

CT523c-3ac2-db-10g-cu LANforge WiFIRE 802.11a/b/g/n/ac 4x4 6 radio WiFi Traffic Generator Supporting 384 Virtual STA Interfaces

The CT523c-3ac2-db-10g-cu wireless traffic generator is an excellent choice for testing Access Points and other WiFi networks. The ath10k (a/b/g/n/ac) chipset NICs can support up to 64 stations per radio. The 2x2 /AX (a/b/g/n/ac/AX) chipset NICs can support a single station or monitor port per radio. Each of the Virtual Stations has its own IP address, IP port space, MAC address and routing table. The Virtual Stations can be assigned to communicate to a particular Access Point, use a particular SSID, and Open or WPA/WPA2 authentication assigned. More advanced 802.1X authentication is also included. Each radio can be configured independently of the other. Transmit power and channel/frequency is configured on a per-radio basis. Most other settings are configurable per virtual station.

There are three ath10k-wave2 /a/n/AC 5Ghz and three ath10k-wave2 /b/g/n/AC 2.4Ghz WiFi radios per CT523c-3ac2-db-10g-cu and multiple LANforge systems can be clustered together for even more realistic radio interference patterns and increased traffic generation capability.

All virtual stations on the same radio must be on the same frequency, but as long as the protocol supports that frequency, the multiple protocols can be used concurrently. For instance, if the radio is configured for a 2.4Ghz channel, the stations can be /b, /g, /n, or /ax. If the radio is on a 5Ghz channel, the stations can be /a, /n, ac, or ax. The bandwidth can be configured for all protocols.

The Virtual Stations may be configured with all of the virtual interfaces on the same subnet, or different subnets, depending on the testing requirements. When used with something like VoIP, it allows all of the VoIP calls to use the standard IP ports (with one call per virtual interface).

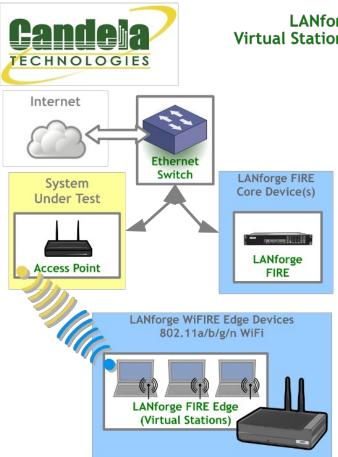
The CT523c-3ac2-db-10g-cu has 42 antenna and is small and quiet enough to sit on a desk or work bench. The CT523c-3ac2-db-10g-cu has no free slots to support additional NICs. Existing STA licenses may be used or additional STA licenses may be purchased (please contact sales for licensing options). No additional hardware or software is required, but it is suggested that you manage the system using the LANforge GUI on a separate machine. The CT523c-3ac2-db-10g-cu can also be managed over a serial console in text mode or through a directly connected monitor, mouse and keyboard.

Performance exceeds 1200Mbps when using the 4x4 802.11AC wave-2 radio: Open, wave2 4x4 | TCP-DL-30sta-open wave-1 3x3 | TCP-DL-30sta-wpa2 wave-1 3x3 NOTE: This product may have a different hardware configuration than the system pictured above.

Refer to your official quote for details.

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Example Network Diagram



LANforge WiFIRE Virtual Station Traffic Generator

LANforge WiFIRE supports 802.11 Virtual Stations and Access Points*. To the System Under Test, it appears as if there are multiple PCs sitting inside the LANforge system generating independent traffic streams over Wireless NICs.

Many Virtual Station interfaces are supported per LANforge WiFIRE machine. LANforge can send traffic from one physical interface on the local machine to another interface on that same machine. Each physical and virtual interface can be configured on the same, or on different IP subnets.

In the configuration on the left, the LANforge FIRE Core can be one physical Ethernet interface and act as the server. The LANforge FIRE Edge can be the Virtual Station interfaces configured on the WiFi radio. Both interfaces can be on the same machine or multiple LANforge machines can be clustered together for increased traffic generation capacity.

* All system support 802.11 a/b/g/n. Some systems support 802.11ac as well.

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Quick Start Guide

- 1. Connect Management Ethernet port to Management network or management PC. If connecting directly to a PC, an Ethernet cross-over cable should be used.
- 2. Connect eth1 wired Ethernet interface to wired Ethernet interface on the AP or network under test. This usually is considered the 'server' side of the network.
- 3. The Client side of the network will be the Virtual Stations configured on the CT523c-3ac2-db-10g-cu

WiFi NIC(s).

- 4. Connect power to standard US or European AC power source. If using external battery pack, then connect to that instead. Click button to power on the unit.
- 5. The CT523c-3ac2-db-10g-cu should now boot. If DHCP is enabled on the Management network, the CT523c-3ac2-db-10g-cu will automatically acquire an IP address. If DHCP is not available, the IP address will be set to **192.168.1.101**.
- 6. Install the LANforge-GUI on a separate management PC or Laptop, or use VNC or remote-desktop programs to access the LANforge system directly. Windows, MAC-OS and Linux GUIs are supported: Select the correct one from the web page served from the LANforge system and install it.
- 7. Start the LANforge-GUI on the management PC and click the 'Discover' button. It should find the CT523c-3ac2-db-10g-cu appliance and add the IP address to the drop-down box in the Connect widget. Press 'Connect' and you will be connected to the CT523c-3ac2-db-10g-cu.
- 8. Select the Port Mgr tab in the GUI. Double-click on the device called 'wiphy0'. This is the Radio device, and should be configured for the correct, channel, country-code, etc. Next, select one or more of the Virtual Station interfaces and click 'Modify'. Enter the correct IP address information, SSID and WPA/WPA2 password (if Enabled). After applying these changes, the Virtual Station interface should associate with the AP and be ready to send traffic. You may create up to 384 Virtual Station interfaces per CT523c-3ac2-db-10g-cu with the 'Create' button.
- 9. Once the interfaces are configured correctly, you can click on the Layer 3, VOIP/RTP and other LANforge-FIRE related GUI tabs and configure/modify/start/stop particular traffic patterns that utilize the virtual stations and wired Ethernet interface. In most cases, you will want one of the FIRE endpoints to be on the wired interface and the other to be on the WiFi Virtual Station interface. It is also valid to generate traffic between two Virtual Station interfaces. The GUI Chamber View window provides some automated test suites. Contact support if you have suggestions for improvements.
- 10. Any GUI modifications take place immediately after you click 'Submit' or 'OK'.

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LANforge WiFIRE Related Images

Virtual Station Configuration Screen

•	sta2003 (j	jedway1) Configu	re Settings	\odot \checkmark							
Port Status Information											
Current: LINK-UP GRO Authorized											
Driver Info: Port Type: WIFI-STA Parent: wiphy0 wiphy0											
Port Configurables											
Standard Configuration Advanced Configuration Misc Configuration Corruptions Custom WiFi											
Enable ——— General Interface Settings											
Set IF Down	Down	🗌 Aux-Mgt									
Set MAC	DHCP-IPv <u>6</u>	☑ DHCP Release	DHCP Vendor ID:	None 💌							
Set TX Q Len	☑ DHCP-IPv4	Secondary-IPs	DHCP Client ID:	None							
Set Offload	DNS Servers:	BLANK	Peer IP:	NA							
	IP Address:	0.0.0.0	Global IPv6:	AUTO							
Services —	IP Mask:	0.0.0.0	Link IPv6:	AUTO							
	Gateway IP:	0.0.0.0	IPv6 GW:	AUTO							
FTP	Alias:		MTU:	1500							
RADIUS	MAC Addr:	04:f0:21:5e:2a:ab	TX Q Len	1000							
	Rpt Timer:	fast (3 s) 🔻	WiFi Bridge:	NONE							
		WiF	i Settings								
TSO Enabled	SSID: je	dway2-wpa2-2000	AP: DEF	AULT							
UFO Enabled	Key/Phrase: jedway2-wpa2-2000 Mode: 802.11abqn-AC										
GS0 Enabled	Freq/Channel: 5260/52 Rate: OS Default										
LRO Enabled	WPA VPA	A2 OSEN WEP									
🕑 GRO Enabled	GRO Enabled Disable HT40 Enable VHT160 Disable SGI										
Print Display Probe Display Scan Sync Apply OK Cancel											

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Layer 3 (Ethernet, UDP, TCP) Connections

LANforge Manager Version(5.2.13)										+ □ ×	
Control Reporting Tear-Off Info Plugins											
	Stop All Restart Manager Refresh H										h HELP
Attenuators / File-10 / Layer-4 / Test Mgr / Test Group / Resource Mgr / Event Log / Alerts / Port Mgr / Messages											
ľ	Status Layer-3			<u> </u>	L3 End	WanLinks					
Rpt Timer: fast (1 s) 🔻 Go Test Manager all 💌 Select All Start Stop Quiesce Clear											
	npt niner		(1 5)	Go rest Ma	lager an			e ocop	quicoco		i -
	View	0 - 200			Go	[Display	Cr <u>e</u> ate <u>M</u> o	dify C	elete	
					- Crass Connects fo	r Selected Test Ma	nogor				
					-cross connects to	i Selected Test Ma	lager		-	1	
Name	Туре	State	Pkt Rx A → B	Pkt Rx A ← B	Rate A \rightarrow B	Rate A ← B	Rx Drop % A	Rx Drop % B D	rop Pkts A	Drop Pkts B	Avg RTT
xcdx-1	LF/UDP	Run	17,294	17,549	9,998,239	9,997,437	0	0	0	0	1 🔺
xcdx-10	LF/UDP	Run	17,377	17,716	9,997,632	9,996,340	0	0	0	0	0
xcdx-2	LF/UDP		17,548	17,802	9,997,351	9,996,964	0	0	0	0	0
xcdx-3	LF/UDP	Run	17,633	17,802	9,997,891	9,996,964	0	0	0	0	0
xcdx-4	LF/UDP		17,633	17,802	9,997,891	9,996,964	0	0	0	0	1 =
xcdx-5	LF/UDP		17,718	17,036	9,997,947	9,992,326		0	0	0	1
xcdx-6	LF/UDP		17,718	17,044	9,997,947	9,997,018		0	0	0	1
xcdx-7	LF/UDP		17,718	17,044	9,997,947	9,997,018		0	0	0	1
xcdx-8	LF/UDP		17,718	17,044	9,997,947	9,997,516		0	0	0	1 🗸
••••••••••••••••••••••••••••••••••••••	LE/UDD	Due	17710	17.044	0.007.047	0.007.010			0		
<u></u>											
Logged in to: 192.168.100.26:4002 as: Admin											

Layer 3 Create/Modify Screen

\$			udp-se - Creat	e/M	odify Cross C	onnect					_ - • ×	
+ - All					Display	Syn	Batch-Create	1	Apply	ОК	Cancel	
0	Cross-Connect			9		Cross-Connect						
CX Name:	udp-se		Report	Timer:	default (5 s)			-				
CX Type:	LANforge / UDP					Endpoint A			Endpoint B			
	Endpoint A Endpoint B				Pld Pat	ern	increasing		▼ increasing ▼			
Resource:	1 (brent-6port)	•	1 (brent-6port)	-	Min IP Port:		AUTO 🔻		· AUTO -			
Port:	1 (eth0)	-	2 (eth1)	-	Max IP I	Port:	Same 🔻		Same 💌			
Min Tx Rate:	New Modem (56 Kbps)	-	New Modem (56 Kbps)	-	Min Dur	ation:	Forever		Forever 💌			
Max Tx Rate:	Same	•	Same	-	Max Du	ration:	Same		Same 🗸			
Min PDU Size:	AUTO	•	AUTO	-	Min Red	onn:	0 (0 ms) 🗸				•	
Max PDU Size:	Same	•	Same	-	Max Re	onn:	Same	-	Same 🗸		-	
IP ToS:	Best Effort (0)	-	Best Effort (0)	-	Multi-C				 Normal (0) 		-	
Pkts To Send:	Infinite	-	Infinite	-			Script		Script			
							Thresholds	_	Thresholds			
2	Cross-Connect						Endpoint A	Endpoint B				
Test Manager	default_tm			-	Snd But	f Size:	OS Default	-	OS Defa	ult	-	
Quiesce:	3 (3 sec)			-	Rcv Buf	Size:	OS Default	-	OS Defa	ult	-	
	Endpoint A		Endpoint B		Send Ba	ad FCS:	zero (0%)	-	zero (G	%)	-	
IP Addr:	AUTO	•	Αυτο	-	Src MAG	:	00:00:00:00:00:00	-	00:00:0	0:00:00:00:0	• 00	
	Replay File		Replay File				Use-Proxy		Use-Proxy			
	🗌 Loop		🗌 Loop		Ргоху А	ddr:						
	Dest Mac		✓ Dest Mac		Ргоху Р	ort:						
Filename:		_		_	Socket	Priority	: 0		0			
Dest MAC:	<custom></custom>	-	<custom></custom>	-			Payload	_		Payload	1	
5	Endpoint A		Endpoint B				Endpoint A		Endpoint B Do Checksum			
Conn Timeout:	10s (10 s)	-	10s (10 s)	-		L	Do Checksum	-	_			
TCP MSS:	OS Default	-	OS Default	-			Duration Quiesce		UnMai	nageo on Quies	CO	
		_					Quiesce-After-Range	-	_	ce-After-l		
							TCP NODELAY			ODELAY		
							Concurrent IP Addrs			rrent IP /	Addrs	
				[Clear-Port-On-Start		Clear-Port-On-Start					
				[Linear-IP-Ports		Linear	-IP-Ports				
				Endp Nar	ne:	udp-se-A		udp-se-B				

Software Features

- 1. Supports real-world protocols:
 - 1. Layer 2: Raw-Ethernet.
 - 2. 802.1Q VLANs.
 - 3. PPPoE: Integrated PPPoE support.

- 4. Layer 3: IPv4, IPv6, UDP/IP, IGMP Multicast UDP, TCP/IP.
- 5. Layer 4-7: FTP, HTTP, HTTPS, TFTP, SFTP, SCP
- 6. 802.11a/b/g/n Wireless Station (up to 192 per machine).
- 7. 802.11a/b/g/n/ac Wireless Station (up to 0).
- 8. 802.11a/n/ac Wireless Station (up to 192 per machine).
- 9. Layer 4-7: TELNET, PING, DNS, SMTP, NMAP (via add-on script).
- 10. File-IO: NFSv3, NFSv4, CIFS, iSCSI.
- 2. Supports up to 1000 concurrent TCP connections with base license package.
- The CT523c-3ac2-db-10g-cu is able to push around 1.2Gbps using the 802.11AC wave-2 radio, depending on the protocols mix, wireless mode and environment, and speed of the network under test. Supports at least 60 VoIP (SIP, RTP) calls if appropriate licenses are purchased.
 Performance results (this system performs similar to the CT523): Open, wave2 4x4 | TCP-DL-30sta-open wave-1 3x3 | TCP-DL-30sta-wpa2 wave-1 3x3
- 4. Supports real-world compliance with ARP protocol.
- 5. Supports ToS (QoS) settings for TCP/IP and UDP/IP connections.
- 6. Uses publicly available Linux and Windows network stacks for increased standards compliance.
- 7. Utilizes libcurl for FTP, HTTP and HTTPS (SSL), TFTP and SCP protocols.
- 8. Supports file system test endpoints (NFS, CIFS, and iSCSI file systems, too!). File system mounts can use the virtual interface feature for advanced testing of file server applications.
- 9. Supports custom command-line programs, such as telnet, SMTP, and ping.
- 10. Comprehensive traffic reports include: Packet Transmit Rate, Packet Receive Rate, Packet Drop %, Transmit Bytes, Receive Bytes, Latency, Jitter, various Ethernet driver level counters, and much more.
- 11. Supports generation of reports that are ready to be imported into your favorite spread-sheet.
- 12. Allows packet sniffing and network protocol decoding with the integrated Wireshark protocol sniffer.
- 13. GUI runs as Java application on Linux, MAC and Microsoft Operating Systems (among others).
- 14. GUI can run remotely, even over low-bandwidth links to accommodate the needs of the users.
- 15. Central management application can manage multiple units, tests, and testers simultaneously.
- 16. Includes easy built-in scripting for iterating through rates and packet sizes, with automated reporting. Also supports scriptable command line interface (telnet) which can be used to automate test scenarios. Perl libraries and example scripts are provided!
- 17. Automatic discovery of LANforge data generators simplifies configuration of LANforge test equipment.
- 18. LANforge traffic generation/management software is supported on Linux and MS Windows.

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Hardware Specification

1. High-End Appliance with quiet fan and 4 slots.

- 2. Operating System: Fedora Linux with customized 64-bit Linux kernel.
- 3. Two 1Gbps Ethernet ports, room for four additional NICs
- 4. Atheros/Qualcomm 802.11a/n/AC 4x4 MIMO wave-2 5Ghz radio with four external antenna each. Radio spec sheet: https://compex.com.sg/shop/wifi-module/mu-mimo-802-11ac-wave-2/wle1216v5-20/ Supports up to 64 virtual stations per radio. Supports one MU-MIMO capable stations per radio.
- 5. Atheros/Qualcomm 802.11b/g/n/AC 4x4 MIMO wave-2 2.4Ghz radio with four external antenna each. Radio spec sheet: https://compex.com.sg/shop/wifi-module/mu-mimo-802-11ac-wave-2/wle1216v2-20/ Supports up to 64 virtual stations per radio. Supports one MU-MIMO capable stations per radio.
- 6. Antenna-to-Radio association: See labels on chassis.
- 7. Intel 2-port 10G-BaseT (rj45) network adapter card, PCI-e x8, 5GT/s bus. Supports 100Mbps, 1Gbps, 2.5Gbps, 5Gbps and 10Gbps base-t
- 8. Intel(R) Core(TM) i7-7700T 2.9Ghz CPU
- 9. DB9 Serial console (115200 8 N 1) for console management & initial configuration.
- 10. HDMI, VGA, USB ports for desktop usage.
- 11. 8 GB RAM.
- 12. 60+ GB Solid State Hard Drive.
- 13. Larger storage drives available.
- 14. External power supply (brick) supplying 5AMP at 24VCD, 120W. Input: 100-240V, 1.8AMP 50-60Hz
- 15. Weight: 12 lbs
- 16. Dimensions: 7.5 x 9.5 x 8 inches Metric: 190 x 240 x 200 mm.
- 17. Operating Temperature: -10 ~ 60°C.
- 18. Certification: CE, FCC, RoHS

List Price: \$56,300 List Price with 1 Year support (17%): \$65,871

Additional Feature Upgrades

Unless otherwise noted in the product description, these features usually cost extra:

- WanPaths (LANforge-ICE feature set)
- Virtual Interfaces: MAC-VLANs, 802.1Q VLANs, WiFi stations, etc
- FIRE Connections: Base FIRE license includes 1000 active connections.
- WiFi RF Attenuator: Adjust WiFi signal strength in a controllable manner.
- **RF Noise generator:** Generate modulated WiFi RF noise.
- RF Noise / Radar Simulator. Simulate RADAR pulses and other non-modulated RF noise.
- SMA RF Cable Bundle: Used to cable LANforge WiFIRE radios to device-under-test.
- LANforge-ICE Network Emulation.
- VOIP: Each concurrent call over the included package requires a license.
- Armageddon: Each pair of ports requires a license if not already included.
- RF Chambers for WiFi testing.
- External battery pack: 12+ hours for CT520, CT523, CT92X and other platforms.

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