

BOOTP/DHCP

Dynamic Configuration Protocols

CIS 68C2-01

UNIX Network Administration

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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?

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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

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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?

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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
 - ✗ **dhcpcd** – Available from www.isc.org

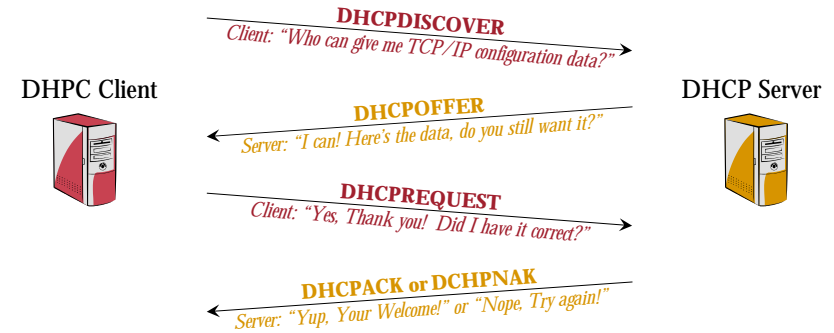
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DCHP

- Basic DHCP Client/Server Conversation



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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

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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 DHCNPACK if data is invalid
 - ✗ Client sends:
 - ✗ DHCPDECLINE if *arp* indicates address in use; restarts process
 - ✗ DHCPREQUEST to renew lease
 - ✗ DHCPRELEASE to relinquish a lease

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DHCP

□ 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
 - ✗ dhcpd server configuration file
 - ✗ Instructions and configuration data for serviced hosts / subnets
 - ✗ Describes *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)