Internet Evolution and IPv6

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Projected lifetime of IPv4 addresses

![Graph showing the projected lifetime of IPv4 addresses with dates from 2000 to 2012.]
Where are IPv6 addresses today?
IPv6 – Global allocations by RIR

- **RIPENCC** 46%
- **ARIN** 23%
- **APNIC** 25%
- **AFRINIC** 2%
- **LACNIC** 4%

Unit: IPv6 pref k
IPv6 – Global allocations by CC

- US 22%
- JP 9%
- DE 7%
- GB 6%
- KR 4%
- NL 4%
- FR 3%
- IT 2%
- CA 2%
- SE 2%
- Other 39%

Unit: IPv6 prefix
IPv6 – Global allocation trend
How much IPv6 is actually in use?
IPv4 – routed prefixes
IPv4 – routed ASNs
IPv6 – routed prefixes
IPv6 – routed ASNs
The InterNAT today
The NAT problem

Internet

NAT
61.100.32.128

10.0.0.202

Phone Network

PABX
02 6262 9898

Extn 202
The InterNAT Today

• Everything now engineered for NAT
  – Client-initiated transactions
  – Application-layer identities
  – Server agents for multi-party rendezvous
  – It seems to work.

• Who bears the cost?
  – End users buy the NATs
  – Applications developers do the hard work
  – ISP costs are externalised
  – But, it does cost a lot.
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
The problem with IPv6?

• Technical
  – IPv6 is stable and well tested
  – But transition issues are still being resolved

• 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 vs long term
  – IPv6 promotion - too much too early?
    • IPv6 is “tired” not “wired”
The result…

- Short term business pressures result in deferral of IPv6 investments
- Insufficient linkage between the added cost and complexity of NAT-based applications and the costs of deploying IPv6
- An evolutionary adoption proves difficult in today’s environment
  - …or in the foreseeable future?
How can it happen?
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

- Still too few compelling benefits to drive new investments in existing services
- 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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