

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 a Device Under Test (DUT) relies on the Dynamic Host Configuration Protocol (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:

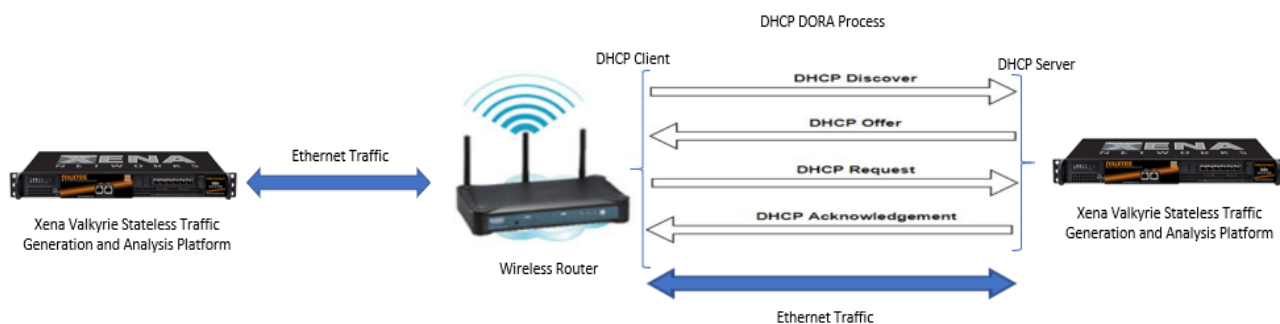
You can download a script from the Xena web site that enables your Valkyrie traffic generator to function as a basic DHCP server.

The DHCP Process

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 DHCP OFFER 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.

Here is an illustration of the DHCP DORA process:



The Xena Script

- The Xena script `dhcp_server.py` loads the `dhcp_server.xpc` file to configure the port that will act as DHCP server.
- It then configures two streams, one for the DHCP offer and another for the DHCP acknowledgment on this port.
- It sends a DHCP offer with IP address, subnet mask and GW (see `dhcp_server.py` line number 173 – 177) 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).

How to implement:

First, download this [zipped folder](https://xenanetworks.com/wp-content/uploads/xena-dhcp-server-v2.zip), which contains the two text file below (or go to <https://xenanetworks.com/wp-content/uploads/xena-dhcp-server-v2.zip>):

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

Please keep both the `dhcp_server.py` script and `dhcp_server.xpc` files in the same directory folder

- 1) Change the Valkyrie chassis management IP address in script `dhcp_server.py` line 166 (which is located close to the end of the file).
- 2) Edit script `dhcp_server.py` line 172 the to use the Valkyrie test port of your choice.
Default content of line 172 is:
"0/0"

The first "0" is the module number, while the second "0" is the port number.

Lines 166 and 172 in `dhcp_server.py` are shown below:

```
164
165 def run_all():
166     chassis = "192.168.1.200" #IP address of chassis running the DHCP server
167     server_config = "dhcp_server.xpc"
168
169     with DHCPSTServer(chassis, server_config, log_level = logging.INFO) as dhcp:
170         # each call of dhcp.act will run in separate Thread
171         dhcp.act(
172             "0/0", # Number of module / number of port running the DHCP server
173             '11.11.11.138', # DHCP server IP
174             '11.11.11.10', # Client IP
175             '255.255.255.0', # Subnet mask
176             '11.11.11.138', # Router IP
177             '11.11.11.138' # DSN IP
178         )
```

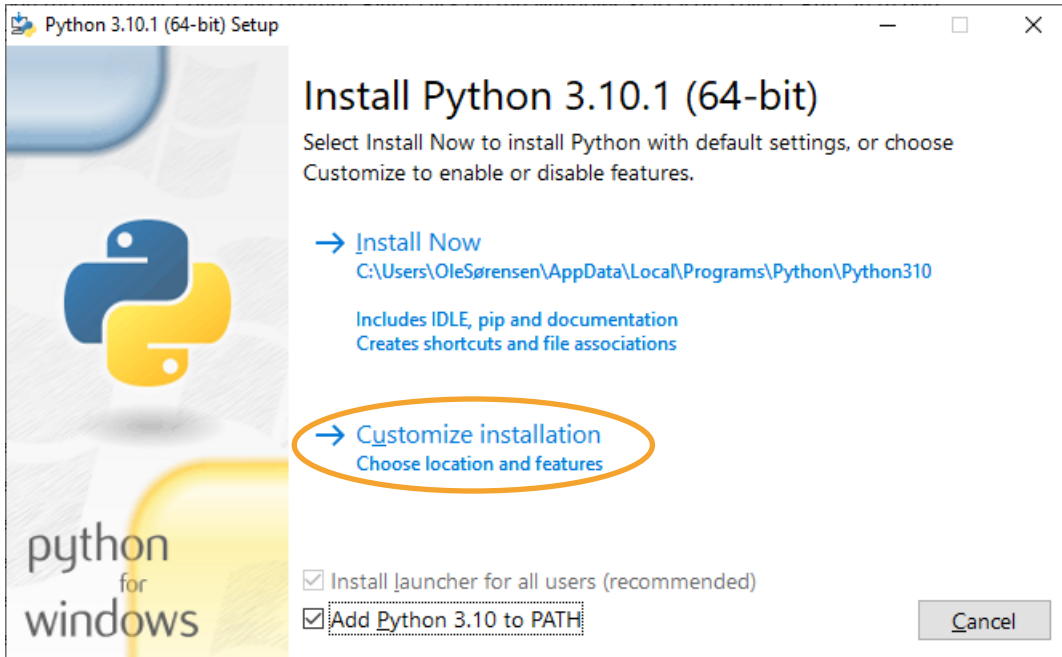
Hint: If you use Notepad++ as editor you will get line numbers shown as indicated above.

Save the script file after editing.

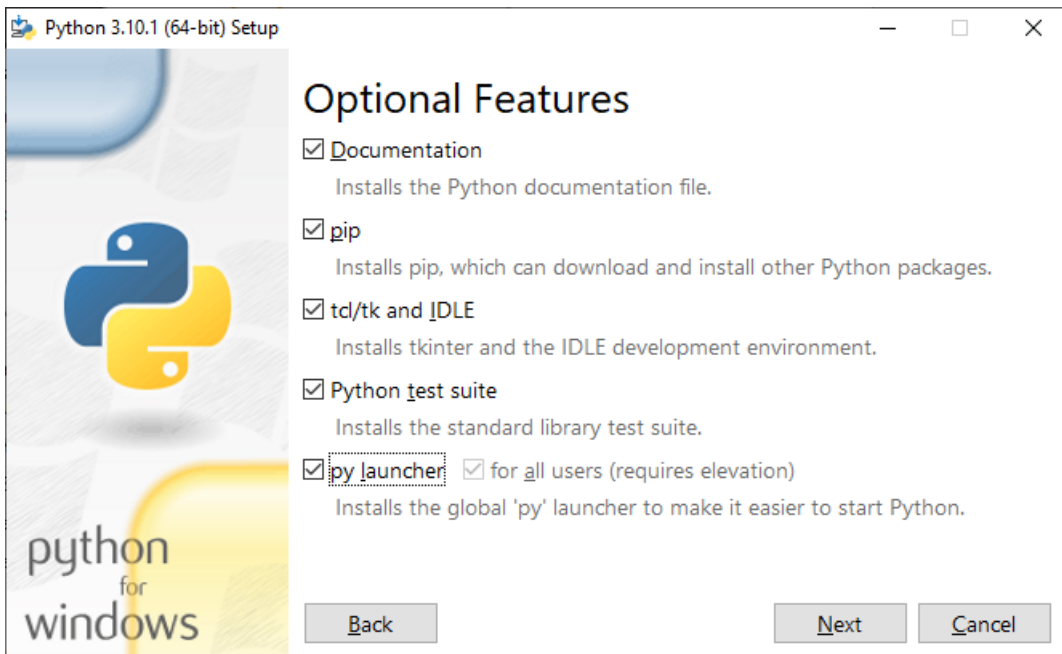
3) Download Python (version 3.10.2) from

<https://www.python.org/downloads/release/python-3102/>

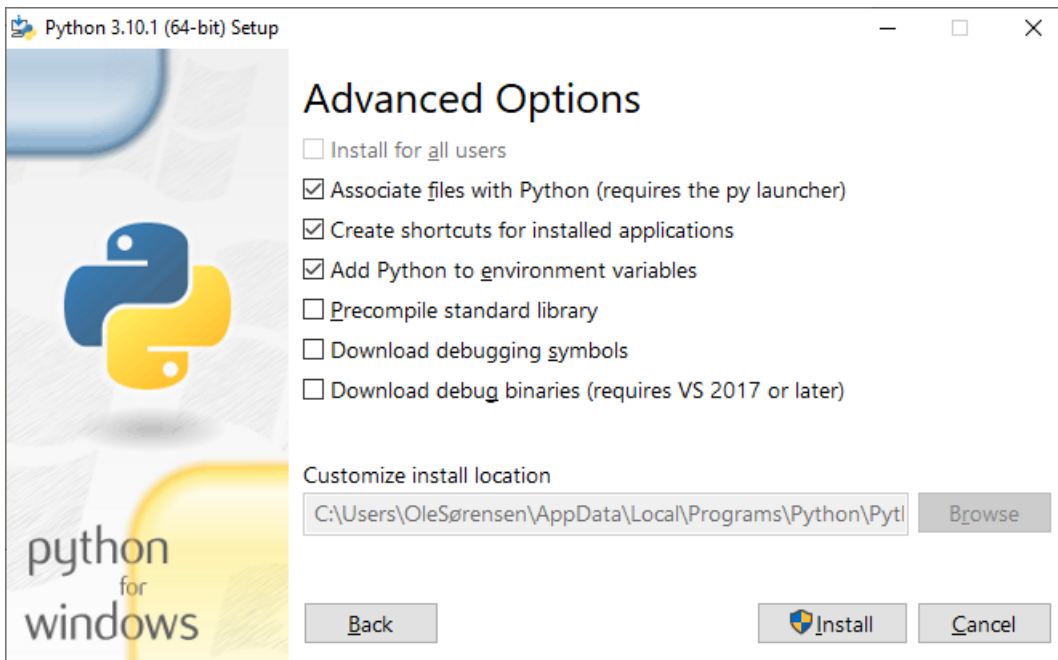
To install Python make sure that the “Add Python to PATH” box has been checked and then select “Customize installation”.



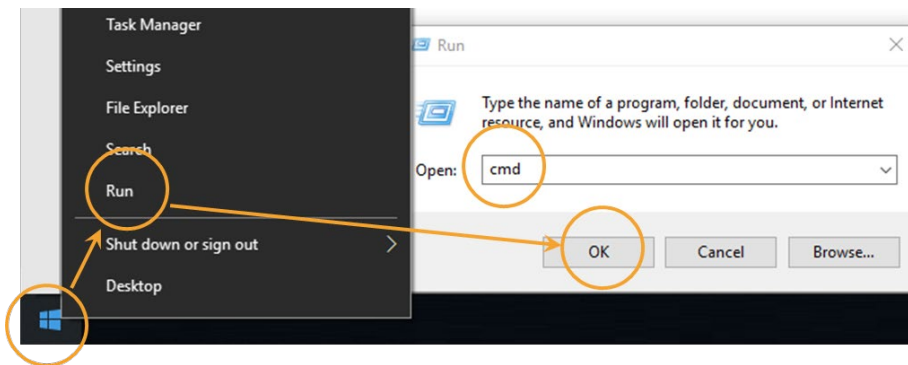
In the page that opens make sure that the boxes below are checked and press “Next”



In the page that now opens make sure that the boxes below are checked and press “Install”



4) Use the following procedure to run Xena DHCP script to assign an IP address to your DUT interface:



5) Use the “cd” command at the command prompt to navigate to the folder where the dhcp_server.py script and dhcp_server.xpc files are saved.

6) Install the xenavalkyrie package by entering the following lines at the command prompt:

```
python -m pip install xenavalkyrie==3.0.1  
python -m pip uninstall pypacker -y  
python -m pip install pypacker==4.3
```

- 7) Run the dhcp_server.py script by entering the following line at the command prompt:

```
python dhcp_server.py
```

You will now see some status lines from the dhcp_server.py script ending with

```
Ready to receive DHCP request
```

When the script has assigned one IP address it will 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:

^ IPv4/IPv6 Properties

IPv4 Properties

IPv4 Address:	<input type="text" value="0.0.0.0"/>
IPv4 Subnet Mask:	<input type="text" value="0.0.0.0"/>
IPv4 Gateway:	<input type="text" value="0.0.0.0"/>
Reply to ARP Requests:	<input type="checkbox"/>
Reply to PINGv4 Requests:	<input type="checkbox"/>
ARP/PINGv4 Address Wildcard:	<input type="checkbox"/> . <input type="checkbox"/> . <input type="checkbox"/> . <input type="checkbox"/>
DHCPv4 Client:	<input type="button" value="Wizard"/>

DHCP Client Wizard

Configure Address Acquisition

This wizard will attempt to dynamically acquire IP addresses for this port and/or the streams created on it using DHCP.

Note: The function will use the capture function while it is running.

Select Acquisition Target(s):

- Get IP Address for Port
- Get IP Address for Streams on Port

Insert Results in Port ARP Table

Port Configuration Validation

Ready to start address acquisition.
Press 'Next' to start acquisition.

DHCP Client Wizard

Acquisition Progress

Status: Completed

Counters: TX Disc: 1, RX Off: 1, TX Req: 1, RX Ack: 1

	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!

You will also see that the "IPv4 Properties" section in the port properties page has been updated with information from the dhcp_server.py file.

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