

```

<?php require_once "lib.php"; title("LANforge Server Install Guide");
require_once("javascript_hdr.php");
$lf_latest = "--lfver 5.4.1";
$kern_latest = "--kver 5.2.21+";
$fedora_latest = "30";
$fedora_earliest = "17";

# Here are items to show check_updates.groovy the latest versions
# in case the instructions don't mention them
?>
<meta name="x-lanforge-version" content="<?php echo $lf_latest ?>" />
<meta name="x-kernel-version" content="<?php echo $kern_latest ?>" />
<meta name="x-fedora-current-version" content="<?php echo $fedora_latest ?>" />
<meta name="x-fedora-earliest-version" content="<?php echo $fedora_earliest ?>" />
</head>
<body>
<?php
require_once("header.php");
require_once("menu.php");
?>
<div id="contentDiv">
<h1 class="big_heading">LANforge Server Installation</h1>

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<a name="overview"><h2 class="big_heading">Overview</h2></a>
<p>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.</p>
<blockquote style='font-weight:bold;font-style:italic;font-size:120%;'>
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.</blockquote>
<p>
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.</p>
<p class='notetext'>Candela Technologies offers support packages! We want to help you get the most out of our product.</p>

<ol>
<li><a name="webauto"><h3 class="big_heading">Installation/Upgrade with Internet Access</h3></a>
<p>
If you are installing or upgrading to LANforge <?=$lf_latest?> or higher, and are using Fedora <?=$fedora_latest?> to <?=$fedora_earliest?> (or related OS), you may want to use the fully automated installation option.
<span class='notetext'>Fedora <?=$fedora_latest?> is currently the suggested OS.</span>
For other OS versions, please contact <a href="mailto:support@candelatech.com">Support</a>

```

for OS installation information.</p>

<p class='notetext'>If you are using CentOS 6, please read the CentOS 6 Instructions below.</p>

<p>The <tt>lf_kinstall.pl</tt> script will take a base install and add 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 <tt>lanforge</tt> on the system before running this script.</p>

Log into LANforge machine as the <tt>root</tt> user, and open a terminal window.

Make sure you can reach www.candelatech.com:

```
<pre>$ ping www.candelatech.com</pre>
```


Run the install/upgrade script. For release 5.4.1, you can use this command:

```
<div class='bigexample'>perl &lt;(curl -s https://www.candelatech.com/lf_kinstall.txt) --do_all_ct --lfver 5.4.1</div>
```

<p>For releases 5.3.9 and earlier and kernel version 4.20.17+.
Change the version numbers as needed by using the latest information
from the release download page.</p>

Example showing an automated install with most options enabled:

```
<span class='bigexample'>perl &lt;(curl -s https://www.candelatech.com/lf_kinstall.txt) --do_all_ct --kver 5.2.21+ --lfver 5.4.1</span>
```

<p class='notetext'>Ensure the script finishes without errors before you continue. Please contact support if you have questions.</p>

<p>If perl does not exist, you can install it on Fedora systems with:

```
<tt>yum install perl</tt> On Ubuntu, try: <tt>apt-get install perl</tt>.</p>
```

<p>

To see all available options use the following command:</P>

```
<pre>perl &lt;(curl -s https://www.candelatech.com/lf_kinstall.txt) --help</pre>
```

<p>

For <?=\$fedora_earliest?> 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):

```
<tt>/usr/local/bin/ctgnome.bash</tt>
```


For fresh installs, on Fedora 15 and higher, you may wish to change the network device names from the bus enumeration style (<tt>plp2</tt>) to classic Linux style (<tt>eth0</tt>). If so, edit the <tt>/etc/udev/rules.d/70-persistent-net.rules</tt> file. You will also need to rename and edit the corresponding <tt>/etc/sysconfig/network-scripts/ifcfg-*</tt> 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.

For fresh installs, you probably need to reconfigure LANforge a bit to

select the proper management interface:<p>

```
<tt>cd /home/lanforge; ./serverctl.bash stop; ./lfconfig --new_layout</tt>
```

<p>

When done configuring, start up LANforge again if you used the text-based <tt>lfconfig</tt> option:

```
<tt>./serverctl.bash start</tt>. If you used the GUI, then LANforge will be restarted automatically.
```

</p>

<p>

Reboot the LANforge machine and make sure it comes back up running the proper kernel and LANforge software.

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

<p>

If you are installing or upgrading to LANforge 5.2.7 or higher, and are using Fedora 19 to Fedora 24 (or related OS), you may want to use the automated installation option. For other OS versions, please contact Support for OS installation information.

</p>

<h3 class="big_heading">Offline/Local Installation or Upgrade</h3>

Offline Install Using Bundle

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

```
<ol>
  <li>Determine what OS you are using: cat /etc/redhat-release Probably you have Fedora 24, Fedora 27, or Fedora 30. The matching bundles would have F24, F27, and 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.</li>
  <li>Release bundles can be found by looking in the release directory, for instance: https://www.candelatech.com/private/downloads/r5.4.1</li>
  <li>Copy the the install bundle for your OS version to /home/lanforge/Downloads/ on the LANforge machine.</li>
  <li>Copy the https://www.candelatech.com/lf\_kinstall.txt file to /home/lanforge/Downloads/lf_kinstall.pl.</li>
  <li>Log in as root and change to the install directory: cd /home/lanforge/Downloads/</li>
  <li>Make sure the new lf_kinstall.pl is executable: chmod a+x lf_kinstall.pl</li>
  <li>Use the following command to unpack and install:</li>
    <pre>./lf_kinstall.pl --use_install_bundle /home/lanforge/Downloads/[install-bundle]</pre>
    <p>Please use the full path to the bundle.</p>
  <li>Reboot system with command: reboot</li>
</ol>
<p>
```

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 5.3.9:

```
<ol>
  <li>Download the install/upgrade script by saving the following link:
    <a href="https://www.candelatech.com/lf_kinstall.txt">https://www.candelatech.com/lf_kinstall.txt
    <p class='notetext'>Note: You may have to copy and paste the lf_kinstall.txt from a browser to a plain text document.</p>
  </li>
```

```
<li>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:
<pre class='code'>cd /home/lanforge/Downloads
dos2unix lf_kinstall.txt
chmod a+x lf_kinstall.txt
./lf_kinstall.txt --do_all_ct --print_only --kver 4.20.17+ --lfver 5.3.9</pre>
<p>
```

You should see output similar to this:

```
<pre class='code'># is-ubuntu: 0 mate-installed: 1 install-mate: 0 is-arm: 0 is-fedora: 1 osveri: 20 is-64: 1
# do-gnome: 0 uveri: 14
```

`lf_kinstall` offline install will need these files:

```
# https://www.candelatech.com/private/downloads/r5.3.9/ct4.20.17+.x64.tar.gz
# https://www.candelatech.com/private/downloads/r5.3.9/board.bin
# https://www.candelatech.com/private/downloads/r5.3.9/firmware-2.bin
# https://www.candelatech.com/private/downloads/r5.3.9/firmware-2-htt-mgt.bin
# https://www.candelatech.com/private/downloads/r5.3.9/ath10k_stock_fw.tgz
# https://www.candelatech.com/private/downloads/r5.3.9/firmware-2-htt-mgt.bin-9887-10-1
# https://www.candelatech.com/private/downloads/r5.3.9/firmware-5-htt-mgt.bin-9888-10-4
# https://www.candelatech.com/private/downloads/r5.3.9/firmware-5-htt-mgt.bin-9984-10-4
# https://www.candelatech.com/private/downloads/r5.3.9/firmware-5-htt-mgt.bin-10-4
# https://www.candelatech.com/private/downloads/r5.3.9/ath10k-firmware-2.bin-upstream
# https://www.candelatech.com/private/downloads/r5.3.9/LANforgeServer-5.3.9_Linux-F20-x64.tar.gz
# https://www.candelatech.com/private/downloads/r5.3.9/xorp_64-F20.tgz
# https://www.candelatech.com/private/downloads/r5.3.9/webstart-5.3.9.tar.gz
# https://www.candelatech.com/private/downloads/r5.3.9/LANforgeDocs-5.3.9.tar.gz
# https://www.candelatech.com/private/downloads/r5.3.9/LANforge-GUI-5.3.9-Installer.exe
# https://www.candelatech.com/private/downloads/r5.3.9/LANforgeGUI_5.3.9_Linux64.tar.bz2
# https://www.candelatech.com/private/downloads/r5.3.9/LANforgeGUI_5.3.9_Linux.tar.bz2
</pre>
```


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`.

Log into LANforge machine as the <code>root</code> user, and open a terminal window.

Perform the following commands:

```
<pre class='code'>cd /home/lanforge/Downloads
./lf_kinstall.txt --do_all_ct --kver 4.20.17+ --lfver 5.3.9 --source_dir /home/lanforge/Downloads</pre>
```

Ensure the script finishes without errors before you continue.

Reboot the LANforge machine and make sure it comes back up running the proper kernel and LANforge software.

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

<h3 class="big_heading">Most Recent Fedora Releases</h3>

<p>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 25:</p>

<div class="tip">The installer has a switch for this: <code>--force_osver</code></div>

```
<pre class='smallterm'>./lf_kinstall.txt --do_all_ct <b>--force_osver F24</b> --lfver 5.3.9 --kver 4.20.17+ --source_dir
/home/lanforge/Downloads</pre>
```

<p>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.

</p>

<h3 class="big_heading">CentOS 6 Installation</h3>

<p>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

<code>lf_kinstall.pl</code> 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:</p>

```
<pre class='code'>yum install -y yum-utils
yum-config-manager --enable centosplus &gt; /dev/null
yum-config-manager --enable contrib &gt; /dev/null
yum-config-manager --enable epel &gt; /dev/null
yum makecache fast
yum install -y man bash-completion bind-utils nfs-utils perl screen rsync vim wget
yum update -y</pre>
```

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

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

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


<h3 class="big_heading">Installing LANforge OpenWRT</h3>

<p>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.

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

<p>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.

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

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

<P>
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.

<P>
Connect with ssh to the r7800 as the <tt>root</tt> user (there is no password by default).
To complete the install, run these commands:</p>

```
<pre>cd /home/lanforge
./install.bash # Ignore the warnings about copying over the same file
./lf_kinstall.pl --do_sys_reconfig --lfver 5.3.9
reboot</pre>
```

<h3 class="big_heading">Upgrading LANforge OpenWRT</h3>

<p>
Download the openwrt-ipq806x-netgear_r7800-squashfs-sysupgrade.bin image from our downloads page.</p>

<P>
Use scp to copy this file to the temp directory on the r7800, for instance:</p>

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

<p>Log into the r7800 and do the upgrade:</p>

```
<pre>sysupgrade /tmp/openwrt-ipq806x-netgear_r7800-squashfs-sysupgrade.bin</pre>
```

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

```
<pre>cd /home/lanforge
./install.bash # Ignore the warnings about copying over the same file
./lf_kinstall.pl --do_sys_reconfig --lfver 5.3.9
reboot</pre>
```

<h3 class="big_heading">Hardware Requirements</h3>

<p>
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.</p>

<h3 class="big_heading">Software Requirements</h3>

<p class='notetext'>NOTE: LANforge now has limited support for the Microsoft Windows operating systems. See the Microsoft specific install section for more information.</p>

<p>
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.</p>

<p>
The installation should include the following:</p>

<dl class="code">

<dt>/usr/bin/perl</dt>

<dd>Required: Perl scripting language.</dd>

<dt>/sbin/ip</dt>

<dd>Required: IP configuration tool, verify version with:

<tt>/sbin/ip -V</tt></dd>

<dt>/usr/sbin/brctl</dt>

<dd>Suggested: Bridge utilities.</dd>

<dt>/usr/sbin/dhcpd</dt>

<dd>Suggested: DHCP Server.</dd>

</dl>

<p>
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).</p>

<h4 class="med_heading">Virtual Router OSPF support</h4>

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

<p>To install:</p>

```
<ol>  
  <li>Change directories to /usr/local as root:<br/>  
  <tt># cd /usr/local</tt></li>  
  
  <li>Unzip the download:<br/>  
  <tt>$ tar -xvzf xorp*.tgz</tt></li>  
  
  <li>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.<br/>  
  <pre># cd /usr/local/xorp  
# ./xorp_install.bash</pre></li>  
</ol>
```

<h4 class="med_heading">Installing a LANforge Linux Kernel</h4>

```
<ol>  
  <li>Download an appropriate pre-built kernel from the  
  <a href="https://www.candelatech.com/downloads.php">downloads page</a>.</li>
```

Install the kernel as root with command similar to:

```
<pre># cd /  
# tar -xvzf /home/lanforge/ct2.6.31.6.p4s.tar.gz  
# /usr/local/bin/kinstall_ct2.6.31.6.bash</pre>
```

<p>If you are using Suse, this kinstall script will probably fail. Try making
the initrd script with a command similar to:</p>

```
<pre># mkinitrd -k ct2.6.31.6.img -i initrd-ct2.6.31.6.img</pre></li>
```

Update <tt>/etc/grub.conf</tt> by adding an entry similar to the text below. You
should usually copy an existing entry and change only the title, kernel image and initrd
image file names.

```
<pre>title Candela Technologies Linux 2.6.31.6
```

```
root (hd0,0)  
kernel /ct2.6.31.6.img ro root=LABEL=/ rhgb quiet  
initrd /initrd-ct2.6.31.6.img</pre>
```

<p>If you are using Suse, you will edit <tt>/boot/grub/menu.lst</tt> instead.</p>

<p>When using recent LANforge kernels on older distributions
(Fedora 11 and earlier), you may need to enable some compatibility code
in the kernel proc file system. To enable this, add: <tt>sysfs.deprecated=1</tt>
to the kernel boot arguments in the grub configuration file.

The kernel installation should now be complete. Reboot and choose the
Candela kernel. To make this the default option, edit the <tt>default=</tt>
line in <tt>/etc/grub.conf</tt>

<h4 class="med_heading">Compiling Your Own Linux Kernel</h4>

<p class='notetext'>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.</p>

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

```
<ol>  
  <li>Download the kernel source repository:  
  <pre>$ git clone https://github.com/greearb/linux-ct-4.7.git</pre>  
  More kernels are available on github:  
  <a href="https://github.com/greearb?tab=repositories">https://github.com/greearb?tab=repositories</a>.  
  </li>  
  <li>Use one of the config files in the <tt>linux-ct-4.7/configs</tt>  
  directory as a starting point.  
  </li>  
  <li>If you are unsure how to compile kernels, consider using a pre-compiled  
  one or contact <a href="mailto:support@candelatech.com">Support</a>.</li>
```

```
</ol>
</li>
<li>
  <a name="get_ready"><h3 class="big_heading">Getting Your Linux Box Ready for LANforge</h3></a>
  <ol>
    <li><b>Install the Necessary Hardware.</b><p>
      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 <a href="mailto:support@candelatech.com">Support</a>. It is likely we have a solution!</li>
    <p>
    <li><b>Install and Configure the Linux Operating System.</b><p>
      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.)
    <p>
      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.
    <p>
      It is assumed that the user will be able to correctly configure the Linux Operating system.
    <p>
      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.
    </li>
    <p>
    <li><b>Install the Wireshark Packet Sniffer.</b>
    <p>
      If you would like to be able to have LANforge automatically launch the <a href="https://www.wireshark.org" target='_new'>Wireshark</a> 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:<br>
      <tt># yum install wireshark-gnome</tt></p>
    <p>
      In the end, LANforge will attempt to execute a file called <tt>/usr/sbin/wireshark</tt>. If that fails, it will attempt to execute <tt>/usr/sbin/ethereal</tt>. So as long as one of these files exists, it will work.
    <p>
      To install the very latest Wireshark with LANforge support, perform the following steps on your LANforge system as root user.
    <pre class='code'>$ yum install -y shtool libtool bison flex glib2-devel gtk2-devel libpcap-devel gcc-c++.x86_64
$ 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-gtk /usr/local/bin/wireshark; fi</pre>
    </li>
    <p>
    <li><b>Install Perl Library: Net::Telnet for use with LANforge Scripting.</b>
    <p>
      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:
    <pre> $ 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</pre></li>
  </ol>
</li>
<li>
  <a name="install"><h3 class="big_heading">Installing LANforge Server on Linux</h3></a>
```

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

<p>

Become root user
<pre>\$ su - root</pre>

Create LANforge Accounts<p>
You should create a lanforge user and install the LANforge software in that user's home directory. Use your preferred method, or use mine:

<tt># adduser lanforge
passwd lanforge</tt>

Install LANforge Server<p>
Copy the LANforgeServer-X.X.X_Linux-XX.tar.gz file to some temporary directory and un-tar it with a command like:

<tt># tar -xvzf LANforgeServer-*_Linux-x86.tar.gz</tt>

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:<p>
<pre># ./install.bash</pre>

<h4>Configure LANforge Server</h4>
<dl class='notetext'>
<dt>NOTE 1</dt>
<dd>The <tt>lfconfig</tt> tool often scrolls information off the screen, so you may need to scroll back to see useful information. On the console, use <tt class='key'>SHIFT-PageUp</tt>, <tt class='key'>SHIFT-PageDown</tt>.

</dd>

<dt>NOTE 2</dt>
<dd>Make sure you enter 'config' when done with the lfconfig changes: It is the <tt>config</tt> option that creates the files needed to run the LANforge applications.</dd>

<dt>NOTE 3</dt>
<dd>Make sure that each resource machine has a unique identifier. This identifier is specified as 'resource', and you can find more details below.</dd>

<dt>NOTE 4</dt>
<dd>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 <tt>0.0.0.0</tt></dd>

</dl>

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

<pre>\$ cd /home/lanforge

\$./lfconfig</pre>

<p>
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 <tt>show_all</tt> command. However, for most configurations, you will not need to change any of the hidden options.</p>

<p>
When you start <tt>lfconfig</tt>, you will see something like this:</p>

<pre class='code'>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:</pre>

<p>

Here are the values you can manipulate, and what they mean:</p>

<dl>

<dt>log_level</dt>

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

<dt>gps_dev</dt>

<dd>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</dd>

<dt>log_dir</dt>

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

<dt>dev_ignore</dt>

<dd>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</dd>

<dt>add_resource_addr</dt>

<dd>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</dd>

<dt>bind_mgt</dt>

<dd>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</dd>

<p>

<dt>rem_resource_addr</dt>

<dd>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</dd>

<p>

<dt>max_tx</dt>

<dd>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</dd>

<p>

<dt>keepalive</dt>

<dd>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</dd>

<p>

<dt>wl_probe_timer</dt>

<dd>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</dd>

<dt>realm</dt>

<dd>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</dd>

<dt>shelf</dt>

<dd>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</dd>

<dt>resource</dt>

<dd>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</dd>

<dt>first_cli_port</dt>

<dd>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</dd>

<dt>connect_mgr</dt>

<dd>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</dd>

<dt>mgt_dev</dt>

<dd>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</dd>

<dt>mode</dt>

<dd>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</dd>

</dl>

<h4 class="med_heading">Example Configurations</h4>

<ul class="blue">

<dt>All-in-One/Stand-alone LANforge-ICE WAN Emulator & Traffic Generator</dt>

<dd>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.

<pre>mgt_dev eth0

resource 1

realm 255

mode both

config</pre></dd>

<dt>LANforge data generator (or WAN Emulator) Resource only machine</dt>

<dd>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.

```
<pre>mgt_dev eth0
```

```
resource 2
realm 22
mode resource
config</pre></dd></li>
```


<dt>LANforge Manager with Clustered Resources</dt>

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

```
<table width="100%" border="0" cellpadding=2>
```

```
<tr>
  <td><span class="menutext"><font size=-1><b><u>Manager (Resource #1)</u></b></font></span></td>
  <td><span class="menutext"><font size=-1><b><u>Resource #2</u></b></font></span></td>
  <td><span class="menutext"><font size=-1><b><u>Resource #3</u></b></font></span></td>
  <td><span class="menutext"><font size=-1><b><u>Resource #4</u></b></font></span></td>
</tr>
```

```
<tr>
  <td><pre>mgt_dev eth0<br>resource 1<br>realm 22<br>mode both<br>config</pre></td>
  <td><pre>mgt_dev eth0<br>resource 2<br>realm 22<br>mode resource<br>config</pre></td>
  <td><pre>mgt_dev eth0<br>resource 3<br>realm 22<br>mode resource<br>config</pre></td>
  <td><pre>mgt_dev eth0<br>resource 4<br>realm 22<br>mode resource<br>config</pre></td>
</tr>
```

```
</table>
```

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

<p class='notetext'>NOTE: Entering the <tt>config</tt> command creates a port configuration file called <tt>lanforge_eth_1</tt> for resource 1 or <tt>lanforge_eth_2</tt> for resource 2, etc., which are saved in the <tt>/home/lanforge</tt> directory.

<p>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.</p>

<p><h4>Start LANforge Servers</h4>

<p>To start the LANforge servers, use the serverctl.bash script as root:</p><pre># ./serverctl.bash start</pre>

<p>From now on, the LANforge server will be started when the machine boots.</p>

<h3 class="med_heading">iSCSI Client</h3>

<p>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.</p>

```
<ul class="yellow">
  <li>32-bit installation as root:<br>
    <tt># yum install iscsi-initiator-utils.i386 scsi-target-utils.i386<br></tt></li><br>
  <li>64-bit installation as root:<br>
    <tt># yum install iscsi-initiator-utils.x86_64 scsi-target-utils.x86_64<br></tt></li><br>
  <li>Disable services after installation as root:<br>
    <tt># chkconfig iscsi off<br>
    # chkconfig iscsid off<br></tt></li><br>
</ul>
```


<h3 class="big_heading">Configuring a Static IP Address</h3>

<p>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
```

-

-

-

-

- [### Installing LANforge Server on Microsoft Windows](#)

- Most LANforge traffic generation and network emulation features are available on Microsoft Windows operating systems. Click here for details on

- <https://www.candelatech.com/datasheet.php#ms> 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

-

- 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.

-

- 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.

-

- 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.

<p>

For example:</p>

<tt>Device ID: {20AC6D62-1D4E-49E1-982A-091CD9329CB3}</tt>

<tt>Management Network Device | {20AC6D62-1D4E-49E1-982A-091CD9329CB3} |</tt>

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 <tt>255</tt> means do not cluster.

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.

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 <tt>Clients <IP:port></tt>. 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.</p>

<p>For example: <tt>IP#1:Port1 IP#2:Port2 IP#3:Port3</tt></p>

<p>Example input for three remote resources is:</p>

```
<pre>192.168.2.2:4002 192.168.2.3:4002 120.5.3.2:4002</pre>
```


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.)

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.

<p class='notetext'>To start the LANforge server on a 'Both' system double click both the LANforge Manager AND LANforge Data Generator shortcuts.</p>

<p>Likewise, a <i>Manager</i> only node will only require the <i>LANforge Manager</i> shortcut executed while a <i>Resource</i> node will only require running the <i>LANforge Data Generator</i> shortcut.

<p class='notetext'>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.</p>

<p>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.</p>

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

Optional packages: Wireshark

The Wireshark tool is an excellent packet sniffer and protocol analyzer. You can download 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 Server on Google Android Devices

With the 5.2.10 release, LANforge now supports most Google Android devices.

The feature set is limited to basic Layer-3, Layer 4-7 and VOIP traffic generation over the WiFi or cellular data networks. It will only work on systems using the ARM CPU architecture, but that will be most devices anyway. It has been tested on Nexus 4 and "HTC My Touch" phones.

To install, search Google Play on your Android device for "LANforge Resource" from Candela Technologies Inc and install the app on your phone. The version of the app (ie, 5.2.11) must match the LANforge manager's release version.

The app can currently only be configured as a resource, so you must be running a LANforge manager process (with proper licenses installed) on a different machine. Each Android device currently is licensed as a 100Mbps connection license.

After launching the LANforge Resource app the first time, configure the realm, manager's IP, and the resource-ID. Then press 'Apply'. This will do internal installation and configuration and start the LANforge processes. If you are upgrading or reinstalling the app, click Remove and then Apply again. If you wish to uninstall the LANforge app, first click **Stop** to make sure any LANforge processes are stopped. The LANforge processes will keep running until you reboot the phone or click the **Stop** button in the LANforge app.

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.

Check the release notes for special instructions:

Go to the [Downloads Page](https://www.candelatech.com/downloads.php) and scroll down to the latest release notes link.

Stop the LANforge server as root:

```
# cd /home/lanforge
```

```
# ./serverctl.bash stop
```

Backup the existing installation:

```
# cd /home
```

```
# tar -cvzf lanforge_bkup.tar.gz lanforge
```

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](https://www.candelatech.com/downloads.php).

```
# uname -r <span class='notetext'># will give you your current kernel version</span>
```

```
# /usr/local/bin/kinstall_ct<span class='notetext'>CURRENT KERNEL</span>.bash
```

```
# cd /
```

```
# tar -xvzf ct<span class='notetext'>NEW KERNEL</span>.tar.gz
```

```
# /usr/local/bin/kinstall_ct<span class='notetext'>NEW KERNEL</span>.bash</pre>
```

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 <span class='notetext'># or <em>vi /etc/grub.conf</em></span>
```

Reboot the system for the new kernel to be in use:

```
# reboot
```

Verify new kernel is running:

```
# uname -a
```

Install the new LANforge server software:

```
# cd /home/lanforge
```

```
# tar -xvzf LANforgeServer-*_Linux-x86.tar.gz
```

```
# cd LANforgeServer-X.X.X
```

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

Regenerate the LANforge configuration as root:

```
# cd .. <span class='notetext'># to /home/lanforge</span>
```

```
# ./lfconfig --new_layout
```

Install your license keys:
Follow the license installation instructions in your license key file.

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:

Check the release notes for special instructions:
Go to the [Downloads Page](https://www.candelatech.com/downloads.php) and scroll down to the latest release notes link.

Stop the LANforge Manager and Data Generator:
Close the DOS windows labeled LANforge Manager and LANforge Data Generator.

Backup your current installation:
Rename or copy the C:\Program Files\LANforge server directory.

DO NOT UNINSTALL - YOU WILL LOSE YOUR LANforge DATABASE:
Simply run the new LANforge Server Installer.

Re-run the Configure LANforge utility:
You will be prompted after installing the new server software.

Install your license keys:
Follow the license installation instructions in your license key file.

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:

- Right-click on the shortcut icon
- Select Properties & Advanced button
- Select **Run as administrator**
- 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 identifiers 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.</dd>

<dt>Q. I'm using Suse 9.1 and having trouble.</dt>

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

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

<dd>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:

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

</dd>

</dl>

<p>

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

<p>

<?php require_once("footer.php"); ?>

</div>

</BODY>

</html>