Observation-Hypothesis

ESNOG Bilbao

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ESNOG Madrid

New GORE/ESNOG RULE

Only held in venues with
“Strange”
Floral Art ?????>

What's going on in 1.0.0.0/8

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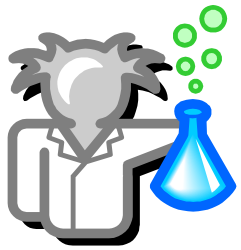


“Standard” Address Testing

- IANA assigns /8 to APNIC
  - RIPE NCC, on APNIC’s behalf, announces selected subnets to test “reachability”
    - RIS, other tests applied.
    - Encourage operational community to test reachability
- APNIC releases /8 to registration services
  - Assignments and allocations proceed

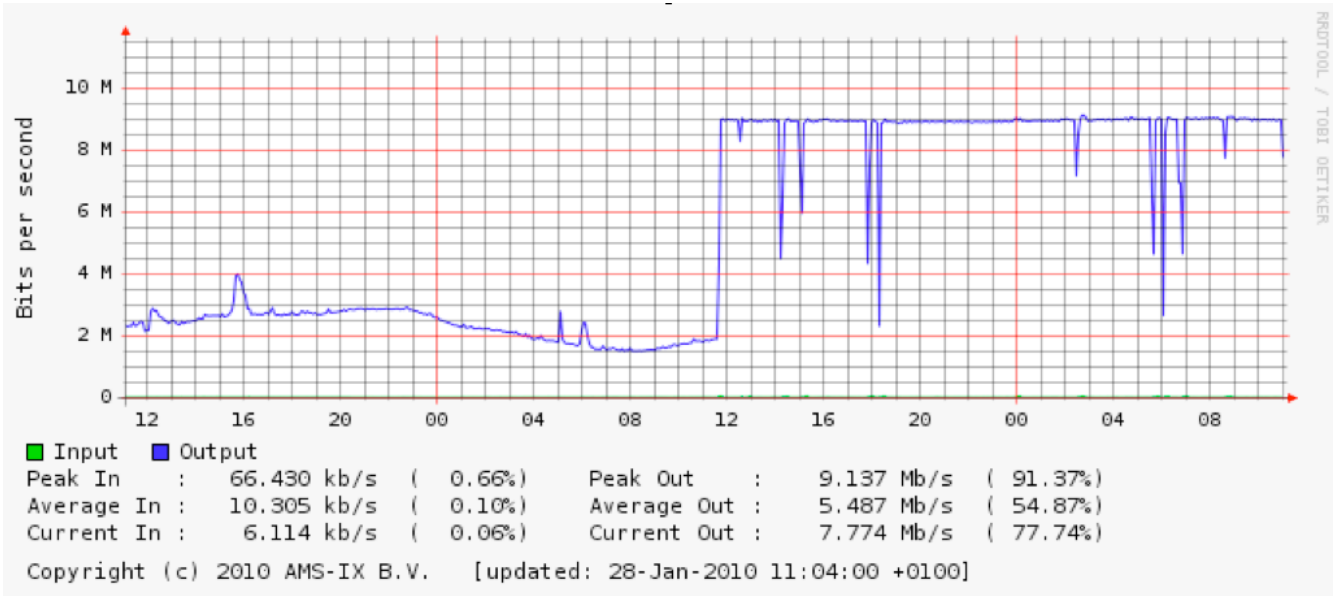
APNIC gratefully acknowledges the assistance of the RIPE NCC and community supporting tests on AP ranges!

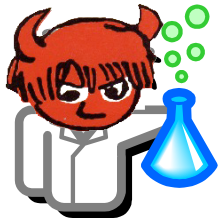
Except..

- IANA allocates Net 1.0.0.0/8 to APNIC in January 2010
  - We had some sense this was going to be different
  - Just how different wasn't clear
  - ….

(Not unexpected) First Warning

- RIPE announces 4 /24s for normal testing at AMS-IX
  - Link floods
  - announcements withdrawn.
  - Report written up on RIPE labs.





Lets Get Serious about Bad Traffic

- There is an issue here about 1/8 acting as a traffic magnet for unsolicited traffic
  - Just how “bad” is 1/8?
  - Are some bits REALLY bad?
  - What sort of badness are we seeing in the traffic?
- So we commenced a program to analyze the “badness” in 1/8

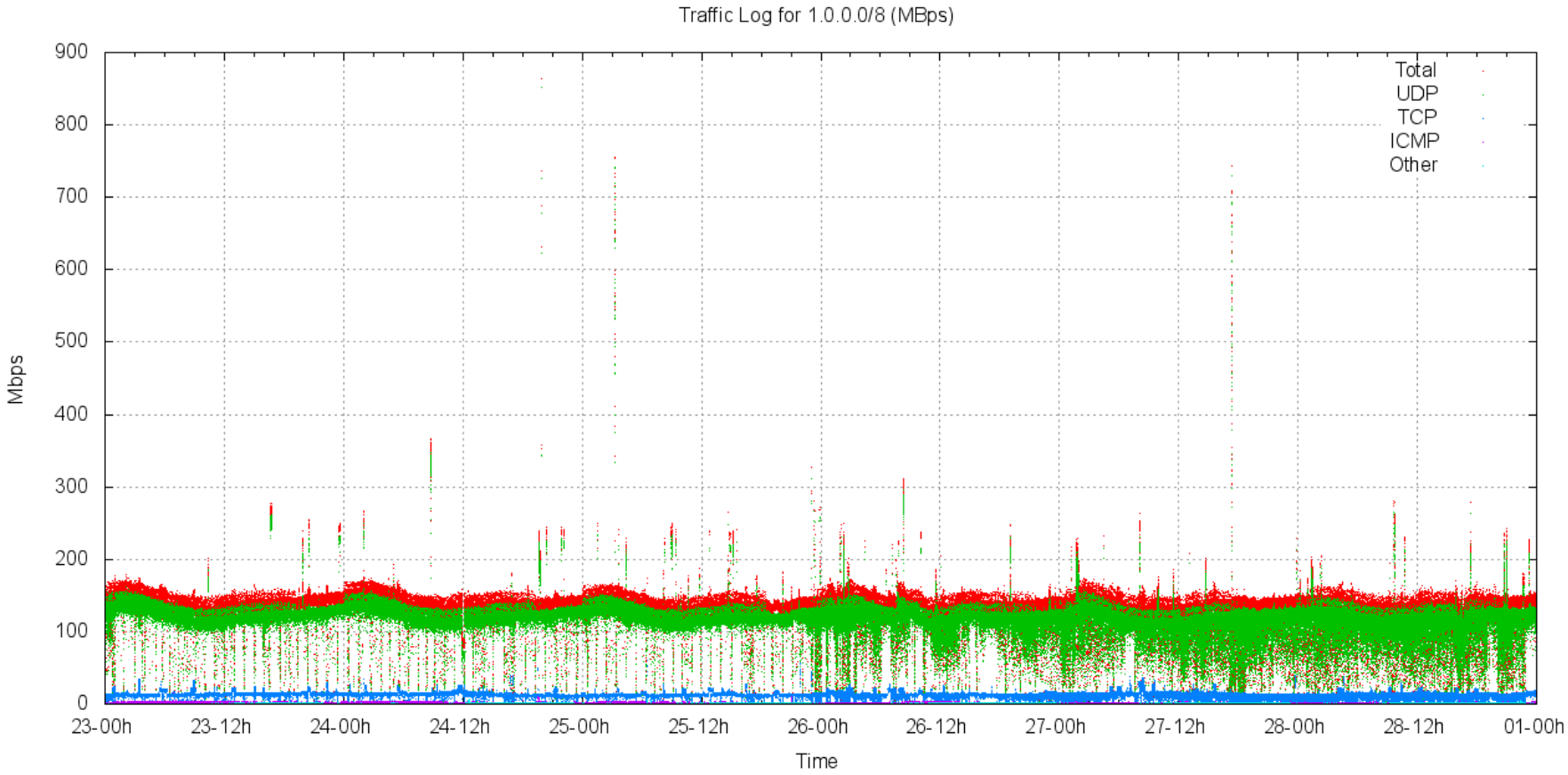
Bigger Badder Faster

- Need multi-gig collectors and large disk space
  - Exceeds APNIC's transit capacity
- Sought collaborators in R&D & Ops community
  - Many responses, for which we thank everyone
  - We worked with Merit, AARNet, Google and Youtube for this exercise
    - Rapid deployment possible, Tb file systems available with good IX connectivity within a couple of days – thanks!
- Long announcements. 1 week+
  - Explore >24h traffic patterns, diurnal behaviours

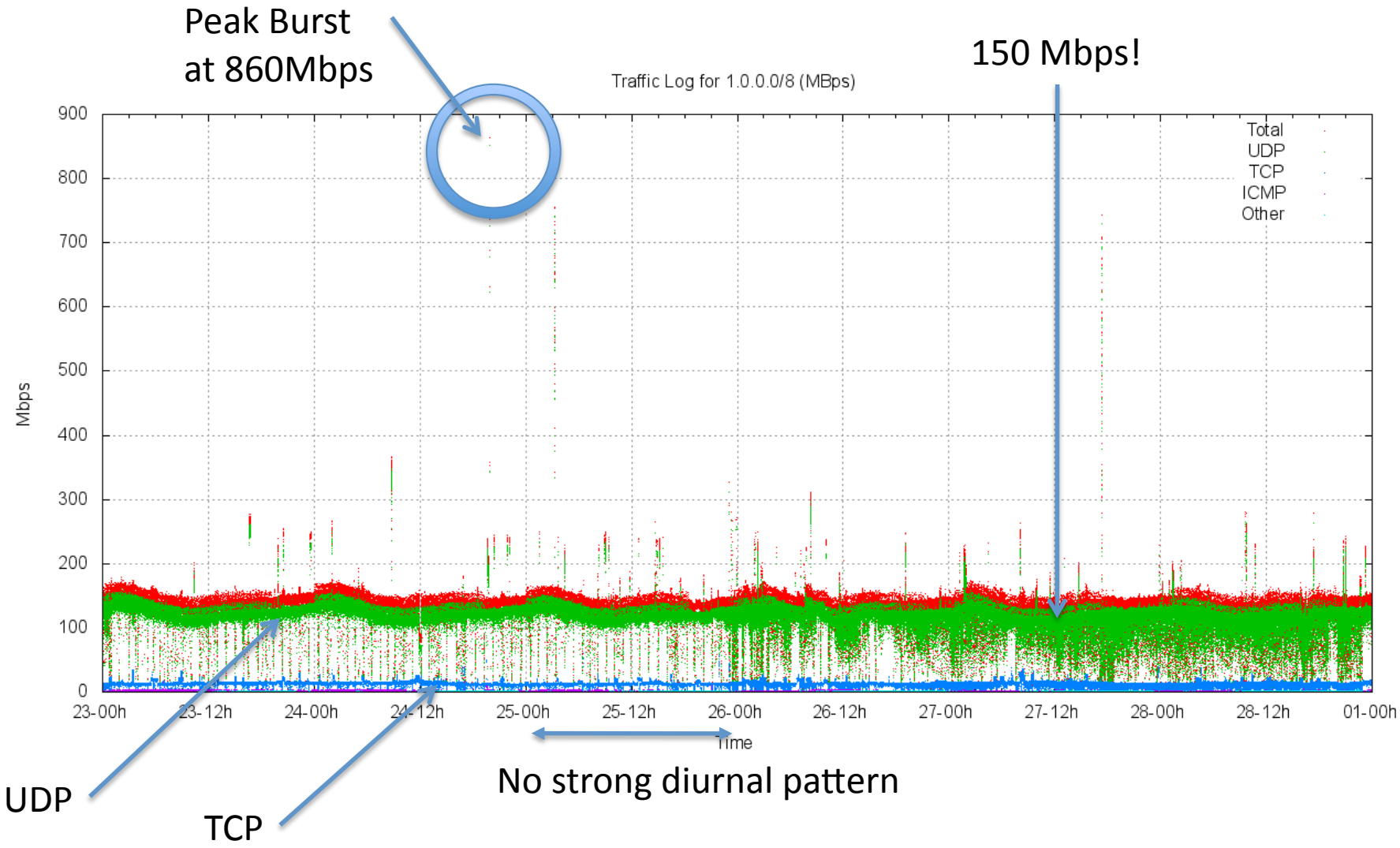
Tickling Badness

- Simple code to ACK all incoming TCP SYNs
  - If any follow up packet sent, that's interesting!
    - See if we can 'draw traffic out of the woodwork'
    - Distinguish one-way probes and DDoS engines, scanners from 'real' uses of the network
  - Based on Geoff's lightweight TCP experimental 'very bad idea' code
    - Not such a bad idea after all then!
- PCAP filter to collect all traffic, dump to disk
  - Applicable to passive and active/tickled capture

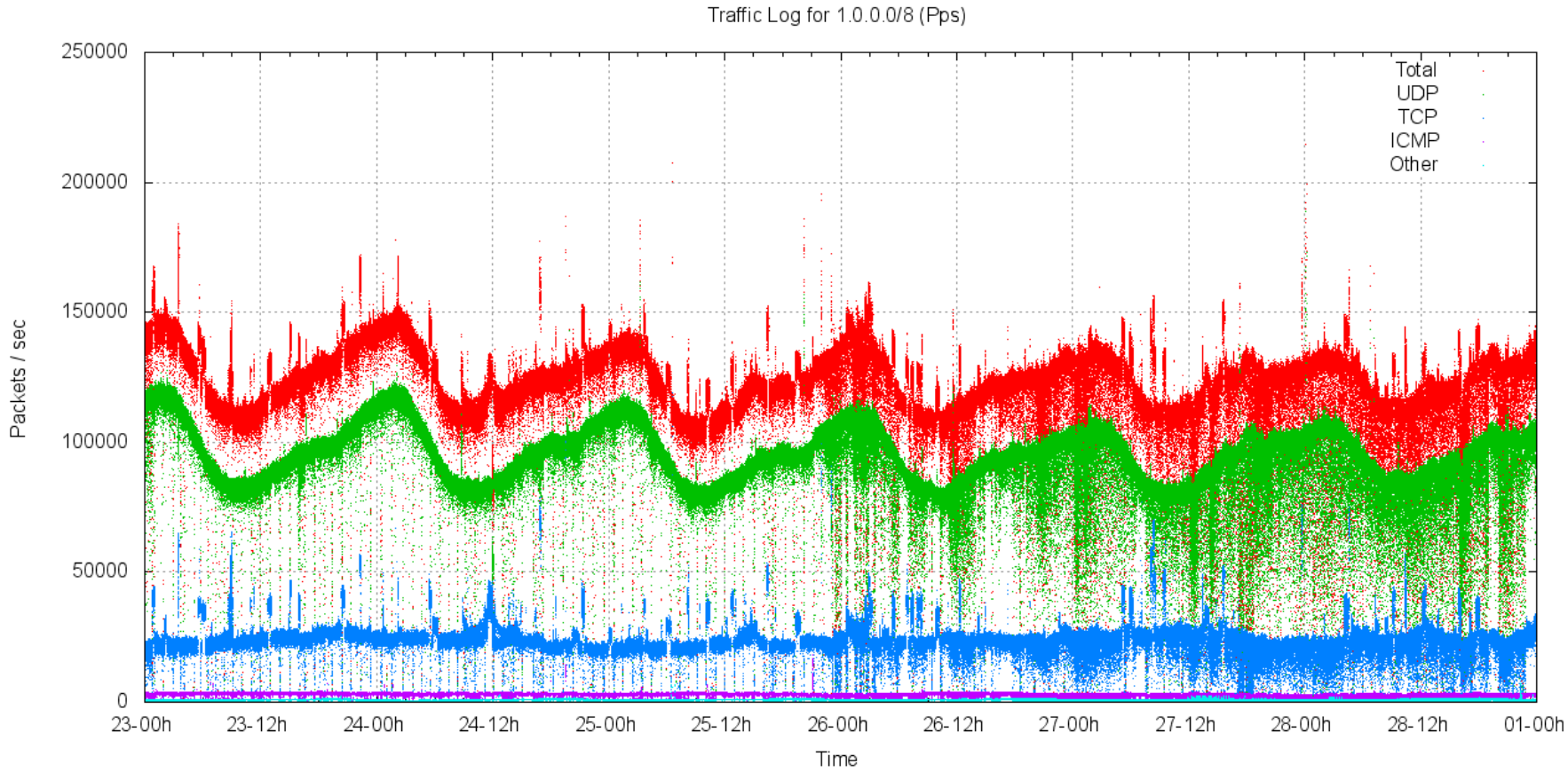
Traffic to 1.0.0.0/8



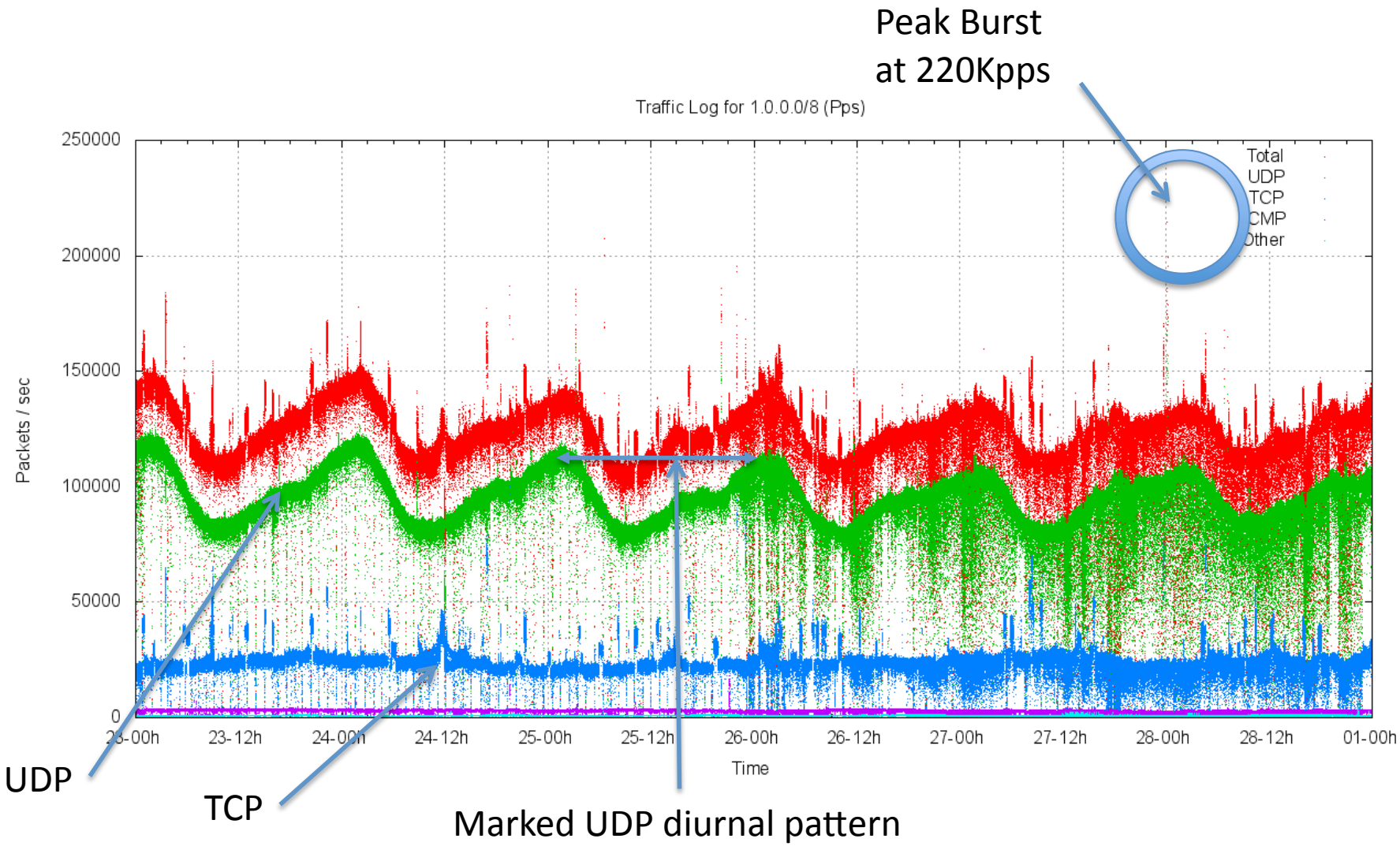
Traffic to 1.0.0.0/8



Packet Rate to 1.0.0.0/8



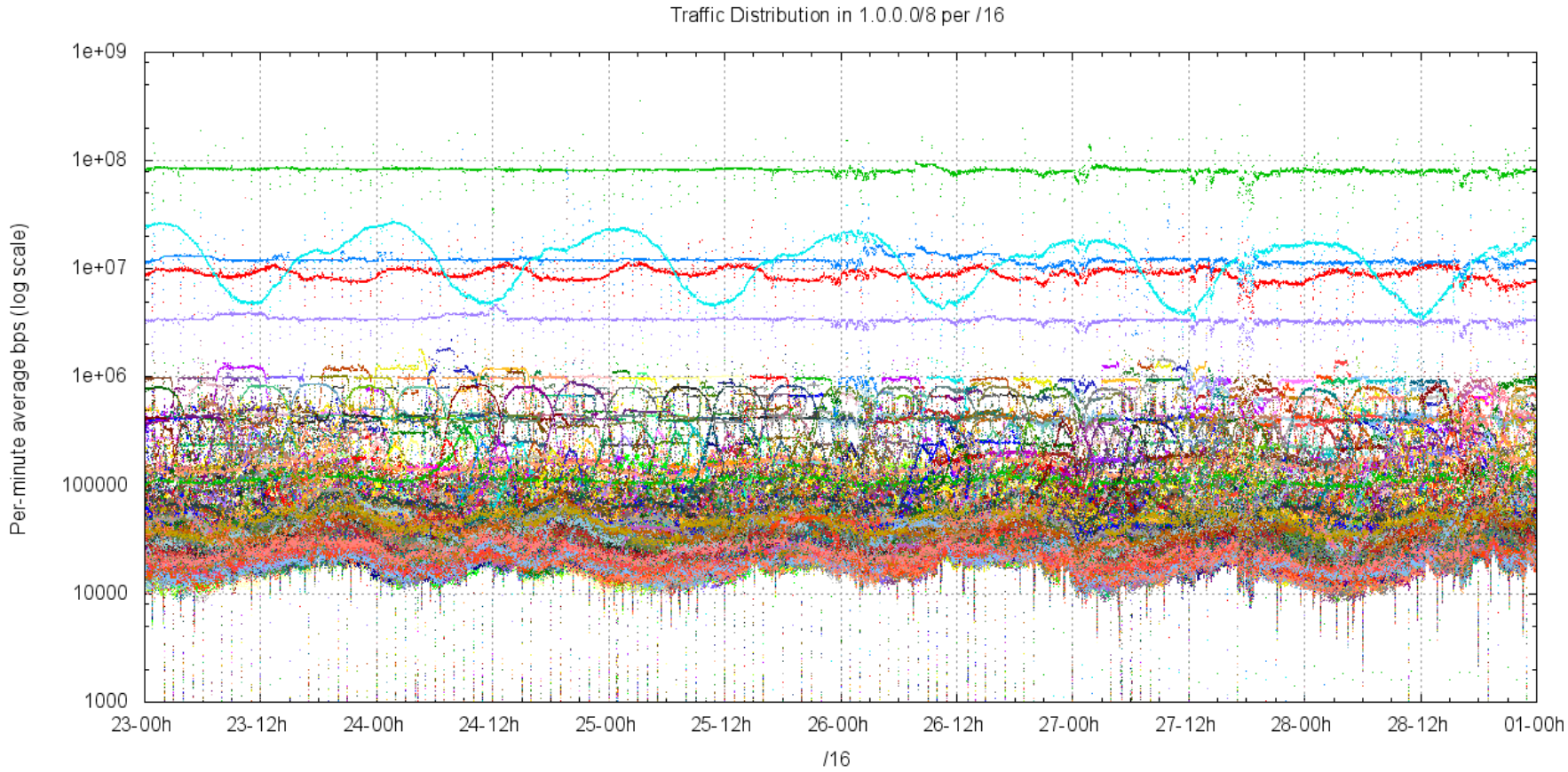
Packet Rate to 1.0.0.0/8



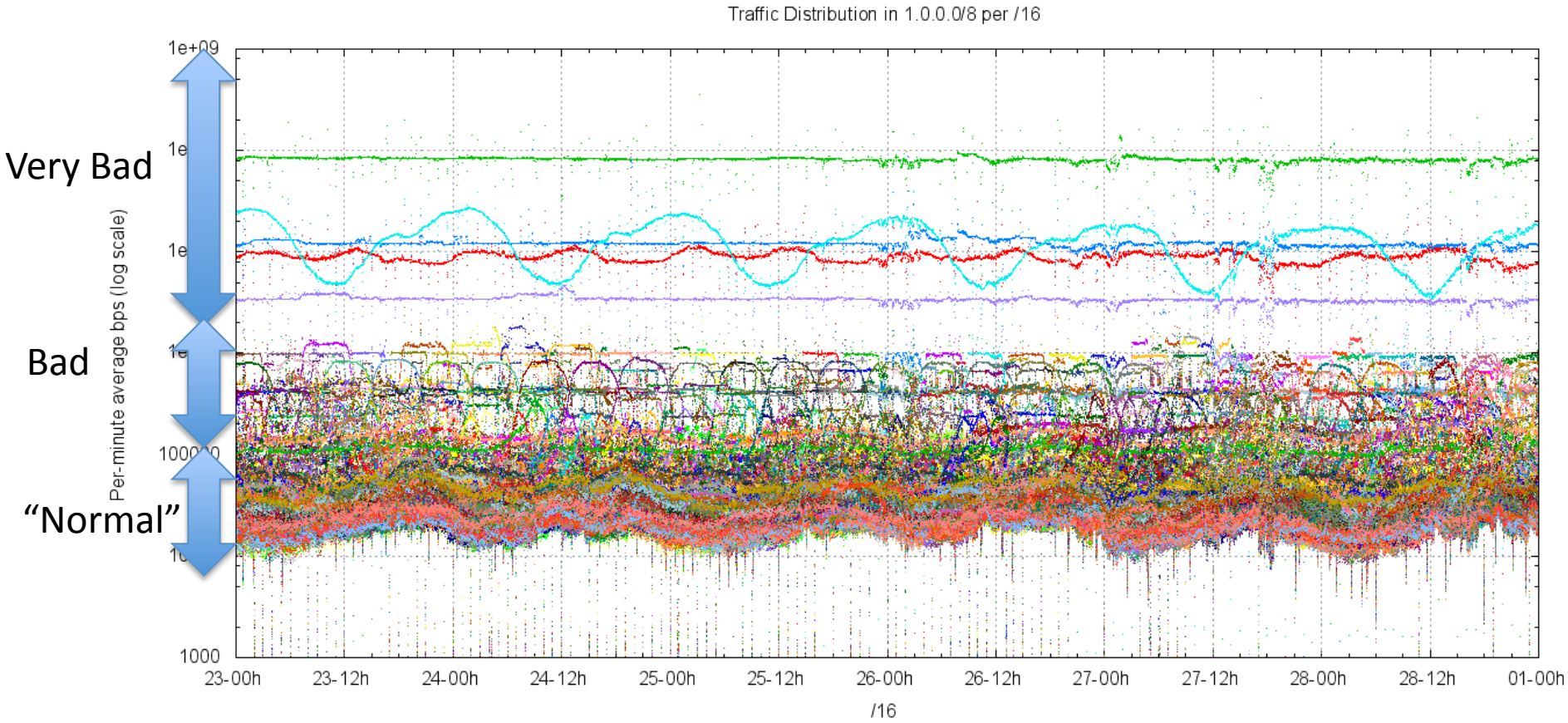
Per subnet

- Sum packet counts seen per second, running average, promote to /16 and /24 counts
  - Rapidly identifies sub-spaces of the /8 range which have high traffic
- Establishes baseline load across entire net
  - But is it uniform?

Traffic Spread by /16



Traffic Spread by /16



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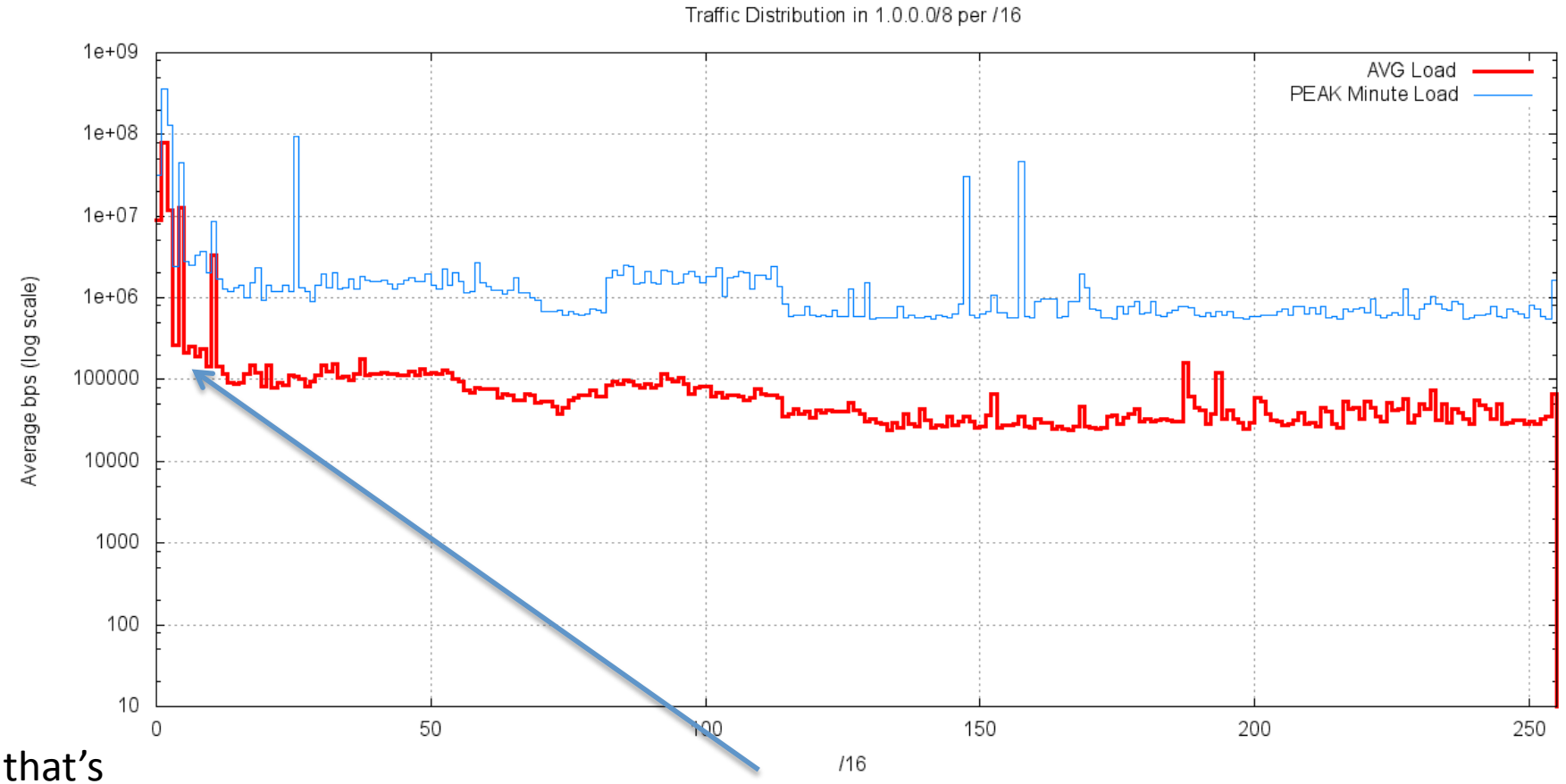


Yes, that's a Log Scale!

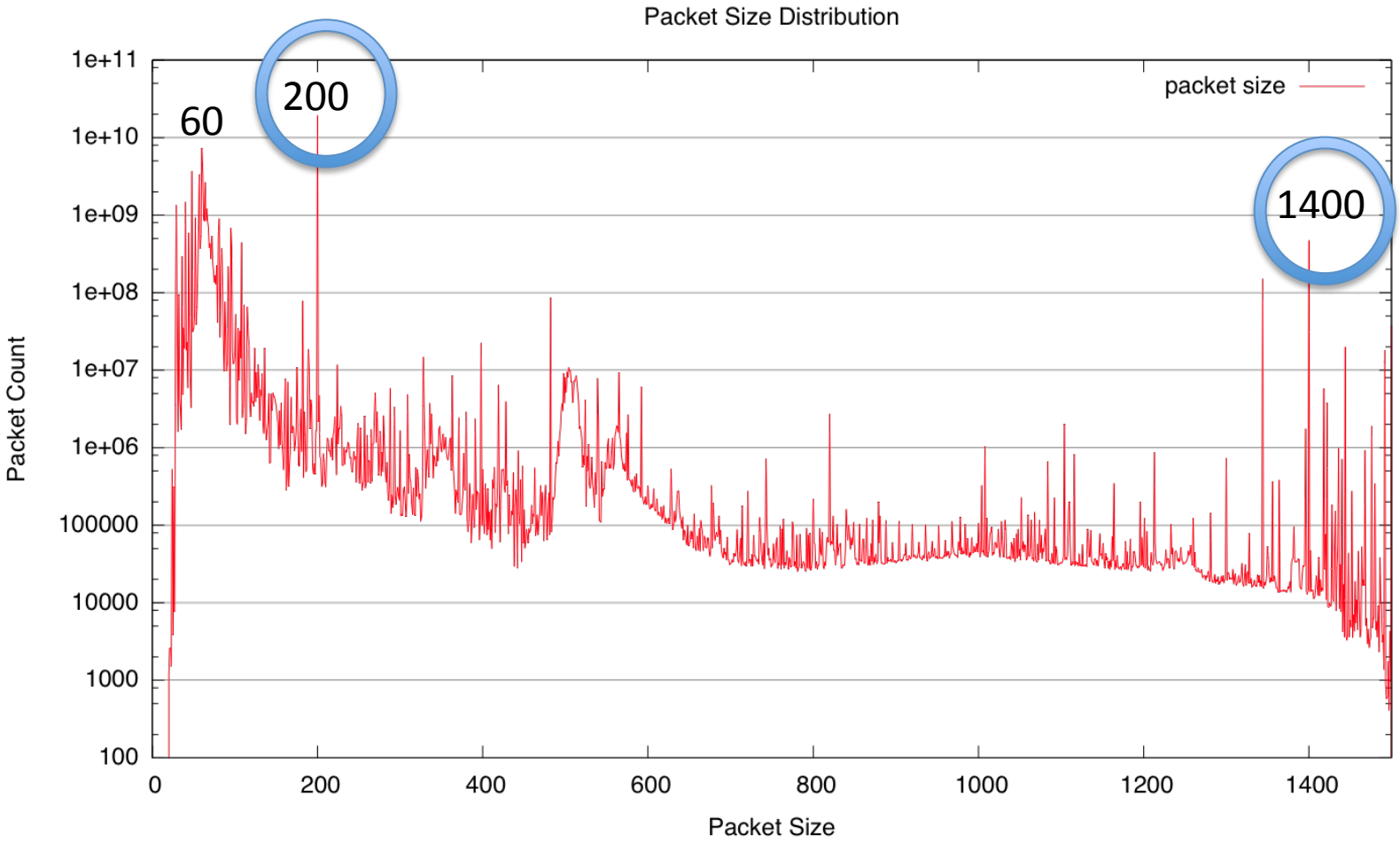
The "hot spots" appear to lie in the low /16s

What is in all these packets?

Packet Size Distribution

- Most packets are very small (< 120 bytes)
- BUT 31% of the packets are exactly 200 bytes in length

Packet Size Distribution



IP Protocol Distribution

76%	UDP
20%	TCP
2.5%	ICMP
0.6%	6in4 (proto 41)
0.1%	GRE

This high concentration of UDP is unusual. Other networks see 55% TCP and 40% UDP in their levels of unsolicited incoming traffic.

UDP Port Distribution

Port	*Count*	*Description*
15206	45%	SIP response with RTP payload
33368	12%	some form of DNS?
0	6%	huh?
514	4%	syslog
80	3%	looks like firewall probing
33528	3%	pseudo-DNS again
3072	1.5%	and more of the same
53	1.4%	real DNS

port 15206?

```
08:48:36.000111 IP (tos 0x8, ttl 55, id 0, offset 0, flags [DF], proto UDP (17), length
200) 208.48.241.3.36670 > 1.1.1.1.15206: [udp sum ok] UDP, length 172
        0x0000:  4508 00c8 0000 4000 3711 7fe7 d030 f103  E.....@.7....0..
        0x0010:  0101 0101 8f3e 3b66 00b4 878c 8008 dbba  .....>;f........
        0x0020:  cc7b 0288 55dd 8ce2 7a63 677b 7e66 6b14  .{..U...zcg{~fk.
        0x0030:  6962 1517 1613 1d05 0605 12d4 9d8c 8dea  ib..............
        0x0040:  6617 ef83 8d9e eee5 f85d 6050 919a 9758  f........]`P...X
        0x0050:  6c66 49d6 5b4d dac5 c3d9 4453 c2d5 4d7a  lfI.[M....DS..Mz
        0x0060:  647f 7966 6f67 7360 1510 1d14 111f 0404  d.yfogs`........
        0x0070:  6490 8e8f 9566 16ce 9b84 859b 93ef 6510  d....f........e.
        0x0080:  4491 859c 5b6e 626d 7b4b 4ece d64d 4f7f  D...[nbm{KN..MO.
        0x0090:  5ac4 555d 4976 7b67 7b7c 7073 6e15 6c15  Z.U]Iv{g{|psn.l.
        0x00a0:  141b 0619 1b15 dd86 8e9b c514 d887 8399  ................
        0x00b0:  9e9c 9de0 637a e693 91d9 617b 7f4c 7764  ....cz....a{.Lwd
        0x00c0:  47d5 5e45 7c46 f7c4                      G.^E|F..
```

UDP packets of 172 bytes in size, appears to point to some kind of audio streaming going on here

And SIP as well..

```
08:48:36.003010 IP 77.165.37.131.5060 > 1.1.1.1.5060: SIP, length: 486
        0x0000:  4508 0202 bf3e 0000 3411 507b 4da5 2583  E....>..4.P{M.%.
        0x0010:  0101 0101 13c4 13c4 01ee b101 5245 4749  ............REGI
        0x0020:  5354 4552 2073 6970 3a31 2e31 2e31 2e31  STER.sip:1.1.1.1
        0x0030:  2053 4950 2f32 2e30 0d0a 4672 6f6d 3a20  .SIP/2.0..From:.
        0x0040:  3c73 6970 3a47 6c6f 6261 6c55 4131 4031  <sip:GlobalUA1@1
        0x0050:  2e31 2e31 2e31 3a35 3036 303e 3b74 6167  .1.1.1:5060>;tag
        0x0060:  3d38 3061 6537 6530 302d 6330 6138 3031  =80ae7e00-c0a801
        0x0070:  6665 2d31 3363 342d 3435 3032 382d 3533  fe-13c4-45028-53
        0x0080:  6264 6234 2d34 3036 6638 3837 332d 3533  bdb4-406f8873-53
        0x0090:  6264 6234 0d0a 546f 3a20 3c73 6970 3a47  bdb4..To:.<sip:G
        0x00a0:  6c6f 6261 6c55 4131 4031 2e31 2e31 2e31  lobalUA1@1.1.1.1
        0x00b0:  3a35 3036 303e 0d0a 4361 6c6c 2d49 443a  :5060>.
```

TCP Port Distribution

Port	*Count*	*Description*
21	40%	ftp
80	9%	http
1433	4%	ms-sql – (slammer lives!)
455	3%	ms-ds – (slammer again!)
6112	2%	?
25	2%	smtp

Who's Bad?

/16 Address Prefix	Average Traffic(AS35361)	Average Traffic(AS237)
1.1.0.0/16	86,757 kbps	79,981 kbps
1.4.0.0/16	19,714 kbps	12,564 kbps
1.0.0.0/16	10,241 kbps	8,816 kbps
1.10.0.0/16	3,656 kbps	3,320 kbps
1.2.0.0/16	3,611 kbps	12,010 kbp

?

Bad, or …

Hanlon's Razor:

> "Never attribute to malice that which can be adequately explained by stupidity."
>
> *(or "cock-up before conspiracy!")*

A lot of this traffic appears to be leakage from private network domains

Some traffic is scanning, some is virus and worms, but the majority of traffic is leakage

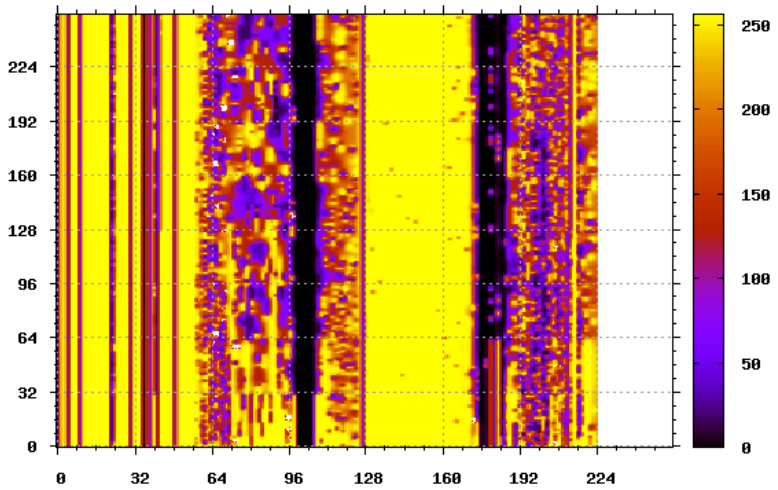
Outcomes

- Holdback on the worst 5 /16s of net-1 recommended for the moment
  - Subject to ongoing testing
    - Parts of these blocks may become viable to release to community
    - Some parts clearly unusable for foreseeable future
- Ongoing tests of all new nets now part of APNIC's process

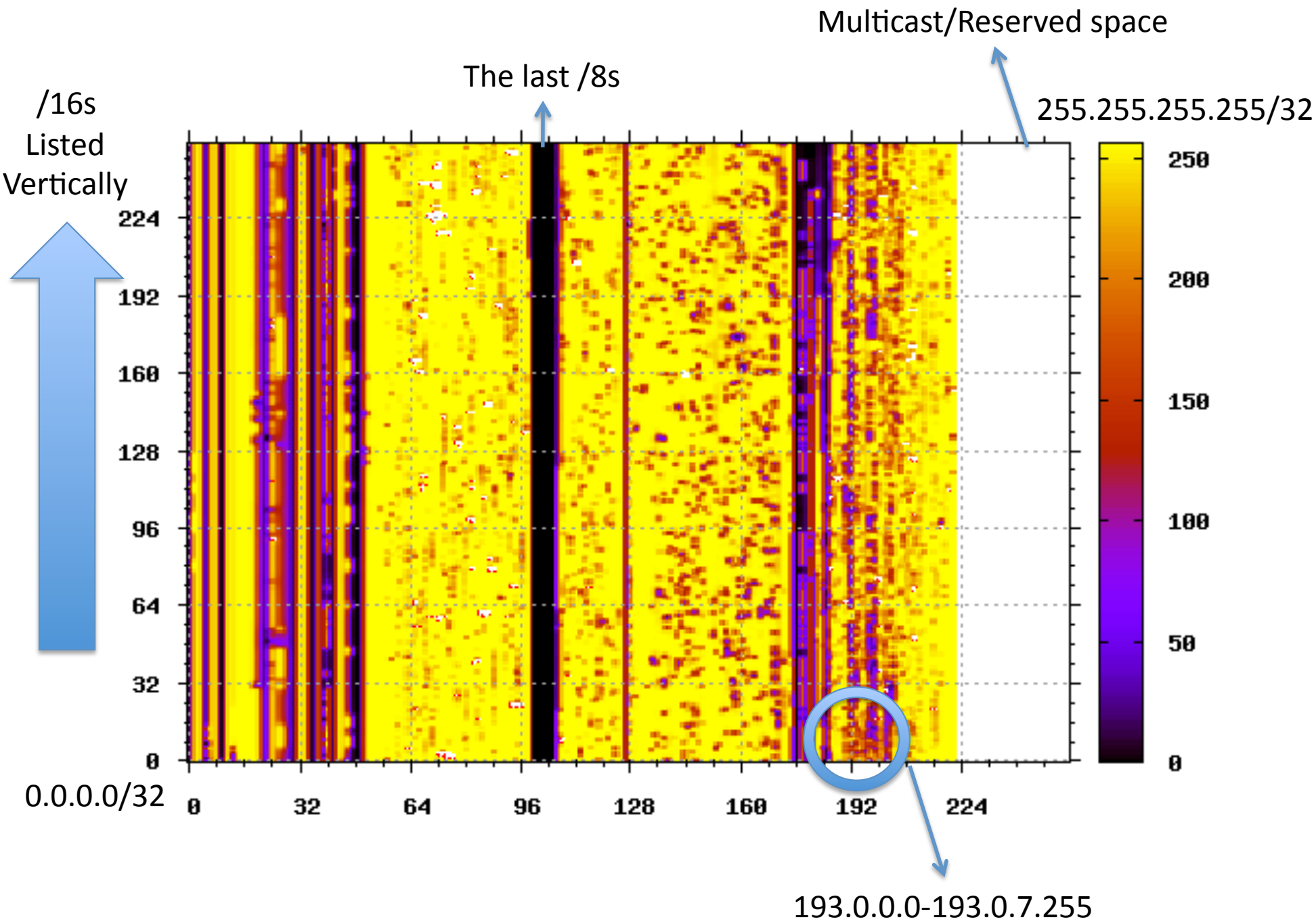
Visualization

- Look at the data in time-series, convert to movie
  - "see" the patterns of usage, identify subnets for futher work
  - Applicable to net address and port
  - Allows side-by-side comparison of src, dst behaviours
- Easy to do, easy to understand

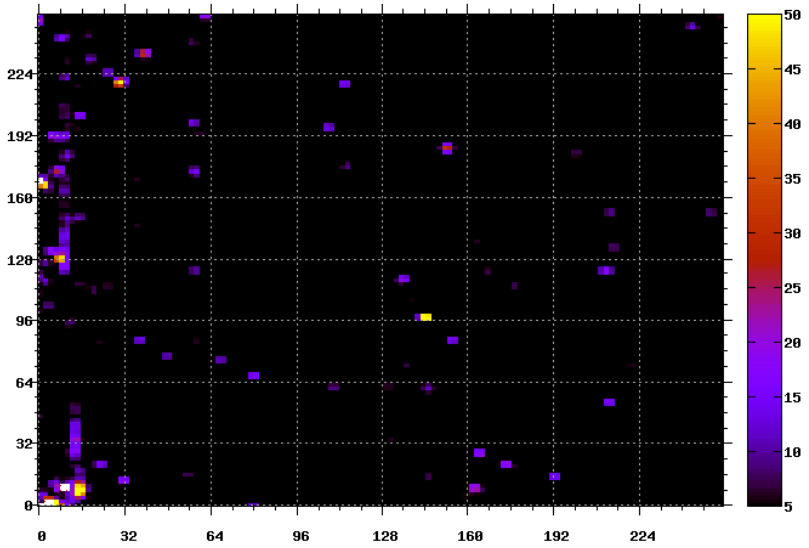
What does the net look like?



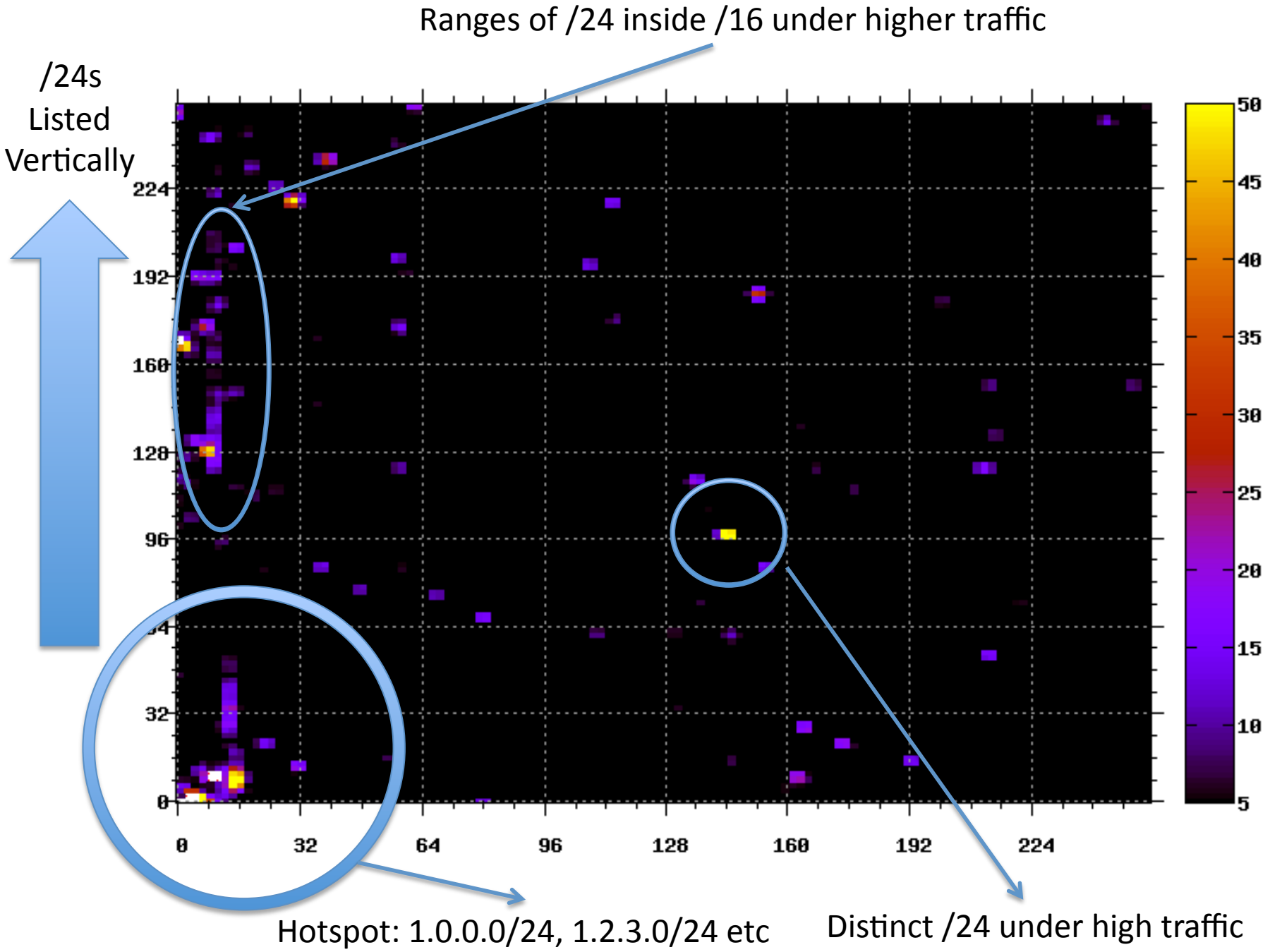
- Map of /16s, as {x,y} points
  - Colour denotes density of the /24 in use for that /16
- Thick Black stripes:
  - IANA reserve
- White stripe 224-255
  - Multicast/Reserved


Multicast/Reserved space
The last /8s
255.255.255.255/32
/16s
Listed
Vertically
224
192
160
128
96
64
32
0
0.0.0.0/32
0
32
64
96
128
160
192
224
250
200
150
100
50
0
193.0.0.0-193.0.7.255

What does net 1.0.0.0/8 look like?



- Map of /24s
  - as {x,y} points.
  - /16 run vertically
  - Colour denotes intensity
    - of traffic directed to the /24


Ranges of /24 inside /16 under higher traffic
/24s
Listed
Vertically
224
192
160
128
96
32
0
0
32
64
96
128
160
192
224
50
45
40
35
30
25
20
15
10
5
Hotspot: 1.0.0.0/24, 1.2.3.0/24 etc
Distinct /24 under high traffic

Lets go to the movies…