

Dynamic Host Configuration Protocol (DHCP)

6강

What to configure?

- Many things --- DHCP can configure close to 200 different things on a host
 - <http://www.iana.org/assignments/bootp-dhcp-parameters/bootp-dhcp-parameters.xml>
- IP address, router address, domain name server address, subnet mask, service gateways...

Autoconfiguration

- Plug and play
- Two kinds of autoconfiguration
 - Stateful → DHCP
 - Stateless

DHCP

- Client/server protocol
 - Application layer protocol → Uses UDP/IP
 - UDP port 67 (server) & 68 (client)
- Evolved from BOOTP
 - Which in turn evolved from RARP
- Most noticeable change: "lease"

Lease

- Address assignment with contracted duration
- Duration depends on how much addresses are in need

Message format

- Fig. 6-1
 - Smells of ARP?
- Use "bootp" filter in Wireshark

Message format

- Fixed part + Options
- Client H/W address is 16 bytes
 - Usually the “H/W” address (i.e. link layer address like MAC address) is only 6 bytes
 - Padding is used
 - Due to fixed length

Message format

- Op
 - 1 = request, 2 = reply (like in ARP)
- HW type
 - Link layer (e.g. Ethernet = 1)
- HW length
 - Address length used by the HW type specified above (e.g. Ethernet = 6 bytes)
- Hops
 - Number of DHCP (bootp) relays that this message have been through so far

Message format

- Transaction ID
 - Like in any other application protocol that uses UDP, this matches a response with the request that triggered the response
- Secs
 - Number of seconds since the first attempt
- Flags
 - "B": broadcast = reply should be broadcast

Message format

- Client IP address
 - If nothing is assigned yet, 0.0.0.0
 - Otherwise, the assigned IP address
- Your IP address
 - This is the IP address that the DHCP server offers to the client
- Next server address
 - The IP address of the “next” server to go to
 - E.g. After address assignment, go to the boot image server to download OS

Message format

- Gateway (relay) IP address
 - The DHCP (bootp) relay address to use
 - Usually the router
 - Today's first-hop routers run DHCP relay
- Server name & boot file name
 - Boot image server and the location of the bootfile
 - When DHCP is used to bootstrap a client computer

Message format

- Options
 - Many (close to 200)
 - Examine some DHCP trace to know which are most popular and what they do

DHCP options

- Close to 200
- TLV format again
- Message type option is important
 - DISCOVER, REQUEST, ACK, NACK, INFORM

DHCP protocol operations

- Fig. 6-2
- State machine (Fig. 6-10)
- Try "ipconfig /release" and "ipconfig /renew"

Rapid commit

- Usually there is only one DHCP server
- Usually the offered address is accepted
- Offer and Request steps can be omitted

Stateless Address Autoconfiguration

- This is about IP address configuration only
 - DHCP can configure close to 200 host parameters other than IP address
- Using link local IP addresses
 - IPv4: 169.254.0.0/16
 - IPv6: fe80::/64

DHCP with relays

- Modern configuration typically uses relays
 - Between clients and the remote DHCP server(s)
- Routers are typically configured as relays
- Note: relays only relay broadcast DHCP packets
 - Unicast packets to/from the DHCP server after the server is found by the client don't have to be relayed