ITFreeTraining

- Discover message (DHCPDiscover)
- Offer message (DHCPOffer)
- Request message (DHCPRequest)
- Decline message (DHCPDecline)
- Acknowledgment message (DHCPAck)
- Negative Acknowledgment message (DHCPNak)
- Release message (DHCPRelease)
- Informational message (DHCPInform)

DHCP Messages Types

For the free video please see
http://itfreetraining.com/dhcp/message-types

There are a number of different DHCP messages types that a DHCP server uses to communicate with devices on the network. This video will look at the different messages types. Understanding the different messages types will assist you in troubleshooting DHCP related errors.

Access the rest of the course: http://ITFreeTraining.com/dhcp
Download the PDF handout: http://ITFreeTraining.com/handouts/dhcp/message-types.pdf

DHCPv4 Messages

- 8 different messages types

Discover message (DHCPDiscover)	Acknowledgment message (DHCPAck)
Offer message (DHCPOffer)	Negative Acknowledgment message (DHCPNak)
Request message (DHCPRequest)	Release message (DHCPRelease)
Decline message (DHCPDecline)	Informational message (DHCPInform)

0:14 In IPv4, there are eight DHCP messages. IPv6 has significantly more. In IPv4, the basic message types are used together when a device requests an IP Address or network configuration. This video has a quick look at each different message type. Later videos look at how multiple message types can be used together to configure a device on the network.

Discover Message

- Broadcast message sent on the network
- Request network configuration

Discover message
(DHCPDiscover)

0:46 The discover message in IPv4 is a broadcast message that is sent to all devices on the local network. Since the device does not have any network configuration, the only way that the device can communicate is to send this message out on the network. The message is saying, I do not have any network configuration and I am looking for a DHCP server. The problem with this approach is that all devices will hear this message and thus is a wasteful use of bandwidth. One of the aims of IPv6 DHCP was to eliminate the need to send broadcasts out on the network.

Offer Message

- DHCP offers IP Address to device

IP Address

DHCP Server

IP Address

DHCP Server

Offer message
(DHCPOffer)
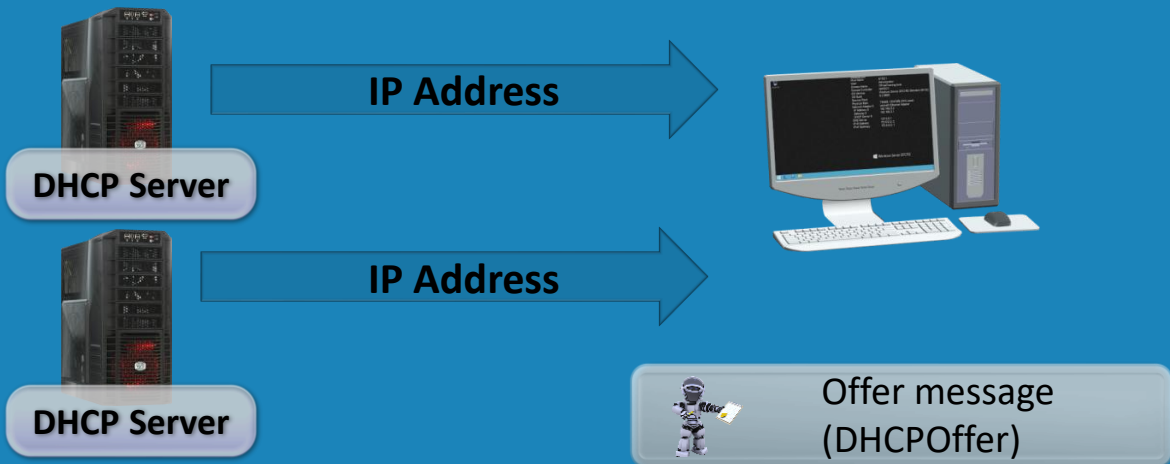
1:12 When a DHCP server receives a discover message, the DHCP server will send an offer message to the device. If there is more than one DHCP server on the network, the device may receive multiple offer messages. Generally the device will accept the first offer message that it receives. The device can request that the offer message is sent using unicast or broadcast, however the decision which to send is ultimately made by the DHCP server. The device will not have an IP Address as yet, however unicast can be used because the DHCP server will be able to obtain the MAC address of the device from the discover message.

Request Message

- Device broadcasts that it wants that IP Address
- Other DHCP servers will withdraw their offer

Request message
(DHCPRequest)

1:40 When the device receives an offer message or multiple offer messages, it will choose one offer message only. The device will have sent a broadcast message on the network saying which offer message that it is going to use. This allows the DHCP server that sent the offer message to know that its offer has been accepted and for other DHCP servers on the network that have sent offer messages to know that their offer messages have not been accepted.

Acknowledgement Message

- DHCP server notifies device it can use the IP address
- Provides additional network configuration
  - DNS, gateway etc

DHCP Server

Allow use & additional configuration

Acknowledgment message (DHCPAck)

2:01 Once the DHCP server receives the request message it will send the device back an acknowledgment message. This can be either unicast or broadcast. The acknowledgment message informs the device that it may use the IP Address. The DHCP server on sending the acknowledgment message will mark the IP Address as unavailable in its DHCP pool so that other devices on the network will not allocate that IP Address. The acknowledgment message will also contain other network configuration, for example, it will contain the DNS and gateway information. Once the device receives this acknowledgment message it will start using that IP Address and associated network configuration.

Negative Acknowledgment message

- Server declines the offer
- Normally used when the request is renewed
  - And IP Address is no longer available

You may not use that IP Address

DHCP Server

Negative Acknowledgment
message (DHCPNak)

2:32 This message is sent by the DHCP server to the device on two different occasions. On the first, in attempting to configure the device, the DHCP server may have allocated the IP Address to another device and that IP Address is no longer available. Given that DHCP configuration happens very quickly, it is unlikely that this will occur. Also given that if a DHCP server receives a lot of requests in a short period of time it would allocate different IP Addresses. This potentially could happen if the DHCP server only had the one IP Address left and two devices request it at the same time.

The second time this could occur, which is more likely, is when the device is attempting to renew its IP Address. If an administrator changes the available pool of IP Addresses, a previously available IP Address may no longer be available. When this occurs, the device will be given a negative acknowledgment message telling it that it cannot use that IP Address any more.

Whenever a device receives a negative acknowledgment message, the device must start the process of obtaining an IP Address again.

3:33 Before a device attempts to use an IP Address, it will send a message on the network to determine if the IP Address is already in use. If the IP Address is in use, the device will send a decline message back to the DHCP server. This will inform the DHCP server that the IP Address is in use. The DHCP server will then temporarily remove that IP Address from its address pool. This can occur, for example, if a person was to statically assign an IP Address to their device.

Release message

- Client gives up IP Address
- Can be configured to be done on shutdown

No longer require the IP Address

DHCP Server

Release message
(DHCPRelease)
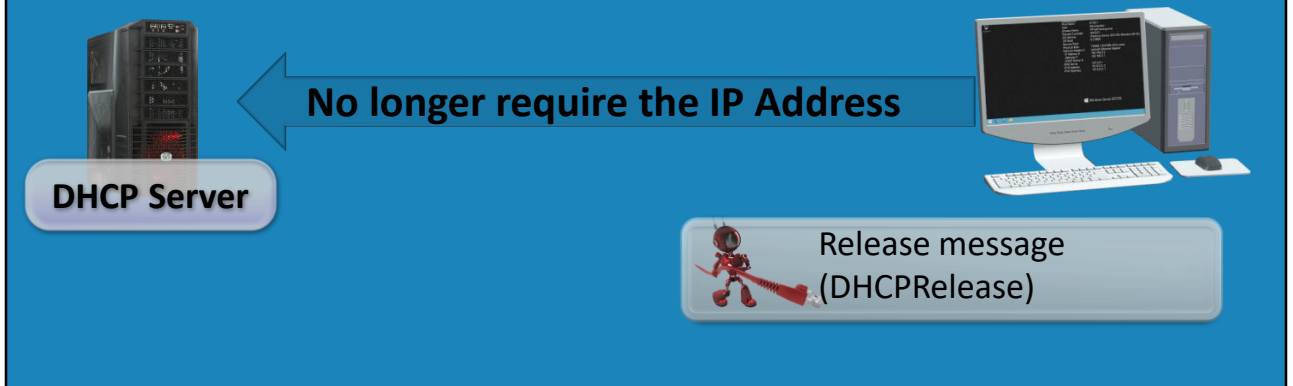
4:02 This message is sent to the DHCP server when the device no longer requires the IP Address. This is normally performed when the administrator runs a command to perform this action. E.g., "IPConfig /release". A Windows computer can also be configured to release an IP Address when the computer is shutdown. This would normally be configured when there are not a lot of free IP Addresses on the network and the administrator needs to make good use of the IP Addresses that they have.

Informational Message

- Additional network configuration
  - E.g. proxy settings

Informational message (DHCPInform)

4:45 Informational messages are message types that are designed to provide additional configuration, other than the original configuration provided by the DHCP server. This information can be requested at anytime. A good example is a proxy server. The computer may request proxy server information when the users open a web browser.

DHCPv6 Messages

- Solicit
- Advertise
- Request
- Confirm
- Renew
- Rebind
- Reply
- Release

- Decline
- Reconfigure
- Information-request
- Relay-forw
- Relay-repl
- Leasequery
- Leasequery-reply
- Leasequery-done

- Leasequery-data
- Reconfigure-request
- Reconfigure-reply
- DHCPv4-query
- DHCPv4-response
- Activeleasequery
- Starttls

5:16 DHCP has 23 messages types. This allows for a lot more features than IPv4 has, however the basic messages types are the same, although in some cases the name of the message type may have changed.

DHCPv4 and DHCPv6

- ## Standard messages used to obtain an IP Address

Discover message
Solicit message

Offer message
Advertise message

Request message
Request message

Acknowledgment message
Reply message

5:37 DHCP for IPv4 and IPv6 uses four messages in order to configure a device on a network with an IP Address. The discover message is changed to the solicit message. Offer message is changed to advertise message. Request messages remains the same. The acknowledgment message changes to the reply message. Later videos look into this process in more detail. Although IPv6 DHCP has more features, the messages work in much the same way.

See http://YouTube.com/ITFreeTraining or http://itfreetraining.com for our always free training videos. This is only one video from the many free courses available on YouTube.

References
"Installing and Configuring Windows Server 2012 R2 Exam Ref 70-410" pages 208-209
"System Administration Guide: IP Services" http://docs.oracle.com/cd/E19253-01/816-4554/dhcp-overview-32a/index.html
"Accounting for Differences between DHCPv6 and DHCP" http://www.gtri.com/accounting-differences-dhcpv6-dhcp/
"DHCP Message Type" https://technet.microsoft.com/en-us/library/cc959876.aspx
"Dynamic Host Configuration Protocol"
https://en.wikipedia.org/wiki/Dynamic_Host_Configuration_Protocol
"Dynamic Host Configuration Protocol" https://www.ietf.org/rfc/rfc2131.txt
"Dynamic Host Configuration Protocol for IPv6 (DHCPv6)" https://tools.ietf.org/html/rfc3315

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