



# BOOTP/DHCP

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## *Dynamic Configuration Protocols*

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CIS 68C2

UNIX Network Administration

# BOOTP/DHCP

- BOOTP/DHCP Overview
  - ✗ Provides comprehensive TCP/IP configuration data
    - ✗ Allows hosts to obtain TCP/IP data from a server
  - ✗ DHCP is a backward compatible replacement for BOOTP
    - ✗ Adds support for full TCP/IP configuration via Options
      - ✗ From *Requirements for Internet Hosts* RFC
    - ✗ Adds dynamic address assignments
      - ✗ This is the most important and useful addition
  - ✗ Consider:
    - ✗ How can client send a request when IP is not configured?
    - ✗ How can server respond to an un-configured interface?

# DHCP

- DHCP supported IP address allocation types
  - ✗ Permanent fixed
    - ✗ Allows use of static IP addresses
    - ✗ Useful for server hosts whose IP address should not change
  - ✗ Manual allocation
    - ✗ IP allocation based on Ethernet/Token Ring physical address
    - ✗ Useful w/clients that must use BOOTP
  - ✗ Automatic allocation
    - ✗ Long term, permanent IP address allocation
  - ✗ Dynamic allocation
    - ✗ Short term allocation – a *lease*
    - ✗ Most commonly used form of allocation

# DHCP

- DHCP Dynamic Allocation vs. DNS
  - ✗ Dynamic IP address allocation creates problems for DNS
    - ✗ Hostname, A records, PTR records
  - ✗ Update to DNS attempts to solve problem
    - ✗ Dynamic DNS – DDNS
    - ✗ DHCP server notifies DDNS system of new information
    - ✗ Issue: What about PTR records and subnets?

# DHCP

## □ DHCP Client

- ✗ **dhcpcd** – Preferred DHCP client daemon
- ✗ **pump** – Essentially obsolete
- ✗ Configuring system as a DHCP client
  - ✗ Add settings to: `/etc/sysconfig/network-scripts/ifcfg-eth0`
    - ✗ `BOOTPROTO=dhcp`
    - ✗ `ONBOOT=yes`

## □ DHCP Server

- ✗ **dhcpd** – Available from [www.isc.org](http://www.isc.org)

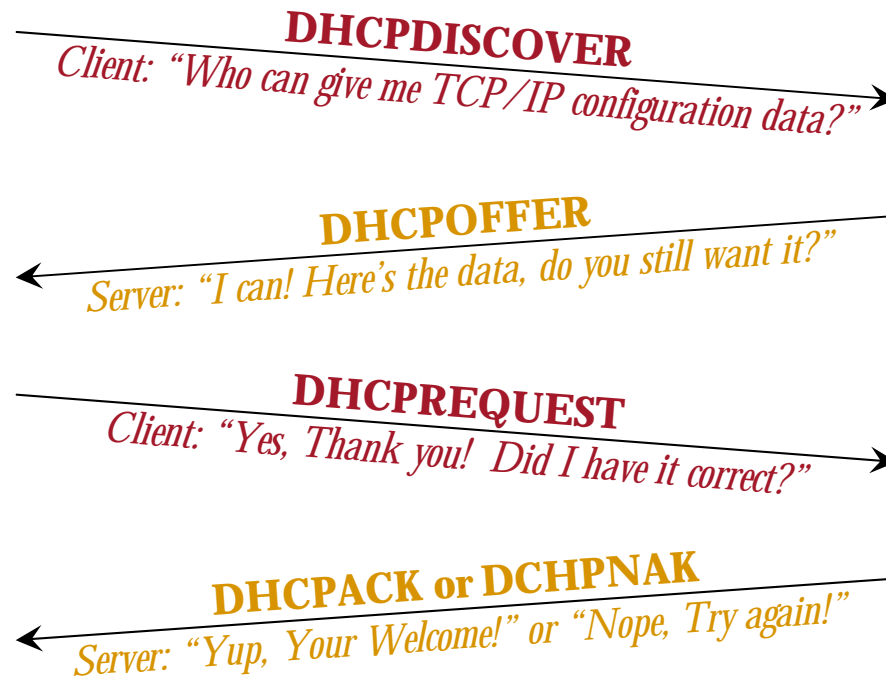
# DCHP

## □ Basic DHCP Client/Server Conversation

DHPC Client



DHCP Server



# DHCP

- How DHCP works – Details
  - ✗ Client sends DHCPDISCOVER packet
    - ✗ Source and destination IP address is 255.255.255.255
      - ✗ The all-1's broadcast address, called the *limited broadcast address*
    - ✗ Destination port is UDP port 67
    - ✗ Packet includes transaction identifier and client identifier
  - ✗ Server receives DHCPDISCOVER packet
    - ✗ Listening for limited broadcasts on UDP/67
  - ✗ Server sends DHCPOFFER packet
    - ✗ Sends limited broadcast, UDP/68
    - ✗ Response includes client's identifiers and configuration data

# DHCP

- How DHCP works – Details
  - ✗ Client receives DHCPOFFER on UDP/68
    - ✗ Accepts DHCPOFFER packets that include client's identifier
    - ✗ Sends DHCPREQUEST
      - ✗ Confirms the configuration data with server
      - ✗ Client is now bound
  - ✗ Server sends DHCPACK if configuration data is valid
    - ✗ Or DHCPNACK if data is invalid
  - ✗ Client sends:
    - ✗ DHCPDECLINE if *arp* indicates address in use; restarts process
    - ✗ DHCPREQUEST to renew lease
    - ✗ DHCPRELEASE to relinquish a lease

# DHCP

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## □ How DHCP works – Details

- ✘ It is desirable to maintain IP mappings across reboots
- ✘ Client will request the same configuration data on reboot
  - ✘ Stores information in permanent cache (eg. on disk, NVRAM).
  - ✘ Its DHCPREQUEST message contains desired configuration data
  - ✘ Server will ACK or NAK the request

# DHCP

## □ DHCP Server Configuration

- ✗ /etc/dhcpd.conf
  - ✗ Configuration file for dhcpd daemon
  - ✗ Instructions and configuration data for serviced hosts / subnets
  - ✗ Describes the topology of serviced networks
  - ✗ Contains hierarchical grouping of options
    - ✗ **shared-network**
    - ✗ **subnet**
    - ✗ **host**
  - ✗ Options within group statement are shared by members of group
  - ✗ Global options are specified outside these topology statements

# DHCP

## □ /etc/dhcpd.conf

```
default-lease-time 3600;
max-lease-time 7200;
option subnet-mask 255.255.255.0;
option domain-name "fhda.edu";
option domain-name-servers 153.18.8.1, 153.18.12.252;
group {
    option routers 10.0.0.200;
    subnet 10.0.0.0 netmask 255.255.255.0 {
        option broadcast-address 10.0.0.255;
        range 10.0.0.1 10.0.0.199;
        range 10.0.0.201 10.0.0.254;
    }
    subnet 11.0.1.0 netmask 255.255.255.0 {
        option broadcast-address 11.0.1.255;
        range 11.0.1.1 11.0.1.255;
    }
}
```

# Additional Information

- Internet Software Consortium – Home of dhcpd
  - × <http://www.isc.org/>
- RFCs
  - × 2131 – Dynamic Host Configuration Protocol
  - × 2132 – DHCP Options and BOOTP Vendor Extensions
  - × 1534 – Interoperation Between DHCP and BOOTP
  - × 951 – Bootstrap Protocol (BOOTP)