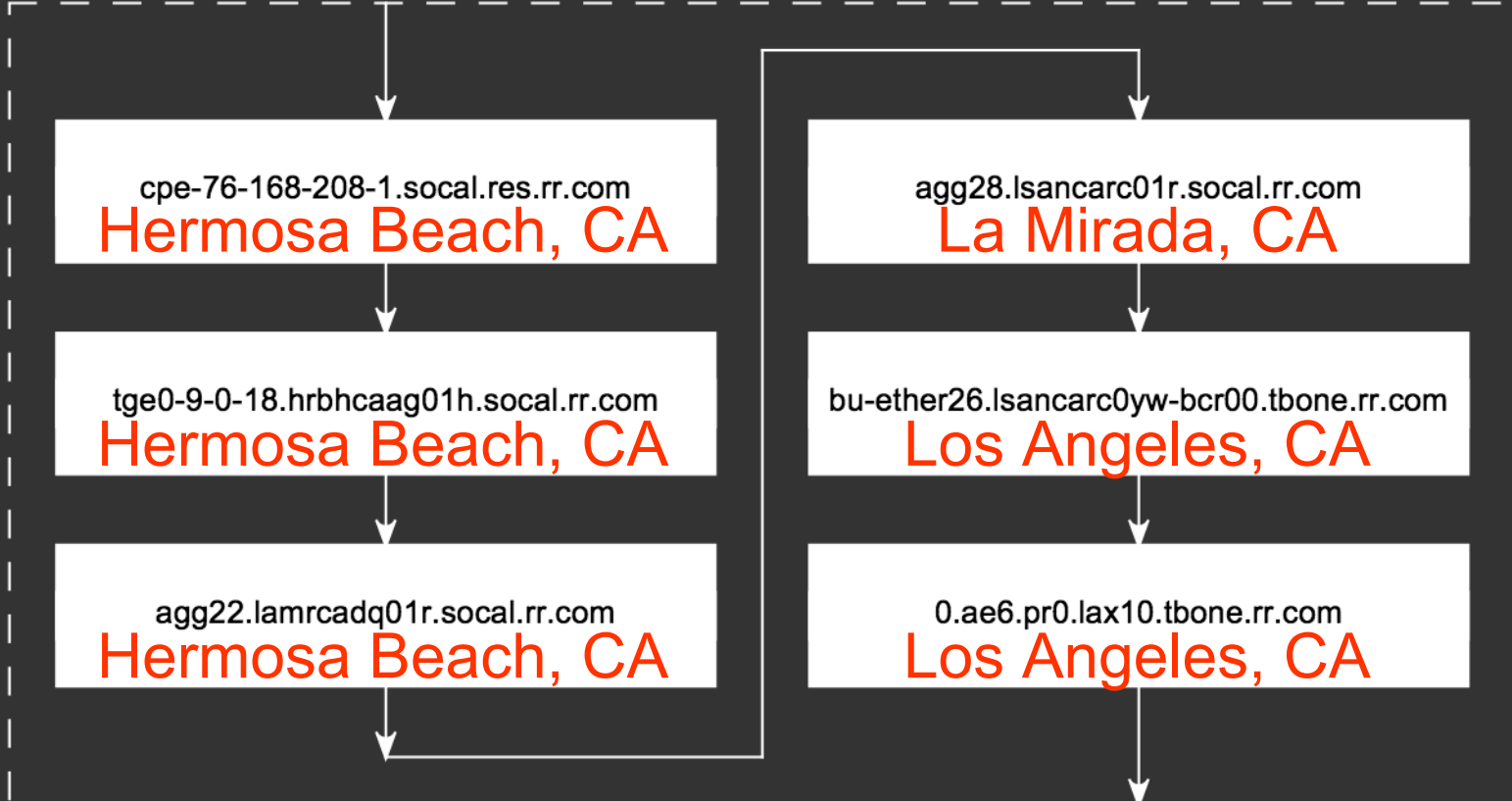
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Hermosa Beach, CA

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Los Angeles, CA



Cogent Co.

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Los Angeles, CA

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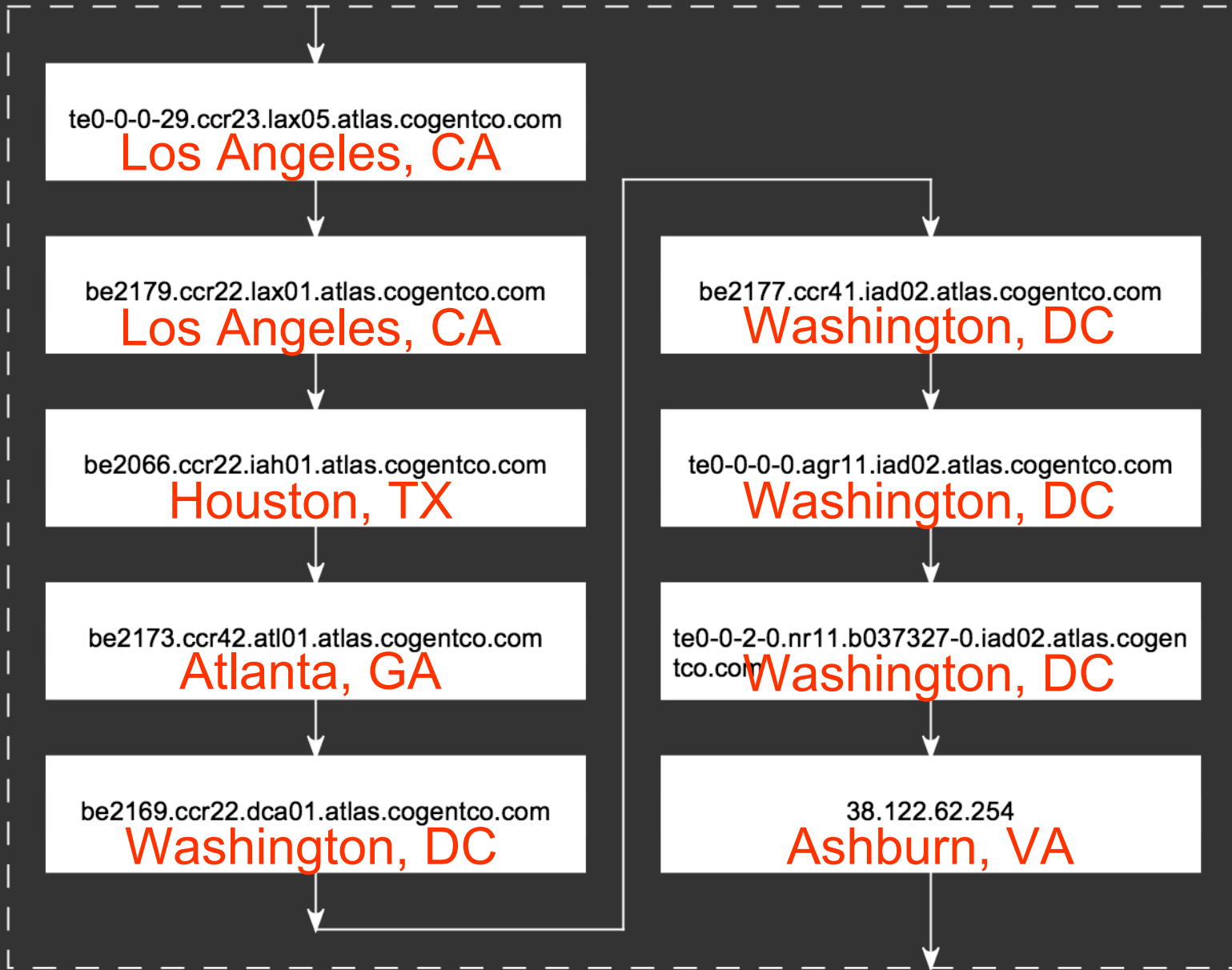
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Washington, DC

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tco.com **Washington, DC**

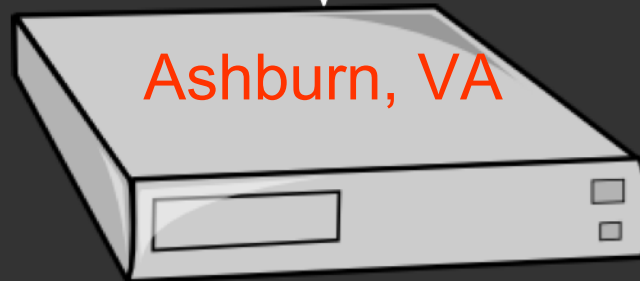
38.122.62.254
Ashburn, VA



DreamHost.com

ip-208-113-156-8.dreamhost.com
Ashburn, VA

ip-208-113-156-14.dreamhost.com
Ashburn, VA



Slightly under 1/10 second!

