
Hurricane Electric

IPv6 Native Backbone – Massive Peering!

Hurricane Electric and thoughts on IPv6 with Teredo & 6to4 relays

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Hurricane Electric – Talk Outline

- ~~Introduction to IPv6~~ *(Just kidding – this talk assumes that!)*

- What's all this additional IPv6 traffic?
 - *(not just the native IPv6-to-IPv6 traffic)*

 - We see much more 6to4 traffic than we thought ...
 - We see much more Teredo traffic than we thought ...

- What's the future trends and why do we care?



IPv6 6to4* and Teredo*

** 6to4 (sometimes written 6 to 4) is a system that allows IPv6 packets to be transmitted over an IPv4 network (generally the IPv4 internet) without the need to configure explicit tunnels. Routing conventions are also in place that allow 6to4 hosts to communicate with hosts on the IPv6 internet. It is typically used when an end-site or end-user wants to connect to the IPv6 Internet using their existing IPv4 connection.*

From Wikipedia, the free encyclopedia <http://en.wikipedia.org/wiki/6to4>

Or read RFC3056 at <http://tools.ietf.org/html/rfc3056>

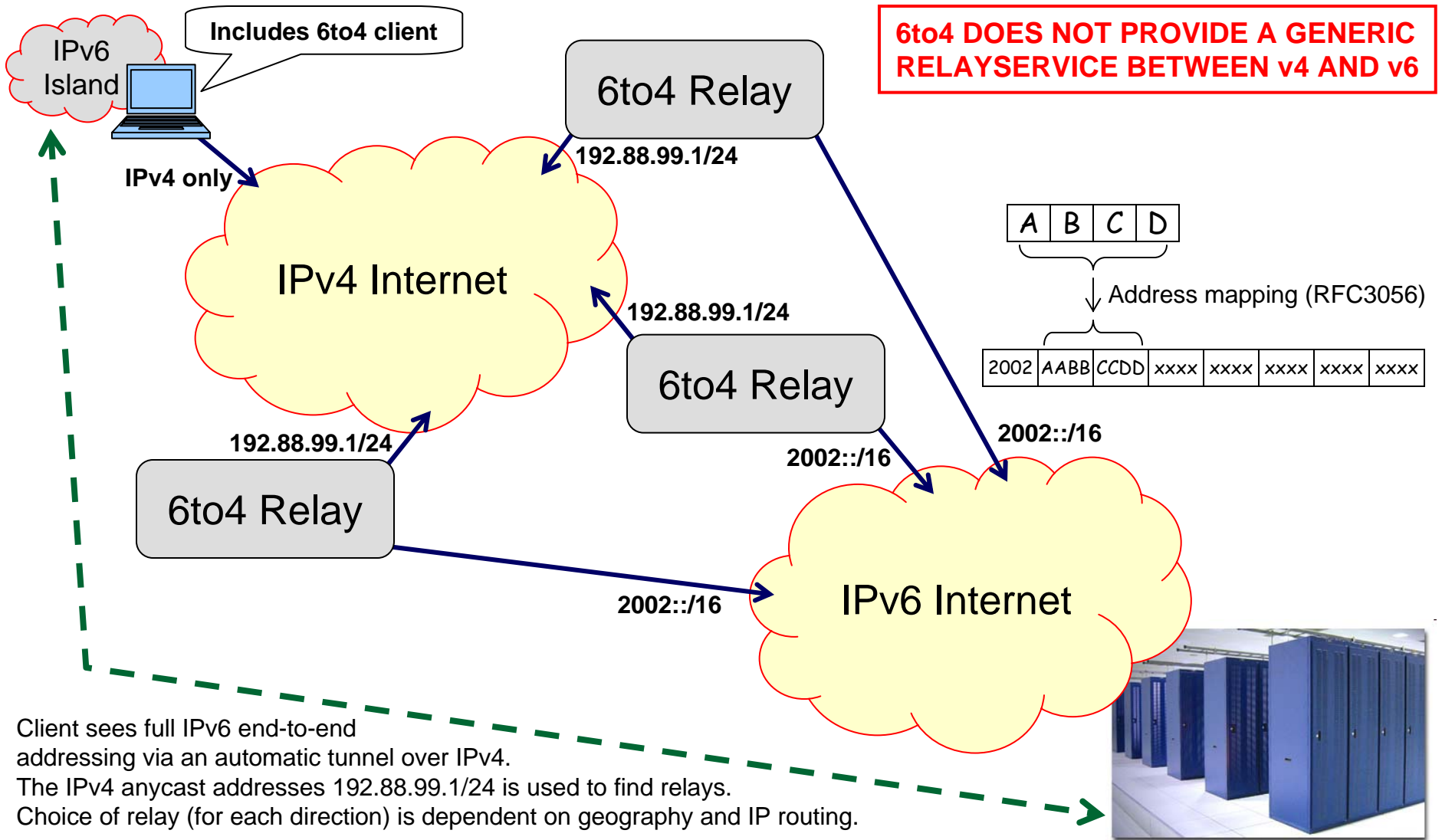
** Teredo is a tunneling protocol designed to grant IPv6 connectivity to nodes that are located behind IPv6-unaware NAT devices. It defines a way of encapsulating IPv6 packets within IPv4 UDP datagrams that can be routed through NAT devices and on the IPv4 internet.*

From Wikipedia, the free encyclopedia http://en.wikipedia.org/wiki/Teredo_tunneling

Or read RFC4380 at <http://tools.ietf.org/html/rfc4380>



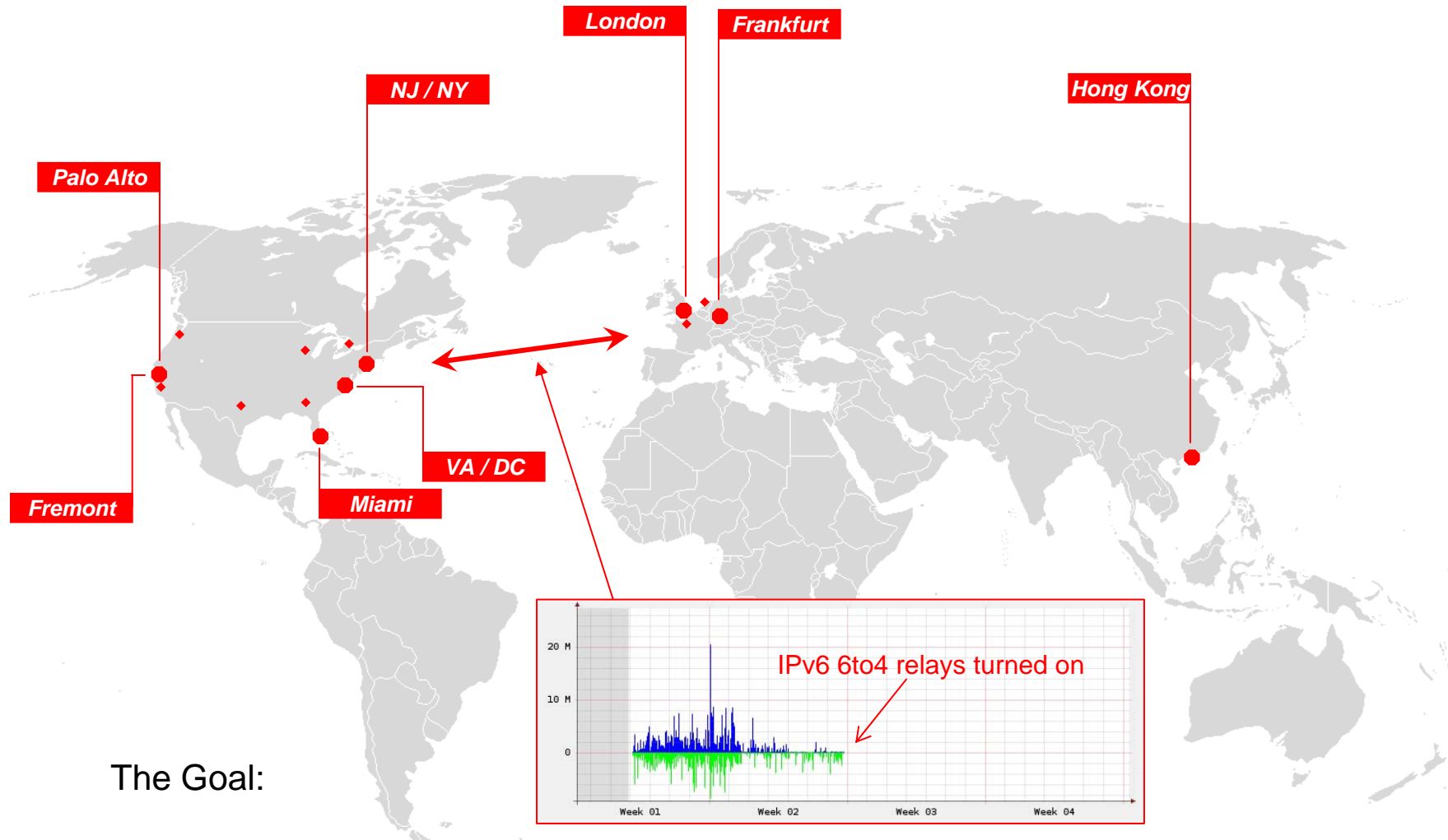
Hurricane Electric – Simple guide to 6to4 operations



Client sees full IPv6 end-to-end addressing via an automatic tunnel over IPv4.
 The IPv4 anycast addresses 192.88.99.1/24 is used to find relays.
 Choice of relay (for each direction) is dependent on geography and IP routing.



Hurricane Electric – 6to4 relay service

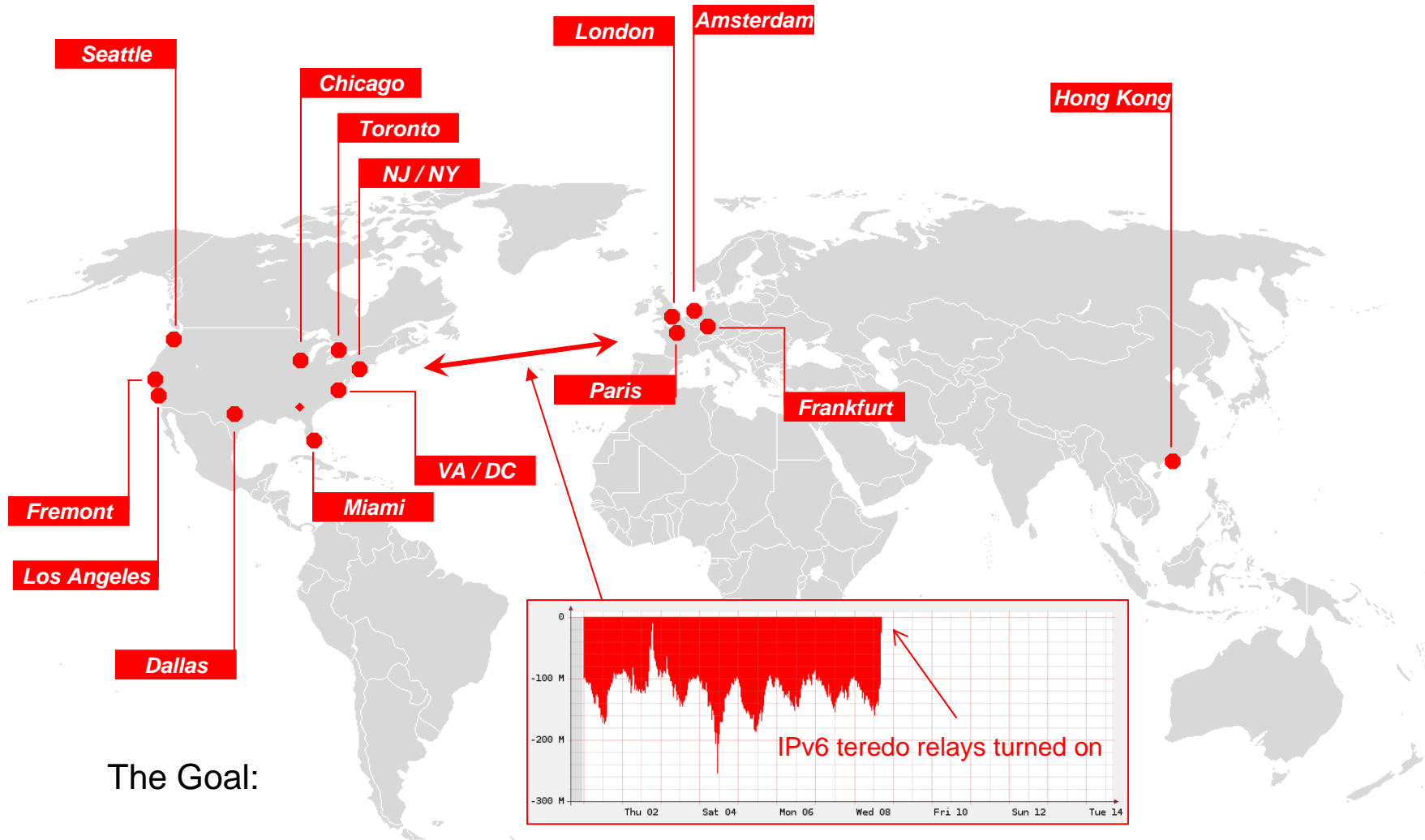


The Goal:

Localize 6to4 traffic (2002::/16 & 192.88.99.1/32 via anycast routing)



Hurricane Electric – Teredo relay service

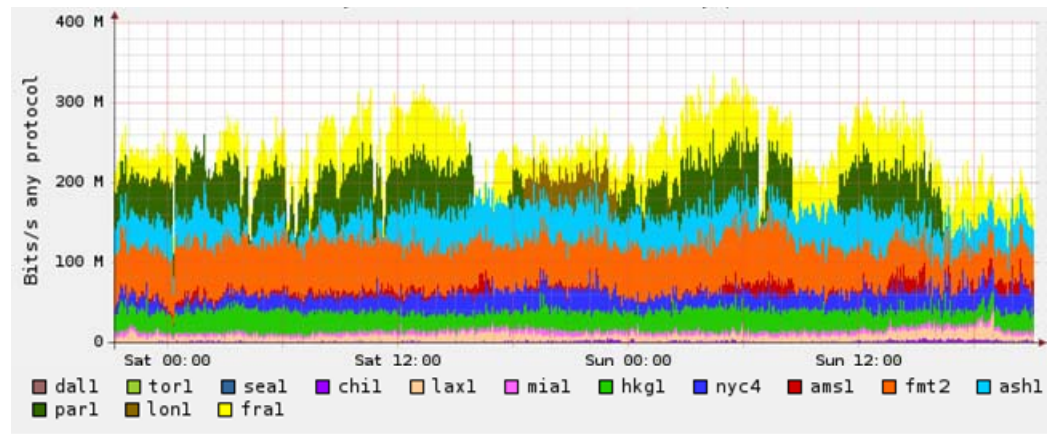
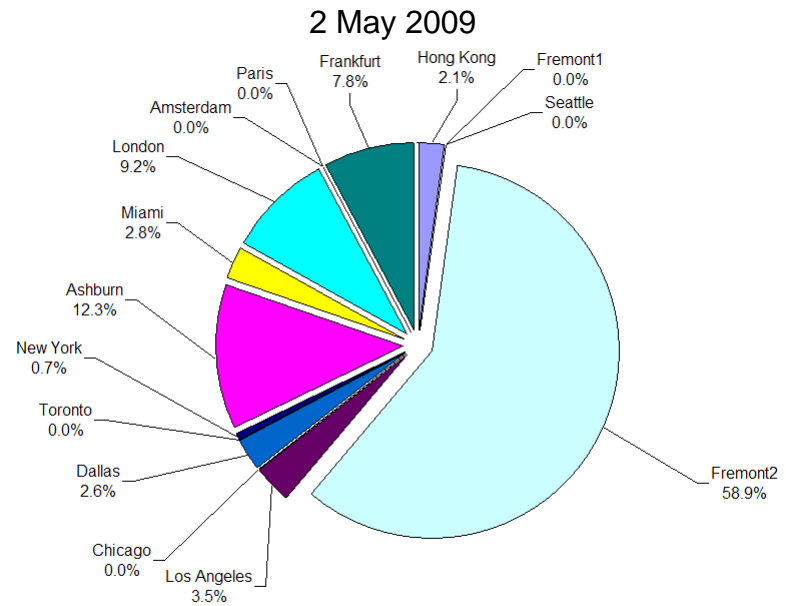
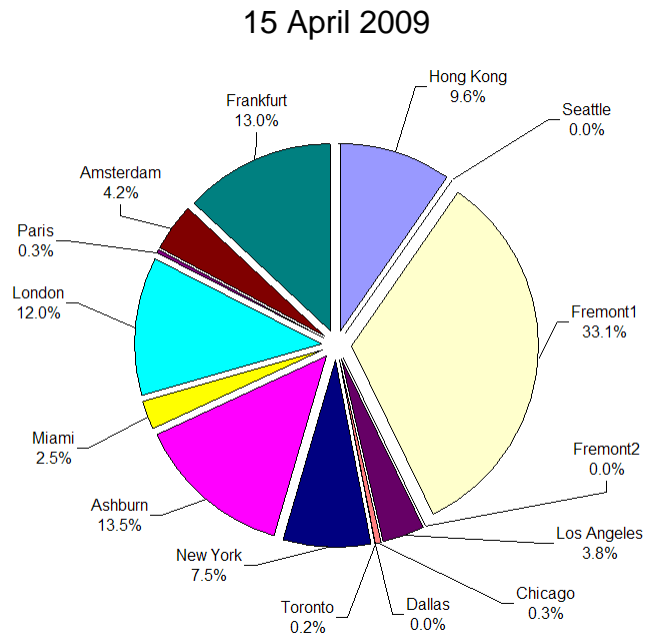


The Goal:

Localize Teredo (2001::/32 via anycast routing)

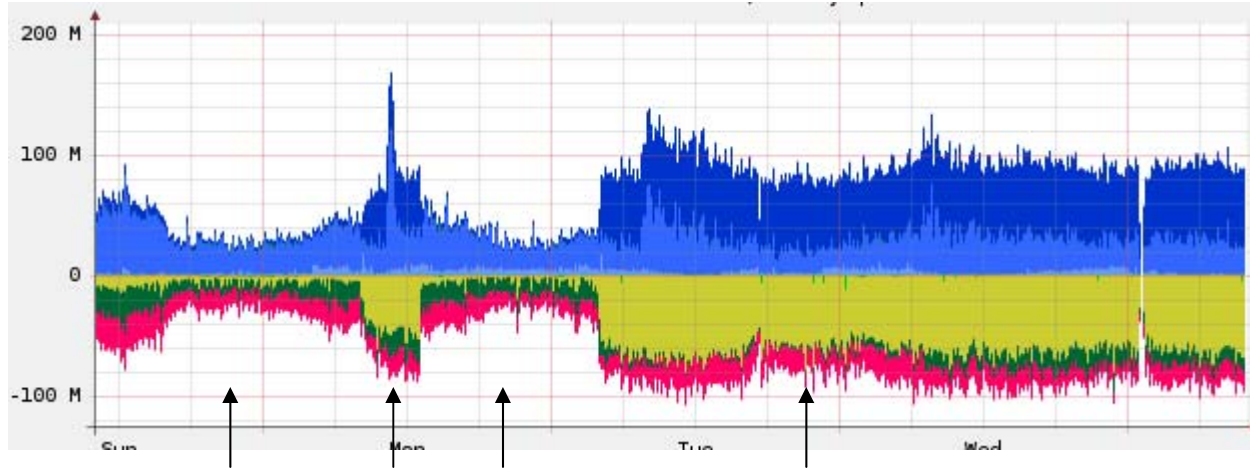


Hurricane Electric – Teredo traffic breakdown

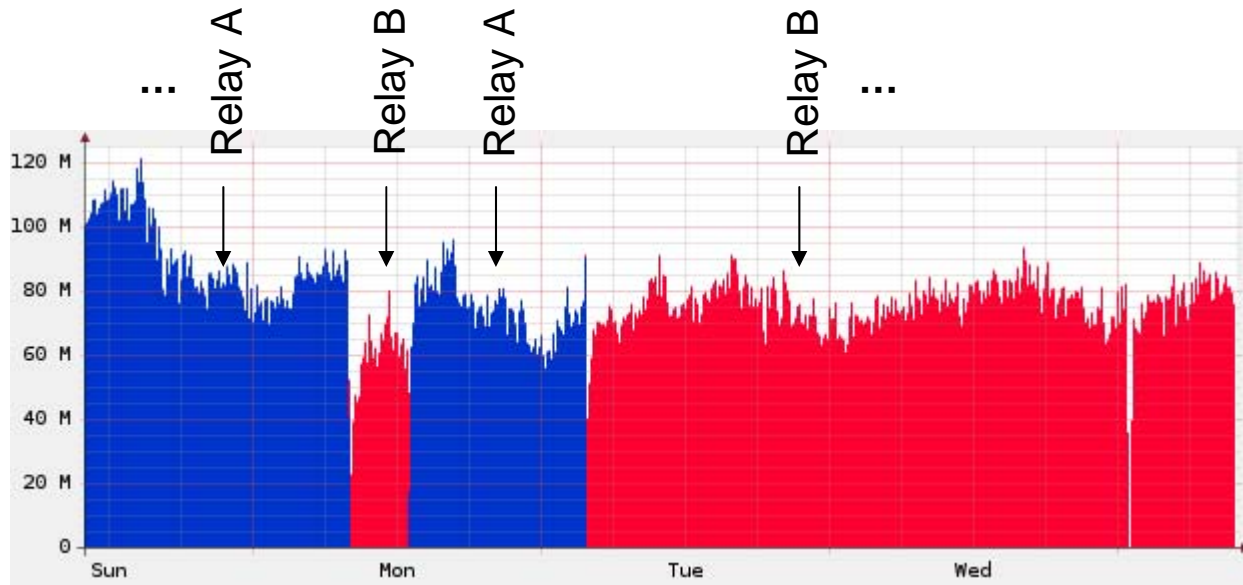


Hurricane Electric – What we were seeing before deploying

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6to4 relay traffic
levels close-by



Peering traffic flowing
towards Teredo relays
in Amsterdam



Hurricane Electric – Teredo trends and why care?

- Improving Teredo and 6to4 relays improves traffic
 - We have see significantly shorter traceroutes and lower latency
 - We have see significantly lower packet loss
 - We have see traffic grow (but not measured over a long time)

- More Teredo users; not less
 - Teredo is on by default on Vista (and Windows 7)
 - Teredo used when IPv6 is not available
 - Enabling IPv6 squashes client usage of Teredo
 - Accessing IPv6 (IPv6 only?) content from non-IPv6 clients can trigger Teredo

- Pushing for IPv6 content is vital
 - This transition time is going to see a growth of Teredo traffic





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