ISOC-AU – IPv6 Forum Downunder
IPv6 & Australia
The Way Forward

2nd IPv6 Summit
Canberra 5-6 December 2006

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Past Activity

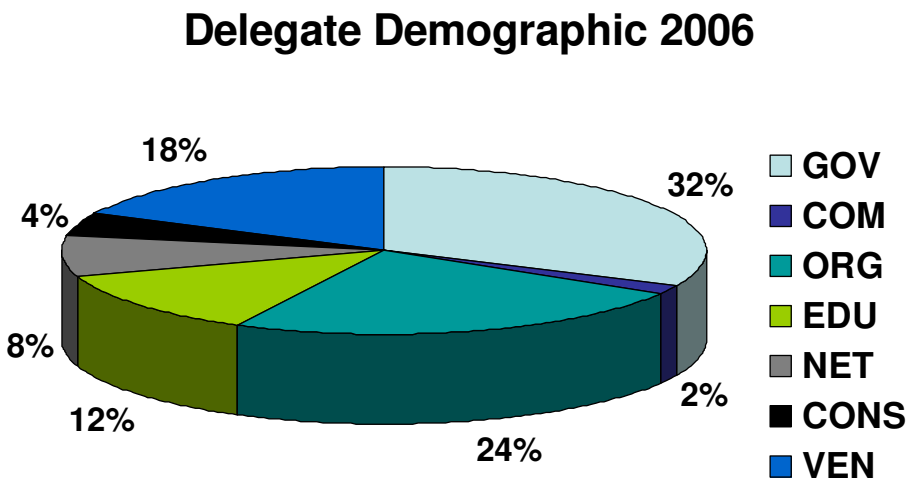
- Launch of IPv6 Forum Downunder
- Participation in various IPv6 Summits, eg Washington DC, WSIS Tunis
- Formation of ISOC-AU IPv6 SIG
- Australian National ICT Industry Alliance
  - Endorsement of national discussion
- Engagement with Australian Government
- Tony Hill a keynote speaker at Global IPv6 Summit 2005, Korea
- First Australian IPv6 Summit 2005, Canberra

IPv6 in 2006 for Australia

- First Australian IPv6 Summit 2005 – follow-up
- IPv6 World Congress Meeting Feb 2006
- IPv6 Readiness Survey
  - http://www.ipv6.org.au/survey.html
- Second Australian IPv6 Summit 2006, Canberra
  - http://www.isoc-au.org.au/ipv6summit/
- *IPv6 for e-Business* project commenced 2006
  - http://www.ipv6.com.au

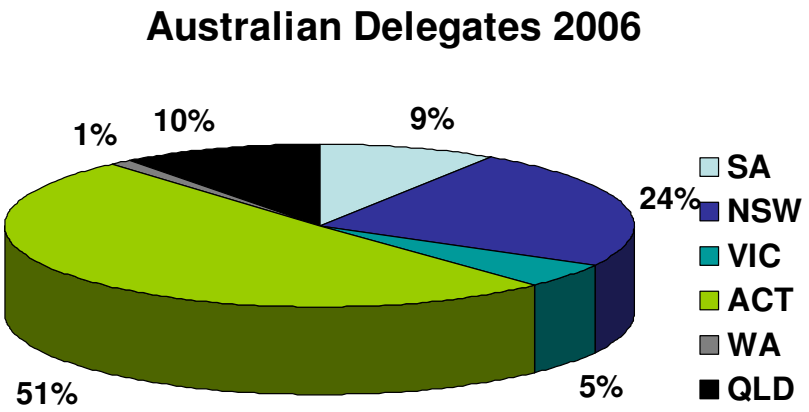
IPv6 Summit 2006 – some observations

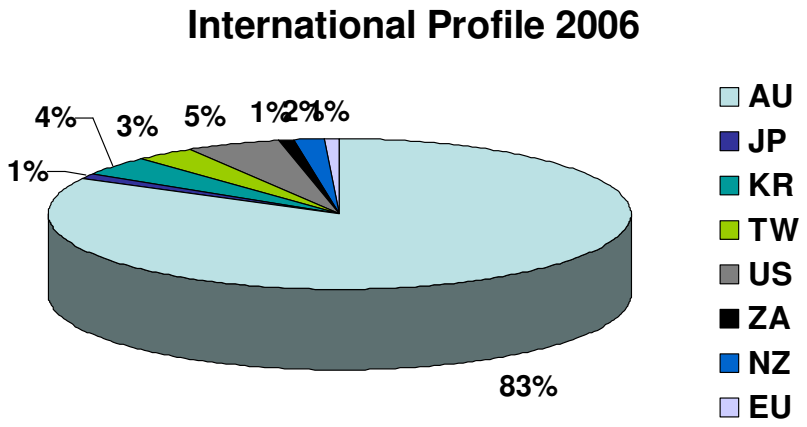
- Bigger audience than 2006
  - Little overlap compared with 2005; from the show of hands…perhaps 15 people who were here last year?
- Demographic:
  - Government
  - Enterprises
  - Organisations
  - Academic
  - Carriers/ISP's
  - Consultants
  - Vendors – H/W & S/W
  - End Users



IPv6 Summit 2007 – some ideas

- Conference content?
  Right balance between technical and business?
- Location?
- Geo demographic:
  - SA
  - NSW
  - Vic
  - ACT
  - WA
  - Qld
- Overall
  - Australia
  - USA
  - Japan
  - South Korea
  - Taiwan
  - South Africa
  - NZ





Summit Observations

- 'tis a brave new world that has such creatures in it':
  - Bunnies with pancakes on their heads
  - Mouse potatoes
  - Meerkats
  - Penguins
  - Higher Level Mammals
- "IP is not responsible for security" Tony Hain
- "It's about perceptions, you'll scare them if they think you'll blow their locks away" Simon Hackett

IPv6 in 2007 for Australia

- 2nd Australian IPv6 Summit 2005 – follow-up
- ISOC-AU Education programs
- IPv6 for eBusiness Seminar Program – 6 sites
- IPv6 Readiness Survey
  - http://www.ipv6.org.au/survey.html
- 3rd Australian IPv6 Summit 2007, Location tbc
  - http://www.isoc-au.org.au/ipv6summit/
- Initial *IPv6 for e-Business* project closes Mar '07
  - http://www.ipv6.com.au

The Way Forward

- *IPv6 for eBusiness* finalises in March 07…then? tbc
- Do we need an IPv6 Centre of Excellence?
- Encouragement for ISP to offer services
- Encouragement for companies to adopt
- Identifying the Business Case(s) for all sectors:
  - Government
  - Commercial
  - End Users
  - Academia
- AGIMO All Agency Business Case in 2H2007.
- DoD IPv6 Transition Office in 2007

The Way Forward (2)

- Australian interoperability test suites
  - experience from MoonV6, IPv6 Ready program, international experiences
- Do we need to replicate everything from overseas before we accept their lessons? Is it really a case of *"There are none so blind as those who will not see?"*
- Even Korea is acknowledging the insufficiency of their government support polices. What can we do to promote government and industry adoption?

The Way Forward (3)

- Need to develop a Road Map to adopt test and familiarisation projects such as is happening in the US, Europe, Taiwan, Korea, Japan, and China.
  - What projects make sense for Australia??
  - How can these be funded?
  - How do we leverage government and vendor test beds for all users
  - Are Public Safety/Emergency Services a good test case for Australia?

IPv6e-B Project MAPPING

www.ipv6.org.au for THE SURVEY

IPv6 for eBusiness: Business Case

1. Business Case Models

Business case scenarios being considered include:

1. The 'do nothing' case
2. It's inevitable, may as well go with the flow
3. Competitive differentiation
4. Competitive protection
5. Return on investment
6. Known opportunities - understood and tangible
7. Unknown opportunities - preparing fertile ground

2. ROI Assessment Tools

Return on Investment tools will assess three to five-year strategic needs under various scenarios.

3. Practical implementation aids

Business Case Unique Attributes

- **Vastly increased address space**
  - Extending the 4 billion IPv4 address space to the 3.4 x 10^38 IPv6 address space allows many existing and new processes to receive addresses. This includes all the world's billions of mobile phones and computing devices. It will also include the nearly 200 addressable processes in a typical motor vehicle. Homes may have tens or hundreds of IP addresses. It has been said that in the future, any device worth more than $10 will have at least one IP address (source: Dr. Dean Economou, CENTIE 2002).

Business Case Unique Attributes

- **Fixed 40-byte headers**
  - IP packet headers have 2 addresses; the Source and the Destination address. In IPv6, the address size increases from 32 bits to 128 bits, a four-fold increase. IPv6 headers therefore carry 256 bits of addressing compared with 64 bits in IPv4. IPv4 packet headers vary in size depending on the attributes that are assigned - they are typically around 20 bytes. With IPv6, a significant rationalization has taken place such that the IPv6 header is now a fixed 40 bytes. Although this is approximately twice as big, the advantage of a fixed versus variable header cannot be understated. IP routing devices can be optimised in IPv6 to deliver increased packet forwarding rates (typically a 12-10% improvement in some cases).

Business Case Unique Attributes

- **Autoconfiguration**
  - Autoconfiguration is the automatic configuration of devices without manual intervention, software configuration programs or jumpers, and devices should just "Plug and Play". When an IPv6 network adapter card is activated, it assigns itself an IP address based on a standard prefix appended to its own MAC address. This enables the device to communication on the local network and seek out any servers that it is allowed to communication with. These might use DHCPv6, AAAA or other mechanisms to download gateway addresses, security setting, policy attributes or other relevant services. This process also includes duplicate address detection, multihoming and other useful network administration activity.

Business Case Unique Attributes

- **Default IPsec Security**
  - IPv4 was developed at a time when Security was not uppermost as a concern. Authenticating protocols such as IPsec were developed later and need to be retrofitted into IPv4 protocol stacks. This leads to interoperability and implementation inconsistencies. IPv6, on the other hand, had security as a major design criteria and conforming standards-based IPv6 protocol stacks have IPsec as a mandatory requirement. All conforming IPv6 sessions can therefore be authenticated. This is not to say that users cannot control whether to use this or not, however the capability is there for everyone.

Business Case Unique Attributes

- **End to end trust (needs Certificate environment)**
  - Network Address Translation (NAT) has broken the end to end trust that was a hallmark of early IPv4 services. As there are one or more translation devices in most of today's Internet connections, there is no visibility between the end-users themselves. The authenticated IPv4 Internet connections stop at these NAT gateways. There can be one or thousands of users behind these gateways and the A party has no way of knowing about them, let alone trusting them. Authenticated IPsec IPv6 sessions will route from end to end. Users and machine-to-machine communication sessions will have confidence that the party/service they are connected with is genuinely who they think it is.

Business Case Unique Attributes

- **Attribute Extension Headers**
  - To conserve space in the IPv6 packet header, a series of Extension Attribute packets have been defined. Instead of burdening the main packet header with security, QoS, encryption, performance and management payloads, these have been assigned their own unique packet structures. If they are needed, they are inserted between the routing header and the payload. The routing header includes an indication as to the presence of Extended Attribute packets. This vastly speeds up the router packet forwarding rates and improves the efficiency of the communications sessions.

Business Case Unique Attributes

- **Anycasting**
  - Anycasting is a unique attribute of IPv6. In IPv4, Unicast and Multicast addressing is supported. A Unicast session is one where a direct session between the source and the destination is established. Most of the IPv4 Internet consists of Unicast sessions. Multicast sessions exist between a single source and multiple predetermined destinations, all of whom receive the source's transmission, much like the broadcast from a satellite to many receivers simultaneously. Anycast addressing, unique to IPv6, refers to a single source calling a predetermined list of Anycast destinations, but only one destination responds and participates in subsequent transmissions. The other Anycast addresses realise that someone has responded and do not participate further. Anycasting has many applications including the distribution of multimedia and video over the Internet. For example, a customer might request a video package from a news server and the geographically-closest server may respond. Or it might be a server that was further away but was more lightly loaded. Or was further away, heavily loaded but connected over a less expensive path. There are many permutations and most have not yet been explored or exploited.

Business Case Unique Attributes

- **MobileIPv6**
  - When a device moves from its home network, its IP address will be recognized as a foreign address in its new location and will be denied service. The gateway it originally was told to use in its home network is no longer valid and communication sessions will not be established. This may happen many times in the course of a single journey, across a city for example, where many different carrier services might be available. To overcome this limitation, a process called MobileIP was developed in IPv4. This consisted of the devices calling 'home' and telling the home network of its changing gateway environments (the foreign correspondent model). This is a very inefficient way to operate as all traffic to and from the mobile device has to be routed via the home network. MobileIP has been extended in IPv6 to overcome this inefficient triangulation. In MobileIPv6, a foreign correspondent server is continuously updated as to the network the device is in and which gateway to use to reach the traveling device. The bulk of the packets flow directly between mobile device and its communicators, and not via the home address. This vastly improves performance and reliability, and reduces cost.

Business Case Unique Attributes

- **Flow Label QoS**
  - All of the Differentiated Services (DiffServ) and Integrated Services (IntServ) Quality of Service attributes from IPv4 are carried over into IPv6. In addition, IPv6 exclusively has a 20-byte Flow Label field. This field is being developed to provide a rich set of Quality of Service attributes for the growing IPv6 world. Many of these sets are being deployed, and market acceptance/adoption will determine the ones that succeed.

Business Case Unique Attributes

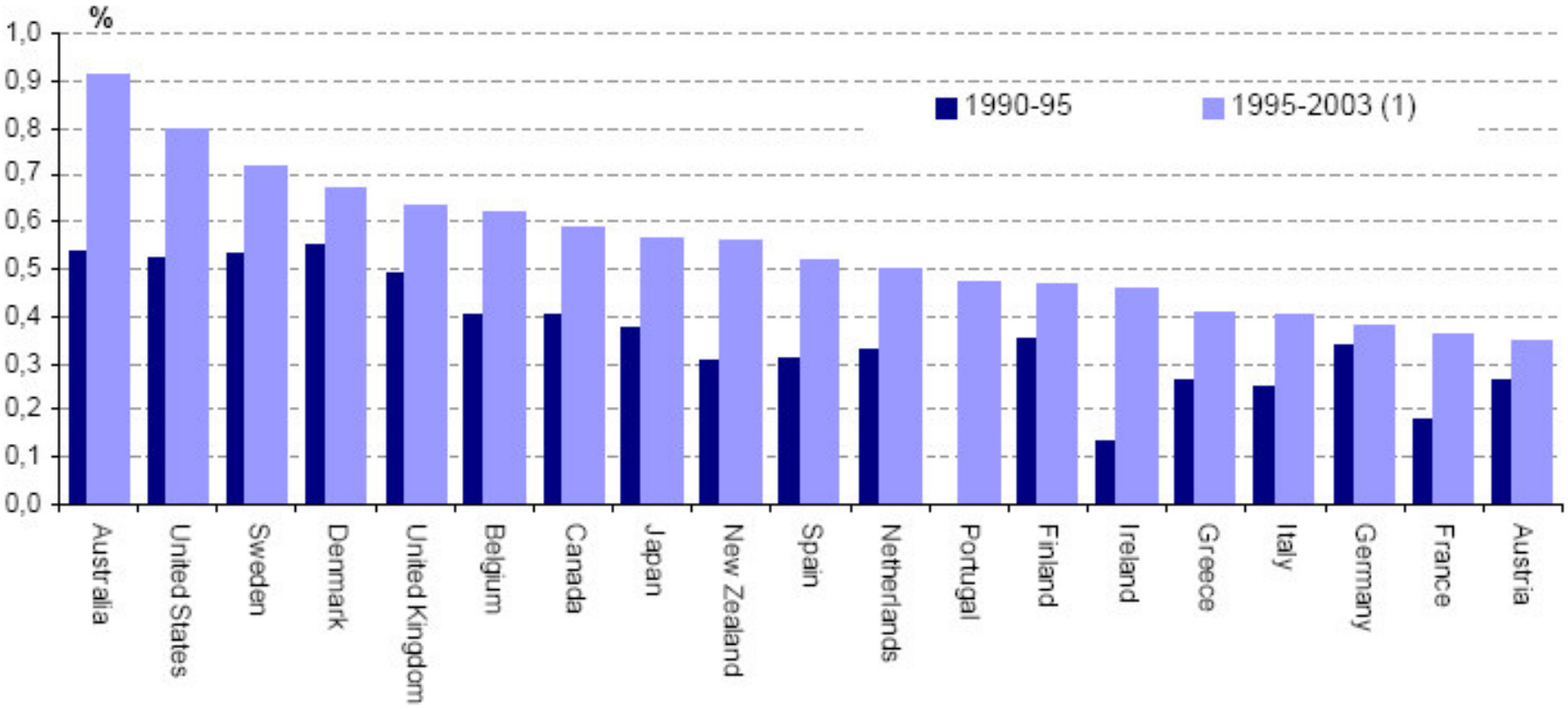
- **7. Unknown opportunities - preparing fertile ground**
- Although the IPv6 protocol has been under development for over 10 years, most of the detailed implementation work is less than 5 years old. Unlike the time when IPv4 was developed, the Internet is now a mainstream activity that touches practically every aspect of daily lives, commerce, government and socialinteractions. Compared with only a short time ago, whole armies of engineers, entrepreneurs and programmers are dedicating their professional lives to exploiting the capabilities of the Next Generation IP. New and innovative enhancements are being made every day to the Internet Protocol Suite. It can be anticipated that unforeseen and innovative applications will continuously come into being. Students being taught IPv6 protocols today will continue to find opportunities to express themselves in new and challenging ways as they graduate into the workforce.
- The basic design of the IPv6 protocol suite is not a closed system. Using the open framework approach of Extended Attribute packets, IPv6 is an extensible protocol that has no practical limits. It provides the functionality we need now, and is open to what we may need in the future. IPv6 is uniquely positioned to support new and innovative applications such as Peer to Peer (P2P), Sensor Networking, GRID and Ambient Intelligence. IPv6 is bringing together researchers across multiple disciplines: computer science, electronics and mechanical engineering, design, architecture, social sciences, and software engineering. It is the platform of the Future.

The Key Driver?

- Expansion in Connected Devices
  - Interoperability between IPv6 and RFID
  - Explosion of Internet enabled mobile phones
  - Potential of broadband over power lines
  - Growth of WiMax
  - VoIP
  - Home automations
  - Desktop applications as a mobile, hand-held PC

- Let's get ourselves ready for this!

Wasting an important opportunity?



ICT Contribution to Economic Growth (from Latif Ladid keynote)

Source: OECD Productivity Database, September 2005, [www.oecd.org/statistics/productivity]

- Questions?
- Hope to see you again next year!