Understanding DHCP

DHCP Packet Format

udp

MAC Header	IP Header	Src port	dst port	length	checksum	DHCP

DHCP Packet Format

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|     op (1)    |   htype (1)   |   hlen (1)    |   hops (1)    |
+---------------+---------------+---------------+---------------+
|                            xid (4)                            |
+-------------------------------+-------------------------------+
|           secs (2)            |           flags (2)           |
+-------------------------------+-------------------------------+
|                          ciaddr  (4)                          |
+---------------------------------------------------------------+
|                          yiaddr  (4)                          |
+---------------------------------------------------------------+
|                          siaddr  (4)                          |
+---------------------------------------------------------------+
|                          giaddr  (4)                          |
+---------------------------------------------------------------+
|                                                               |
|                          chaddr  (16)                         |
|                                                               |
|                                                               |
+---------------------------------------------------------------+
|                                                               |
|                          sname   (64)                         |
+---------------------------------------------------------------+
|                                                               |
|                          file    (128)                        |
+---------------------------------------------------------------+
|                                                               |
|                          options (variable)                   |
+---------------------------------------------------------------+
```
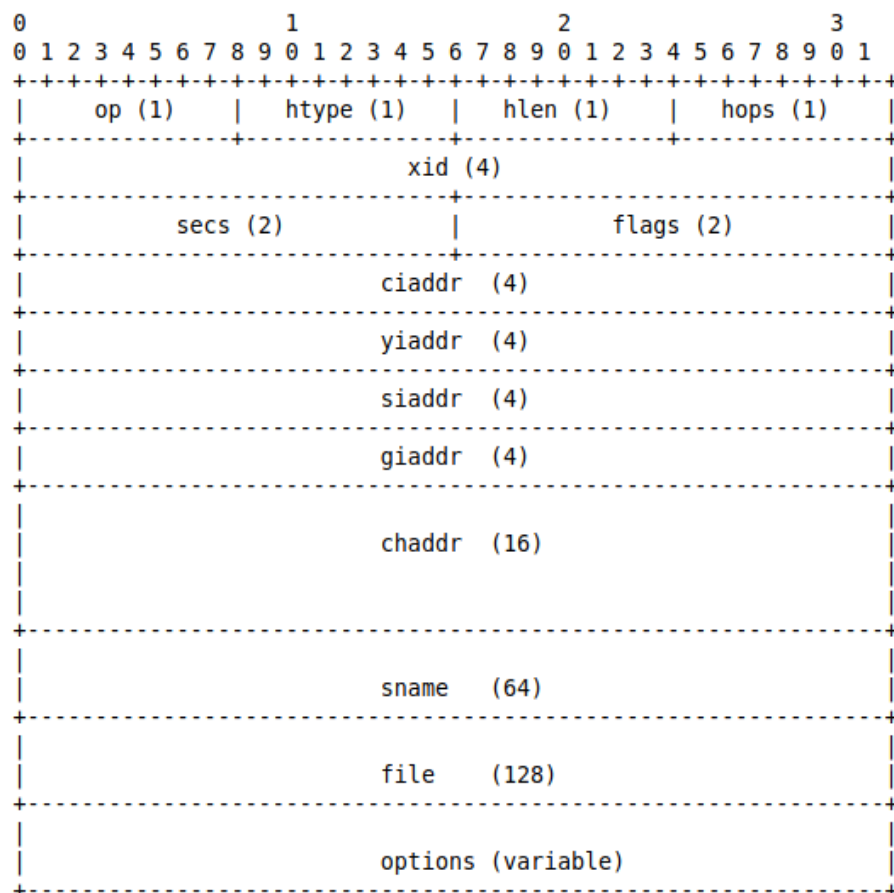
Figure 1: Format of a DHCP message

```
FIELD      OCTETS       DESCRIPTION
-----      ------       -----------

op            1  Message op code / message type.
                 1 = BOOTREQUEST, 2 = BOOTREPLY
htype         1  Hardware address type, see ARP section in "Assigned
                 Numbers" RFC; e.g., '1' = 10mb ethernet.
hlen          1  Hardware address length (e.g.  '6' for 10mb
                 ethernet).
hops          1  Client sets to zero, optionally used by relay agents
                 when booting via a relay agent.
xid           4  Transaction ID, a random number chosen by the
                 client, used by the client and server to associate
                 messages and responses between a client and a
                 server.
secs          2  Filled in by client, seconds elapsed since client
                 began address acquisition or renewal process.
flags         2  Flags (see figure 2).
ciaddr        4  Client IP address; only filled in if client is in
                 BOUND, RENEW or REBINDING state and can respond
                 to ARP requests.
yiaddr        4  'your' (client) IP address.
siaddr        4  IP address of next server to use in bootstrap;
                 returned in DHCPOFFER, DHCPACK by server.
giaddr        4  Relay agent IP address, used in booting via a
                 relay agent.
chaddr       16  Client hardware address.
sname        64  Optional server host name, null terminated string.
file        128  Boot file name, null terminated string; "generic"
                 name or null in DHCPDISCOVER, fully qualified
                 directory-path name in DHCPOFFER.
options     var  Optional parameters field.  See the options
                 documents for a list of defined options.
```

Table 1: Description of fields in a DHCP message
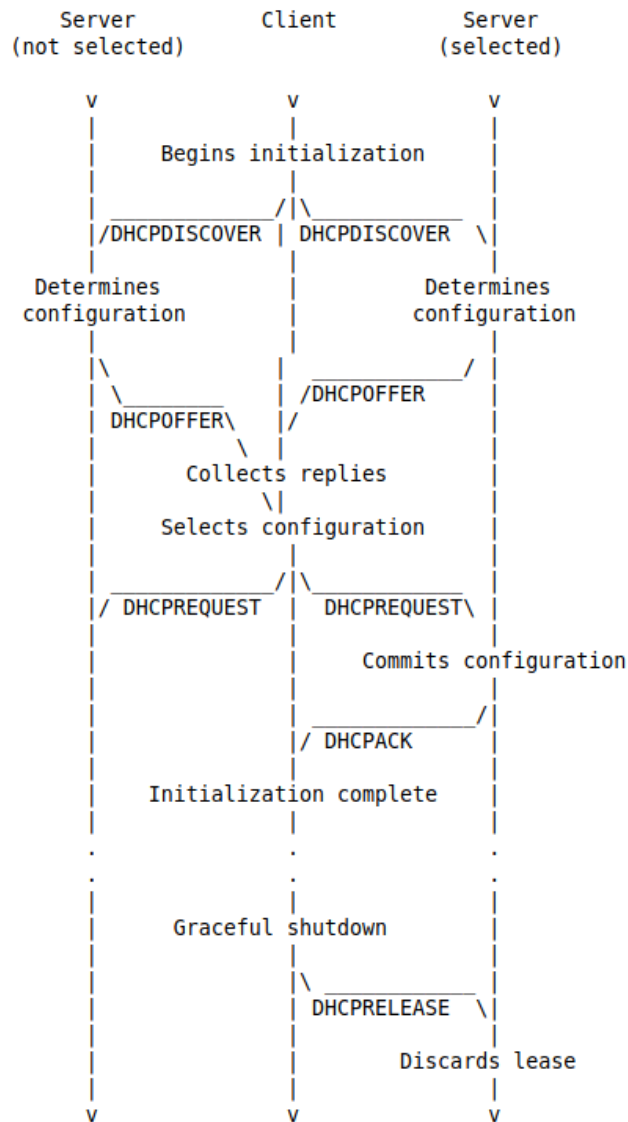
DHCP Interaction Flow

Figure 3: Timeline diagram of messages exchanged between DHCP
client and servers when allocating a new network address

DHCP Specification

Endpoint	DHCP Message	Contents	Support
DHCP Server	DHCPDISCOVER	When a server receives a DHCPDISCOVER message from a client, the server choose a network address for the requesting client If no address is available, the server may report to system administrator	YES
		Option: DHCP message type (MUST)	YES
		Option: Requested IP Address (MAY)	Not yet
		Option: IP Address lease time (MAY)	Not yet
	DHCPOFFER	Once the network address and lease have been determined, the server constructs a DHCPOFFER message with the offered configuration parameters	YES
		Option: IP lease time (MUST)	YES
		Option: Server Identifier (MUST)	YES
		Option: DHCP Message Type (MUST)	YES

DHCP Specification

Endpoint	DHCP Message	Contents	Support
DHCP Server	DHCPREQUEST	A DHCPREQUEST message may come from a client responding to a DHCPOFFER message from a server, verifying a previously allocated IP address.	YES
		Option: DHCP message type (MUST)	YES
		Option: Server Identifier (MUST)	YES
		Option: requested IP address (MUST) be filled in yiaddr value from the chosen DHCPOFFER	YES
	DHCPACK	The server selected in the DHCPREQUEST message commits the binding for the client to persistent storage and responds with a DHCPACK message containing the configuration parameters for the requesting client	YES
		Option: DHCP message type (MUST)	YES
		Option: Server Identifier (MUST)	YES
	DHCPNAK	If the selected server is unable to satisfy the DHCPREQUEST message (e.g., the requested network address has been allocated), the server SHOULD respond with a DHCPNAK message.	YES
		Option: DHCP message type (MUST)	YES
		Option: Server Identifier (MUST)	YES

DHCP Specification

Endpoint	DHCP Message	Contents	Support
DHCP Server	DHCPDECLINE		Not yet
	DHCPRELEASE		Not yet
	DHCPINFORM		Not yet

Left issues

1. The default value for IP address lease time?

2. DHCP packets' buffer allocation and release.

3. Server's identifier needed as a unicast ip address.