

## CT521-64 LANforge WiFIRE 802.11a/b/g/n dual-radio WiFi Traffic Generator supporting 64 Virtual STA Interfaces

The CT521-64 wireless traffic generator is an excellent choice for testing Access Points and other WiFi networks. The CT521-64 uses a modified Wireless driver for WiFi NICs based on the Atheros chipset. It can support up to 64 Virtual Stations. 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 have a WEP (64 or 128bit) or WPA/WPA2 authentication. More advanced 802.1X authentication is also included. There are two WiFi radios per CT521-64 and multiple LANforge systems can be clustered together for even more realistic radio interference patterns and increased traffic generation capability. Each radio can be configured independently of the other, and supports 802.11 a, b, g or n mode. Transmit power and channel/frequency is configured on a per-radio basis. Most other settings are configurable per virtual station.

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, or n. If the radio is on a 5Ghz channel, the stations can be a or n. The bandwidth can be configured for all protocols. For 802.11n and 802.11AC, configuring the MCS rates also determines the number of spatial streams (1x1, 2x2, 3x3, 4x4 etc).

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 CT521-64 has one small and quiet fan and 6 antenna. It will fit into a small travel bag or briefcase for easy portability. 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 CT521-64 can also be managed over a serial console in text mode or through a directly connected monitor, mouse and keyboard.





NOTE: This product may have a different hardware configuration than the system pictured above.  
Refer to your official quote for details.

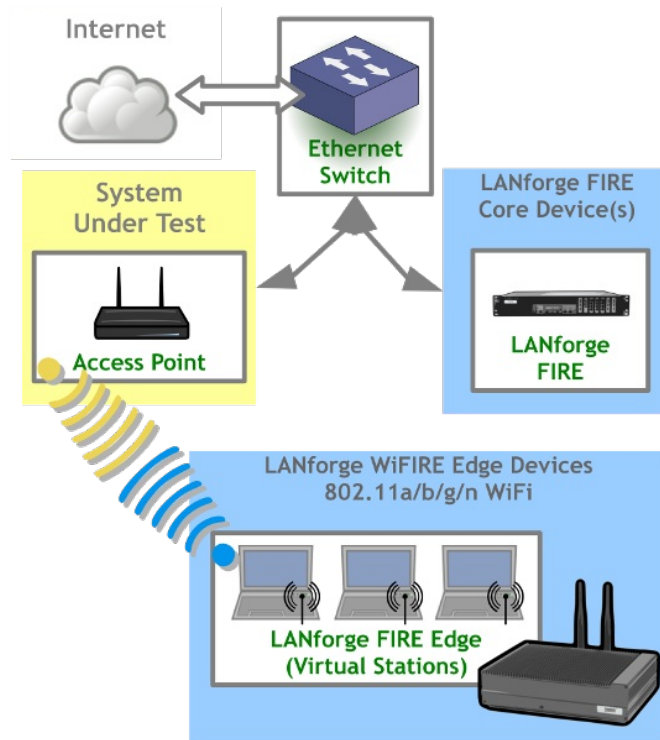
---

Candela Technologies Inc., 2417 Main Street, Suite 201, P.O. Box 3285, Ferndale, WA 98248, USA  
www.candelatech.com | sales@candelatech.com | +1 360 380 1618

## 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.

Candela Technologies Inc., 2417 Main Street, Suite 201, P.O. Box 3285, Ferndale, WA 98248, USA  
www.candelatech.com | sales@candelatech.com | +1 360 380 1618

### 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 CT521-64 WiFi NIC(s).
4. Connect power to standard US or European AC power source. If using external battery pack, then connect to that instead.
5. Install the LANforge-GUI on a separate management PC or Laptop. Windows and Linux GUIs are supported: Select the correct one from the CDROM or Candela Technologies Download page and install it. The CT521-64 appliance has a web server that also provides the LANforge GUIs.
6. The CT521-64 should now boot. If DHCP is enabled on the Management network, the CT521-64 will automatically acquire an IP address. If DHCP is not available, the IP address will be set to **192.168.1.101** by the LANforge scripts.
7. Start the LANforge-GUI on the management PC and click the 'Discover' button. It should find the CT521-64 appliance and add the IP address to the drop-down box in the Connect widget. Press 'Connect'

and you will be connected to the CT521-64.

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 64 Virtual Station interfaces per CT521-64 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 Plugins menu (and right-click on some tables) provides some plugins to do automated testing and reporting. Contact support if you have suggestions for improvements.
10. Any GUI modifications take place immediately after you click 'Submit'.

Candela Technologies Inc., 2417 Main Street, Suite 201, P.O. Box 3285, Ferndale, WA 98248, USA  
www.candelatech.com | sales@candelatech.com | +1 360 380 1618

## LANforge WiFIRE Related Images

### Virtual Station Configuration Screen

**sta1 (brent-521) Configure Settings**

**Port Status Information**  
Current: LINK-DOWN GRO NONE  
Driver Info: Port Type: WIFI-STA Parent: wiphy0

**Port Configurables**

**Standard Configuration** | Advanced Configuration | Misc Configuration | Custom WiFi

**Enable**

- Set IF Down
- 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

**General Interface Settings**

Down  Aux-Mgt

DHCP-IPv6  DHCP Release DHCP Vendor ID: None

DHCP-IPv4  DHCP Client ID: None

DNS Servers: BLANK 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: 00:0e:8e:6f:81:f8 TX Q Len: 1000

Rpt Timer: medium (8 s) WiFi Bridge: NONE

**WiFi Settings**

SSID: brenttest-523 AP: DEFAULT

Key/Phrase: mypasswd Mode: 8 (8)

Freq/Channel: 2437/6 Rate: OS Default

WPA  WPA2  OSEN  WEP  Disable HT40  Disable SGI

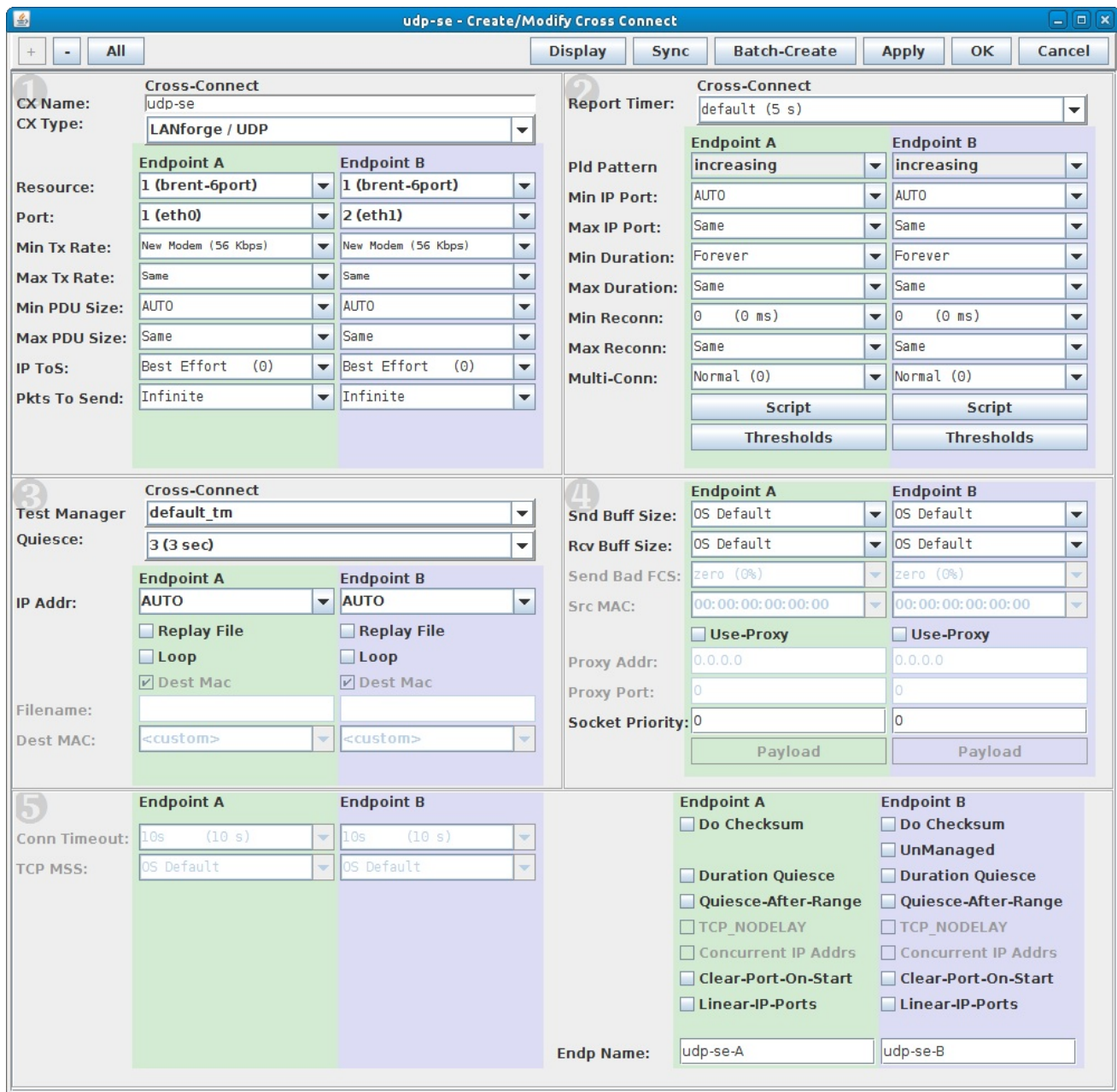
Print View Details Probe Display Scan Sync Apply OK Cancel

## Layer 3 (Ethernet, UDP, TCP) Connections

The screenshot shows the LANforge Manager interface. At the top, there's a menu bar with 'Control', 'Reporting', 'Tear-Off', 'Info', and 'Plugins'. Below the menu bar is a toolbar with buttons: 'Stop All', 'Restart Manager', 'Refresh', and 'HELP'. The main content area is divided into several tabs: 'Attenuators', 'File-I/O', 'Layer-4', 'Test Mgr', 'Test Group', 'Resource Mgr', 'Event Log', 'Alerts', 'Port Mgr', and 'Messages'. The 'Test Mgr' tab is active, showing a 'Layer-3' sub-tab. Below the tabs, there are controls for 'Rpt Timer' (set to 'fast (1 s)') and 'Test Manager' (set to 'all'). There are buttons for 'Select All', 'Start', 'Stop', 'Quiesce', and 'Clear'. A red arrow points to the 'Start' button. Below these controls is a 'View' dropdown set to '0 - 200' and a 'Go' button. The main area contains a table titled 'Cross Connects for Selected Test Manager'. The table has columns for Name, Type, State, Pkt Rx A → B, Pkt Rx A ← B, Rate A → B, Rate A ← B, Rx Drop % A, Rx Drop % B, Drop Pkts A, Drop Pkts B, and Avg RTT. The table lists connections xcdx-1 through xcdx-10, all in 'Run' state. At the bottom, it says 'Logged in to: 192.168.100.26:4002 as: Admin'.

Name	Type	State	Pkt Rx A → B	Pkt Rx A ← B	Rate A → B	Rate A ← B	Rx Drop % A	Rx Drop % B	Drop 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	Run	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	Run	17,633	17,802	9,997,891	9,996,964	0	0	0	0	1
xcdx-5	LF/UDP	Run	17,718	17,036	9,997,947	9,992,326	0	0	0	0	1
xcdx-6	LF/UDP	Run	17,718	17,044	9,997,947	9,997,018	0	0	0	0	1
xcdx-7	LF/UDP	Run	17,718	17,044	9,997,947	9,997,018	0	0	0	0	1
xcdx-8	LF/UDP	Run	17,718	17,044	9,997,947	9,997,516	0	0	0	0	1

## Layer 3 Create/Modify Screen



## 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: FTP, HTTP, HTTPS, TFTP, SFTP, SCP
  6. 802.11a/b/g/n Wireless Station (up to 64 per machine).
  7. Layer 4: TELNET, PING, DNS, SMTP, NMAP (via add-on script).
  8. File-IO: NFSv3, NFSv4, CIFS, iSCSI.
2. Supports up to 1000 concurrent TCP connections with base license package.
3. The CT521-64 is able to push up to 345Mbps through an AP, depending on the protocols mix, wireless mode and environment, and speed of the network under test. Supports at least 20 VoIP (SIP, RTP) calls if appropriate licenses are purchased. More powerful systems are also available.
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, Solaris 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, Solaris and MS Windows.

---

*Candela Technologies Inc., 2417 Main Street, Suite 201, P.O. Box 3285, Ferndale, WA 98248, USA  
www.candelatech.com | sales@candelatech.com | +1 360 380 1618*

## **Hardware Specification**

1. High-End Appliance with quiet fan.
2. Operating System: Fedora Linux with customized 64-bit Linux kernel.
3. Two 1Gbps Ethernet ports, room for two wifi NICs.
4. Two Atheros chipset 802.11a/b/g/n 3x3 MIMO Wireless NICs with three external antenna each. Supports up to 64 virtual stations.
5. Antenna-to-Radio association: <http://candelatech.com/ct521-antenna.php>
6. Intel M-620 Core-i7 2.6 GHz processor.
7. RJ45 Serial console (38400 8 N 1) for console management & initial configuration.
8. VGA, USB ports for desktop usage.
9. 8 GB RAM.
10. 40 GB Solid State Hard Drive.
11. Larger storage drive and compact-flash available.
12. 9-30v 4AMP external power supply (brick).
13. Weight: 8 lbs
14. Dimensions: 11 x 8 x 2.6 inches Metric: 277 x 194 x 67 mm.
15. Operating Temperature: -20 ~ 55°C.

16. Certification: CE Emission, FCC Class A, RoHS Compliant.

List Price: \$14,995    List Price with 1 Year support (17%): \$17,544

---

## 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 / Radar Simulator**: Simulate RADAR pulses and other 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.
- External battery pack: 12+ hours for CT521, CT523, CT919, CT92X platforms. Ask for others.

---

*Candela Technologies Inc., 2417 Main Street, Suite 201, P.O. Box 3285, Ferndale, WA 98248, USA  
www.candelatech.com | sales@candelatech.com | +1 360 380 1618*

Last modified: Fri Mar 3 11:18:35 PST 2017