

Testing AP performance and stability with the AP-Auto Automated test suite.

Goal: Setup and run a AP-Auto test for an AP using the LANforge CT522 or similar system in order to test how well the AP can handle station load, performance, and stability. The AP-Auto test is similar to the TR-398 test, but is designed to be functional with a minimum amount of test equipment. A 2-radio LANforge system and DUT is all that is required to run these tests.

In this test scenario, the LANforge CT522 is used to create stations and run throughput, stability, and station capacity tests. This example assumes you have some experience with Chamber View, and that you have a LANforge system and a DUT AP. The AP and LANforge may be in chambers, but that is not required. This feature requires LANforge version 5.4.1 or higher.



- 1. Configure Chamber View for AP-Auto and Similar Tests.
 - A. Open Chamber View by clicking on the 'Chamber View' button in the LANforge-GUI. If you have an appropriate scenario and DUT 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. When complete, your configuration should look something like this. The 'jw3' is the DUT AP, and LF-1 is the LANforge system.



B. Create a Device Under Test (DUT) Profile that matches your AP. The BSSID is important to configured so that LANforge knows when it is connected to the correct AP.

Create/Modify DUT									
Name	jwЗ								
Image file	NONE		Choose Image ×						
SW Info		HW Info	compex 3x3, 2x2, wavel						
Model Number		Serial Number							
Serial port		WAN							
LAN		API version	0						
SSID-1	jw3-0	Password-1							
SSID-2	jw3-1	Password-2							
SSID-3		Password-3							
Mgt IP	0.0.0.0	Ant-1	0						
Ant-2	0	Ant-3	0						
BSSID-1	04:f0:21:7b:37:2a	BSSID-2	04:f0:21:f2:ea:bd						
BSSID-3)0:00:00:00:00:00	Active	AP DUT						
STA DUT	WEP	WPA	WPA2						
WPA3	🗌 802.11r	802.1x EAP-TTLS	Provides DHCP on LAN						
Provides DHCP on WAN									
Notes									
	Apply	<u>O</u> K <u>C</u> ancel							

C. Configure a Chamber View Scenario and add the STA profile (mapped to desired wiphyX radio and DUT). Add an upstream profile mapped to DUT LAN side (or possibly WAN side if that is more appropriate for your DUT). The traffic flow in the scenario is not required for the AP-Auto test, but it will not cause any trouble if you have traffic configured in the scenario.

Create/Modify Scenario											•	×							
S	enario	r	Fext Output																
Scenario Name [f-to-jw3 ▼ Delete Scenario Create Profile Create Traffic Profile Add Row																			
Del Resource Profile Amount Uses-1 Uses-2 Frequency Maps To Traffic-1																			
×	1.1	-	STA: STA-AC	Ŧ	1 (1)		•	wiphyl	-	AUTO	•	AUTO (-1	Mhz)	•	DUT: jw3 Radio-2	-	tcp-dl-6m-vi		•
×	1.1	•	STA: STA-AC	•	1 (1)		•	wiphy0	•	AUTO	•	AUTO (-1	Mhz)	•	DUT: jw3 Radio-1	•	tcp-dl-6m-vi		-
🗙 1.1 👻 Upstream: upstream			Upstream: upstream	•	1 (1)		•	ethl	-	AUTO	•	AUTO (-1	Mhz)	•	DUT: jw3 LAN	•	NA		•
Build New Scenario						Update and Save Scenario						<u>A</u> pply and Save Scenario					<u>C</u> ance		

2. Use Chamber View for the AP-Auto test.

A. Open Chamber View by clicking on the 'Chamber View' button in the LANforge-GUI. Load appropriate scenario. Apply the Scenario, then Build the scenario.

•	Chamber View	\odot \otimes \otimes						
top-dl-5mvi STA-AC	C C C C C C C C C C C C C C							
	Show I ANforde Show RSSI							
Show External CX Show Internal CX Show Attenuators Show WiFi Connections	Show Dut Image: Show Host Show Dut Image: Show Bps Show Inactive DUT Apply Motion Info Print Show Device Profiles Show Traffic Profiles	enario <u>C</u> lose						

B. Select the AP-Auto test and click Run Test. You should see the AP-Auto Test configuration window pop up. It will remember the last configuration for most fields, and you can also save and load configurations on the 'Advanced Configuration' tab.. Select the DUT 2G and DUT 5G SSIDs. This test requires that Open or PSK is filled out. The enterprise SSID is optional. Use 'NA' for SSIDs that are not enabled. Select the LANforge radios to be used in this test. You need at least one 2.4Ghz radion and one 5Ghz radio for full functionality. At the bottom, select the test cases to be run.:

• AP Automated Test • • •											
Capacity Configuration Pass/Fail Configu	uration Report Con	figuration									
Settings Advanced Configuration											
	Open DUT	PSK DUT	Enterprise DUT								
Selected DUT 2G:	jw3 jw3-0 🔻	NA 🔻	NA								
Selected DUT 5G:	jw3 jw3-1 💌	NA 🔻	NA 👻								
Upstream Port:	1.1.1 eth1 💌										
2.4Ghz Radios	5Ghz Radios										
1.1.9 wiphy0 🗸	1.1.7 wiphy1 🗸										
_	•										
_	•										
_	•										
_											
_	•										
_	•										
_	•										
Tests to run:	Estimated Test Dura	tion: 27 m									
Basic Client Connectivity	Throughput vs Pk	tt Size									
Dual Band Performance											
Long-Term											
<u>S</u> tart	Another	Iteration	Pause	<u>C</u> ancel							

C. The Advanced Configuration tab lets you save and restore test configurations and also tune the behaviour of the automated tests.:

•	AP Autom	nat	ed Test		\odot	×
Capacity Configuration	Pass/Fail Configuration	Re	eport Configuration			
Settings			Advanced Configuration	n		
Save	DEFAULT					
Load	DEFAULT	•				
Delete	DEFAULT	Ŧ				
IP ToS:	Best Effort (0)	•	Multi-Conn:	One (1)		•
Skip 2.4Ghz Tests	Skip 5Ghz Tests		Skip Dual-Band Tests			
2.4Ghz Station Count:	Default (64)	Ŧ	5Ghz Station Count:	Default (64)		•
Dual-Band Station Count:	Large (128)	•				
Duration:	Default (20 sec)	•	Interval:	Default (5 sec)		-
Long-Term Download Ra	85%	•	Long-Term Upload Rate:	85%		-
Long-Term Duration:	1800 (30 min)	•	Long-Term Graph Interval:	30 (30 sec)		-
Long-Term Station Count:	Two (Default) (2)	•				
Hunt Retries:	Default (1)	•				
Frame Sizes:	64, 1370, MTU					
Capacity Amounts:	1, 10, 20, 50, 100, 200					
Packet Loss Threshold:	1% (1%)	-				
	<u>S</u> tart		Another Iteration	Pause C	ancel]

D. The Capacity Configuration tab lets you configure the Capacity test. By default, it will run with maximum capabilities and MTU frame size in the downstream direction. But, you can use this tab to also enable upstream traffic, iterate over different Modes, Spatial Streams and Bandwidths, as well as use the various packet sizes configured on the 'Advanced Configuration' tab.:

AP Automated Test										
Capacity Configuration Pass/Fail Co	nfiguration Report C	figuration Report Configuration								
Settings	Advance	d Configuration								
🖌 Capacity: Download	Capacity: Upload	🕑 Use Packet Sizes								
Mode	Spatial Streams	Bandwidth								
Auto	AUTO	AUTO								
802.11a	1	20								
802.11b	2	40								
802.11g	3	80								
802.11abg	4	160								
802.11abgn										
802.11bgn										
802.11bg										
802.11abgn-AC										
802.11an-AC										
802.11an										
802.11bgn-AC										
802.11abgri-AA										
802.11ap-AX										
OVERT ON PA										
Start	Another Iteration	Pause	<u>C</u> ancel							

E. The Pass/Fail Configuration tab lets you enter pass/fail criteria based on wifi modes, packet sizes, spatial streams and more. If you do not fill in this section, then the test will attempt to provide some basic automated pass/fail criteria, and you can also just ignore the pass/fail for the Capacity and packet-size tests and let a human judge the results.:

• A	P Automated Test	\odot \otimes \otimes
Capacity Configuration Pass/Fail Con	nfiguration Report Configuration	
Settings	Advanced Configura	ation
Enter Pass/Fail Criteria for Capacity and	l Throughput vs Packet Size tests	
Enter Pass/Fail Criteria for Capacity and # modes: /a, /an-20 4x4, /an-40 4x4, /b, /bg, /bgn-2 # stations: 1, 10, 20, 50 # Non-specified and fields set to "*" means match # For a/b/g modes, Auto-BW == 20, Auto-NSS == 1 # For /n modes, Auto-BW == 40, Auto-NSS == 4 # For /ac and /ax modes, Auto-BW == 80, Auto-NSS # /a mode 5 * 64 2Mbps mode=802.11a sta=1 5 * 1370 25Mbps mode=802.11a sta=1 5 * 1370 25Mbps mode=802.11a sta=1 5 * 64 50Mbps mode=802.11a sta=1 5 * 64 50Mbps mode=802.11a sta=1 b = 20 ms 5 * 64 50Mbps mode=802.11an sta=1 bw=20 ms 5 * 64 50Mbps mode=802.11an sta=1 bw=20 ms 5 * 64 50Mbps mode=802.11an sta=1 bw=40 ms 5 * 64 50Mbps mode=802.11an sta=1 bw=40 ms 5 * 1370 455Mbps mode=802.11an sta=1 bw=40 ms 5 * 1370 456Mbps mode=802.11an sta=1 bw=40 ms 2.4 * 64 1Mbps mode=802.11b sta=* 2.4 * MTU 7Mbps mode=802.11b sta=* 2.4 * 64 2Mbps mode=802.11b sta=* # For any amount of stations 2.4 * 64 2Mbps mode=802.11b sta=* # For any amount of stations 2.4 * 64 2Mbps mode=802.11b sta=*	I Throughput vs Packet Size tests 0. /anAC-20.40.80 all. 1 5 == 4 .4 .55=4 .55=4 .55=4 .55=4 .55=4 .55=4	
2.4 * 1370 21Mbps mode=802.11bg sta=* 2.4 * MTU 22Mbps mode=802.11bg sta=*		
2.4 * 64 50Mbps mode=802.11bgn sta=1 bw=20 n 2.4 * 1370 240Mbps mode=802.11bgn sta=1 bw=2 2.4 * MTU 241Mbps mode=802.11bgn sta=1 bw=20 2.4 * 64 50Mbps mode=802.11bgn sta=10 bw=20 2.4 * 64 50.240Mbps mode=802.11bgn sta=10 bw=20	ss=4 10 nss=4 0 nss=4 nss=4	
2.4 * MTU 241Mbps mode=802.11bgn sta=10 bw=	20 nss=4 20 nss=4	
2.4 * 64 50Mbps mode=802.11bgn sta=50 bw=20 2.4 * 1370 240Mbps mode=802.11bgn sta=50 bw= 2.4 * MTU 245Mbps mode=802.11bgn sta=50 bw=20	nss=4 :20 nss=4 20 nss=4	•
<u>S</u> tart	Another Iteration	Pause <u>C</u> ancel

F. Here is an example set of pass/fail criteria in text form for easier cut/paste

```
# modes: /a, /an-20 4x4, /an-40 4x4, /b, /bg, /bgn-20, /anAC-20,40,80
# stations: 1, 10, 20, 50, ...
# Non-specified and fields set to "*" means match all.
# For a/b/g modes, Auto-BW == 20, Auto-NSS == 1
# For /n modes, Auto-BW == 40, Auto-NSS == 4
# For /ac and /ax modes, Auto-BW == 80, Auto-NSS == 4
# /a mode
5 * 64 2Mbps mode=802.11a sta=1
5 * 1370 25Mbps mode=802.11a sta=1
5 * MTU 26Mbps mode=802.11a sta=1
5 * 64 50Mbps mode=802.11an sta=1 bw=20 nss=4
5 * 1370 245Mbps mode=802.11an sta=1 bw=20 nss=4
5 * MTU 245Mbps mode=802.11an sta=1 bw=20 nss=4
5 * 64 50Mbps mode=802.11an sta=1 bw=40 nss=4
5 * 1370 455Mbps mode=802.11an sta=1 bw=40 nss=4
5 * MTU 456Mbps mode=802.11an sta=1 bw=40 nss=4
# For any amount of /b stations
2.4 * 64 1Mbps mode=802.11b sta=*
2.4 * 1370 7Mbps mode=802.11b sta=*
```

```
# For any amount of /bg stations
2.4 * 64 2Mbps mode=802.11bg sta=*
2.4 * 1370 21Mbps mode=802.11bg sta=*
2.4 * MTU 22Mbps mode=802.11bg sta=*
# For /bgn 20Mhz stations.
2.4 * 64 50Mbps mode=802.11bgn sta=1 bw=20 nss=4
2.4 * 1370 240Mbps mode=802.11bgn sta=1 bw=20 nss=4
2.4 * MTU 241Mbps mode=802.11bgn sta=1 bw=20 nss=4
2.4 * 64 50Mbps mode=802.11bgn sta=10 bw=20 nss=4
2.4 * 1370 240Mbps mode=802.11bgn sta=10 bw=20 nss=4
2.4 * MTU 241Mbps mode=802.11bgn sta=10 bw=20 nss=4
2.4 * 64 50Mbps mode=802.11bgn sta=50 bw=20 nss=4
2.4 * 1370 240Mbps mode=802.11bgn sta=50 bw=20 nss=4
2.4 * MTU 245Mbps mode=802.11bgn sta=50 bw=20 nss=4
2.4 * 64 50Mbps mode=802.11bgn sta=100 bw=20 nss=4
2.4 * 1370 235Mbps mode=802.11bgn sta=100 bw=20 nss=4
2.4 * MTU 245Mbps mode=802.11bgn sta=100 bw=20 nss=4
2.4 * 64 50Mbps mode=802.11bgn sta=200 bw=20 nss=4
2.4 * 1370 230Mbps mode=802.11bgn sta=200 bw=20 nss=4
2.4 * MTU 235Mbps mode=802.11bgn sta=200 bw=20 nss=4
# 40Mhz /n on 2.4, same values for all number of stations currently.
2.4 * 64 50Mbps mode=802.11bgn sta=* bw=40 nss=4
2.4 * 1370 280Mbps mode=802.11bgn sta=* bw=40 nss=4
2.4 * MTU 281Mbps mode=802.11bgn sta=* bw=40 nss=4
# For /an-AC 20Mhz stations.
5 * 64 50Mbps mode=802.11an-AC sta=1 bw=20 nss=4
5 * 1370 300Mbps mode=802.11an-AC sta=1 bw=20 nss=4
5 * MTU 305Mbps mode=802.11an-AC sta=1 bw=20 nss=4
# For /an-AC 40Mhz stations
5 * 64 50Mbps mode=802.11an-AC sta=1 bw=40 nss=4
5 * 1370 615Mbps mode=802.11an-AC sta=1 bw=40 nss=4
5 * MTU 630Mbps mode=802.11an-AC sta=1 bw=40 nss=4
# For /an-AC 80Mhz stations.
5 DL 64 50Mbps mode=802.11an-AC sta=1 bw=80 nss=4
5 DL 1370 1300Mbps mode=802.11an-AC sta=1 bw=80 nss=4
5 DL MTU 1300Mbps mode=802.11an-AC sta=1 bw=80 nss=4
5 UL 64 50Mbps mode=802.11an-AC sta=1 bw=80 nss=4
5 UL 1370 1100Mbps mode=802.11an-AC sta=1 bw=80 nss=4
5 UL MTU 1100Mbps mode=802.11an-AC sta=1 bw=80 nss=4
5 DL 64 50Mbps mode=802.11an-AC sta=10 bw=80 nss=4
5 DL 1370 1300Mbps mode=802.11an-AC sta=10 bw=80 nss=4
5 DL MTU 1300Mbps mode=802.11an-AC sta=10 bw=80 nss=4
5 UL 64 50Mbps mode=802.11an-AC sta=10 bw=80 nss=4
5 UL 1370 1200Mbps mode=802.11an-AC sta=10 bw=80 nss=4
5 UL MTU 1200Mbps mode=802.11an-AC sta=10 bw=80 nss=4
```

2.4 * MTU 7Mbps mode=802.11b sta=*

5 * 64 50Mbps mode=802.11an-AC sta=50 bw=80 nss=4 5 * 1370 1200Mbps mode=802.11an-AC sta=50 bw=80 nss=4 5 * MTU 1200Mbps mode=802.11an-AC sta=50 bw=80 nss=4
5 * 64 50Mbps mode=802.11an-AC sta=100 bw=80 nss=4 5 * 1370 1100Mbps mode=802.11an-AC sta=100 bw=80 nss=4 5 * MTU 1100Mbps mode=802.11an-AC sta=100 bw=80 nss=4
<pre># Auto (full capabilities) entries, for tput test, DUT is wave-1 3x3/2x2 2.4 * 64 50Mbps mode=Auto sta=* bw=Auto nss=Auto 2.4 * 1370 280Mbps mode=Auto sta=* bw=Auto nss=Auto 2.4 * MTU 282Mbps mode=Auto sta=* bw=Auto nss=Auto</pre>
5 * 64 50Mbps mode=Auto sta=* bw=Auto nss=Auto 5 * 1370 650Mbps mode=Auto sta=* bw=Auto nss=Auto 5 * MTU 650Mbps mode=Auto sta=* bw=Auto nss=Auto

G. The Report Configuration tab lets you add some notes and other details to the generated report.:

•	AP Automated Test	 × × 								
Capacity Configuration	Pass/Fail Configuration Report Configuration									
Settings	Settings Advanced Configuration									
Show Events	Show Log Entries 🗌 Auto Save Report									
Graph Background Color:	0xE0ECF8									
Operator Information:										
Report Location:										
Notes to be added near th	e top of the report:									
		_								
		=								
•										
	Start Another Iteration Pause	<u>C</u> ancel								

H. When the configuration is complete, click the **Start** button (which will change to 'Stop' once start is clicked) to start the test. An interactive report tab will be created and will be updated as the test runs.

•					AP Au	utomated Te	st					\odot \otimes \otimes
Settings	Advanced Config	guration C	Capacity Config	uration	Pass/Fa	il Configuratio	n Report	t Configuration	Repo	rt * x		
0.5 · H 0.4 ·												
0.3 -												
0.2 -												
0.1 -												
0.0												
						Band						
	Ca	pacity l	Results									
		Туре	Res	ult			Not	es				
	Est	timated Ite	rations INFO	108) (non-si	upported coi	nbinations	s will be skipp	ed)			
	Co	nfiguration	NOTE INFO) Spat	ial Strea	ams: AUTO						
	Co	nfiguration	NOTE INFO) Ban	dwidths	to test: AUT	20					
	Co	nfiguration	NOTE INFO	D Mod	les to tes	st: 802.11a 8	02.11b 80)2.11bgn 802	.11bg 80	02.11an-A	.C	
	NC	DTE	INFO) Skip	ping un-	supported n	ode: 802.	11a for band	: 2.4Ghz			
	Сара	city Det	ails									
	Band	NSS BV	W Mode S	tations	UL/DL	Pkt Size I	eported	Requested	Result	Crite	ria	
	2.4Ghz	AUTO 20	802.11b 1		DL	64 1	.01 Mbps	1.00 Mbps	PASS	User-Sp	ecified	=
	2.4Ghz	AUTO 20	802.11b 1		DL	1370 6	.90 Mbps	7.00 Mbps	FAIL	User-Sp	ecified	
	2.4Ghz	AUTO 20	802.11b 1		DL	MTU 7	.01 Mbps	7.00 Mbps	PASS	User-Sp	ecified	
Running 1 9 2.4Ghz_802	STA Upload test for .11b_BW-20_Pkt-6	r 20 second: 4_UL Capacit	s. ty			Verbosi	y: 0 1 2	345678	3 9 1 0 1 1	<u>C</u> lose	Save HTML	Save <u>P</u> DF
							<u>S</u> top	🗌 Anot	her Iterat	ion	Pause	<u>C</u> ancel

I. 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 AP-Auto Report.

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