

IETF 81 – World IPv6 Day Operators Review

Hurricane Electric
IPv6 Native Backbone – Massive Peering!

Enabled IPv6 Years Ago!

IETF 81

Quebec Canada – 26th July 2011

Martin J. Levy, Director IPv6 Strategy
Hurricane Electric

Upgrading America's Digital Infrastructure with IPv6

NATIVE IPv6
EVERYWHERE

- Agenda

- World IPv6 Day – a success on many many fronts!
 - IPv6 awareness increased dramatically!
 - Real IPv6 usage; real IPv6 deployment; real measurements
 - Post W6D IPv6 traffic levels sustained

- IPv6 and “The Global IPv6 Deployment Progress Report”
 - <http://bgp.he.net/ipv6-progress-report.cgi>

- Summary



WORLD IPv6 DAY

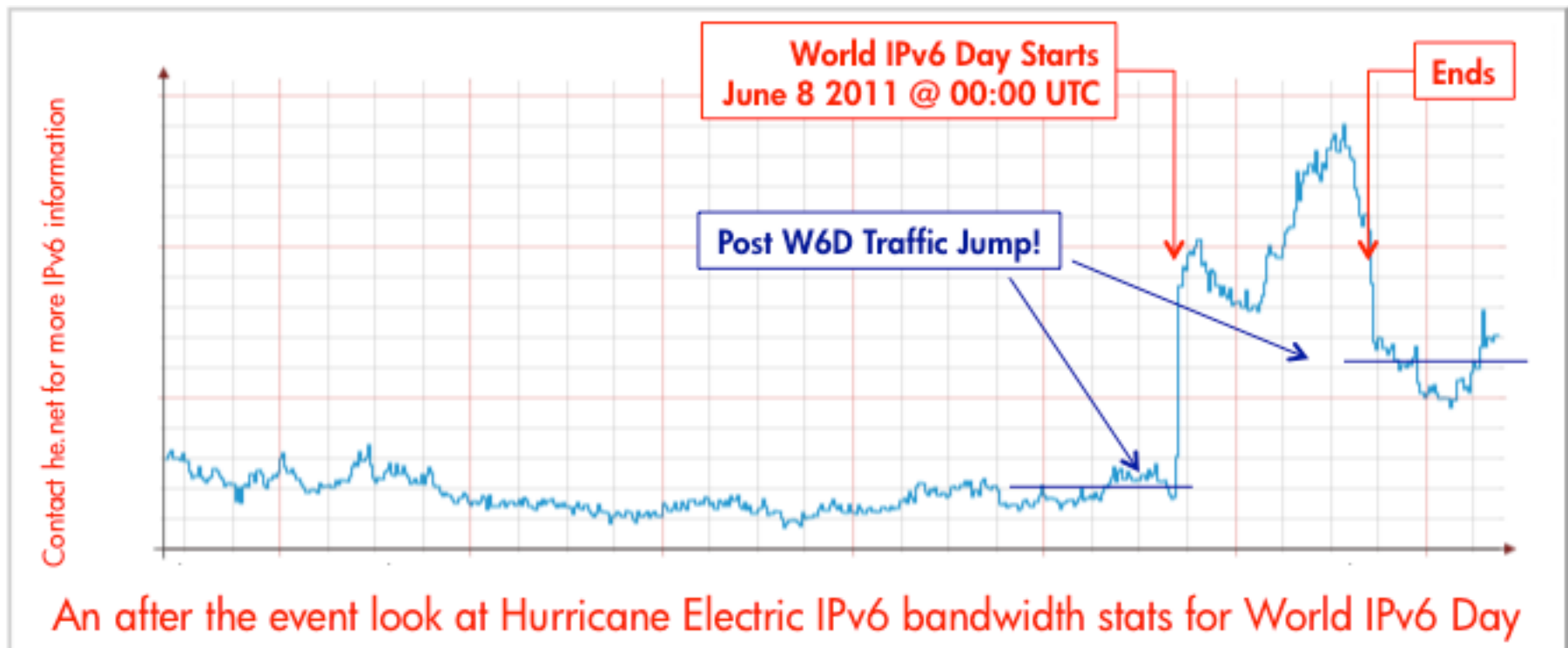
(IPv6 didn't need a deadline; but no-one's complaining)



World IPv6 Day and IPv6 traffic

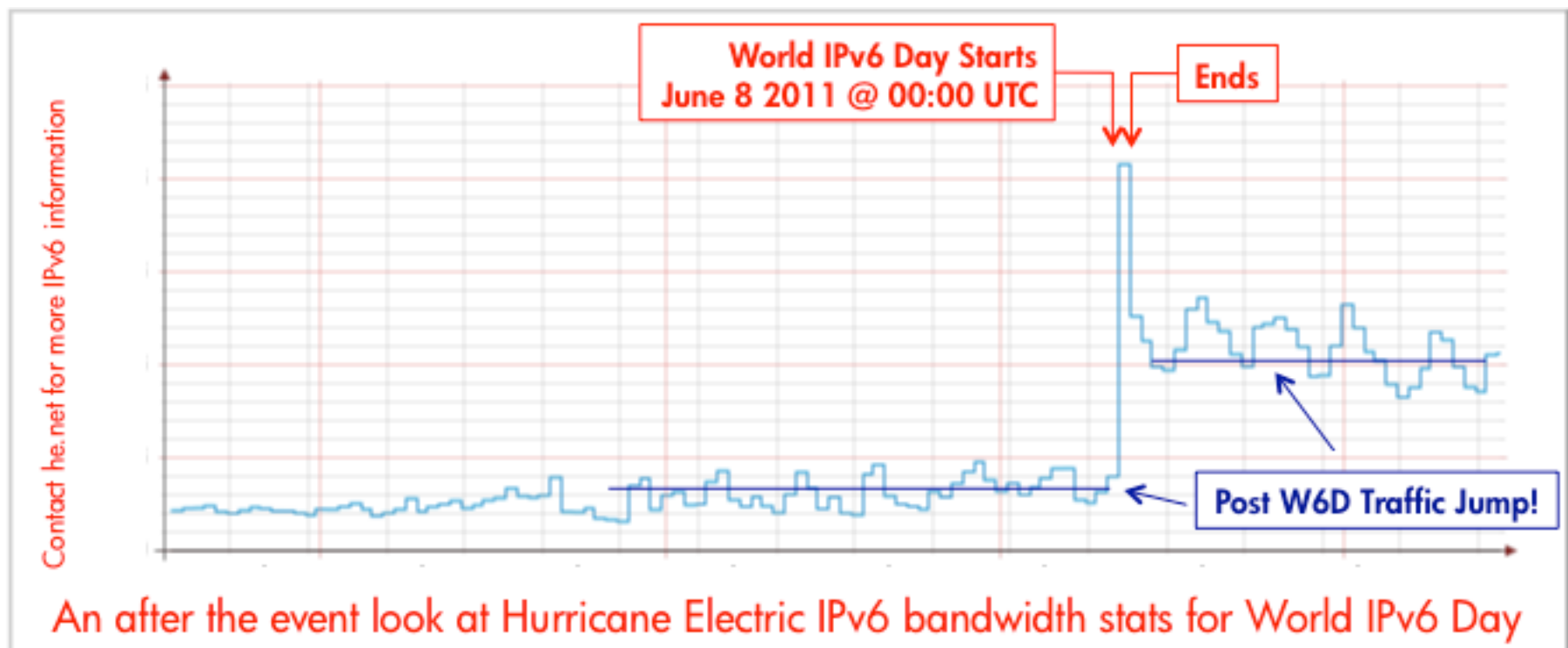
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- World IPv6 Day was about enabling web-based traffic for IPv6
 - Focus on content providers
 - Web (port 80 & 443 TCP traffic) plotted below



World IPv6 Day and IPv6 traffic (cont)

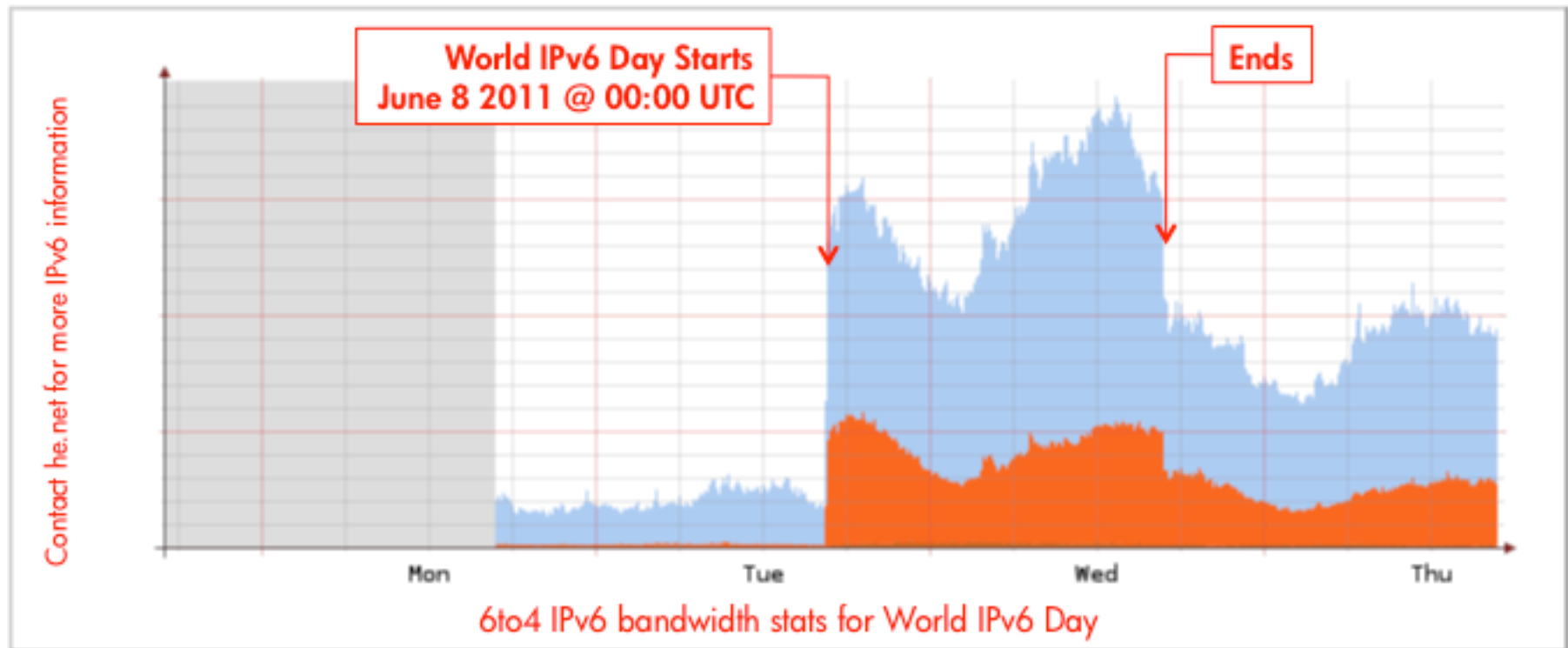
- Long term win since W6D in IPv6 traffic levels
 - That means there are both content and eyeballs in play



World IPv6 Day and 6to4 IPv6 traffic

NATIVE IPv6
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- Yes – there is 6to4 traffic
 - Lots of traffic!
- Largest 6to4 global deployment (with Teredo included)
 - AMS ASH CHI FMT FRA HKG LAX LON MIA NYC PAO PAR SEA SIN SJC STO TYO



W6D – The #1 issue ...

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- PMTU & ICMP6 blocking
 - Heard again and again all over the net
 - Enabling IPv6 for the first time – too-aggressive filtering

- Two failure modes
 - Pre W6D testing – normally on “ipv6.example.com”
 - During W6D – affected “www.example.com”

- Trigger points?
 - Testing from Teredo or 6to4 enabled end-nodes
 - Real-world tunnels

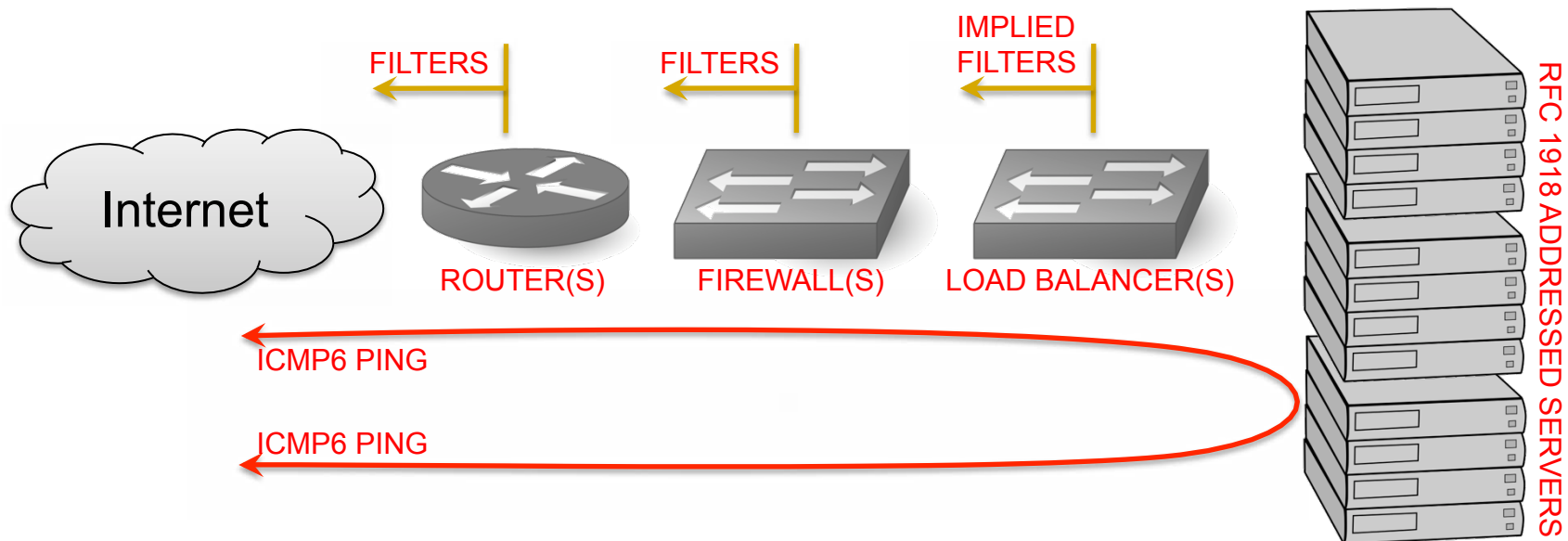


W6D – The Teredo special-case ...

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■ ICMP6 blocking

- Teredo requires end-node to respond to a ping to initiate protocol
- This breaks classic enterprise firewall/filter setups
- Consensus is that elements ahead of server perform this function



“GLOBAL IPv6 DEPLOYMENT PROGRESS REPORT”

<http://bgp.he.net/ipv6-progress-report.cgi>

IPv6 in the real world measured - it's out there!



<http://bgp.he.net/ipv6-progress-report.cgi>

Networks Running IPv6

We can measure the percentage of networks running IPv6 by comparing the set of ASes in the IPv6 routing table to those in the combined set of IPv4 and IPv6. IPv4 and IPv6 RIBs Last Parsed: Tue Jul 19 01:12:31 PDT 2011

IPv4 ASes: 38415

IPv6 ASes: 4400

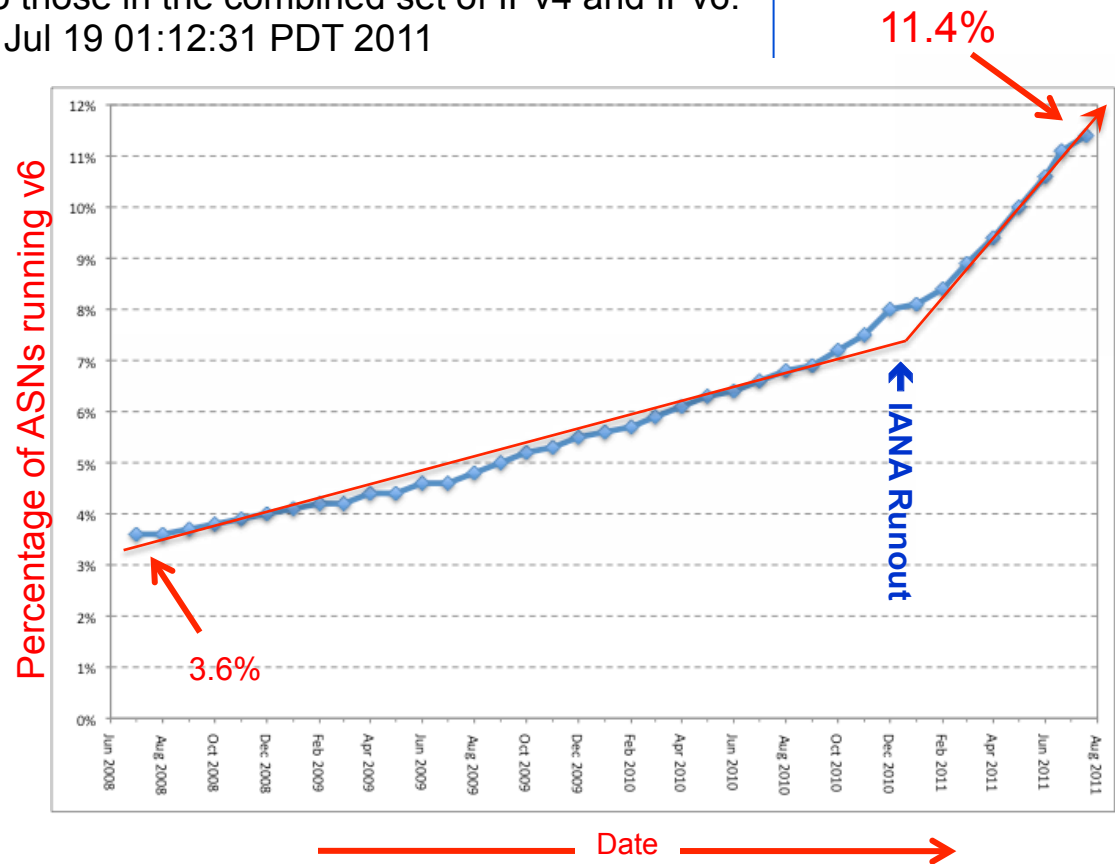
ASes using only IPv4: 34115

ASes using only IPv6: 100

ASes using IPv4 and IPv6: 4300

ASes using IPv4 or IPv6: 38515

Percentage of ASes (IPv4 or IPv6) running IPv6: 11.4%



SUMMARY

(Are we done?)

Summary

NATIVE IPv6
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- IPv6 within the ISP world is well tried-and-tested
 - Backbones saying “we have IPv6” is old news
- IPv6 is required to support end-sites where IPv4 exhaustion exists
 - Duh!
- IPv6 is not complex; just needs some focus-time and education
- IPv6 network configurations are well documented
 - However, enterprise and content players new to IPv6 are over aggressive
- World IPv6 Day was a success in getting out the IPv6 story!





Every Day is v6 Day
at Hurricane Electric

Contact:

Martin J. Levy
Director, IPv6 Strategy
Hurricane Electric
760 Mission Court
Fremont, CA 94539, USA
<http://he.net/>

martin at he dot net
+1 (510) 580 4167

ADDITIONAL SLIDES



ANATOMY OF IPv6 ENABLED ISP HURRICANE ELECTRIC

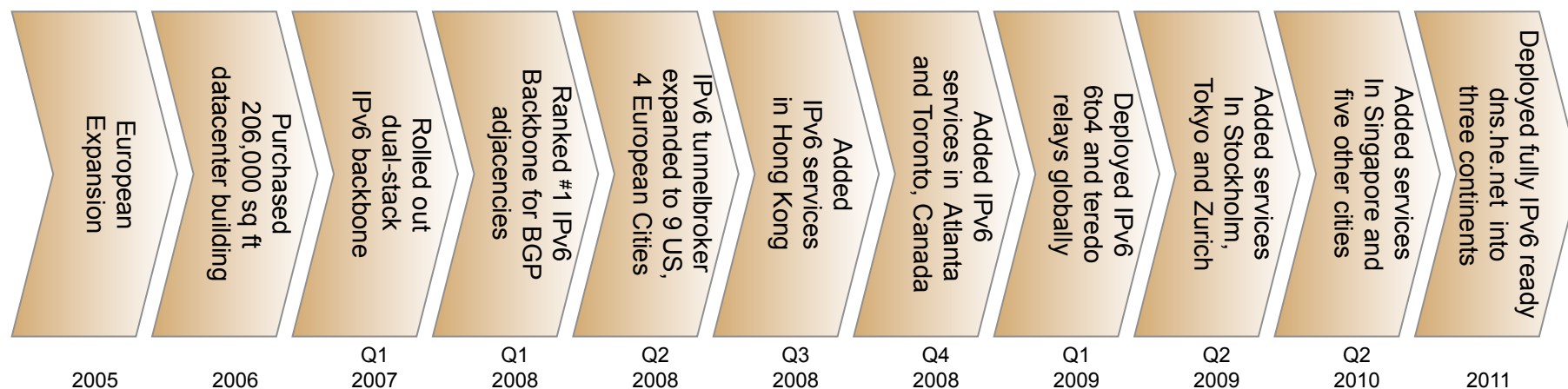
AS6939

(A few quick slides)

About Hurricane Electric (the quick “IPv6” review)

NATIVE IPv6
EVERYWHERE

- Founded 17+ years ago - ISP & datacenter operator
 - 1994 – Roots within the Silicon Valley high-tech community
 - 1999 – Expanded IPv4 network nationwide in the US
 - 2001 – Started IPv6 native and tunnel connectivity (<http://tunnelbroker.net>)
 - 2006 – Full “technology refresh” enabled native dual-stack IPv6 backbone
 - 2008 – Became largest IPv6 backbone globally (> 1Gbps IPv6 traffic level)

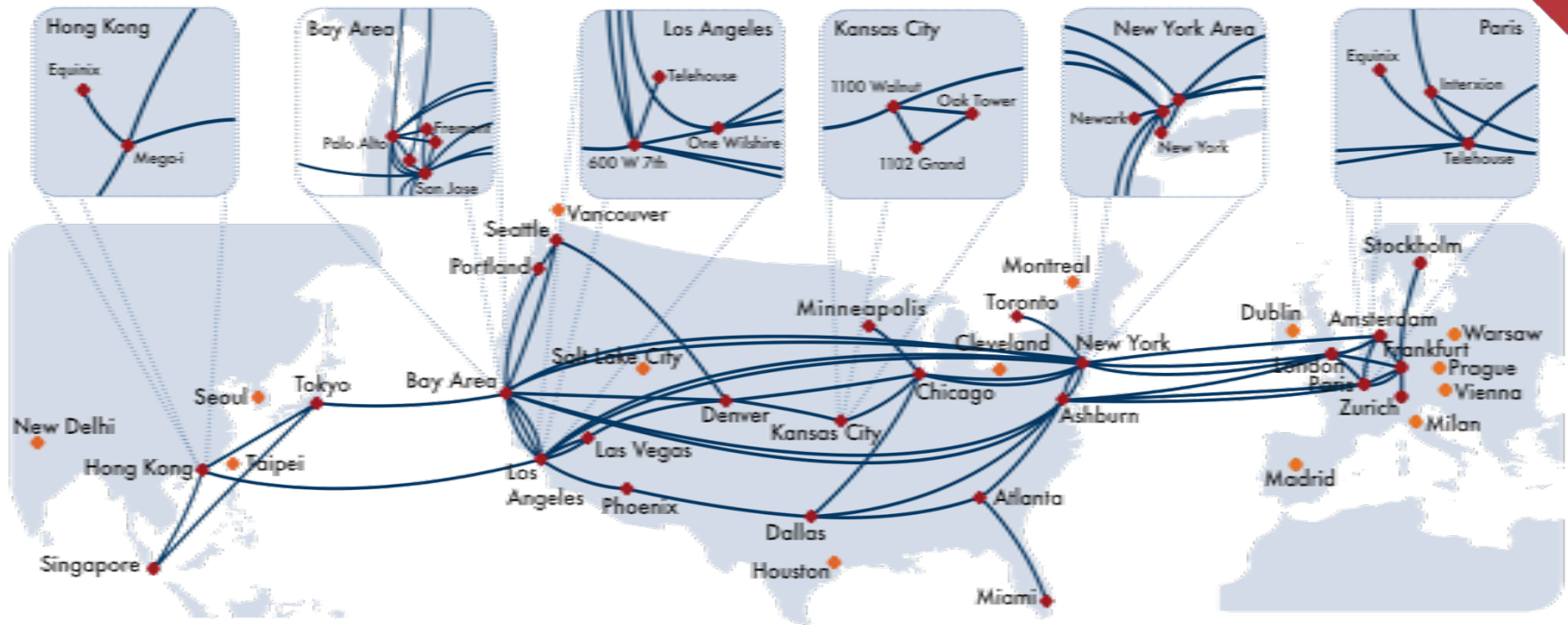


- 2009 – Continued expansion into Asia; enabled IPv6 6to4 & Teredo global service
- 2010 – Added more geographic coverage; expanded IPv6 6to4 and DNS service
- 2011 – Trying to stop talking about IPv6 and just talk about “the Internet”



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**NATIVE IPv6
EVERYWHERE**



IPv6/IPv4 Peering everywhere

Every POP and interconnection enabled for IPv6

Every datacenter enabled for IPv6



Hurricane Electric mindset – always “yes” to IPv6

NATIVE IPv6
EVERYWHERE

- It's 2011 (and not 2005, 2006, 2007, etc)
 - IPv6 capable hardware subsystems are available
 - IPv6 capable operating systems are available
 - IPv6 capable open-source software packages are available
 - IPv6 capable service providers are available
 - IPv6 expertise is absolutely available!

- It's 2011
 - No reason to say “no” to IPv6 anymore

- Providing IPv6 services is not everything ...
 - ... but it's got to be a solid part of every networking setup

