

## LANforge Network Tester Overview

- Overview
- LANforge FIRE (Network Traffic Generation tool)
  - LANforge FIRE Business Case
  - LANforge FIRE Features
  - Test Scenarios
    - Typical LANforge FIRE Configuration
    - LANforge FIRE testing DSL
    - LANforge FIRE testing Cable
    - LANforge FIRE generating Line-speed UDP traffic
    - Testing Specific Protocols
    - LANforge FIRE generating HTTP traffic
    - LANforge FIRE generating FTP traffic
    - LANforge FIRE testing file systems with File Endpoints
    - Integrating third-party programs, such as ping
    - LANforge FIRE generating VoIP & RTP traffic
    - LANforge FIRE simulating TFTP (BOOTP/DHCP) traffic
  - Sample Configurations
- LANforge ICE (WAN and Network Simulation tool)
  - LANforge ICE Business Case
  - LANforge ICE Features
  - Test Scenarios
  - Sample Configurations
- LANforge Quote Generator
- LANforge Component Details & Part Numbers

---

*Candela Technologies* , 2614 Aldergrove Road, Ferndale, WA 98248, USA  
[www.candelatech.com](http://www.candelatech.com) | [sales@candelatech.com](mailto:sales@candelatech.com) | +1 360 380 1281

## Overview

Candela Technologies' LANforge platform excels at several different aspects of Network related testing and simulation. The **LANforge FIRE** configuration is used for Traffic Generation, and will be used to simulate the edge of the network you are testing. The **LANforge ICE** feature set is used to simulate the core of a network, and will be used to test and verify applications that communicate through the core. **LANforge ICE** can be used to replace or augment any requirement for having a T1, DSL, OC3, OC12, Satellite, Dial-Up and other limited speed or lossy network link in your network diagrams. **LANforge FIRE** and **LANforge ICE** are two personalities of the same software, so they can even be configured to run simultaneously on the same set of hardware.

---

*Candela Technologies , 2614 Aldergrove Road, Ferndale, WA 98248, USA  
www.candelatech.com | sales@candelatech.com | +1 360 380 1281*

---

## LANforge FIRE Network Traffic Generator

---

The **LANforge FIRE** platform can generate FTP, HTTP, HTTPS, VoIP (SIP, H.323, RTP, RTCP), TCP/IP, UDP/IP, Ethernet, PPPoE, PPP-over-T1, and custom payloads. It currently supports Ethernet (up to Gigabit), 802.1Q VLAN, PPP-over-T1, and Token Ring networks. LANforge software includes support for testing file systems, including network file systems like NFS, SMB, and iSCSI. LANforge FIRE can be configured in many different ways, offering Gigabit Ethernet support on the high end, and high-density and inexpensive 10/100 Ethernet ports for lower speed applications. Using the MAC-VLAN feature, one can emulate an entire subnet of machines with a single LANforge machine. It is specifically designed to meet the requirements of testing today's Last-Mile and Metro-Edge systems which must handle simultaneous customer traffic across a large number of ports, equipment including Digital Subscriber Access Multiplexers (DSLAMs), Cable Access Systems, and their respective Customer Premise Equipment like DSL and Cable modems. Recent LANforge improvements make LANforge an appropriate tool for testing higher-speed networks up to Gigabit line speeds.

**LANforge FIRE** can also be an excellent choice for stress testing your own Linux hardware, especially server type configurations that rely heavily on real-world networking performance. For example, if you are trying to get an idea of how well your new dual-CPU system with 2 Gigabit NICs performs, you could load LANforge on each one (with your own custom compiled kernel if you wish), and drive Ethernet, UDP, TCP, FTP and other traffic against other LANforge enabled stations.

The affordable cost per port, ease of use, and standards compliant networking stack makes the LANforge an essential piece of equipment in every test lab.

### LANforge FIRE: The Business Case

- Validates stability and data throughput on devices under evaluation.
- Useful for testing any network, and especially cost effective for efforts requiring many data-generating ports, such as DSL, Cable-Modem, and Satellite modems.
- Turn key solution. The LANforge systems come pre-installed and configured based upon customer supplied information. Software-only packages are available as well.
- Implements a modular architecture that allows you to leverage your existing LANforge investment as your need for capacity increases.
- Ease of use - Manage entire LANforge installation through one interface, from anywhere on the network.

---

*Candela Technologies* , 2614 Aldergrove Road, Ferndale, WA 98248, USA  
[www.candelatech.com](http://www.candelatech.com) | [sales@candelatech.com](mailto:sales@candelatech.com) | +1 360 380 1281

## Product Features and Highlights

- Supports real-world protocols: (Benchmarked on Candela Technologies-supplied hardware.)
  - Layer 2: Raw-Ethernet (150Mbps, bi-directional, per processor)
  - Layer 3: Armageddon accelerated UDP/IP (960Mbps on Gigabit, 97Mbps on 10/100bt)
  - Layer 3: UDP/IP (250 Mbps, bi-directional, per processor)
  - Layer 3: IGMP Multicast UDP
  - Layer 3: TCP/IP (250 Mbps, bi-directional, per processor)
  - Layer 4: FTP (200Mbps, bi-directional, per processor)
  - Layer 4: HTTP (200Mbps, download, per processor)
  - Layer 4: HTTPS (250Mbps, download, high-end dual-processor system)
  - Layer 4: GOPHER (not benchmarked)
  - Layer 4: TELNET (not benchmarked)
  - Layer 4: PING (not benchmarked)
  - Layer 4: VOIP Call Generator (SIP, RTP, RTCP), 70+ calls per machine
- Supports over 2000 connections on a single machine.
- Supports PPPoE, including automated creation and deletion of the PPPoE interfaces.
- LANforge WiFIRE feature provides advanced testing and traffic loading on 802.11a/b/g Wireless networks.
- Supports real-world compliance with ARP protocol.
- Supports ToS (QoS) settings for TCP/IP and UDP/IP connections.
- Uses publicly available Linux networking stack for increased standards compliance.
- Utilizes [libcurl](#) for FTP, GOPHER, HTTP and HTTPS protocols.
- Supports file system test endpoints (can be used for NFS, SMB and iSCSI file systems too!)
- Supports custom programs, like ping and traceroute.
- Comprehensive traffic reports include: Packet Transmit rate, Packet Receive rate, Packet Receive Drop %, Transmit Bytes, Receive Bytes, Latency, various ethernet driver level counters, and much more.
- Supports generation of reports that are ready to be imported into your favorite spread-sheet.
- Allows packet sniffing and network protocol decoding with the integrated [Ethereal](#) protocol sniffer.
- GUI runs as Java application on Linux, Solaris and Microsoft Operating Systems (among others).
- GUI can run remotely, even over a dial-up modem link to accommodate the needs of the users.
- Central management application can manage multiple units, tests, and testers simultaneously.
- Supports scriptable command line interface (telnet) which can be used to automate test scenarios. Perl libraries and example scripts are also provided!
- Comprehensive management information detailing all aspects of the LANforge system including processor card statistics, test cases, and ethernet port statistics.
- Contains 12 or more physical data-generating ethernet ports per 2U LANforge chassis, and can be purchased in a variety of form factors.
- Emulates up to 250 unique machines with one physical interface with the MAC-VLAN feature!
- Supports up to 250 802.1Q VLANs.
- Automatic discovery of LANforge processor cards simplifies configuration of LANforge test equipment.
- LANforge traffic generation and management software supported on [Red Hat Linux](#) and [Microsoft Windows 2000 and XP](#)

---

*Candela Technologies* , 2614 Aldergrove Road, Ferndale, WA 98248, USA  
[www.candelatech.com](http://www.candelatech.com) | [sales@candelatech.com](mailto:sales@candelatech.com) | +1 360 380 1281

## LANforge VoIP/RTP Call Generator Feature Highlights

- SIP and/or H.323 protocol used for call management.
  - SIP currently supported only on Linux. H.323 supported on both Windows and Linux.
  - SIP/UDP supported, H.323 uses both UDP and TCP.
  - Can use directed mode, where VoIP phones call directly to themselves.
  - Can also use Gateway mode where the VoIP phones register with a SIP or H.323 gateway.
- RTP protocol used for streaming media transport, and supports the following CODECS. More codecs will be supported in the future.
  - G.711u: 64kbps data stream, 50 packets per second (SIP, H.323)
  - Speex: 16kbps data stream, 50 packets per second, [www.speex.org](http://www.speex.org) (SIP ONLY)
  - G.726-16: 16kbps data stream, 50 packets per second (SIP ONLY)
  - G.726-24: 24kbps data stream, 50 packets per second (SIP ONLY)
  - G.726-32: 32kbps data stream, 50 packets per second (SIP ONLY)
  - G.726-40: 40kbps data stream, 50 packets per second (SIP ONLY)
  - G.729a: 8kbps data stream, 50 packets per second (SIP ONLY)
  - NONE: A messaging-only configuration is now supported (SIP ONLY)
- Supports PESQ automated voice quality testing (Not supported on Windows)
- RTCP protocol used for streaming media statistics (SIP only)
- Each LANforge VoIP/RTP endpoint can play from a wav file and record to a separate wav file. Almost any sound file can be converted to the correct wav file format with tools bundled with LANforge. Sample voice files are included.
- Current benchmarks show support for 140 or more emulated VoIP phones per machine.
- LANforge VoIP/RTP endpoints can call other LANforge endpoints or third party SIP or H.323 phones like Cisco and Grandstream. Third party phones can also call LANforge endpoints and hear the WAV file being played.

## LANforge WiFIRE 802.11a/b/g Traffic Generator Feature Highlights

- Useful for testing Wireless Access Points and deployments.
- Can emulate up to 31 802.11a/b/g wireless client stations (Virtual STAs).
- Each Virtual STA can be associated with a particular Access Point (AP).
- Each Virtual STA has unique MAC address, IP address and routing table.
- 128bit WEP supported.
- Supports all LANforge FIRE traffic generation features, including HTTP, TCP, UDP, VOIP (SIP, RTP) and more.

---

*Candela Technologies* , 2614 Aldergrove Road, Ferndale, WA 98248, USA  
[www.candelatech.com](http://www.candelatech.com) | [sales@candelatech.com](mailto:sales@candelatech.com) | +1 360 380 1281

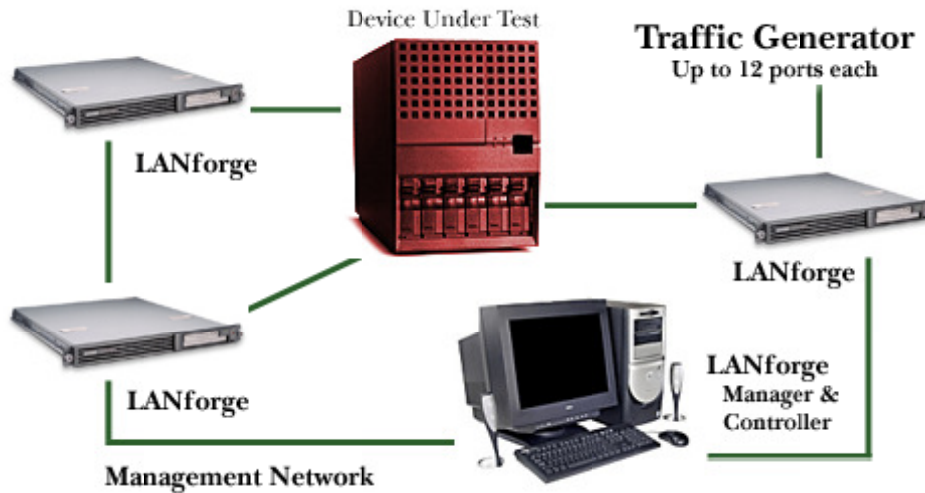
## Test Scenarios

- Run simultaneous Raw Ethernet, UDP/IP, TCP/IP, FTP, VoIP, and HTTP over the same ethernet ports.
- Identify dropped, duplicate, reordered and corrupted packets.
- Create streams of various packet sizes and payloads, including:
  - Fixed payload size and contents.
  - Random payload size and contents.
  - Custom packets, including all headers, as specified by the user.
- Use fine grain control over packet rate, including the ability to specify bursty traffic to give a true representation of customer usage patterns.
- Blast your system-under-test with line speed 64 byte packets with randomized MAC and TCP addresses, to see if it can survive!
- Create regression scripts using LANforge perl libraries or your own favorite scripting language.
- Change MAC Addresses and IP information dynamically with a script, simulating mobile clients.
- Generate file system traffic to test local machine's performance.
- Generate NFS, SMB, and/or iSCSI file system traffic to test network and network-storage devices.

---

*Candela Technologies , 2614 Aldergrove Road, Ferndale, WA 98248, USA*  
*www.candelatech.com | sales@candelatech.com | +1 360 380 1281*

**Figure 1: Typical LANforge Installation**



The LANforge system consists of a single manager process, and one or more traffic generator machines (clients/cards). The cards are connected to the manager over an ethernet management interface so that all management traffic is out-of-band, which ensures accurate reports regardless of the state of the network under test. Only the data-producing ports should be connected to the device or devices under test.

The LANforge manager runs the management server, and potentially, the LANforge GUI (graphical user interface). Because the LANforge GUI connects to the manager over TCP/IP, it can be run remotely, and because it is written in Java, it will work on many different types of computers, including Windows, Solaris, and Linux. Depending on your hardware and speed requirements, you can also run the GUI, Management Server, and traffic-generation server on a single Linux system. That allows the minimum LANforge FIRE installation to be a single machine with 2 or more ethernet interfaces.

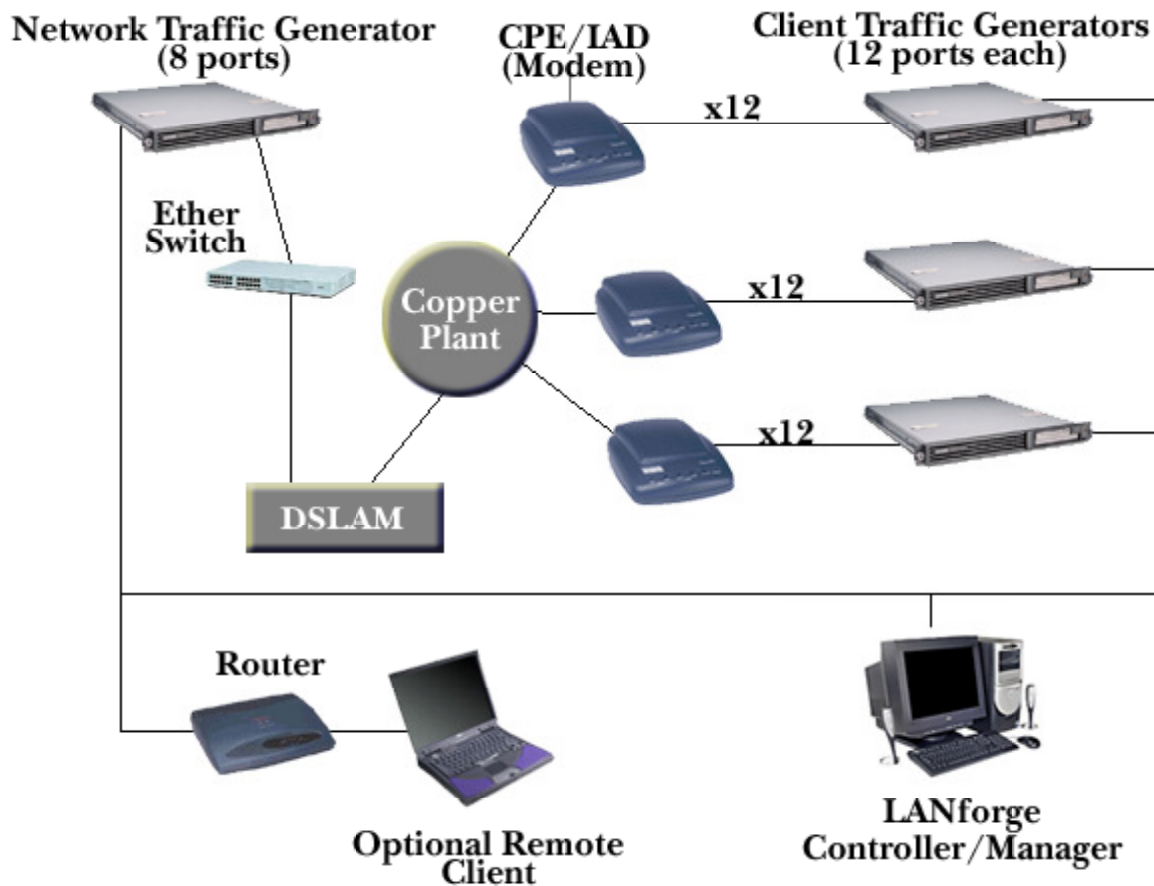
---

*Candela Technologies* , 2614 Aldergrove Road, Ferndale, WA 98248, USA  
[www.candelatech.com](http://www.candelatech.com) | [sales@candelatech.com](mailto:sales@candelatech.com) | +1 360 380 1281

## Specific LANforge Example (DSL)

Suppose that you have a DSLAM you wish to test with the LANforge package. The DSLAM has one 10/100BaseT ethernet interface that goes towards the network, and supports ninety-six (96) CPE DSL modems. Each DSL modem has at least one ethernet port for the customer's equipment (or LANforge) to connect to.

**Figure 2: LANforge testing a DSL System**

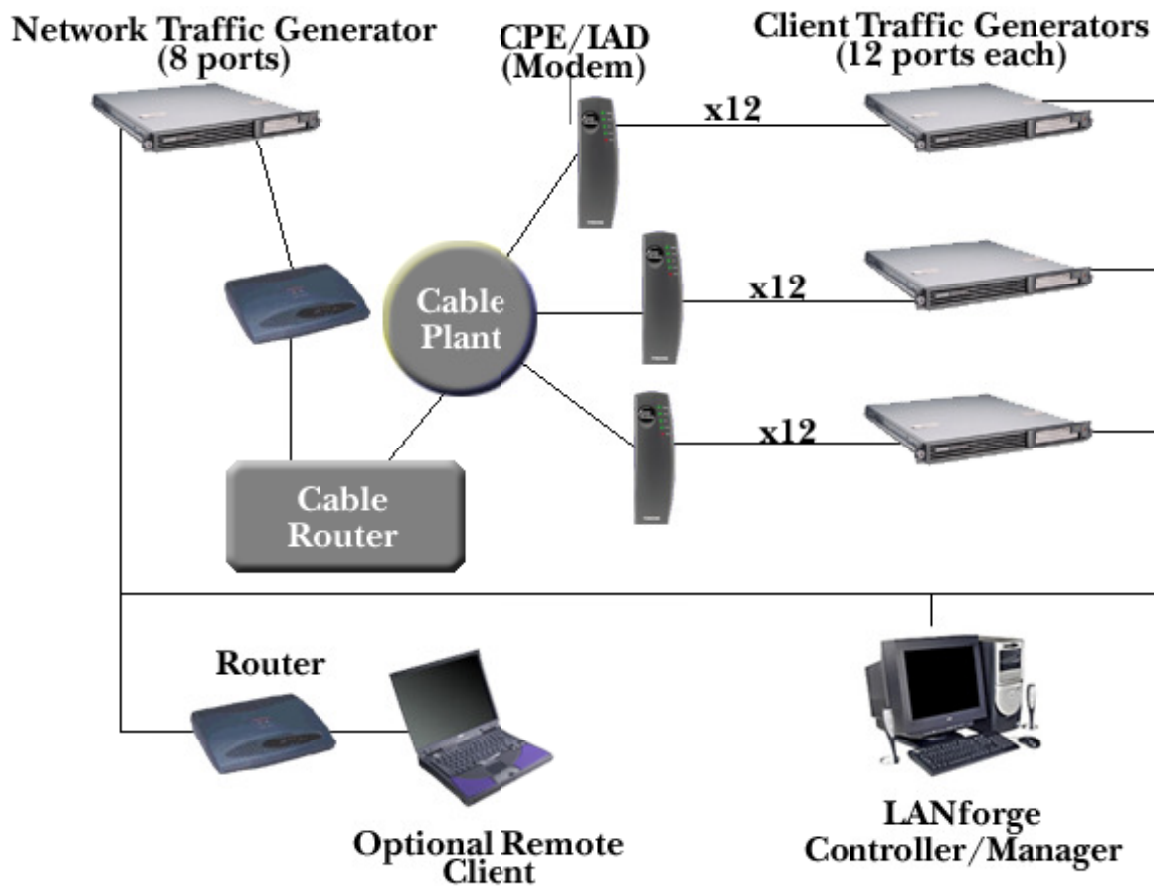


*Candela Technologies* , 2614 Aldergrove Road, Ferndale, WA 98248, USA  
[www.candelatech.com](http://www.candelatech.com) | [sales@candelatech.com](mailto:sales@candelatech.com) | +1 360 380 1281

## Specific LANforge Example (Cable)

LANforge can also test Data-over-Cable systems. The example below illustrates how you might set up LANforge to test a system that includes a router for the upstream data traffic.

**Figure 3: LANforge testing a Cable Access System**



*Candela Technologies* , 2614 Aldergrove Road, Ferndale, WA 98248, USA  
[www.candelatech.com](http://www.candelatech.com) | [sales@candelatech.com](mailto:sales@candelatech.com) | +1 360 380 1281

## Generating Line-speed UDP traffic

**LANforge** supports linux kernel accelerated UDP traffic generation and reception. This feature, known as LANforge Armageddon, generates line-speed packet rates on 10/100Mbps networks, and can currently generate up to 999Mbps on Gigabit Ethernet networks.

LANforge Armageddon can also customize or randomize various Ethernet, IP, and UDP header fields, making it an excellent tool for break-it testing to see if your system-under-test can withstand the onslaught.

---

*Candela Technologies , 2614 Aldergrove Road, Ferndale, WA 98248, USA*  
*[www.candelatech.com](http://www.candelatech.com) / [sales@candelatech.com](mailto:sales@candelatech.com) / +1 360 380 1281*

# Testing Specific Protocols

**LANforge** directly supports: Ethernet, PPPoE, UDP/IP, TCP/IP, FTP, PING, GOPHER, VoIP (SIP, H.323, RTP, RTCP), HTTP and HTTPS. Generally, these protocols will be sufficient to test any network. Some users may want to specify their own packets for specific tests, and to that end, LANforge gives you the ability to input any ethernet packet directly onto the network. The LANforge GUI also offers some protocol builders for common protocols like TCP/IP, UDP/IP, and Ethernet.

- **Generating World Wide Web (HTTP) Traffic**

The World Wide Web generally uses the HTTP protocol, which runs on top of TCP/IP. Typical traffic is highly bursty and contains random sized packets. It is also largely uni-directional, with the bulk of the traffic flowing downstream towards the customer. Because TCP/IP is a stream based protocol, if you are testing a device that routes (as opposed to a simple layer-two bridge), then you will most likely want to have many relatively slow connections flowing from a few LANforge ports representing servers to many LANforge ports representing the clients. These Cross-Connects should have bursty traffic rates, as well as random payload sizes.

You can set up a web server (potentially on another LANforge machine), and tell LANforge to download URLs at some specified rate (urls-per-10-minutes). Unlike browser tests, LANforge will not try to cache any values, so you will always get the traffic patterns you request!

Most other, non-streaming, protocols also run over TCP/IP. It has the nice feature of using all available bandwidth, but it also slows down when the network becomes congested. If you are trying to gauge the total-throughput of a system, TCP/IP Cross-Connects with large (4000 bytes or higher) payloads will be the easiest method. Just tell the LANforge to run at a speed higher than your system-under-test can handle, and then watch the actual rate that LANforge displays.

- **Generating FTP Traffic**

Another popular Internet protocol is FTP. FTP generates highly unidirectional traffic, in either the upload or download direction. LANforge FIRE supports FTP uploads as well as downloads. LANforge machines also come with an FTP server, so you will not need any external equipment to do your testing, though you may use your own FTP server if you so wish.

- **Generating File-System Traffic**

LANforge FIRE can be used to generate file-system traffic (ie read and write to files on the local machine). You can specify, among other features, the size and number of files to read/write and the size of the individual calls to the read and write system calls. You can also calculate and check a 32-bit checksum on the reads & writes for correctness checking. Because Linux can mount file systems over the network, including NFS, SAMBA (SMB), and iSCSI, this feature can allow you to generate network file protocols as well.

- **Using LANforge to integrate generic programs**

LANforge FIRE can launch and display results from almost any command-line Linux tool, such as ping and traceroute. LANforge facilitates your testing by providing a framework in which to run such tools and store their results in a centralized place. Contact Candela Technologies if you have questions about a specific program.

---

*Candela Technologies*, 2614 Aldergrove Road, Ferndale, WA 98248, USA  
[www.candelatech.com](http://www.candelatech.com) | [sales@candelatech.com](mailto:sales@candelatech.com) | +1 360 380 1281

- **Generating VoIP and RTP traffic**

Voice Over IP (VoIP) and other streaming media protocols usually run over UDP/IP. This is a connectionless protocol, and it may lose or re-order packets from time to time. However, it has much less overhead than TCP/IP, and because most streaming protocols are real-time sensitive, it is better to be fast and occasionally lose a packet, than to always run slow(er).

LANforge now supports the SIP and H.323 VoIP messaging protocol, and can generate the RTP media stream as well. A male and female voice wav file is included and the customer can provide other wav files as well. Several RTP codecs are supported including G711u, G729, G726-16, G726-32 and Speex. More codecs will be supported as customers request them. A high-end LANforge chassis can emulate 140 or more VoIP phones, including all SIP messaging and RTP media streams. Multiple LANforge machines can be clustered together for even more call capacity.

- **Simulating TFTP (BOOTP/DHCP)**

The Trivial File Transfer Protocol (TFTP) and Boot Protocol (BOOTP)/Dynamic Host Control Protocol (DHCP) are often used to boot network computers and Customer-Premise-Equipment (cable/DSL modems). All three protocols run over UDP/IP. Generally, these protocols run as fast as their network will allow, so if you are trying to simulate this protocol you will want to tell LANforge to run at the highest speed possible without dropping more than 1% of the traffic. These Cross-Connects should be of type UDP/IP and the payload size should fit into the MTU for your network.

## **Example LANforge FIRE Hardware Configurations**

In order to have a fully function LANforge testing system, you will need at least **one** of the **Data Generator** units with at least 2 ethernet ports. From this basic configuration, you can add more data-generators and more ports to each data generator. If you do not have Candela's Linux kernel patches installed, the minimal configuration is two machines with at least 1 port each.

See the [LANforge Standard Systems](#) page for suggested configurations.

---

*Candela Technologies , 2614 Aldergrove Road, Ferndale, WA 98248, USA  
www.candelatech.com | sales@candelatech.com | +1 360 380 1281*

---

# LANforge ICE WAN Emulator

---

The **LANforge ICE** platform is used to simulate T1, DS3, OC-3, OC-12, GigE, DSL, Satellite, Dial-Up, and other Wide Area Networks (WANs). **LANforge ICE** can simulate many attributes of a WAN, including latency, jitter, packet-loss, packet-reordering, packet-duplication and bandwidth constraints. Latency and jitter is configurable in 1ms increments, and the packet-loss, reordering, and duplication settings are X packets per million.

**LANforge ICE** can be configured to run entirely on a single laptop provided by Candela Technologies or a distributor, and it can also be configured on rack-mounted units or your own machines. The Linux version is currently more accurate and faster, but the Windows solution is fine for speeds of 45Mbps and slower.

## LANforge ICE: The Business Case

- Reduces lab and training costs by replacing expensive WAN hardware, such as T1 and FrameRelay devices.
- Automates testing with various scripting features and libraries.
- Compact form factor and rack-mount chassis conserves valuable lab space.
- Laptop form factor makes LANforge ICE a friendly traveling companion, and a good option for **trade shows** and **customer demos**.
- Validates stability and functionality of devices and programs functioning across a wide variety of network conditions.
- Very affordable, especially when compared to competitors.
- Delivers advanced, remote, cross-platform, graphical management interface.
- Implements a modular architecture that allows you to leverage your existing LANforge investment as your need for capacity increases.
- Turn key solution. The LANforge systems come pre-installed and configured based upon customer supplied information. Software only packages are available as well.
- Ease of use - central management of entire LANforge system from anywhere on the network.

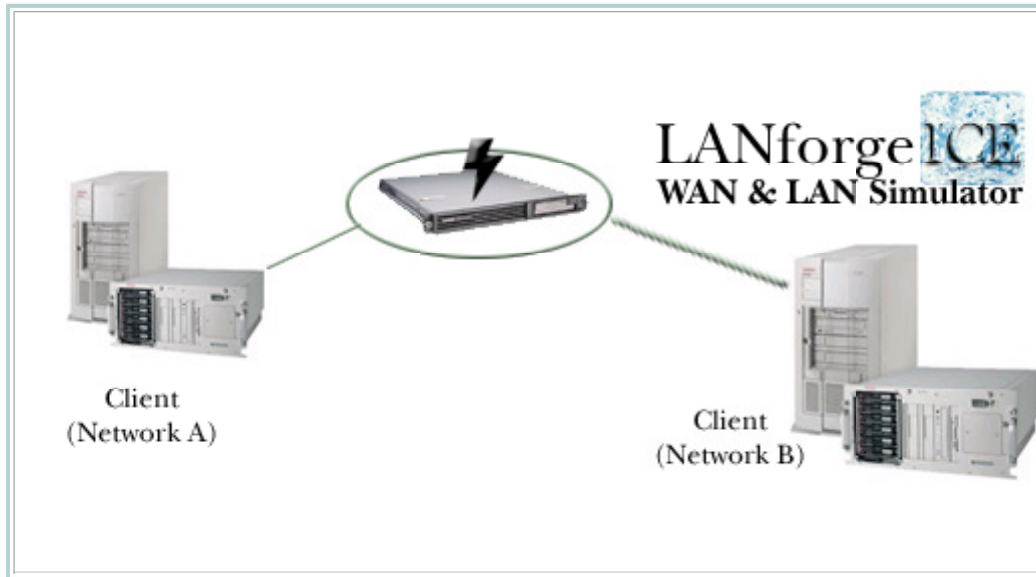
## Product Features

- Able to simulate DS1, DS3, DSL, OC-3, OC-12, GigE, CableModem, Satellite links and other rate-limited networks.
- Can modify various network attributes including: line-speed, latency, jitter, packet-loss, packet-reordering, and packet-duplication.
- Supports WanPath feature to allow configuration of specific behaviour between different MAC/IP pairs or subnets using a single pair of physical interfaces.
- Available configurations include all-in-one Laptops and rackmount systems for stationary labs.
- Allows packet sniffing and network protocol decoding with the integrated **Ethereal** protocol sniffer.
- Comprehensive management information detailing all aspects of the LANforge system including processor card statistics, test cases, and ethernet port statistics.
- GUI runs as Java application on Linux and Microsoft Operating Systems (among others).
- GUI can run remotely, even over a dial-up modem link to accommodate the needs of the users.
- Central management application can manage multiple units, tests, and testers simultaneously.
- Supports scriptable command line interface (telnet) which can be used to automate test scenarios. Perl libraries and example scripts are also provided!
- Automatic discovery of LANforge processor cards simplifies maintenance of LANforge test equipment.
- LANforge traffic generation and management software qualified on **Red Hat Linux** and **Microsoft Windows 2000 and XP**.

---

*Candela Technologies , 2614 Aldergrove Road, Ferndale, WA 98248, USA*  
*www.candelatech.com / sales@candelatech.com / +1 360 380 1281*

**Figure 1: Typical LANforge ICE Installation**



---

*Candela Technologies* , 2614 Aldergrove Road, Ferndale, WA 98248, USA  
[www.candelatech.com](http://www.candelatech.com) | [sales@candelatech.com](mailto:sales@candelatech.com) | +1 360 380 1281

## Test Scenarios

- Simulate a full T1 with 35ms latency, 10ms jitter, and 15 packets-per-million drop rate.
- Simulate a DSL connection with 15ms latency, 10ms jitter, and 150 packets-per-million drop rate, running 784Kbps downstream and 256Kbps upstream.
- Insertion duplicate and reordered packets to verify your RTP streaming protocols can handle it gracefully.
- Create regression scripts using LANforge perl libraries or your own favorite scripting language.

## Example LANforge ICE Configurations

**LANforge ICE** is usually installed on a single machine with two Ethernet ports free for use by LANforge. It takes exactly two ports to simulate a WAN link, but if you wish to run several WAN simulations simultaneously, you may order a **LANforge ICE** configuration with 4 or more ports. **LANforge ICE** also supports 802.1Q VLANs, and when used in conjunction with a properly configured VLAN ethernet switch, a single LANforge machine can easily emulate 48 or more unique networks configurations. The devices under test do NOT need to use or support 802.1Q VLANs, just regular ethernet.

See the [LANforge Standard Systems](#) page for suggested configurations.

---

*Candela Technologies , 2614 Aldergrove Road, Ferndale, WA 98248, USA*  
*[www.candelatech.com](http://www.candelatech.com) | [sales@candelatech.com](mailto:sales@candelatech.com) | +1 360 380 1281*

## Product Specifications & List Prices

For a free, no-obligation quote, go to the [LANforge Quote Generator](#). If you don't have an account already, you will need to [Create An Account](#).

| Product Number | Description                                                                  |
|----------------|------------------------------------------------------------------------------|
| LF0200         | Economy 4-port Appliance                                                     |
| LF1000         | Economy 1U Rack-mount Data Generator                                         |
| LF1001         | Mid-Range 1U Rack-mount Data Generator                                       |
| LF1002         | Dual-Xeon 1U Rack-mount Data Generator                                       |
| LF1010         | 2U Rack-mount Data Generator and/or Controller (12+ ports capacity)          |
| LF1011         | Dual-CPU 2U Rack-mount Data Generator and/or Controller (12+ ports capacity) |
| LF1015         | Economy Portable Data Generator and/or Controller (4+ ports capacity)        |
| LF1016         | Mid-Range Portable Data Generator and/or Controller (4+ ports capacity)      |
| LF1500         | Sleek and portable Laptop, (2 ports capacity)                                |
| SW1000m        | LANforge FIRE Software-only Port License Bundle (100Mbps)                    |
| SW1000         | LANforge FIRE Software-only Port License (100Mbps)                           |
| SW1001m        | LANforge FIRE Software-only Port License Bundle (1000Mbps)                   |
| SW1001         | LANforge FIRE Software-only Port License (1000Mbps)                          |
| SW1002         | LANforge FIRE Software-only VoIP/RTP License.                                |
| SW1003         | LANforge FIRE PESQ license for use with VoIP/RTP Call Generator.             |
| SW1005         | LANforge FIRE: Armageddon Software License (100Mbps)                         |
| SW1006         | LANforge FIRE: Armageddon Software License (1000Mbps)                        |
| SW1011         | LANforge ICE 2Mbps Software-only License                                     |
| SW1012         | LANforge ICE 45Mbps Software-only License                                    |
| SW1013         | LANforge ICE 155Mbps Software-only License                                   |
| SW1014         | LANforge ICE 1Gbps Software-only License                                     |
| SW1020         | LANforge ICE WanPath Software-only License                                   |
| SW1030         | LANforge ICE T1 WanPath Software-only License                                |

---

*Candela Technologies , 2614 Aldergrove Road, Ferndale, WA 98248, USA*  
*[www.candelatech.com](http://www.candelatech.com) / [sales@candelatech.com](mailto:sales@candelatech.com) / +1 360 380 1281*

# LANforge Component Details

## Supported Network Adapters (NICs)

Candela suggests Intel pro/100 and pro/1000 ethernet adapters for most configurations. In most cases, there is no additional cost for the ethernet hardware: The purchase of a chassis and software licenses include the cost of the NICs. In certain cases, such as Fibre ethernet NICs, there will be an additional charge.

Supported Adapters:

- Single port Intel Pro/100 10/100 NIC
- Dual port Intel Pro/1000 10/100/1000 NIC
- Quad port Intel Pro/1000 10/100/1000 NIC
- Quad port Broadcom 10/100/1000 NIC
- Six port Intel Pro/1000 10/100/1000 NIC
- Dual port Intel Pro/1000 Fibre NIC NIC

## Economy 4-port Appliance

The LF0200 is a small appliance with no moving parts. It's dimensions are 6 x 9 x 1.5 inches, and it weighs 3 pounds. The system includes a 1Ghz VIA CPU, 256MB RAM, 512MB Compact Flash disk for the hard-drive, and 4 10/100 ethernet interfaces. The system is powered off of an external DC power supply brick (included). The unit has a serial console for initial configuration, and it is expected that the user will install the LANforge-GUI on their own laptop or desktop to manage the LANforge system. It is possible to manage the system over the serial console using the Command Line Interface if required. The operating system is based on Fedora Core Linux for easy configuration.

The LF0200 is perfect for LANforge ICE WAN emulations up to 45Mbps, and 2 ports of traffic generation at up to 70Mbps (full duplex). The system supports other features such as VOIP as well.

To fully appreciate this small system, please see the pictures of the [front](#), [back](#), and [inside](#) of the machine.



## Economy LF1000 Data Generator

The LF1000 is a 1U (1 Rack Unit) shelf that fits into a standard 19 inch (wide) frame. It is only 15 inches deep. It will come with at least 256MB RAM and a 1.8Ghz or better Intel processor. It can support one [add-in card](#). The LF1000 has Keyboard, Mouse, and Monitor ports, as well as a two built-in 10/100 ethernet network interfaces.

## Mid-Range LF1001 Data Generator

The LF1001 is a 1U (1 Rack Unit) shelf that fits into a standard 19 inch (wide) frame. It is only 15 inches deep. It will come with at least 512MB RAM and a 2.8Ghz P-IV processor. It can support one [add-in card](#). The LF1001 has Keyboard, Mouse, and Monitor ports, as well as a two built-in 10/100/1000 ethernet network interfaces.

---

*Candela Technologies* , 2614 Aldergrove Road, Ferndale, WA 98248, USA  
[www.candelatech.com](http://www.candelatech.com) / [sales@candelatech.com](mailto:sales@candelatech.com) / +1 360 380 1281

#### Dual-Xeon LF1002 Data Generator

The LF1002 is a 1U (1 Rack Unit) shelf that fits into a standard 19 inch (wide) frame. It is only 22 inches deep (a 15-inch deep chassis can be had for about \$500 more.) This system will have 2 Xeon processors and 1GB of RAM. It can support one **add-in card**. The LF1002 has Keyboard, Mouse, and Monitor ports, as well as two built-in 10/100/1000 ethernet network interfaces.

#### LF1010 Data Generator

The LF1010 is a 2U (2 Rack Unit) shelf that fits into a standard 19 inch (wide) frame. It can support up to two 6-port network cards and has 2 built-in 10/100/1000 interfaces. The LF1010 has Keyboard, Mouse, and Monitor ports, as well as a 10/100 ethernet network interface used for management of the unit.



#### LF1011 Data Generator

The LF1011 is a Dual-CPU 2U (2 Rack Unit) shelf that fits into a standard 19 inch (wide) frame. It can support up to two 6-port network cards. This machine will be much more powerful than the LF1010 machine, and will be able to reach Gigabit line speeds (full duplex) with LANforge-Armageddon on at least 2 interfaces. The LF1011 has Keyboard, Mouse, and Monitor ports, as well as a 10/100/1000 ethernet network interface used for management of the unit.

#### LF1015 Economy Data Generator/Management Machine

The LF1015 is a portable small-form-factor machine perfect for demo systems and aesthetic installations. These machines are powerful, and yet run very quiet and are very presentable. The LF1015 will have at least 256MB of RAM and a 2.8Ghz Pentium-4 processor. It can support at least one additional network card. The LF1015 has Keyboard, Mouse, and Monitor ports, as well as a 10/100 ethernet network interface used for management of the unit.



---

*Candela Technologies* , 2614 Aldergrove Road, Ferndale, WA 98248, USA  
[www.candelatech.com](http://www.candelatech.com) / [sales@candelatech.com](mailto:sales@candelatech.com) / +1 360 380 1281

#### LF1016 Mid-Range Data Generator/Management Machine

The LF1016 is a portable small-form-factor machine perfect for demo systems and aesthetic installations. These machines are powerful, and yet run very quiet and are very presentable. The LF1016 will have at least 512MB of RAM and a 3.0Ghz Pentium-4 processor. It can support at least one additional network card. The LF1016 has Keyboard, Mouse, and Monitor ports, as well as a 10/100 ethernet network interface used for management of the unit.



#### LF1500 Laptop: Data Generator/Controller/GUI

The LF1500 is a Laptop configured to run the Linux operating system. It can support two data-generating ports and can run either LANforge ICE or LANforge FIRE. Ideal for a portable network testing and simulation device. Other portable options may be available: Contact Candela Technologies for more information.

#### SW1000m LANforge FIRE Software Only Port License Bundle (100Mbps)

If you wish to provide your own hardware, and load LANforge FIRE software on it, then you can just buy software port licenses. The minimum order is two port licenses. Additional port licenses are sold at a discount. This license is for two 10/100bt (100Mbps) and slower interfaces. See below for SW1000 licensing for additional ports.

#### SW1000 LANforge FIRE Software Only Port License (100Mbps)

If you wish to provide your own hardware, and load LANforge FIRE software on it, then you can just buy software port licenses. The license cost is based on the number of ports, speed of those ports, and the number of machines. This can be a very economical way to create a test environment suited to your particular needs, but it cannot compare with the ease-of-use of pre-configured LANforge hardware delivered to your door! This license is for 10/100bt (100Mbps) and slower interfaces.

#### SW1001m LANforge FIRE Software Only Port License Bundle (1000Mbps)

If you wish to provide your own hardware, and load LANforge FIRE software on it, then you can just buy software port licenses. The minimum order is two port licenses. Additional port licenses are sold at a discount. This license is for two Gigabit-speed (1000Mbps) network interfaces. See below for SW1001 licensing for additional ports.

#### SW1001 LANforge FIRE Software Only Port License (1000Mbps)

If you wish to provide your own hardware, and load LANforge FIRE software on it, then you can just buy software port licenses. The license cost is based on the number of ports, speed of those ports, and the number of machines. This can be a very economical way to create a test environment suited to your particular needs, but it cannot compare with the ease-of-use of pre-configured LANforge hardware delivered to your door! This license is for Gigabit-speed (1000Mbps) network interfaces.

---

*Candela Technologies* , 2614 Aldergrove Road, Ferndale, WA 98248, USA  
[www.candelatech.com](http://www.candelatech.com) / [sales@candelatech.com](mailto:sales@candelatech.com) / +1 360 380 1281

SW1002 LANforge VoIP/RTP Software Only License

Each license can be used to support a single call. A minimum order of 10 licenses may apply. VoIP connections can be made simultaneously with other LANforge FIRE traffic generation protocols like TCP/IP, HTTP and FTP. At least one SW1000 or SW1001 license will be needed for each LANforge machine running VoIP/RTP.

SW1003 LANforge PESQ License

A single PESQ server can be used by any number of LANforge machines, but in general it cannot handle more than about 15 active calls requesting PESQ services at any given time (this is due to hardware limitations). You will need 1 license for each machine on which you wish to run a PESQ server.

SW1005 LANforge FIRE: Armageddon Software Only License (100Mbps)

If you wish to utilize the Armageddon accelerated traffic generation feature, you must purchase an additional software license for each Armageddon connection you wish to run simultaneously. This license is for use with 10/100 (100Mbps) or slower speed interfaces.

SW1006 LANforge FIRE: Armageddon Software Only License (1000Mbps)

If you wish to utilize the Armageddon accelerated traffic generation feature, you must purchase an additional software license for each Armageddon connection you wish to run simultaneously. This license is for use with Gigabit (1000Mbps) speed interfaces.

SW1011 2Mbps LANforge ICE Software Only License

If you wish to provide your own hardware, and load LANforge ICE software on it, then you can just buy software WanLink licenses. This can be a very economical way to create a test environment suited to your particular needs, but it cannot compare with the ease-of-use of pre-configured LANforge hardware delivered to your door! Licenses are priced depending on the maximum allowed speed, and the SW1011 maximum is 2Mbps.

SW1012 45Mbps LANforge ICE Software Only License

If you wish to provide your own hardware, and load LANforge ICE software on it, then you can just buy software WanLink licenses. This can be a very economical way to create a test environment suited to your particular needs, but it cannot compare with the ease-of-use of pre-configured LANforge hardware delivered to your door! Licenses are priced depending on the maximum allowed speed, and the SW1012 maximum is 45Mbps.

SW1013 155Mbps LANforge ICE Software Only License

If you wish to provide your own hardware, and load LANforge ICE software on it, then you can just buy software WanLink licenses. This can be a very economical way to create a test environment suited to your particular needs, but it cannot compare with the ease-of-use of pre-configured LANforge hardware delivered to your door! Licenses are priced depending on the maximum allowed speed, and the SW1013 maximum is 155Mbps.

SW1014 1Gbps LANforge ICE Software Only License

If you wish to provide your own hardware, and load LANforge ICE software on it, then you can just buy software WanLink licenses. This can be a very economical way to create a test environment suited to your particular needs, but it cannot compare with the ease-of-use of pre-configured LANforge hardware delivered to your door! Licenses are priced depending on the maximum allowed speed, and the SW1014 maximum is 1Gbps.

SW1020 LANforge ICE WanPath Software Only License

WanPaths are virtual paths you can set up in LANforge ICE WanLinks to further constrain traffic between individual machines or subnets. WanPaths can match based on IP addresses (and subnets) or MAC addresses.

---

*Candela Technologies* , 2614 Aldergrove Road, Ferndale, WA 98248, USA  
[www.candelatech.com](http://www.candelatech.com) / [sales@candelatech.com](mailto:sales@candelatech.com) / +1 360 380 1281

SW1030 LANforge ICE T1 WanLink Software Only License

T1 WanLinks are used to provide a T1 impairment device. Current supported impairments include configurable latency, X per billion bit-flips and X per billion bit-transposes. Specific T1 hardware, available from Candela Technologies, is required to use this software: Contact Candela for more information.

---

*Candela Technologies* , 2614 Aldergrove Road, Ferndale, WA 98248, USA  
[www.candelatech.com](http://www.candelatech.com) / [sales@candelatech.com](mailto:sales@candelatech.com) / +1 360 380 1281  
Last modified: Thu May 11 14:48:25 PDT 2006