

APPLICATION NOTE

DHCP IP Assignment

How to use Valkyrie as a DHCP server

Don't want to add a DHCP Server to a test environment? Here is some simple scripting that lets you use a Valkyrie traffic generator to function as a basic DHCP server.

NOTE: To use this method you need to download a zip folder containing 2 text documents.

The Challenge:

When the DUT relies on DHCP to obtain an IP address prior to testing, it may not be desirable to add an additional device into the test environment to act as a DHCP server. This could be due to costs, space, heat or power usage or IT management restrictions.

The Solution:

Xena has a script that enables your Valkyrie traffic generator to function as a basic DHCP server.

DHCP IP assignment follows 4-step DORA (Discovery, Offer, Request, Acknowledgment) process as below:

- 1. DHCP Discover**
The client sends broadcast messages on the network subnet using the destination address 255.255.255.255 or the specific subnet broadcast address.
- 2. DHCP Offer**
When a DHCP server receives a DHCPDISCOVER message from a client (which is an IP address lease request), the server reserves an IP address for the client and makes a lease offer by sending a DHCPOFFER message to the client. This message contains the client's MAC address, the IP address that the server is offering, the subnet mask, the lease duration, and the IP address of the DHCP server making the offer.
- 3. DHCP Request**
In response to the DHCP offer, the client replies with a DHCP request, broadcast to the server, requesting the offered address.
- 4. DHCP Acknowledgment**
This stage involves sending a DHCPACK packet to the client. The packet includes the lease duration and any other configuration information that the client might have requested. At this point, the IP configuration process is completed.

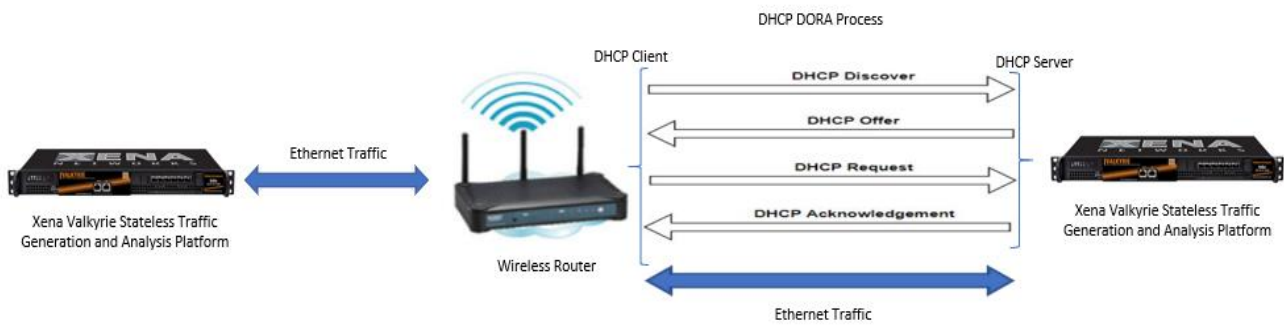
The Xena Script

The Xena script implements this thus:

- The `Xena dhcp_server.py` script loads the `dhcp_server.xpc` file, so we can verify it on ValkyrieManager.
- It then configures two streams, one for the DHCP offer and another for the DHCP acknowledgment.
- It sends a DHCP offer with IP address, subnet mask and GW (see `dhcp_server.py` line number 135) to the DUT as soon as it receives the DHCP discovery request on the connected test port. (The scripts fetch the MAC address of the source out of DHCP discovery message.)

- And finally, in order to assign an IP address to the DUT, it sends a DHCP acknowledgment in response to the DHCP request message (as per the DORA process).

Here is an illustration of the DHCP DORA process:



How to implement:

First, download these two text file in this [zipped folder](#) (or go to <https://xenanetworks.com/wp-content/uploads/xena-dhcp-server.zip>):

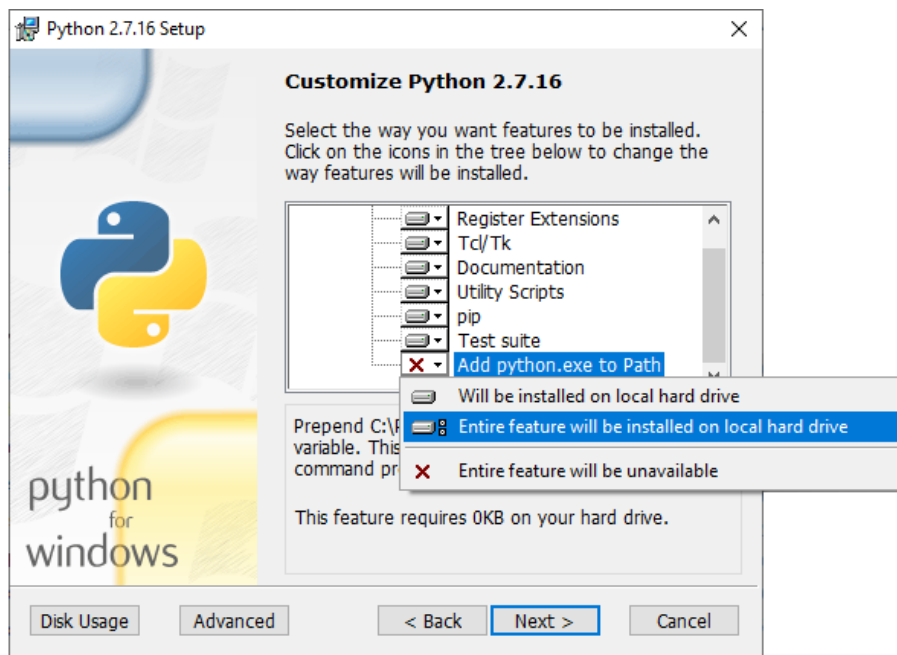
- `dhcp_server.py`
- `dhcp_server.xpc`

Then use this procedure to run Xena DHCP script to assign an IP address to your DUT interface.

1) Download and install Python (version 2.7.16)

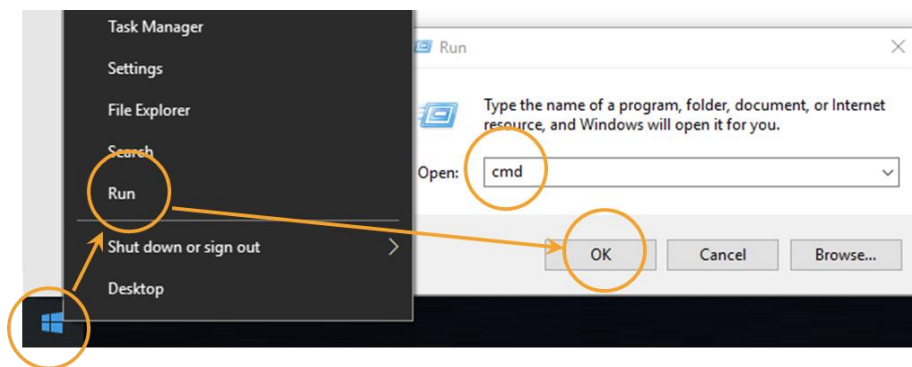
- ➔ <https://www.python.org/downloads/release/python-2716/>
- ➔ At the step “Customize Python 2.7.16” scroll down to the item “Add python.exe to Path”; click on it and select “Entire feature will be installed on the local hard drive”.

This will allow you to activate Python from any folder on your PC.



- ➔ Confirm the installation. Command: `python --version`. Output should be Python 2.7.16
Please keep both the `dhcp_server.py` script and `dhcp_server.xpc` files in the same directory folder.

To get to Command: Right-click on the Windows Start icon, select “Run” in th pop-up, make sure that the resulting screen shows “Open cmd” and click “OK”.



- 2) Change the Valkyrie chassis management IP address in script `dhcp_server.py` line 22.
- 3) Edit script `dhcp_server.py` line 23 to use the Valkyrie test port of your choice.
Default content of line 23 is:
`server_location = chassis + '/' + '0/1'`
The “0” at the end of the line is the module number, while “1” is the port number
- 4) Install Xena Valkyrie package:
Command: `python -m pip install xenavalkyrie`

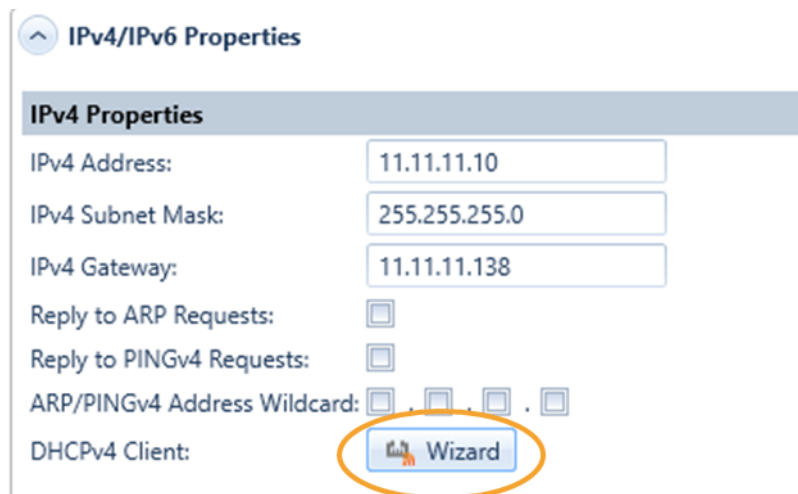
- 5) Run dhcp_server.py script.

Command: `python dhcp_server.py`

You will now see numerous status lines from the dhcp_server.py script. They will continue until the script has assigned one IP address. The script will then stop, but can of course be restarted to assign the IP address again.

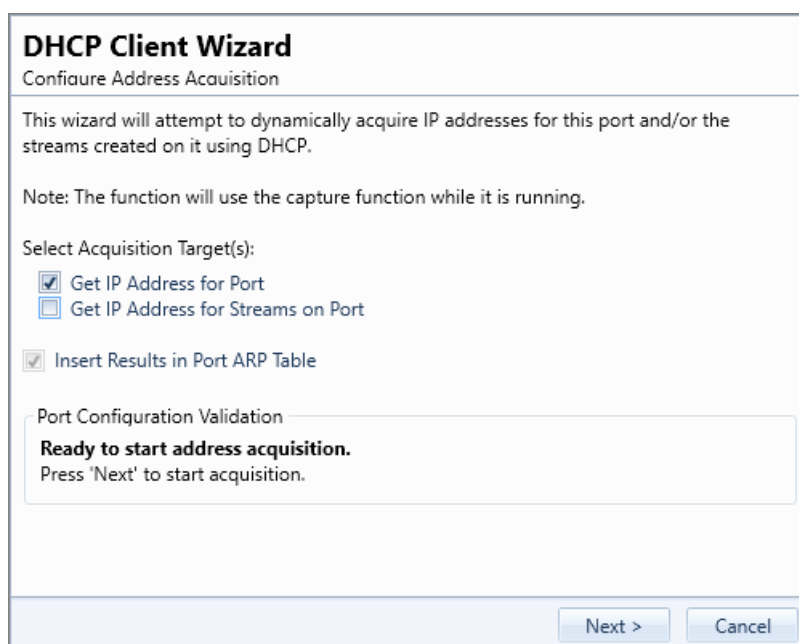
How to verify the implementation:

- 1) Choose a port on your Valkyrie traffic generator connected to the one running the dhcp_server.py script, and then activate the DHCP Wizard in the port properties page:



The screenshot shows the 'IPv4/IPv6 Properties' dialog box. Under the 'IPv4 Properties' section, the following fields are visible: IPv4 Address (11.11.11.10), IPv4 Subnet Mask (255.255.255.0), IPv4 Gateway (11.11.11.138), Reply to ARP Requests (unchecked), Reply to PINGv4 Requests (unchecked), and ARP/PINGv4 Address Wildcard (four unchecked checkboxes). The 'DHCPv4 Client' section at the bottom contains a 'Wizard' button, which is circled in orange.

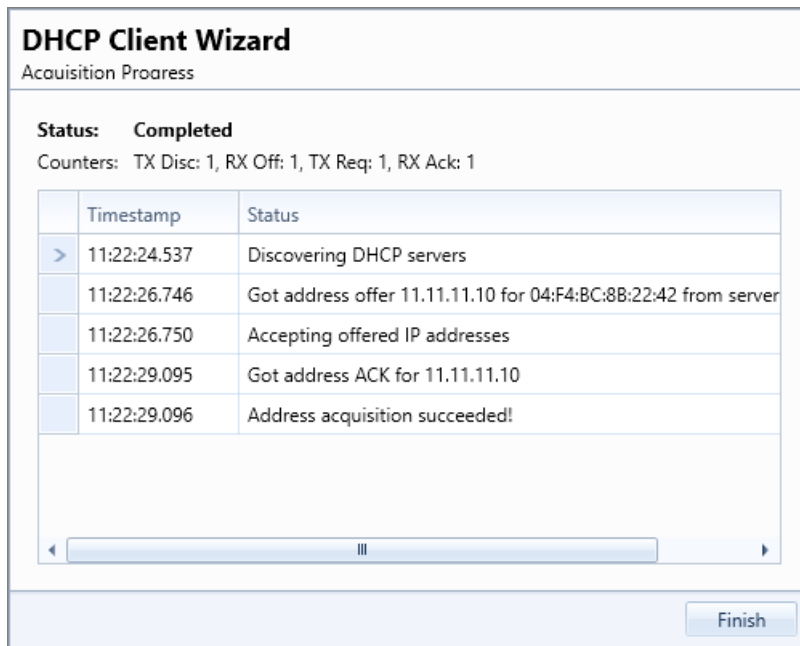
- 2) In the pop-up window, select "Get IP Address for Port":



The screenshot shows the 'DHCP Client Wizard' dialog box. The title is 'DHCP Client Wizard' and the subtitle is 'Configure Address Acquisition'. The main text reads: 'This wizard will attempt to dynamically acquire IP addresses for this port and/or the streams created on it using DHCP.' Below this is a note: 'Note: The function will use the capture function while it is running.' Under 'Select Acquisition Target(s):', there are three checkboxes: 'Get IP Address for Port' (checked), 'Get IP Address for Streams on Port' (unchecked), and 'Insert Results in Port ARP Table' (checked). At the bottom, there is a 'Port Configuration Validation' section with the text: 'Ready to start address acquisition. Press 'Next' to start acquisition.' The dialog box has 'Next >' and 'Cancel' buttons at the bottom right.

You can also select “Get IP Address for Stream on Port” if the stream is configured with an IPv4 header: the dhcp_server.py script will assign one IP address and then stop.

- 3) When you press **Next** in the above screen the IP you can follow the process in the screen below:



The screenshot shows a window titled "DHCP Client Wizard" with a subtitle "Acquisition Progress". The status is "Completed". Below the status, it shows "Counters: TX Disc: 1, RX Off: 1, TX Req: 1, RX Ack: 1". A table lists the steps of the DHCP process with timestamps and status descriptions. A "Finish" button is located at the bottom right of the window.

	Timestamp	Status
>	11:22:24.537	Discovering DHCP servers
	11:22:26.746	Got address offer 11.11.11.10 for 04:F4:BC:8B:22:42 from server
	11:22:26.750	Accepting offered IP addresses
	11:22:29.095	Got address ACK for 11.11.11.10
	11:22:29.096	Address acquisition succeeded!

This will let you verify that the DHCP DORA sequence has been successful.