

## **CT964 LANforge-ICE 1Gbps WAN Emulator - 8GB RAM**

The CT964 is an excellent choice for a 1U rack-mount network emulator supporting speeds up to 990Mbps (bi-directional) on multiple ports. The CT964 comes standard with 8GB RAM to support multiple seconds of latency. The CT964 fits into a standard rack and is 14 inches deep. It supports standard VGA, Keyboard, and Mouse interfaces for easy console/desktop access to the system. The CT964 is relatively noisy, so it is better for a data center deployment than a desktop environment. The CT964 hardware can support up to 4 WAN emulations with each emulation running at near 1Gbps bi-directional. Contact your sales representative if you prefer more than a single WAN emulation. No additional hardware or software is required, but you may wish to manage the system using the LANforge-GUI on a separate machine.



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

## **Example Network Diagram**



This diagram shows how one might use LANforge ICE to emulate a Wide Area Network between a Server and Client. When the Client communicates with the Server, the traffic will flow through the Ethernet switches and then through LANforge ICE. LANforge ICE will enforce the rate limitation and other network emulation as configured. The Client and Server are on the same subnet. For a simpler configuration, the Client and Server can be directly connected to the LANforge ICE system.

### Quick Start Guide

1. Connect Management Ethernet port to Management network or management PC. Or, connect VGA, Keyboard, and Mouse to the chassis and manage it locally.
2. Connect Client to one WAN emulation port and Server to the other. The two interfaces will be bridged and this bridge will inject the network emulation.
3. Connect power plug to a standard US or European AC power source.
4. If managing remotely, 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.
5. The CT964 should now boot. If DHCP is enabled on the Management network, the CT964 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.
6. Start the LANforge-GUI on the management PC, or the CT964 server if managing locally, and click the 'Discover' button. It should find the CT964 appliance and add the IP address to the drop-down box in the Connect widget. Press 'Connect' and you will be connected to the CT964.
7. Select the WanLinks tab in the GUI. One of the pre-configured tests should already be running. You may double-click the row in the top section to modify the configuration. You can also view a real-time report of the test with the 'Display' button. Any modifications take place immediately after you click 'Submit'.

## LANforge-ICE Related Screen Shots

### WanLinks Tab

LANforge Manager Version(5.2.4)

Control Reporting Tear-Off Help

Stop All Restart Manager Refresh HELP

Layer-4 Generic Test Mgr Resource Mgr Serial Spans PPP-Links Event Log Alerts Port Mgr Messages

Status Layer-3 L3 Endps VoIP/RTP VoIP/RTP Endps Armageddon WanLinks Collision-Domains File-IO

Rpt Timer: fast (1 s) Go Test Manager all

Select All Start Switch Stop Clear

Hide Stopped Display Create Modify Batch Modify Delete

**WanLinks for Selected Test Manager**

Name	EID	K-M	State	Endpoints (A <-> B)	Pkt Tx A->B	Pkt Tx A<-B	Rate A->B	Rate A<-B	Rpt Timer
VRWL-1.1.000	6.22	✓	Run	VRWL-1.1.000-A ...	565,080	439,422	1,000,000,000	1,000,000,000	1.00
VRWL-1.1.001	6.3	✓	Run	VRWL-1.1.001-A ...	4,054,185	3,658,228	1,000,000,000	1,000,000,000	1.00
VRWL-1.1.002	6.2	✓	Run	VRWL-1.1.002-A ...	18,632	18,593	44,736,000	44,736,000	1.00
VRWL-1.1.003	6.4	✓	Run	VRWL-1.1.003-A ...	3,657,007	4,040,390	1,000,000,000	1,000,000,000	1.00

**All WanLink Endpoints**

WPs	Name	Run	Script	Max Rate	Tx Pkts	Rx Pkts	Tx Rate	Tx Drop %	Dropped	Tx-Failed	Failed-Late	TX Bytes
+	VRWL-1.1.0...	✓	Stopped	1,000,000,...	439,422	565,088	1,014,228	0	0	0	0	653,589,...
+	VRWL-1.1.0...	✓	Stopped	1,000,000,...	565,080	439,434	1,020,730	0	0	9	0	843,838,...
+	VRWL-1.1.0...	✓	None	1,000,000,...	3,658,228	4,054,215	69,677	0	0	0	0	782,190,...
+	VRWL-1.1.0...	✓	None	1,000,000,...	4,054,185	3,658,203	77,642	0	0	0	0	866,984,...
+	VRWL-1.1.0...	✓	None	44,736,000	18,593	18,613	85,816	0	0	0	0	3,980,56...
+	VRWL-1.1.0...	✓	None	44,736,000	18,632	18,612	85,849	0	0	0	0	3,988,51...

Logged in to: 192.168.100.138:4002 as: Admin

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## WanLink Display

WanLink Display: VRWL-1.1.000 Manager: brent-6port

Endpoint: VRWL-1.1.000-A (1.1.9.65)

Endpoint: VRWL-1.1.000-B (1.1.11.66)

30-sec Averages

WAN Speed: 128 Kbps TX Rate: 128.124 Kbps  
 RX Rate: 130.572 Kbps TX Pkts: 981  
 Dropped: 0 Duplicated: 0  
 Reordered: 0 TX Failed: 0

4.295 Gbps  
 16.777 Mbps  
 65.526 Kbps  
 256 bps  
 0 bps  
 128 Kbps  
 96 Kbps  
 64 Kbps  
 32 Kbps  
 0 bps

Rx Bytes Dropped [Record-Dropped]  
 Rx Throughput [Recorded]

129 KB Backlog

30-sec Averages

WAN Speed: 128 Kbps TX Rate: 127.734 Kbps  
 RX Rate: 140.298 Kbps TX Pkts: 1100  
 Dropped: 0 Duplicated: 0  
 Reordered: 0 TX Failed: 0

4.295 Gbps  
 16.777 Mbps  
 65.526 Kbps  
 256 bps  
 0 bps  
 128 Kbps  
 96 Kbps  
 64 Kbps  
 32 Kbps  
 0 bps

Rx Bytes Dropped [Record-Dropped]  
 Rx Throughput [Recorded]

129 KB Backlog

**WanPaths for WanLink Endpoint: VRWL-1.1.000-A**

Name	Tx Rate	Disabled	!	IF	Filter Pattern	Tx Pkts	Rx Pkts	TX Bytes	RX Bytes	Dropped	Dup Pkts	OOO Pkts	Co

**WanPaths for WanLink Endpoint: VRWL-1.1.000-B**

Name	Tx Rate	Disabled	!	IF	Filter Pattern	Tx Pkts	Rx Pkts	TX Bytes	RX Bytes	Dropped	Dup Pkts	OOO Pkts	Co

Display Selected Paths  Pause Display Print Modify Stop Refresh Clear Close

## Create/Modify WanLink Window

VRWL-1.1.009 - Create/Modify WanLink
Apply OK Display WanLink & WanPaths Cancel

**1 WanLink Information**

Name: VRWL-1.1.009

Presets: CUSTOM

Endpoint A	Endpoint B
Port: 25 (oddVR14b)	27 (oddVR15b)
Transfer Rate: 11 ( 1.544 Mbps )	11 ( 1.544 Mbps )
Delay: zero (0 us)	zero (0 us)
Drop-Freq: zero (0%)	zero (0%)
Jitter: zero (0 us)	zero (0 us)
Jitter-Freq: zero (0%)	zero (0%)

**2 WanLink Information**

Pass-Through  HW Pass-Through

Coupled-Mode  Kernel-Mode

Resource: 1 (lec2010-ath9k-1)

Rpt Timer: fast (1 s)

Endpoint A	Endpoint B
Reorder-Freq: zero (0%)	zero (0%)
Dup-Freq: zero (0%)	zero (0%)
Drop Burst: min 1 max 1	min 1 max 1
Reorder Amt: min 1 max 20	min 1 max 20

Script Script

**3 Endpoint A WAN Paths** **Endpoint B WAN Paths**

Name	Tx Rate	Disabled	!	Filter Pattern	Delay
wp1	1.544 M	<input type="checkbox"/>	<input type="checkbox"/>	Src: 0.0.0.0/0 Dest: 0.0.0.0/0	50

**4 WanLink Information**

CPU-ID: 0

Test Manager: default\_tm

Endpoint A	Endpoint B
Replay File: <input type="checkbox"/> ICEcap Replay	<input type="checkbox"/> ICEcap Replay
Dir: <input type="text"/>	<input type="text"/>
<input checked="" type="checkbox"/> Loop Replay	<input checked="" type="checkbox"/> Loop Replay
<input checked="" type="checkbox"/> Replay Latency	<input checked="" type="checkbox"/> Replay Latency
<input checked="" type="checkbox"/> Replay Loss	<input checked="" type="checkbox"/> Replay Loss
<input checked="" type="checkbox"/> Replay Dup	<input checked="" type="checkbox"/> Replay Dup
<input checked="" type="checkbox"/> Replay Bandwidth	<input checked="" type="checkbox"/> Replay Bandwidth

Dump File:

Force Packet Gap  Force Packet Gap

Drop-Xth  Drop-Xth

Reorder-Xth  Reorder-Xth

QDisc: FIFO FIFO

Max Lateness: AUTO AUTO

Backlog Buffer: AUTO AUTO

	Endpoint A	Endpoint B		Endpoint A	Endpoint B
Corruption: 1 Rate:	0	0	Corruption: 4 Rate:	0	0
Corruption:	Random Write	Random Write	Corruption:	Random Write	Random Write
Byte-to-Write:	0	0	Byte-to-Write:	0	0
Range Offset	min 0 max 0	min 0 max 0	Range Offset	min 0 max 0	min 0 max 0
<input type="checkbox"/> Chain-to-Next	<input type="checkbox"/> Chain-to-Next	<input type="checkbox"/> Chain-to-Next	<input type="checkbox"/> Chain-to-Next	<input type="checkbox"/> Chain-to-Next	<input type="checkbox"/> Chain-to-Next
<input type="checkbox"/> Checksum	<input type="checkbox"/> Checksum	<input type="checkbox"/> Checksum	<input type="checkbox"/> Checksum	<input type="checkbox"/> Checksum	<input type="checkbox"/> Checksum

## Software Features

1. General purpose WAN and Network impairment emulator.
2. Able to simulate DS1, DS3, OC3, OC12, DSL, CableModem, Satellite links and other rate-limited networks, from 10bps up to 1Gbps (full duplex).
3. Can modify various network attributes including: network-speed, latency, jitter, packet-loss, packet-reordering, and packet-duplication.
4. Supports Packet corruptions, including bit-flips, bit-transposes and byte-overwrites.
5. Supports WanPath feature to allow configuration of specific behavior between different IP subnets, MAC addresses or other packet filters using a single pair of physical interfaces. WanPath support may require purchase of additional WanPath licenses, please ask your sales contact for more information.
6. Supports routed and bridged mode for more flexibility in how you configure your network and LANforge-ICE.
7. Supports WAN emulation across virtual 802.1Q VLAN interfaces more efficient use of limited physical network interfaces.
8. Supports 'WAN-Playback' allowing one to capture the characteristics of a live WAN and later have LANforge-ICE emulate those captured characteristics. The playback file is in XML format, and can be easily created by hand or with scripts. The free LANforge-ICEcap tool can be used to probe networks and automatically create the XML playback file.
9. Allows packet sniffing and network protocol decoding with the integrated [Wireshark](#) protocol sniffer.
10. Includes comprehensive management information detailing all aspects of the LANforge system including processor statistics, test cases, and Ethernet port statistics.
11. GUI runs as Java application on Linux, MAC and Microsoft Operating Systems (among others).
12. GUI can run remotely, even over low-bandwidth links to accommodate the needs of the users.
13. Central management application can manage multiple units, tests, and testers simultaneously.
14. Includes easy built-in scripting to automatically iterate through bandwidth, latency and other settings. Advanced programmatic scripting over a TCP socket also supported and example perl libraries and scripts are included.
15. Automatic discovery of LANforge resources simplifies maintenance and configuration of LANforge test equipment.

## Hardware Specification

1. High-End Intel Multi-Core 1U rackmount server.
2. Operating System: Fedora 64-bit Linux with customized Linux kernel.
3. 4 built-in 10/100/1000 Ethernet interfaces, one of which should be used for management.
4. 1 IPMI port.
5. High-availability Ethernet hardware bypass option available.
6. One Quad-Core Intel E3 v2 processor, 3.6+Ghz
7. 1 PCIe x16 slot (2-6 port 10/100/1000, 1-2 port 10G fibre, etc)
8. 8 GB or more RAM.
9. 40 GB or larger Hard Drive.
10. Solid State Drive option available.
11. Standard US or European power supply (automatically detects EU v/s US power).
12. Weight: 18 lbs or 8.2 kg.

13. Dimensions: 17 x 14 x 1.75 inches (14-inch deep 1U rackmount server) Metric: 432 x 356 x 44 mm.

14. Power Supply: Fixed 350W AC

15. Estimated Power Usage: 1.4 Amps @ 120 VAC under load, 0.7 Amps idle.

16. ROHS compliant.

List Price: \$9,290 List Price with 1 Year support (17%): \$10,869

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## 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
- LANforge FIRE traffic generation.
- VOIP: Each concurrent call over the included package requires a license.
- VoIP-Mobile Audio Quality Testing using POLQA/PESQ.
- Mobile-Mobile Audio Quality Testing using POLQA/PESQ.
- 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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Last modified: Tue Mar 17 14:55:49 PDT 2026