IPv6 in University Courses

IPv6 Hui
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Quick Survey

- Based on responses from
  - Auckland
  - Waikato
  - Massey
  - Victoria
  - Otago

Years 3 and 4

- IPv4 address depletion
  - Address allocation and management
- IPv6 overview
  - Comparison with IPv4
- New header and header extensions
  - Protocol features, e.g. QoS, security, mobility
- Deployment issues
  - Comparison of NAT and IPv6
  - Tunneling
  - Routing

Graduate Research

- Currently limited to a few students
- Dual stack test beds generally available
- PlanetLab will extend opportunities
  - Workshop in November

What else should we do?

- Should we use IPv6 as the default protocol stack in our teaching?
  - Recent ARIN/CAIDA survey shows “lack of IPv6 expertise” as a significant barrier to adoption
  - Currently we tend to use IPv4 and refer to IPv6 as the future
    - IPv4 X-day ~= 4 Jul 2011

Auckland

- At UoA we cover IPv6 basics as part of our Stage 3 networking course
- We cover IPv6 deployment issues in our Stage 4 networking course.
- Of course it's only one topic among many, but anyone who takes these courses will get the basic idea. We touch on most of the topics you mention. "impact on ... architectures" is a bit too much to cover in the time available, though.
- Our department servers and student labs are fully dual stacked, so students doing Wireshark assignments see IPv6 traffic as a matter of course.
- Currently we have one PhD student, one MSc student, and one Stage 4(honours) student working on IPv6 topics, and we are planning to setup a small dedicated test bed for them, in addition to the live IPv6 service on the UoA network and possibly PlanetLab usage too.

Waikato

- We've regarded teaching IPv6 as an important part of our networking courses for many years now. It is useful to be able to show to students that there is a different set of answers to the problems that IPv4 answers and it is used to encourage students to think about why the protocols are designed they way they are.
- Our network course is always evolving, but the current state w.r.t IPv6 is:
  - It is mentioned as solution to the IPv4 address depletion issue at second year.
  - It is taught as a new protocol with efforts to compare it with IPv4 (as above) at third year.
  - Our fourth year course is topics based. In the past IPv6 migration was a topic on its own but we are moving more to including IPv6 issues in a range of other topics.
  - Practical assignments at fourth year have included IPv6 for routing and protocol analysis for several years.
- Richard Nelson.

Massey

- Thanks for the email. I cover IPv6 in my third year Computer Networkingpaper (159.334) and it currently spans 2 - 3 lectures. The topics covered are:
- 1. IP Version 6 Background/History
- 2. IPv6 Overview
- 3. New Header format
- 4. Extension Headers and Options
- 5. Quality of Service
- 6. Security
- 7. ICMP Version 6
- 8. Migration Issues IPv4 to IPv6
- 9. Depletion of the IPv4 Address space - issues and some solutions.
- 10. Overview of APNIC and its role (also IANA)
- 11. IPv6 at Massey University
- In my advanced Telecommunications topics (4th year paper) 143.466 we also cover advanced routing protocols with reference to both their IPv4 and Ipv6 incarnations. We have some student projects that involve advanced routing in Gb Ethernet networks and we have a working pilot based around routers built from FPGA cards. The pilot scheme uses IPv6 exclusively so students working in that area need to be familiar with the protocol in order to set up the networking arrangements. As for implementation, I am not very familiar with the details but it is my understanding that Massey ITS have a dual stack arrangement to allow forIPv4 and IPv6 implementation. Is this the type of information that you require?

Victoria

- IPv6 and issues are mentioned in lectures in COMP306/NWEN302.
  - Practicum includes writing a simple packet sniffer with decodingwhich includes IPv6
- There are lectures on IPv6 in COMP414 Advanced Networking – more in depth rationale, packet structure, protocol operation, ICMPv6, tunneling/interworking, QOS and routing.
- In COMP417 Internet Technology we are including both IPv4 and 6 in their practical work (building an ISP).

Otago

- COSC 244 and TELE 202: teach IPv4 address depletion, IPv6 protocol, and tunnelling of IPv6.
- INFO 233: IPv6 introduction, IPv4 vs IPv6 comparison
- INFO334: IPv6: migration and deployments, overview of IPv6 benefits and drawbacks from the net management perspective
- TELE 302: NAT vs IPv6, IPv6 tunnelling through IPv4 network, IPv6 migration, IPSec w.r.t. IPv6
- TELE 402 teaches IPv6 socket API
- TELE411: IPv6 mobility, mobile IP, multi-home support, IPv6 in the context of IMS.
- TELE 413: QoS solutions in IPv6
- INFO404: IPv6: security and secure channels