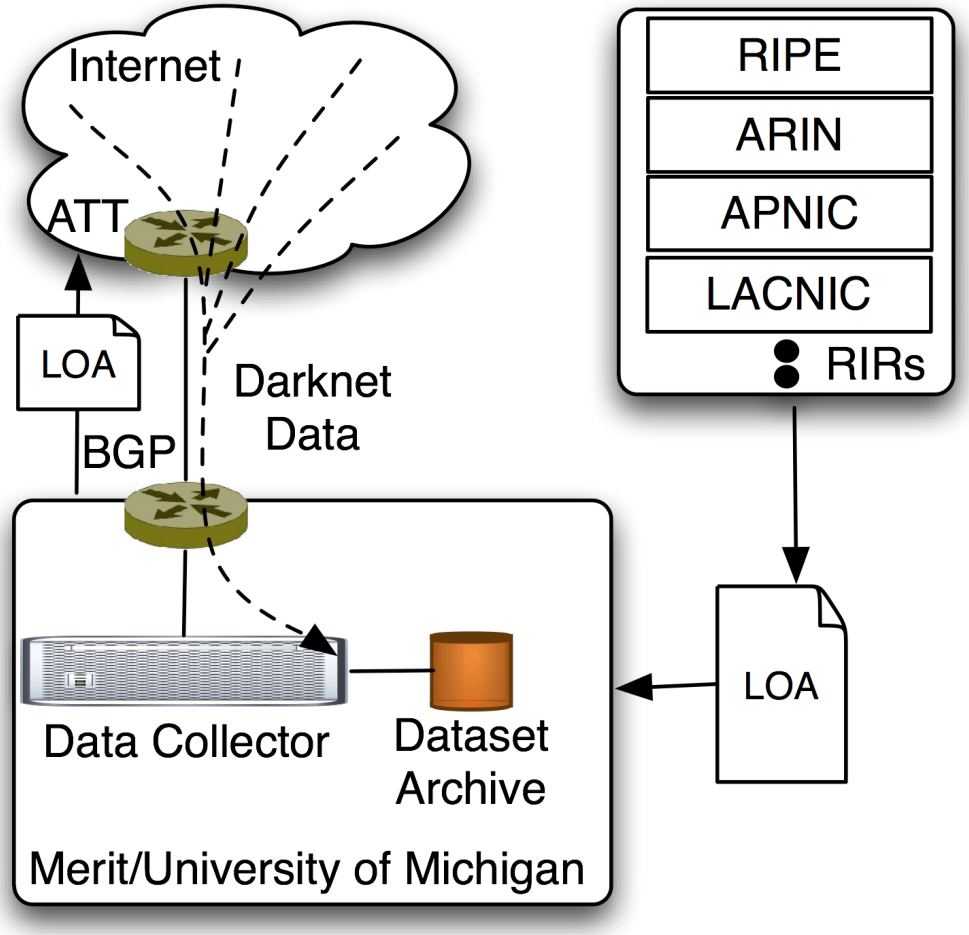
Internet Pollution – Part 2

Scott Walls, Manish Karir
Merit Network Inc.

A Framework for Internet Pollution Analysis

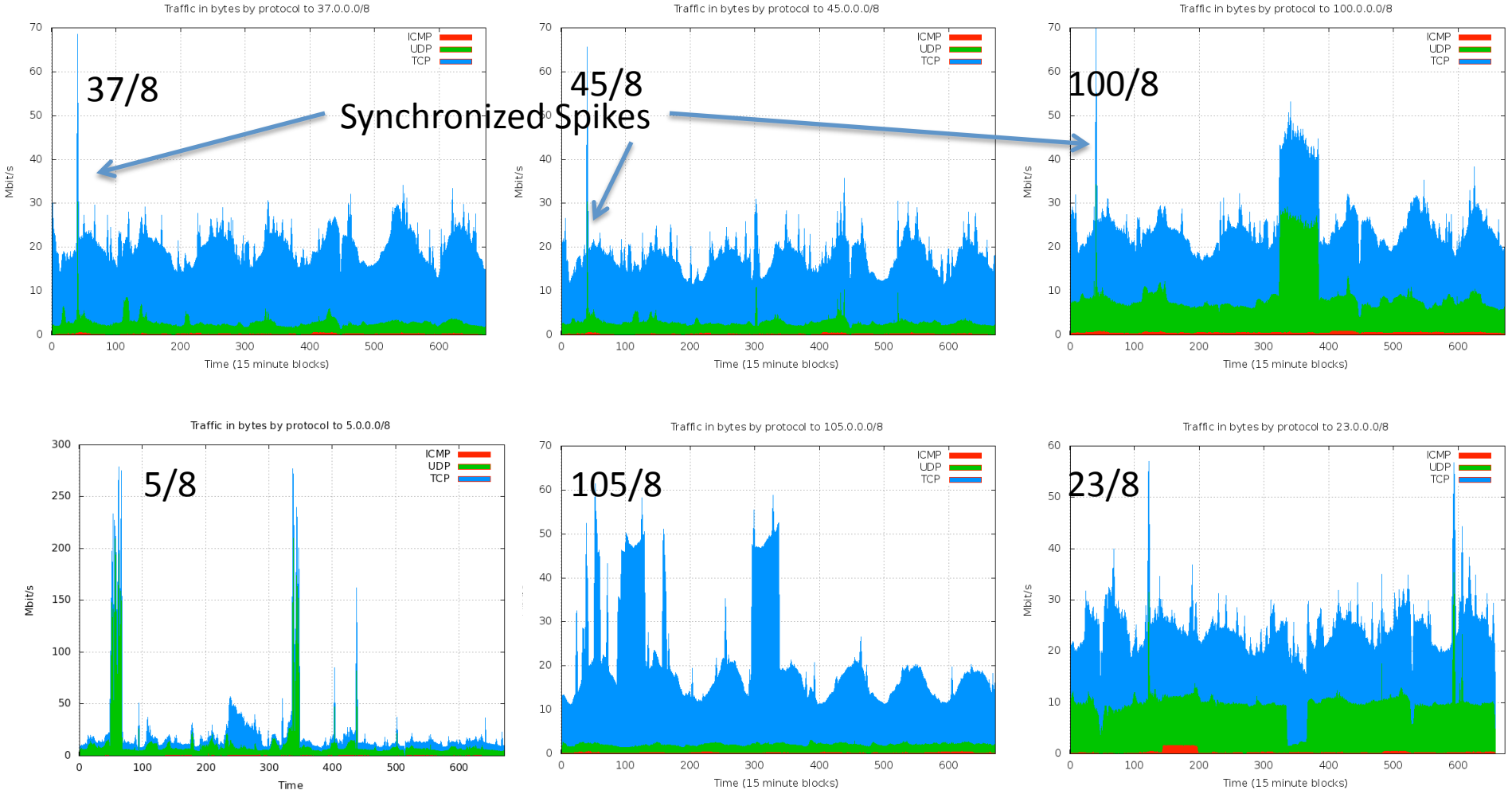


- Work with RIRs to identify upcoming allocation
- Obtain LOA
- Advertise, Collect, Analyze, Archive, Provide to research community
- Cleanup/Quarantine recommendations
- Support from DHS via PREDICT Project

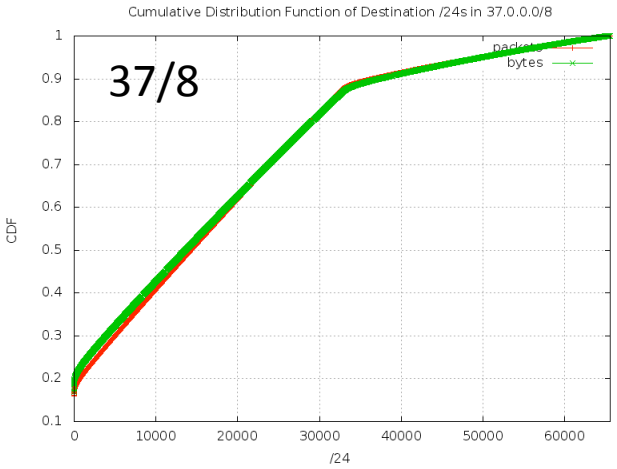
Cross RIR Darknet Traffic Analysis

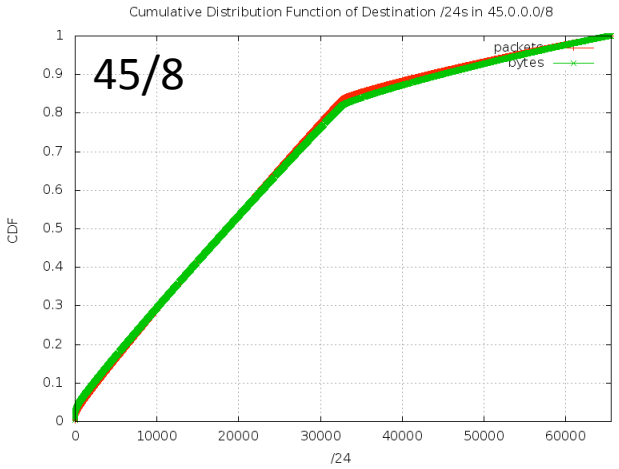
- Goal: Analyze darknet traffic to determine how much and what kinds of pollution were present in each block and determine whether cleanup/quarantine were viable options
- 23/8, 100/8, 45/8 - ARIN
- 5/8, 37/8 - RIPE
- 105/8 – AfriNIC
- Several 7 day long datasets were collected – here we are presenting results from a 6 /8 collection with 3 simultaneous announcements (37, 45, 100)
- Alternate dataset has all 6 /8 announcements at the same time

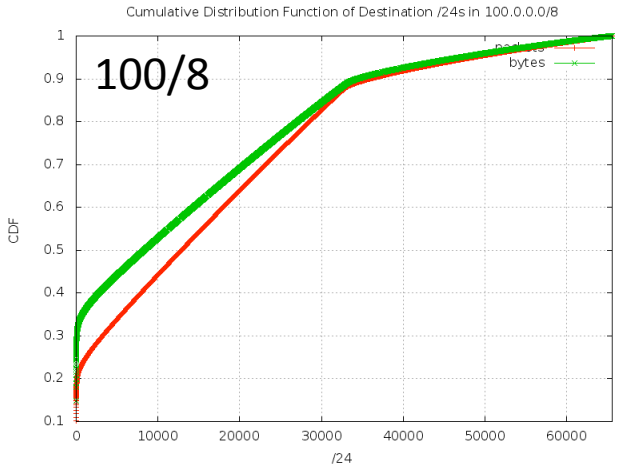
Comparing Traffic Volumes

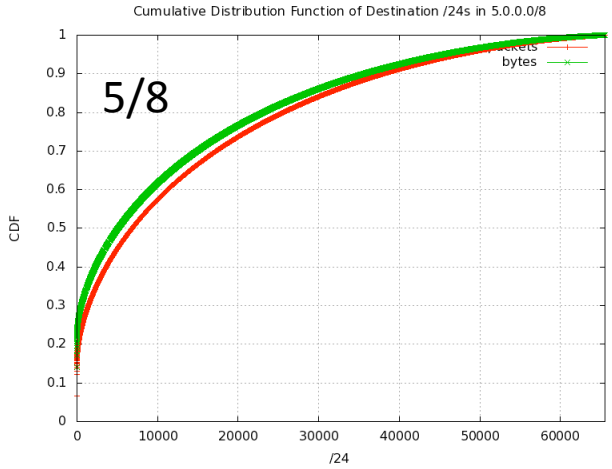


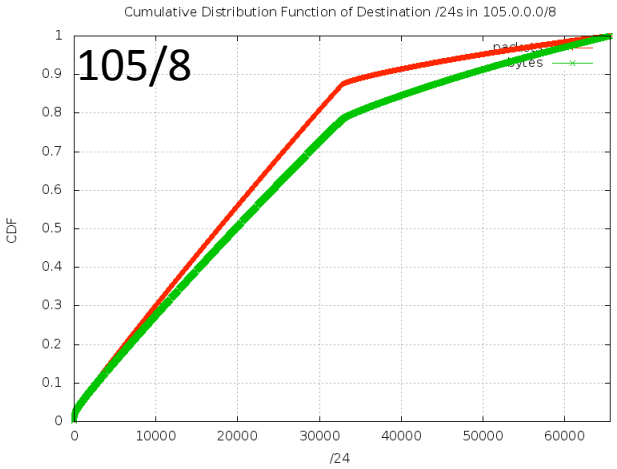
Comparing Hotspot Activity

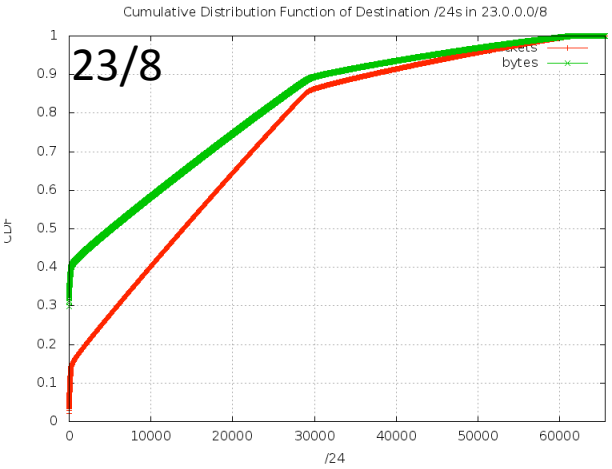




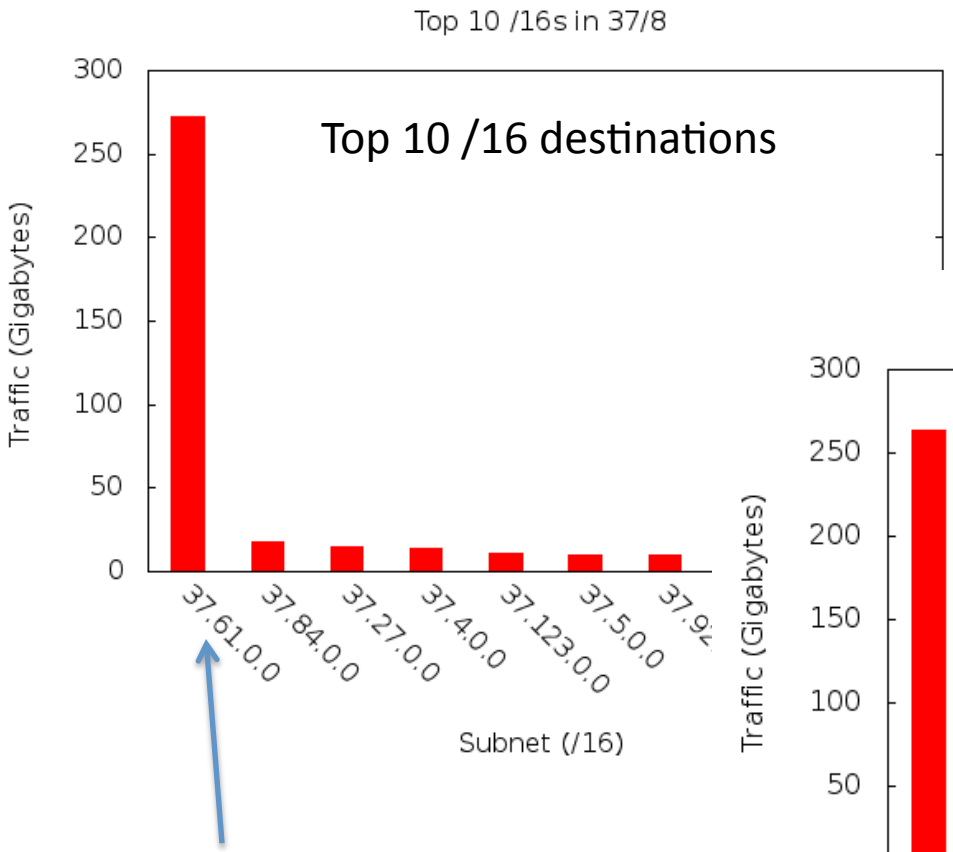


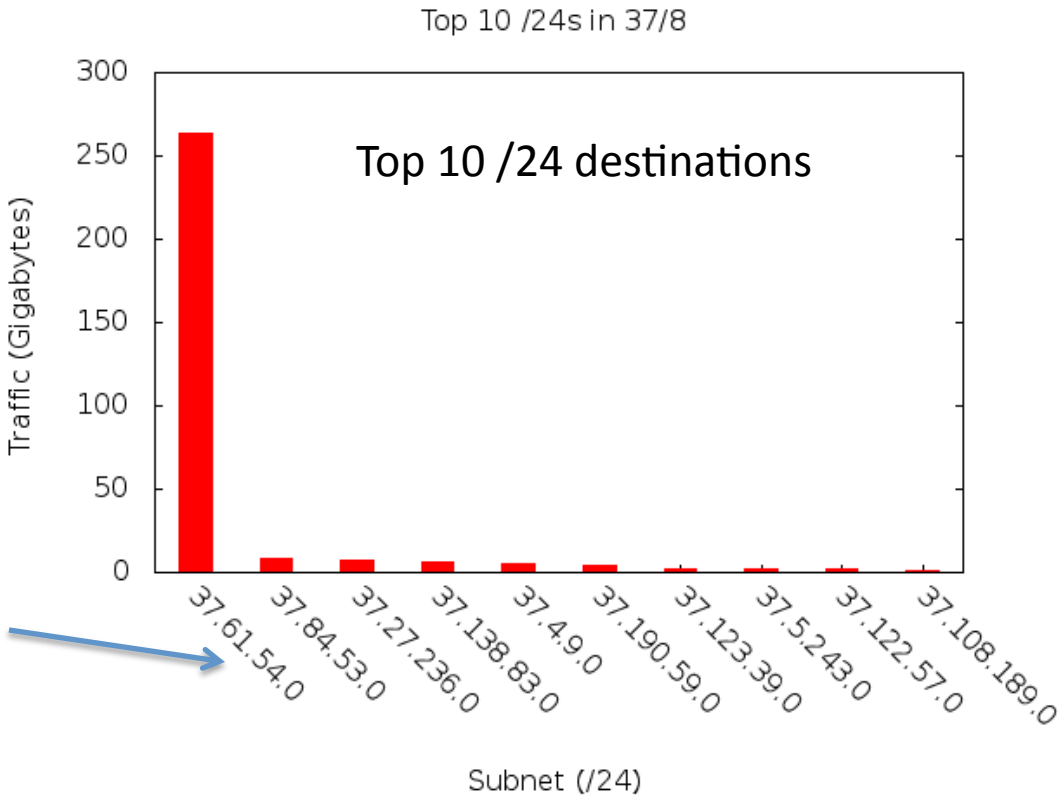






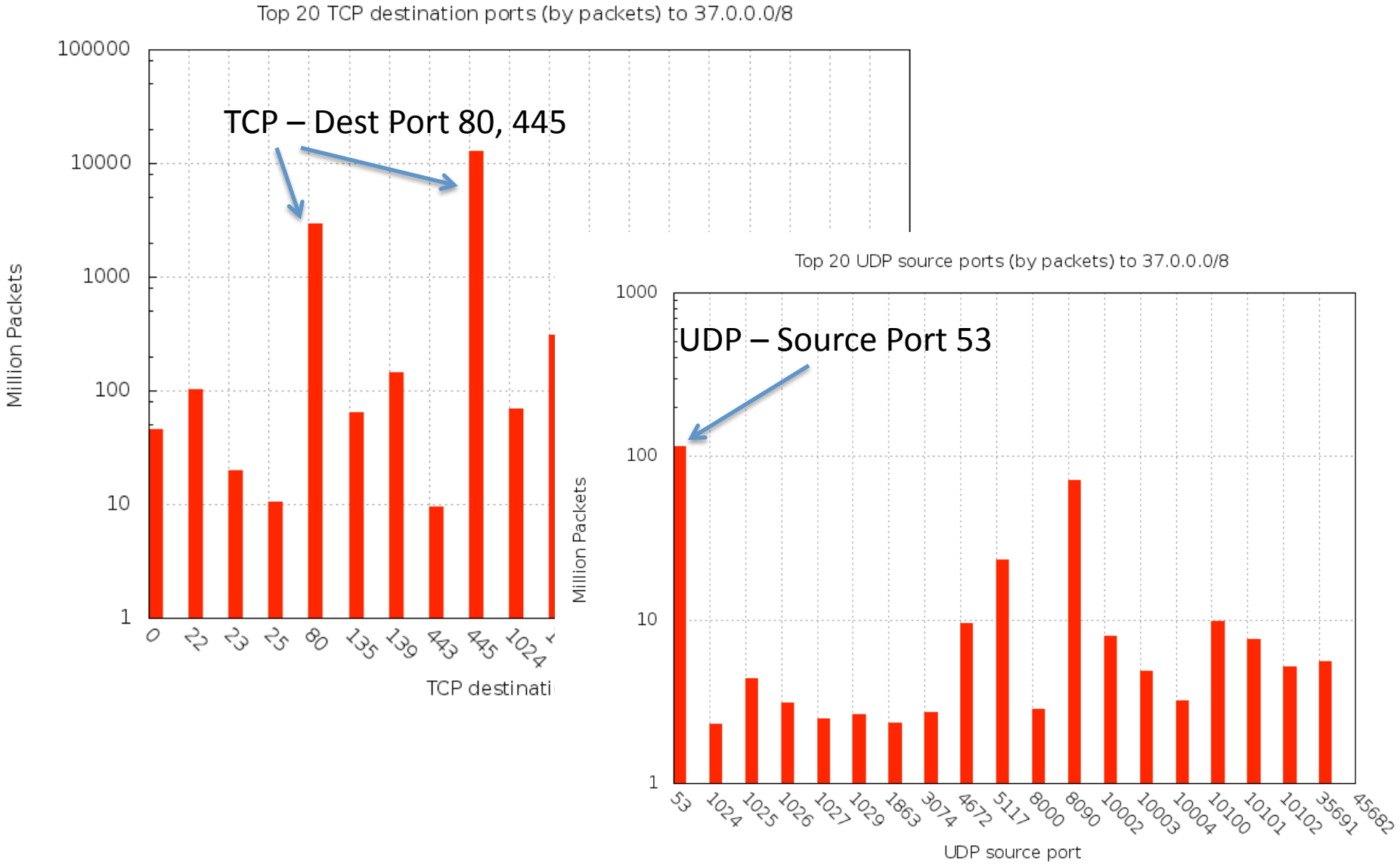
37/8





Single /16 and single /24 account for majority of the captured traffic by byte count

37/8


Top 20 TCP destination ports (by packets) to 37.0.0.0/8
TCP – Dest Port 80, 445
Million Packets
100000
10000
1000
100
10
1
0
22
23
25
80
135
139
443
445
1024
TCP destinati
Top 20 UDP source ports (by packets) to 37.0.0.0/8
UDP – Source Port 53
Million Packets
1000
100
10
1
53
1024
1025
1026
1027
1029
1863
3074
4672
5117
8000
8090
10002
10003
10004
10100
10101
10102
35691
45682
UDP source port

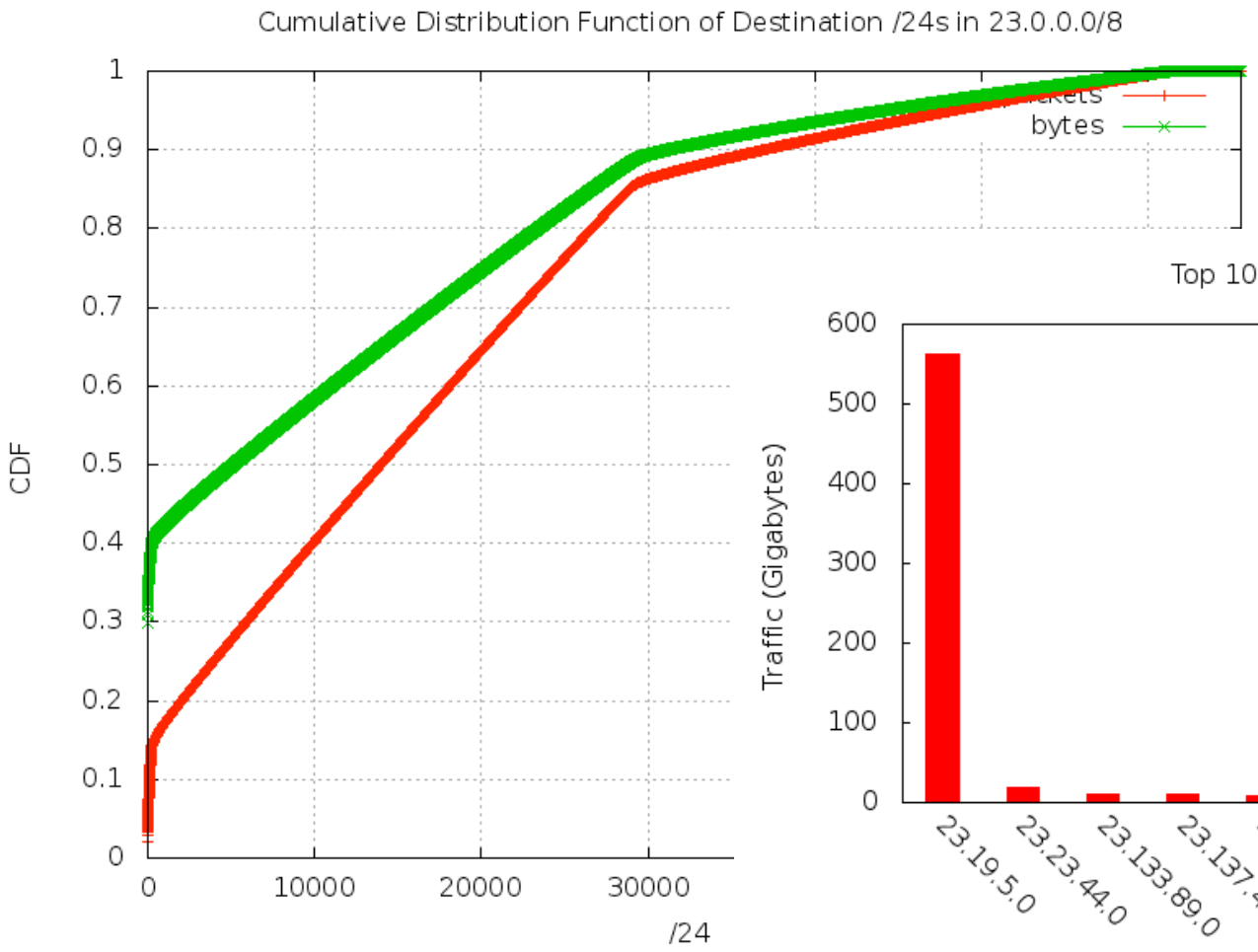
37/8

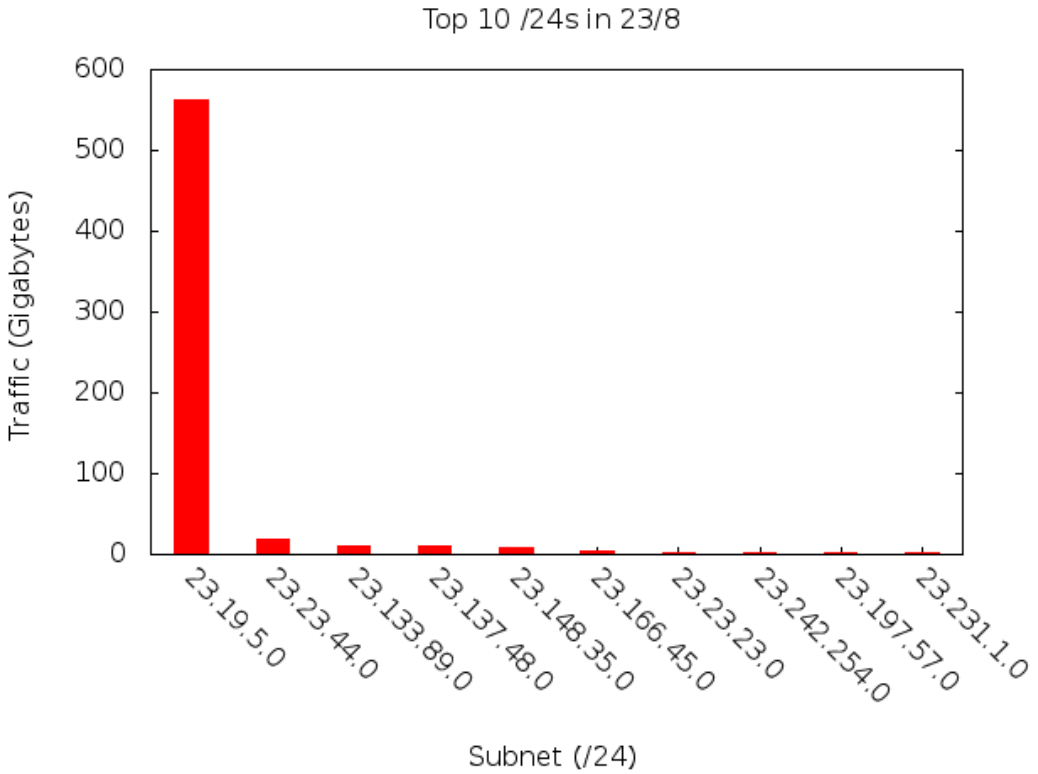
- Port 80 TCP traffic all appears to be directed at single IP address and appears to be related with facebook blocking in china

http://www.renesys.com/blog/2010/06/two-strikes-i-root.shtml

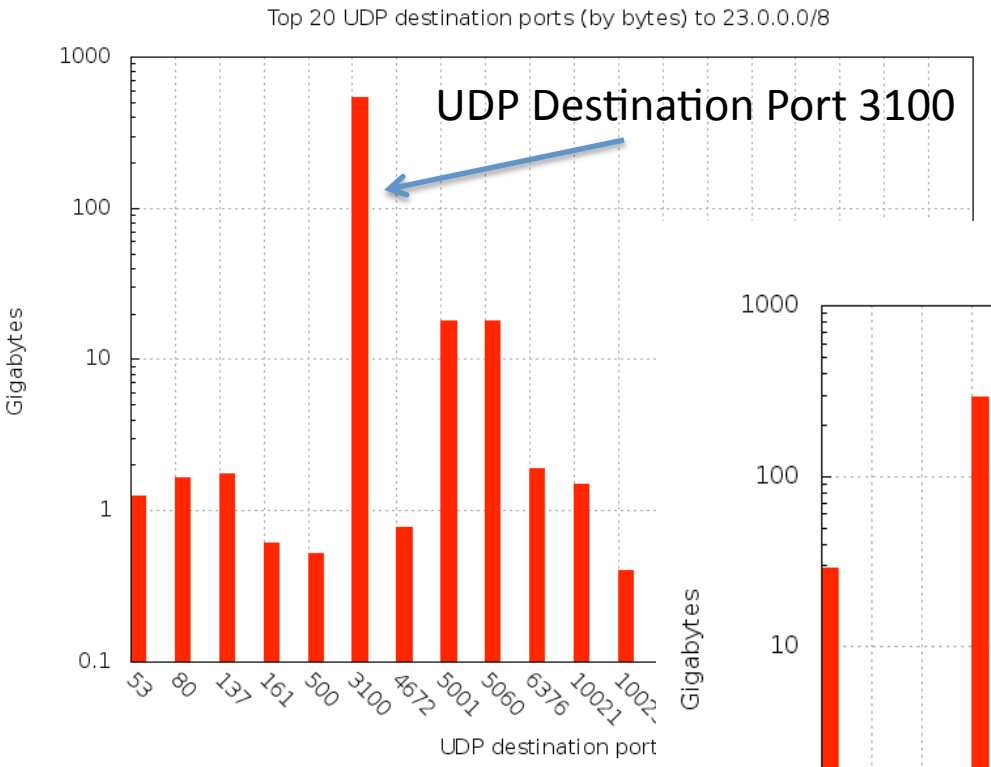
```
dig @dns1.chinatelecom.com.cn. www.facebook.com.
...
  www.facebook.com. 11556 IN A 37.61.54.158
  www.facebook.com. 24055 IN A 78.16.49.15
  www.facebook.com. 38730 IN A 203.98.7.65
```

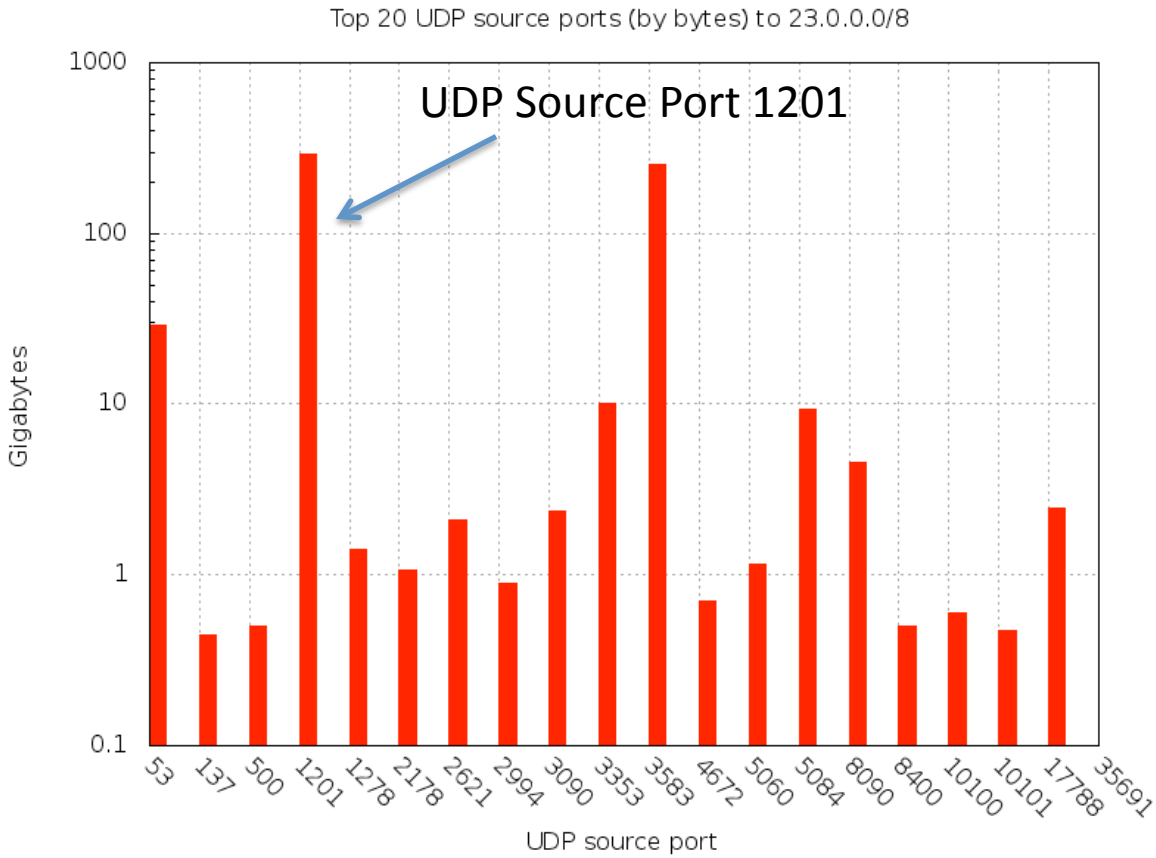
23/8


Cumulative Distribution Function of Destination /24s in 23.0.0.0/8
CDF
/24
bytes
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
10000
20000
30000


Top 10 /24s in 23/8
Traffic (Gigabytes)
Subnet (/24)
0
100
200
300
400
500
600
23.19.5.0
23.23.44.0
23.133.89.0
23.137.48.0
23.148.35.0
23.166.45.0
23.23.23.0
23.242.254.0
23.197.57.0
23.231.1.0

23/8

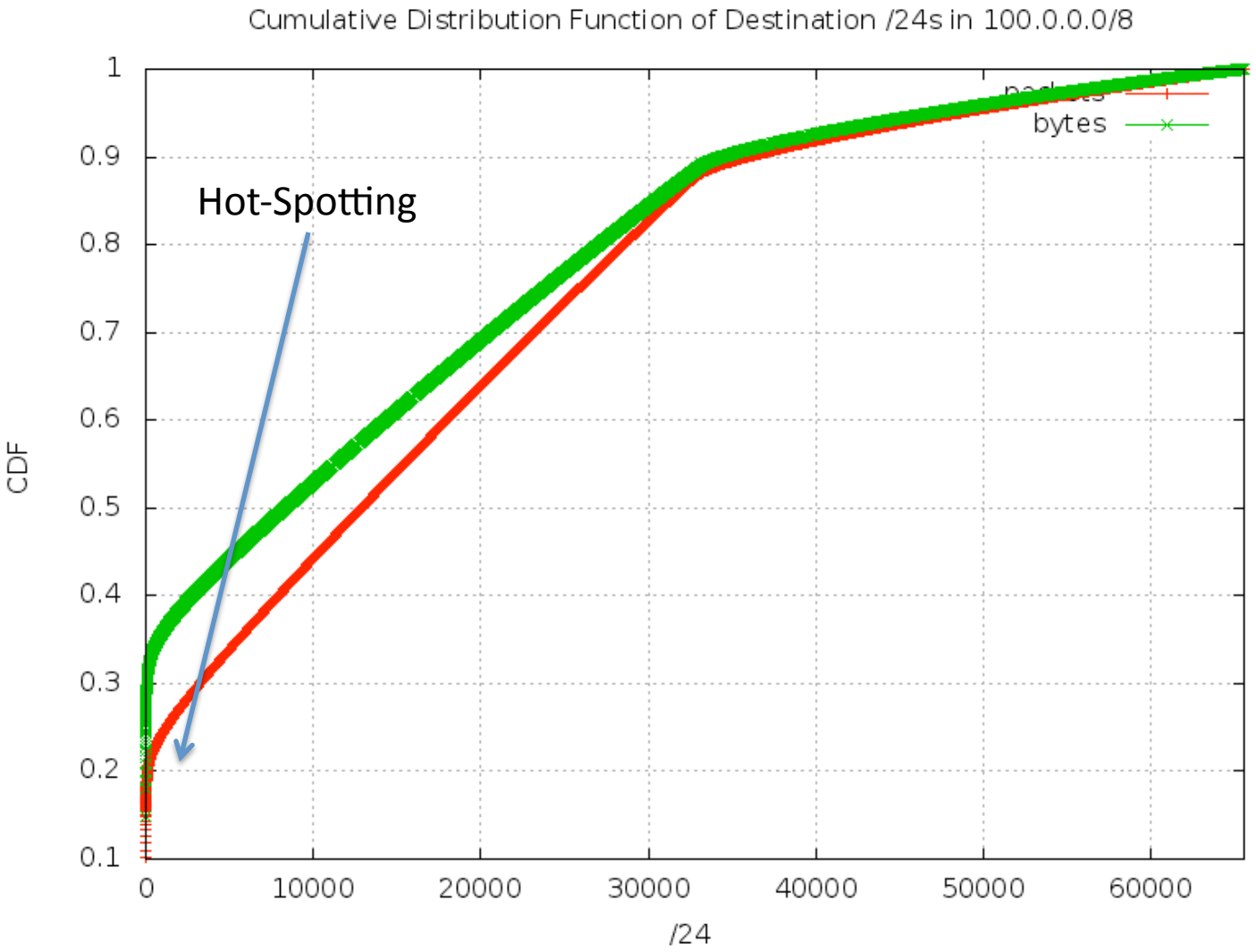

Top 20 UDP destination ports (by bytes) to 23.0.0.0/8
UDP Destination Port 3100
Gigabytes
1000
100
10
1
0.1
53
80
137
161
500
3100
4672
5001
5060
6376
10021
UDP destination port


Top 20 UDP source ports (by bytes) to 23.0.0.0/8
UDP Source Port 1201
Gigabytes
1000
100
10
1
0.1
53
137
500
1201
1278
2178
2621
2994
3090
3353
3583
4672
5060
5084
8090
8400
10100
10101
17788
35691
UDP source port

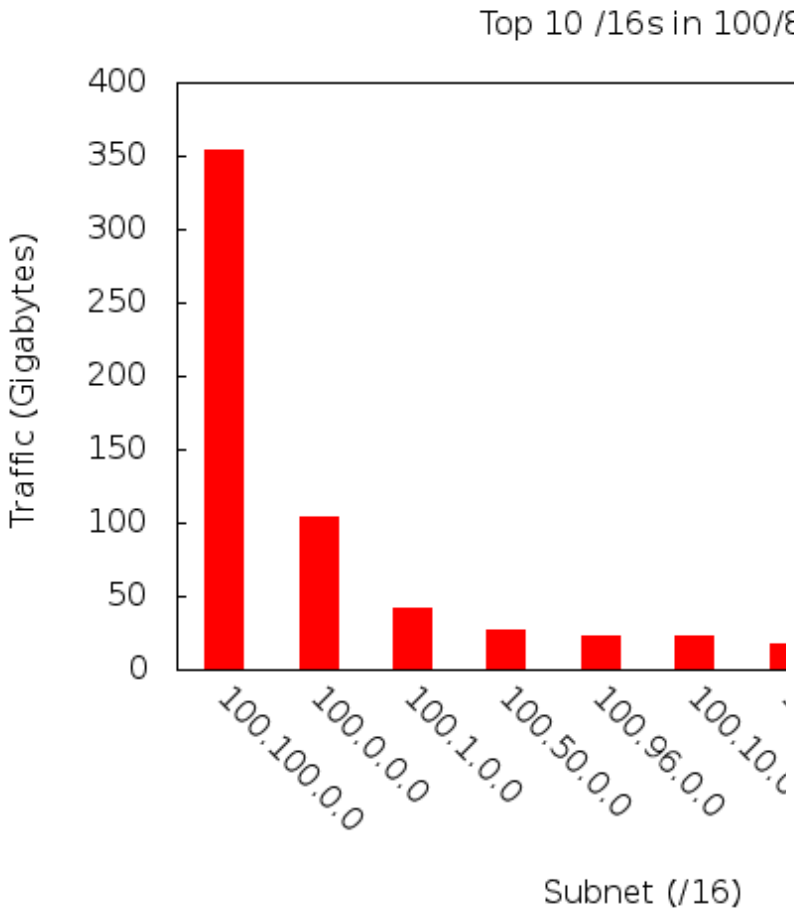
23/8

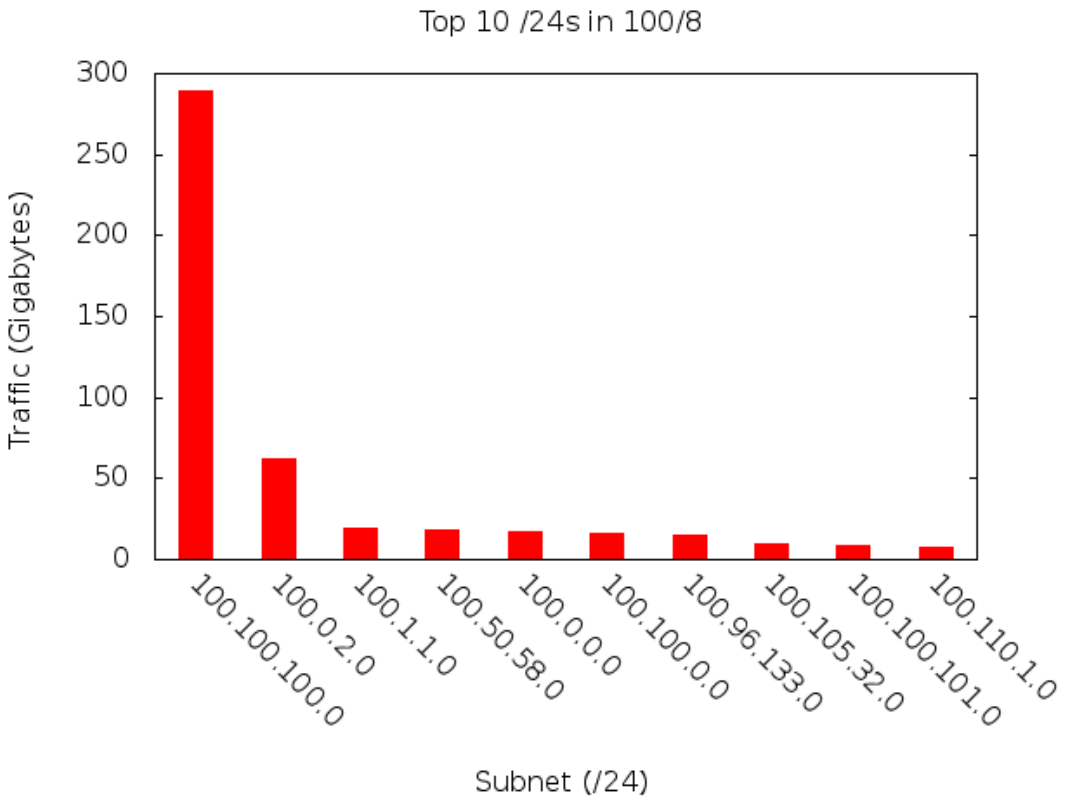
- Traffic from source port 1201 to dest port 3100 from single source to single destination
- Video stream – decoded to 1080p video!

100/8

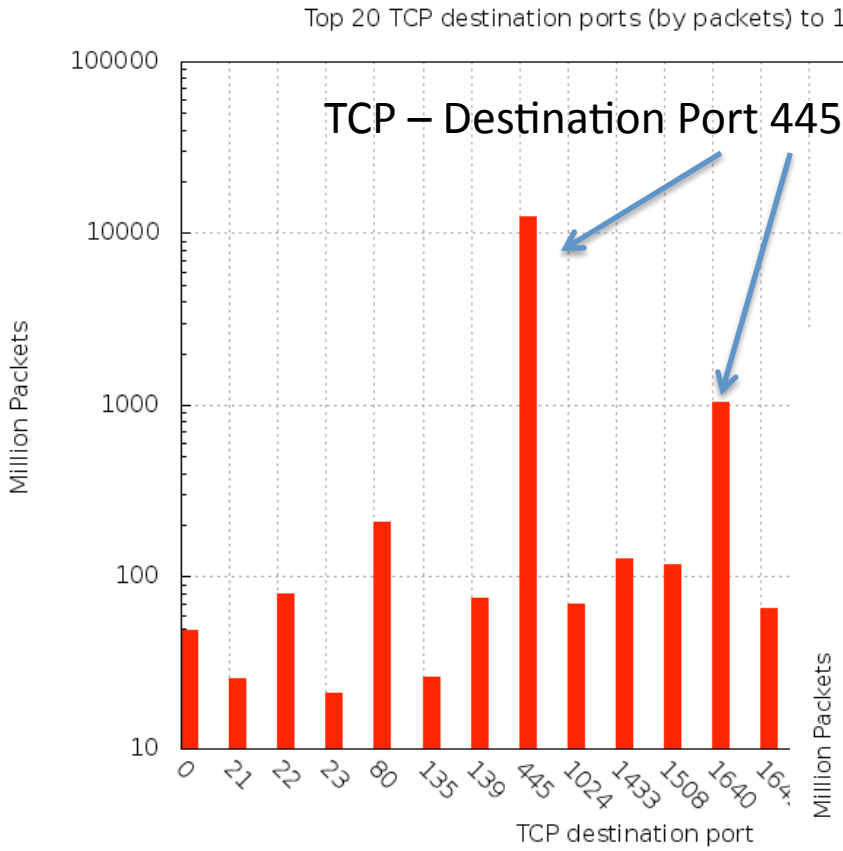

Cumulative Distribution Function of Destination /24s in 100.0.0.0/8
CDF
/24
bytes
Hot-Spotting
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
10000
20000
30000
40000
50000
60000

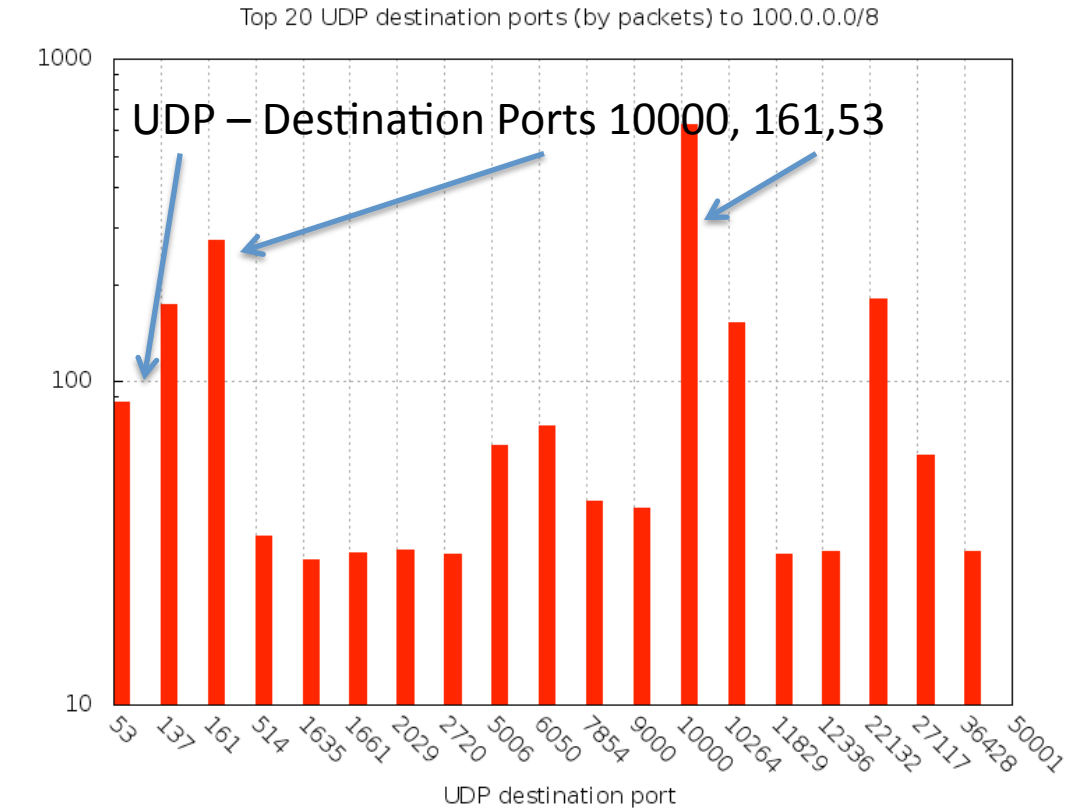
100/8


Top 10 /16s in 100/8
Traffic (Gigabytes)
400
350
300
250
200
150
100
50
0
100.100.0.0
100.0.0.0
100.1.0.0
100.50.0.0
100.96.0.0
Subnet (/16)


Top 10 /24s in 100/8
Traffic (Gigabytes)
300
250
200
150
100
50
0
100.100.100.0
100.0.2.0
100.1.1.0
100.50.58.0
100.0.0.0
100.100.0.0
100.96.133.0
100.105.32.0
100.100.101.0
100.110.1.0
Subnet (/24)

100/8

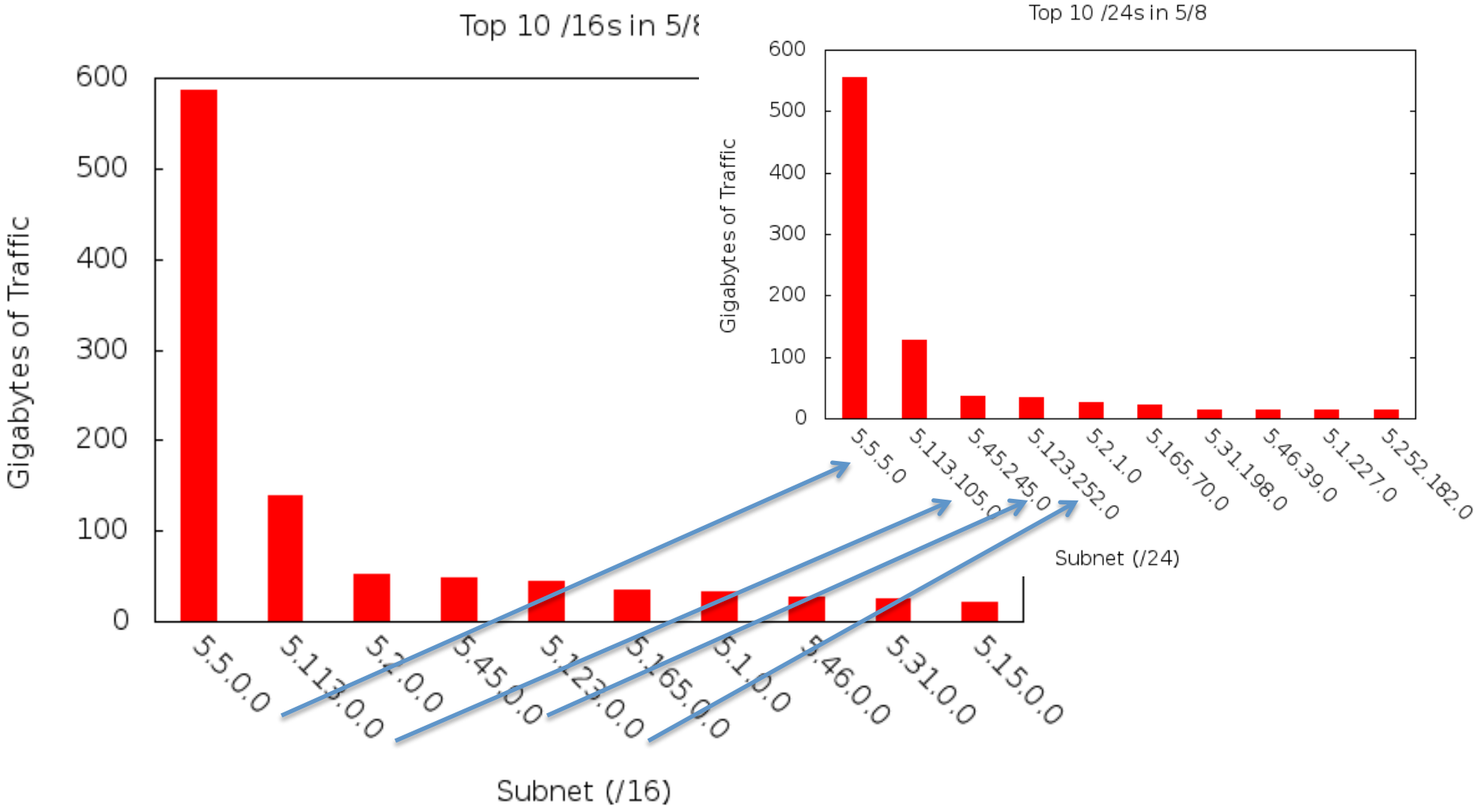

Top 20 TCP destination ports (by packets) to 100.0.0.0/8
TCP – Destination Port 445, 1640
Million Packets
100000
10000
1000
100
10
0
21
22
23
80
135
139
445
1024
1433
1508
1640
TCP destination port


Top 20 UDP destination ports (by packets) to 100.0.0.0/8
UDP – Destination Ports 10000, 161,53
Million Packets
1000
100
10
53
137
161
514
1635
1661
2029
2720
5006
6050
7854
9000
10000
10264
11829
12336
22132
27117
36428
50001
UDP destination port

100/8

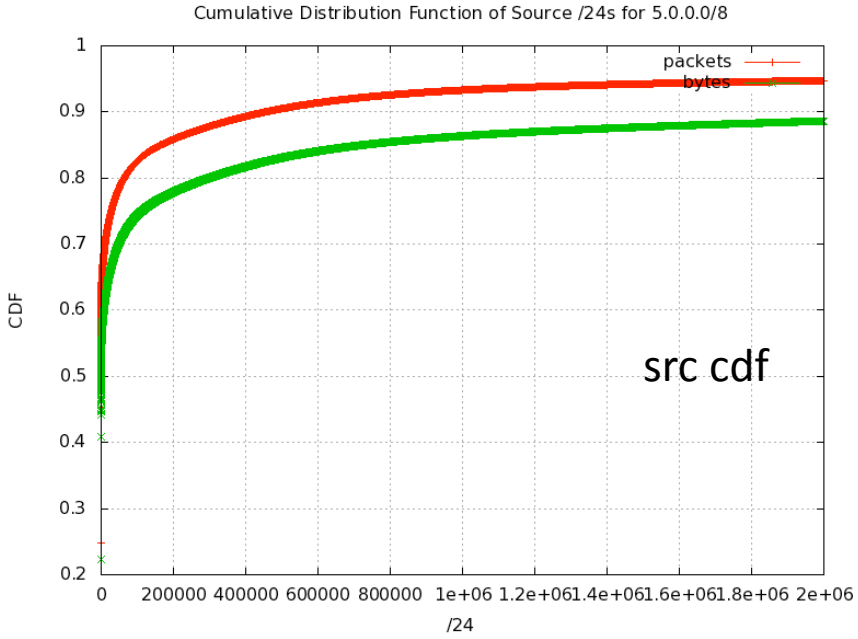
- UDP port 161 – SNMP traffic – default settings in manuals
- UDP source port 10000 – 33 byte packets – micro-torrent some SNMP etc.

5/8

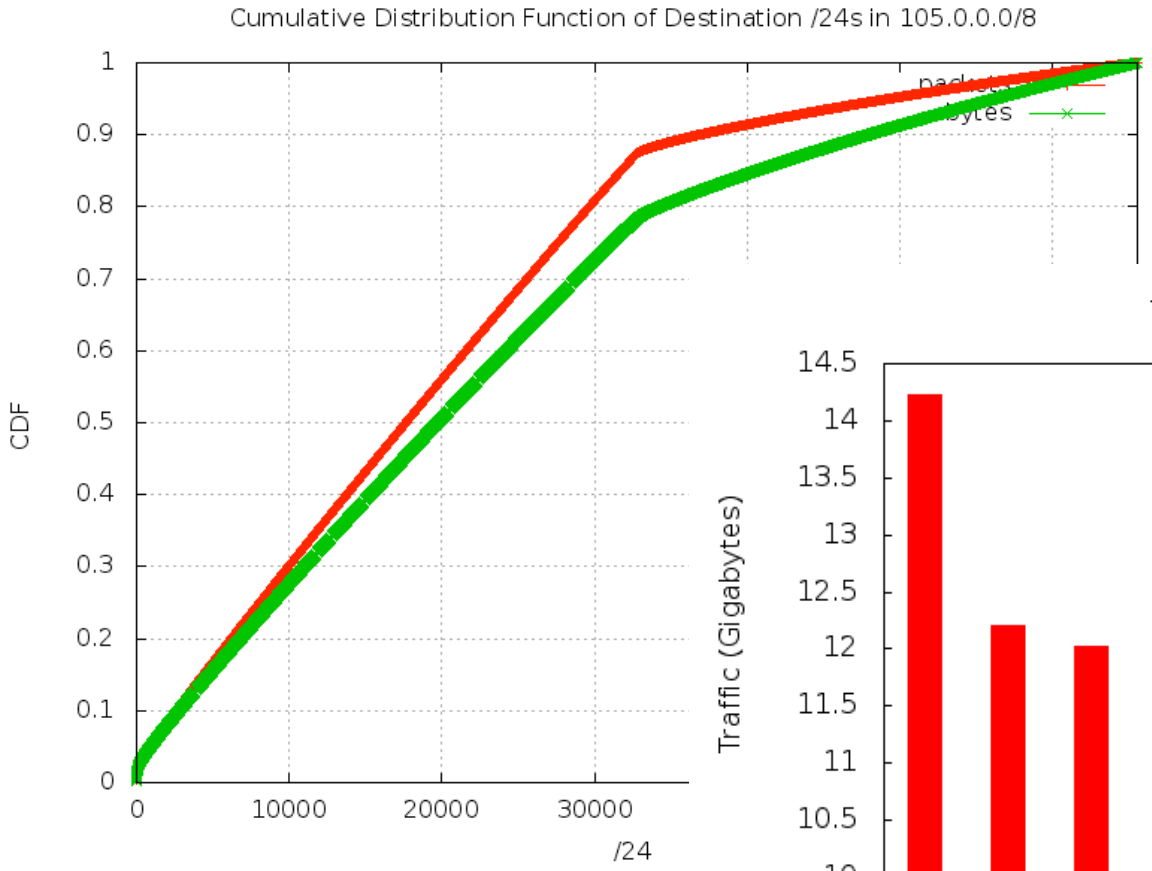

Top 10 /16s in 5/8
Gigabytes of Traffic
600
500
400
300
200
100
0
5.5.0.0
5.113.0.0
5.2.0.0
5.45.0.0
5.123.0.0
5.165.0.0
5.1.0.0
5.46.0.0
5.31.0.0
5.15.0.0
Subnet (/16)
Top 10 /24s in 5/8
Gigabytes of Traffic
600
500
400
300
200
100
0
5.5.5.0
5.113.105.0
5.45.245.0
5.123.252.0
5.2.1.0
5.165.70.0
5.31.198.0
5.46.39.0
5.1.227.0
5.252.182.0
Subnet (/24)

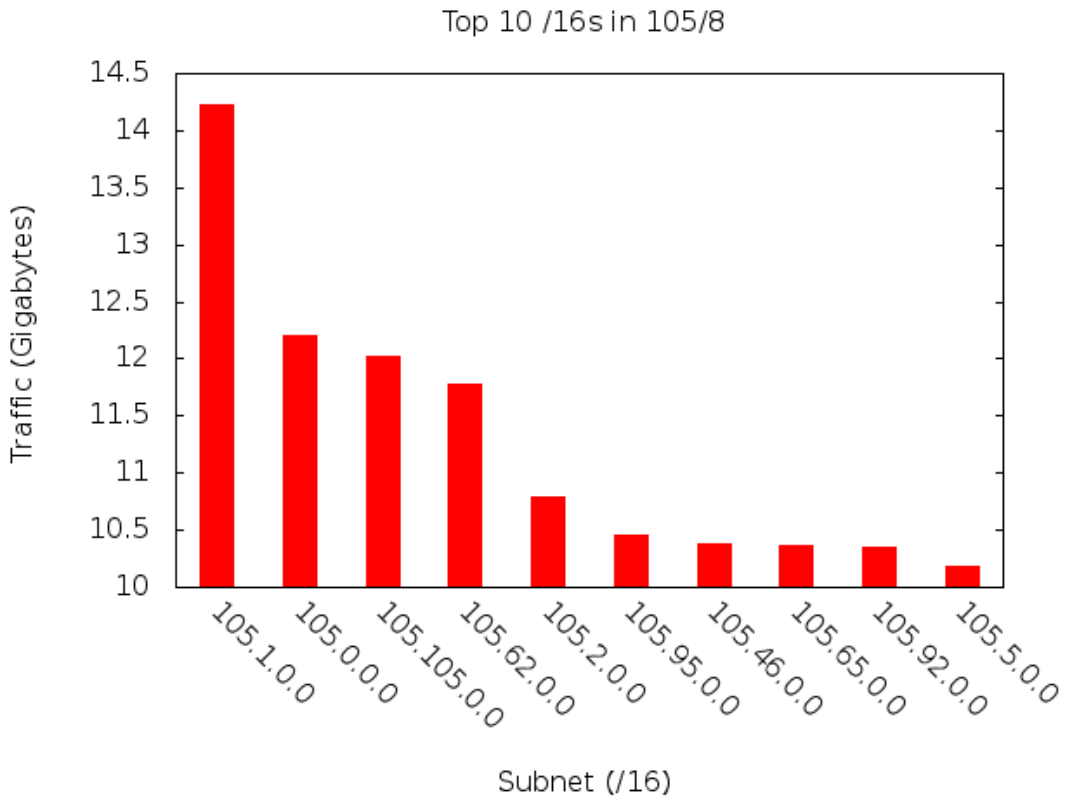
5/8

- Traffic spikes of upto 250Mbps
  - 5.5.5.5 – UDP – 250Byte pkts random ports/srcip
- ICMP6! 5.113.105.0/24
- Flash video – 5.45.245.0/24

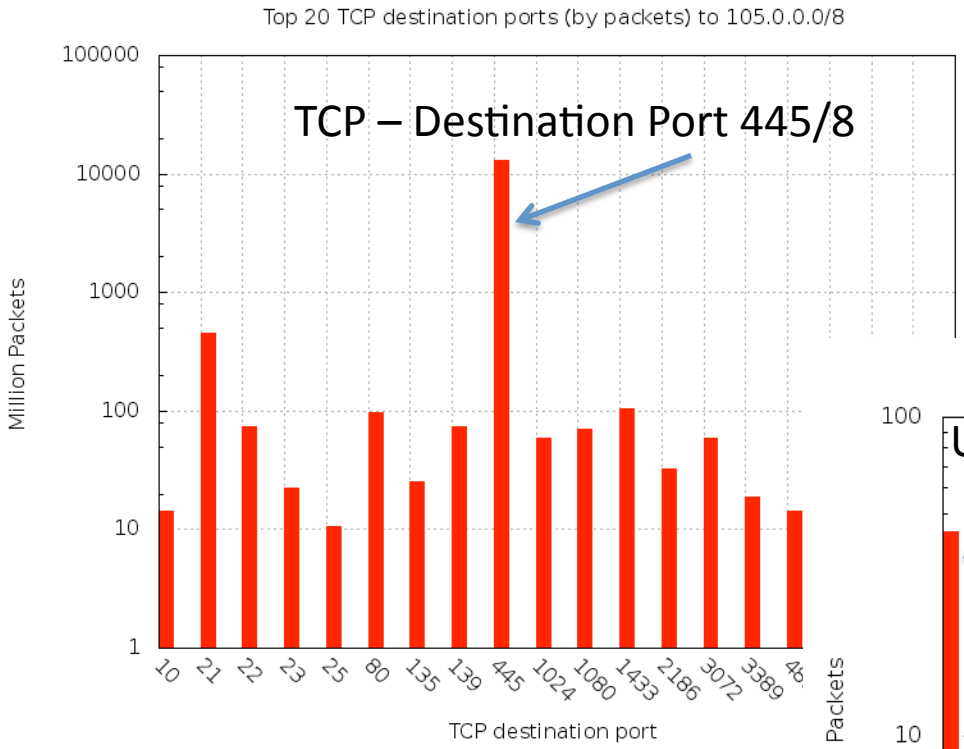


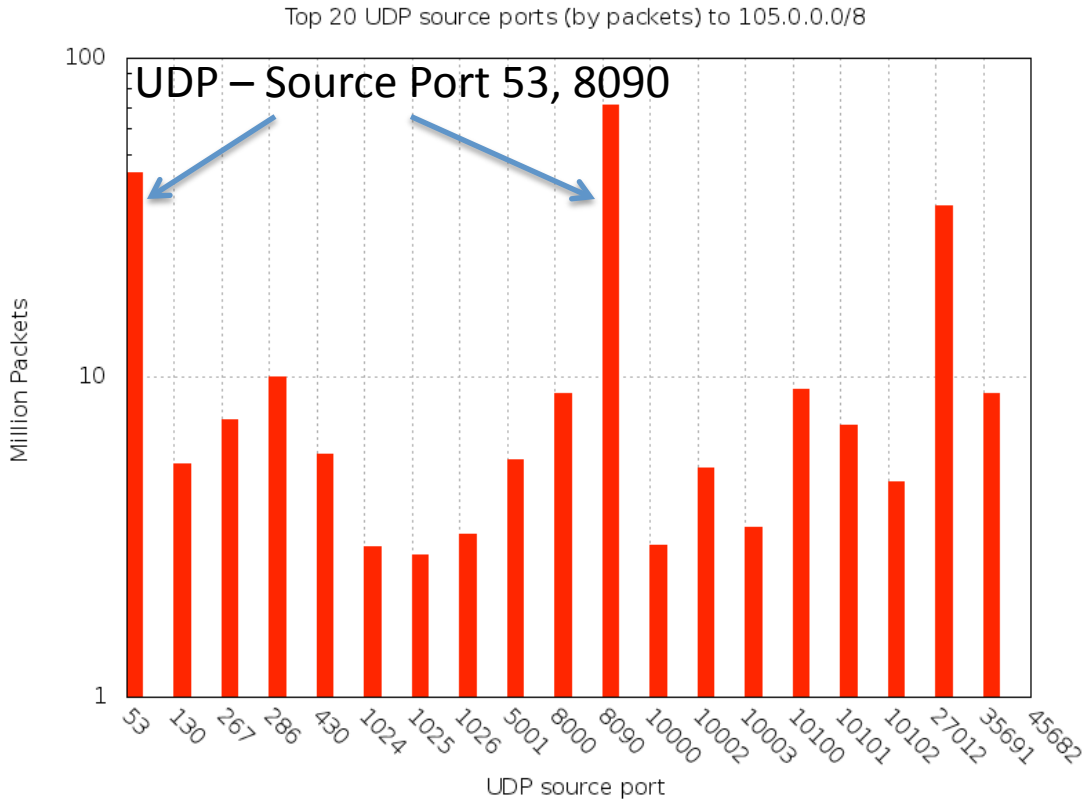
105/8


Cumulative Distribution Function of Destination /24s in 105.0.0.0/8
CDF
/24
bytes
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
10000
20000
30000

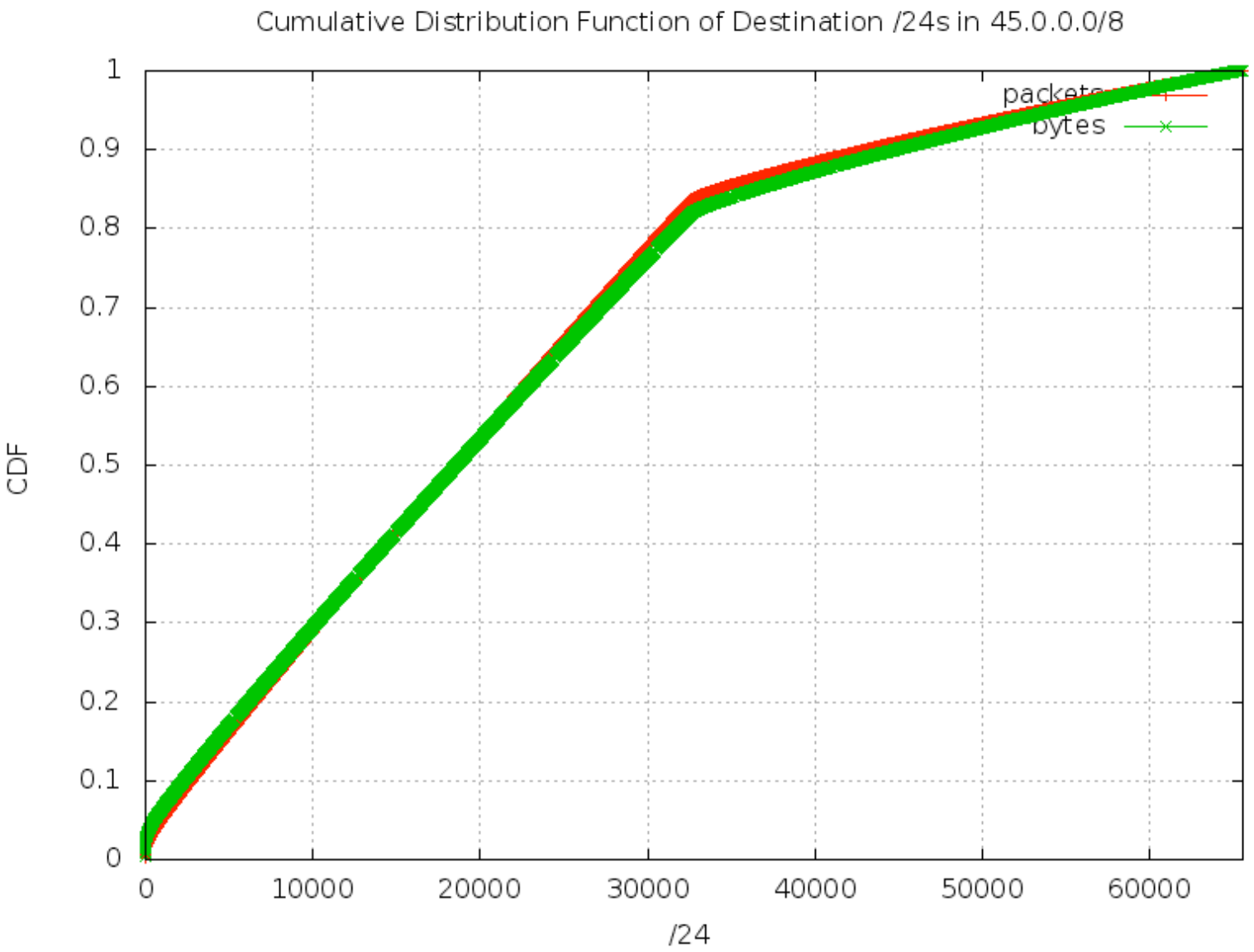

Top 10 /16s in 105/8
Traffic (Gigabytes)
Subnet (/16)
14.5
14
13.5
13
12.5
12
11.5
11
10.5
10
105.1.0.0
105.0.0.0
105.105.0.0
105.62.0.0
105.2.0.0
105.95.0.0
105.46.0.0
105.65.0.0
105.92.0.0
105.5.0.0

105/8

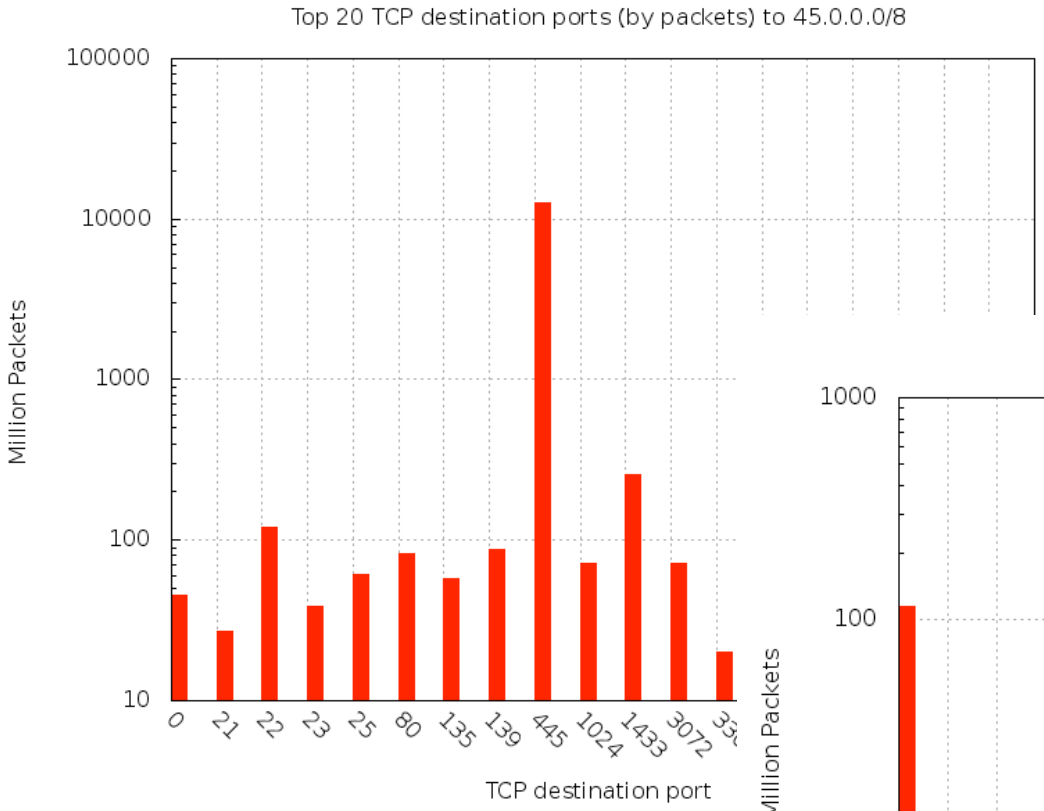

Top 20 TCP destination ports (by packets) to 105.0.0.0/8
TCP – Destination Port 445/8
Million Packets
100000
10000
1000
100
10
1
10
21
22
23
25
80
135
139
445
1024
1080
1433
2186
3072
3389
TCP destination port

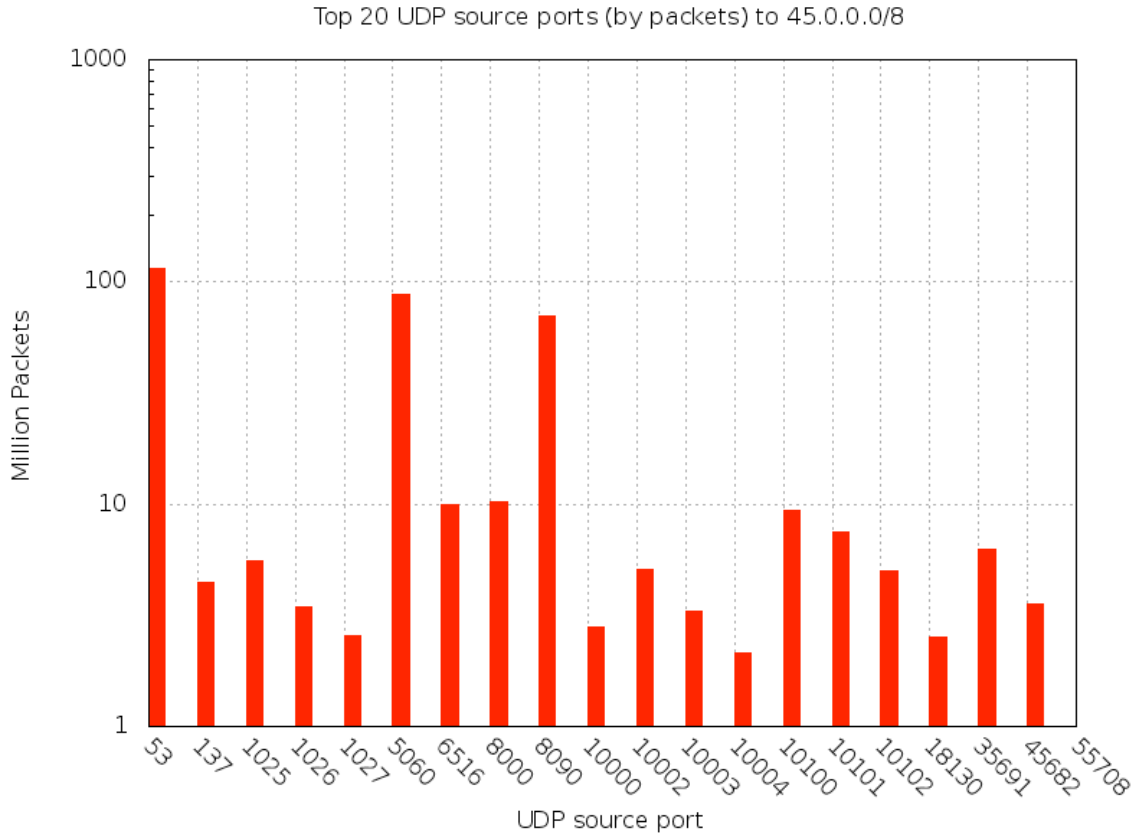

Top 20 UDP source ports (by packets) to 105.0.0.0/8
UDP – Source Port 53, 8090
Million Packets
100
10
1
53
130
267
286
430
1024
1025
1026
5001
8000
8090
10000
10002
10003
10100
10101
10102
27012
35691
45682
UDP source port

45/8

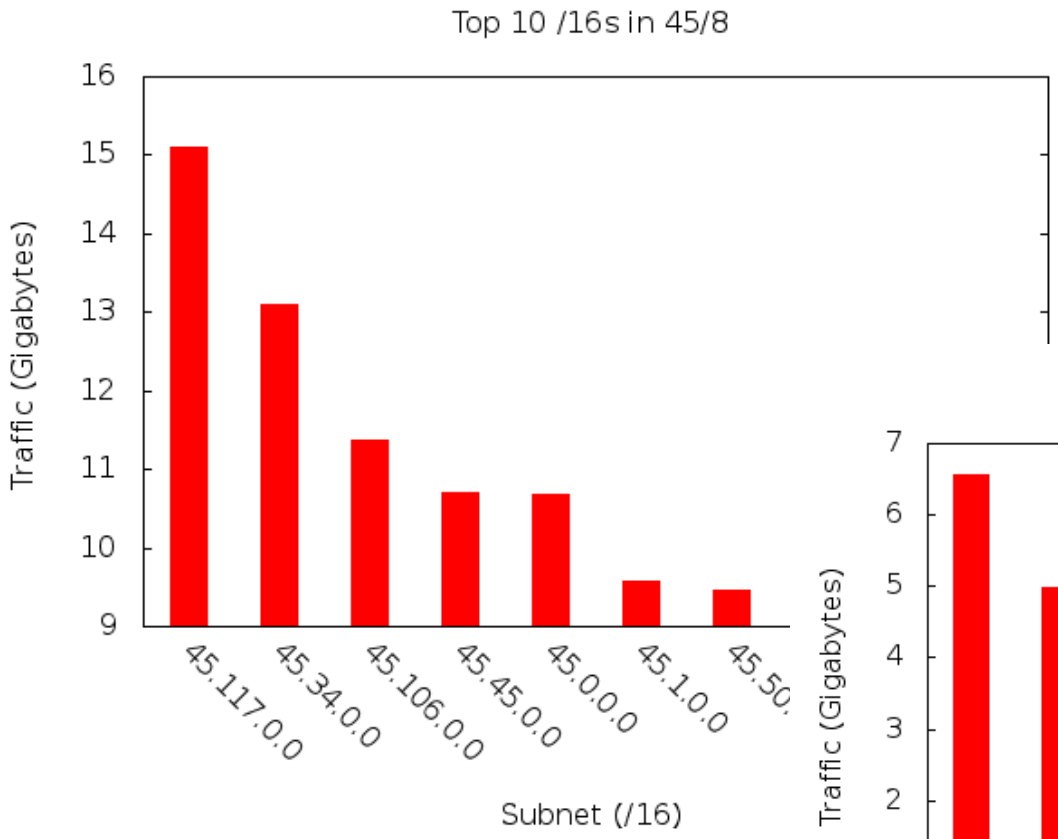

Cumulative Distribution Function of Destination /24s in 45.0.0.0/8
CDF
/24
packets
bytes
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
10000
20000
30000
40000
50000
60000

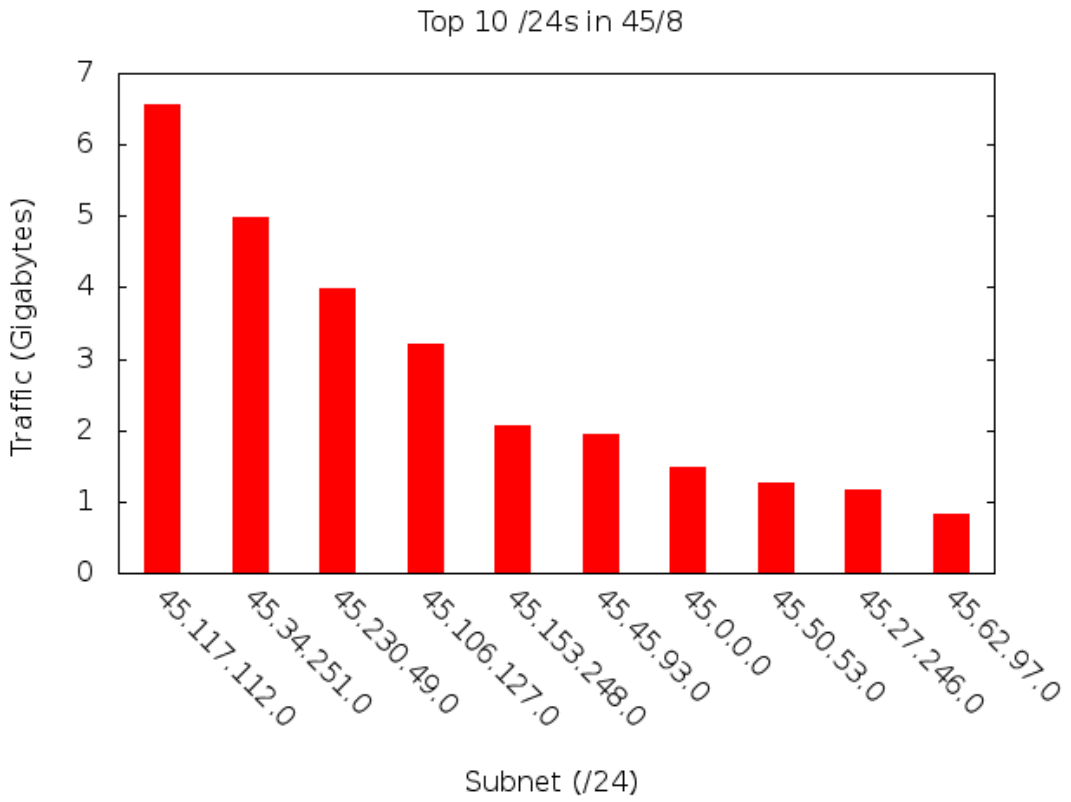
45/8


Top 20 TCP destination ports (by packets) to 45.0.0.0/8
Million Packets
100000
10000
1000
100
10
0
21
22
23
25
80
135
139
445
1024
1433
3072
TCP destination port


Top 20 UDP source ports (by packets) to 45.0.0.0/8
Million Packets
1000
100
10
1
53
137
1025
1026
1027
5060
6516
8000
8090
10000
10002
10003
10004
10100
10101
10102
18130
35691
45682
55708
UDP source port

45/8


Top 10 /16s in 45/8
Traffic (Gigabytes)
16
15
14
13
12
11
10
9
45.117.0.0
45.34.0.0
45.106.0.0
45.45.0.0
45.0.0.0
45.1.0.0
45.50.
Subnet (/16)


Top 10 /24s in 45/8
Traffic (Gigabytes)
7
6
5
4
3
2
1
0
45.117.112.0
45.34.251.0
45.230.49.0
45.106.127.0
45.153.248.0
45.45.93.0
45.0.0.0
45.50.53.0
45.27.246.0
45.62.97.0
Subnet (/24)

Conclusions

- Pollution tends to greatly skew darknet traffic
  - Diverse darknets – diverse reasons for pollution
- General characteristics of background radiation:
  - 15-30Mbps of base traffic for /8 spikes upto 70Mbps
  - Heavily dominated by conficker for TCP traffic
  - DNS for UDP traffic from small set of servers (*)
- Sharing results with relevant RIRs so that they can determine appropriate action regarding cleanup/ quarantine

Conclusions

- 100/8, 5/8, 23/8 show relatively abnormal amounts of traffic to portions of the address space
  - Special consideration for:
    - 37.61.54.0/24
    - 23.19.5/24
    - 100.100.100.0/24, 100.0.2.0/24, 100.1.1.0/24
    - 5.5.5.0/24, 5.13.105/24, 5.45.245.0/24, 5.123.252.0/24
  - 45/8, 105/8 relatively clean