The Cost of NOT Deploying IPv6

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Jordi Palet, Consulintel

(jordi.palet@consulintel.es)

Introduction

- In general, when considering deploying IPv6, only the “cost” of doing so it is being foreseen:
  - Training
  - Network upgrade
  - Dual stack operation

Training Cost

- This is probably the higher cost
- Despite IPv6 is not “so different” compared with IPv4, this may be perceived as one of the higher costs
- However, many companies have recurrent training for many other new technologies and protocols
- So if adequately planned, IPv6 training should not mean an extra

Network Upgrade Cost

- Typically new network equipment or upgrades are planned ahead the time for many other reasons apart from IPv6:
  - more bandwidth capacity, intrinsic network grow, procurement of new services and applications for customers, etc.
- So both, hardware and Operation and Maintenance tools become IPv6 enabled in a natural update cycle
- IPv6 should not mean an extra cost if adequately planned ahead

Dual Stack Operation Cost

- Today, generally, deploying IPv6 means operating a dual stack (IPv4+IPv6) infrastructure.
- Obviously this may be perceived as an extra cost (managing two networks), but actually is not exactly the case, because O&M tools make it very well integrated:
  - same as operating IPv4 and VPNs or other similar technologies and/or overlay networks
- Moreover, in the future as IPv6 traffic becomes dominant, we will see more and more networks which can run only IPv6, at least in the core, but possibly also in the access with protocols such as softwires (L2TP), and operate dual stack only in CPEs, upstream routers and data centers

Cost or Planning Ahead ?

- Planning ahead is the key for any new protocol, technology and services, not just IPv6, and that helps to minimize those costs, or even make it near to zero
- However, often we don't think in what is the cost of NOT deploying IPv6
- Those cost are typically "hidden" and not so easy to realize, so let's try doing that exercise

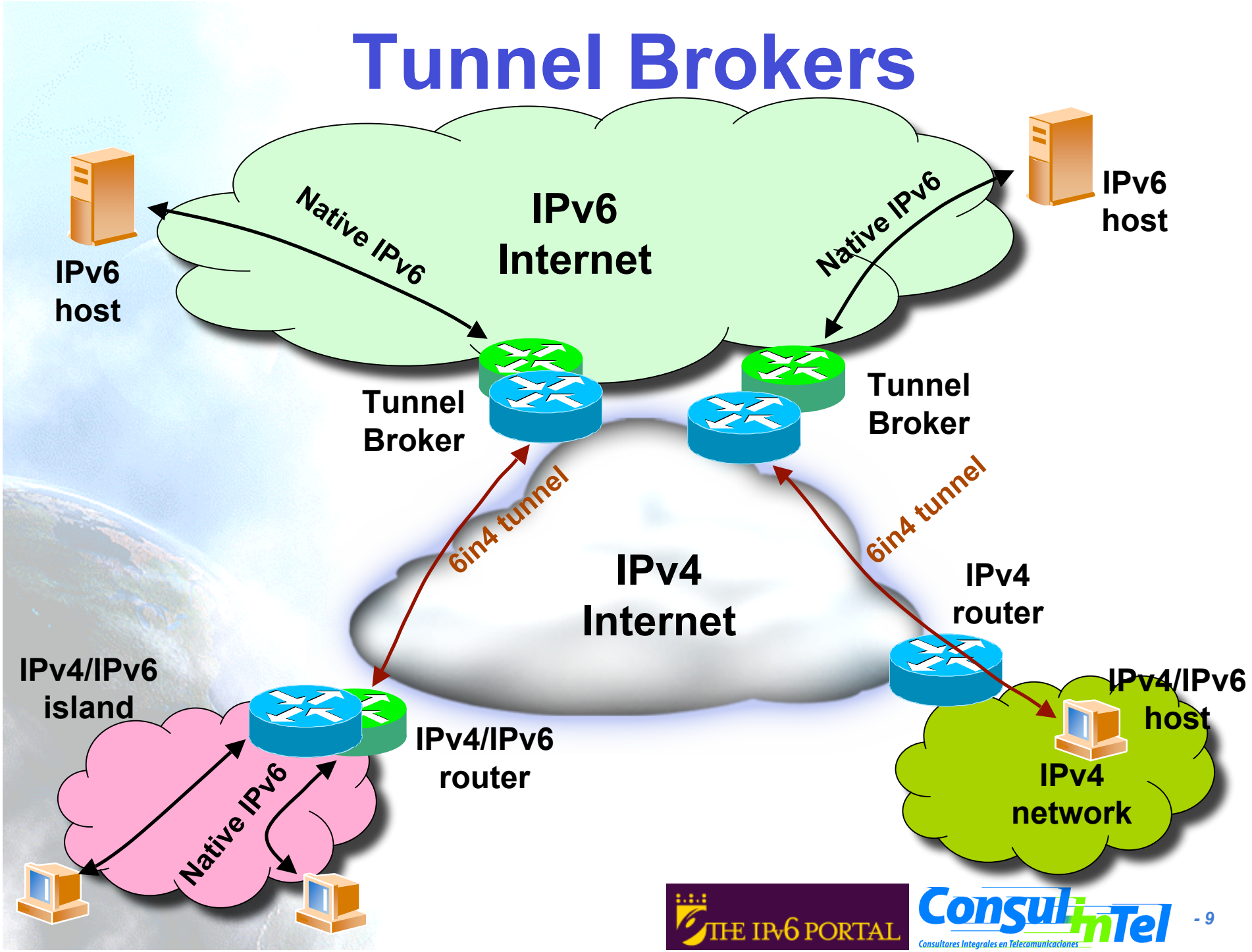
Cost of NAT

- Many studies already demonstrated that operating a network with NAT means extra complexity and cost
- This cost is even higher when deploying VoIP, triple play, end-to-end security, peer-to-peer, on-line-gaming, new business and many other applications which don't operate so easily thru NAT
- The development cost of applications in order to traverse NAT and work seamlessly across different network scenarios is a very high cost
- ISPs started to realize this: "a customer call to first line support for resolving a NAT issue, cost us the profit of that customer for a complete year; if that call needs to be scaled to second line support, then it means the profit for the entire customer life"
- NAT also means extra cost in power consumption !
- And remember … NAT is NOT security

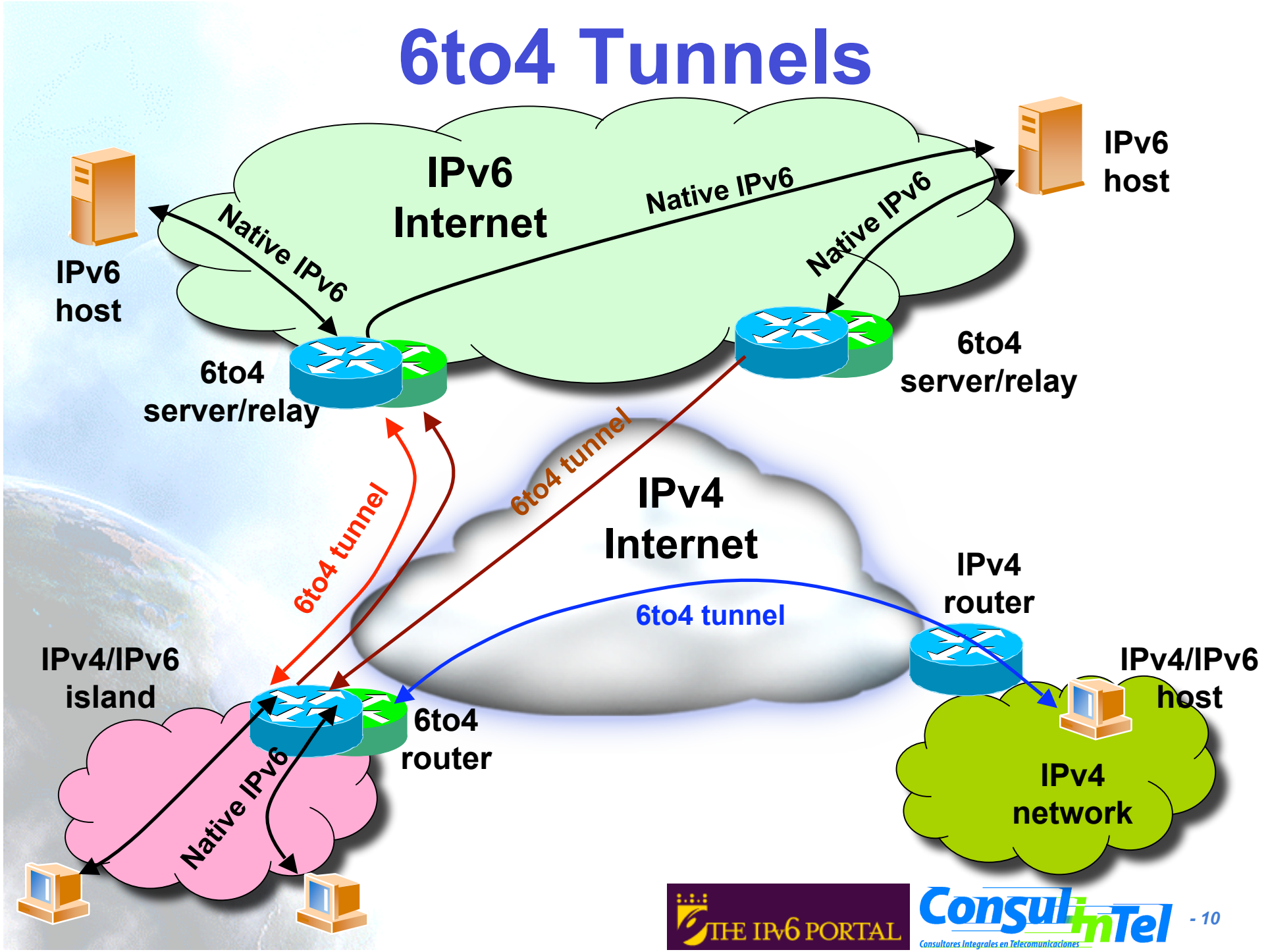
The Transition to IPv6

- IPv6 transition started some time ago
- Many transition technologies available
- Some of them are making a move
  - Tunnel Brokers (and somehow manually configured tunnels)
  - 6to4 tunnels
  - Teredo
- This is happening without any need of support from ISPs, but how good or bad is that ?

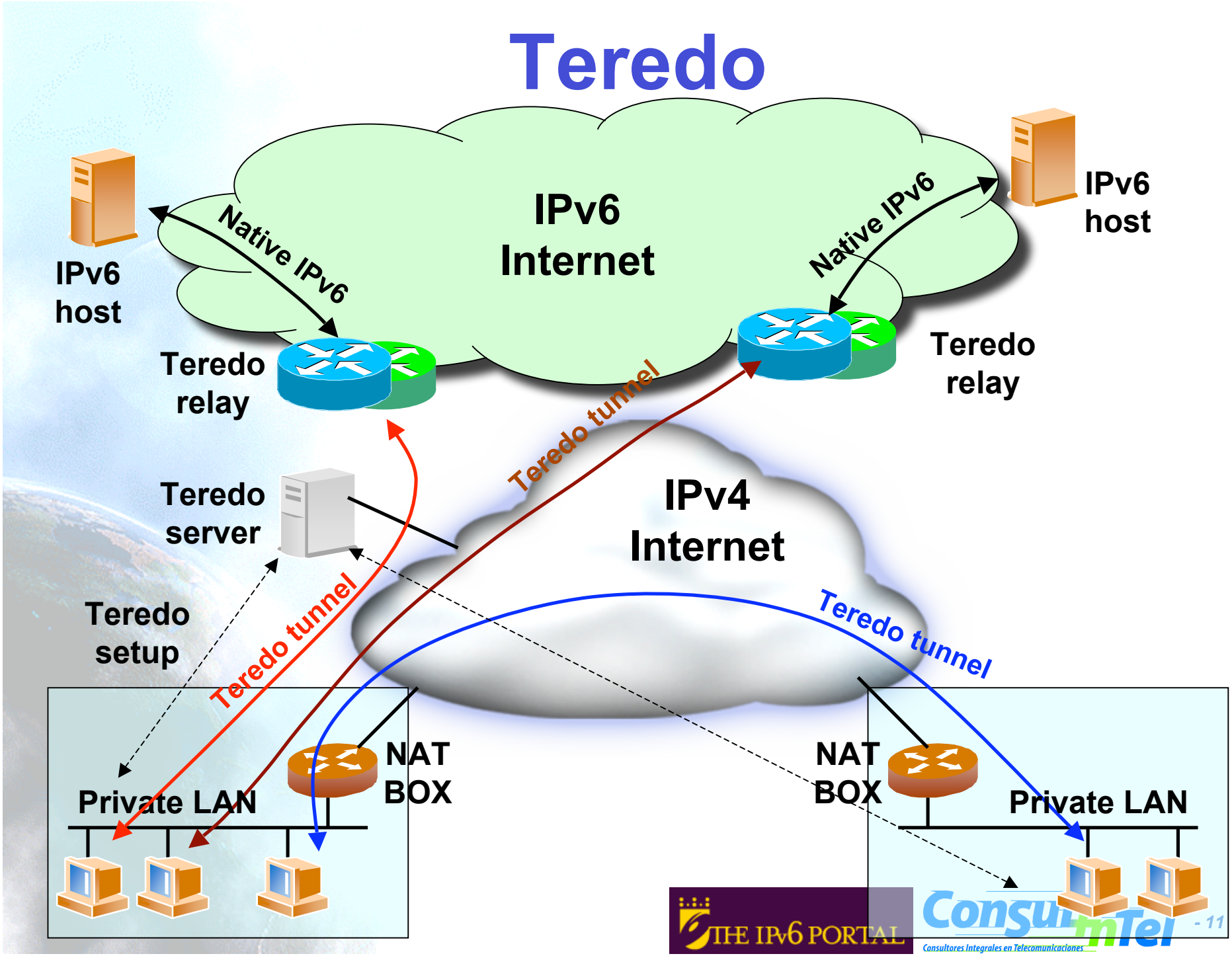
Tunnel Brokers



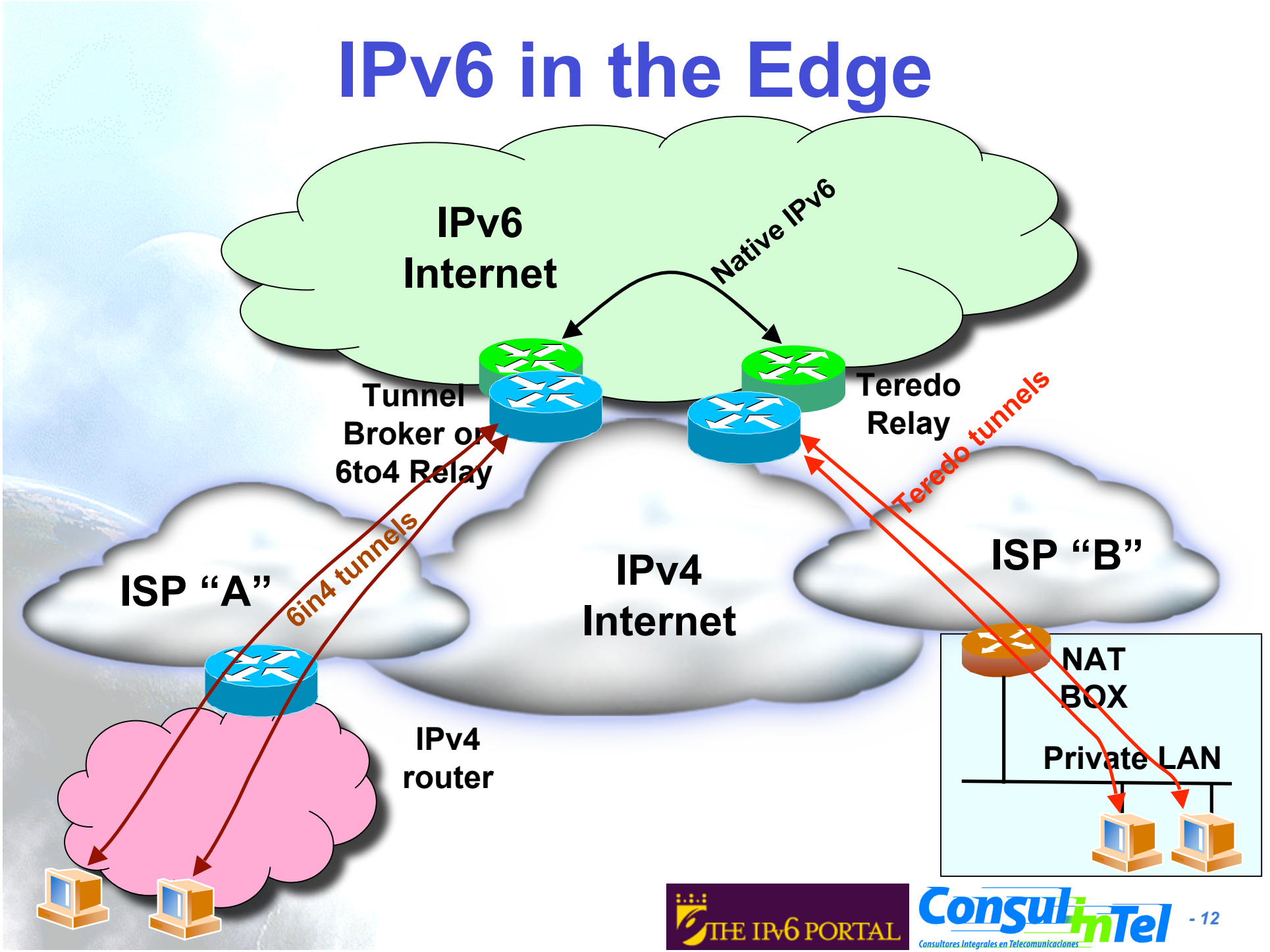
6to4 Tunnels



Teredo


IPv6 host
Native IPv6
IPv6 Internet
Native IPv6
IPv6 host
Teredo relay
Teredo relay
Teredo tunnel
Teredo server
IPv4 Internet
Teredo setup
Teredo tunnel
Teredo tunnel
NAT BOX
Private LAN
NAT BOX
Private LAN

IPv6 in the Edge



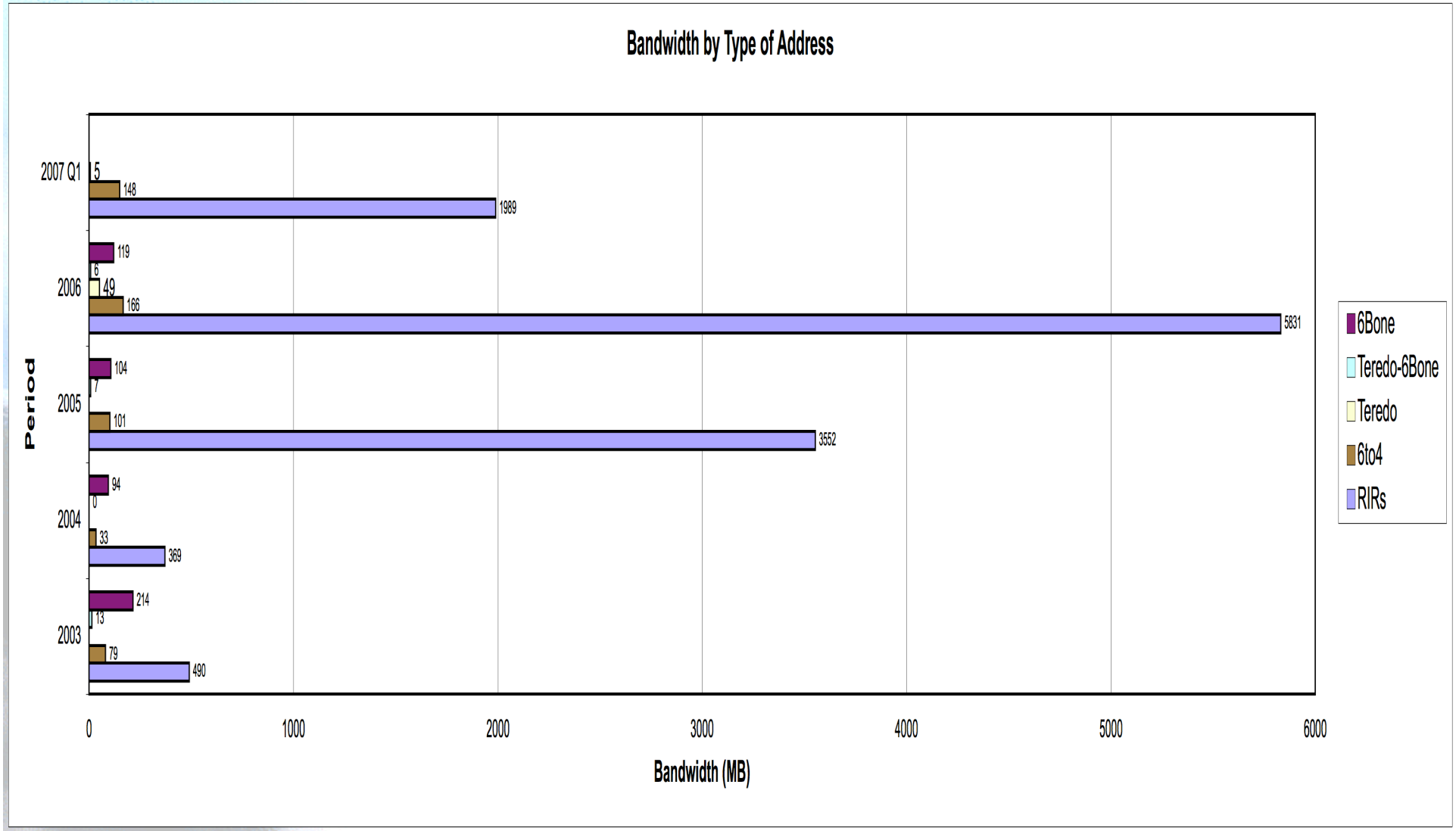
The “Hidden” Transition

- The transition is not only a process initiated by ISPs and enterprise networks
- In fact, more operating systems are available with IPv6 enabled by default and more applications make automatically usage of IPv6 even when it is not available in the ISP or enterprise network
  - The hosts at the edge of the networks start using more and more IPv6-enabled applications, in a transparent way, such as peer-to-peer and collaborative tools
  - In order to do so, they may need to tunnel IPv6 and the “tunnel-end-points” (TEP) may be located outside the network of the local ISP
  - This means:
    - Extra RTT
    - Extra (small) overhead for the IPv6 encapsulation
    - Extra (small) packet exchange for the tunnel setup and “keep-alives”
    - Extra bandwidth/transit up to the TEP and back to the other peer, which in turn may mean additional ISP regional/national/international transit
- The transition of the edges is going to be a cost for ISPs if they don’t deploy “local” transition mechanisms
- This is happening as a matter of fact. Widows Vista will be, probably an important detonator to make this more visible in the next 12-18 months

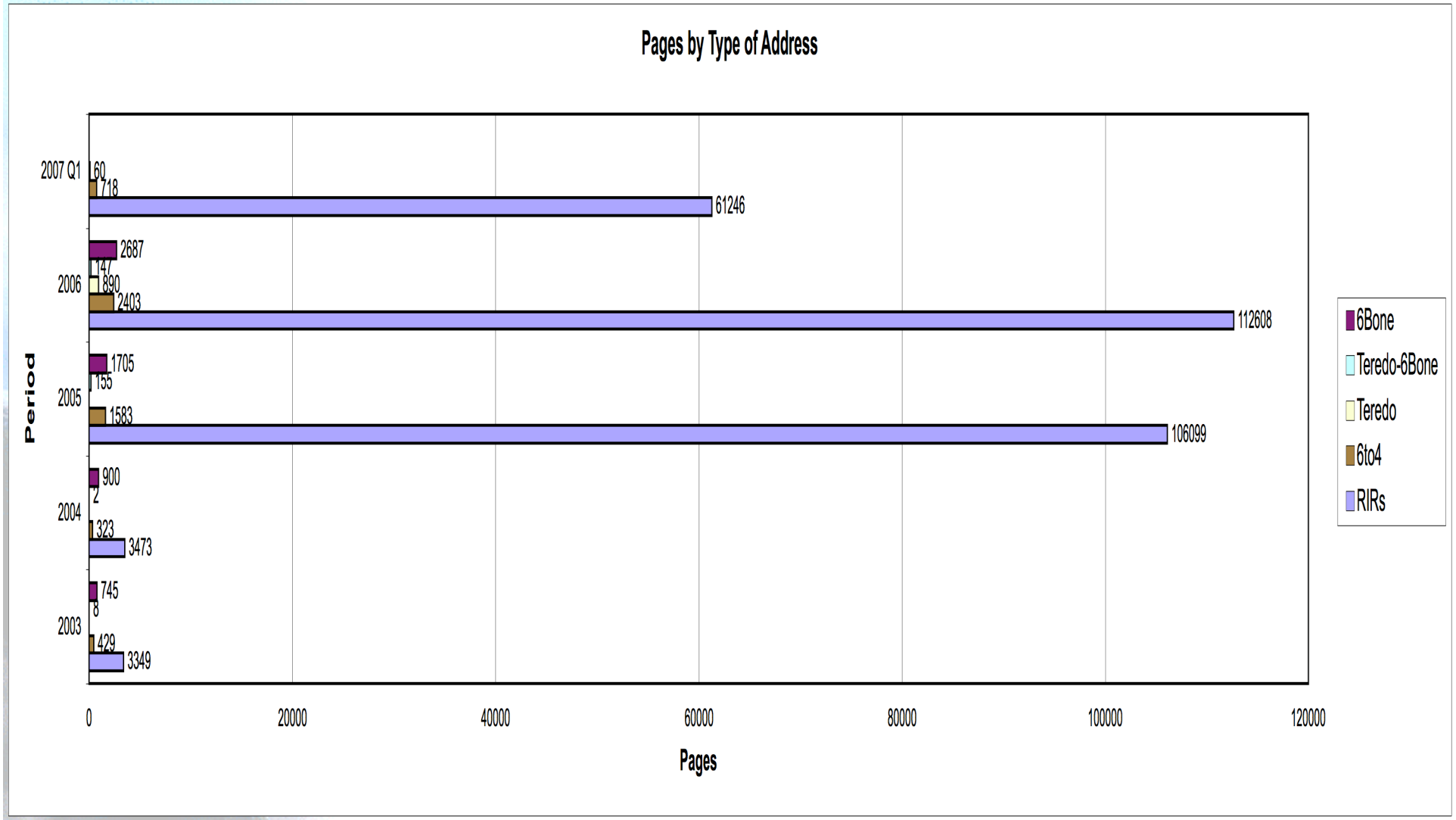
The Value of the Customers

- Last, but not least …
- How about missing revenues when customers start realizing that your competitors offer a better service (perceived quality of service), because they deployed either native IPv6 or transition services ?

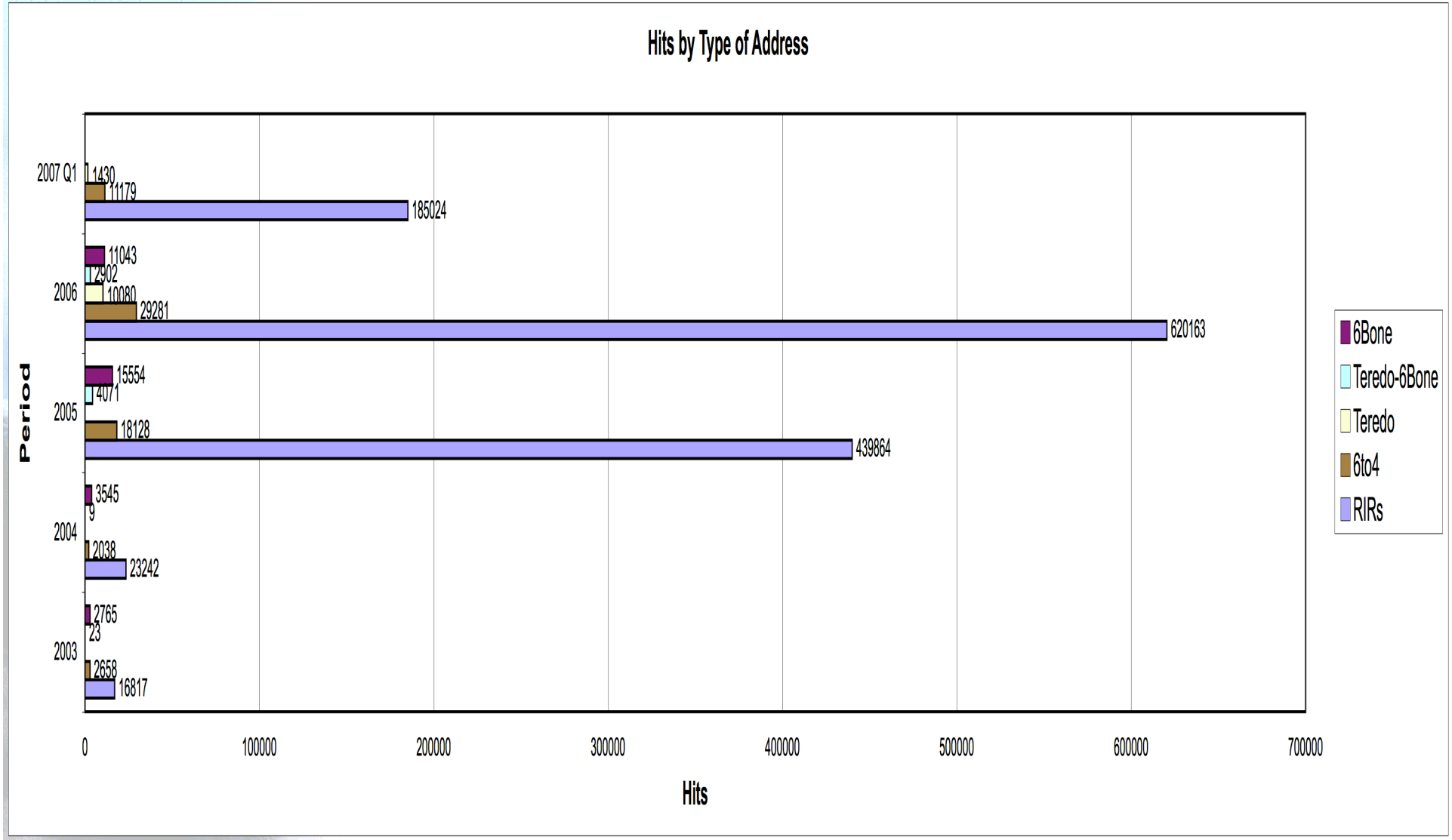
Some Stats (1)


Bandwidth by Type of Address
Period
2007 Q1
2006
2005
2004
2003
5
148
1989
119
6
49
166
5831
104
7
101
3552
94
0
33
369
214
13
79
490
0
1000
2000
3000
4000
5000
6000
Bandwidth (MB)
6Bone
Teredo-6Bone
Teredo
6to4
RIRs

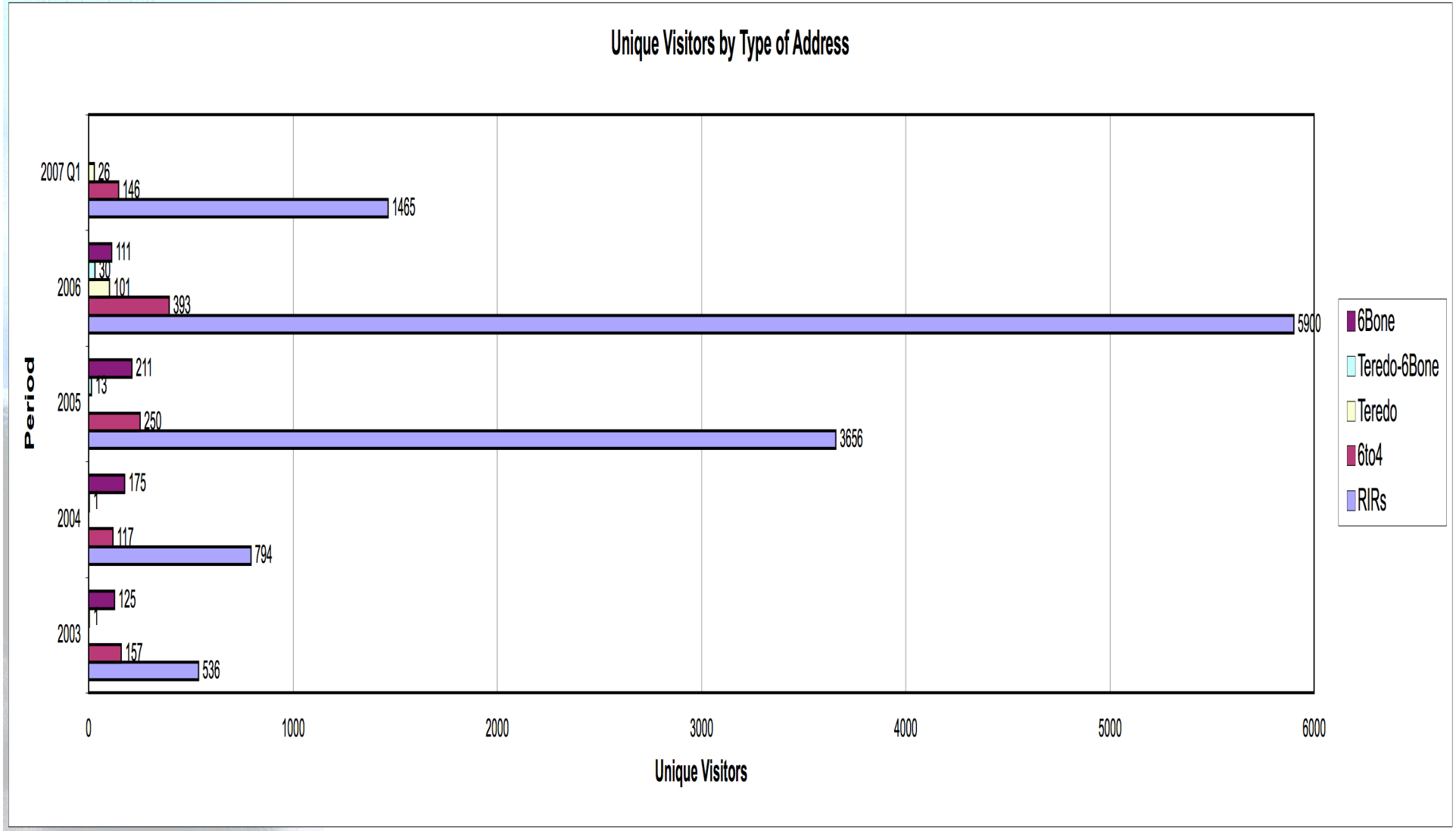
Some Stats (2)


Pages by Type of Address
Period
2007 Q1
2006
2005
2004
2003
60
718
61246
2687
147
890
2403
112608
1705
155
1583
106099
900
2
323
3473
745
8
429
3349
0
20000
40000
60000
80000
100000
120000
Pages
6Bone
Teredo-6Bone
Teredo
6to4
RIRs

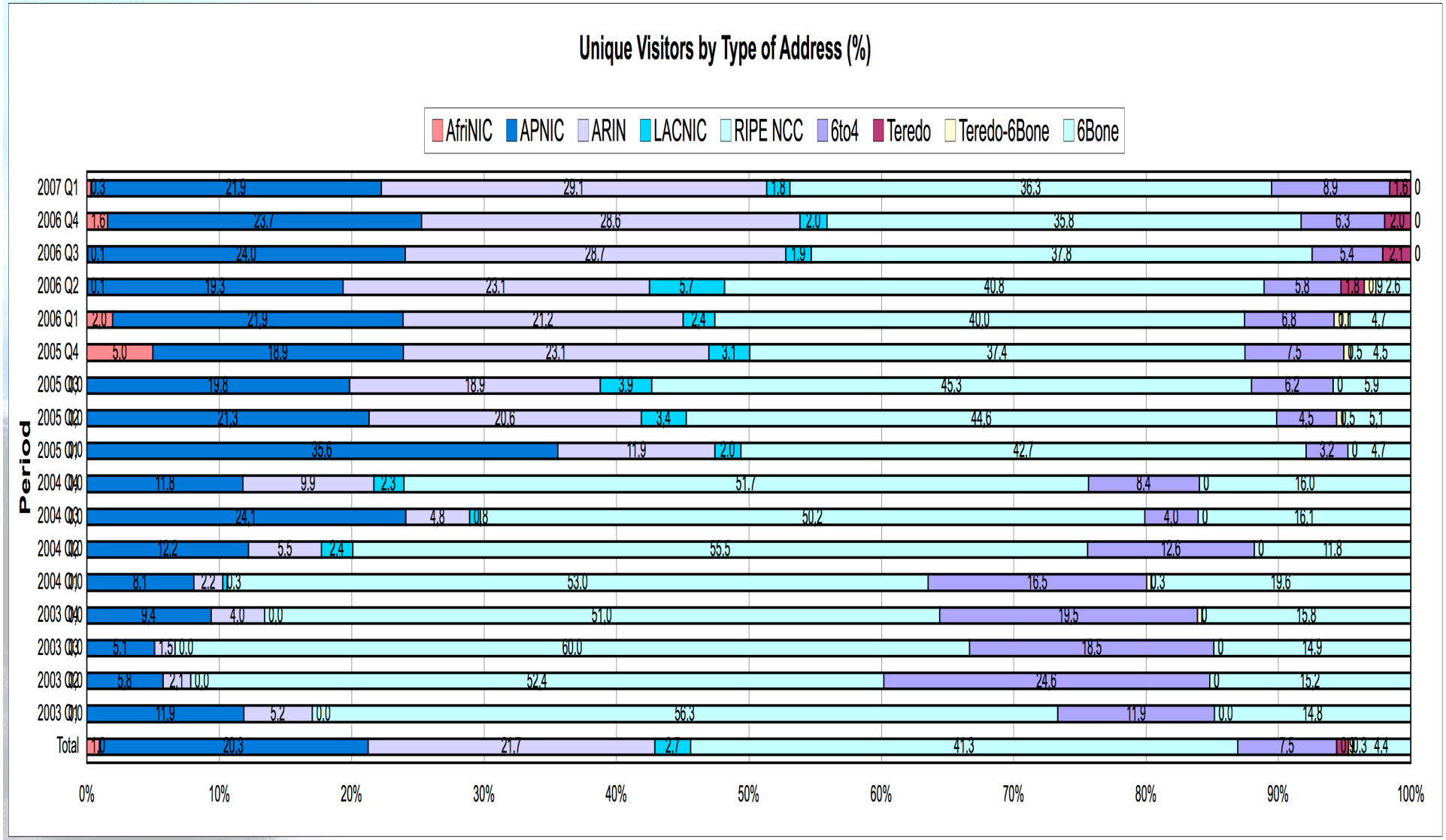
Some Stats (3)


Hits by Type of Address
Period
2007 Q1
2006
2005
2004
2003
1430
11179
185024
11043
2902
10080
29281
620163
15554
4071
18128
439864
3545
9
2038
23242
2765
23
2658
16817
0
100000
200000
300000
400000
500000
600000
700000
Hits
6Bone
Teredo-6Bone
Teredo
6to4
RIRs

Some Stats (4)


Unique Visitors by Type of Address
Period
2007 Q1
2006
2005
2004
2003
26
146
1465
111
30
101
393
5900
211
13
250
3656
175
1
117
794
125
1
157
536
0
1000
2000
3000
4000
5000
6000
Unique Visitors
6Bone
Teredo-6Bone
Teredo
6to4
RIRs

Some Stats (5)


Unique Visitors by Type of Address (%)
AfriNIC
APNIC
ARIN
LACNIC
RIPE NCC
6to4
Teredo
Teredo-6Bone
6Bone
Period
2007 Q1
2006 Q4
2006 Q3
2006 Q2
2006 Q1
2005 Q4
2005 Q3
2005 Q2
2005 Q1
2004 Q4
2004 Q3
2004 Q2
2004 Q1
2003 Q4
2003 Q3
2003 Q2
2003 Q1
Total
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%

Conclusion

- IPv4 has its own hidden costs factors, which are not well perceived
- IPv6 transition cost, if adequately planned ahead, may be minimized and brought to “near zero”
- Even if native support is not feasible now, smaller and inexpensive steps can be taken as an approach for an ISP to become IPv6-enabled by means of supporting transition mechanisms. So deploy NOW:
  - 6to4 and Teredo relays in your network
  - native IPv6 connectivity to your upstream providers or manually configured tunnels to your upstream providers (or others), if native is not possible
- NOT deploying IPv6 will also become a cost, possibly higher than doing it, with the time and global adoption by hosts at customer sites, as a matter of fact when upgrading to new operating systems, using new services and applications
- Customers are smart: They know nothing about IPv6, however they will end up understanding that some applications and services “run only” or “run better” with ISPs offering IPv6 services
- As usual: Competition is the key and “innovation” keeps you on the loop

Thanks !

Contact:

- Jordi Palet Martínez (Consulintel): jordi.palet@consulintel.es

The IPv6 Portal:

- http://www.ipv6tf.org