Candela
TECHNOLOGIES
Network Testing and Emulation Solutions

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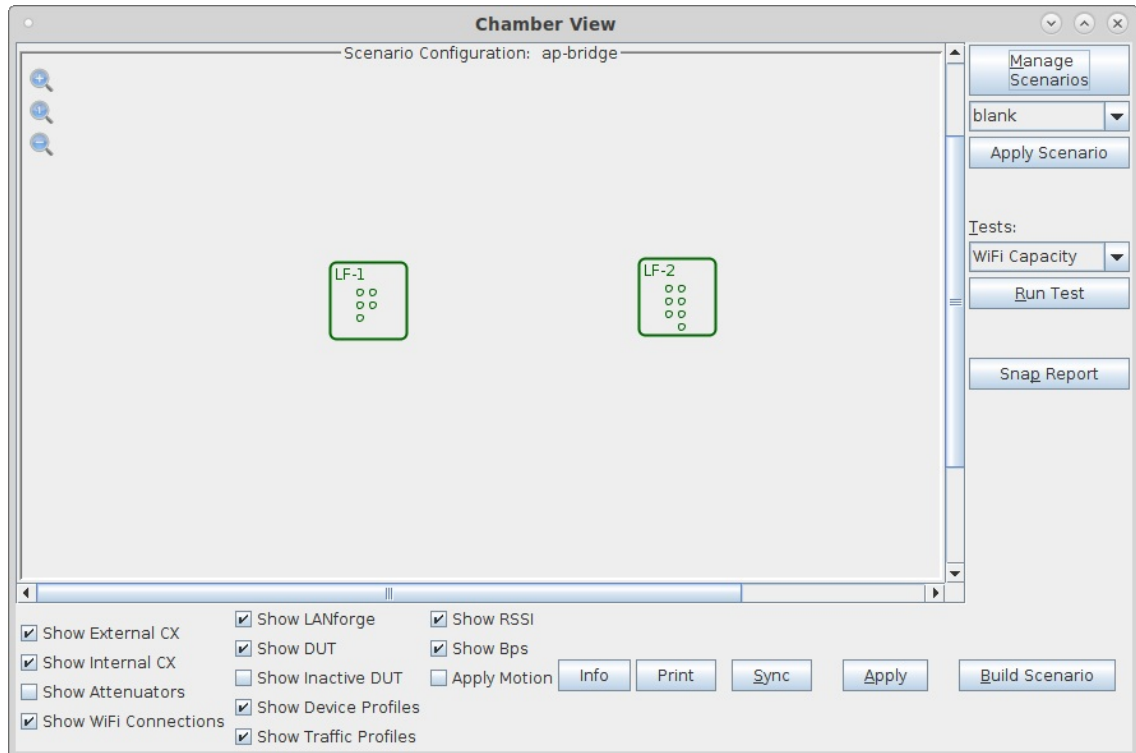support@candelatech.com
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LANforge as 802.11k/v/r Access Point Cluster

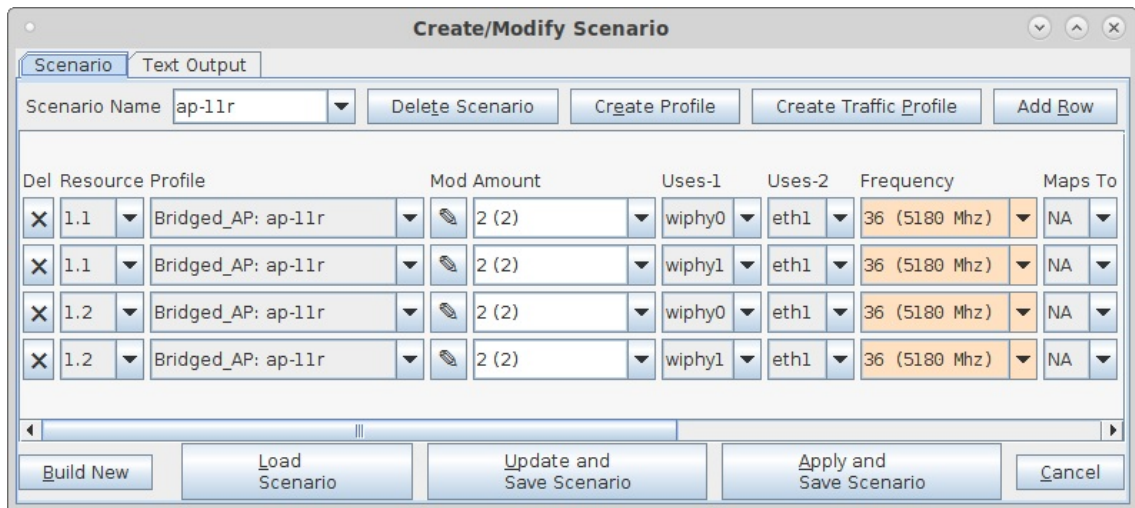**Goal**: Create 8 LANforge APs supporting 802.11k, v, and r in bridged mode using Chamber View

In this test scenario, two LANforge CT522 systems are used to create 8 APs. The APs can be used for 802.11k/v/r roaming and related testing. No external radius server is needed. The 'eth1' interfaces on the two LANforges should be connected to the same LAN. NOTE: As of this writing, there is a bug when 802.11w (MFP) is enabled. We are not currently clear whether it is an AP issue or a Station issue.

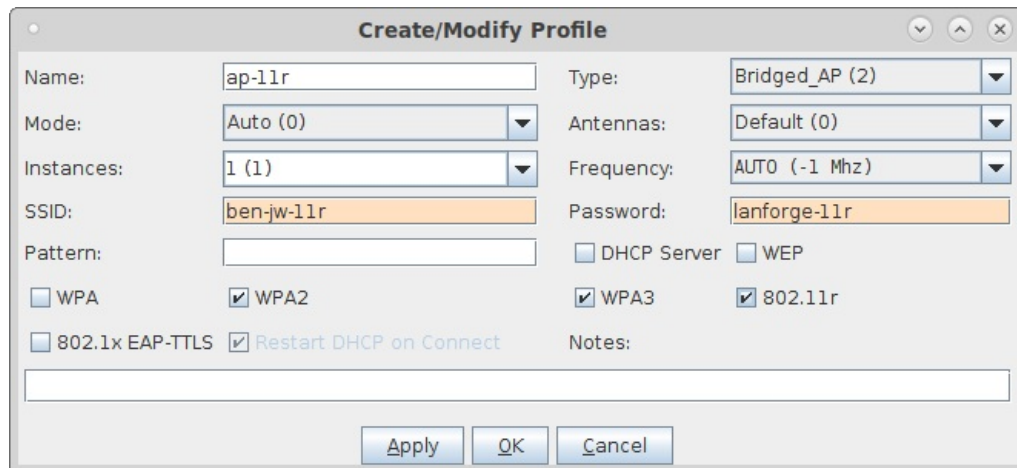1. Configure Chamber View to create 802.11r Access Points.
    A. Open Chamber View by clicking on the 'Chamber View' button in the LANforge-GUI. You can right-click in Chamber View to create various objects. The LANforge system(s) should show up as green boxes in Chamber View.

B. Configure a Chamber View Scenario and add the AP profiles.

Create/Modify Scenario

Scenario | Text Output

Scenario Name ap-11r ▼ | Delete Scenario | Create Profile | Create Traffic Profile | Add Row

Del	Resource	Profile	Mod	Amount	Uses-1	Uses-2	Frequency	Maps To
✕	1.1 ▼	Bridged_AP: ap-11r ▼	✎	2 (2) ▼	wiphy0 ▼	eth1 ▼	36 (5180 Mhz) ▼	NA ▼
✕	1.1 ▼	Bridged_AP: ap-11r ▼	✎	2 (2) ▼	wiphy1 ▼	eth1 ▼	36 (5180 Mhz) ▼	NA ▼
✕	1.2 ▼	Bridged_AP: ap-11r ▼	✎	2 (2) ▼	wiphy0 ▼	eth1 ▼	36 (5180 Mhz) ▼	NA ▼
✕	1.2 ▼	Bridged_AP: ap-11r ▼	✎	2 (2) ▼	wiphy1 ▼	eth1 ▼	36 (5180 Mhz) ▼	NA ▼

Build New | Load Scenario | Update and Save Scenario | Apply and Save Scenario | Cancel

C. This example uses one 802.11r AP profile for all APs.

Create/Modify Profile

Name: ap-11r | Type: Bridged_AP (2) ▼

Mode: Auto (0) ▼ | Antennas: Default (0) ▼

Instances: 1 (1) ▼ | Frequency: AUTO (-1 Mhz) ▼

SSID: ben-jw-11r | Password: lanforge-11r

Pattern: | ☐ DHCP Server ☐ WEP

☐ WPA ☑ WPA2 ☑ WPA3 ☑ 802.11r

☐ 802.1x EAP-TTLS ☑ Restart DHCP on Connect Notes:

Apply | OK | Cancel

D. Once you have saved and selected the Scenario, click **Apply Scenario** and then click **Build Scenario**. The APs will be created, bridge devices will be created and will contain the APs and the Ethernet ports selected in the scenario. A radius server will be created and started. The Access Point devices will be started as part of the build process, so the system is now ready to be used. You can also make further modifications to the AP configuration by modifying the vap interfaces in the Port-Mgr tab of the LANforge GUI.
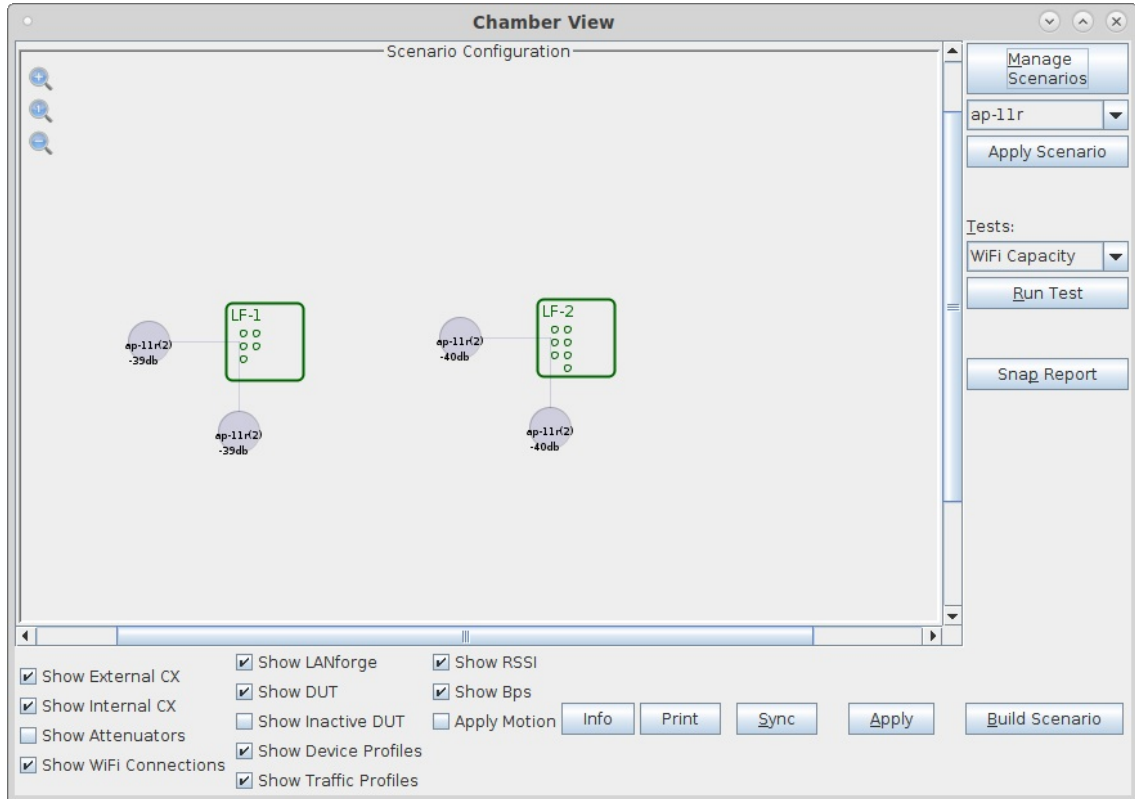
E. To give you some idea of the underlying configuration, please see this VAP configuration window.

F. And the 'custom' magic that makes the .11r cluster talk to itself.


```
vap0001 (jw4-ben) Configure Settings

                        Port Status Information
            Current:    LINK-UP GRO  NONE
            Driver Info:  Port Type: WIFI-AP   Parent: wiphy0    [ wiphy0... ]

                           Port Configurables
   [ Standard Configuration ][ Advanced Configuration ][ Misc Configuration ][ Custom WiFi ]
                              Custom WiFi




   User-Specified supplicant/hostapd configuration text (may require Port reset to take effect)
   wpa_key_mgmt=FT-EAP
   ft_over_ds=1
   nas_identifier=c44bd175d147
   mobility_domain=4321
   r0_key_lifetime=10000
   r1_key_holder=c44bd175d147
   reassociation_deadline=1000
   pmk_r1_push=1

   r0kh=04:f0:21:a7:f6:2a 04f021a7f62a 0000000000000000000000000000023
   r0kh=04:f0:21:a3:c1:2a 04f021a3c12a 0000000000000000000000000000024
   r0kh=04:f0:21:17:22:bd 04f0211722bd 0000000000000000000000000000025
   r0kh=04:f0:21:84:13:bd 04f0218413bd 0000000000000000000000000000026
   r0kh=c4:4b:d1:11:34:47 c44bd1113447 0000000000000000000000000000027
   r0kh=04:f0:21:92:c0:cf 04f02192c0cf 0000000000000000000000000000028
   r0kh=04:f0:21:0d:28:cf 04f0210d28cf 0000000000000000000000000000029
   r1kh=04:f0:21:a7:f6:2a 04:f0:21:a7:f6:2a 0000000000000000000000000000004
   r1kh=04:f0:21:a3:c1:2a 04:f0:21:a3:c1:2a 000000000000000000000000000000b
   r1kh=04:f0:21:17:22:bd 04:f0:21:17:22:bd 000000000000000000000000000012
```

G. Normally you would configure your own Station device to connect to this AP cluster. In this case, LANforge stations were used. Here is a screenshot of the config window to give some idea of how to configure your own stations.

sta0000 (lf0313-6477) Configure Settings

Port Status Information

Current: LINK-UP GRO Authorized

Driver Info: Port Type: WIFI-STA Parent: wiphy1   [wiphy1...]

Port Configurables

| Standard Configuration | Advanced Configuration | Misc Configuration | Corruptions | Custom WiFi |

General Interface Settings

☐ Down   ☐ Aux-Mgt

☐ DHCP-IPv6   ☑ DHCP Release   DHCP Vendor ID: [None ▼]

☑ DHCP-IPv4   [Secondary-IPs] DHCP Client ID: [None ▼]

DNS Servers: [8.8.8.8]   Peer IP: [NA]

IP Address: [0.0.0.0]   Global IPv6: [AUTO]

IP Mask: [0.0.0.0]   Link IPv6:   [AUTO]

Gateway IP: [0.0.0.0]   IPv6 GW: [AUTO]

Alias: [   ]   MTU: [1500]

MAC Addr: [04:f0:21:7b:37:f3] TX Q Len   [1000]

Rpt Timer: [faster (1 s) ▼]   WiFi Bridge: [NONE ▼]

Enable

☐ Set MAC
☐ Set TX Q Len
☐ Set MTU
☐ Set Offload
☐ Set PROMISC

Services

☐ HTTP
☐ FTP
☐ RADIUS

Low Level

☐ PROMISC
☐ TSO Enabled
☐ UFO Enabled
☐ GSO Enabled
☐ LRO Enabled
☑ GRO Enabled

WiFi Settings

SSID: [ben-jw-11r ▼]   AP: [DEFAULT]

Key/Phrase: [lanforge-11r]   Mode: [(Auto) ▼]

Freq/Channel: 5180/36   Rate: [OS Default ▼]

☐ WPA ☑ WPA2 ☑ WPA3 ☐ OSEN ☐ WEP

☐ Disable HT40 ☐ Enable VHT160 ☐ Disable SGI

[Print] [Display]   [Probe] [Display Scan] [Sync]   [Apply] [OK]   [Cancel]

H. The Station advanced screen shows the EAP-TTLS config and key management. Note that 802.11w is disabled in this test to work around some bug.