

# IPv6 – Now or Never?

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# We've all heard that:

- IPv4 is running out of addresses
- The technology folk have spent over a decade developing a successor technology in IP version 6
- IPv6 is now “ready”
  - IPv6 is supported in most Windows and Unix platforms
  - IPv6 is supported in most router implementations
  - IPv6 supports better quality of service, better security, better auto-configuration
  - IPv6 addresses are available
  - IPv6 is deployed as an operational global network

# And yet...

- The industry response to IPv6 so far has been one of general apathy
  - Research networks, and some carrier and industry ISPs have commenced IPv6 deployment
  - Most sectors of the industry are still taking little notice of IPv6

At the start of 2006 IPv6 has 3% of the network providers, 0.4% of the address announcements, and around 0.0001% of the traffic volumes as compared to IPv4

# Back to the question...

- Is IPv6 a **now** activity?
  - Should you be looking at gearing up to support IPv6-based services on your network in 2006
- Is IPv6 a **later** activity?
  - Is this an activity that is below the threshold at present, but one that cannot be completely ignored
- Or **never**?
  - It just won't happen within the current planning horizon for the industry

# IPv6 Now?

- Its very challenging to make a case that deployment of IPv6 network services should be part of the industry's 2006 priorities
- Indeed, its easier to make the case that it should NOT!
  - This is not a costless exercise – there are additional capital costs, operational costs and service support costs
  - But it is a revenueless exercise – customers will not pay a premium for IPv6 services
  - Internet access services already operate at low revenue margins – IPv6 deployment will further erode service margins
  - There is no external forcing function - we do not appear to be about to run out of IPv4 addresses in 2006



# IPv6 Never?

- Its equally challenging to make the case that we can continue to fuel the Internet on IPv4 for the indefinite future and that there is no need for IPv6
  - We will exhaust the IPv4 address pool in the coming years - it's definitely a case of 'when' rather than a case of 'if'
  - NATs will not scale forever – they are a source of operational fragility, and cannot provide limitless room for network expansion
  - IPv4 networks are accumulating cost at the same rate that they accumulate network complexity
  - There is the opportunity for price competition here - if IPv6 can provide similar functionality to IPv4, but at a unit cost of less than 10% of current IPv4 service delivery costs, then IPv4 will rapidly decline in relative market share

# IPv6 Later?

- Its not “now”, and probably not “never”
- So “later” looks like the most likely scenario for IPv6
- **When** is later?

# What is the trigger for change?

- At what point, and under what conditions, does a common position of “later” become a common position of “now”?
- So far we have no clear answer from industry on this question

# Pressure for Change?

- The pain of deployment complexity is not shared uniformly:
  - ISPs are not application authors -- thank god!
  - ISPs are not device manufacturers -- also a good thing!
- There appear to be no clear “early adopter” rewards for IPv6
  - Existing players have strong motivations to defer expenditure decisions -- because their share price is plummeting
  - New players have no compelling motivations to leap too far ahead of their seed capital
  - All players see no incremental benefit in early adoption
  - And many players short term interests lie in deferral of additional expenditure
  - The return on investment in the IPv6 business case is simply not evident in today’s ISP industry

# The Case for IPv6

- IPv4 address scarcity is already driving network service provision.
  - Network designs are based on address scarcity
  - Application designs are based on address scarcity
- We can probably support cheaper networks and more capable applications in networks that support clear and coherent end-to-end packet transit
- IPv6 is a conservative, well-tested technology
- IPv6 has already achieved network deployment, end host deployment, and fielded application support

# But....

- But we are not sending the right signals that this is ‘cooked and ready’ - we are still playing with:
  - The Address Plan
  - Aspects of Stateless auto-configuration
  - Unique Local Addresses (whatever they may be today!)
  - Flow Label
  - QoS
  - Security
  - Mobility
  - Multi-addressing
  - Multi-homing
  - Routing capabilities
  - Revisiting endpoint identity and network locator semantics

# The Business Obstacles for IPv6

- Deployment by regulation or fiat has not worked in the past – repeatedly
  - GOSIP anyone?
- There are no network effects that drive differentials at the edge
  - its still email and still the web
- There is today a robust supply industry based on network complexity, address scarcity, and insecurity
  - And they are not going to go away quietly or quickly
- There is the prospect of further revenue erosion from simpler cheaper network models
  - Further share price erosion in an already gutted industry

# More Business Obstacles for IPv6

- Having already reinvested large sums in packet-based data communications over the past decade there is little investor interest in still further infrastructure investment at present
  - The only money around these days is to fund MPLS fantasies!
- There is no current incremental revenue model to match incremental costs
  - Oops!
- IPv6 promotion may have been too much too early – these days IPv6 may be seen as tired not wired
  - Too much powerpoint animation!
- Short term individual interests do not match long term common imperatives
  - The market response is never an intelligent one
- “Everything over HTTP” has proved far more viable than it should have

# Maybe it's just deregulation

- Near term business pressures simply 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 at the edge and the costs of infrastructure deployment of IPv6 in the middle
  - Deregulated markets are not perfect information markets – pain becomes isolated from potential remedy

# Learning from IPv4

- IPv4 leveraged:
  - Significantly cheaper switching technologies
  - Massive shift to efficient network use
  - Significantly lower operational costs
  - Structural cost transferral
- IPv4 represented a compelling and revolutionary business case of delivery of stunningly cheaper and better services to end consumers

# IPv6?

- IPv6 represents an opportunity to embrace the communications requirements of a device-dense world
  - Way much more than PCs
  - Device population that is at least some 2 – 3 orders of magnitude larger than today's Internet. We are talking of a networked environment servicing hundreds of billions of chattering devices

# From iPod to iPOT



If we are seriously looking towards a world of billions of chattering devices then we need to look at an evolved IPv6 communications service industry that understands the full implications of the words “commodity” and “utility”



# The IPv6 Condition

- There are no compelling technical feature levers in IPv6 that are driving new investments in existing IP service platforms
- There are no compelling revenue levers in IPv6 that are driving drive new investments in existing IP service platforms
- The silicon industry has made the shift from value to volume years ago
- What will drive IPv6 deployment in a device rich world is also a radical and **revolutionary** value to volume shift in the IP packet carriage industry

# IPv6 Leverage

- Volume over Value

- Supporting a network infrastructure that can push down unit cost of packet delivery by orders of magnitude
- Commodity volume economics can push the industry into providing
  - even “thicker” transmission systems
  - simpler, faster switching systems
  - utility-based provider industry
  - Lightweight application transaction models

# Another turn of the screw?

- IPv4 forced a reluctant communications industry to transition to a new industry profile with:
  - More players
  - Less control
  - More services
  - Lower margins
  - Greater uncertainty
- So it looks like the IPv6 future may well be **one** where IPv6 is forced into direct customer competition with existing IPv4+NAT networks
  - And the primary leverage here is one of cheaper and bigger, and not necessarily *better*

# IPv6 Later

Maybe IPv6 is the catalyst towards shifting a reluctant Internet infrastructure industry one further giant leap into a future of commodity utility plumbing

But this is likely to be a process that will take a further 5 to 10 years to unfold – in which case “later” might look like a reasonable business decision for IPv6 in 2006



# Thank you