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# Renumbering

Manual  
Stateless  
Stateful



# Renumbering – Three Techniques

- Three techniques
  - manual – network and host addresses changed by administrative action (hands-on)
  - stateless – network device addresses changed by hand, RAs used to renumber hosts
  - stateful – use DHCPv6



# Renumbering – Process 1-6

1. Obtain future prefixes and plan allocation throughout the network.
2. Update ACL and ingress/egress filters to permit traffic flow for new addresses.
3. Assign an address to network infrastructure devices; leave old addressing intact.
4. Update routing environment to add new prefix information.
5. Reduce TTL values on affected DNS records.
6. Assign addresses to hosts; leave old addressing intact.



# Renumbering – Process 7-12

7. Locate embedded addresses in applications and other “hidden” places.
8. Update DNS to reflect new addresses for servers and peer-capable (non client-only) hosts.
9. Remove old addresses from hosts.
10. Remove old addresses and prefixes from network infrastructure and routing.
11. Remove old prefixes from ACL and ingress/egress filters.
12. Disconnect the old prefix provider.



# Renumbering – New Prefixes

- Choose new ISP
- Obtain new /48
- Match 1-1 with current networks



# Renumbering – Edge Filtering

- Edge filtering is standard network security practice
- Checks outgoing packets for correct source address
- Update to cover both old and new prefixes



# Renumbering – Add Network Addr

- Add new addresses to core infrastructure
- Leave old addresses in place
- Make sure routing is complete
- Must support old-address to new-address traffic



# Renumbering – Shorten DNS Life

- Turn down DNS TTL
- Do not remove any records
- Makes transition period shorter
- Choose reasonable value



# Renumbering – Add Addrs to Hosts

- Add new addresses to hosts
- Leave old addresses in place
- Choose valid and preferred lifetimes to affect change:
  - new prefix – infinity/infinity
  - old prefix – infinity/0



# Renumbering – Find Embedded Addrs

- Find all old addresses
  - scripts
  - applications
  - /etc/hosts files
  - “ip host” on Cisco routers
- Use logging to find ones you missed
- Use IDS to find ones you missed



# Renumbering – Update DNS

- Update DNS records to reflect new addresses
- Now inbound connections will come to new addresses
- Takes awhile for full changeover based on TTL and cache DNS machines that don't use provided TTL



# Renumbering – Remove Old Addr

- Monitor for full changeover to complete
- No harm in waiting quite awhile for network to stabilize
- Remove old addresses on hosts, then network
- Remember to fix ACL
- Disconnect old ISP



# Renumbering – Stateless

- All about host renumbering
- Stateless renumbering uses IPv6 RAs
- “Easy way to renumber”
- Some manual renumbering probably still needed
- RAs advertise lifetimes



# Renumbering – Process 1-6

1. Obtain future prefixes and plan allocation throughout the network.
2. Update ACL and ingress/egress filters to permit traffic flow for new addresses.
3. Assign addresses to network infrastructure devices; leave old addressing intact.
4. Update routing environment with new prefix information.
5. Reduce TTL values on affected DNS records.
6. **Introduce new prefixes on links via RAs, with modified lifetimes.**



# Renumbering – Process 7-12

7. Locate embedded addresses in applications and other “hidden” places.
8. Update DNS to reflect new addresses for servers and peer-capable (non client-only) hosts.
- 9. Remove RAs for old prefixes.**
10. Remove old addresses and prefixes from network infrastructure and routing.
11. Remove old prefixes from ACL and ingress/egress filters.
12. Disconnect the “old” prefix provider.



# Renumbering – Network w/1 Router

- Introduce new prefix with infinite valid and preferred lifetime
- Change old prefix announcement to use zero preferred but infinite valid lifetimes
- New connections will use new prefix
- In-flight connections will finish gracefully



# Renumbering – Network w/2 Router

- Dual-router network uses “router lifetime”
- Affects which router is default router
- Backup router provides limited capability if default router goes down
- Once sessions complete, old prefix announcement can be removed
- Time to leave old prefix in place and valid depends on applications



# Renumbering – Stateful

- Uses DHCPv6
- Review:
  - DHCPv6 clients locate servers
  - Request address and default route
  - Servers provide information
  - Clients configure
  - Clients renew address assignment, if possible, at end of lease time



# Stateful – Process 1-8

1. Obtain future prefixes and plan allocation throughout network.
2. Update ACL and ingress/egress filters to permit traffic flow for new addresses.
3. Assign address to network infrastructure devices; leave old addressing intact.
4. Update routing environment to add new prefix information.
5. Reduce TTL values on affected DNS records.
6. **Reduce DHCP lease time.**
7. **Update DHCPv6 server address scopes to assign addresses from both network prefixes.**
8. Wait for lease period to be sure all hosts have obtained new addresses.



# Stateful – Process 9 - 15

9. Update DNS to reflect new addresses for servers and peer-capable (non client-only) hosts.
10. Wait several days to weeks for all sessions to timeout.
11. Locate embedded addresses in applications and other hidden places.
- 12. Update DHCPv6 server address scopes and remove old addresses; lengthen lease duration back to normal value.**
13. Remove old addresses and prefixes from network infrastructure and routing.
14. Remove old prefixes from ACL and ingress/egress filters.
15. Disconnect old prefix provider.



# Renumbering – Stateful - Stages

- There are the main stages, then:
  - Initially, hosts had single global address
  - Next, hosts have two address, one preferred. both valid
  - Lastly, old address removed entirely



# Renumbering – Recap

- Manual renumbering just like IPv4 – everything done by hand and carefully coordinated in time
- Stateless easiest, best for clients, built-in feature of IPv6
- Stateful much like IPv4, well-understood, introduces concept of multiple DHCP addresses per hosts

