

DHCP

ITL

Dynamic Host Configuration

- RFC 2131 – DHCP
- RFC 2132 – DHCP Options
- RFC 951 – BOOTP

Overview

- How to Configure Hosts that
 - Should not store this information (for manageability)
 - Cannot store configuration info locally
- RARP – limited usefulness
- BOOTP – designed for diskless workstations
- DHCP – update of BOOTP (more options)

DHCP Process Flow

- | | |
|--------------------------|------------------|
| • Client | • Server(s) |
| – broadcast dhcpdiscover | – send dhcpoffer |
| – send dhcprequest | – send dhcpack |
| – send dhcprelease | |

DHCP Process Flow, cont.

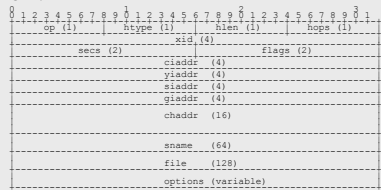
- Client renews
 - broadcast dhcprequest
 - Server(s)
 - send dhcpack
-
- send dhcprelease

DHCP Process Flow, cont.

- Client moved
 - send dhcprequest
 - Server(s)
 - send dhcpack
-
- broadcast dhcpdiscover
 - send dhcpoffer
 - send dhcprequest
 - send dhcpack
 - send dhcprelease

DHCP Message Structure

in UDP:



Protocol Fields from RFC2131

- **op**: Message op code / message type
1 = BOOTREQUEST, 2 = BOOTREPLY
- **htype**: Hardware address type
"1" = 10mb ethernet.
- **hlen**: Hardware address length
"6" for 10mb ethernet
- **hops**: Client sets to zero, optionally used by relay agents when booting via a relay agent.
- **xid**: Transaction ID, a random number chosen by the client

Fields cont.

- **secs**: Filled in by client, seconds elapsed since client began address acquisition or renewal process.
- **flags**: Used to request broadcast reply
- **ciaddr**: Client IP address; only filled in if client is in BOUND, RENEW or REBINDING state and can respond to ARP requests.
- **yiaddr**: 'your' (client) IP address.
- **siaddr**: IP address of next server to use in bootstrap; returned by server.

Fields cont.

- **giaddr**: Relay agent IP address
- **chaddr**: Client hardware address.
- **sname**: Optional server host name
- **file**: Boot file name
- **Options**: Optional parameters field

DHCP Options

- Message Format comes from BOOTP
 - Boot-request and Boot-reply op codes
- DHCP commands sent as options
- Many other pieces of information can be sent in optional fields

Option Field Structure

- Tag (1 octet)
 - 0 – pad, 255 – end of options
- Option Length (1 octet), except for 0 & 255
- Option Data
- Tags 128-254 are reserved for “site specific” options, all others are registered

Option Examples

- Tag 1 (Length 4)
 - Subnet Mask
- Tag 3 (Length 4n)
 - n Router Addresses
- Tag 53 (Length 1)
 - DHCP Message Type

Clients and Servers

	Client	Server
Windows	built-in (all versions) ipconfig	Windows 2003 Server Server management snap-in
Mac OS X	built-in ipconfig (!!!)	bootpd Integrated with LDAP
Linux	dhclient	dhcpcd

Ipconfig - Windows

```
USAGE:
ipconfig [/? | /all | /release [adapter] | /renew [adapter]
         /flushdns | /registerdns
         | /showclassid adapter
         | /setclassid adapter [classidset] ]

adapter Full name or pattern with '*' and '?' to 'match',
         * matches any character, ? matches one character.

Options
/? Display this help message.
/all Display full configuration information.
/release Release the IP address for the specified adapter.
/renew Renew the IP address for the specified adapter.
/flushdns Flushes the DNS Resolver cache.
/registerdns Refreshes all DHCP leases and re-registers DNS names.
/displaydns Display the contents of the DNS Resolver Cache.
/showclassid Displays all the dhcp class IDs allowed for adapter.
/setclassid Modifies the dhcp class id.
```

ipconfig output (Windows)

```
Windows 2000 IP Configuration
Host Name . . . . . : hans-laptop1
Primary DNS Suffix . . . . . :
Node Type . . . . . : Hybrid
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No

Ethernet adapter Local Area Connection:

Connection-specific DNS Suffix . . : Intel(R) PRO/100+ MiniPCI
Description . . . . . :
DHCP Enabled. . . . . : Yes
IP Address . . . . . : 132.235.74.219
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . : 132.235.74.254
DHCP Server . . . . . : 132.235.255.15
DNS Servers . . . . . : 132.235.64.1
. . . . . : 132.235.64.2
Primary WINS Server . . . . . : 132.235.234.235
Secondary WINS Server . . . . . : 121.235.187.38
Lease Obtained. . . . . : Friday, April 20, 2001 08:50:49
Lease Expires . . . . . : Friday, April 20, 2001 08:50:49
```

Linux

- /sbin/dhclient (see *man dhclient*)
 - dhclient -r
 - Release address and exit
 - dhclient normally starts at boot and uses *dhclient.conf* to determine which interfaces to request addresses on.

Mac OS X

- GUI
 - Turn interface off and back on
 - Reinitializes loadable kernel module and renews DHCP
- /usr/sbin/ipconfig (???.?)
 - ipconfig set *interface mode*
switches interface settings (e.g. from DHCP to MANUAL and back)
 - used for diagnostics only (e.g. can display the content of the last DHCP packet received)

DHCP Server on Unix/Linux

```
NAME
    dhcpd - Dynamic Host Configuration Protocol
    Server

SYNOPSIS
    dhcpd [ -p port ] [ -f ] [ -d ] [ -q ] [ -cf
    config-file ]
    [ -lf lease-file ] [ if0 [ ...ifN ] ]
```

See "man dhcpd3" and "man dhcpd.conf"

simple dhcpd.conf file

```
subnet 239.252.197.0 netmask 255.255.255.0 {
    range 239.252.197.10 239.252.197.250;
}
```

See "man dhcpd.conf"

More Complete

```
subnet 239.252.197.0 netmask 255.255.255.0 {
  range 239.252.197.10 239.252.197.250;
  default-lease-time 600; max-lease-time 7200;
  option subnet-mask 255.255.255.0;
  option broadcast-address 239.252.197.255;
  option routers 239.252.197.1;
  option domain-name-servers 239.252.197.2,
                             239.252.197.3;
  option domain-name "isc.org";
}
```

Note: there is a typo in the man page

The Relay

