



512K IPv4 Routes:

The New Normal

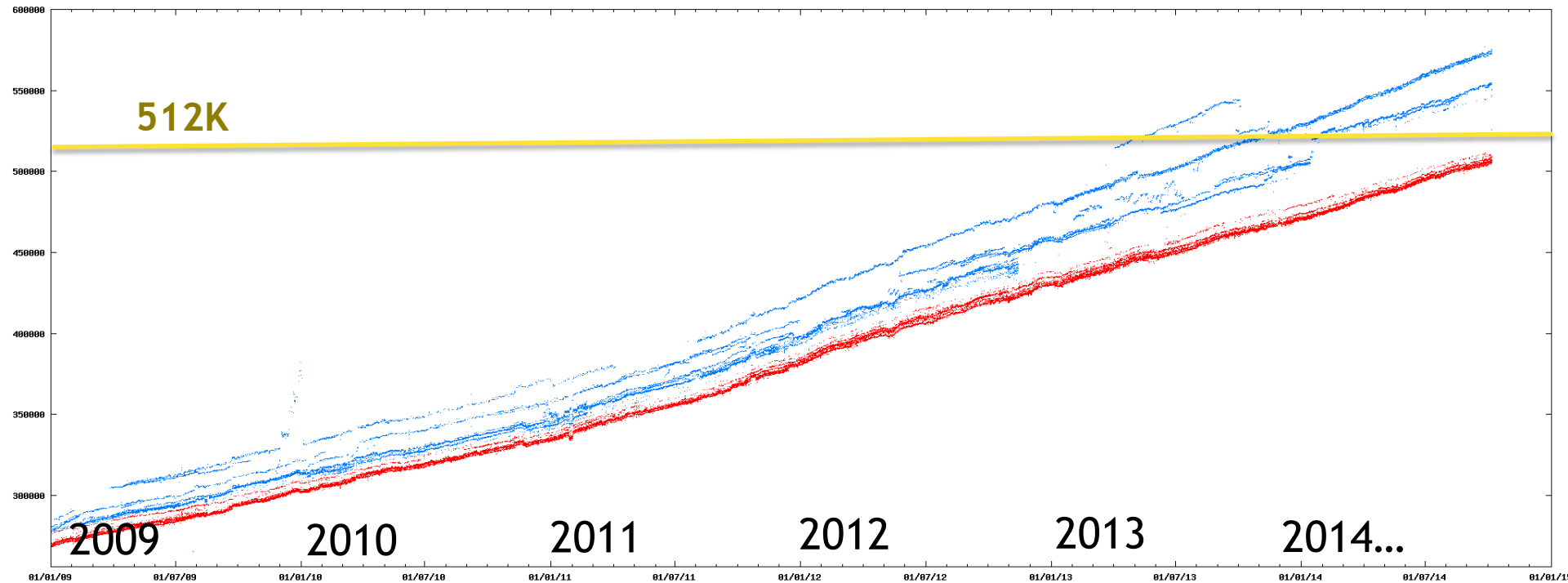
Jim Cowie

Chief Scientist, Dyn Research

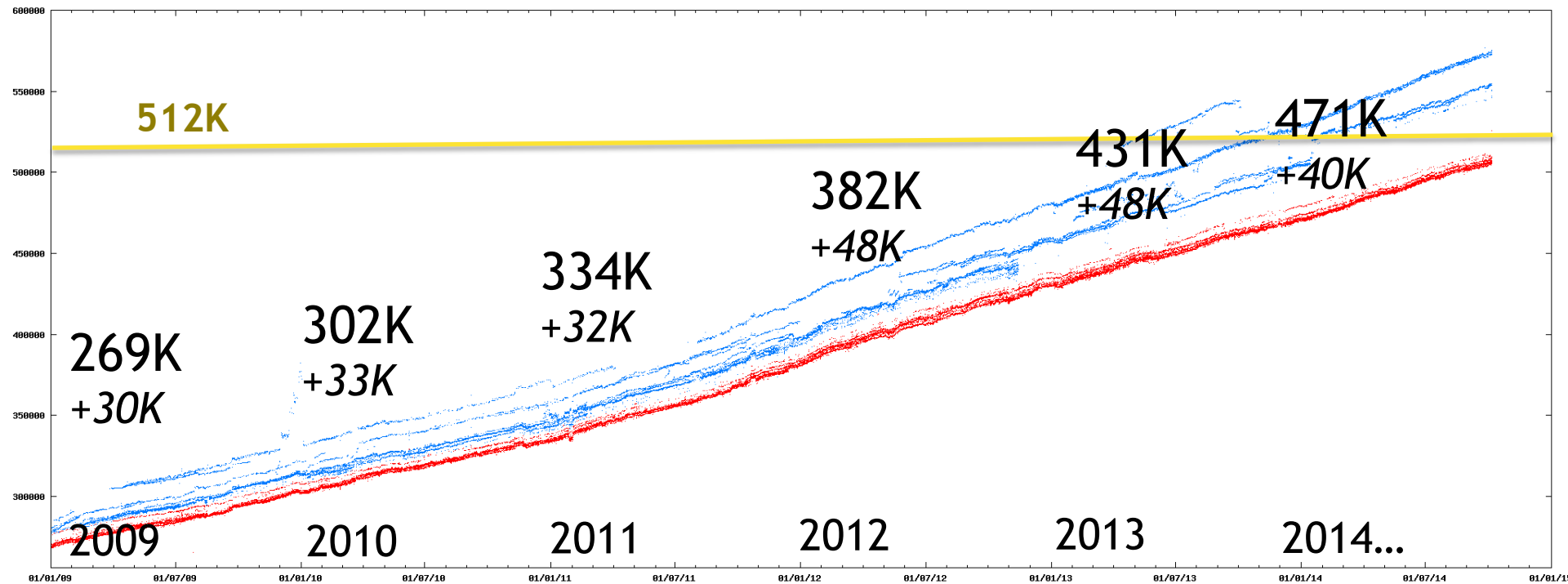
NANOG 62, Baltimore

7 October 2014

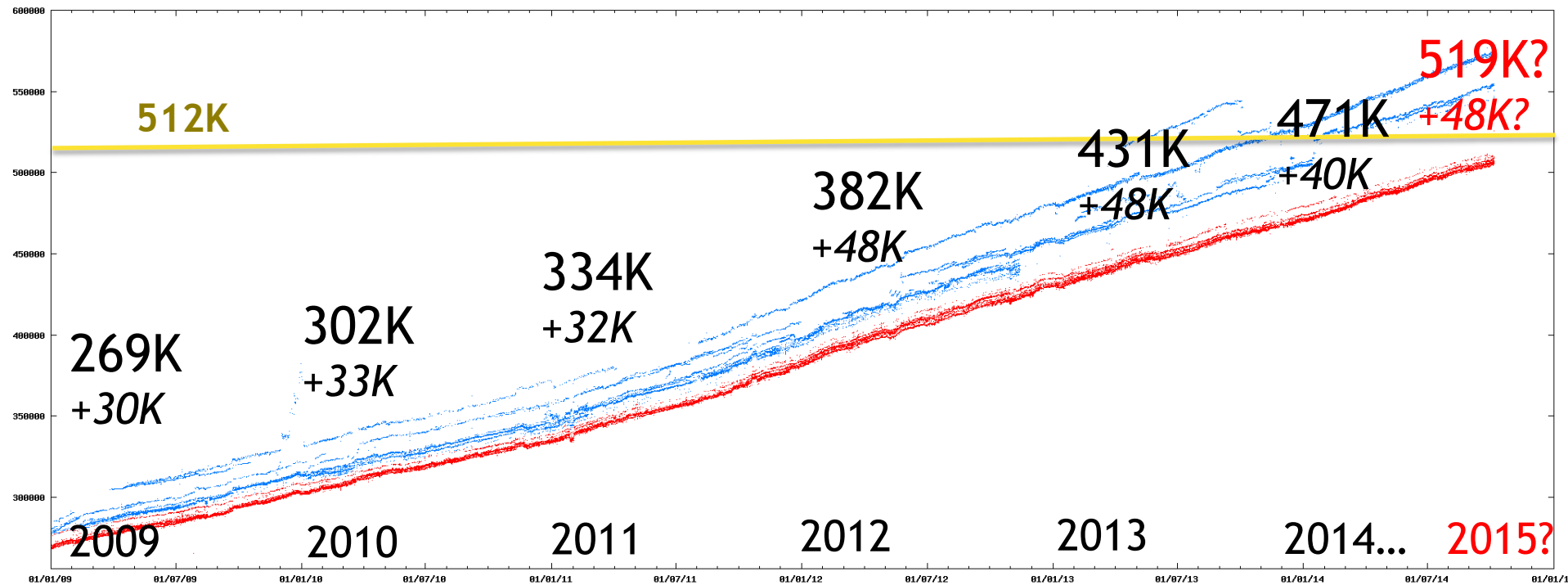
Up And To The Right: IPv4 Routing Table Sizes



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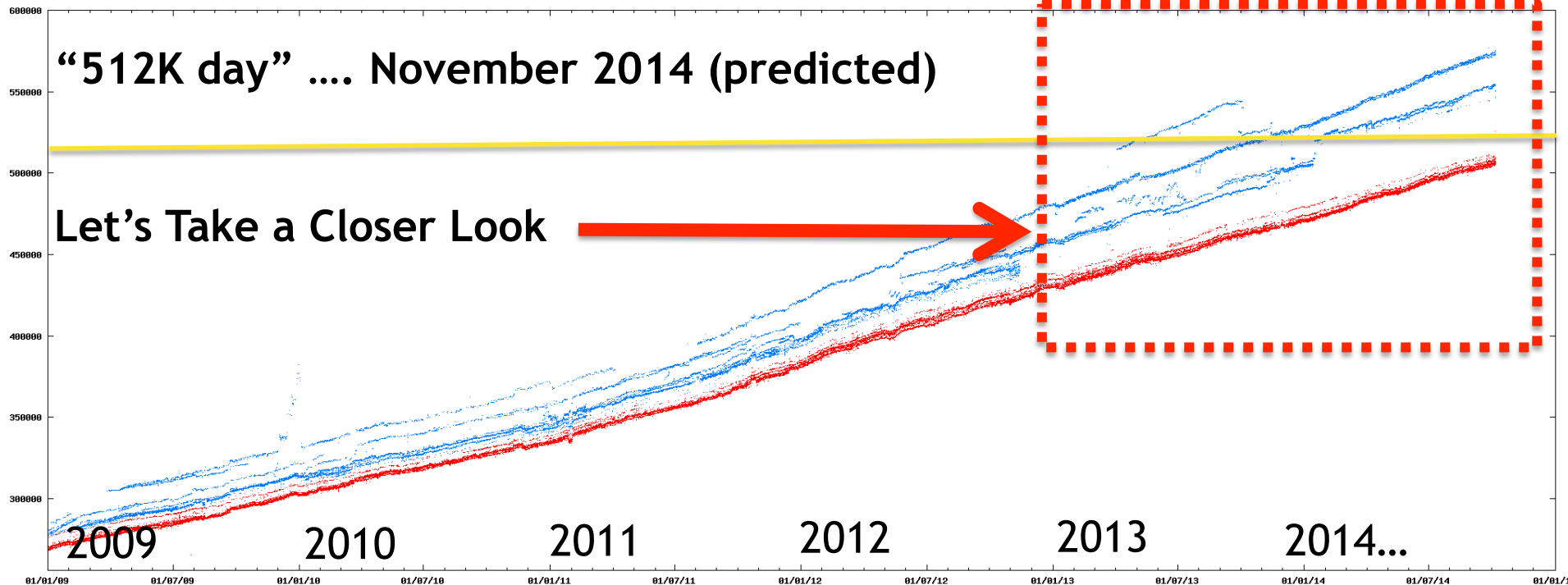
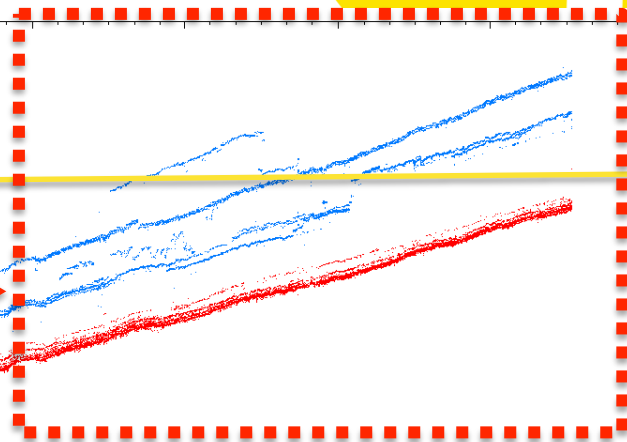
Up And To The Right: IPv4 Routing Table Sizes



Up And To The Right: IPv4 Routing Table Sizes

“512K day” November 2014 (predicted)

Let's Take a Closer Look

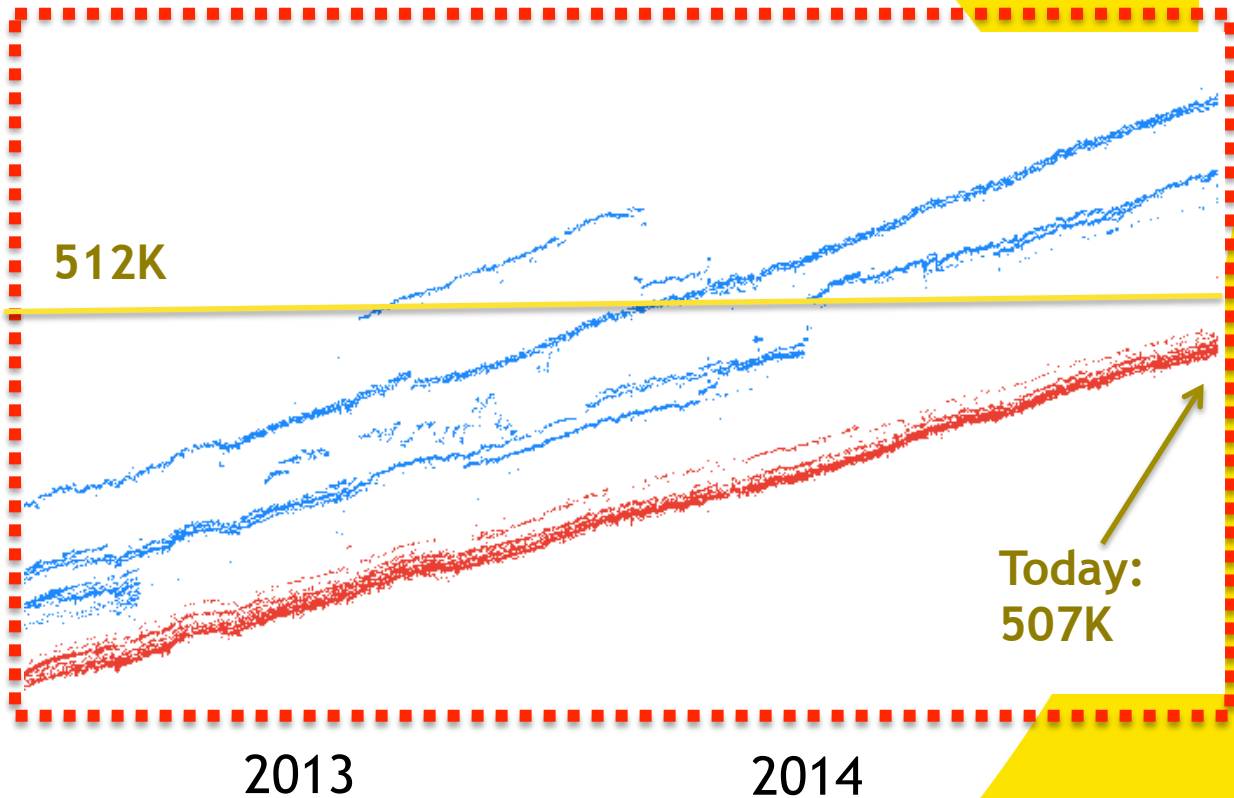


“Consensus” is Broadening

Today's consensus estimate: **507K**
(October 6th 2014)

61% of our peers believe it's higher than consensus

23% believe it's higher than 512K already



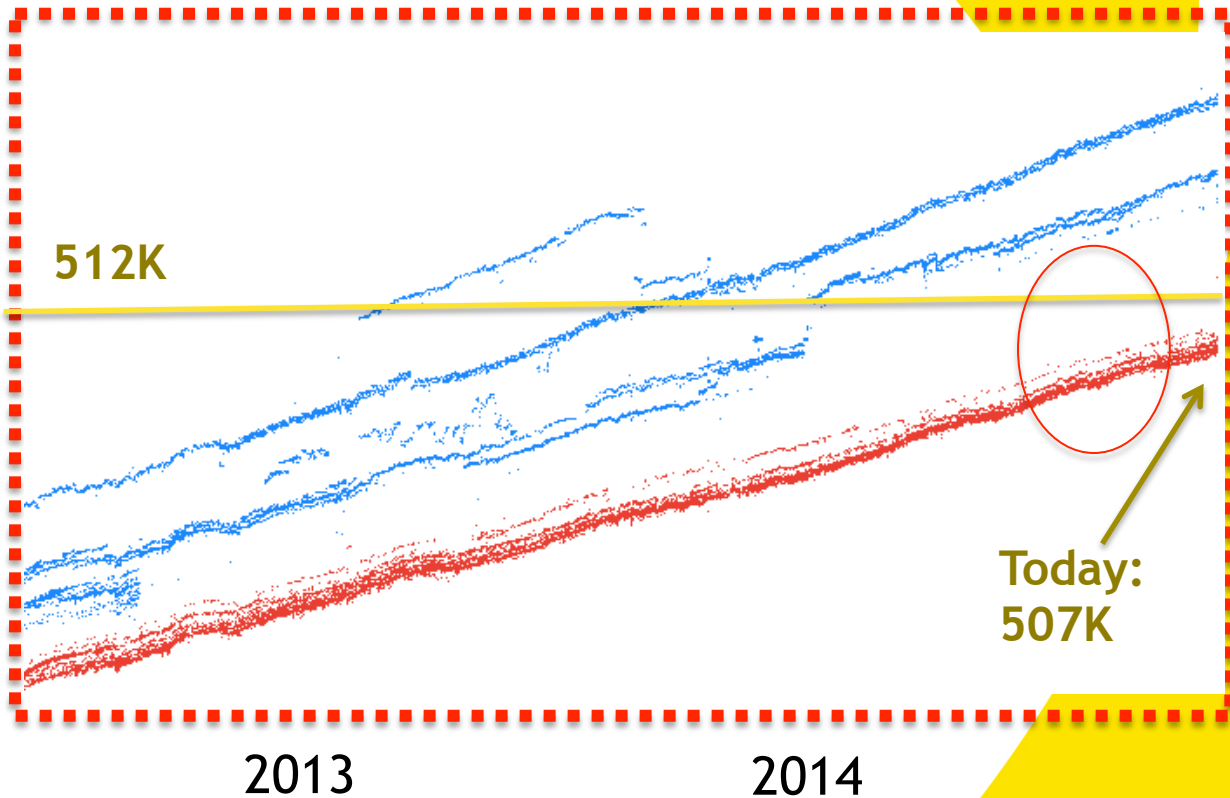
“512K Day” Panic: 12 August 2014 (7:49:30 UTC)

Invisible at 1hr resolution.

This was a “normal intraday fluctuation”

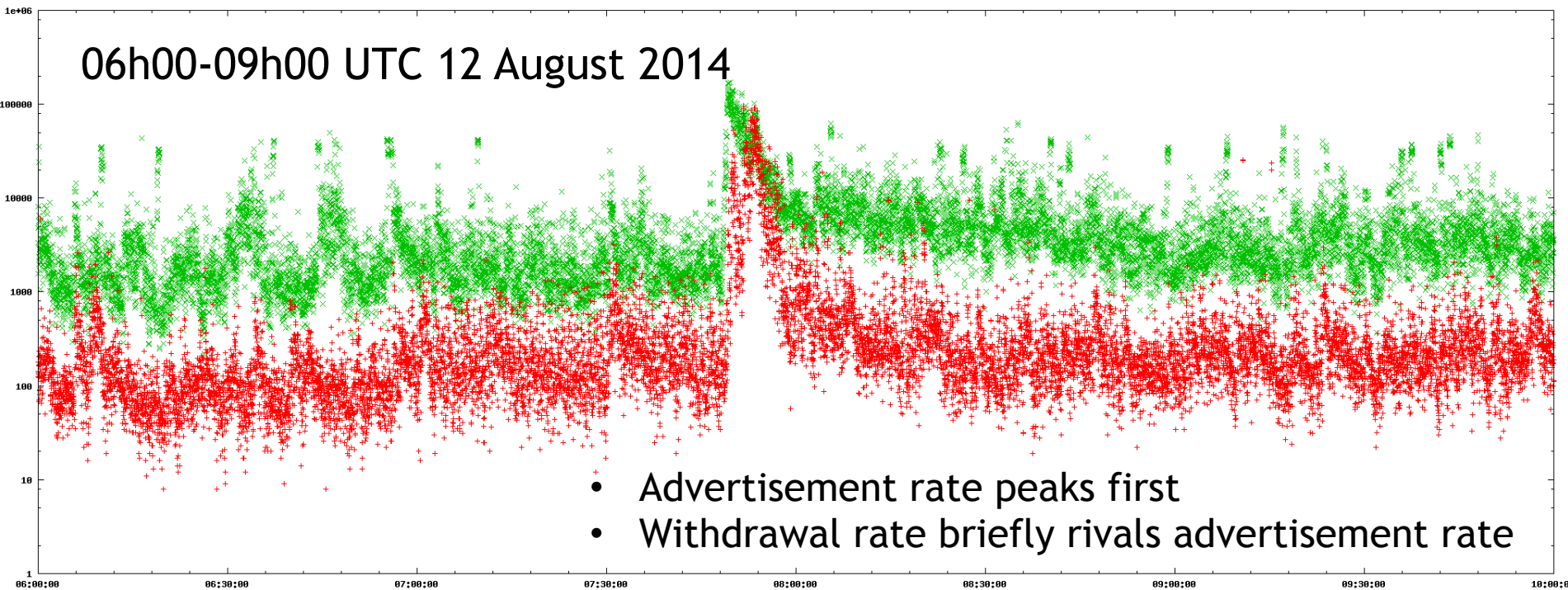
...Except that we’re so close to 512K.

Global table pushed across the line....



One-second BGP announce/withdraw rates (logscale)

06h00-09h00 UTC 12 August 2014



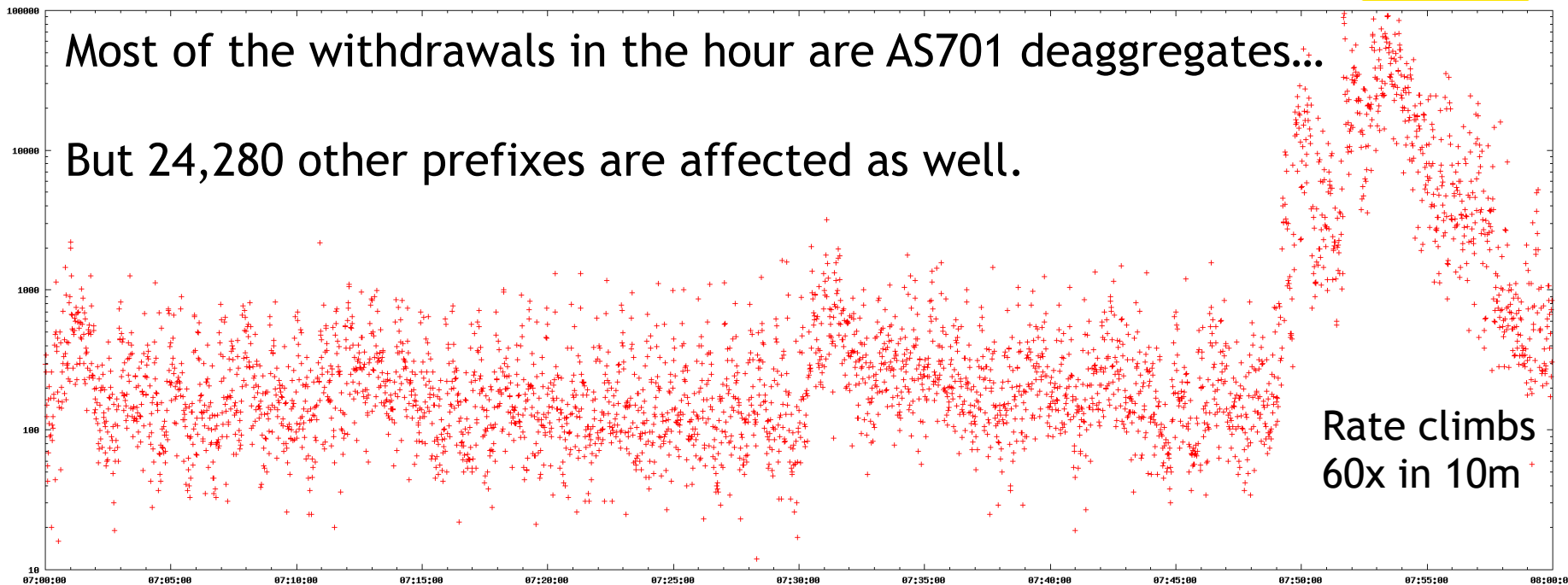
- Advertisement rate peaks first
- Withdrawal rate briefly rivals advertisement rate

Affected prefixes may represent equipment suffering from TCAM exhaustion

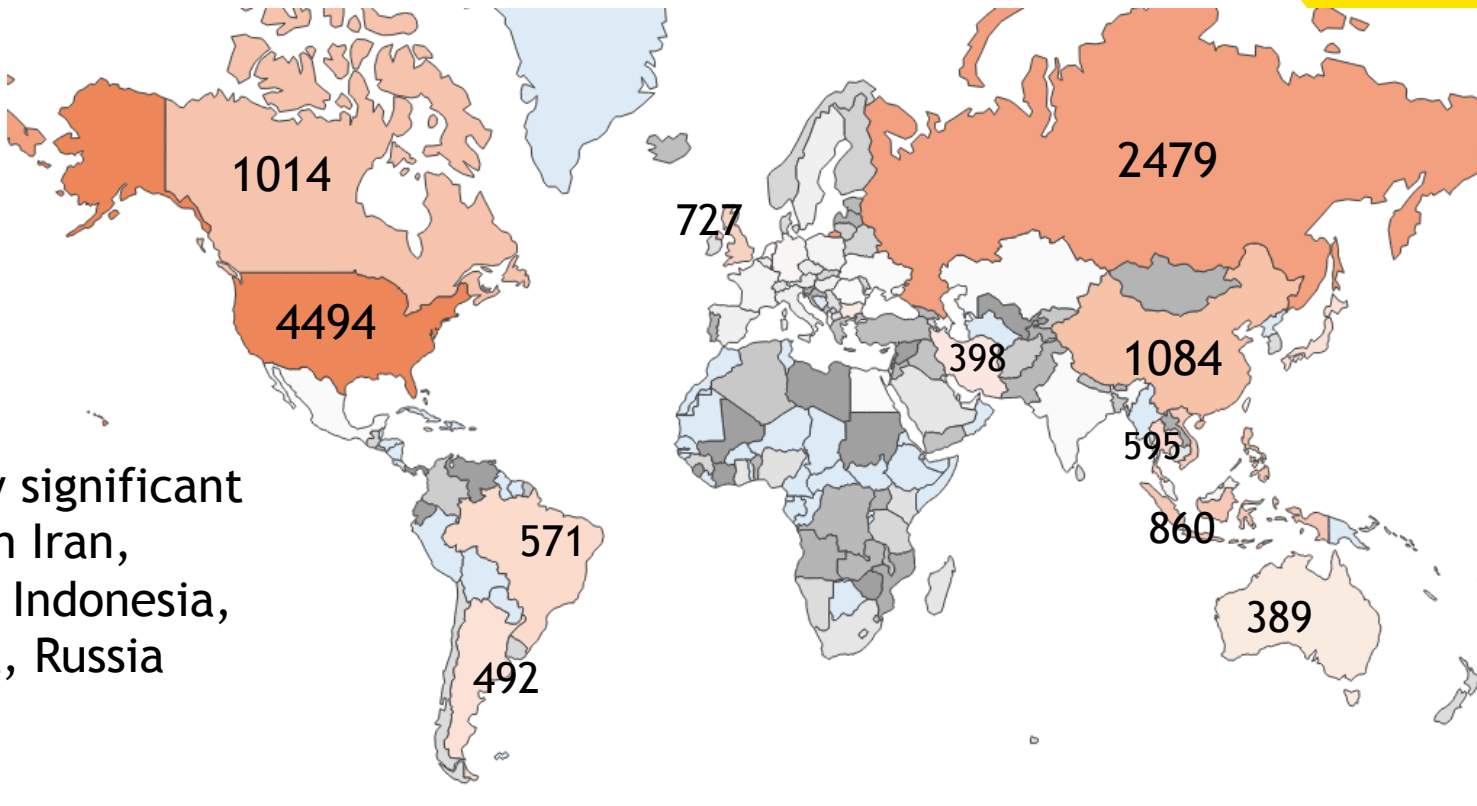
- Consensus routing table size was roughly 500,000 that morning
- VZ (AS701) deaggregated almost **30,000 /24s** at 7:48:38 UTC
- Consensus routing table size hits 528,000 for **10 minutes**
- 528K > 512K; All hell breaks loose
- Aggregates withdrawn, table reverts to safely less than 512K



One-second BGP withdrawal rates, logscale



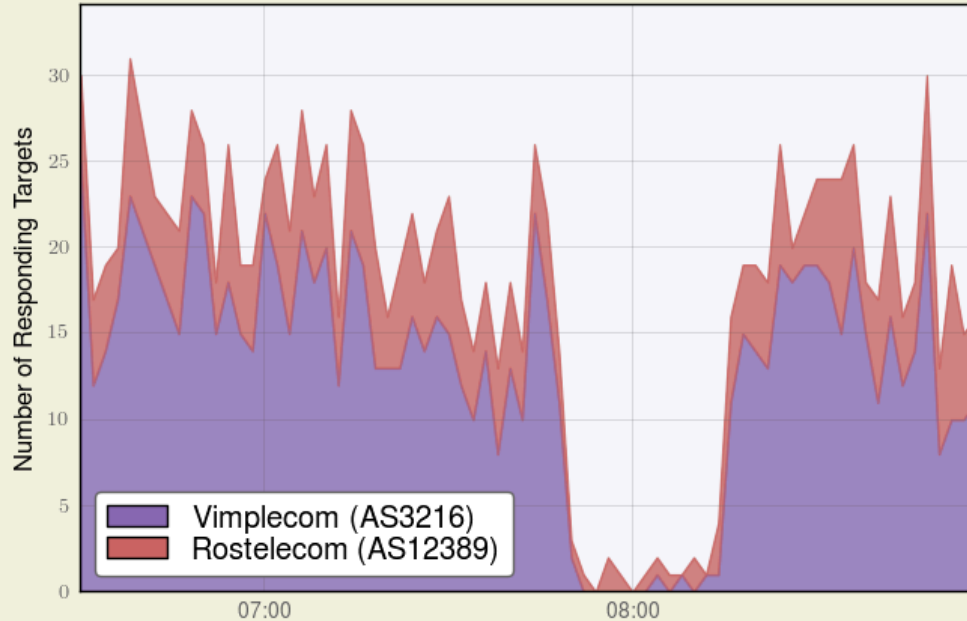
Affected Prefixes, By Country



Relatively significant impacts in Iran, Thailand, Indonesia, Argentina, Russia

Upstreams of Vimpelcom (21332)

12 Aug 2014 through 12 Aug 2014



Source: Traceroute Data



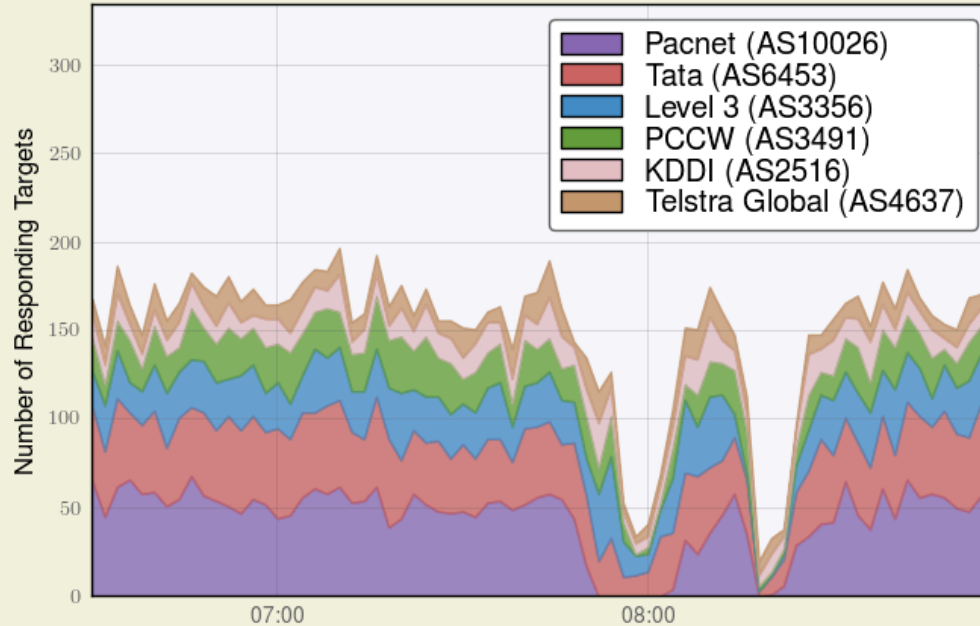
Affected routers in critical places

Russian provider Vimpelcom's AS21332 suffers some significant impairment during the event, as seen through the lens of traceroute completion failure.



Upstreams of Bayan Telecommunications (6648)

12 Aug 2014 through 12 Aug 2014



Source: Traceroute Data

renesys

DELIVERED BY Dyn

Affected routers in critical places

Bayan (PH) loses its
Pacnet transit.. twice



Conclusions

- Affected countries/networks are likely to suffer again as consensus table reaches 512K organically, “for real”
- We project that this will begin occurring broadly later this month, with **consensus 512K emerging by mid-November**
- Hopefully this brief event in August was enough to encourage people to upgrade and/or reallocate TCAM appropriately.....

Thank you!

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Dyn Research
<http://research.dyn.com>