Internet Evolution and IPv6

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APNIC
Where are IPv6 addresses today?
IPv6 – Global allocations by RIR

- RIPE NCC: 737 (45%)
- AFRINIC: 37 (2%)
- LACNIC: 87 (5%)
- ARIN: 438 (27%)
- APNIC: 337 (21%)

Unit: IPv6 pref k
IPv6 – Global allocations by CC
IPv6 – Global allocations by CC

<table>
<thead>
<tr>
<th>Country</th>
<th>Allocations</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>AU</td>
<td>8206</td>
<td>15%</td>
</tr>
<tr>
<td>JP</td>
<td>7275</td>
<td>13%</td>
</tr>
<tr>
<td>DE</td>
<td>9580</td>
<td>17%</td>
</tr>
<tr>
<td>FR</td>
<td>8233</td>
<td>15%</td>
</tr>
<tr>
<td>KR</td>
<td>5191</td>
<td>9%</td>
</tr>
<tr>
<td>EU</td>
<td>6157</td>
<td>11%</td>
</tr>
<tr>
<td>IT</td>
<td>4131</td>
<td>7%</td>
</tr>
<tr>
<td>PL</td>
<td>2088</td>
<td>4%</td>
</tr>
<tr>
<td>TW</td>
<td>2309</td>
<td>4%</td>
</tr>
<tr>
<td>Other</td>
<td>2936</td>
<td>5%</td>
</tr>
</tbody>
</table>

Unit: 32 prefix
IPv6 – Global allocation growth
Where is IPv6 being used today?
IPv6 – routed prefixes
IPv4 – routed prefixes

http://bgp.potaroo.net/as2.0/bgp-active.html
IPv6 – routed ASNs
IPv4 – routed ASNs

http://bgp.potaroo.net/as1221/bgp-active.html
Those graphs again...
The InterNAT today
The InterNAT Today

• Everything now engineered for NAT
  – Client-initiated transactions
  – Application-layer identities
  – Server agents for multi-party rendezvous
  – Multi-party shared NAT state

• Who bears the cost?
  – End users buy the NATs
  – Applications developers do the hard work
  – ISP costs are externalised

• Seems to work!
Where is the ISP Industry?

- **Telco consolidation**…
  - Intense competition in the ISP industry has finished
  - The focus has shifted away from the ISP and away carriage services and towards to content services

- **Commoditization**…
  - Mass market access deployment has marginal rates of return on capital
  - ISP products remain undifferentiated – triple play, NGN and IMS based products have so far failed to achieve visible takeup

- **Stasis**…
  - Low margins and poor capital return have created a sluggish industry that is unresponsive to change
  - Resistive to efforts to evolve the IP level service model
So what’s the problem?
The problem is reality

• Technical
  – IPv6 is stable and well tested
  – But many technical issues are still being debated…
    • “The perfect is the enemy of the good”
  – Industry needs confidence and certainty

• Business
  – NAT has worked too well
  – Existing industry based on externalizing the costs for address scarcity, and insecurity
  – Lack of investor interest in more infrastructure investment
    • Short term interests vs long term imperatives
  – IPv6 promotion - too much too early?
    • IPv6 may be seen as “tired” and not “wired”
The result…

- Short term business pressures support the case for further deferral of IPv6 infrastructure investment
- There is insufficient linkage between the added cost, complexity and fragility of NAT-based applications and the costs of infrastructure deployment of IPv6
- An evolutionary adoption seems unlikely in today’s environment
  - …or in the foreseeable future
The IPv4 revolution

• The 1990’s – a new world of...
  – Cheaper switching technologies
  – Cheaper bandwidth
  – Lower operational costs
  – The PC revolution, funded by users

• The Internet boom
  – The dumb (and cheap) network
  – Technical and business innovation at the ends
  – Many rewards for new services and innovation
An IPv6 revolution…

• The 2000’s – a new world of…
  – Commodity Internet provision, lean and mean
  – Massive reduction in cost of consumer electronics
  – A network-ready society

• The IPv6 boom?
  – “Internet for Everything”
  – Serving the communications requirements of a device-dense world
  – Device population some 2–3 orders of magnitude larger than today’s Internet
  – Service costs must be cheaper by 2-3 orders of magnitude – per packet
IPv6 – From PC to iPOD to iPOT

• A world of billions of chattering devices

• Or even trillions…
In conclusion…
The IPv6 Challenge

• There are still too few compelling feature or revenue levers in IPv6 to drive new investments in existing service platforms
• But the silicon industry has made the shift from value to volume years ago
• The Internet industry might follow this lead
  – From value to volume in IP(v6) packets
  – Reducing packet transmission costs by orders of magnitude
  – To an IPv6 Internet embracing a world of trillions of devices
  – To a true utility model of service provision
Thank you

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