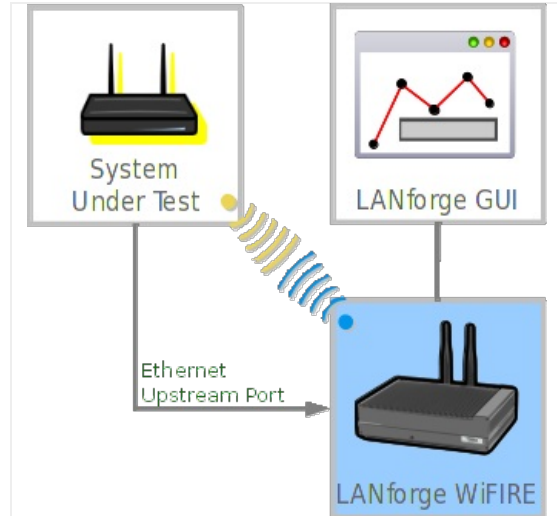


## Testing Station Roaming with 802.11r, 802.11k and Protected Management Frames

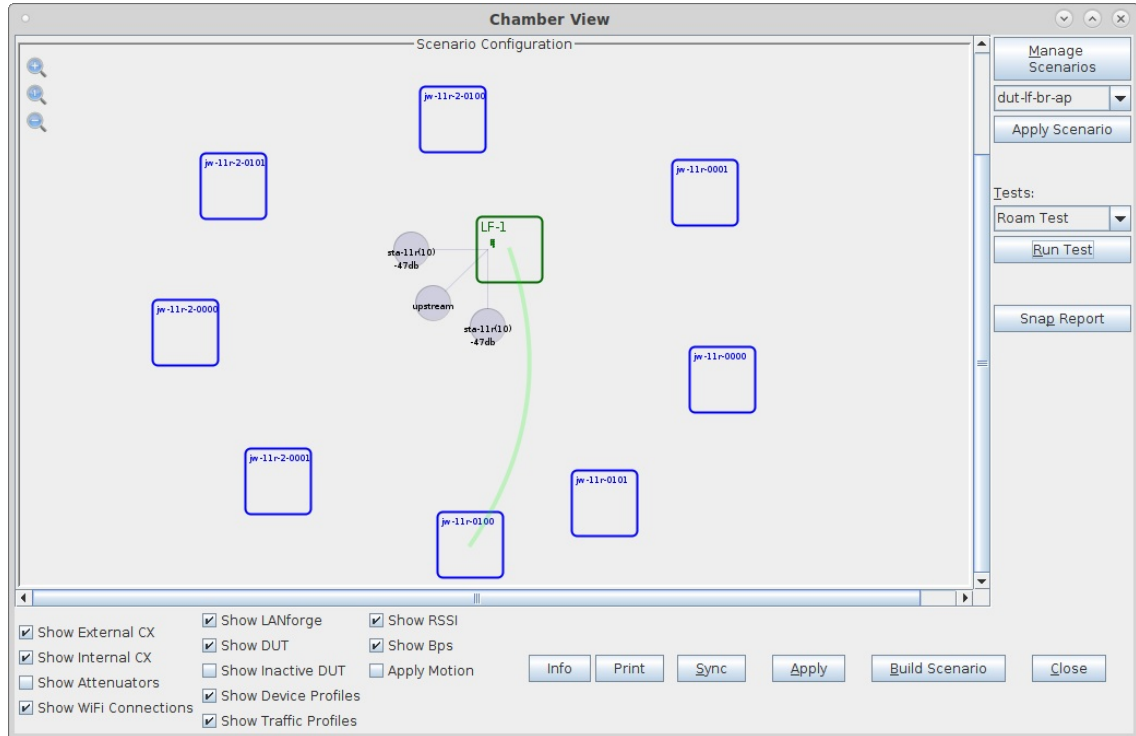
**Goal:** Setup and run a Station Roam test against a cluster of APs supporting 802.11k, 802.11r, and Protected Management Frames (PMF/MFP). This test uses a 2-radio LANforge CT522 system, but other similar systems will work as well. This tests AP functionality and stability over many roam attempts. This is a good test of the AP's management plane stability, and may also be a good controller test in case the AP system uses a controller.

In this test scenario, the LANforge CT522 is used to create 2 stations and then have them roam between the APs. The test will count the number of successful roams as well as various different failure cases. This example assumes you have some experience with Chamber View, and that you have a LANforge system and properly configured AP cluster. A programmable attenuator and two isolation chambers would add the ability to test station roams at different RF signal levels, but this test normally runs fine without chambers or attenuators. This feature is in LANforge version 5.3.9 and higher.



1. Configure Chamber View for Station Roaming and Similar Tests.

- A. Open Chamber View by clicking on the 'Chamber View' button in the LANforge-GUI. If you have an appropriate scenario already created, then skip to the next section, otherwise you will need to build a scenario that matches your system. You can right-click in Chamber View to create various objects. If you do not have chambers or attenuators, just create the DUT object and skip the chamber setup. This image shows the completed setup.



- B. Create a Device Under Test (DUT) Profile for each of your APs. The BSSID is important to be configured so that LANforge knows when it is connected to the correct AP. The authentication information and BSSID should be the same for all APs in the cluster, so probably you just need to change the name and BSSID for each of your DUTs and click save. To aid the visual representation of the roaming, consider putting the DUTs in a circle around the LANforge system as shown in the image above.

The screenshot shows the 'Create/Modify DUT' dialog box. The 'Name' field is 'jw-11r-0100'. The 'Image file' is 'NONE'. The 'SW Info' and 'HW Info' fields are empty. The 'SSID-1' is 'ben-jw-11r' and 'BSSID-1' is '04:f0:21:17:22:bd'. The 'Mgt IP' is '0.0.0.0'. The 'Ant-2' is '0'. The 'BSSID-3' is '00:00:00:00:00:00'. The 'Active' checkbox is checked. The 'AP DUT' checkbox is checked. The 'WPA3' checkbox is checked. The 'Provides DHCP on LAN' checkbox is checked. The 'Provides DHCP on WAN' checkbox is unchecked. The 'Notes' field is empty. The bottom buttons are 'Apply', 'OK', and 'Cancel'.

C. Configure an Upstream profile using eth1 on the LANforge system.

**Create/Modify Profile**

Name:  Type:

Mode:  Antennas:

Instances:  Frequency:

SSID:

Pattern:

WPA  WPA2  DHCP Server  WEP

802.1x EAP-TTLS  Restart DHCP on Connect  WPA3  802.11r

Notes:

D. Configure an STA profile supporting 802.11r on the LANforge system. Roaming tests normally should de-select the Restart DHCP on Connect behaviour, as shown.

**Create/Modify Profile**

Name:  Type:

Mode:  Antennas:

Instances:  Frequency:

SSID:

Pattern:

WPA  WPA2  DHCP Server  WEP

802.1x EAP-TTLS  Restart DHCP on Connect  802.11r

Notes:

E. Configure a Chamber View Scenario and add the STA profile (mapped to desired wiphyX radios and DUT). Add an upstream profile mapped to DUT LAN side (or possibly WAN side if that is more appropriate for your DUT). You can map to any of the DUT APs in the cluster and the system will still be able to roam to the others.

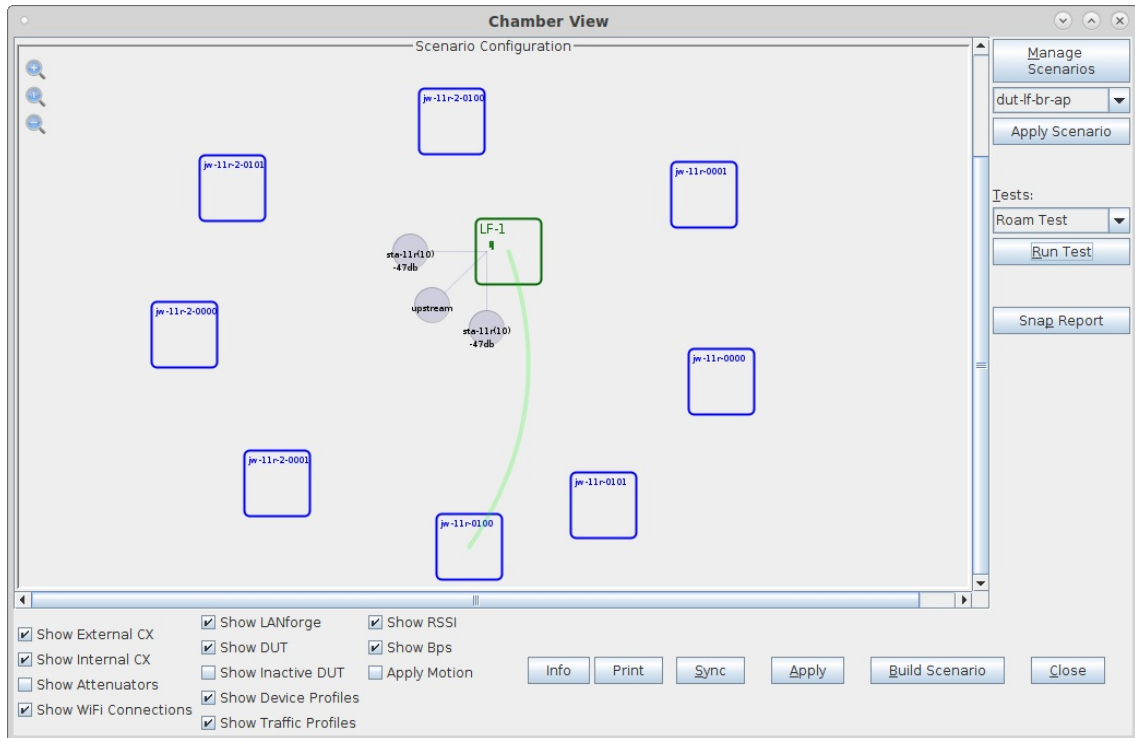
**Create/Modify Scenario**

Scenario Name:

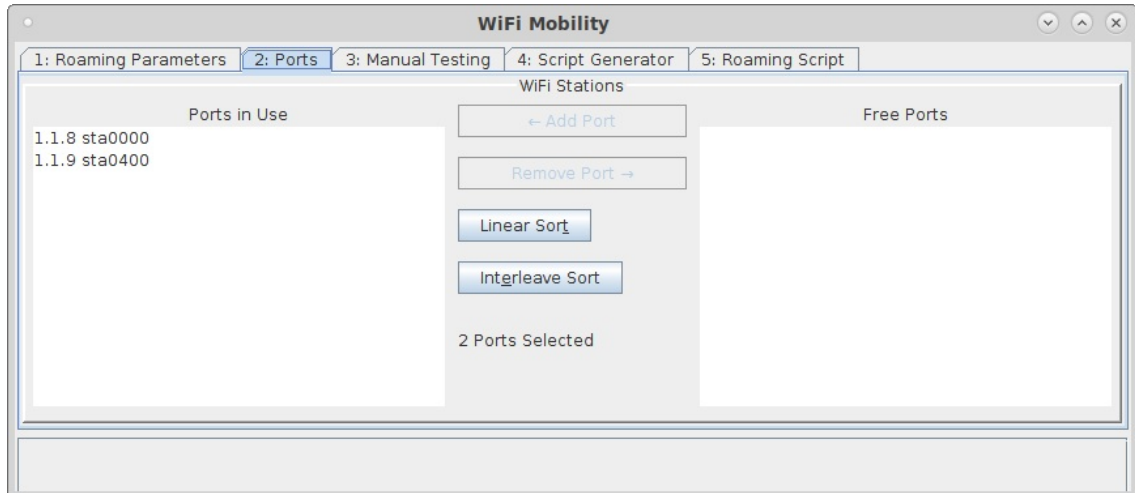
Del	Resource Profile	Mod	Amount	Uses-1	Uses-2	Frequency	Maps To
<input checked="" type="checkbox"/>	1.1 STA: sta-11r	<input type="text" value="1"/>	<input type="text" value="1"/>	wiphy1	AUTO	AUTO (-1 Mhz)	DUT: jw-11r-2-0000 Radio-1
<input checked="" type="checkbox"/>	1.1 Upstream: upstream	<input type="text" value="1 (1)"/>	<input type="text" value="1 (1)"/>	eth1	AUTO	AUTO (-1 Mhz)	DUT: jw-11r-0001 LAN
<input checked="" type="checkbox"/>	1.1 STA: sta-11r	<input type="text" value="1"/>	<input type="text" value="1"/>	wiphy0	AUTO	AUTO (-1 Mhz)	DUT: jw-11r-2-0000 Radio-1

2. Use Chamber View to run a Station Roam test.

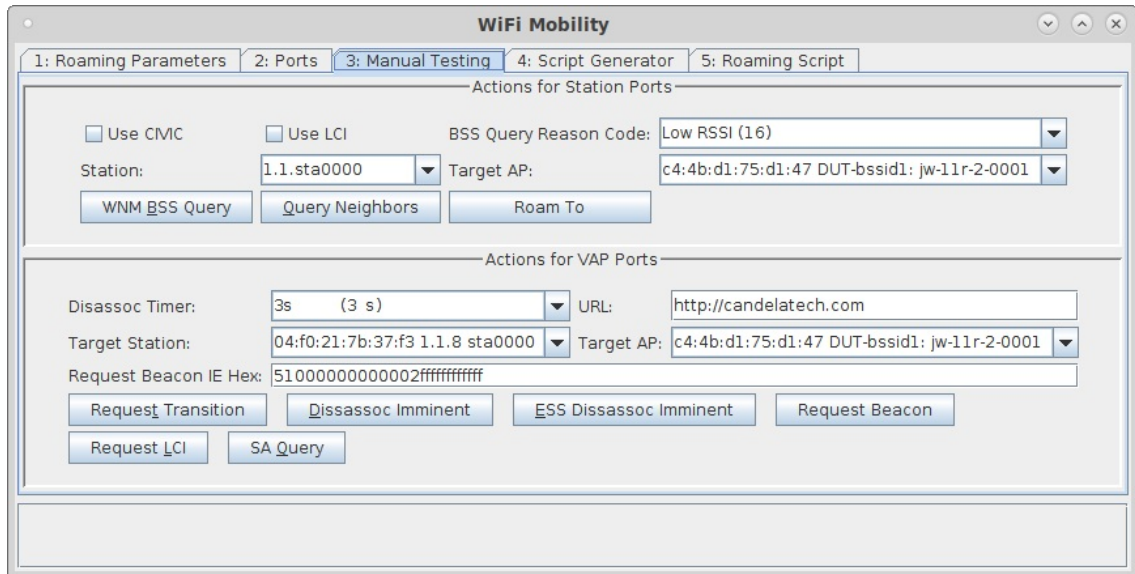
- A. Open Chamber View by clicking on the 'Chamber View' button in the LANforge-GUI. Load appropriate scenario or create a new scenario as needed. Apply the Scenario, then Build the scenario.



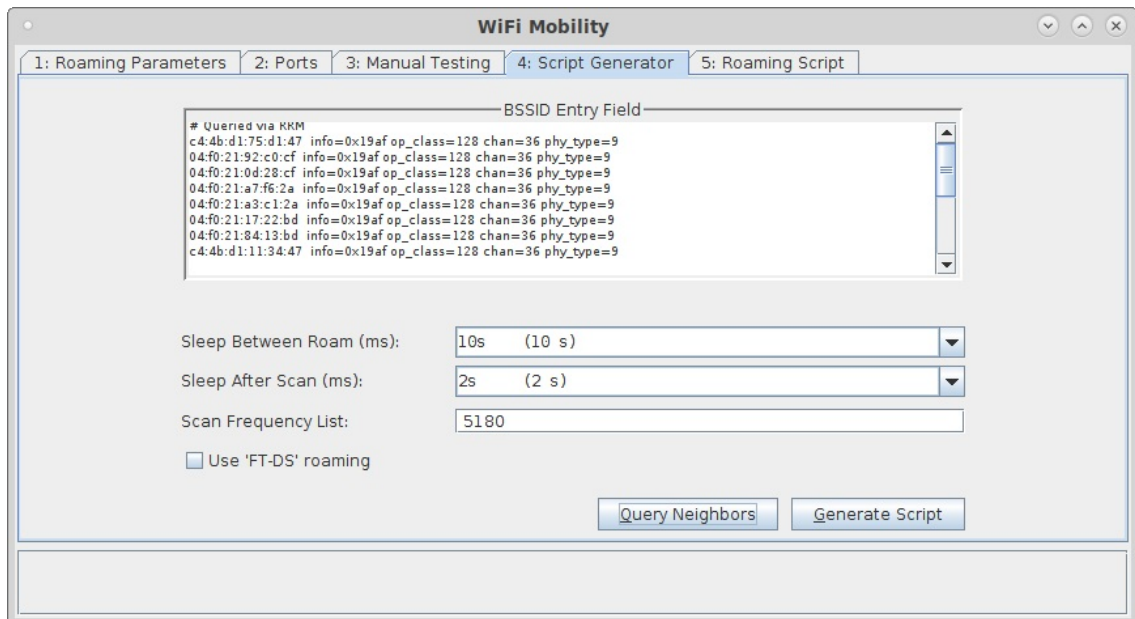
- B. Select the **Roam Test** test and click **Run Test**. You should see the Wifi Mobility Test configuration window pop up. You can normally just use the defaults in the Roaming Parameters tab, so that tab is ignored in this example. By default, all of the stations will be selected to use in the roam test. You may adjust the selection at this time.:



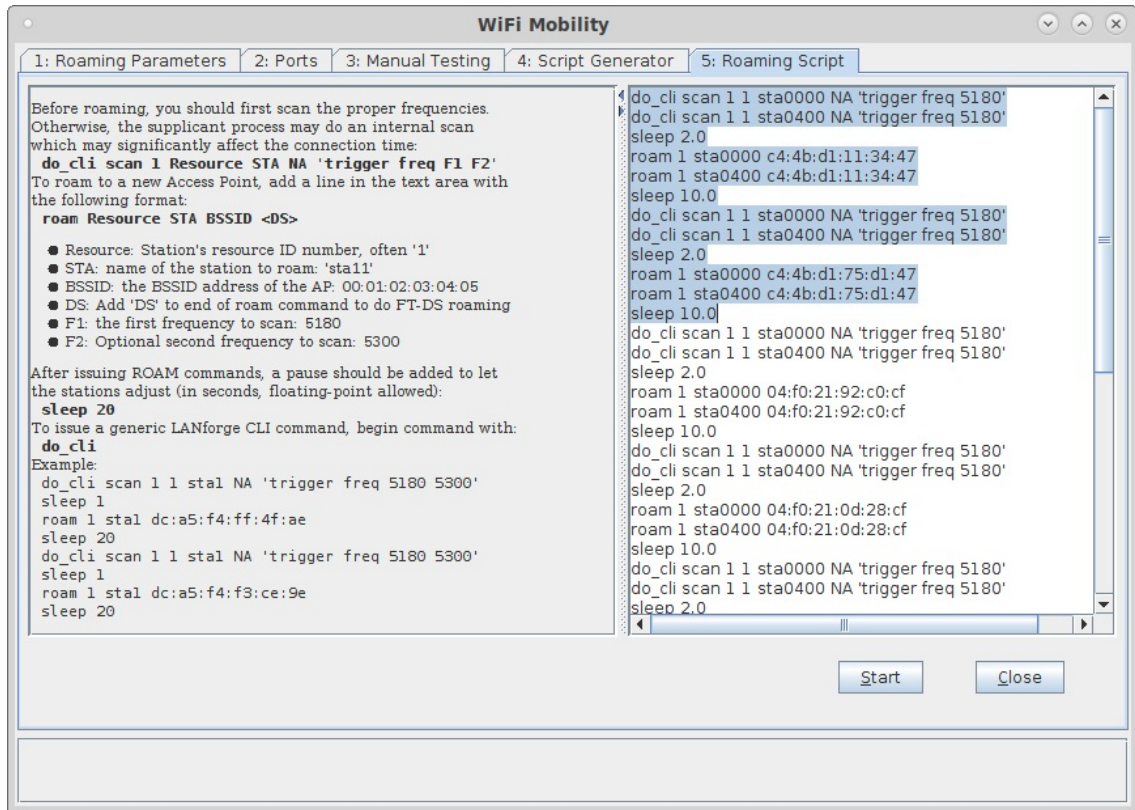
- C. You can do some manual testing, including some 802.11k/v features on the Manual Testing tab, but in this example, we will not be using those features.



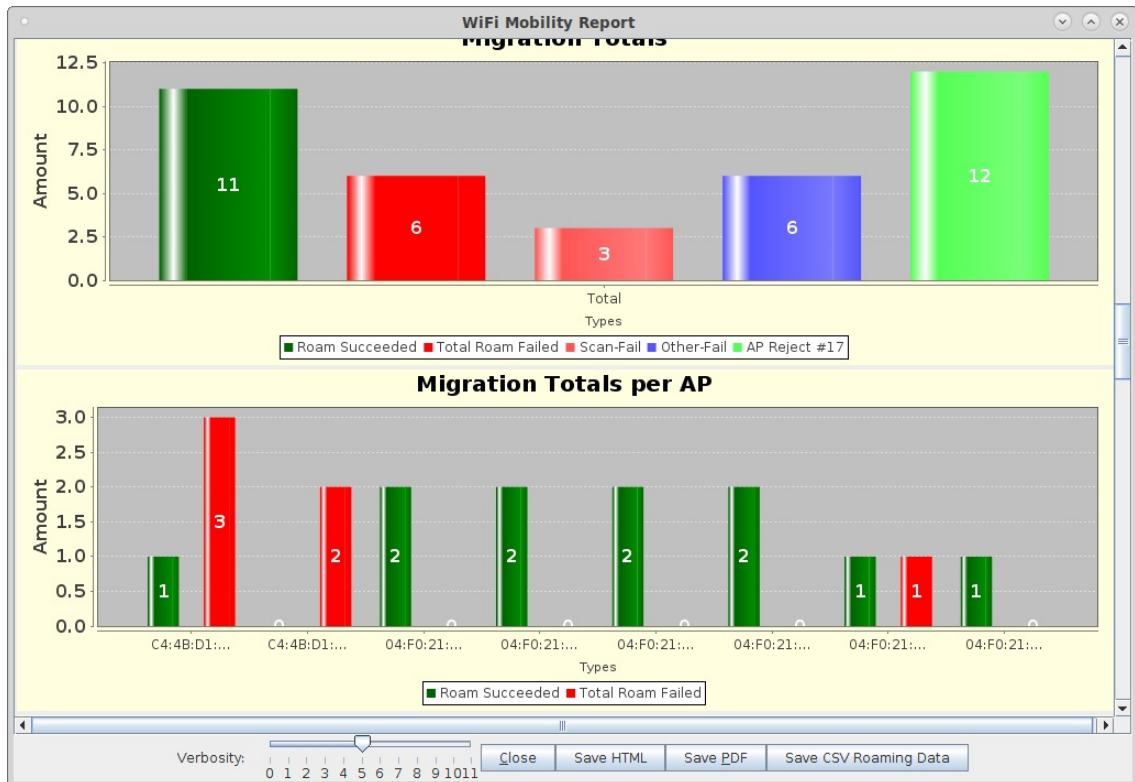
- D. The Script Generator tab is used to create the roaming script. If your APs support Neighbor Report Requests, then you can click the Query Neighbors button and it should populate the BSSID Entry Field as well as the Scan Frequency List. If your stations have not been brought up yet, then the Query Neighbors button will cause them to associate. It may take a small bit of time until the neighbor report becomes available, please click the Query Neighbors button again after 10 or so seconds. Double-check that all of your APs are found and that the frequency list is the expected value. If your AP does not support Neighbor Query, then manually enter the BSSIDs and frequencies.



- E. When the BSSIDs have been discovered to manually entered, click the Generate Script button. The generated script describes the roaming behaviour. You may also edit or paste in your own script, and you may save the generated script text for later use.



- F. To start the test, click the **Start** button (which will change to 'Stop' once start is clicked) to start the test. An interactive report window will be created and will be updated as the test runs. The AP cluster used in this example has some issues and is rejecting a lot of roam attempts with 'code-17', which indicates the AP thinks it has no more capacity. Hopefully your system works better!



- G. When the test is complete, click the **Save HTML** button to save an HTML report and generate the PDF. The PDF file will be linked from the HTML page. You can also click 'Save PDF' and the browser will be directed to open the pdf file directly. Please see this [example Roam Report](#)

