

IPv6 Deployment/Transition Experiences

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EDU IPv6 deployment matrix

IPv4 only

Services

IPv6 adoption

Clients	IPv4 only	Very little v6 adoption Infrastructure v6-capable	Major services (www, email) are dual-stack UCLA WPI U of Maine SDSMT
	IPv6 adoption	Client networks IPv6 capable UC Berkeley	“Eutopia” LSU Virginia Tech

EDU IPv6 deployment

- Most EDUs in the Internet2/NLR community are (still?) aiming for dual-stack. Why?
 - We pretty much have enough IPv4 address space (although those /8s have mostly been given back).
 - We want IPv6 resources to be available to our users.
 - We want our resources to be available to an IPv6-only Internet, when it starts to surface.

EDU IPv6 deployment

- Wireless network issues:
 - Rogue RAs
 - Broken wireless gear
- 6to4 and Teredo
 - 6to4:
 - Leaky gateways
 - Where is the traffic going
 - Recommendation to run our own 6to4 relays: experiences

UCB IPv6 transition/deployment

- Wireless was our big accomplishment this year
 - Problem statement:
 - Burning through IPv4 addresses like crazy, as mobile devices would grab addresses without authenticating to our captive portal.
 - IPv6 rogue RAs were a big problem.
 - We built our own captive portal solution (open source perl + FreeBSD).
 - 1:1 IPv4 NAT. Why? Security/DMCA notifications.
 - Native IPv6 end-to-end

Wireless: Rogue RAs

- Big issue at EDUs which often have large blanket wireless networks (some of which are totally flat). [Also an issue at conferences, but I digress.]
- Computer (laptop) may get 6to4 address and start “connection-sharing” by advertising RAs.
 - All IPv6 hosts that grab onto that RA push their IPv6 traffic through that host.
 - What happens when host shuts down? What if it’s misconfigured?

But I digress...

- MR. SINATRA: Michael Sinatra, UC Berkeley. I agree with Cathy in just about all of her sentiment. And I have one other thing to say, which is that -- this is slightly off topic, but it's kind of an operational issue -- if you have the IP address 192.35.164.158, you're announcing yourself as an IPv6 router, please stop doing that.
- You're running 6 to 4; you're running yourself as a to 4 relay, please stop doing that because it's breaking our IPv6 connectivity. And yes, I do support the idea of the proposal. Thanks.
- SPEAKER: What was the last octet?
- MR. CURRAN: Yes, repeat the information -- point of information.
- SPEAKER: 164.158, those were the last two octets. 158 was the last octet.
 - ARIN XXII, Los Angeles, October 2008

Wireless: Rogue RAs

- What Berkeley did: Motivated us to get native v6 on our wireless net, then set our legitimate RAs to a priority of “high.” Works, but:
 - Assumes problem is caused only by misconfigured hosts, not malicious hosts.
 - What we really need is RA Snooping/RA Guard functionality in switches. (Can currently be implemented in some limited gear using ACLs--see <http://events.internet2.edu/2008/jt-hawaii/sessionDetails.cfm?session=3638&event=278>)

Wireless: Rogue RAs

- Because many of the rogues are 6to4 hosts, it is a general recommendation to run a 6to4 relay, and several EDUs are running internal 6to4 relays.
 - Helps reduce traffic that is relayed off-campus.
 - Can selectively block IPv6 connectivity while returning ICMP6 unreachables, therefore allowing (almost all) OSes to fall back to IPv4 immediately.
- Some EDUs block IP protocol 41. I don't think this is a great idea.

6to4

- As we know, hosts will tend to configure 6to4 addresses, by default with Vista and Windows 7. MacOS can also be configured to get 6to4 addresses.
- Traffic goes to “nearest” 6to4 relay router? Do we always know where that traffic goes? What happens if the router goes down?
- Many large EDUs are running their own 6to4 relay routers. But that sometimes has problems.
- If you leak the anycast route for your 6to4 router, you will get “interesting” results. E.g. Comcast and “midwestern university.”

Wireless: Broken RAs

- Ruckus Wireless: Makes lightweight managed APs.
- They had a great feature: Forward IPv6 toward the wireless LAN but block it in the opposite direction.
- Voila! Hosts receive RAs, undergo SLAAC, and all resulting v6 traffic gets dropped on the floor!
- After a lot of “constructive complaining,” Ruckus appears to have fixed the problem. They did realize how serious it was.

Wireless: Broken RAs

- Wireless issues have prevented us from being able to “turn on” google.com AAAA records for our caching resolvers.
- Hopefully we can do this soon, now that the Ruckus issue is fixed.

Teredo

- EDUs have somewhat different user base than most cable or DSL providers, and we generally try to run native v6.
- But we do get various little NAT routers for various reasons.
- Some folks are starting to put in Teredo relays (e.g. miredo).
 - This will pick up traffic sourced in your IPv6 network destined for Teredo hosts.
 - You will not be able to relay traffic in the other direction.
 - Good if you have a lot of IPv6 services enabled; not necessarily if you have a lot of Teredo hosts.
- Unclear how much traffic this captures.