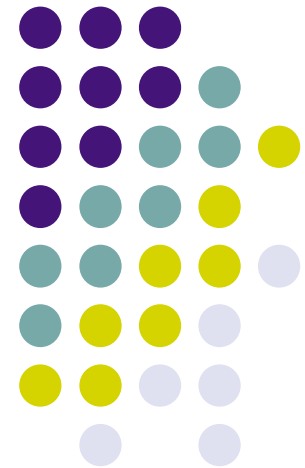


# IPv6 Renumbering: Enterprise Tests Overview

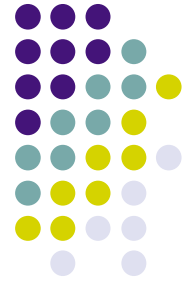
---

Tim Chown, Mark Thompson,  
Alan Ford, Stig Venaas  
*{tjc, mkt, ajf101, sv}@ecs.soton.ac.uk*

IETF63, Paris, 1st August 2005



# Scenario



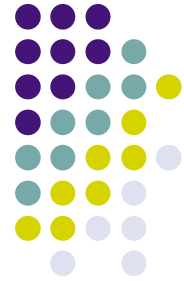
- Apply *draft-ietf-v6ops-renumbering-procedure-05*
- Renumbering university department IPv6 network
  - JANET allocation: 2001:630::/32
  - University allocation: 2001:630:d0::/48
  - Department (ECS) allocation: 2001:630:d0:0::/52
- A production dual-stack network
  - All links and key services dual-stack: DNS, MX, web, ...
  - Over 1,000 nodes on network, though not all IPv6-enabled
- Renumbered department to 2001:630:d0:f000::/52
  - No use of DHCPv6 (yet), just stateless autoconfiguration
- Leverage IPv6 multiaddressing and RFC3484

# Procedure specifics



- Ramping down DNS TTLs
- Setting Router Advertisement parameters
  - Set to 2 hour validity time (see 5.5.3 of RFC2462)
- Finding all the places...
  - Manual reconfigurations, some server/process restarts
- Make new prefix routable, before adding any RAs
  - Apply security policy first
- Begin advertising new prefix via RAs
  - Add new DNS data, ensuring DNS scripts allow multiaddressing
- Enter multiaddressed state, prior to deprecation
- After reasonable time (we chose 3 days), deprecate
- Finally just use the new prefix

# Procedure notes, host view



- RFC3484 address selection used when:
  - (1) Nodes have both prefixes in use, equal preference
  - (2) Nodes use new prefix, old prefix deprecated
- RFC3484 implementations on Linux, BSD, OS/X and XP behave well for (2), but less so for (1)
- Some hosts (OS/X, BSD, Linux) still send data with old source address even after marked invalid
  - Receiver cannot then communicate back to sender
- RFC2462 dictates minimum renumbering time 2hrs unless authenticated RAs used (RFC2462)
- Don't have to cut all subnets over at same time
- Overall, the procedure basically works

# Observations (1)



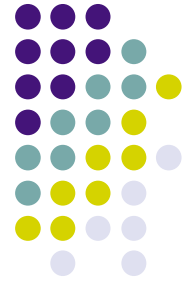
- Important to identify where literals used (since they need to be changed/updated)
  - No sites we spoke to had a literal usage inventory
  - It's very useful to have tools to detect missed instances, e.g. using scripts looking at data from a Netflow collector
- Can reduce the need for server restarts by using non-specific bindings
- Should avoid unnecessary caching
  - Resolve per connection (performance permitting)
- Seek to avoid unnecessary use of literals
  - e.g. use uRPF check not explicit source address filters

# Observations (2)



- Management of the process remains ‘clumsy’
  - Have to manually configure routers
  - Should consider multiaddressed systems as ‘normal’
- Would like to be able to use tokens in configurations
  - e.g. tokenise to reduce duplication in ACL entries
- Solaris offers a host token feature - can configure just host part (64 bits) of the interface address
- Embedded RP means renumbering will change the multicast group address in use
  - How do receivers discover this and new address?
- Maybe A6 would have helped?

# What about use of ULAs?



- IPv6 has Unique Local Addresses
  - Replaces old 'site local' unicast prefixes
  - *draft-ietf-ipv6-unique-local-addr-09*
- Can use both ULAs and global addresses (without NAT)
  - Use ULAs for stable internal communication during renumbering
  - Prefer ULAs internally, prefer globals externally
- Has issues, e.g.
  - Invariably leads to use of a two-faced DNS
  - Possible address leakage (although probably not ambiguous)
  - Possible application issues
  - RFC 3484 implementations will select ULA for source when sending multicast because ULA is treated as global scope
- Are ULAs worth the cost?

# Future work



- Analysis/testing of policy based routing where required
  - Issue is somewhat skipped over in the Baker text
- Test DHCP Prefix Delegation (RFC3633)
  - Repeat enterprise experiment using routers supporting DHCP-PD (planned for Aug'05)
- Further tests of parallel Unique Local Address (ULA) usage
- Test with DHCPv6 client/server usage
- Test management tool behaviour
  - Need a good, consistent, dual-stack management environment
- Update related RFCs/drafts
  - e.g. RFC3484 needs an update for ULA introduction
  - Also *draft-chown-v6ops-renumber-thinkabout-03*