sales@candelatech.com
support@candelatech.com
+1 (360) 380-1618 [PST, GMT -8]

LANforge Server Installation

Contents

Overview

Candela Technologies typically delivers the LANforge system fully installed and configured on tested and approved hardware platforms, such as a 1U rack mounted unit. Anyone having a thorough understanding of Linux operating systems, however, should be able to install and configure a functional LANforge system on their hardware platform of choice. LANforge also supports Windows XP, Vista, and Windows 7, but LANforge works best on Linux.

> ***Legal use of the LANforge system is based upon licensed data-generating ports and/or machines. You must own a license for every port or machine configured to generate traffic.***

This document is targeted at those who wish to install the LANforge Demo software on their own hardware, and those who are re-installing software on hardware furnished by Candela Technologies.

Candela Technologies offers support packages! We want to help you get the most out of our product.

1. Installation/Upgrade with Internet Access

If you are installing or upgrading to LANforge 5.4.5 or higher, and are using Fedora 19 to 36, you may want to use the fully automated installation option. Fedora 36 is currently the suggested OS. For other OS versions, please contact Support for OS installation information.

For *CentOS 6*, see CentOS 6 Instructions.
For *Ubuntu*, see Ubuntu Instructions.

The `lf_kinstall.pl` script will take a base install and add the appropriate packages, install or upgrade LANforge server, GUI, kernel and supporting files and tweak the OS to run best with LANforge. We suggest you create the account `lanforge` on the system before running this script.

1. **Preparation:**
    1. Log into LANforge machine as the `root` user, and open a terminal window.
    2. Make sure you can reach *www.candelatech.com*:
       `# ping www.candelatech.com` ↵.
       If you are unable to reach www.candelatech.com, then possibly your machine:
        - Did not get a DHCP address.
        - Does not have the correct nameserver set.
        - Lacks an Internet connection.

       Please contact support.
    3. Check that you have **perl** installed: `# which perl` ↵
       If perl does not exist, you can install it:
        - On Fedora: `yum install perl`
        - On Ubuntu: `apt-get install perl`
    4. Go to root's home directory: `# cd /root` ↵
2. **Upgrading with `/root/upgrade.bash`:**
    1. Check using `ls update.bash`. If you have *update.bash* you can immedately upgrade with this command: `# ./upgrade.bash` ↵
    2. This command will upgrade system packages and LANforge software.
3. **Using *lf_kinstall.pl* to install or upgrade:**
   You can either download *lf_kinstall.pl* or use the *perl/curl* one-liner:

   Download lf_kinstall.pl:

   ```
   # wget -o lf_kinstall.pl https://www.candelatech.com/;
   chmod +x lf_kinstall.pl ↵
   ```

   Oneline curl/perl call:

   ```
   # perl <(curl -s https://www.candelatech.com/lf_kinstall.txt) {options follow...} ↵
   ```

   (This does not save the file, good for only one use.)

   > i When you see *lf_kinstall.pl* in the examples below, you can replace it with the perl/curl command.

4. Run the install/upgrade script. For **release 5.4.5**, you canse use this command:

   ```
   ./lf_kinstall.pl --do_all_ct --lfver 5.4.5
   ```

   or:

   ```
   perl <(curl -s https://www.candelatech.com/lf_kinstall.txt) --do_all_ct --lfver 5.4.5
   ```

   For **releases 5.4.1 and earlier** and/or different kernel versions, change the version numbers as needed by using the latest information from the release download page.

   Example: install with kernel 5.19.11+ with most options enabled:

   ```
   ./lf_kinstall.pl --do_all_ct --kver 5.19.11+ --lfver 5.4.5
   ```

   Ensure the script **finishes without errors before you continue.** Please contact support if you have questions.

   To see all available options use the following command:
   `# ./lf_kinstall.pl --help` ↵

For 19 and higher systems (gnome-3 based systems), the script will tweak the desktop settings if you are logged into the graphical desktop. If you are not logged in currently, just run the tweak commands next time you do log in (as user lanforge):
`/usr/local/bin/ctgnome.bash`

5. **Interface Names**

   Please double check the interface names: `# ip -br link show`

   For fresh installs, on Fedora 15 and higher, you may wish to change the network device names from the bus enumeration style (`p1p2`) to classic Linux style (`eth0`). If so, edit the `/etc/udev/rules.d/70-persistent-net.rules` file. You will also need to rename and edit the corresponding `/etc/sysconfig/network-scripts/ifcfg-*` files to match the new names. When done, reboot to make sure the system comes back up with the specified kernel and with properly named network interfaces.

6. **Configure the Management Network Interface**

   For fresh installs, you probably need the LANforge to use the correct management network interface.

   - **LFConfig GUI**
     Double click on the LFConfig icon on the desktop.
     1. Select eth0 (or appropriate)
     2. Click Apply

   - **CLI lfconfig:**
     1. ```
        # cd /home/lanforge
        # ./serverctl.bash stop
        # ./lfconfig --new_layout
        ```

        ```
        Key               Acceptable Values          Value
        ************************************************
        log_level         [0-65535]                  7
        log_dir           [directory path]           /home/lanforge
        add_resource_addr [host:port]                SEE LIST ABOVE
        rem_resource_addr [host:port]                SEE LIST ABOVE
        realm             [1-255]                    45
        resource          [1-511]                    1
        mgt_dev           [ethernet device]          eth0
        mode              [resource, manager, both]  both
        log_file_len      [0-2G]                     0
        bind_mgt          [0-1]                      0
        shelf             [1-8]                      1
        dev_ignore        [eth0 eth1 ... ethN]
        first_cli_port    [1025-4199]                4001
        connect_mgr       [host:port]
        gps_dev           [device file]              NONE
        max_tx            [1-500]                    5
        max_send_mmsg_mem [1000-500000]              32000
        max_send_mmsg_pkts [1-1000]                  500
        keepalive         [1000-500000]              30000
        wl_probe_timer    [50-2000]                  50
        Other Commands:   help, show_all
        ************************************************
        ```

     2. `Your command: mgt_dev: eth0`
     3. `Your command: config`
        Please see the LFConfig section to learn mnore about the `lfconfig` command.
     4. If you did not install a new kernel (upgrade) you may restart lanforge:
        `# ./serverctl.bash start`

7. **Reboot the machine:**
   After a fresh (first time) installation, or any time you upgrade the Linux kernel, *reboot the LANforge machine*. `# reboot`

   The machine will reboot to a black screen with a white login prompt.

   Contact Support if you have any questions or notice problems with the install script.

2. **Offline/Local Installation or Upgrade**
        ```

Offline Install Using Bundle

A bundle is a single tar archive that contains all the downloaded elements of a typicall **upgrade of an existing installation**. This reduces effort to copy items to an offline or un-routable instance of LANforge.

You can use the offline-bundle when:

- Your LANforge machine is 64-bit
- Your LANforge machine is Fedora 21 or more recent
- Your LANforge machine already as LANforge installed

You should avoid the install-bundle when:

- You have reinstalled your OS (please be online and use `lf_kinstall.pl --do_all_ct`)
- Your machine is 32-bit (Please ask for a quote for machine upgrade)
- Your machine has not completed the `lf_kinstall.pl --do_all_ct` step

If you have a LANforge machine you purchased from us and it still runs LANforge, you can use the offline-bundle.

Steps for using the offline-bundle:

1. Determine what OS you are using: `cat /etc/os-release` Probably you have Fedora 24, 27, 30, 34 or Fedora 36. The matching bundles would have F24, F27, F30, F34 or F30 in their name for these releases.

   If you have some other OS release that does not have a bundle packaged for it, contact support.
2. Bundles can be found by looking in the release directory, for instance: https://www.candelatech.com/private/downloads/r5.4.5
3. Copy the the install bundle for your OS version to `/home/lanforge/Downloads/` on the LANforge machine.
4. Copy the https://www.candelatech.com/lf_kinstall.txt file to `/home/lanforge/Downloads/lf_kinstall.pl`.
5. Log in as root and change to the install directory: `cd /home/lanforge/Downloads/`
6. Make sure the new lf_kinstall.pl is executable: `chmod a+x lf_kinstall.pl`
7. Use the following command to unpack and install:

   ```
   ./lf_kinstall.pl --use_install_bundle /home/lanforge/Downloads/[install-bundle]
   ```

   Please use the **full path** to the bundle.
8. Reboot system with command: `reboot`

Offline Install

Offline install means LANforge is without access to the Internet and cannot download operating system updates. (You may have to update those packages separately.) You *can* update LANforge in such an isolated environment if you can place a PC with the updates on the same isolated network. These instructions are primarily for updating an existing system.

The version numbers below are examples. Change them as needed by using the latest information by reading the release download page.

The following example is for upgrading a **64 bit**, Fedora **20** based system to LANforge release **5.4.5**:

1. Download the install/upgrade script by saving the following link: https://www.candelatech.com/lf_kinstall.txt

   Note: You may have to copy and paste the `lf_kinstall.txt` from a browser to a plain text document.

2. Copy the lf_kinstall.txt file to the LANforge machine, using winscp or similar and save it in the `/home/lanforge/Downloads` directory. Perform the following commands to get a list of files to download:

```
cd /home/lanforge/Downloads
dos2unix lf_kinstall.txt
chmod a+x lf_kinstall.txt
./lf_kinstall.txt --do_all_ct --print_only --lfver 5.4.5 --kver 5.19.11+
```

You should see output similar to this:

```
# is-ubuntu: 0 mate-installed: 1 install-mate: 0  is-arm: 0 is-fedora: 1  osver
# do-gnome: 0  uveri: 14

# lf_kinstall offline install will need these files:

# https://www.candelatech.com/private/downloads/r5.4.5/ct4.20.17+.x64.tar.gz
# https://www.candelatech.com/private/downloads/r5.4.5/board.bin
# https://www.candelatech.com/private/downloads/r5.4.5/firmware-2.bin
# https://www.candelatech.com/private/downloads/r5.4.5/firmware-2-htt-mgt.bin
# https://www.candelatech.com/private/downloads/r5.4.5/ath10k_stock_fw.tgz
# https://www.candelatech.com/private/downloads/r5.4.5/firmware-2-htt-mgt.bin-9
# https://www.candelatech.com/private/downloads/r5.4.5/firmware-5-htt-mgt.bin-9
# https://www.candelatech.com/private/downloads/r5.4.5/firmware-5-htt-mgt.bin-9
# https://www.candelatech.com/private/downloads/r5.4.5/firmware-5-htt-mgt.bin-1
# https://www.candelatech.com/private/downloads/r5.4.5/ath10k-firmware-2.bin-up
# https://www.candelatech.com/private/downloads/r5.4.5/LANforgeServer-5.4.5_Lin
# https://www.candelatech.com/private/downloads/r5.4.5/xorp_64-F20.tgz
# https://www.candelatech.com/private/downloads/r5.4.5/LANforgeDocs-5.4.5.tar.g
# https://www.candelatech.com/private/downloads/r5.4.5/LANforge-GUI-5.4.5-Insta
# https://www.candelatech.com/private/downloads/r5.4.5/LANforgeGUI_5.4.5_Linux6
# https://www.candelatech.com/private/downloads/r5.4.5/LANforgeGUI_5.4.5_Linux.
```

3. Download the URLs and transfer them to the `/home/lanforge/Downloads` directory. If you do not have a password, you may log in as user `guest` with password `guest`.
4. Log into LANforge machine as the `root` user, and open a terminal window.
5. Perform the following commands:

```
cd /home/lanforge/Downloads
./lf_kinstall.txt --do_all_ct --kver 5.19.11+ --lfver 5.4.5 --source_dir /home/
```

6. Ensure the script finishes without errors before you continue.
7. Reboot the LANforge machine and make sure it comes back up running the proper kernel and LANforge software.
8. Contact Support if you have any questions or notice problems with the install script.

3. Most Recent Fedora Releases

If you get the latest version of Fedora, it will often be more recent than our validated Fedora target. If you are installing LANforge on the *latest* version of Fedora, you will probably discover that our packages are labeled one release behind the most recent Fedora release. Below is an example of doing an offline installation on Fedora 45:

> The installer has a switch for this: **`--force_osver`**

```
./lf_kinstall.txt --do_all_ct --force_osver F45 --lfver 5.4.5 --kver 5.19.11+ --source_dir /home/lanforge/Downloads
```

LANforge Server and GUI software is tested on recent Fedora versions, but it is not always possible to keep up with the *latest* version. In some cases, versions of Fedora have been inappropriate and *those releases get skipped.*

4. CentOS 6 Installation

CentOS 6 (6.9 as of this writing) often installs with a very minimal package set and might require

preparation before they will run the `lf_kinstall.pl` script. This is very true for the CentOS 6 *Minimal Installation*. To prepare the system for LANforge, login as **root** to your system and run the following commands:

```
yum install -y yum-utils
yum-config-manager --enable centosplus > /dev/null
yum-config-manager --enable contrib > /dev/null
yum-config-manager --enable epel > /dev/null
yum makecache fast
yum install -y man bash-completion bind-utils nfs-utils perl screen rsync vim wget
yum update -y
```

After these commands are executed, you can continue with the automated installation instructions. You should not need to reboot.

(Optional) If your system needs access to NFS shares during installation, these commands will enable NFS:

```
/sbin/chkconfig rpcbind on
/sbin/chkconfig nfs on
/sbin/service rpcbind start
/sbin/service nfs start
/sbin/rpc.statd
```

5. Installing LANforge OpenWRT

With LANforge 5.3.8 and higher releases, LANforge has beta support for running on OpenWRT. So far, we only have images for the Netgear r7800 platform (dual 4x4 MU-MIMO radios). These platforms may be useful for testing with many lower-speed appliances to act like a full room of users, for instance.

For a new install, download the **openwrt-ipq806x-netgear_r7800-squashfs-factory.img** image from our downloads page. For an upgrade, see next section.

To install on the Netgear r7800, you first connect it to a Linux machine that has 'tftp' installed on it. The Linux machine should have a network port on the 192.168.1.X subnet, with IP address other than 192.168.1.1. Connect the r7800 LAN port 4 to this interface. Power up the Netgear with the 'reset' pin pressed. The power LED should start blinking **white** after a short time. This indicates that the r7800's boot loader is waiting for tftp.

On the Linux machine, cd to the directory that contains the factory.img file that you downloaded. Upload the file to the r7800:

```
tftp 192.168.1.1
 tftp> bin
 tftp> put openwrt-ipq806x-netgear_r7800-squashfs-factory.img
```

The r7800 should reboot soon after. The yellow port will be the management port and will try to do DHCP by default. If it cannot get a DHCP address, it will be 192.168.1.101.

Connect with ssh to the r7800 as the `root` user (there is no password by default). To complete the install, run these commands:

```
cd /home/lanforge
./install.bash   # Ignore the warnings about copying over the same file
./lf_kinstall.pl --lfver 5.4.5 --do_sys_reconfig
reboot
```

6. Upgrading LANforge OpenWRT

Download the **openwrt-ipq806x-netgear_r7800-squashfs-sysupgrade.bin** image from our downloads page.

Use scp to copy this file to the temp directory on the r7800, for instance:

```
scp openwrt-ipq806x-netgear_r7800-squashfs-sysupgrade.bin root@192.168.100.221:/tmp/
```

Log into the r7800 and do the upgrade:

```
sysupgrade /tmp/openwrt-ipq806x-netgear_r7800-squashfs-sysupgrade.bin
```

The system will reboot, when it comes back up, log in again and configure LANforge:

```
cd /home/lanforge
./install.bash   #Ignore the warnings about copying over the same file
./lf_kinstall.pl --lfver 5.4.5 --do_sys_reconfig
reboot
```

7. Hardware Requirements

The LANforge-FIRE Network Traffic Generator configuration typically requires at least two ethernet ports: one for network management and one for data-generation. The LANforge-ICE Network Emulator works best using a minimum of three ethernet ports. Your unit's performance will be directly related to the CPU and memory as well as the quality of the ethernet hardware and PCI(e) bus. Candela Technologies suggests a minimum of 128MB RAM and a 600Mhz processor. You may be interested to look over the LANforge Hardware Install Guide for more information.

8. Software Requirements

NOTE: LANforge now has limited support for the Microsoft Windows operating systems. See the Microsoft specific install section for more information.

The LANforge product line is primarily developed and tested on Fedora Linux. However, the LANforge processes should work on any distribution based on the 2.6 or higher Linux kernel. To help guarantee success, Candela Technologies recommends that you use Fedora Linux with Candela's custom kernel. If using Fedora Core 4 or higher, be sure to disable SELinux. See below for a suggested kernel patches and .config file if you are compiling your own kernel. Specific work-arounds for Suse and other versions of Linux are found in the troubleshooting section at the end of this document.

The installation should include the following:

`/usr/bin/perl`

Required: Perl scripting language.

`/sbin/ip`

Required: IP configuration tool, verify version with: `/sbin/ip -V`

`/usr/sbin/brctl`

Suggested: Bridge utilities.

`/usr/sbin/dhcpd`

Suggested: DHCP Server.

Any modern distribution should install everything that is required by default, and optional packages can be installed with the normal package management tools (yum, apt-get, etc).

Virtual Router OSPF support

If you want to use Virtual Routers with OSPF or multicast routing, download the xorp package from the LANforge release directory.

To install:

1. Change directories to /usr/local as root:
   `# cd /usr/local`
2. Unzip the download:
   `$ tar -xvzf xorp*.tgz`
3. Run the install script. It will create a xorp user, add xorp to both root and xorp groups, and

attempt to fix library problems if any exist.

```
# cd /usr/local/xorp
# ./xorp_install.bash
```

Installing a LANforge Linux Kernel

1. Download an appropriate pre-built kernel from the downloads page.
2. Install the kernel as root with command similar to:
   ```
   # cd /
   # tar -xvzf /home/lanforge/ct2.6.31.6.p4s.tar.gz
   # /usr/local/bin/kinstall_ct2.6.31.6.bash
   ```
   If you are using Suse, this kinstall script will probably fail. Try making the initrd script with a command similar to:
   ```
   # mkinitrd -k ct2.6.31.6.img -i initrd-ct2.6.31.6.img
   ```
3. Update GRUB (the bootloader):
   - Please use the lf_kinstall.pl script to do this.
   - `# ./lf_kinstall.pl --do_grub --kver 2.6.31+`
   - Please do not edit the /boot/grub2/grub.conf files manually.
   - If you need to change boot settings, please edit `/etc/default/grub`. If you do edit that, follow it up with:
     - Fedora: `# grub2-mkconfig -o /boot/grub2/grub.cfg`
     - Ubuntu: `# update-grub2`

Compiling Your Own Linux Kernel

NOTE: For optimum performance, you should use one of the pre-compiled LANforge Linux kernels, or compile your own with the Candela patches applied. Pre-compiled LANforge Linux kernels can be found on the Downloads page.

Candela now publishes its patched linux tree in a public git code repository on github.

1. Download the kernel source respository:

   ```
   $ git clone https://github.com/greearb/linux-ct-4.7.git
   ```

   More kernels are available on github: https://github.com/greearb?tab=repositories.
2. Use one of the config files in the `linux-ct-4.7/configs` directory as a starting point.
3. If you are unsure how to compile kernels, consider using a pre-compiled one or contact Support.

9. Getting Your Linux Box Ready for LANforge

1. **Install the Necessary Hardware.**

   Ensure that you have at least two ethernet interfaces installed in your target platform. Ensure you have at least 64MB of RAM installed. LANforge is very flexible, so if you have hardware constraints that do not appear to be supported by LANforge, please contact Support. It is likely we have a solution!

2. **Install and Configure the Linux Operating System.**

   Choose a distribution that meets the requirements above and install according to its instructions. If you are using RedHat or Fedora, choose the 'Server' or 'All' package selection, or customize to your specific needs and hope it works! (It probably will.)

   An IP address should be assigned to the management port, and the other ethernet port(s) can be left unconfigured at this time. You can use DHCP for the management port.

   It is assumed that the user will be able to correctly configure the Linux Operating system.

   In addition to installing the OS, you may want to install and configure the Network Time

Protocol (NTP) tools. You can configure NTP as part of the initial login process on Fedora Core 2 and above.

3. **Install the Wireshark Packet Sniffer.**

   If you would like to be able to have LANforge automatically launch the Wireshark packet sniffer, then you must install Wireshark. If you choose not to install Wireshark, however, LANforge will still function normally. The particular version to install and additional packages you have to download depends on your Linux distribution. For Fedora Core 5 and similar distributions, Wireshark is included on the install CDROMs, though it is not always installed by default. You can usually install it with this command as root user:

   ```
   # yum install wireshark-gnome
   ```

   In the end, LANforge will attempt to execute a file called `/usr/sbin/wireshark`. If that fails, it will attempt to execute `/usr/sbin/ethereal`. So as long as one of these files exists, it will work.

   To install the very latest Wireshark with LANforge support, perform the following steps on your LANforge system as root user.

   ```
   $ yum install -y shtool libtool bison flex glib2-devel gtk2-devel libpcap-devel
   $ cd /home/lanforge
   $ git clone https://code.wireshark.org/review/wireshark
   $ cd wireshark
   $ git checkout HEAD
   $ libtoolize --force
   $ aclocal
   $ autoheader
   $ automake --force-missing --add-missing
   $ autoconf
   $ ./configure
   $ make
   $ make install
   $ if [ -f /usr/local/bin/wireshark-gtk ]; then mv -f /usr/local/bin/wireshark-g
   ```

4. **Install Perl Library: Net::Telnet for use with LANforge Scripting.**

   If you wish to use LANforge scripting, you will need the Net::Telnet perl library installed. The easiest way to install is to use Perl's MCPAN tool:

   ```
    $ perl -MCPAN -e shell
   ## Choose 'no' when it asks you if you want to manually configure
   ## perl.  The auto-config works just fine.
   CPAN> install Net::Telnet
   CPAN> quit
   ```

10. Installing LANforge Server on Linux

Now that you have the Linux Operating System installed on your box, you are ready to install the LANforge components.

1. **Become root user** `$ sudo su` ↵

   Other commands work well: `sudo -s`, `su - root`

2. **On Ubuntu, Redhat 7, CentOS 7**

   Please use `# ./lf_kinstall.pl --do_interop --lfver 5.4.6` ↵. That command will:

   1. Create the *lanforge* account
   2. Install required libraries
   3. Install package dependencies.
   4. Configure the desktop to use MATE.
   5. Install xrdp and vnc servers.

6. Install LANforge GUI

3. Other Linux Systems

Follow these instructions if you have a Linux system installed and you want to run LANforgeServer on it, but do not want to run `lf_kinstall.pl` to install all the required dependencies. **This is unlikely to work well.** If this doesn't work well, you might need to reinstall your OS to get it back to its former state. We suggest you:

1. Maintain current Candelatech support so we can help you.
2. Backup your machine using a disk-image program like Ghost.

Manual Steps

1. **Create LANforge Accounts**
   You should create a lanforge user and install the LANforge software in that user's home directory. Use your preferred method, or use mine:
   ```
   # adduser lanforge
   # passwd lanforge
   ```
2. **Install LANforge Server**
   Copy the LANforgeServer-X.X.X_Linux-XX.tar.gz file to some temporary directory and un-tar it with a command like:
   `# tar -xvzf LANforgeServer-*_Linux-x86.tar.gz` That command should create a LANforgeServer-X.X.X directory, in which the distribution exists. Change to that directory as root, and you will find an install.bash file.
   Run this script:

   ```
   # ./install.bash
   ```

4. Configure LANforge Server

NOTE 1

> The `lfconfig` tool often scrolls information off the screen, so you may need to scroll back to see useful information. On the console, use `SHIFT-PageUp`, `SHIFT-PageDown`.

NOTE 2

> Make sure you enter 'config' when done with the lfconfig changes: It is the `config` option that creates the files needed to run the LANforge applications.

NOTE 3

> Make sure that each resource machine has a unique identifier. This identifier is specified as 'resource', and you can find more details below.

NOTE 4

> If you wish to run the LANforge-ICE WAN Emulator on a machine with only two ethernet ports, the management device (mgt_dev) must be 'lo', the loopback device. This means you will not be able to get network connectivity to this machine when LANforge is running as both of the ICE interfaces must have an IP address of `0.0.0.0`

After running the install script, cd to the `/home/lanforge` directory as root and run the lfconfig script to configure LANforge:

```
$ cd /home/lanforge
$ ./lfconfig
```

It is an interactive script that allows you to set certain configuration options and then generate the start/stop scripts to control LANforge. The lfconfig script now hides some of the less often used options. You can view them with the `show_all` command. However, for most configurations, you will not need to change any of the hidden options.

When you start `lfconfig`, you will see something like this:

```
Interfaces: eth0 eth1 eth2 eth3
Resource interface assignment:
  Resource 1:  eth0 eth1 eth2 eth3
Specified Resource Addresses:
  127.0.0.1:4004
Key              Acceptable Values          Value
************************************************
log_level        [0-65535]                  7
log_dir          [directory path]           /home/lanforge
add_resource_addr [host:port]               SEE LIST ABOVE
```

```
rem_resource_addr [host:port]               SEE LIST ABOVE
realm             [1-255]                   255
resource          [1-511]                   1
mgt_dev           [ethernet device]         eth0
mode              [resource, manager, both] both
bind_mgt          [0-1]                     0
shelf             [1-8]                     1
dev_ignore        [eth0 eth1 ... ethN]
first_cli_port    [1025-4199]               4001
connect_mgr       [host:port]
gps_dev           [device file]             NONE
max_tx            [1-500]                   5
wl_probe_timer    [50-2000]                 50
Other Commands:  help, show_all
************************************************
If these values are correct, enter 'config', otherwise change
the values by entering the key followed by the new value, for example:
mode manager
Your command:
```

Here are the values you can manipulate, and what they mean:

log_level

Suggested value is 7, run the btserver binary with the -h option to see what the logging level means.
Example: log_level 7

gps_dev

GPS Device, for those wishing to integrate a GPS through the serial port using the NMEA protocol.
Example: gps_dev /dev/ttyS0
Example: gps_dev NONE

log_dir

Suggested value is /home/lanforge, specifies where the logs are to be stored.
Example: log_dir /tmp

dev_ignore

If you don't want to use some of your interfaces for LANforge, then enter them here. Otherwise, lfconfig will attempt to use them all.
Example: dev_ignore eth5 eth6 tr3

add_resource_addr

Add to the list of remote LANforge addresses. These are LANforge resources that will otherwise not be discovered for various reasons. You must have TCP/IP connectivity to them of course!
Example: add_resource_addr 192.168.5.5:4002

bind_mgt

If enabled, LANforge will only listen on the mgt-dev's IP for management traffic. If disabled, it will listen on all IPs on the local machine. Enabling this can help make LANforge more secure, but may also make it harder to access. The value 0 means disabled, 1 is enabled. NOTE: If you enable the bind_mgt option and are in mode 'both', and not using 'lo' for management device, then you will need to explicitly add a resource addr for [ip-of-mgt-port]:4004 so that the manager can communicate with the client process.
Example: bind_mgt 1

rem_resource_addr

Remove from the list of remote LANforge addresses. These are LANforge resources that will otherwise not be discovered for various reasons. You must have TCP/IP connectivity to them of course!
Example: rem_resource_addr 192.168.5.5:4002

max_tx

Maximum number of packets to tx per 'round.' The higher this number is the better performance you may achieve. However, if you make it too high, you may increase dropped packets due to making the traffic pattern too bursty. Suggested value is between 5 and 10 for traffic patterns around 2000 packets-per-second.

Example: max_tx 50

keepalive

Resource keepalive timer, in miliseconds. After this time with no communication, the manager will request an update, and after 4 times this interval, the remote resource process will be considered dead. Default is 30,000 (30 seconds.)
Example: keepalive 60000

wl_probe_timer

Number of milliseconds between probes of kernel-mode WanLink stats. Default is 50. Increasing this will save some processing time, at the cost of less accurate 3-second report averages and graphs. Example: wl_probe_timer 50

realm

LANforge resources grouped (clustered) with the same realm value can be managed by a single LANforge-GUI. LANforge processes will ignore messages from other realms. Valid range of values is 1-255, inclusive, and the default is 255. If set to 255, it will never cluster with other LANforge systems, even if the other system is set to 255 also.
Example: realm 1

shelf

This is the virtual 'shelf' that this LANforge instance should belong to. Unless you have a very large installation, you should enter 1 here. If you have more than 511 LANforge resources, then you will need to put them into a second shelf.
Example: shelf 1

resource

Every LANforge resource (data-generator) on a given shelf MUST have a unique instance (machine) identifier. Suggested values are 1 for the first data-generator machine, 2 for the second, 3 for the third, etc. This was previously called 'client'.
Example: resource 1

first_cli_port

This is the CLI (command line interface) port. If you have multiple resources configured on the same machine (unlikely), then the second will be 2 greater than the first, etc. The binary (GUI) port for a given resource will always be one more than the CLI interface port. You can usually leave this at its default: 4001
Example: first_cli_port 4001

connect_mgr

Tell resource to connect to a known manager. Normally managers connect to resources, but sometimes it's useful to connect the other way to get around firewalls and when using mobile resources that may often change their management IP address.
Example: connect_mgr 192.168.100.20:4002
Example: connect_mgr NONE

mgt_dev

This is the ethernet device that the LANforge management traffic is carried over. The management devices for the LANforge manager and LANforge resources should be connected to the same ethernet broadcast domain (LAN). If you want this system to be completely self-contained, you can have mgt_dev be lo (loopback).
Example: mgt_dev eth0

mode

This determines the behavior of the LANforge software. You need exactly one LANforge manager for each network, and at least 1 LANforge resource. The basic software is the same, and its behavior is determined by the mode you enter here. Use 'both' for a single machine configuration. For multiple machine configurations, you will usually have one machine in mode 'both', and the remaining machines in mode 'resource'.
Example: mode resource

Example Configurations

- **All-in-One/Stand-alone LANforge-ICE WAN Emulator & Traffic Generator**

  This is the default configuration and enables a machine with 3 ports to be a fully functional WAN emulator and/or traffic generator. The LANforge-GUI can be installed on the same machine to enable easy management as well. **NOTE**: LANforge resources with the default realm of 255 cannot be clustered. See the clustered resources example below to enable this feature.

```
mgt_dev eth0
resource 1
realm 255
mode both
config
```

- **LANforge data generator (or WAN Emulator) Resource only machine**

  Generally, you will have one system that is both a manager and a traffic generator (see above), and the rest will be only resources. The manager will discover the resources and will be the central point for configuring the entire system. The resource machines must have unique identifiers (resource must be unique). **NOTE**: LANforge resources with the default realm of 255 cannot be clustered. See the clustered resources example below to enable this feature.

```
mgt_dev eth0
resource 2
realm 22
mode resource
config
```

- **LANforge Manager with Clustered Resources**

  Configure LANforge resources in the same realm as the manager as illustrated by the list of lfconfig key value entries in the example below:

Manager (Resource #1)	Resource #2	Resource #3	Resource #4

`mgt_dev eth0`
`resource 1`
`realm 22`
`mode both`
`config`
	`mgt_dev eth0`
	`resource 2`
	`realm 22`
	`mode resource`
	`config`
		`mgt_dev eth0`
		`resource 3`
		`realm 22`
		`mode resource`
		`config`
			`mgt_dev eth0`
			`resource 4`
			`realm 22`
			`mode resource`
			`config`

  All clustered resources will now be displayed on the **Status** page of the LANforge-GUI and will be listed in the **Port Mgr** tab.

  NOTE: Entering the `config` command creates a port configuration file called `lanforge_eth_1` for resource 1 or `lanforge_eth_2` for resource 2, etc., which are saved in the `/home/lanforge` directory.

After running the lfconfig script, you should have a box that is functionally similar to the LF1000 Series units. Now, go to the Hardware Installation Guide and proceed to install your new box into the LANforge system.

5. **Start LANforge Servers**

   To start the LANforge servers, use the **serverctl.bash** script as root:

```
# ./serverctl.bash start
```

   From now on, the LANforge server will be started when the machine boots.

iSCSI Client

Two packages must be installed to support ISCSI client. Following installation, the Level 3/5 iscsi and iscsid services must be disabled to facilitate LANforge control. LANforge can/should configure the rest of it for you by setting up file-io endpoints of type iscsi.

- 32-bit installation as root:
  ```
  # yum install iscsi-initiator-utils.i386 scsi-target-utils.i386
  ```

- 64-bit installation as root:
  ```
  # yum install iscsi-initiator-utils.x86_64 scsi-target-utils.x86_64
  ```

- Disable services after installation as root:
  ```
  # chkconfig iscsi off
  # chkconfig iscsid off
  ```

11. Configuring a Static IP Address

For current LANforge releases, you can just use the GUI to set the preferred fixed address (or DHCP) from the **Port-Mgr** tab just as you would configure any other interface. For older LANforge releases, or if you prefer to do it manually, follow the steps below.

NOTE: You should NOT change the management interface's IP address while LANforge is running. You should first stop LANforge, then change the IP, then start LANforge again. Or, you can just reboot the machine and the new settings will take affect automatically.

- Stop LANforge as root:
  ```
  # /home/lanforge/serverctl.bash stop
  ```

- **NOTE**: For Redhat, Fedora, and similar systems, you will edit the `/etc/sysconfig/network-scripts/ifcfg-[device-name]` file.

  These examples assume the management interface is called 'eth3'. Your system may be using a different management interface! A DHCP configuration file looks similar to:

  ```
  DEVICE=eth3
  ONBOOT=yes
  BOOTPROTO=dhcp
  ```

- To change to a fixed address, use settings similar to:

  ```
  DEVICE=eth3
  ONBOOT=yes
  IPADDR=192.168.1.101
  NETMASK=255.255.255.0
  ```

- You may also want to configure the default gateway/router for the system by editing the `/etc/sysconfig/network` adding a line similar to:

  ```
  GATEWAY=192.168.1.1
  ```

- To have the new settings take affect, you can bring the interface down and back up again with the commands (as user root):

  ```
  # ifdown eth3
  # ifup eth3
  ```

- Or if connected via IP:

  ```
  # (ifdown eth3; ifup eth3)
  ```

- Start LANforge as root:

  ```
  # /home/lanforge/serverctl.bash start
  ```

12. Installing LANforge Server on MacOS

1. **Become root user**

```
$ sudo su - root
```

2. **Automated install:**

```
curl -o lf_kinstall.pl https://www.candelatech.com/lf_kinstall.pl
chmod a+x lf_kinstall.pl
./lf_kinstall.pl --do_all_ct --lfver 5.4.6
```

Change directory to /Users/lanforge and skip to the "Configure LANforge Server" step below.

3. **Create LANforge Accounts**

You should create a lanforge user and install the LANforge software in that user's home directory. Use your preferred method, or use mine:
`# sysadminctl -addUser lanforge -password lanforge -shell /bin/bash`

4. **Install MacOS Mac Ports project.**

This is optional, but required for at least some things (like VOIP with PESQ/POLQA analysis). After this is installed, add some additional tools: `# port install md5sha1sum`

5. **Install LANforge Server**

Copy the LANforgeServer-X.X.X_MacOS-XX.tar.gz file to some temporary directory and un-tar it with a command like:
`# tar -xvzf LANforgeServer-*_MacOS*.tar.gz` That command should create a LANforgeServer-X.X.X directory, in which the distribution exists. Change to that directory as root, and you will find an install.bash file.
Run this script:

```
# ./install.bash
```

6. **Configure LANforge Server**

NOTE 1

> The `lfconfig` tool often scrolls information off the screen, so you may need to scroll back to see useful information.

NOTE 2

> Make sure you enter 'config' when done with the lfconfig changes: It is the `config` option that creates the files needed to run the LANforge applications.

NOTE 3

> Make sure that each resource machine has a unique identifier. This identifier is specified as 'resource', and you can find more details below.

After running the install script, cd to the `/Users/lanforge` directory as root and run the lfconfig script to configure LANforge:

```
$ cd /Users/lanforge
$ ./lfconfig
```

It is an interactive script that allows you to set certain configuration options and then generate the start/stop scripts to control LANforge. The lfconfig script now hides some of the less often used options. You can view them with the `show_all` command. However, for most configurations, you will not need to change any of the hidden options.

When you start `lfconfig`, you will see something like this:

```
Interfaces: en0 en1 en2 en3
Resource interface assignment:
  Resource 6:  en1 en2 en3
Specified Resource Addresses:
```

```
Key               Acceptable Values          Value
*************************************************
log_level         [0-65535]                  7
log_dir           [directory path]           /Users/lanforge
add_resource_addr [host:port]                SEE LIST ABOVE
rem_resource_addr [host:port]                SEE LIST ABOVE
realm             [1-255]                    222
resource          [1-511]                    6
mgt_dev           [ethernet device]          en0
mode              [resource, manager, both]  resource
log_file_len      [0-2G]                     0
bind_mgt          [0-1]                      0
shelf             [1-8]                      1
dev_ignore        [eth0 eth1 ... ethN]
first_cli_port    [1025-4199]                4001
connect_mgr       [host:port]
gps_dev           [device file]              NONE
max_tx            [1-500]                    5
max_send_mmsg_mem [1000-500000]              32000
max_send_mmsg_pkts [1-1000]                  500
keepalive         [1000-500000]              30000
wl_probe_timer    [50-2000]                  50
Other Commands:   help, show_all
*************************************************

If these values are correct, enter 'config', otherwise change
the values by entering the key followed by the new value, for example:
mode manager
Your command:
```

Here are the values you can manipulate, and what they mean:

log_level

Suggested value is 7, run the btserver binary with the -h option to see what the logging level means.
Example: log_level 7

gps_dev

GPS Device, for those wishing to integrate a GPS through the serial port using the NMEA protocol.
Example: gps_dev /dev/ttyS0
Example: gps_dev NONE

log_dir

Suggested value is /Users/lanforge, specifies where the logs are to be stored.
Example: log_dir /tmp

dev_ignore

If you don't want to use some of your interfaces for LANforge, then enter them here. Otherwise, lfconfig will attempt to use them all.
Example: dev_ignore eth5 eth6 tr3

add_resource_addr

Add to the list of remote LANforge addresses. These are LANforge resources that will otherwise not be discovered for various reasons. You must have TCP/IP connectivity to them of course!
Example: add_resource_addr 192.168.5.5:4002

bind_mgt

If enabled, LANforge will only listen on the mgt-dev's IP for management traffic. If disabled, it will listen on all IPs on the local machine. Enabling this can help make LANforge more secure, but may also make it harder to access. The value 0 means disabled, 1 is enabled. NOTE: If you enable the bind_mgt option and are in mode 'both', and not using 'lo' for management device, then you will need to explicitly add a resource addr for [ip-of-mgt-port]:4004 so that the manager can communicate with the client process.
Example: bind_mgt 1

rem_resource_addr

Remove from the list of remote LANforge addresses. These are LANforge resources that will otherwise not be discovered for various reasons. You must have TCP/IP connectivity to them of course!
Example: rem_resource_addr 192.168.5.5:4002

max_tx

Maximum number of packets to tx per 'round.' The higher this number is the better performance you may achieve. However, if you make it too high, you may increase dropped packets due to making the traffic pattern too bursty. Suggested value is between 5 and 10 for traffic patterns around 2000 packets-per-second.
Example: max_tx 50

keepalive

Resource keepalive timer, in miliseconds. After this time with no communication, the manager will request an update, and after 4 times this interval, the remote resource process will be considered dead. Default is 30,000 (30 seconds.)
Example: keepalive 60000

realm

LANforge resources grouped (clustered) with the same realm value can be managed by a single LANforge-GUI. LANforge processes will ignore messages from other realms. Valid range of values is 1-255, inclusive, and the default is 255. If set to 255, it will never cluster with other LANforge systems, even if the other system is set to 255 also.
Example: realm 1

shelf

This is the virtual 'shelf' that this LANforge instance should belong to. Unless you have a very large installation, you should enter 1 here. If you have more than 511 LANforge resources, then you will need to put them into a second shelf.
Example: shelf 1

resource

Every LANforge resource (data-generator) on a given shelf MUST have a unique instance (machine) identifier. Suggested values are 1 for the first data-generator machine, 2 for the second, 3 for the third, etc. This was previously called 'client'.
Example: resource 1

first_cli_port

This is the CLI (command line interface) port. If you have multiple resources configured on the same machine (unlikely), then the second will be 2 greater than the first, etc. The binary (GUI) port for a given resource will always be one more than the CLI interface port. You can usually leave this at its default: 4001
Example: first_cli_port 4001

connect_mgr

Tell resource to connect to a known manager. Normally managers connect to resources, but sometimes it's useful to connect the other way to get around firewalls and when using mobile resources that may often change their management IP address.
Example: connect_mgr 192.168.100.20:4002
Example: connect_mgr NONE

mgt_dev

This is the ethernet device that the LANforge management traffic is carried over. The management devices for the LANforge manager and LANforge resources should be connected to the same ethernet broadcast domain (LAN). If you want this system to be completely self-contained, you can have mgt_dev be lo (loopback).
Example: mgt_dev Ethernet

mode

This determines the behavior of the LANforge software. You need exactly one LANforge manager for each network, and at least 1 LANforge resource. The basic software is the same, and its behavior is determined by the mode you enter here. Use 'both' for a single machine configuration. For multiple machine configurations, you will usually have one machine in mode 'both', and the remaining machines in mode 'resource'.
Example: mode resource

Example Configurations

- **LANforge data generator Resource only machine**

  Generally, you will have one system that is both a manager and a traffic generator, and the rest will be only resources. The manager will discover the resources and will be the central point for configuring the entire system. The resource machines must have unique identifiers (resource must be unique). **NOTE**: LANforge resources with the default realm of 255 cannot be clustered. See the clustered resources example below to enable this feature.

  ```
  mgt_dev Ethernet
  resource 2
  realm 22
  mode resource
  config
  ```

- **Optional: Enable VNC and SSH access** On recent MacOS, this cannot be automated, so you have to configure this on the MacOS machine through it's UI.

  1. Open up Sharing Preferences on your Mac and then click the Screen sharing section.
  2. Make sure Screen sharing is enabled and then click the Computer settings button.
  3. Check the VNC Viewers may control screen with password check box and enter a VNC password. You'll be prompted for this password when you connect.
  4. Enable "Remote Login" in Sharing section to allow ssh login.
     If this is stuck with "Remote login starting..." or similar, then try running this as root user in a terminal:

     ```
     launchctl load -w /System/Library/LaunchDaemons/ssh.plist
     ```

- **Optional: Enable sudo without password** Enable sudo without a password on MacOS edit /etc/sudoers:

  ```
  sudo visudo
  ```

  . Then find the admin group permission section: %admin ALL = (ALL) ALL. Change to add NOPASSWD: %admin ALL = (ALL) NOPASSWD: ALL.

After running the lfconfig script, reboot and LANforge should start automatically.

7. Installing LANforge Server on Microsoft Windows

BETA: Automated install procedure.

1. NOTE: Sometimes, the install commands seem to just hang waiting for input. If you see no activity for a while, try hitting 'Enter'. Also, check for popped-under windows waiting for clicks to continue installation of packages...
2. Open administrator powershell, change to a user-directory if needed, and run commands below to download setup script and configure for Adminstrator autologin:
   1. Download setup script:
      ```
      PS> wget http://www.candelatech.com/windows_lf_setup.ps1 -o windows_lf_setup.ps1 ↵
      ```
   2. Allow executing powershell scripts.
      ```
      PS> Set-ExecutionPolicy Bypass ↵
      ```
   3. Enable Administrator auto-login and disable a lot of security.
      ```
      PS> .\windows_lf_setup.ps1 -autologin ↵
      ```
   4. Reboot
      ```
      PS> shutdown /r ↵
      ```

3. Reboot, now you should be logged in as Administrator user. If not, then fix that before continuing.
    1. Download setup script again since you are probably in a different directory now.
    ```
    PS> wget http://www.candelatech.com/windows_lf_setup.ps1 -o windows_lf_setup.ps1
    ```
    2. Install ssh, wireshark, vnc, lanforge and other tools and do automated configuration where possible.
    3. In powershell window as administrator
    ```
    PS> .\windows_lf_setup.ps1 -lfver 5.4.6
    ```
    4. # Be sure to configure LANforge to be proper resource-id, realm, mgt-port Please see the LFConfig section.
    5. Reboot:
    ```
    PS> shutdown /r
    ```
4. If this worked properly, you should see Administrator desktop and LANforge running upon reboot. Happy testing!

Classic install guide, more secure, more control, more work: Most LANforge traffic generation and network emulation features are available on Microsoft Windows operating systems. Click here for details on supported features. LANforge on Linux is still the most precise, featureful, and highest performing option. Please contact Candela Technologies or your sales representative if you have questions about whether a feature you need is supported on Windows. Windows managers can manage Linux data generators, and vice versa.

Currently, only Windows XP, Vista and Windows 7 are actively tested. LANforge may work on other platforms as well.

Install the LANforge Server Files

1. Execute the **LANforge Server-Installer.exe** program. At the end of the LANforge install, you have an option to run the "**Configure LANforge**" tool. Please do run this tool (or re-run from the desktop) and click 'Configure' unless you are certain you do not need to do so.
2. In the configuration tool, select the mode (you will want one machine configured to be 'Both' (Manager and Resource) in your realm). The rest of the machines should be configured in resource mode only.
3. The text box at the top of the configuration tool shows the LANforge server startup information and the list of interfaces found on the machine. You will need to choose one of the adapters for your management interface. 'Management Network Device' from one of the 'Device ID:' fields.

    For example:

    ```
    Device ID: {20AC6D62-1D4E-49E1-982A-091CD9329CB3}
    Management Network Device | {20AC6D62-1D4E-49E1-982A-091CD9329CB3} |
    ```
4. The 'Realm Number' can be any value between 1 and 255. By placing a machine into a certain realm, you ensure that the LANforge software will only communicate with other machines in that same realm. Realm `255` means do not cluster.
5. Each LANforge machine in a cluster must have a unique identifier. This is the 'Resource Id Number', and it corresponds to the resource number in the LANforge GUI. Typically, you use 1 for the first system, 2 for the second, and so forth.
6. If your management network is routed, and you are configuring a machine as Manager or Both mode, then you will need to specify the IP addresses for the other LANforge resource machines in the `Clients <IP:port>`. The reason is that while LANforge can automatically discover other LANforge machines on the local subnet, it cannot automatically discover LANforge machines on other subnets. The syntax for multiple resources is a space separated list of IP address and ports. The default port is 4002, unless you manually edit the start scripts.

    For example: `IP#1:Port1 IP#2:Port2 IP#3:Port3`

    Example input for three remote resources is:

```
192.168.2.2:4002 192.168.2.3:4002 120.5.3.2:4002
```

7. If you are configured for mode 'Both' or 'Manager', then you must install the LANforge license keys sent to you by Candela Technologies or your LANforge reseller. Install these license keys per instructions in the license file. (Typically, copy the keys to a file called license.txt in the LANforge install directory.)
8. Configuration should now be complete. Click on the 'Configure' button to create the LANforge server start script shortcuts (LANforge Manager and LANforge Data Generator) on the desktop.

   To start the LANforge server on a 'Both' system double click **both** the *LANforge Manager* **AND** *LANforge Data Generator* shortcuts.

   Likewise, a *Manager* only node will only require the *LANforge Manager* shorcut executed while a *Resource* node will only require running the *LANforge Data Generator* shortcut.

   NOTE: Windows Vista and Windows 7 users must run the LANforge Manager, LANforge Data Generator and usually the LANforge GUI as administrator for a LANforge system to function properly.

   The shortcut properties should be modified to run as administrator: right-click on the shortcut icon, select Properties and click the Advanced button. Select 'Run as administrator' then click OK on both the Advanced Properties and LANforge Manager (or LANforge Data Generator) Properties windows.
9. Optional packages: NTP
   If you want to keep the clocks for multiple systems in sync (to better report latencies with LANforge-FIRE, for instance), you should consider installing NTP.
   Candela suggests this page for more info and downloads:
   https://www.meinberg.de/english/sw/ntp.htm
10. Optional packages: Wireshark
    The Wireshark tool is an excellent packet sniffer and protocol analyzer. You can dowload it from: www.wireshark.org. In order for LANforge to be able to automatically launch Wireshark, it must be installed in its default install directory on the same drive as LANforge is installed. You can also launch Wireshark manually of course.

- ## Installing LANforge Interop App on Android Devices

The LANforge Interop App running on an Android device gives ability to control the WiFi settings on most Android devices, generate TCP and UDP traffic, as well as do specialized traffic tests like using the Android web browser to download files and play movies.

1. **Enable ADB debugging connection on Android phone.**
   1. Open up settings
   2. Scroll down to “About Phone”, tap it once.
   3. Select “Software Information”.
   4. Tap “Build Version”, four or more times until you get a notification that it is in developer mode. If Build Version isn't there, try “build number”.
   5. Go back to the main Settings menu list.
   6. See “Developer options” now at the bottom of the list. Tap on it to open.
   7. Scroll down list to “Debugging” section and enable "USB Debugging".
   8. Optional: Scroll down to “Networking” section, configure WiFi networking related options:
      Enable Wireless display certification
      Enable Wi-Fi Verbose Logging
      Disable Wi-Fi scan throttling
2. **Connect your Phone to the LANforge using usb cable.**
   The phone should then show up in the Interop tab in the LANforge GUI.
3. In interop tab, double click on the new device, and give it a unique user name and click OK.
4. Click Batch Modify.
   1. When that window opens, click the Install button. If you are running the LANforge GUI inside a VNC or Remote Desktop session, then you can click the 'Launch GUI' button to get an

interactive display of your Android device.

2. The LANforge Manager IP field is an IP address that the Android device can connect to once it is associated with the DUT. Often this is the 'upstream' Ethernet port on LANforge.
3. Fill in the SSID, Password and Encryption type. If using wpa2, use that option instead of psk2 in the encryption pulldown unless you are certain your Android device needs to use psk2.
4. Press 'Start'. This should launch the LANforge Interop App on the Android device, have it configure the wifi as requested, and connect to the LANforge manager on the selected IP address.

5. Assuming that all worked as expected, then the Status panel in the LANforge GUI will now show the new device, and the Interop App on the Android device will switch from the intro screen to a screen filled with stats and other available tabs.

- ## Upgrading LANforge Server on Linux

Follow these instructions to upgrade your LANforge Server from an existing Linux installation. Some Example Configurations are listed in the Installing LANforge Server on Linux section.

1. **Check the release notes for special instructions:**
   Go to the Downloads Page and scroll down to the latest release notes link.
2. **Stop the LANforge server as root:**

```
# cd /home/lanforge
# ./serverctl.bash stop
```

3. **Backup the existing installation:**

```
# cd /home
# tar -cvzf lanforge_bkup.tar.gz lanforge
```

4. **Upgrade the LANforge kernel as root:** Generally, the kernel version should be upgraded to match the LANforge software version both of which can be found on the Downloads Page.

```
# uname -r # will give you your current kernel version
# /usr/local/bin/kinstall_ct<CURRENT KERNEL>.bash
# cd /
# tar -xvzf ct<NEW KERNEL>.tar.gz
# /usr/local/bin/kinstall_ct<NEW KERNEL>.bash
```

5. **Update GRUB configuration file with new kernel name:**
   Copy/paste the default entry and modify it to have the new kernel version. Save and exit file when complete.

```
# nano /etc/grub.conf # or vi /etc/grub.conf
```

6. **Reboot the system for the new kernel to be in use:**

```
# reboot
```

7. **Verify new kernel is running:**

```
# uname -a
```

8. **Install the new LANforge server software:**

```
# cd /home/lanforge
# tar -xvzf LANforgeServer-*_Linux-x86.tar.gz
# cd LANforgeServer-X.X.X
# ./install.bash
```

9. **Regenerate the LANforge configuration as root:**

```
# cd .. # to /home/lanforge
# ./lfconfig --new_layout
```

10. **Install your license keys:**

    Follow the license installation instructions in your license key file.

11. **Start the upgraded LANforge server:**
    `# ./serverctl.bash start`

Upgrading LANforge Server on Microsoft Windows

To upgrade your LANforge server from an existing Windows installation, follow these instructions:

1. **Check the release notes for special instructions:**
   Go to the Downloads Page and scroll down to the latest release notes link.
2. **Stop the LANforge Manager and Data Generator:**
   Close the DOS windows labeled LANforge Manager and LANforge Data Generator.
3. **Backup your current installation:**
   Rename or copy the C:\Program Files\LANforge server directory.
4. **DO NOT UNINSTALL - YOU WILL LOSE YOUR LANforge DATABASE**
   Simply run the new LANforge Server Installer.
5. **Re-run the Configure LANforge utility.**
   You will be prompted after installing the new server software.
6. **Install your license keys:**
   Follow the license installation instructions in your license key file.
7. **Start the LANforge server:**
   For a 'Both' node, double-click the LANforge Data Generator and LANforge Manager icons.

   Otherwise, double-click the appropriate icon for the node type.

   NOTE: Windows Vista and Windows 7 users must run the LANforge Manager, LANforge Data Generator as *Administrator* for a LANforge system to function properly.

   The shortcut properties should be modified to run as Administrator:

   1. Right-click on the shortcut icon
   2. Select Properties→Advanced button
   3. Select **Run as administrator**
   4. then click **OK** on both the Advanced Properties and LANforge Manager (or LANforge Data Generator) Properties windows.

LANforge Data Generator Installation Troubleshooting Guide

Q. I upgraded my system to Fedora 11 and NetworkManager is causing problems.

A. Make sure NetworkManager is OFF and Network is ON in level 3 and level 5 services. From the console, enter the # ntsysv command as root (level 3 services). Turn NetworkManager OFF and Network ON, select OK, and reboot. From a terminal window, enter the # system-config-services command as root (level 5 services). Turn NetworkManager OFF and Network ON, click Save, and select File/Quit, then reboot. To continue using PackageKit (Fedora 9 and later) without NetworkManager, edit `/etc/PackageKit/PackageKit.conf` and change the following value: `UseNetworkManager=false`

Q. I upgraded my system to Fedora 11 and ssh (or console login) session fails.

A. Make sure SELinux is disabled in System/Administration/SELinux Management. Select 'Disabled' for System Default Enforcing Mode and reboot.

Q. Things kind of seem to work, but not really.

A. Unless you specifically know otherwise, make sure the resource indentifiers are unique for every system in your LANforge realm. These numbers correspond to the 'Card Numbers' in the GUI and CLI commands. Also, make sure that all of your LANforge software is of the same version.

Q. I'm using Suse 9.1 and having trouble.

A. We found that removing the second 'localhost' entry in the `/etc/hosts` file (the one starting with `::1`) made LANforge work. I think that without this change, LANforge may try to use IPv6.

Q. I'm using Windows Vista and neither LANforge Manager or Data Generator is working.

A. Windows Vista users must run the LANforge Manager and LANforge Data Generator as administrator to function properly. The shortcut properties should be modified to run as administrator:

1. Right-click on the shortcut icon
2. Select Properties→Advanced button
3. Select **Run as administrator**
4. then click **OK** on both the Advanced Properties and LANforge Manager (or LANforge Data Generator) Properties windows.

If you have a problem not answered here, please contact Candela Technologies technical support at support@candelatech.com.