

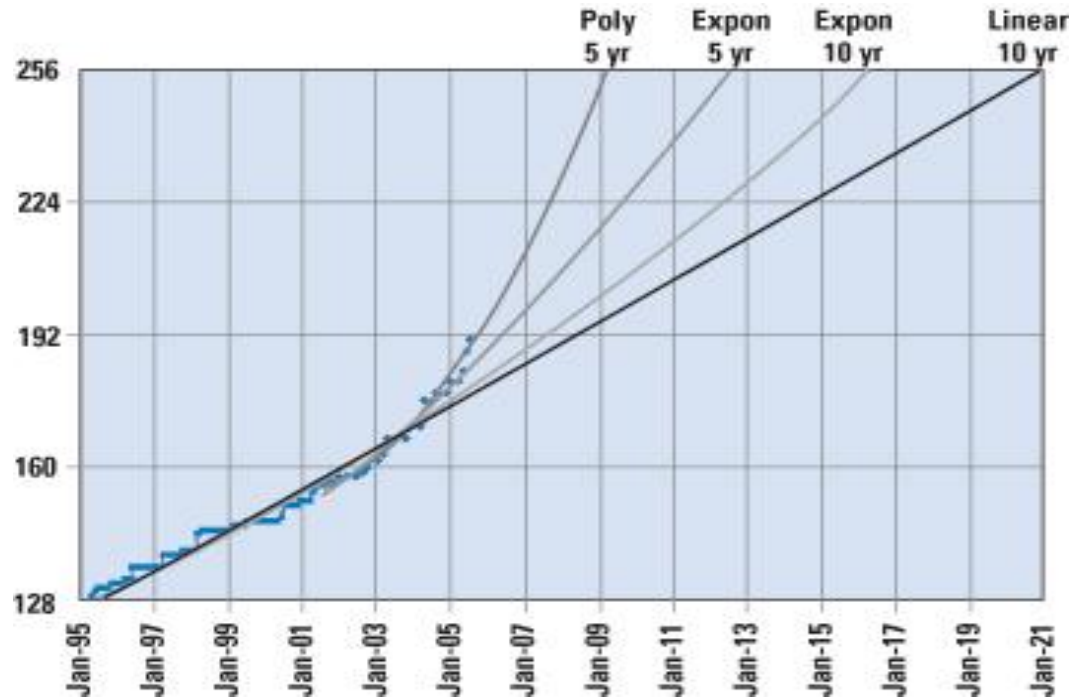
# From IPv6 Day to IPv6 every day

Presented by  
Yves Poppe  
Director Bus. Dev. & Strategy  
IP Services

**Texas IPv6 Summit**  
Austin, Texas  
Sept 13-14th 2011



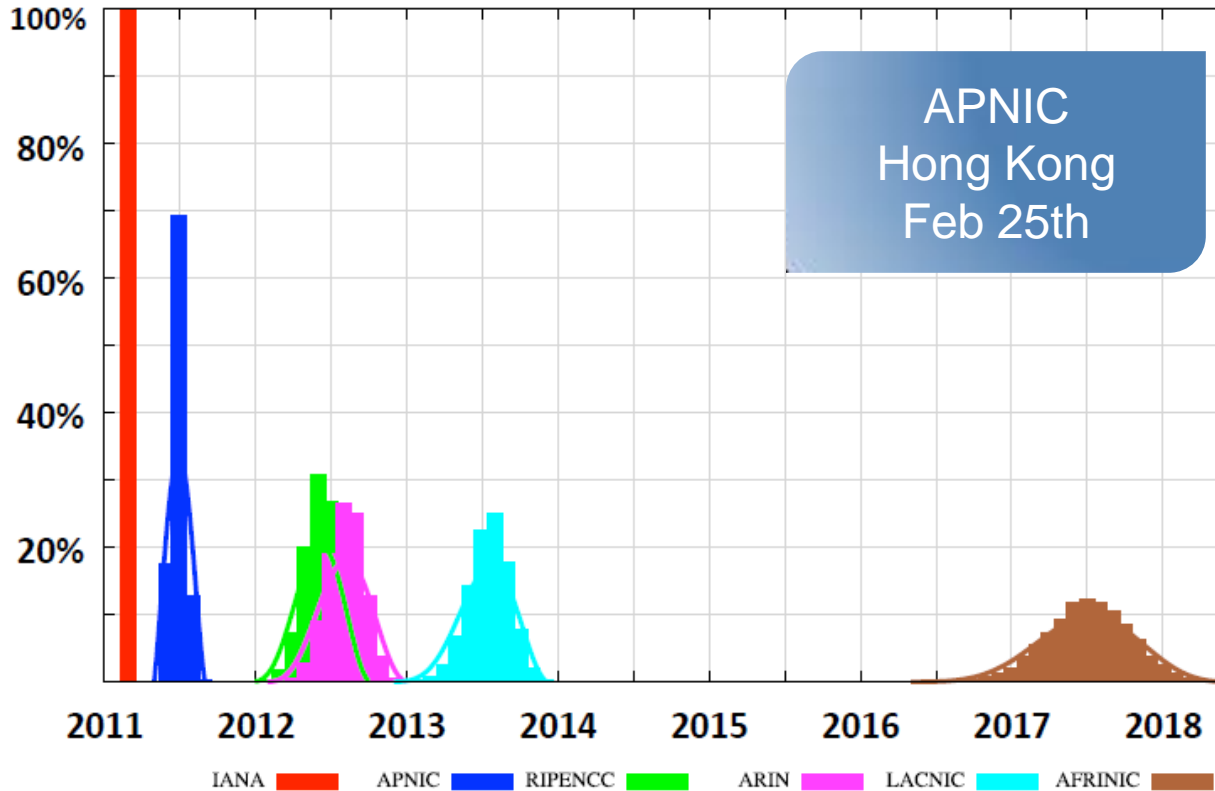
# The dark science (art?) of predictions



When will we run out of IPv4 addresses? Mid 2005 extrapolations ranged from 2008 (Tony Hain) to 2020 (Geoff Huston), not surprising that wait and see remained prevalent. On January 31<sup>st</sup> 2011 it finally happened: IANA allocated its last two freely available 'slash eights'. A wake-up call for many.

# The new guessing game:

When will the RIR's run out of IPv4?



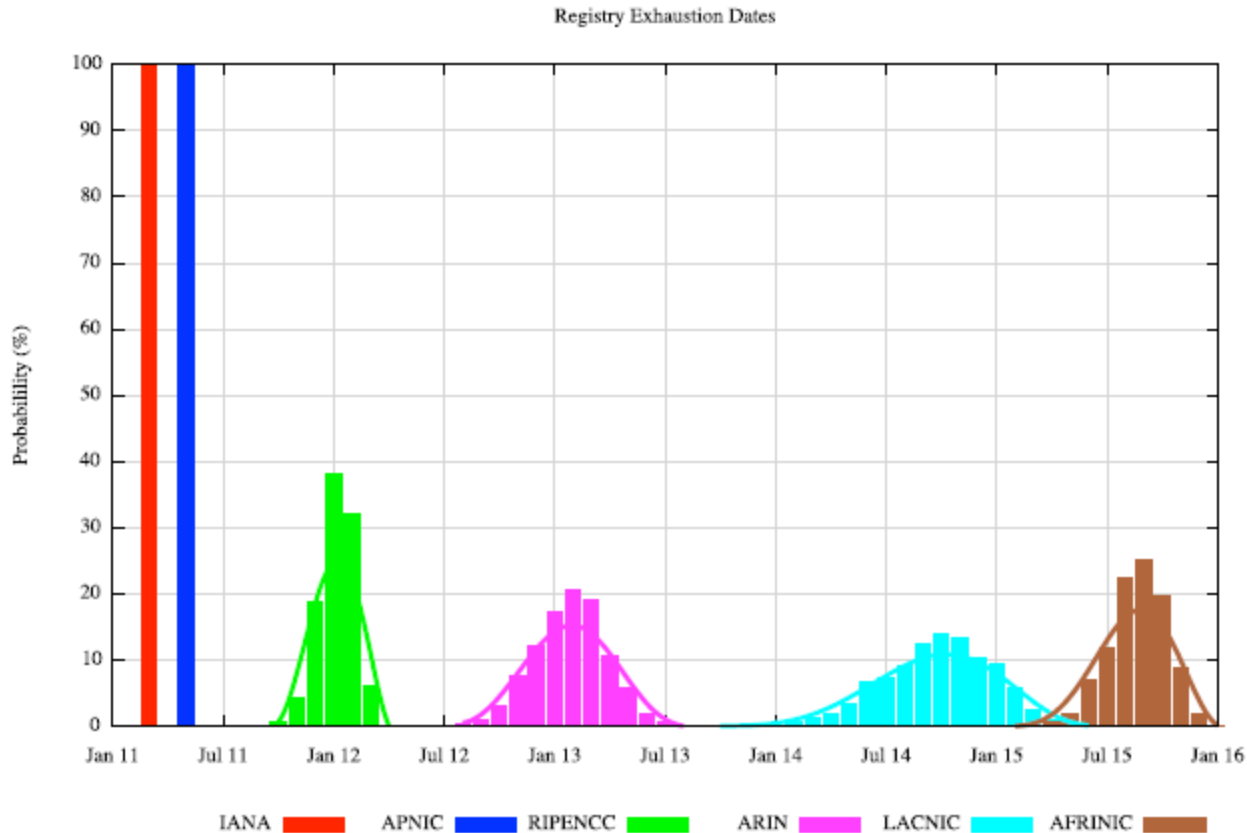
APNIC  
Hong Kong  
Feb 25th

Source: Geoff Huston presentation

© 2010 Tata Communications Ltd., All Rights Reserved

# Drifting Bell curves

APNIC ran out on april 15th with strict rationing of remaining IPv4 addresses now in place. RIPE could run out by the end of the year and ARIN by mid 2012.



© 2010 Tata Communications Ltd., All Rights Reserved

# IPv6 is more than a new address format; it is a fundamental game changer

Solves address shortage

Better QoS (flow lables)

Restores p2p communication

Auto configuration

Mobility

- **Much easier roaming**
- **Better spectrum utilization**
- **Better battery life!**

- **Mobile Ad-Hoc networking**
- **Mobile networks**
- **Sensor networks**
- **Plug and Play networks**

Security

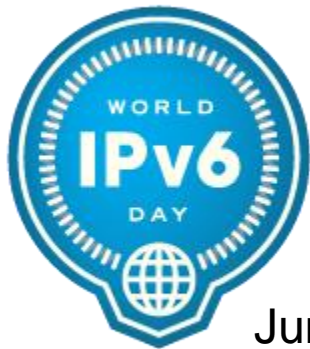
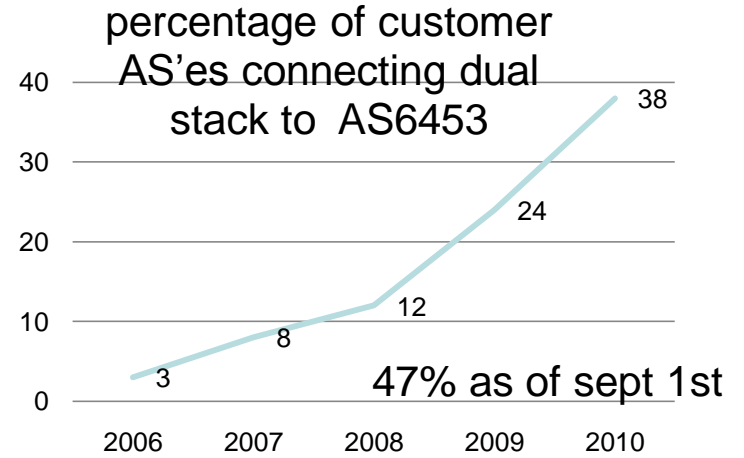
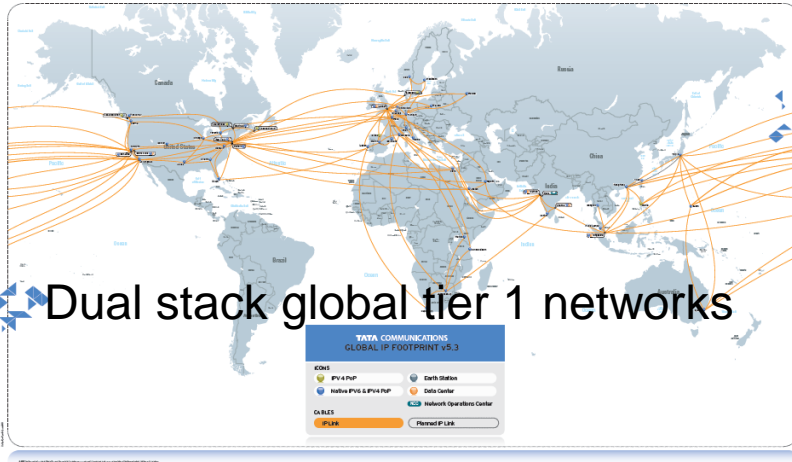
- **IPsec mandatory**

Permanent addresses

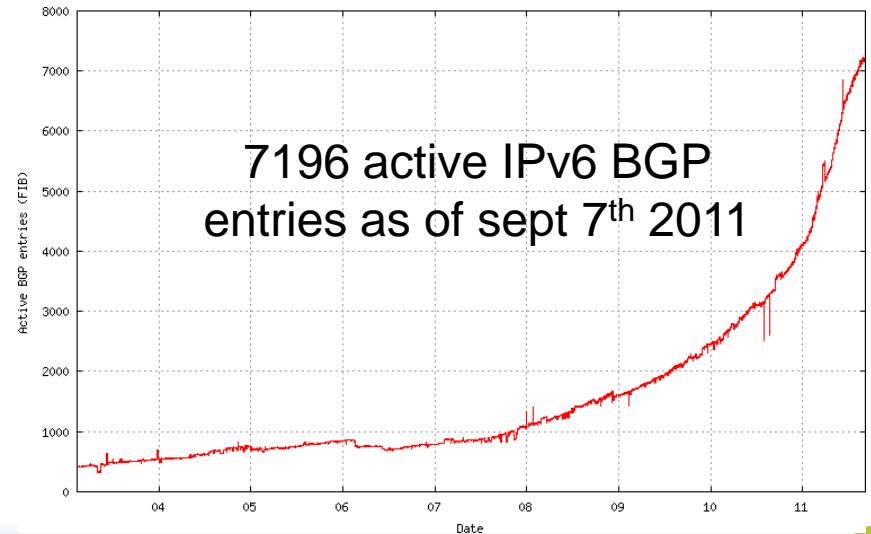
- **Identity (CLID)**
- **Traceability (RFID)**
- **Addressability!**
- **IP address based billing**

Multicast

# IPv6 : we have lift-off on the network side



June 8th was a major success

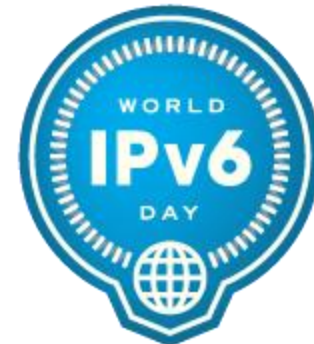


# IPv6 Day : a fitness test for the internet ecosystem

In preparation peering links were double verified and a specialized helpdesk set up for the day. Traffic monitoring tools were IPv6 enabled at a number of strategic locations.

The Tata Communications website [www.tatacommunications.com](http://www.tatacommunications.com) website was already IPv6 enabled and has been accessible in IPv6 ever since.

June 8th demonstrated the resiliency of the global Network and quite advanced readiness amongst all major backbone providers in anticipation of an eventual major and sudden surge in IPv6 traffic .



# specialized helpdesk for IPv6 day

AS 4755

AS 6453

REPORT FROM AS4755

S.no	Date (GMT)	Time (GMT)	URL	IPv6 Address	IPv4 Address	IPv6 RTT Avg	IPv4 RTT Avg	IPv4 Status	IPv6 Status	Traceroute Results
1	7-06-2011	01:16:25	tatacommunications.com	2001:5a0:5000:2::149	121.243.66.50	281	24	↑	↑	Traceroute Result
2	7-06-2011	01:16:25	www.google.co.in	2404:6800:8008::68	74.125.236.48	69	24	↑	↑	Traceroute Result
3	7-06-2011	01:16:25	in.yahoo.com	2a00:1288:f00e:1fe::3001	121.101.152.169	153	26	↑	↑	Traceroute Result
4	7-06-2011	01:16:25	www.youtube.com	2404:6800:8006::5b	209.85.153.136	90	21	↑	↑	Traceroute Result
5	7-06-2011	01:16:25	www.facebook.com	2620:0:1c18:d0:face:b00c:0:2	69.171.224.13	264	309	↑	↑	Traceroute Result
6	7-06-2011	01:16:25	www.bing.com	2600:140e:5::3f96:8359	115.112.224.8	353	24	↑	↑	Traceroute Result
7	7-06-2011	01:16:25	www.xbox.com	2402:6800:720:11:230:48ff:fe8d	203.77.189.7	453	292	↑	↑	Traceroute Result
8	7-06-2011	01:16:25	www.aol.com	2001:4b0:1668:2202:2::1	64.12.245.203	268	Not Reachable	↑	↑	Traceroute Result
9	7-06-2011	01:16:25	www.mapquest.com	2001:4b0:1668:2202:2::3	64.12.99.162	267	Not Reachable	↑	↑	Traceroute Result
10	7-06-2011	01:16:25	www.t-online.de	2003:2:2:40:62:153:159:92	62.153.159.92	Not Reachable	299	↑	↓	Traceroute Result
11	7-06-2011	01:16:25	www.cisco.com	2001:420:80:1c:15c0:d06:f00d	60.254.168.170	272	278	↑	↑	Traceroute Result

AS 4755

AS 6453

REPORT FROM AS6453

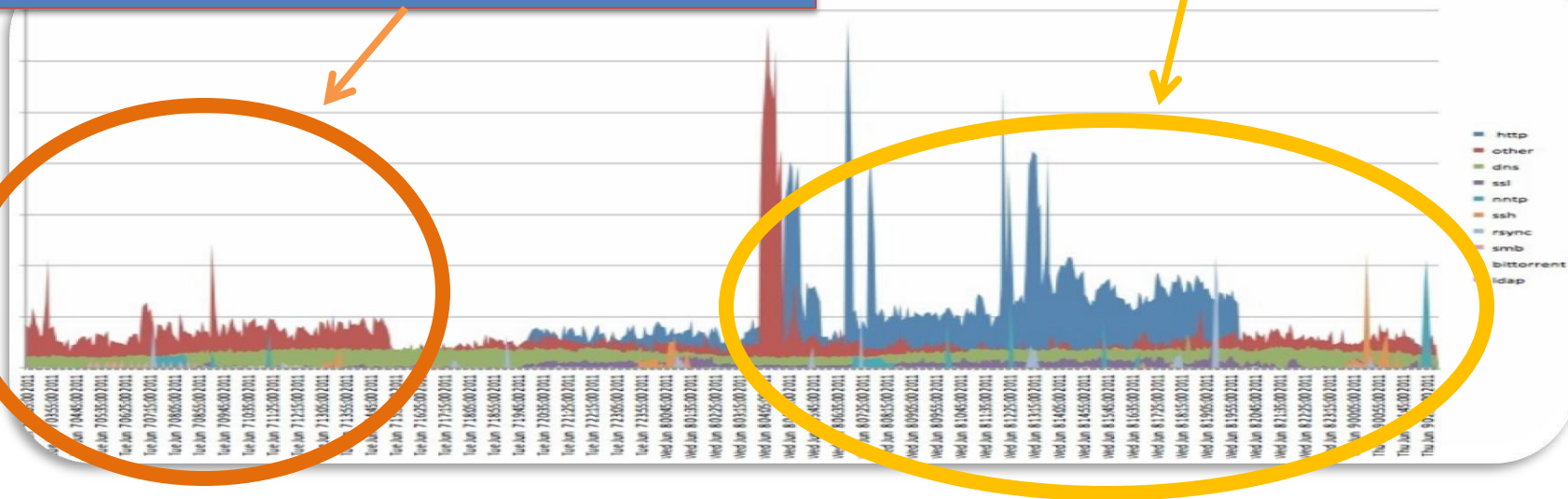
S.no	Date (GMT)	Time (GMT)	URL	IPv6 Address	IPv4 Address	IPv6 RTT Avg	IPv4 RTT Avg	IPv4 Status	IPv6 Status	Traceroute Results
1	7-06-2011	00:50:01	tatacommunications.com	2001:5a0:5000:2::149	121.243.66.50	13	201	↑	↑	Traceroute Result
2	7-06-2011	00:50:01	www.google.co.in	2404:6800:800b::93	74.125.235.51	247	234	↑	↑	Traceroute Result
3	7-06-2011	00:50:01	in.yahoo.com	2001:4998:00b:1fe::3000	67.195.160.76	33	Not Reachable	↑	↑	Traceroute Result
4	7-06-2011	00:50:01	www.youtube.com	2404:6800:800b::be	74.125.235.38	241	240	↑	↑	Traceroute Result
5	7-06-2011	00:50:01	www.facebook.com	2620:0:1c08:4000:face:b00c::	69.171.224.41	71	90	↑	↑	Traceroute Result
6	7-06-2011	00:50:01	www.bing.com	2001:418:2007:1::a88f1169	204.245.162.35	Not Reachable	Not Reachable	↑	↑	Traceroute Result
7	7-06-2011	00:50:01	www.xbox.com	2001:418:2007:1::a88f1128	204.245.162.41	Not Reachable	Not Reachable	↑	↑	Traceroute Result
8	7-06-2011	00:50:01	www.aol.com	2001:4b0:1668:2202:2::1	64.12.245.203	Not Reachable	Not Reachable	↑	↑	Traceroute Result
9	7-06-2011	00:50:01	www.mapquest.com	2001:4b0:1668:2202:2::3	64.12.99.162	Not Reachable	Not Reachable	↑	↑	Traceroute Result
10	7-06-2011	00:50:01	www.t-online.de	2003:2:2:40:62:153:159:92	62.153.159.92	Not Reachable	99	↑	↓	Traceroute Result
11	7-06-2011	00:50:01	www.cisco.com	2001:420:80:1c:15c0:d06:f00d	72.246.112.170	78	Not Reachable	↑	↑	Traceroute Result



# What did we actually see on World IPv6 Day?

Typical day dominated by Peer to Peer and other file transfer

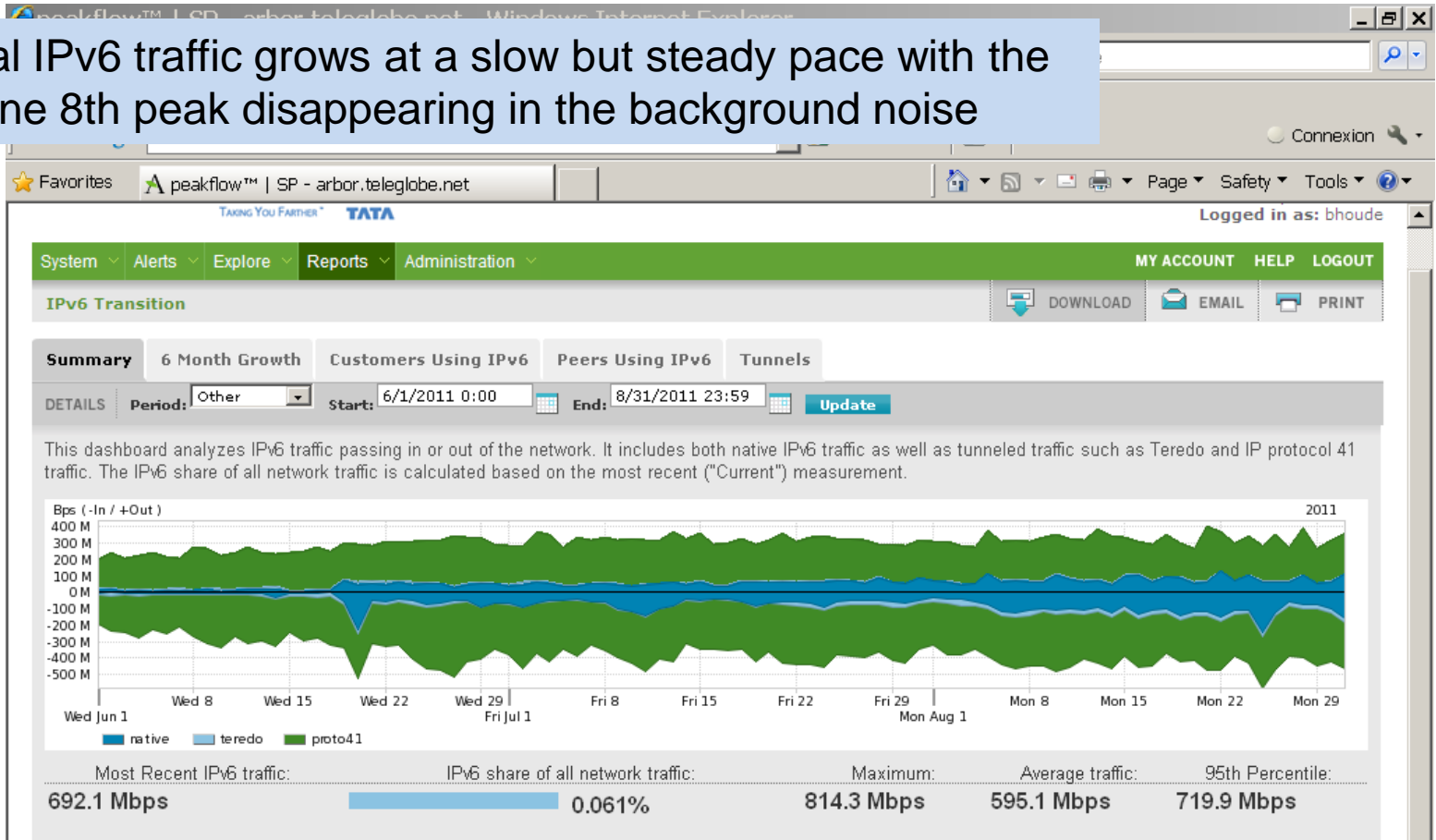
World Day IPv6 day traffic surge



- The experiment on a global scale has enabled content providers and ISP's alike to gain confidence in their IPv6 deployments.
- On June 8<sup>th</sup>, AS6453 witnessed the sharpest spikes in IPv6 traffic in the US and Europe regions and we reported a 67% day over day traffic increase.

# IPv6 since IPv6 day seen through AS6453 ....

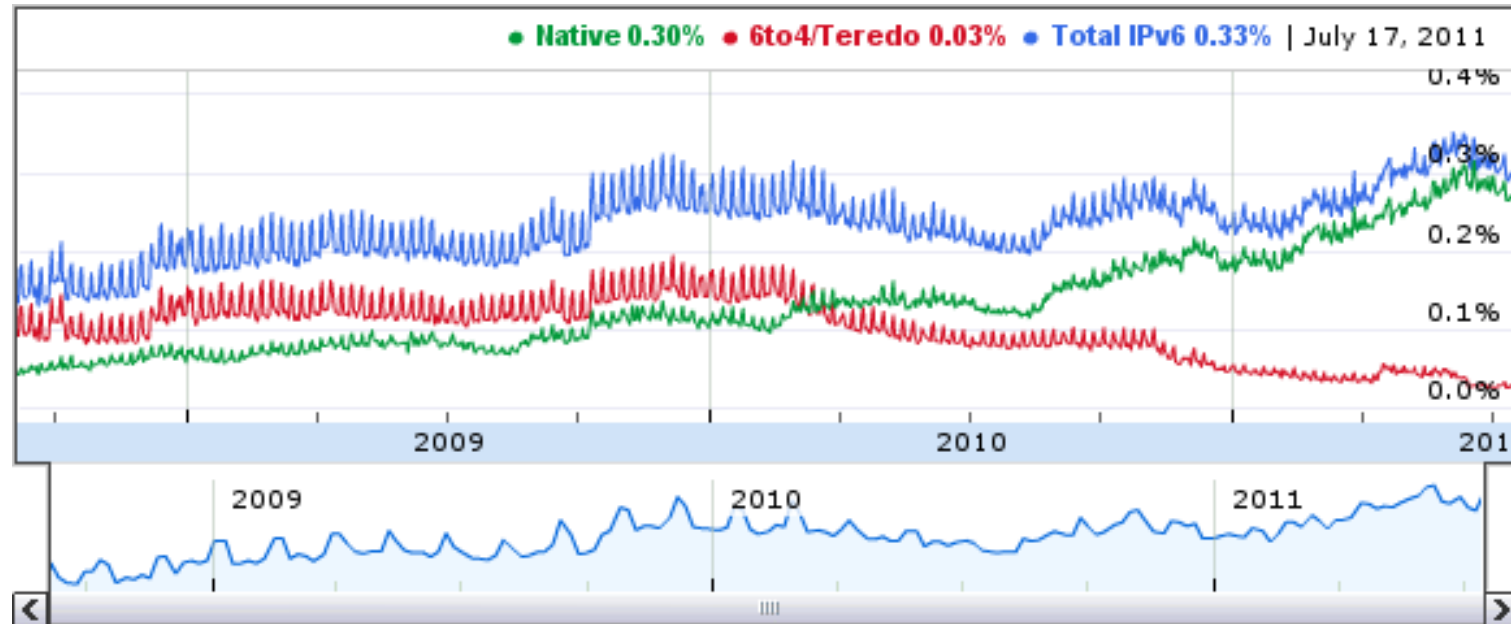
Global IPv6 traffic grows at a slow but steady pace with the june 8th peak disappearing in the background noise



Note that these figures represent only a fraction of the overall Pv4 plus IPv6 traffic of AS6453 derived from probes on a selected number of network points.

© 2010 Tata Communications Ltd., All Rights Reserved

# IPv6 traffic seen by Google



End July France was the IPv6 traffic champion at 3.6% while Japan clocked in at 1.4% . Without France and Japan world IPv6 traffic share fell to 0.1%

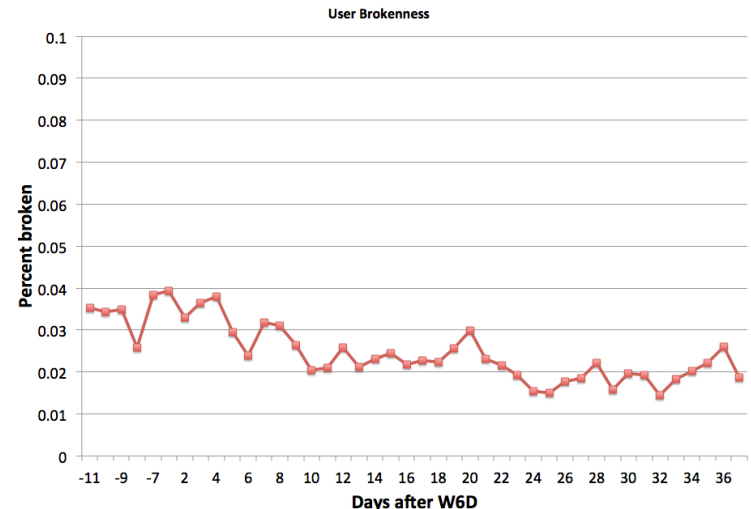
As reported by Lorenzo Colitti at the Quebec IETF meeting on July 25th  
<http://www.ietf.org/proceedings/81/slides/plenaryt-9.pdf>



# The brokenness issue as delaying factor

Concern about brokenness still delays opening the IPv6 floodgates on the content side. Youtube, Yahoo and facebook provided an update on the issue on July 25th in Quebec City at the IETF meeting:

Facebook reports brokenness down to around 0.02%. Google reports brokenness issues largely fixed in Chrome, Firefox 7 follows, Apple's OS X Lion more robust, IE to follow soon.



Chrome versions with fast fallback are 99.995% as reliable as IPv4

© 2010 Tata Communications Ltd., All Rights Reserved



## Some of the lessons learned from IPv6 day

Major tier-1 carriers IP networks are dual stack with adequate peerings to cope with the transition from IPv4 to IPv6 and sudden shifts in relative traffic.

Upgrade to dual stack is still patchy amongst tier 2&3 carriers but improving fast.

Major content providers found the 'brokenness' going down also but still too high to allow for total commercial deployment at that point in time.

Enterprise market was nowhere to be seen.

Work-around options such as 6rd or DS-lite are workable and gaining popularity on the local access to avoid the bottleneck of sizeable investments in non easily upgradeable IPv4 only CPE boxes, cable modems and DSL's





## In conclusion

The reality of the IPv4 address exhaustion sinks in : business continuity makes adoption and gradual transition to IPv6 unavoidable.

Immediate priority: mandate IPv6 support in all procurement processes for hardware, software and internet services. Train your people; plan some capex and opex. Upgrade customer facing services first.

End of the decade prediction?

50 billion humans and devices connecting to an open, mobile, and freely accessible internet, will spawn another generation of disruptive applications and revenue streams and continue our transformation to homo connectus .

**P.S. IPv6 will just be a footnote.**



# Thank You

**« These days all competitive advantages are fleeting. So the smartest companies are learning to create new ones – again and again and again »**

Robert D. Hof , Business Week