

# NetX Duo™

## Dynamic Host Configuration Protocol for Clients

User Guide

Renesas Synergy™ Platform

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# Renesas Synergy Specific Information

If you are using NetX Duo DHCP Client for the Renesas Synergy platform, please use the following information.

## Multiple Interface Support

**Page 7:** Multiple interface support for the DHCP client has not been tested with SSP v1.5.0.

## Product Distribution

**Page 9:** The distribution of DHCP included with the Renesas Synergy SSP installation does not include the file `demo_netxduo_dhcp.c` or `demo_netxduo_multihome_dhcp_client.c`. Please ignore references to these files.

## Installation

**Page 9:** If you are using Renesas Synergy SSP and the e2 studio ISDE, DHCP will already be installed. You can ignore the DHCP Installation section.



## **Dynamic Host Configuration Protocol for Clients**

# **User Guide**

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# Chapter 1

## Introduction to DHCP Client

In NetX Duo, the application's IP address is one of the supplied parameters to the *nx\_ip\_create* service call. Supplying the IP address poses no problem if the IP address is known to the application, either statically or through user configuration. However, there are some instances where the application doesn't know or care what its IP address is. In such situations, a zero IP address should be supplied to the *nx\_ip\_create* function and the DHCP Client protocol should be used to dynamically obtain an IP address.

### **Dynamic IP Address Assignment**

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The basic service used to obtain a dynamic IP address from the network is the Reverse Address Resolution Protocol (RARP). This protocol is similar to ARP, except it is designed to obtain an IP address for itself instead of finding the MAC address for another network node. The low-level RARP message is broadcast on the local network and it is the responsibility of a server on the network to respond with an RARP response, which contains a dynamically allocated IP address.

Although RARP provides a service for dynamic allocation of IP addresses, it has several shortcomings. The most glaring deficiency is that RARP only provides dynamic allocation of the IP address. In most situations, more information is necessary in order for a device to properly participate on a network. In addition to an IP address, most devices need the network mask and the gateway IP address. The IP address of a DNS server and other network information may also be needed. RARP does not have the ability to provide this information.

### **RARP Alternatives**

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In order to overcome the deficiencies of RARP, researchers developed a more comprehensive IP address allocation mechanism called the boot strap Protocol (BOOTP). This protocol has the ability to dynamically allocate an IP address and also provide additional important network information. However, BOOTP has the drawback of being designed for static network configurations. It does not allow for quick or automated address assignment.

This is where the Dynamic Host Configuration Protocol (DHCP) is extremely useful. DHCP is designed to extend the basic functionality of BOOTP to include completely automated IP server allocation and



completely dynamic IP address allocation through “leasing” an IP address to a client for a specified period of time. DHCP can also be configured to allocate IP addresses in a static manner like BOOTP.

## DHCP Messages

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Although DHCP greatly enhances the functionality of BOOTP, DHCP uses the same message format as BOOTP and supports the same vendor options as BOOTP. In order to perform its function, DHCP introduces seven new DHCP-specific options, as follows:

DISCOVER	(1)	(sent by DHCP Client)
OFFER	(2)	(sent by DHCP Server)
REQUEST	(3)	(sent by DHCP Client)
DECLINE	(4)	(sent by DHCP Client)
ACK	(5)	(sent by DHCP Server)
NACK	(6)	(sent by DHCP Server)
RELEASE	(7)	(sent by DHCP Client)
INFORM	(8)	(sent by DHCP Client)
FORCERENEW	(9)	(sent by DHCP Client)

## DHCP Communication

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DHCP utilizes the UDP protocol to send requests and field responses. Prior to having an IP address, UDP messages carrying the DHCP information are sent and received by utilizing the IP broadcast address of 255.255.255.255.

## DHCP Client State Machine

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The DHCP Client is implemented as a state machine. The state machine is processed by an internal DHCP thread that is created during *nx\_dhcp\_create* processing. The main states of DHCP Client are as follows:

State	Meaning
<b>NX_DHCP_STATE_BOOT</b>	Starting with a previous IP address
<b>NX_DHCP_STATE_INIT</b>	Starting with no previous IP address value
<b>NX_DHCP_STATE_SELECTING</b>	Waiting for a response from any DHCP server

<b>NX_DHCP_STATE_REQUESTING</b>	DHCP Server identified, IP address request sent
<b>NX_DHCP_STATE_BOUND</b>	DHCP IP Address lease established
<b>NX_DHCP_STATE_RENEWING</b>	DHCP IP Address lease renewal time elapsed, renewal requested
<b>NX_DHCP_STATE_REBINDING</b>	DHCP IP Address lease rebind time elapsed, renewal requested
<b>NX_DHCP_STATE_FORCERENEW</b>	DHCP IP Address lease established, force renewal by server or by application
<b>NX_DHCP_STATE_ADDRESS_PROBING</b>	DHCP IP Address probing, send the ARP probe to detect IP address conflict.

## **DHCP Client Multiple Interface Support**

---

The DHCP Client was previously implemented to run on only a single network interface. The default behavior was (and still is) for the DHCP Client to run on the primary interface. By calling *nx\_dhcp\_set\_interface\_index*, the application could (and still can) run DHCP on a secondary network interface instead of the primary interface.

It now supports DHCP running on multiple interfaces in parallel. See **DHCP Client on Multiple Interfaces Simultaneously** in Chapter Two for specific details how to run DHCP Client on more than one physical interface simultaneously.

## **DHCP User Request**

---

Once the DHCP server grants an IP address, the DHCP client processing can request additional parameters — one at a time — by using the *nx\_dhcp\_user\_option\_request* service.

### **DHCP Client Socket Queue**

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The DHCP Client automatically clears broadcast packets from DHCP Servers intended for other DHCP Clients from its socket receive queue while waiting for Server to respond to itself. In a busy network, not doing so could cause packets intended for the Client to be dropped.

### **DHCP RFCs**

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NetX Duo DHCP Client is compliant with RFC2132, RFC2131, and related RFCs.

## Chapter 2

### Installation and Use of DHCP Client

This chapter contains a description of various issues related to installation, setup, and usage of the DHCP component.

#### Product Distribution

---

NetX Duo DHCP Client is shipped on a single CD-ROM compatible disk. The package includes two source files and a PDF file that contains this document, as follows:

<b><code>nxd_dhcp_client.h</code></b>	Header file for NetX Duo DHCP
<b><code>nxd_dhcp_client.c</code></b>	C Source file for DHCP NetX Duo
<b><code>nxd_dhcp_client.pdf</code></b>	User Guide for NetX Duo DHCP
<b><code>demo_netxduo_dhcp.c</code></b>	NetX Duo DHCP Client demonstration
<b><code>demo_netxduo_multihome_dhcp_client.c</code></b>	NetX Duo DHCP Client demonstration of DHCP on multiple interfaces

#### DHCP Installation

---

To use NetX Duo DHCP Client, the entire distribution mentioned previously should be copied to the same directory where NetX Duo is installed. For example, if NetX Duo is installed in the directory “*\threadx\arm7\green*” then the *nxd\_dhcp\_client.h* and *nxd\_dhcp\_client.c* files should be copied into this directory.

#### Using DHCP

---

Using DHCP for NetX Duo is easy. Basically, the application code must include *nxd\_dhcp\_client.h* after it includes *tx\_api.h* and *nx\_api.h*, in order to use ThreadX and NetX Duo, respectively. Once *nxd\_dhcp\_client.h* is included, the application code is then able to make the DHCP function calls specified later in this guide. The application must also include *nxd\_dhcp\_client.c* in the build process. This file must be compiled in the same manner as other application files and its object form must be linked along with the files of the application. This is all that is required to use NetX DHCP.

Note that since DHCP utilizes NetX Duo UDP services, UDP must be enabled with the *nx\_udp\_enable* call prior to using DHCP.

To obtain a previously assigned IP address, the DHCP Client can initiate the DHCP process with the Request message and Option 50 “Requested IP Address” to the DHCP Server. The DHCP Server will respond with either an ACK message if it grants the IP address to the Client or a NACK if it refuses. In the latter case, the DHCP Client restarts the DHCP process at the Init state with a Discover message and no requested IP address. The host application first creates the DHCP Client, then calls the *nx\_dhcp\_request\_client\_ip* API service to set the requested IP address before starting the DHCP process with *nx\_dhcp\_start*. An example DHCP application is provided elsewhere in this document for more details.

### **In the Bound State**

---

While the DHCP Client is in the bound state, the DHCP Client thread processes the Client state once per interval (as specified by `NX_DHCP_TIME_INTERVAL`) and decrements the time remaining on the IP lease assigned to the Client. When the renewal time has elapsed the DHCP Client state is updated to the RENEW state where the Client will request a renewal from the DHCP Server.

### **Sending DHCP Messages To The Server**

---

The DHCP Client has API services that allow the host application to send a message to the DHCP Server. Note these services are NOT intended for the host application to manually run the DHCP Client protocol.

- *nx\_dhcp\_release*: this sends a RELEASE message to the Server when the host application is either leaving the network or needs relinquish its IP address.
- *nx\_dhcp\_decline*: this sends a DECLINE message to the Server if the host application determines independently of the DHCP Client that its IP address is already in use.
- *nx\_dhcp\_forcerenew*: this sends a FORCERENEW message to the Server
- *nx\_dhcp\_send\_request*: This takes as an argument a DHCP message type, as specified in *nxd\_dhcp\_client.h*, and sends the message to the Server. This is intended primarily for sending the DHCP INFORM message.

See “*Description of DHCP Services*” for more information about these services elsewhere in this document.

## Starting and Stopping the DHCP Client

---

To stop the DHCP Client, regardless if it has achieved a bound state, the host application calls *nx\_dhcp\_stop*.

To restart a DHCP Client, the host application must first stop the DHCP Client using the *nx\_dhcp\_stop* service described above. Then the host can call *nx\_dhcp\_start* to resume the DHCP Client. If the host application wishes to clear a previous DHCP Client profile, for example, one obtained from a previous DHCP Server on another network, the host application should call *nx\_dhcp\_reinitialize* to perform this task internally before calling *nx\_dhcp\_start*.

A typical sequence might be:

```
nx_dhcp_stop(&my_dhcp);  
  
nx_dhcp_reinitialize(&my_dhcp);  
  
nx_dhcp_start(&my_dhcp);
```

For DHCP applications running on only a single DHCP interface, stopping the DHCP Client also inactivates the DHCP CLIENT timer. Thus it is no longer keeping track of the time remaining on the IP lease. Stopping DHCP Client on a particular interface will not inactivate the DHCP Client timer but will stop timer updates to the time remaining on the IP lease on that interface

Therefore, stopping the DHCP Client is not advised unless the host application requires rebooting or switching networks.

## Using the DHCP Client with Auto IP

---

The NetX Duo DHCP Client works concurrently with the Auto IP protocol in applications where DHCP and Auto IP guarantee an address where a DHCP Server is not guaranteed to be available or responding. However, If the host is unable to detect a Server or get an IP address assigned, it can switch to the Auto IP protocol for a local IP address. However before doing so, it is advisable to stop the DHCP Client temporarily while Auto IP goes through the “probe” and “defense” stages. Once an Auto IP address is assigned to the host, the DHCP Client can be restarted and if a DHCP Server does become available, the host IP address can accept the IP address offered by the DHCP Server while the application is running.

The NetX Duo Auto IP has an address change notification for the host to monitor its activities in the event of an IP address change.

## **Packet Chaining**

---

For more efficient use of packet pool and memory resources, the DHCP Client can handle incoming chained packets (datagrams exceeding the driver MTU) from the Ethernet driver. If the driver has this capability, the application can set the packet pool for receiving packets to below the mandatory `NX_DHCP_PACKET_PAYLOAD` bytes. `NX_DHCP_PACKET_PAYLOAD` should accommodate the physical network (typically Ethernet) frame, plus 548 bytes of DHCP message data, and IP and UDP.

Note that the application can optimize the packet payload and number of packets in the packet pool that is part of the DHCP Client, and which is used for sending DHCP messages out. It can optimize the size based on expected usage and size of the DHCP Client messages.

## Small Example System

---

An example of how to use NetX Duo is shown in Figure 1.1 below. The application thread entry function *my\_thread\_entry* is created at line 101. After successful creation, DHCP processing is initiated with the *nx\_dhcp\_start* call at line 108. At this point, the DHCP Client thread task separately attempts to contact a DHCP server. During this process, the application code waits for a valid IP address to be registered with the IP instance using the *nx\_ip\_status\_check* service (or *nx\_ip\_interface\_status\_check* for a secondary interface) on line 95. This is more commonly done in a loop with a shorter wait option.

After line 127, DHCP has received a valid IP address and the application can then proceed, utilizing NetX Duo TCP/IP services as desired.

```

0001 #include "tx_api.h"
0002 #include "nx_api.h"
0003 #include "nxd_dhcp_client.h"
0004
0005 #define DEMO_STACK_SIZE 4096
0006 TX_THREAD my_thread;
0007 NX_PACKET_POOL my_pool;
0008 NX_IP my_ip;
0009 NX_DHCP my_dhcp;
0010
0011 /* Define function prototypes. */
0012
0013 void my_thread_entry(ULONG thread_input);
0014 void my_netx_driver(struct NX_IP_DRIVER_STRUCT *driver_req);
0015
0016 /* Define main entry point. */
0017
0018 intmain()
0019 {
0020
0021     /* Enter the ThreadX kernel. */
0022     tx_kernel_enter();
0023 }
0024
0025
0026 /* Define what the initial system looks like. */
0027
0028 void tx_application_define(void *first_unused_memory)
0029 {
0030
0031     CHAR *pointer;
0032     UINT status;
0033
0034     /* Setup the working pointer. */
0035     pointer = (CHAR *) first_unused_memory;
0036
0037     /* Create "my_thread". */
0038     tx_thread_create(&my_thread, "my thread", my_thread_entry, 0,
0039                     pointer, DEMO_STACK_SIZE,
0040                     2, 2, TX_NO_TIME_SLICE, TX_AUTO_START);
0041     pointer = pointer + DEMO_STACK_SIZE;
0042
0043     /* Initialize the NetX Duo system. */
0044     nx_system_initialize();
0045
0046     /* Create a packet pool. */
0047     status = nx_packet_pool_create(&my_pool, "NetX Main Packet Pool",
0048                                   1024, pointer, 64000);
0049     pointer = pointer + 64000;
0050
0051     /* Check for pool creation error. */
0052     if (status)
0053         error_counter++;
0054
0055

```



```

0056      /* Create an IP instance without an IP address. */
0057      status = nx_ip_create(&my_ip, "My NetX IP Instance", IP_ADDRESS(0,0,0,0),
0058                          0xFFFFFFFF, &my_pool, my_netx_driver, pointer,
0059                          DEMO_STACK_SIZE, 1);
0060      pointer = pointer + DEMO_STACK_SIZE;
0061
0062      /* Check for IP create errors. */
0063      if (status)
0064          error_counter++;
0065
0066      /* Enable ARP and supply ARP cache memory for my IP Instance. */
0067      status = nx_arp_enable(&my_ip, (void *) pointer, 1024);
0068      pointer = pointer + 1024;
0069
0070      /* Check for ARP enable errors. */
0071      if (status)
0072          error_counter++;
0073
0074      /* Enable UDP. */
0075      status = nx_udp_enable(&my_ip);
0076      if (status)
0077          error_counter++;
0078 }
0079
0080
0081 /* Define my thread. */
0082
0083 void    my_thread_entry(ULONG thread_input)
0084 {
0085
0086     UINT          status;
0087     ULONG         actual_status;
0088     NX_PACKET     *my_packet;
0089
0090     /* Wait for the link to come up. */
0091     do
0092     {
0093
0094         /* Get the link status. */
0095         status = nx_ip_status_check(&my_ip, NX_IP_LINK_ENABLED,
0096                                   &actual_status, 100);
0097
0098     } while (status != NX_SUCCESS);
0099
0100     /* Create a DHCP instance. */
0101     status = nx_dhcp_create(&my_dhcp, &my_ip, "My DHCP");
0102
0103     /* Check for DHCP create error. */
0104     if (status)
0105         error_counter++;
0106
0107     /* Start DHCP. */
0108     nx_dhcp_start(&my_dhcp);
0109
0110     /* Check for DHCP start error. */
0111     if (status)
0112         error_counter++;
0113
0114     /* Wait for IP address to be resolved through DHCP. */
0115     nx_ip_status_check(&my_ip, NX_IP_ADDRESS_RESOLVED,
0116                      (ULONG *) &status, 100000);
0117
0118     /* Check to see if we have a valid IP address. */
0119     if (status)
0120     {
0121         error_counter++;
0122         return;
0123     }
0124     else
0125     {
0126
0127         /* Yes, a valid IP address is now on lease... All NetX Duo
0128          services are available.
0129         */
0130     }
0131 }

```

Figure 1.1 Example of DHCP use with NetX Duo

## Multi-Server Environments

---

On networks where there is more than one DHCP Server, the DHCP Client accepts the first received DHCP Server Offer message, advances to the Request state, and ignores any other received offers.

## ARP Probes

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The DHCP Client can be configured to send one or more ARP probes after IP address assignment from the DHCP Server to verify the IP address is not already in use. The ARP probe step is recommended by RFC 2131 and is particularly important in environments with more than one DHCP Server. If the host application enables the `NX_DHCP_CLIENT_SEND_ARP_PROBE` option (see **Configuration Options** in Chapter Two for additional ARP probe options), the DHCP Client will send a 'self addressed' ARP probe and wait for the specified time for a response. If none is received, the DHCP Client advances to the Bound state. If a response is received, the DHCP Client assumes the address is already in use. It automatically sends a DECLINE message to the Server, and reinitializes the Client to restart the DHCP probes again from the INIT state. This restarts the DHCP state machine and the Client sends another DISCOVER message to the Server.

## BOOTP Protocol

---

The DHCP Client also supports the BOOTP protocol as well the DHCP protocol. To enable this option and use BOOTP instead of DHCP, the host application must set the `NX_DHCP_BOOTP_ENABLE` configuration option. The host application can still request specific IP addresses in the BOOTP protocol. However, the DHCP Client does not support loading the host operating system as BOOTP is sometimes used to do.

## DHCP on a Secondary Interface

---

The NetX Duo DHCP Client can run on secondary interfaces rather than the default primary interface.

To run NetX Duo DHCP Client on a secondary network interface, the host application must set the interface index of the DHCP Client to the secondary interface using the `nx_dhcp_set_interface_index` API service.

The interface must already be attached to the primary network interface using the *nx\_ip\_interface\_attach* service. See the NetX Duo User Guide for more details on attaching secondary interfaces.

Below is an example system (Figure 1.2) in which the host application connects to the DHCP server on its secondary interface. On line 65, the secondary interface is attached to the IP task with a null IP address. On line 104, after the DHCP Client instance is created, the DHCP Client interface index is set to 1 (e.g. the offset from the primary interface which itself is index 0) by calling *nx\_dhcp\_set\_interface\_index*. Then the DHCP Client is ready to be started in line 108.

```

0001 #include "tx_api.h"
0002 #include "nx_api.h"
0003 #include "nxd_dhcp_client.h"
0004
0005 #define DEMO_STACK_SIZE 4096
0006 TX_THREAD my_thread;
0007 NX_PACKET_POOL my_pool;
0008 NX_IP my_ip;
0009 NX_DHCP my_dhcp;
0010
0011 /* Define function prototypes. */
0012
0013 void my_thread_entry(ULONG thread_input);
0014 void my_netx_driver(struct NX_IP_DRIVER_STRUCT *driver_req);
0015
0016 /* Define main entry point. */
0017
0018 intmain()
0019 {
0020
0021     /* Enter the Threadx kernel. */
0022     tx_kernel_enter();
0023 }
0024
0025 /* Define what the initial system looks like. */
0026
0027 void tx_application_define(void *first_unused_memory)
0028 {
0029     CHAR *pointer;
0030     UINT status;
0031
0032     /* Setup the working pointer. */
0033     pointer = (CHAR *) first_unused_memory;
0034
0035     /* Create "my_thread". */
0036     tx_thread_create(&my_thread, "my thread", my_thread_entry, 0,
0037                     pointer, DEMO_STACK_SIZE,
0038                     2, 2, TX_NO_TIME_SLICE, TX_AUTO_START);
0039     pointer = pointer + DEMO_STACK_SIZE;
0040
0041     /* Initialize the NetX Duo system. */
0042     nx_system_initialize();
0043
0044     /* Create a packet pool. */
0045     status = nx_packet_pool_create(&my_pool, "NetX Main Packet Pool",
0046                                   1024, pointer, 64000);
0047     pointer = pointer + 64000;
0048
0049     /* check for pool creation error. */
0050     if (status)
0051         error_counter++;
0052
0053     /* Create an IP instance without an IP address. */
0054     status = nx_ip_create(&my_ip, "My NetX IP Instance", IP_ADDRESS(0,0,0,0),
0055                           0xFFFFFFFF, &my_pool, my_netx_driver, pointer, STACK_SIZE, 1);
0056     pointer = pointer + DEMO_STACK_SIZE;
0057
0058
0059
0060

```

```

0061      /* Check for IP create errors.  */
0062      if (status)
0063          error_counter++;
0064
0065      status = _nx_ip_interface_attach(&ip_0, "port_2", IP_ADDRESS(0, 0, 0,0),
                                0xFFFFFFFFUL, my_netx_driver);

0066      /* Enable ARP and supply ARP cache memory for my IP Instance.  */
0067      status = nx_arp_enable(&my_ip, (void *) pointer, 1024);
0068      pointer = pointer + 1024;
0069
0070      /* Check for ARP enable errors.  */
0071      if (status)
0072          error_counter++;
0073
0074      /* Enable UDP.  */
0075      status = nx_udp_enable(&my_ip);
0076      if (status)
0077          error_counter++;
0078 }
0079
0080 void    my_thread_entry(ULONG thread_input)
0081 {
0082     UINT          status;
0083     ULONG         status;
0084     NX_PACKET     *my_packet;
0085
0086     /* wait for the link to come up.  */
0087     do
0088     {
0089         /* Get the link status.  */
0090         status = nx_ip_status_check(&my_ip, NX_IP_LINK_ENABLED, & status, 100);
0091     } while (status != NX_SUCCESS);
0092
0093     /* Create a DHCP instance.  */
0094     status = nx_dhcp_create(&my_dhcp, &my_ip, "My DHCP");
0095
0096     /* Check for DHCP create error.  */
0097     if (status)
0098         error_counter++;
0099
0100     /* Set the DHCP client interface to the secondary interface.
0101     status = nx_dhcp_set_interface_index(&my_dhcp, 1);
0102
0103     /* Start DHCP.  */
0104     nx_dhcp_start(&my_dhcp);
0105
0106     /* Check for DHCP start error.  */
0107     if (status)
0108         error_counter++;
0109
0110     /* wait for IP address to be resolved through DHCP.  */
0111     nx_ip_status_check(&my_ip, NX_IP_ADDRESS_RESOLVED,
0112                       (ULONG *) &status, 100000);
0113
0114     /* Check to see if we have a valid IP address.  */
0115     if (status)
0116     {
0117         error_counter++;
0118         return;
0119     }
0120     else
0121     {
0122         /* Yes, a valid IP address is now on lease... All NetX Duo
0123         services are available.
0124         }
0125     }
0126 }

```

Figure 1.2 Example of DHCP for NetX Duo with multihome support

## DHCP Client on Multiple Interfaces Simultaneously

---

To run DHCP Client on multiple interfaces, `NX_MAX_PHYSICAL_INTERFACES` in `nx_api.h` must be set to the number of physical interfaces connected to the device. By default, this value is 1 (e.g. the primary interface). To register an additional interface to the IP instance use the `nx_ip_interface_attach` service. See the NetX Duo User Guide for more details on attaching secondary interfaces.

The next step is to set the `NX_DHCP_CLIENT_MAX_RECORDS` in `nxd_dhcp_client.h` to the maximum number of interfaces expected to run DHCP simultaneously. Note that `NX_DHCP_CLIENT_MAX_RECORDS` does not have to equal `NX_MAX_PHYSICAL_INTERFACES`. For example, `NX_MAX_PHYSICAL_INTERFACES` can be 3 and `NX_DHCP_CLIENT_MAX_RECORDS` equal to 2. In this configuration, only two interfaces (and they can be any two of the three physical interfaces at any time) of the three physical interfaces can run DHCP at any one time. DHCP Client Records do not have a one to one mapping to network interfaces e.g. Client Record 1 does not automatically correlate to physical interface index 1.

`NX_DHCP_CLIENT_MAX_RECORDS` can also be set to greater than `NX_MAX_PHYSICAL_INTERFACES` but this would create unused client records and be an inefficient use of memory.

Before it can start DHCP on any interface, the application must enable those interfaces by calling `nx_dhcp_interface_enable`. Note that the exception is the primary interface which is automatically enabled in the `nx_dhcp_create` call (and which can be disabled using the `nx_dhcp_interface_disable` service discussed below).

At any time, an interface can be disabled for DHCP or DHCP can be stopped on that interface independently of other interfaces running DHCP.

As mentioned above, to enable a specific interface for DHCP, use the `nx_dhcp_interface_enable` service and specify the physical interface index in the input argument. Up to `NX_DHCP_CLIENT_MAX_RECORDS` interfaces can be enabled with the only limitation that the interface index input argument be less than `NX_MAX_PHYSICAL_INTERFACES`.

To start DHCP on a specific interface, use the `nx_dhcp_interface_start` service. To start DHCP on all enabled interfaces, use the `nx_dhcp_start` service. (Interfaces that have already started DHCP will not be affected by `nx_dhcp_start`.)

To stop DHCP on an interface, use the *nx\_dhcp\_interface\_stop* service. DHCP must already have started on that interface or an error status is returned. To stop DHCP on all enabled interfaces, use the *nx\_dhcp\_stop* service. DHCP can be stopped independently of other interfaces at any time.

Most of the existing DHCP Client services have an 'interface' equivalent e.g. *nx\_dhcp\_interface\_release* is the interface specific equivalent of *nx\_dhcp\_release*. If DHCP Client is configured for a single interface, they perform the same action.

Note that non-interface specific DHCP Client services typically apply to all interfaces but not all. In the latter case, the non-interface specific service applies to the first DHCP enabled interface found in searching the DHCP Client list of interface records. See **Description of Services** in Chapter Three for how a non-interface specific service performs when multiple interfaces are enabled for DHCP.

In the example sequence below, the IP instance has two network interfaces and first runs DHCP on the secondary interface. At some time later, it starts DHCP on the primary interface. Then it releases the IP address on the primary interface and restarts DHCP on the primary interface:

```
nx_dhcp_create(&my_dhcp_client);
/* By default this enables primary interface for DHCP. */

nx_dhcp_interface_enable(&my_dhcp_client, 1);
/* Secondary interface is enabled. */

nx_dhcp_interface_start(&my_dhcp_client, 1);
/* DHCP is started on secondary interface. */

/* Some time later... */

nx_dhcp_interface_start(&my_dhcp_client, 0);
/* DHCP is started on primary interface. */

nx_dhcp_interface_release(&my_dhcp_client, 0);

/* Some time later... */

nx_dhcp_interface_start(&my_dhcp_client, 0);
/* DHCP is restarted on primary interface. */
```

For a complete list of interface specific services see **Description of Services** in Chapter Three.

## Configuration Options

---

User configurable DHCP options in *nxd\_dhcp\_client.h* allow the host application to fine tune DHCP Client for its particular requirements. The following is a list of these parameters:

Define	Meaning
<b>NX_DHCP_ENABLE_BOOTP</b>	Defined, this option enables the BOOTP protocol instead of DHCP. By default this option is disabled.
<b>NX_DHCP_CLIENT_RESTORE_STATE</b>	If defined, this enables the DHCP Client to save its current DHCP Client license 'state' including time remaining on the lease, and restore this state between DHCP Client application reboots. The default value is disabled.
<b>NX_DHCP_CLIENT_USER_CREATE_PACKET_POOL</b>	If set, the DHCP Client will not create its own packet pool. The host application must use the <i>nxd_dhcp_packet_pool_set</i> service to set the DHCP Client packet pool. The default value is disabled.
<b>NX_DHCP_CLIENT_SEND_ARP_PROBE</b>	Defined, this enables the DHCP Client to send an ARP probe after IP address assignment to verify the assigned DHCP address is not owned by another host. By default, this option is disabled.
<b>NX_DHCP_ARP_PROBE_WAIT</b>	Defines the length of time the DHCP Client waits for a response after sending an ARP probe. The default value is one second (1 * NX_IP_PERIODIC_RATE)

<b>NX_DHCP_ARP_PROBE_MIN</b>	Defines the minimum variation in the interval between sending ARP probes. The value is defaulted to 1 second.
<b>NX_DHCP_ARP_PROBE_MAX</b>	Defines the maximum variation in the interval between sending ARP probes. The value is defaulted to 2 seconds.
<b>NX_DHCP_ARP_PROBE_NUM</b>	Defines the number of ARP probes sent for determining if the IP address assigned by the DHCP server is already in use. The value is defaulted to 3 probes.
<b>NX_DHCP_RESTART_WAIT</b>	Defines the length of time the DHCP Client waits to restart DHCP if the IP address assigned to the DHCP Client is already in use. The value is defaulted to 10 seconds.
<b>NX_DHCP_CLIENT_MAX_RECORDS</b>	Specifies the maximum number of interface records to save to the DHCP Client instance. A DHCP Client interface record is a record of the DHCP Client running on a specific interface. The default value is set as physical interfaces count(NX_MAX_PHYSICAL_INTERFACES).
<b>NX_DHCP_CLIENT_SEND_MAX_DHCP_MESSAGE_OPTION</b>	Defined, this enables the DHCP Client to send maximum DHCP message size option. By default, this option is disabled.
<b>NX_DHCP_CLIENT_ENABLE_HOST_NAME_CHECK</b>	Defined, this enables the DHCP Client to check the input host name in the nx_dhcp_create call for invalid characters or length. By default, this option is disabled.



<b>NX_DHCP_THREAD_PRIORITY</b>	Priority of the DHCP thread. By default, this value specifies that the DHCP thread runs at priority 3.
<b>NX_DHCP_THREAD_STACK_SIZE</b>	Size of the DHCP thread stack. By default, the size is 2048 bytes.
<b>NX_DHCP_TIME_INTERVAL</b>	Interval in seconds when the DHCP Client timer expiration function executes. This function updates all the timeouts in the DHCP process e.g. if messages should be retransmitted or DHCP Client state changed. By default, this value is 1 second.
<b>NX_DHCP_OPTIONS_BUFFER_SIZE</b>	Size of DHCP options buffer. By default, this value is 312 bytes.
<b>NX_DHCP_PACKET_PAYLOAD</b>	Specifies the size in bytes of the DHCP Client packet payload. The default value is $\text{NX\_DHCP\_MINIMUM\_IP\_DATAGRAM} +$ physical header size. The physical header size in a wireline network is usually the Ethernet frame size.
<b>NX_DHCP_PACKET_POOL_SIZE</b>	Specifies the size of the DHCP Client packet pool. The default value is $(5 * \text{NX\_DHCP\_PACKET\_PAYLOAD})$ which will provide four packets plus room for internal packet pool overhead.
<b>NX_DHCP_MIN_RETRANS_TIMEOUT</b>	Specifies the minimum wait option for receiving a DHCP Server reply to client message before retransmitting the message. The default value is the RFC 2131 recommended 4 seconds.

<b>NX_DHCP_MAX_RETRANS_TIMEOUT</b>	Specifies the maximum wait option for receiving a DHCP Server reply to client message before retransmitting the message. The default value is 64 seconds.
<b>NX_DHCP_MIN_RENEW_TIMEOUT</b>	Specifies minimum wait option for receiving a DHCP Server message and sending a renewal request after the DHCP Client is bound to an IP address. The default value is 60 seconds. However, the DHCP Client uses the Renew and Rebind expiration times from the DHCP server message before defaulting to the minimum renew timeout.
<b>NX_DHCP_TYPE_OF_SERVICE</b>	Type of service required for the DHCP UDP requests. By default, this value is defined as NX_IP_NORMAL to indicate normal IP packet service.
<b>NX_DHCP_FRAGMENT_OPTION</b>	Fragment enable for DHCP UDP requests. By default, this value is NX_DONT_FRAGMENT to disable DHCP UDP fragmenting.
<b>NX_DHCP_TIME_TO_LIVE</b>	Specifies the number of routers this packet can pass before it is discarded. The default value is set to 0x80.
<b>NX_DHCP_QUEUE_DEPTH</b>	Specifies the number of maximum depth of receive queue. The default value is set to 4.

## Chapter 3

### Description of DHCP Client Services

This chapter contains a description of all NetX Duo DHCP services (listed below) in alphabetic order.

In the “Return Values” section in the following API descriptions, values in **BOLD** are not affected by the **NX\_DISABLE\_ERROR\_CHECKING** define that is used to disable API error checking, while non-bold values are completely disabled.

`nx_dhcp_create`  
*Create a DHCP instance*

`nx_dhcp_clear_broadcast_flag`  
*Clear broadcast flag on Client messages*

`nx_dhcp_delete`  
*Delete a DHCP instance*

`nx_dhcp_force_renew`  
*Send a force renew message*

`nx_dhcp_packet_pool_set`  
*Set the DHCP Client packet pool*

`nx_dhcp_decline`  
*Send Decline message to server*

`nx_dhcp_release`  
*Send Release message to server*

`nx_dhcp_reinitialize`  
*Clear DHCP client network parameters*

`nx_dhcp_request_client_ip`  
*Specify a specific IP address*

`nx_dhcp_send_request`  
*Send DHCP message to server*

`nx_dhcp_start`  
*Start the DHCP Client processing*

`nx_dhcp_stop`  
*Stop the DHCP Client processing*

`nx_dhcp_set_interface_index`  
*Set the interface to run DHCP Client*

`nx_dhcp_server_address_get`  
*Get the DHCP server IP address*

`nx_dhcp_state_change_notify`  
*Set the callback function when DHCP state changes*

`nx_dhcp_user_option_retrieve`  
*Retrieve the specified DHCP option*

`nx_dhcp_user_option_convert`  
*Convert four bytes to ULONG*

Interface specific DHCP Client services:

`nx_dhcp_interface_clear_broadcast_flag`  
*Clear broadcast flag on Client messages  
on specified interface*

`nx_dhcp_interface_enable`  
*Enable interface to run DHCP  
on the specified interface*

`nx_dhcp_interface_disable`  
*Disable interface to run DHCP  
on the specified interface*

`nx_dhcp_interface_decline`  
*Send Decline message to server  
on the specified interface*

`nx_dhcp_interface_force_renew`  
*Send a force renew message  
on the specified interface*

`nx_dhcp_interface_reinitialize`  
*Clear DHCP client network parameters  
on the specified interface*

nx\_dhcp\_interface\_release  
*Send Release message to server  
 on the specified interface*

nx\_dhcp\_interface\_request\_client\_ip  
*Specify a specific IP address  
 on the specified interface*

nx\_dhcp\_interface\_send\_request  
*Send DHCP message to server  
 on the specified interface*

nx\_dhcp\_interface\_server\_address\_get  
*Get the DHCP server IP address  
 on the specified interface*

nx\_dhcp\_interface\_start  
*Start the DHCP Client processing  
 on the specified interface*

nx\_dhcp\_interface\_stop  
*Stop the DHCP Client processing  
 on the specified interface*

nx\_dhcp\_interface\_state\_change\_notify  
*Set the callback function when DHCP state changes  
 on the specified interface*

nx\_dhcp\_interface\_user\_option\_retrieve  
*Retrieve the specified DHCP option  
 on the specified interface*

DHCP Client Services if NX\_DHCP\_CLIENT\_RESTORE\_STATE is  
 defined:

nx\_dhcp\_resume  
*Resume previously established DHCP Client state*

nx\_dhcp\_suspend  
*Suspend processing the DHCP Client state*

nx\_dhcp\_client\_get\_record  
*Create a record of the DHCP Client state*

nx\_dhcp\_client\_restore\_record  
*Restore a previously saved record to the DHCP Client*

`nx_dhcp_client_update_time_remaining`

*Update the time remaining in the current DHCP state*

Interface Specific DHCP Client Services if

`NX_DHCP_CLIENT_RESTORE_STATE` is defined:

`nx_dhcp_client_interface_get_record`

*Create a record of the DHCP Client state  
on the specified interface*

`nx_dhcp_client_interface_restore_record`

*Restore a previously saved record to the DHCP Client  
on the specified interface*

`nx_dhcp_client_interface_update_time_remaining`

*Update the time remaining in the current DHCP state  
on the specified interface*

**nx\_dhcp\_create**

Create a DHCP instance

**Prototype**

```
UINT nx_dhcp_create(NX_DHCP *dhcp_ptr, NX_IP *ip_ptr, CHAR *name_ptr);
```

**Description**

This service creates a DHCP instance for the previously created IP instance. By default the primary interface is enabled for running DHCP. The name input, while not used in the NetX Duo implementation of DHCP Client, must follow RFC 1035 criteria for host names. The total length must not exceed 255 characters, the labels separate by dots must begin with a letter, and end with a letter or number, and may contain hyphens but no other non-alphanumeric character.

If the application would like to run DHCP another interface registered with the IP instance, (using *nx\_ip\_interface\_attach*), the application can call *nx\_dhcp\_set\_interface\_index* to run DHCP on just that interface, or *nx\_dhcp\_interface\_enable* to run DHCP on that interface as well. See description of these services for more details.

**Note:** The application must make sure the DHCP Client packet pool payload can support the minimum DHCP message size specified by the RFC 2131 Section 2 (548 bytes of DHCP message data plus UDP, IP and physical network frame headers).

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to DHCP control block.
<b>ip_ptr</b>	Pointer to previously created IP instance.
<b>name_ptr</b>	Pointer to host name for DHCP instance.

**Return Values**

<b>NX_SUCCESS</b>	(0x00)	Successful DHCP create
<b>NX_DHCP_INVALID_NAME</b>	(0xA8)	Invalid host name
<b>NX_DHCP_INVALID_PAYLOAD</b>	(0x9C)	Payload too small for DHCP message
<b>NX_PTR_ERROR</b>	(0x16)	Invalid IP or DHCP pointer

**Allowed From**

Threads, Initialization

## Example

```
/* Create a DHCP instance. */  
status = nx_dhcp_create(&my_dhcp, &my_ip, "My-DHCP");  
/* If status is NX_SUCCESS a DHCP instance was successfully created. */
```



**nx\_dhcp\_interface\_enable**

Enable the specified interface to run DHCP

**Prototype**

```
UINT nx_dhcp_interface_enable(NX_DHCP *dhcp_ptr, UINT interface_index);
```

**Description**

This service enables the specified interface for running DHCP. By default the primary interface is enabled for DHCP Client. At this point, DHCP can be started on this interface either by calling *nx\_dhcp\_interface\_start* or to start DHCP on all enabled interfaces *nx\_dhcp\_start*.

Note the application must first register this interface with the IP instance, using *nx\_ip\_interface\_attach*.

Further, there must be an available DHCP Client interface 'record' to add this interface to the list of enabled interfaces. By default NX\_DHCP\_CLIENT\_MAX\_RECORDS is defined to 1. Set this option to the maximum number of interfaces expected to run DHCP Client simultaneously. Typically NX\_DHCP\_CLIENT\_MAX\_RECORDS will equal NX\_MAX\_PHYSICAL\_INTERFACES; however, if a device has more physical interfaces than it expects to run DHCP Client, it can save memory by setting NX\_DHCP\_CLIENT\_MAX\_RECORDS to less than that number. There is not a one to one mapping of physical interfaces with DHCP Client interface records.

The difference between this service and *nx\_dhcp\_set\_interface\_index* is the latter sets only a single interface to run DHCP whereas this service simply adds the specified interface to the list of Client interfaces enabled for DHCP.

To disable an interface for DHCP, the application can call the *nx\_dhcp\_interface\_disable* service.

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to DHCP control block.
<b>interface_index</b>	Index of interface to enable DHCP on

**Return Values**

<b>NX_SUCCESS</b>	(0x00)	Successful DHCP enable
<b>NX_DHCP_NO_RECORDS_AVAILABLE</b>	(0xA7)	No record available for another

		Interface to be enabled for DHCP
<b>NX_DHCP_INTERFACE_ALREADY_ENABLED</b>		
	(0xA3)	Interface enabled for DHCP
NX_PTR_ERROR	(0x16)	Invalid IP or DHCP pointer
NX_INVALID_INTERFACE		
	(0x4C)	Invalid network interface

### Allowed From

Threads, Initialization

### Example

```

/* Enable DHCP on a secondary interface. It is already enabled on the primary
   interface. NX_DHCP_CLIENT_MAX_RECORDS is set to 2. */
status = nx_dhcp_interface_enable(&my_dhcp, 1);
/* If status is NX_SUCCESS the interface was successfully enabled. */

status = nx_dhcp_start(&my_dhcp);
/* If status is NX_SUCCESS DHCP is running on interface 0 and 1. */

```

**nx\_dhcp\_interface\_disable**


---

 Disable the specified interface to run DHCP
**Prototype**

```
UINT nx_dhcp_interface_disable(NX_DHCP *dhcp_ptr,
                               UINT interface_index);
```

**Description**

This service disables the specified interface for running DHCP. It reinitializes the DHCP Client on this interface.

To restart the DHCP Client the application must re-enable the interface using *nx\_dhcp\_interface\_enable* and restart DHCP by calling *nx\_dhcp\_interface\_start*.

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to DHCP control block.
<b>interface_index</b>	Index of interface to disable DHCP on

**Return Values**

<b>NX_SUCCESS</b>	(0x00)	Successful DHCP create
<b>NX_DHCP_INTERFACE_NOT_ENABLED</b>	(0xA4)	Interface not enabled for DHCP
<b>NX_PTR_ERROR</b>	(0x16)	Invalid IP or DHCP pointer
<b>NX_CALLER_ERROR</b>	(0x11)	Invalid caller of this service
<b>NX_INVALID_INTERFACE</b>	(0x4C)	Invalid network interface

**Allowed From**

Threads

**Example**

```
/* Disable DHCP on a secondary interface.
. */
status = nx_dhcp_interface_disable(&my_dhcp, 1);
/* If status is NX_SUCCESS the interface is successfully disabled. */
```

**nx\_dhcp\_clear\_broadcast\_flag**

Set the DHCP broadcast flag

**Prototype**

```
UINT nx_dhcp_clear_broadcast_flag(NX_DHCP *dhcp_ptr, UINT clear_flag);
```

**Description**

This service sets or clears the broadcast flag the DHCP message header for all interfaces enabled for DHCP. For some DHCP messages (e.g. DISCOVER) the broadcast flag is set to broadcast because the Client does not have an IP address.

clear\_flag

NX\_TRUE broadcast flag is cleared (request unicast response)

NX\_FALSE broadcast flag is set (request broadcast response)

This service is intended for DHCP Clients that must go through a router to get to the DHCP Server, where the router rejects forwarding broadcast messages.

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to DHCP control block
<b>clear_flag</b>	Value to set the broadcast flag to

**Return Values**

<b>NX_SUCCESS</b>	(0x00)	Successfully set flag
<b>NX_PTR_ERROR</b>	(0x16)	Invalid IP or DHCP pointer

**Allowed From**

Threads, Initialization

**Example**

```
/* Send DHCP Client messages with the broadcast flag cleared (e.g. request a
   unicast response). */
status = nx_dhcp_clear_broadcast_flag(&my_dhcp, NX_TRUE);
/* If status is NX_SUCCESS the DHCP Client broadcast flag is updated. */
```

**nx\_dhcp\_interface\_clear\_broadcast\_flag**

Set or clear the broadcast flag on the specified interface

**Prototype**

```
UINT nx_dhcp_interface_clear_broadcast_flag(NX_DHCP *dhcp_ptr,
                                           UINT interface_index,
                                           UINT clear_flag);
```

**Description**

This service enables the DHCP Client host application to set or clear the broadcast flag in DHCP Client messages to the DHCP Server on the specified interface. For more details see `nx_dhcp_clear_broadcast_flag`

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to DHCP control block
<b>interface_index</b>	Index of interface to set the broadcast flag
<b>clear_flag</b>	Value to set the broadcast flag to

**Return Values**

<b>NX_SUCCESS</b>	(0x00)	Successfully set flag
<b>NX_DHCP_INTERFACE_NOT_ENABLED</b>	(0xA4)	Interface not enabled for DHCP
<b>NX_PTR_ERROR</b>	(0x16)	Invalid IP or DHCP pointer
<b>NX_INVALID_INTERFACE</b>	(0x4C)	Invalid network interface

**Allowed From**

Threads, Initialization

**Example**

```
/* Send DHCP Client messages with the broadcast flag cleared (e.g. request a
   unicast response) on a previously attached secondary interface. */
iface_index = 1;
status = nx_dhcp_interface_clear_broadcast_flag(&my_dhcp, iface_index, NX_TRUE);
/* If status is NX_SUCCESS the DHCP Client broadcast flag is updated. */
```

**nx\_dhcp\_delete**

Delete a DHCP instance

**Prototype**

```
UINT nx_dhcp_delete(NX_DHCP *dhcp_ptr);
```

**Description**

This service deletes a previously created DHCP instance.

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to previously created DHCP instance.
-----------------	--

**Return Values**

<b>NX_SUCCESS</b>	(0x00)	Successful DHCP delete.
<b>NX_PTR_ERROR</b>	(0x16)	Invalid DHCP pointer.
<b>NX_CALLER_ERROR</b>	(0x11)	Invalid caller of this service.

**Allowed From**

Threads

**Example**

```
/* Delete a DHCP instance. */
status = nx_dhcp_delete(&my_dhcp);

/* If status is NX_SUCCESS the DHCP instance was successfully deleted. */
```

**nx\_dhcp\_force\_renew**

Send a force renew message

**Prototype**

```
UINT nx_dhcp_force_renew(NX_DHCP *dhcp_ptr);
```

**Description**

This service enables the host application to send a force renew message on all interfaces enabled for DHCP.

To send a force renew on a specific interface when multiple interfaces are DHCP-enabled, use *nx\_dhcp\_interface\_force\_renew*.

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to previously created DHCP instance.
-----------------	--

**Return Values**

<b>NX_SUCCESS</b>	(0x00)	Successful DHCP force renew.
<b>NX_DHCP_NOT_BOUND</b>	(0x94)	Client IP address not bound.
<b>NX_PTR_ERROR</b>	(0x16)	Invalid DHCP pointer.
<b>NX_CALLER_ERROR</b>	(0x11)	Invalid caller of this service.

**Allowed From**

Threads

**Example**

```
/* Send a force renew message from the client. */
status = nx_dhcp_force_renew(&my_dhcp);

/* If status is NX_SUCCESS the DHCP client state is the FORCE RENEW state. */
```

**nx\_dhcp\_interface\_force\_renew**

Send a force renew message on the specified interface

**Prototype**

```
UINT nx_dhcp_interface_force_renew(NX_DHCP *dhcp_ptr,
                                   UINT interface_index);
```

**Description**

This service enables the host application to send a force renew message on the input interface as long as that interface has been enabled for DHCP (see *nx\_dhcp\_interface\_enable*).

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to previously created DHCP instance.
-----------------	--

**Return Values**

<b>NX_SUCCESS</b>	(0x00)	Successful sent force renew.
<b>NX_DHCP_INTERFACE_NOT_ENABLED</b>	(0xA4)	Interface not enabled for DHCP
<b>NX_PTR_ERROR</b>	(0x16)	Invalid IP or DHCP pointer
<b>NX_INVALID_INTERFACE</b>	(0x4C)	Invalid network interface

**Allowed From**

Threads

**Example**

```
/* Send a force renew message to the server on interface 1. */
status = nx_dhcp_interface_force_renew(&my_dhcp, 1);

/* If status is NX_SUCCESS the DHCP client state is the FORCE RENEW state. */
```



**nx\_dhcp\_packet\_pool\_set**

Set the DHCP Client packet pool

**Prototype**

```
UINT nx_dhcp_packet_pool_set(NX_DHCP *dhcp_ptr,
                             NX_PACKET_POOL *packet_pool_ptr);
```

**Description**

This service allows the application to create the DHCP Client packet pool by passing in a pointer to a previously created packet pool in this service call. To use this feature, the host application must define `NX_DHCP_CLIENT_USER_CREATE_PACKET_POOL`. When defined, the *nx\_dhcp\_create* service will not create the Client's packet pool. Note that the application is recommended to use the default values for the DHCP client packet pool payload, defined as `NX_DHCP_PACKET_PAYLOAD` in *nxd\_dhcp\_client.h* when creating the packet pool.

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to DHCP control block.
<b>packet_pool_ptr</b>	Pointer to previously created packet pool

**Return Values**

<b>NX_SUCCESS</b>	(0x00)	DHCP Client packet pool is set
<b>NX_NOT_ENABLED</b>	(0x14)	Service is not enabled
<b>NX_PTR_ERROR</b>	(0x16)	Invalid DHCP pointer
<b>NX_DHCP_INVALID_PAYLOAD(0x9C)</b>		Payload is too small

**Allowed From**

Application code

**Example**

```
/* Create the packet pool. */
status = nx_packet_pool_create(&dhcp_pool, "DHCP Client Packet Pool",
                               NX_DHCP_PACKET_PAYLOAD, pointer, (15 * NX_DHCP_PACKET_PAYLOAD));

/* Create the DHCP Client. */
status = nx_dhcp_create(&dhcp_0, &ip_0, "janetsdhcp1");

/* Set the DHCP Client packet pool. */
status = nx_dhcp_packet_pool_set(&my_dhcp, packet_pool_ptr);
/* If status is NX_SUCCESS packet pool was successfully set. */
```

**nx\_dhcp\_request\_client\_ip**

Set requested IP address for DHCP instance

**Prototype**

```
UINT nx_dhcp_request_client_ip(NX_DHCP *dhcp_ptr,
                              ULONG client_ip_address,
                              UINT skip_discover_message);
```

**Description**

This service sets the IP address for the DHCP Client to request from the DHCP Server on the first interface enabled for DHCP in the DHCP Client record. If the *skip\_discover\_message* flag is set, the DHCP Client skips the Discover message and sends a Request message.

To set the request for a specific IP for DHCP messages on a specific interface, use the *nx\_dhcp\_interface\_request\_client\_ip* service.

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to DHCP control block.
<b>client_ip_address</b>	IP address to request from DHCP server
<b>skip_discover_message</b>	If true, DHCP Client sends Request message If false, it sends the Discover message.

**Return Values**

<b>NX_SUCCESS</b>	(0x00)	Requested IP address is set.
<b>NX_PTR_ERROR</b>	(0x16)	Invalid DHCP pointer
<b>NX_DHCP_INVALID_IP_REQUEST</b>	(0x9D)	NULL IP address requested

**Allowed From**

Threads

**Example**

```
/* Set the DHCP Client requested IP address and skip the discover message. */
status = nx_dhcp_request_client_ip(&my_dhcp, IP(192,168,0,6), NX_TRUE);
/* If status is NX_SUCCESS requested IP address was successfully set. */
```

**nx\_dhcp\_interface\_request\_client\_ip**

Set requested IP address for DHCP instance on specified interface

**Prototype**

```
UINT nx_dhcp_interface_request_client_ip(NX_DHCP *dhcp_ptr,
                                         UINT interface_index,
                                         ULONG client_ip_address,
                                         UINT skip_discover_message);
```

**Description**

This service sets the IP address for the DHCP Client to request from the DHCP Server on the specified interface, if that interface is enabled for DHCP (see *nx\_dhcp\_interface\_enable*). If the *skip\_discover\_message* flag is set, the DHCP Client skips the Discover message and sends a Request message.

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to DHCP control block.
<b>Interface_index</b>	Index of interface to request IP address on
<b>client_ip_address</b>	IP address to request from DHCP server
<b>skip_discover_message</b>	If true, DHCP Client sends Request message; else it sends the Discover message.

**Return Values**

<b>NX_SUCCESS</b>	(0x00)	Requested IP address is set.
<b>NX_DHCP_INTERFACE_NOT_ENABLED</b>	(0xA4)	Interface not enabled for DHCP
<b>NX_PTR_ERROR</b>	(0x16)	Invalid IP or DHCP pointer
<b>NX_INVALID_INTERFACE</b>	(0x4C)	Invalid network interface

**Allowed From**

Threads

**Example**

```
/* Set the DHCP Client requested IP address and skip the discover message on
   interface 0. */
status = nx_dhcp_interface_request_client_ip(&my_dhcp, 0, IP(192,168,0,6),
NX_TRUE);

/* If status is NX_SUCCESS requested IP address was successfully set. */
```

**nx\_dhcp\_reinitialize**

Clear the DHCP client network parameters

**Prototype**

```
UINT nx_dhcp_reinitialize(NX_DHCP *dhcp_ptr);
```

**Description**

This service clears the host application network parameters (IP address, network address and network mask), and clears the DHCP Client state on all interfaces enabled for DHCP. It is used in combination with *nx\_dhcp\_stop* and *nx\_dhcp\_start* to 'restart' the DHCP state machine:

```
nx_dhcp_stop(&my_dhcp);
nx_dhcp_reinitialize(&my_dhcp);
nx_dhcp_start(&my_dhcp);
```

To reinitialize the DHCP Client on a specific interface when multiple interfaces are enabled for DHCP, use the *nx\_dhcp\_interface\_reinitialize* service.

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to previously created DHCP instance.
-----------------	--

**Return Values**

<b>NX_SUCCESS</b>	(0x00)	DHCP successfully reinitialized
<b>NX_PTR_ERROR</b>	(0x16)	Invalid DHCP pointer

**Allowed From**

Threads

**Example**

```
/* Reinitialize the previously started DHCP client. */
status = nx_dhcp_reinitialize(&my_dhcp);

/* If status is NX_SUCCESS the host application successfully reinitialized its
network parameters and DHCP client state. */
```

**nx\_dhcp\_interface\_reinitialize**


---

Clear the DHCP client network parameters on the specified interface

**Prototype**

```
UINT nx_dhcp_interface_reinitialize(NX_DHCP *dhcp_ptr,
                                   UINT interface_index);
```

**Description**

This service clears the network parameters (IP address, network address and network mask) on the specified interface if that interface is enabled for DHCP (see *nx\_dhcp\_interface\_enable*). See *nx\_dhcp\_reinitialize* for more details.

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to previously created DHCP instance
<b>interface_index</b>	Index of interface to reinitialize.

**Return Values**

<b>NX_SUCCESS</b>	(0x00)	Interface successfully reinitialized
<b>NX_DHCP_INTERFACE_NOT_ENABLED</b>	(0xA4)	Interface not enabled for DHCP
<b>NX_PTR_ERROR</b>	(0x16)	Invalid DHCP pointer
<b>NX_CALLER_ERROR</b>	(0x11)	Invalid caller of this service.
<b>NX_INVALID_INTERFACE</b>	(0x4C)	Invalid network interface

**Allowed From**

Threads

**Example**

```
/* Reinitialize the previously started DHCP client on interface 1. */
status = nx_dhcp_interface_reinitialize(&my_dhcp, 1);

/* If status is NX_SUCCESS the host application successfully reinitialized its
network parameters and DHCP client state. */
```

**nx\_dhcp\_release**

Release Leased IP address

**Prototype**

```
UINT nx_dhcp_release(NX_DHCP *dhcp_ptr);
```

**Description**

This service releases the IP address obtained from a DHCP server by sending the RELEASE message to that server. It then reinitializes the DHCP Client. This service is applied to all interfaces enabled for DHCP.

The application can restart the DHCP Client by calling *nx\_dhcp\_start*.

To release an address back to the DHCP server on a specific interface, use the *nx\_dhcp\_interface\_release* service

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to previously created DHCP instance.
-----------------	--

**Return Values**

<b>NX_SUCCESS</b>	(0x00)	Successful DHCP release.
<b>NX_DHCP_NOT_BOUND</b>	(0x94)	The IP address has not been leased so it can't be released.
<b>NX_PTR_ERROR</b>	(0x16)	Invalid DHCP pointer.
<b>NX_CALLER_ERROR</b>	(0x11)	Invalid caller of this service.

**Allowed From**

Threads

**Example**

```
/* Release the previously leased IP address. */
status = nx_dhcp_release(&my_dhcp);

/* If status is NX_SUCCESS the previous IP lease was successfully released. */
```

**nx\_dhcp\_interface\_release**

Release IP address on the specified interface

**Prototype**

```
UINT nx_dhcp_interface_release(NX_DHCP *dhcp_ptr,
                               UINT interface_index);
```

**Description**

This service releases the IP address obtained from a DHCP server on the specified interface and reinitializes the DHCP Client. The DHCP Client can be restarted by calling *nx\_dhcp\_start*.

**Input Parameters**

**dhcp\_ptr** Pointer to previously created DHCP instance.

**Return Values**

<b>NX_SUCCESS</b>	(0x00)	Successful DHCP release.
<b>NX_DHCP_INTERFACE_NOT_ENABLED</b>	(0xA4)	Interface not enabled for DHCP
<b>NX_DHCP_NOT_BOUND</b>	(0x94)	The IP address has not been leased so it can't be released.
<b>NX_PTR_ERROR</b>	(0x16)	Invalid DHCP pointer
<b>NX_CALLER_ERROR</b>	(0x11)	Invalid caller of this service.
<b>NX_INVALID_INTERFACE</b>	(0x4C)	Invalid network interface

**Allowed From**

Threads

**Example**

```
/* Release the previously leased IP address on interface 1. */
status = nx_dhcp_interface_release(&my_dhcp, 1);

/* If status is NX_SUCCESS the previous IP lease was successfully released. */
```

**nx\_dhcp\_decline**

Decline IP address from DHCP Server

**Prototype**

```
UINT nx_dhcp_decline(NX_DHCP *dhcp_ptr);
```

**Description**

This service declines an IP address leased from the DHCP server on all interfaces enabled for DHCP. If `NX_DHCP_CLIENT_SEND_ARP_PROBE` is defined, the DHCP Client will send a DECLINE message if it detects that the IP address is already in use. See **ARP Probes** in Chapter One for more information on ARP probe configuration in the NetX Duo DHCP Client.

The application can use this service to decline its IP address if it discovers the address is in use by other means.

This service reinitializes the DHCP Client so that it can be restarted by calling `nx_dhcp_start`.

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to previously created DHCP instance.
-----------------	--

**Return Values**

<b>NX_SUCCESS</b>	(0x00)	Decline successfully sent
<b>NX_DHCP_NOT_BOUND</b>	(0x94)	DHCP Client not bound
<b>NX_PTR_ERROR</b>	(0x16)	Invalid DHCP pointer
<b>NX_CALLER_ERROR</b>	(0x11)	Invalid caller of this service

**Allowed From**

Threads

**Example**

```
/* Decline the IP address offered by the DHCP server. */
status = nx_dhcp_decline(&my_dhcp);

/* If status is NX_SUCCESS the previous IP address decline message was
successfully transmitted. */
```



**nx\_dhcp\_interface\_decline**

Decline IP address from DHCP Server on the specified interface

**Prototype**

```
UINT nx_dhcp_interface_decline(NX_DHCP *dhcp_ptr,
                               UINT interface_index);
```

**Description**

This service sends the DECLINE message to the server to decline an IP address assigned by the DHCP server. It also reinitializes the DHCP Client. See *nx\_dhcp\_decline* for more details.

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to previously created DHCP instance.
<b>Interface_index</b>	Index of interface to decline IP address

**Return Values**

<b>NX_SUCCESS</b>	(0x00)	DHCP decline message sent
<b>NX_DHCP_NOT_BOUND</b>	(0x94)	DHCP Client not bound
<b>NX_DHCP_INTERFACE_NOT_ENABLED</b>	(0xA4)	Interface not enabled for DHCP
<b>NX_PTR_ERROR</b>	(0x16)	Invalid DHCP pointer
<b>NX_CALLER_ERROR</b>	(0x11)	Invalid caller of this service.
<b>NX_INVALID_INTERFACE</b>	(0x4C)	Invalid network interface

**Allowed From**

Threads

**Example**

```
/* Decline the IP address offered by the DHCP server on interface 2. */
status = nx_dhcp_interface_decline(&my_dhcp, 2);

/* If status is NX_SUCCESS the previous IP address decline message was
successfully trasmitted. */
```

**nx\_dhcp\_send\_request**

Send DHCP message to Server

**Prototype**

```
UINT nx_dhcp_send_request(NX_DHCP *dhcp_ptr, UINT dhcp_message_type);
```

**Description**

This service sends the specified DHCP message to the DHCP server on the first interface enabled for DHCP found in the DHCP Client record. To send a RELEASE or DECLINE message, the application must use the *nx\_dhcp[\_interface]\_release()* or *nx\_dhcp[\_interface]\_decline()* services respectively.

The DHCP Client must be started to use this service except for sending the INFORM\_REQUEST message type.

Note: This service is not intended for the host application to 'drive' the DHCP Client state machine.

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to DHCP control block.
<b>dhcp_message_type</b>	Message request (defined in <i>nxd_dhcp_client.h</i> )

**Return Values**

<b>NX_SUCCESS</b>	(0x00)	DHCP message sent
<b>NX_DHCP_NOT_STARTED</b>	(0x96)	Invalid interface index
<b>NX_DHCP_INVALID_MESSAGE</b>	(0x9B)	Invalid message type to send
<b>NX_PTR_ERROR</b>	(0x16)	Invalid pointer input

**Allowed From**

Threads

**Example**

```
/* Send the DHCP INFORM REQUEST message to the server. */
status = nx_dhcp_send_request(&my_dhcp, NX_DHCP_TYPE_DHCPINFORM);
/* If status is NX_SUCCESS a DHCP message was successfully sent. */
```

**nx\_dhcp\_interface\_send\_request**

Send DHCP message to Server on a specific interface

**Prototype**

```
UINT nx_dhcp_interface_send_request(NX_DHCP *dhcp_ptr,
                                    UINT interface_index,
                                    UINT dhcp_message_type);
```

**Description**

This service sends a message to the DHCP server on the specified interface if that interface is enabled for DHCP. To send a RELEASE or DECLINE message, the application must use the *nx\_dhcp[\_interface]\_release()* or *nx\_dhcp\_interface\_decline()* services respectively.

The DHCP Client must be started to use this service except for sending the DHCP INFORM REQUEST message type.

This service is not intended for the host application to 'drive' the DHCP Client state machine.

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to DHCP control block.
<b>Interface_index</b>	Index of interface to send message on
<b>dhcp_message_type</b>	Message request (defined in nxd_dhcp_client.h)

**Return Values**

<b>NX_SUCCESS</b>	(0x00)	DHCP message sent
<b>NX_DHCP_NOT_STARTED</b>	(0x96)	Invalid interface index
<b>NX_DHCP_INVALID_MESSAGE</b>	(0x9B)	Invalid message type to send
<b>NX_DHCP_INTERFACE_NOT_ENABLED</b>	(0xA4)	Interface not enabled for DHCP
<b>NX_PTR_ERROR</b>	(0x16)	Invalid DHCP pointer
<b>NX_CALLER_ERROR</b>	(0x11)	Invalid caller of this service.
<b>NX_INVALID_INTERFACE</b>	(0x4C)	Invalid network interface

**Allowed From**

Threads

**Example**

```
/* Send the INFORM REQUEST message to the server on the primary interface. */
status = nx_dhcp_interface_send_request(&my_dhcp, 0, NX_DHCP_TYPE_DHCPIFORM);
/* If status is NX_SUCCESS a DHCP message was successfully sent. */
```

**nx\_dhcp\_server\_address\_get**

Get the DHCP Client's DHCP server IP address

**Prototype**

```
UINT nx_dhcp_server_address_get(NX_DHCP *dhcp_ptr,
                                ULONG server_address);
```

**Description**

This service retrieves the DHCP Client DHCP server IP address on the first interface enabled for DHCP found in the DHCP Client record. The caller can only use this service after the DHCP Client is bound to an IP address assigned by the DHCP Server. The host application can use the *nx\_ip\_status\_check* service to verify IP address is set, or it can use the *nx\_dhcp\_state\_change\_notify* and query the DHCP Client state is NX\_DHCP\_STATE\_BOUND. See *nx\_dhcp\_state\_change\_notify* for more details about setting the state change callback function.

To find the DHCP server on a specific interface when multiple interfaces are enabled for DHCP Client, use the *nx\_dhcp\_interface\_server\_address\_get* service

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to DHCP control block.
<b>server_address</b>	Pointer to server IP address

**Return Values**

<b>NX_SUCCESS</b>	(0x00)	DHCP server address returned
<b>NX_DHCP_NO_INTERFACES_ENABLED</b>	(0xA5)	No interfaces enabled for DHCP
<b>NX_PTR_ERROR</b>	(0x16)	Invalid input pointer
<b>NX_CALLER_ERROR</b>	(0x11)	Invalid caller of this service.

**Allowed From**

Threads

**Example**

```
/* Use the state change notify service to determine the Client transition to the
bound state and get its DHCP server IP address.
*/ void dhcp_state_change(NX_DHCP *dhcp_ptr, UCHAR new_state)
{
    ULONG server_address;
```

```
UINT status;

/* Increment state changes counter. */
state_changes++;

if (dhcp_0.nx_dhcp_state == NX_DHCP_STATE_BOUND)
{
    status = nx_dhcp_server_address_get(&dhcp_0, &server_address);
}
```

**nx\_dhcp\_interface\_server\_address\_get**


---

Get the DHCP Client's DHCP server IP address on the specified interface

**Prototype**

```
UINT nx_dhcp_interface_server_address_get(NX_DHCP *dhcp_ptr,
                                          UINT interface_index,
                                          ULONG server_address);
```

**Description**

This service retrieves the DHCP Client DHCP server IP address on the specified interface if that interface is enabled for DHCP. The DHCP Client must be in the Bound state. After starting the DHCP Client on that interface, the host application can either use the *nx\_ip\_status\_check* service to verify the IP address is set, or it can use the DHCP Client state change callback and query the DHCP Client state is NX\_DHCP\_STATE\_BOUND. See *nx\_dhcp\_state\_change\_notify* for more details about setting the state change callback function.

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to DHCP control block.
<b>Interface_index</b>	Index of interface to obtain IP address
<b>server_address</b>	Pointer to server IP address

**Return Values**

<b>NX_SUCCESS</b>	(0x00)	DHCP server address returned
<b>NX_DHCP_NO_INTERFACES_ENABLED</b>	(0xA5)	No interfaces enabled for DHCP
<b>NX_DHCP_NOT_BOUND</b>	(0x94)	DHCP Client not bound
<b>NX_PTR_ERROR</b>	(0x16)	Invalid DHCP pointer
<b>NX_CALLER_ERROR</b>	(0x11)	Invalid caller of this service.
<b>NX_INVALID_INTERFACE</b>	(0x4C)	Invalid network interface

**Allowed From**

Threads

**Example**

```
/* Use the state change notify service to determine the Client transition to the
bound state and get its DHCP server IP address.
*/ void dhcp_state_change(NX_DHCP *dhcp_ptr, UCHAR new_state)
{
    ULONG server_address;
    UINT status;
```

[illegible]

**nx\_dhcp\_set\_interface\_index**

Set network interface for DHCP instance

**Prototype**

```
UINT nx_dhcp_set_interface_index(NX_DHCP *dhcp_ptr, UINT index);
```

**Description**

This service sets the network interface for the DHCP instance to connect to the DHCP Server on when running DHCP Client configured for a single network interface.

By default the DHCP Client runs on the primary interface. To run DHCP on a secondary service, use this service to set the secondary interface as the DHCP Client interface. The application must previously register the specified interface to the IP instance using the *nx\_ip\_interface\_attach* service.

Note that this service is intended for applications that intend to run the DHCP Client on only one interface. To run DHCP on multiple interfaces see *nx\_dhcp\_interface\_enable* for more details.

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to DHCP control block.
<b>index</b>	Index of device network interface

**Return Values**

<b>NX_SUCCESS</b>	(0x00)	Interface is successfully set.
<b>NX_INVALID_INTERFACE</b>	(0x4C)	Invalid network interface
<b>NX_DHCP_INTERFACE_ALREADY_ENABLED</b>	(0xA3)	Interface enabled for DHCP
<b>NX_DHCP_NO_RECORDS_AVAILABLE</b>	(0xA7)	No record available for another
<b>NX_PTR_ERROR</b>	(0x16)	Invalid DHCP pointer

**Allowed From**

Threads

**Example**

```
/* Set the DHCP Client interface to the secondary interface (index 1). */
status = nx_dhcp_set_interface_index(&my_dhcp, 1);
/* If status is NX_SUCCESS a DHCP interface was successfully set. */
```



**nx\_dhcp\_start**

Start DHCP processing

**Prototype**

```
UINT nx_dhcp_start(NX_DHCP *dhcp_ptr);
```

**Description**

This service starts DHCP processing on all interfaces enabled for DHCP. By default the primary interface is enabled for DHCP when the application calls *nx\_dhcp\_create*.

To verify when the IP instance is bound to an IP address on the DHCP Client interface, use *nx\_ip\_status\_check* to see confirm the IP address is valid.

If there are other interfaces already running DHCP, this service will not affect them.

To start DHCP on a specific interface when multiple interfaces are enabled, use the *nx\_dhcp\_interface\_start* service.

**Input Parameters**

**dhcp\_ptr**                      Pointer to previously created DHCP instance.

**Return Values**

<b>NX_SUCCESS</b>	(0x00)	Successful DHCP start.
<b>NX_DHCP_ALREADY_STARTED</b>	(0x93)	DHCP already started.
<b>NX_PTR_ERROR</b>	(0x16)	Invalid DHCP pointer.
<b>NX_CALLER_ERROR</b>	(0x11)	Invalid caller of service.

**Allowed From**

Threads

**Example**

```
/* Start the DHCP processing for this IP instance. */
status = nx_dhcp_start(&my_dhcp);

/* If status is NX_SUCCESS the DHCP was successfully started. */
```

**nx\_dhcp\_interface\_start**

Start DHCP processing on the specified interface

**Prototype**

```
UINT nx_dhcp_interface_start(NX_DHCP *dhcp_ptr, UINT interface_index);
```

**Description**

This service starts DHCP processing on the specified interface if that interface is enabled for DHCP. See *nx\_dhcp\_interface\_enable()* for more details about enabling an interface for DHCP. By default the primary interface is enabled for DHCP when the application calls *nx\_dhcp\_create*.

If there are no other interfaces running DHCP Client this service will start/resume the DHCP Client thread and (re)activate the DHCP Client timer.

The application should use *nx\_ip\_status\_check* to verify if an IP address is obtained.

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to previously created DHCP instance.
<b>Interface_index</b>	Index on which to start the DHCP Client

**Return Values**

<b>NX_SUCCESS</b>	(0x00)	Successful DHCP start.
<b>NX_DHCP_ALREADY_STARTED</b>	(0x93)	DHCP already started.
<b>NX_PTR_ERROR</b>	(0x16)	Invalid DHCP pointer.
<b>NX_CALLER_ERROR</b>	(0x11)	Invalid caller of service.
<b>NX_INVALID_INTERFACE</b>	(0x4C)	Invalid network interface

**Allowed From**

Threads

**Example**

```
/* Start the DHCP processing for this IP instance on interface 1. */
status = nx_dhcp_interface_start(&my_dhcp, 1);

/* If status is NX_SUCCESS the DHCP was successfully started. */
```

**nx\_dhcp\_state\_change\_notify**

Set DHCP state change callback function

**Prototype**

```
UINT nx_dhcp_state_change_notify(  
    NX_DHCP *dhcp_ptr,  
    VOID (*dhcp_state_change_notify)(NX_DHCP *dhcp_ptr,  
                                     UCHAR new_state));
```

**Description**

This service registers the specified callback function `dhcp_state_change_notify` for notifying an application of DHCP state changes. The callback function supplies the state the DHCP Client has transitioned into.

Following are values associated with the various DHCP states:

State	Value
NX_DHCP_STATE_BOOT	1
NX_DHCP_STATE_INIT	2
NX_DHCP_STATE_SELECTING	3
NX_DHCP_STATE_REQUESTING	4
NX_DHCP_STATE_BOUND	5
NX_DHCP_STATE_RENEWING	6
NX_DHCP_STATE_REBINDING	7
NX_DHCP_STATE_FORCERENEW	8
NX_DHCP_STATE_ADDRESS_PROBING	9

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to previously created DHCP instance.
<b>dhcp_state_change_notify</b>	State change callback function pointer

**Return Values**

<b>NX_SUCCESS</b>	(0x00)	Successful callback set.
<b>NX_PTR_ERROR</b>	(0x16)	Invalid DHCP pointer.
<b>NX_CALLER_ERROR</b>	(0x11)	Invalid caller of service.

**Allowed From**

Threads, Initialization

**Example**

```
/* Register the "my_state_change" function to be called on any DHCP state change,  
assuming DHCP has already been created. */  
status = nx_dhcp_state_change_notify(&my_dhcp, my_state_change);  
  
/* If status is NX_SUCCESS the callback function was successfully  
registered. */
```

**nx\_dhcp\_interface\_state\_change\_notify**


---

Set DHCP state change callback function on the specified interface

**Prototype**

```
UINT nx_dhcp_interface_state_change_notify(
    NX_DHCP *dhcp_ptr,
    UINT interface_index,
    VOID (*dhcp_state_change_notify)(NX_DHCP *dhcp_ptr,
    UINT interface_index,
    UCHAR new_state));
```

**Description**

This service registers the specified callback function for notifying an application of DHCP state changes. The callback function input arguments are the interface index and the state the DHCP Client has transitioned to on that interface.

For more information about state change functions, see *nx\_dhcp\_state\_change\_notify()*.

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to previously created DHCP instance.
<b>dhcp_interface_state_change_notify</b>	Application callback function pointer

**Return Values**

<b>NX_SUCCESS</b>	(0x00)	Successful callback set.
<b>NX_PTR_ERROR</b>	(0x16)	Invalid DHCP pointer.

**Allowed From**

Threads, Initialization

**Example**

```
/* Register the "my_state_change" function to be called on any DHCP state change,
   assuming DHCP has already been created. */
void dhcp_interstate_state_change(NX_DHCP *dhcp_ptr, UINT iface_index,
    UCHAR new_state);

status = nx_dhcp_interstate_state_change_notify(&my_dhcp,
    dhcp_interstate_state_change);
```

```
/* If status is NX_SUCCESS the callback function was successfully  
   registered. */
```

**nx\_dhcp\_stop**

Stops DHCP processing

**Prototype**

```
UINT nx_dhcp_stop(NX_DHCP *dhcp_ptr);
```

**Description**

This service stops DHCP processing on all interfaces that have started DHCP processing. If there are no interfaces processing DHCP, this service will suspend the DHCP Client thread, and inactivate the DHCP Client timer.

To stop DHCP on a specific interface if multiple interfaces are enabled for DHCP, use the *nx\_dhcp\_interface\_stop* service.

**Input Parameters**

**dhcp\_ptr**                      Pointer to previously created DHCP instance.

**Return Values**

<b>NX_SUCCESS</b>	(0x00)	Successful DHCP stop
<b>NX_DHCP_NOT_STARTED</b>	(0x96)	The DHCP instance not started.
<b>NX_PTR_ERROR</b>	(0x16)	Invalid DHCP pointer.
<b>NX_CALLER_ERROR</b>	(0x11)	Invalid caller of service.

**Allowed From**

Threads

**Example**

```
/* Stop the DHCP processing for this IP instance. */
status = nx_dhcp_stop(&my_dhcp);

/* If status is NX_SUCCESS the DHCP was successfully stopped. */
```

**nx\_dhcp\_interface\_stop**


---

 Stop DHCP processing on the specified interface
**Prototype**

```
UINT nx_dhcp_interface_stop(NX_DHCP *dhcp_ptr, UINT interface_index);
```

**Description**

This service stops DHCP processing on the specified interface if DHCP is already started. If there are no other interfaces running DHCP, the DHCP thread and timer are suspended.

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to previously created DHCP instance.
<b>Interface_index</b>	Interface on which to stop DHCP processing

**Return Values**

<b>NX_SUCCESS</b>	(0x00)	Successful DHCP stop
<b>NX_DHCP_NOT_STARTED</b>	(0x96)	DHCP not started.
<b>NX_PTR_ERROR</b>	(0x16)	Invalid DHCP pointer.
<b>NX_CALLER_ERROR</b>	(0x11)	Invalid caller of service.
<b>NX_INVALID_INTERFACE</b>	(0x4C)	Invalid network interface

**Allowed From**

Threads

**Example**

```
/* Stop DHCP processing for this IP instance on interface 1. */
status = nx_dhcp_interface_stop(&my_dhcp, 1);

/* If status is NX_SUCCESS the DHCP was successfully stopped. */
```



**nx\_dhcp\_user\_option\_retrieve**

Retrieve a DHCP option from last server response

**Prototype**

```
UINT nx_dhcp_user_option_retrieve(NX_DHCP *dhcp_ptr,
                                  UINT request_option, UCHAR *destination_ptr,
                                  UINT *destination_size);
```

**Description**

This service retrieves the specified DHCP option from the DHCP options buffer on the first interface enabled for DHCP found on the DHCP Client record. If successful, the option data is copied into the specified buffer.

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to previously created DHCP instance.
<b>request_option</b>	DHCP option, as specified by the RFCs. See the NX_DHCP_OPTION option in <i>nxd_dhcp_client.h</i> .
<b>destination_ptr</b>	Pointer to the destination for the response string.
<b>destination_size</b>	Pointer to the size of the destination and on return, the destination to place the number of bytes returned.

**Return Values**

<b>NX_SUCCESS</b>	(0x00)	Successful option retrieval.
<b>NX_DHCP_NOT_BOUND</b>	(0x94)	DHCP Client not bound.
<b>NX_DHCP_NO_INTERFACES_ENABLED</b>	<b>(0xA5)</b>	No interfaces enabled for DHCP
<b>NX_DHCP_DEST_TO_SMALL</b>	(0x95)	Destination is too small to hold response.
<b>NX_DHCP_PARSE_ERROR</b>	(0x97)	Option not found in Server response.
<b>NX_PTR_ERROR</b>	(0x16)	Invalid input pointer.
<b>NX_CALLER_ERROR</b>	(0x11)	Invalid caller of this service.

**Allowed From**

Threads

**Example**

```
UCHAR  dns_ip_string[4];
ULONG  size;

/* Obtain the IP address of the DNS server. */
size = sizeof(dns_ip_string);
status = nx_dhcp_user_option_retrieve(&my_dhcp, NX_DHCP_OPTION_DNS_SVR,
                                       dns_ip_string, &size);

/* If status is NX_SUCCESS the DNS IP address is in dns_ip_string. */
```

## **nx\_dhcp\_interface\_user\_option\_retrieve**

Retrieve a DHCP option from last server response on the specified interface

### **Prototype**

```
UINT nx_dhcp_interface_user_option_retrieve(NX_DHCP *dhcp_ptr,
      UINT interface_index,
      UINT request_option, UCHAR *destination_ptr,
      UINT *destination_size);
```

### **Description**

This service retrieves the specified DHCP option from the DHCP options buffer on the specified interface, if that interface is enabled for DHCP. If successful, the option data is copied into the specified buffer.

### **Input Parameters**

<b>dhcp_ptr</b>	Pointer to previously created DHCP instance.
<b>Interface_index</b>	Index on which to retrieve the specified option
<b>request_option</b>	DHCP option, as specified by the RFCs. See the NX_DHCP_OPTION option in <i>nxd_dhcp_client.h</i> .
<b>destination_ptr</b>	Pointer to the destination for the response string.
<b>destination_size</b>	Pointer to the size of the destination and on return, the destination to place the number of bytes returned.

### **Return Values**

<b>NX_SUCCESS</b>	(0x00)	Successful option retrieval.
<b>NX_DHCP_NOT_BOUND</b>	(0x94)	IP address not assigned
<b>NX_DHCP_DEST_TO_SMALL</b>	(0x95)	Buffer is too small
<b>NX_DHCP_PARSE_ERROR</b>	(0x97)	DHCP Option not found in Server response.
<b>NX_PTR_ERROR</b>	(0x16)	Invalid DHCP pointer.
<b>NX_CALLER_ERROR</b>	(0x11)	Invalid caller of service.
<b>NX_INVALID_INTERFACE</b>	(0x4C)	Invalid network interface

### **Allowed From**

Threads

### **Example**

```
UCHAR  dns_ip_string[4];
ULONG  size;

/* Obtain the IP address of the DNS server on the primary interface. */
size = sizeof(dnx_ip_string);
```

```
status = nx_dhcp_interface_user_option_retrieve(&my_dhcp, 0,  
NX_DHCP_OPTION_DNS_SVR,  
    dns_ip_string, &size);  
  
/* If status is NX_SUCCESS the DNS IP address is in dns_ip_string. */
```

**nx\_dhcp\_user\_option\_convert**Convert four bytes to ULONG

---

**Prototype**

```
ULONG nx_dhcp_user_option_convert(UCHAR *option_string_ptr);
```

**Description**

This service converts the four characters pointed to by “option\_string\_ptr” into an unsigned long value. It is especially useful when IP addresses are present.

**Input Parameters**

<b>option_string_ptr</b>	Pointer to previously retrieved option string.
--------------------------	--

**Return Values**

<b>Value</b>	Value of first four bytes.
--------------	----------------------------

**Allowed From**

Threads

**Example**

```
UCHAR  dns_ip_string[4];
ULONG  dns_ip;

/* Convert the first four bytes of “dns_ip_string” to an actual IP
address in “dns_ip.” */
dns_ip= nx_dhcp_user_option_convert(dns_ip_string);

/* If status is NX_SUCCESS the DNS IP address is in “dns_ip.” */
```

**nx\_dhcp\_user\_option\_add\_callback\_set**

Set callback function for adding user supplied options

**Prototype**

```
ULONG nx_dhcp_user_option_add_callback_set(NX_DHCP *dhcp_ptr,
      UINT (*dhcp_user_option_add)(NX_DHCP *dhcp_ptr,
      UINT iface_index,
      UINT message_type,
      UCHAR *user_option_ptr,
      UINT *user_option_length));
```

**Description**

This service registers the specified callback function for adding user supplied options.

If the callback function specified, the applications can add user supplied options into the packet by `iface_index` and `message_type`.

Note: In user's routine. Applications must follow the DHCP options format when add user supplied options. The total size of user options must be less or equal to `user_option_length`, and update the `user_option_length` as real options length. Return `NX_TRUE` if add options successfully, else return `NX_FALSE`.

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to previously created DHCP instance.
<b>dhcp_user_option_add</b>	Pointer to user option add function.

**Return Values**

<b>NX_SUCCESS</b>	(0x00)	Successful callback set.
<b>NX_PTR_ERROR</b>	(0x16)	Invalid pointer.

**Allowed From**

Threads

**Example**

```
/* Register the "my_dhcp_user_option_add" function to be called when add DHCP
options, assuming DHCP has already been created. */
status = nx_dhcp_user_option_add_callback_set(&my_dhcp, my_dhcp_user_option_add);
/* If status is NX_SUCCESS the callback function was successfully registered. */
```

## Appendix A

### Description of the Restore State Feature

The NetX Duo DHCP Client configuration option, `NX_DHCP_CLIENT_RESTORE_STATE`, allows a system to restore a previously created DHCP Client Record in a Bound state between system reboots.

When this option is enabled, the application can suspend and resume the DHCP Client thread. There is also a service to update the DHCP Client with the elapsed time between suspending and resuming the thread.

#### Restoring the DHCP Client between Reboots

---

Before restoring a DHCP Client after rebooting, a previously created DHCP Client that must reach the Bound state and be assigned an IP address from the DHCP server. Before it powers down, the DHCP application must then save the current DHCP Client record to non-volatile memory. There must also be an independent 'time keeper' elsewhere in the system to keep track of the time elapsed during this powered down state. On powering up, the application creates a new DHCP Client instance, and then updates it with the previously created DHCP Client record. The elapsed time is obtained from the "time keeper" and then applied to the time remaining on the DHCP Client lease. Note that this may cause the DHCP Client to change states e.g. from BOUND to RENEWING. At this point, the application can resume the DHCP Client.

If the time elapsed during power down puts the DHCP Client state in either a RENEW or REBIND state, the DHCP Client will automatically initiate DHCP messages requesting to renew or rebind the IP address lease. If the IP address is expired, the DHCP Client will automatically clear the IP address on the IP instance and begin the DHCP process from the INIT state, requesting a new IP address.

In this manner the DHCP Client can operate between reboots as if uninterrupted.

Below is an illustration of this feature. This assumes DHCP Client is running only on the primary interface.

```
/* On the power up, create an IP instance, DHCP Client, enable ICMP and UDP
   and other resources (not shown) for the DHCP Client/application
   in tx_application_define(). */

/* Define the DHCP application thread. */
void thread_dhcp_client_entry(ULONG thread_input)
{
    UINT status;
```

```

UINT          time_elapsed = 0;
NX_DHCP_CLIENT_RECORD client_nv_record;

if (/* The application checks if there is a previously saved DHCP Client record. */
{
    /* No previously saved client record. Start the DHCP Client in the INIT state. */
    status = nx_dhcp_start(&dhcp_0);

    if (status != NX_SUCCESS)
        return;

    do
    {
        /* Wait for DHCP to assign the IP address. */
    } while (status != NX_SUCCESS);

    /* We have a valid IP address. */

    /* At some point decide we power down the system. */

    /* Save the Client state data which we will subsequently need to restore the DHCP
       Client. */
    status = nx_dhcp_client_get_record(&dhcp_0, &client_nv_record);

    /* Copy this memory to non-volatile memory (not shown). */

    /* Delete the IP and DHCP Client instances before powering down. */
    nx_dhcp_delete(&dhcp_0);

    nx_ip_delete(&ip_0);

    /* Ready to power down, having released other resources as necessary. */
}
else
{
    /* The application has determined there is a previously saved record. We will
       restore it to the current DHCP Client instance. */

    /* Get the previous Client state data from non-volatile memory. */

    /* Apply the record to the current Client instance. This will also
       update the IP instance with IP address, mask etc. */
    status = nx_dhcp_client_restore_record(&dhcp_0, &client_nv_record, time_elapsed);

    if (status != NX_SUCCESS)
        return;

    /* We are ready to resume the DHCP Client thread and use the assigned IP address. */
    status = nx_dhcp_resume(&dhcp_0);

    if (status != NX_SUCCESS)
        return;
}
}

```

## Resuming the DHCP Client Thread after Suspension

---

To suspend a DHCP Client thread without powering down, the application calls *nx\_dhcp\_suspend* on a DHCP Client which has achieved the BOUND state and which has a valid IP address. When it is ready to resume the DHCP Client it first calls *nx\_dhcp\_client\_update\_time\_remaining* to update the time remaining on the DHCP address lease (obtaining the time elapsed from an independent time keeper). Then it calls the *nx\_dhcp\_resume* to resume the DHCP Client thread.



If the time elapsed puts the DHCP Client state in either a RENEW or REBIND state, the DHCP Client will automatically initiate DHCP messages requesting to renew or rebind the IP address lease. If the IP address is expired, the DHCP Client will automatically clear the IP address and begin the DHCP process from the INIT state, requesting a new IP address.

Below is an illustration of using this feature.

```

/* Create an IP instance, DHCP Client, enable ICMP and UDP
   and other resources (not shown) typically in tx_application_define(). */

/* Define the DHCP application thread. */
void thread_dhcp_client_entry(ULONG thread_input)
{
    /* Start the DHCP Client. */
    status = nx_dhcp_start(&dhcp_0);

    if (status != NX_SUCCESS)
        return;

    while(1)
    {
        /* wait for DHCP to obtain an IP address. */

        /* Do tasks with the IP address e.g. send pings to another host on the network... */
        status = nx_icmp_ping(...);

        if (status != NX_SUCCESS)
            printf("Failed %d byte Ping!\n", length);

        /* At some later time, suspend the DHCP Client e.g. the device is going to low
           power mode (sleep) so we do not want any threads to wake it up. */
        nx_dhcp_suspend(&dhcp_0);

        /* During this suspended state, an independent timer is keeping track of the elapsed
           time. */

        /* At some point, we are ready to resume the DHCP Client thread. */
        /* Update the DHCP Client lease time remaining with the time elapsed. */
        status = nx_dhcp_client_update_time_remaining(&dhcp_0, time_elapsed);

        if (status != NX_SUCCESS)
            return;

        /* We now can resume the DHCP Client thread. */
        status = nx_dhcp_resume(&dhcp_0);

        if (status != NX_SUCCESS)
            return;

        /* Resume tasks e.g. ping another host. */
        status = nx_icmp_ping(...);
    }
}

```

Below is a list of services for restoring a DHCP Client state from memory and for suspending and resuming the DHCP Client.

**nx\_dhcp\_client\_get\_record**

Create a record of the current DHCP Client state

**Prototype**

```
ULONG nx_dhcp_client_get_record(NX_DHCP *dhcp_ptr,
                                NX_DHCP_CLIENT_RECORD *record_ptr);
```

**Description**

This service saves the DHCP Client running on the first interface enabled for DHCP found on the DHCP Client instance to the record pointed to by *record\_ptr*. This allows the DHCP Client application restore its DHCP Client state after, for example, a power down and reboot.

To save a DHCP Client record on a specific interface if more than one interface is enabled for DHCP, use the *nx\_dhcp\_interface\_client\_get\_record* service.

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to DHCP Client
<b>record_ptr</b>	Pointer to DHCP Client record

**Return Values**

<b>NX_SUCCESS</b>	(0x0)	Client record created
<b>NX_DHCP_NOT_BOUND</b>	(0x94)	Client not in Bound state
<b>NX_DHCP_NO_INTERFACES_ENABLED</b>	(0xA5)	No interfaces enabled for DHCP
<b>NX_PTR_ERROR</b>	(0x16)	Invalid pointer input

**Allowed From**

Threads

**Example**

```
NX_DHCP_CLIENT_RECORD dhcp_record;

/* Obtain a record of the current client state. */
status= nx_dhcp_client_get_record(dhcp_ptr, &dhcp_record);

/* If status is NX_SUCCESS dhcp_record contains the current DHCP client record. */
```

**nx\_dhcp\_interface\_client\_get\_record**

Create a record of the current DHCP Client state on the specified interface

**Prototype**

```
ULONG nx_dhcp_interface_client_get_record(NX_DHCP *dhcp_ptr,
                                          UINT interface_index,
                                          NX_DHCP_CLIENT_RECORD *record_ptr);
```

**Description**

This service saves the DHCP Client running on the specified interface to the record pointed to by `record_ptr`. This allows the DHCP Client application restore its DHCP Client state after, for example, a power down and reboot.

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to DHCP Client
<b>interface_index</b>	Index on which to get record
<b>record_ptr</b>	Pointer to DHCP Client record

**Return Values**

<b>NX_SUCCESS</b>	(0x0)	Client record created
<b>NX_DHCP_NOT_BOUND</b>	(0x94)	Client not in Bound state
<b>NX_DHCP_BAD_INTERFACE_INDEX_ERROR</b>	(0x9A)	Invalid interface index
<b>NX_PTR_ERROR</b>	(0x16)	Invalid DHCP pointer.
<b>NX_INVALID_INTERFACE</b>	(0x4C)	Invalid network interface

**Allowed From**

Threads

**Example**

```
NX_DHCP_CLIENT_RECORD dhcp_record;

/* Obtain a record of the current client state on interface 1. */
status= nx_dhcp_interface_client_get_record(dhcp_ptr, 1, &dhcp_record);

/* If status is NX_SUCCESS dhcp_record contains the current DHCP client record. */
```

**nx\_dhcp\_client\_restore\_record**

Restore DHCP Client from a previously saved record

**Prototype**

```
ULONG nx_dhcp_client_restore_record(NX_DHCP *dhcp_ptr,
                                     NX_DHCP_CLIENT_RECORD
                                     *record_ptr, ULONG time_elapsed);
```

**Description**

This service enables an application to restore its DHCP Client from a previous session using the DHCP Client record pointed to by `record_ptr`. The `time_elapsed` input is applied to the time remaining on DHCP Client lease.

This requires that the DHCP Client application created a record of the DHCP Client before powering down, and saved that record to nonvolatile memory.

If more than one interface is enabled for DHCP Client, this service is applied to the first valid interface found in the DHCP Client instance.

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to DHCP Client
<b>record_ptr</b>	Pointer to DHCP Client record
<b>time_elapsed</b>	Time to subtract from the lease time remaining in the input client record

**Return Values**

<b>NX_SUCCESS</b>	(0x0)	Client record restored
<b>NX_DHCP_NO_INTERFACES_ENABLED</b>	(0xA5)	No interfaces running DHCP
<b>NX_PTR_ERROR</b>	(0x16)	Invalid pointer Input

**Allowed From**

Threads

**Example**

```
NX_DHCP_CLIENT_RECORD dhcp_record;
ULONG time_elapsed;

/* Obtain time (timer ticks) elapsed from independent time keeper. */
```

```
Time_elapsed = /* to be determined by application */ 1000;

/* Obtain a record of the current client state. */
status= nx_dhcp_client_restore_record(client_ptr, &dhcp_record, time_elapsed);

/* If status is NX_SUCCESS the current DHCP Client pointed to by dhcp_ptr
contains the current client record updated for time elapsed during power down. */
```

## **nx\_dhcp\_interface\_client\_restore\_record**

Restore DHCP Client from a previously saved record on specified interface

### **Prototype**

```
ULONG nx_dhcp_interface_client_restore_record(NX_DHCP *dhcp_ptr,
                                              NX_DHCP_CLIENT_RECORD
                                              *record_ptr, ULONG time_elapsed);
```

### **Description**

This service enables an application to restore its DHCP Client on the specified interface using the DHCP Client record pointed to by record\_ptr. The time\_elapsed input is applied to the time remaining on DHCP Client lease.

This requires that the DHCP Client application created a record of the DHCP Client before powering down, and saved that record to nonvolatile memory.

If more than one interface is enabled for DHCP Client, this service is applied to the first valid interface found in the DHCP Client instance.

### **Input Parameters**

<b>dhcp_ptr</b>	Pointer to DHCP Client
<b>record_ptr</b>	Pointer to DHCP Client record
<b>time_elapsed</b>	Time to subtract from the lease time remaining in the input client record

### **Return Values**

<b>NX_SUCCESS</b>	(0x0)	Client record restored
<b>NX_DHCP_NOT_BOUND</b>	(0x94)	Client not bound to IP address
<b>NX_DHCP_BAD_INTERFACE_INDEX_ERROR</b>	(0x9A)	Invalid interface index
<b>NX_PTR_ERROR</b>	(0x16)	Invalid DHCP pointer.
<b>NX_INVALID_INTERFACE</b>	(0x4C)	Invalid network interface

### **Allowed From**

Threads

### **Example**

```
NX_DHCP_CLIENT_RECORD dhcp_record;
```

```
ULONG          time_elapsed;

/* Obtain time (timer ticks) elapsed from independent time keeper. */
Time_elapsed = /* to be determined by application */ 1000;

/* Obtain a record of the current client state on the primary interface. */
status= nx_dhcp_interface_client_restore_record(client_ptr, 0, &dhcp_record,
time_elapsed);

/* If status is NX_SUCCESS the current DHCP Client pointed to by dhcp_ptr
contains the current client record updated for time elapsed during power down. */
```

**nx\_dhcp\_client\_update\_time\_remaining**

Update the time remaining on DHCP Client lease

**Prototype**

```
ULONG nx_dhcp_client_update_time_remaining(NX_DHCP *dhcp_ptr
                                           ULONG time_elapsed);
```

**Description**

This service updates the time remaining on the DHCP Client IP address lease with the `time_elapsed` input on the first interface enabled for DHCP found on the DHCP Client instance. The application must suspend the DHCP Client thread before using this service using *nx\_dhcp\_suspend*. After calling this service, the application can resume the DHCP Client thread by calling *nx\_dhcp\_resume*.

This is intended for DHCP Client applications that need to suspend the DHCP Client thread for a period of time, and then update the IP address lease time remaining.

Note: This service is not intended to be used with *nx\_dhcp\_client\_get\_record* and *nx\_dhcp\_client\_restore\_record* described previously). These services are previously described in this section.

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to DHCP Client
<b>time_elapsed</b>	Time to subtract from the time remaining on the IP address lease

**Return Values**

<b>NX_SUCCESS</b>	(0x0)	Client IP lease updated
<b>NX_DHCP_NO_INTERFACES_ENABLED</b>	(0xA5)	No interfaces enabled for DHCP
<b>NX_PTR_ERROR</b>	(0x16)	Invalid Pointer Input

**Allowed From**

Threads

**Example**

```
ULONG          time_elapsed;
/* Obtain time (timer ticks) elapsed from independent time keeper. */
```



```
time_elapsed = /* to be determined by application */ 1000;

/* Apply the elapsed time to the DHCP Client address lease. */
status= nx_dhcp_client_update_time_remaining(client_ptr, time_elapsed);

/* If status is NX_SUCCESS the DHCP Client is updated for time elapsed. */
```

## **nx\_dhcp\_interface\_client\_update\_time\_remaining**

Update the time remaining on DHCP Client lease on the specified interface

### **Prototype**

```
ULONG nx_dhcp_interface_client_update_time_remaining(NX_DHCP *dhcp_ptr,
                                                    UINT interface_index,
                                                    ULONG time_elapsed);
```

### **Description**

This service updates the time remaining on the DHCP Client IP address lease with the `time_elapsed` input on the specified interface if that interface is enabled for DHCP. The application must suspend the DHCP Client thread before using this service using *nx\_dhcp\_suspend*. After calling this service, the application can resume the DHCP Client thread by calling *nx\_dhcp\_resume*. Note suspending and resuming the DHCP Client thread applies to all interfaces enabled for DHCP.

This is intended for DHCP Client applications that need to suspend the DHCP Client thread for a period of time, and then update the IP address lease time remaining.

Note: This service is not intended to be used with *nx\_dhcp\_client\_get\_record* and *nx\_dhcp\_client\_restore\_record* described previously). These services are previously described in this section.

### **Input Parameters**

<b>dhcp_ptr</b>	Pointer to DHCP Client
<b>interface_index</b>	Index to interface to apply elapsed time to
<b>time_elapsed</b>	Time to subtract from the time remaining on the IP address lease

### **Return Values**

<b>NX_SUCCESS</b>	(0x0)	Client IP lease updated
<b>NX_DHCP_BAD_INTERFACE_INDEX_ERROR</b>	(0x9A)	Invalid interface index
<b>NX_PTR_ERROR</b>	(0x16)	Invalid DHCP pointer.
<b>NX_INVALID_INTERFACE</b>	(0x4C)	Invalid network interface

### **Allowed From**

Threads

## Example

```
ULONG          time_elapsed;

/* Obtain time (timer ticks) elapsed from independent time keeper. */
time_elapsed = /* to be determined by application */ 1000;

/* Apply the elapsed time to the DHCP Client address lease on interface 1. */
status= nx_dhcp_interface_client_update_time_remaining(client_ptr, 1,
time_elapsed);

/* If status is NX_SUCCESS the DHCP Client is updated for time elapsed. */
```

**nx\_dhcp\_suspend**

Suspend the DHCP Client thread

**Prototype**

```
ULONG nx_dhcp_suspend(NX_DHCP *dhcp_ptr);
```

**Description**

This service suspends the current DHCP Client thread. Note that unlike *nx\_dhcp\_stop*, there is no change to the DHCP Client state when this service is called.

This service suspends DHCP running on all interfaces enabled for DHCP.

To update the DHCP Client state with elapsed time while the DHCP Client is suspended, see the *nx\_dhcp\_client\_update\_time\_remaining* described previously. To resume a suspended DHCP Client thread, the application should call *nx\_dhcp\_resume*.

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to DHCP Client
-----------------	------------------------

**Return Values**

<b>NX_SUCCESS</b>	(0x0)	Client thread is suspended
<b>NX_PTR_ERROR</b>	(0x16)	Invalid pointer Input

**Allowed From**

Threads

**Example**

```
/* Pause the DHCP client thread. */
status= nx_dhcp_suspend(client_ptr);

/* If status is NX_SUCCESS the current DHCP Client thread is paused. */
```

**nx\_dhcp\_resume**

Resume a suspended DHCP Client thread

**Prototype**

```
ULONG nx_dhcp_resume(NX_DHCP *dhcp_ptr);
```

**Description**

This service resumes a suspended DHCP Client thread. Note that there is no change to the actual DHCP Client state after resuming the Client thread. To update the time remaining on the DHCP Client IP address lease with elapsed time before calling *nx\_dhcp\_resume*, see the *nx\_dhcp\_client\_update\_time\_remaining* described previously.

This service resumes DHCP running on all interfaces enabled for DHCP.

**Input Parameters**

<b>dhcp_ptr</b>	Pointer to DHCP Client
-----------------	------------------------

**Return Values**

<b>NX_SUCCESS</b>	(0x0)	Client thread is resumed
<b>NX_PTR_ERROR</b>	(0x16)	Invalid pointer Input

**Allowed From**

Threads

**Example**

```
/* Resume the DHCP client thread. */
status= nx_dhcp_resume(client_ptr);

/* If status is NX_SUCCESS the current DHCP Client thread is resumed. */
```

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