IPv6 Autoconfiguration

Stateless and Stateful

Rabat, Maroc
28 - 30 Mars 2007

Philippe.Bereski@alcatel.fr
Simon.Muyal@renater.fr
Bernard.Tuy@renater.fr

Copy ... Rights

• This slide set is the ownership of the 6DISS project via its partners
• The Powerpoint version of this material may be reused and modified only with written authorization
• Using part of this material must mention 6DISS courtesy
• PDF files are available from www.6diss.org
• Looking for a contact?
  • Mail to : martin.potts@martel-consulting.ch
  • Or bernard.tuy@renater.fr
Contributions

• Main authors
  – Miguel Baptista, FCCN, Portugal
  – Carlos Friaças, FCCN, Portugal
• Contributors
  – Mónica Domingues, FCCN, Portugal
  – Paulo Ferreira, FCCN, Portugal
  – Bernard Tuy, Renater, France

Prerequisites

• You must have followed previously the modules:
  – 010-IPv6 Introduction
  – 020-IPv6 Protocol
  – 030-IPv6 Addressing
  – 040-IPv6 Associated Protocols
Agenda

- Stateless Autoconfiguration
- Stateful Autoconfiguration (DHCPv6)
- Conclusions

Stateless Autoconfiguration

- Hosts should be plug & play
- Uses some of the Neighbor Discovery ICMPv6 messages
- When booting, the host asks for network parameters:
  - IPv6 prefix(es)
  - default router address(es)
  - hop limit
  - (link local) MTU
Stateless Autoconfiguration

• Only routers have to be manually configured
  – but work on prefix delegation is in progress
    (http://www.ietf.org/rfc/rfc3633.txt)

• Hosts can get automatically an IPv6 address
  – BUT it isn’t automatically registered in the DNS

• but servers should be manually configured

Stateless Autoconfiguration

• IPv6 Stateless Address Autoconfiguration is described in RFC 2462

• Hosts are listening for Router Advertisements (RA) messages, periodically transmitted by routers

• RA messages coming from the router(s) on the link identify the subnet

• Allows a host to create a global IPv6 address from:
  – Its interface identifier (EUI-64 address)
  – Link Prefix (obtained via Router Advertisement)
• Global Address = combine Link Prefix with EUI-64 address
Stateless Autoconfiguration

- Usually, the router sending the RA messages is used, by hosts, as the default router
- If the RA doesn’t carry any prefix
  - The hosts don’t configure (automatically) any global IPv6 address (but may configure the default gateway address)
- RA messages contain two flags indicating what type of stateful autoconfiguration (if any) should be performed
- It’s impossible to automatically send DNS server addresses
- IPv6 addresses depend on NIC card

Stateless Autoconfiguration example

Internet

MAC address is 00:0E:0C:31:C8:1F
EUI-64 address is 20E:0CFF:FE31:C81F

1. Create the link local address
2. Do a Duplicate Address Detection
3. Send Router Solicitation
4. Create global address
5. Do a DAD
6. Set Default Router

2001:690:1:1::/0

And the DNS Server Address ?!
Stateful autoconfiguration (DHCPv6)

• Dynamic Host Configuration Protocol for IPv6
  – RFC 3315
  – stateful counterpart to IPv6 Stateless Address Autoconfiguration.

• According to RFC 3315 DHCPv6 is used when:
  – no router is found
  – Or if Router advertisement message enable use of DHCP

Stateful autoconfiguration (DHCPv6)

• DHCPv6 works in a client-server model
  – Server
    • Responds to requests from clients
    • Optionally provides the client with:
      – IPv6 addresses
      – Other configuration parameters (DNS servers…)
    • Is listening on multicast addresses:
      – All_DHCP_Relay_Agents_and_Servers (FF02::1:2)
      – All_DHCP_Servers (FF05::1:3)
    • Memorize client’s state
    • Provide means for securing access control to network resources
**Stateful autoconfiguration (DHCPv6)**

- **Client**
  - initiates requests on a link to obtain configuration parameters
  - use its link local address to connect the server
  - Send requests to FF02::1:2 multicast address (All_DHCP_Relay_Agents_and_Servers)

- **Relay agent**
  - node that acts as an intermediary to deliver DHCP messages between clients and servers
  - is on the same link as the client
  - is listening on multicast addresses:
    - All_DHCP_Relay_Agents_and_Servers (FF02::1:2)

---

**Stateful Autoconfiguration example**

1. IP address capability
2. DNS servers’ address?
3. DHCPv6 Server
   - FF02::1:2
   - (All_DHCP_Relay_Agents_and_Servers)
4. Server responds with a Reply Message
5. Host configures the DNS server

Example: in /etc/resolver.conf file

---

Rabat, Maroc – Mars 2007
Conclusions

• The two types of configuration complement each other
  – Example: we can obtain the address from stateless autoconfiguration and the DNS server address from DHCPv6

• In dual-stack networks we can obtain DNS server addresses from **DHCPv4**

• DHCPv6 clients still aren’t available in Operating Systems.
  – So, we still need to run a client
  – No transparent to users

Questions?