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Various Techniques Cookbooks

The Various Techniques Cookbooks provide miscellaneous examples of how to perform various network configuration tasks. Each is a set of step-by-step instructions intended to help build your familiarity with network configuration in Linux and Windows.

Please contact us at support@candelatech.com if you have any questions.

All Network Configuration Cookbook Examples

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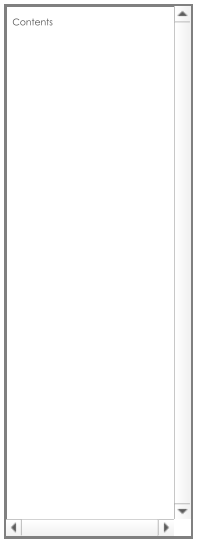
Install Script lf_kinstall.pl

Goal: Install and reconfigure your LANforge server with the lf_kinstall.pl script.

The `lf_kinstall.pl` script can configure a majority of Linux OS features that LANforge requires changes to. This includes:

- Disabling SELinux
- Disableing firewall
- Downloading dnf and LANforce updates
- Adding VNC and RDP access
- Adding firmware
- Disabling or reconfiguring NetworkManager
- Enabling serial console
- Modifying kernel options for iommu, pci-aer and kernel memory
- ...and more...



Usage

`lf_kinstall.pl --lfver {lanforge version} --kver {kernel version} {command}`
Note: the parameters `--do_kern` and `--do_grub` requires the `--kver` option to specify the kernel version. Candelatech Linux kernels end with "+" to denote extra patches. Use `--debug|--verbose|-d` to enable debugging.
Example: `./lf_kinstall.pl --kver 3.5.7+ --lfver 5.2.7 --do_lanforge`

Please refer to the Install Guide and the options reference:
• Install guide:
`http://www.candelatech.com/lfserver_install.php#webauto`
• Reference: `http://www.candelatech.com/cookbook.php?vol=misc&book=lf_kinstall`

Common Options

--help
This message.

--lfver
Specify LANforge version (i.e., 5.2.6)

--kver
Specify kernel version, use a + at the end of kernel versions for Candelatech kernels

--proxy
Use a proxy for curl, e.g. `http://%user:%password@%proxy-ip:%port`

--do_all_ct
Enables all options except: `--xrandr, --runlevel`

--do_upgrade
Also `--do_update.` Upgrades LANforge software, kernel, firmware, packages and OS packages. No system settings altered. Skips cpu-burn.

--do_lanforge
Installs LANforge software ONLY, i.e. no kernel installed. No system settings altered.

--do_firmware
Download and install ath10k 802.11AC NIC firmware.

--do_kern
Install the kernel via download or `--source_dir.` Enables 'do_grub' option.

--help_all
Show advanced options

--skip_pip
Avoid doing pip upgrades; might be necessary if you have proxies

--skip_yum_all
Don't yum update packages, or install new ones.

--secureme

reconfigure system to bind to the management port and other security necessities * bind btserver to management port * bind_mgt enables listening on localhost/127.0.0.1 * indicate to GUI to bind ports to management address Also: `--do_secure --do_secureme --secure`

Please refer to the Install Guide and the options reference:
• Install guide:
`http://www.candelatech.com/lfserver_install.php#webauto`
• Reference: `http://www.candelatech.com/cookbook.php?vol=misc&book=lf_kinstall`

Advanced Options

--acknowledge

Also -g. Acknowledge that your licenses are out of date to continue updates

--add_random_www_data

creates a series of files in `/var/www/html` accessable using the url `/slug_list.html`

--bind_apache_mgt_port

configures an `/etc/hosts` entry lanforge-srv that matches the ip address of the mgt_dev in `/home/lanforge/config.values.` Updates the `/etc/httpd` or `/etc/apache2` files to bind to that address. Use this option each time you change the mgt_dev.

--build_url

Also: `--build_path.` This path is appended directly after the `--download_from` hostname. The default download path will not be used. The string `$lfver` will not be inserted. Build paths will not adhere to a directory pattern, use the full path.

--bundle_dest

Also: `--bundle_dir.` Specify a directory that the bundle archive should be created in. Use this is to keep bundles from being written to the tmp_dir or src_dir

--clone_lvm

[source-drive,dest-drive], or [source-drive,file://file-name] or [source.img.xz,dest-drive] Clone the disk with the LVM partitions to the specified disk. == *Do not use on a running system, use this from a live boot disk.* ==
1: Boot from F39 Live Install CD and open a terminal and become root. Do not plug in multiple USB drives at once when booting.
2: download `./lf_kinstall.pl`: wget `https://www.candelatech.com/./lf_kinstall.pl`
3: chmod +x `./lf_kinstall.pl`
4: use lsusb to check your target drives: lsusb -o name,model,label,partlabel,size
5: [optional] Plug another USB drive into the system if necessary
6: copy the disk image: To copy disk to disk: ./ `./lf_kinstall.pl --clone_lvm /dev/sda,/de/sdb` To copy disk to file (for backing up a machine image): ./ `./lf_kinstall.pl --clone_lvm /dev/sda,file://run/media/liveuser/usb/lanforge-dev-sda.img` To copy compressed disk image to installed drive: ./ `./lf_kinstall.pl --clone_lvm /run/media/liveuser/usb/lanforge-dev-sda.img.xz,/dev/sda` This command will not compress a disk image; please do that on a workstation.
7: when installing a system, follow with: ./ `./lf_kinstall.pl --resize_lvm`
8: when installing to a second drive to mirror the disks: ./ `./lf_kinstall.pl --promote_lvm_clone /dev/sdb` When applying a new image to a system, when you reboot with the system image and it complains about not successfully loading the system, refer to `--regen_initrd.`

--create_install_bundle

Also: `--install_bundle, --create_bundle, --create_tarball` Create a tarball in tmp_dir for copying to another LANforge system, will infer `--osver, --osveri` for current system unless you specify `--force_osver, --force_osveri, --force_uname.` A complicated example for building a bundle for Adtran:
`./lf_kinstall.pl --create_bundle --lfver 5.4.8 --kver 6.10.3+ --force_osver "rpi5" \`
`--force_osveri 5 --force_uname` adtran-aarch64 `--tmp_dir` `pwd` `--source_dir` `pwd` `--bundle_dest` ./bundles/

--create_lanforge_user

adds user lanforge and directory `/home/lanforge` create:pypirc: create pypirc file

--create_raid

Also `--make_raid` [drive1,drive2...] Turn two or more blank drives into a mirrored LVM filesystem If there have been filesystems installed on these drives before, use `--wipe_raid` to remove the filesystems.
Example: `./lf_kinstall.pl --make_raid nvme0n1p1,nvme1n1p1`

--create_lvm

Also `--make_lvm` [drive] Turn one drive into an LVM filesystem image. Use this on a system before installing a LANforge system that you want to develop. This is not intended for image installation. If there have been filesystems on the drive before, please use `--wipe_raid` to remove the old filesystems. Example of developing a system from a blank SSD: 1. Boot from a Live Install CD image 2. Download `./lf_kinstall.pl`: wget `http://www.candelateh.com/./lf_kinstall.pl` chmod +x `./lf_kinstall.pl` 3. Double check the drives in the system: lsblk -o name,model,label,partlabel,size 4. `./lf_kinstall.pl --make_lvm /dev/sda` This should leave the system ready to install Fedora or another OS onto. Depending on drive and kernel details, you might have to reboot back into the Live Install CD at this point (because of disk partition changes). 5. Install the OS onto the LVM partions. The partions are GPT and are intended for UEFI installation. `/dev/sda1` BIOS Boot partition `/dev/sda2` EFI data partition `/dev/sda3 /boot` partition `/dev/sda4` LVM physical volume for Volume Group Your LVM Volume Group will be ctvg_1234 to keep it distinct from any other system volume groups. ctvg_1234-lv_root for / partition ctvg_1234-lv_home for `/home` partition ctvg_1234-lv_swap for swap space. 6. After OS installation, reboot back to OS DO NOT use `--resize_lvm` or `--promote_lvm_mirror` at this point. 7. touch `/home/lanforge/did_cpuburn` `/home/lanforge/did_disktest` You do not need to both testing the system, those flag files will be erased by `--do_image_prep` 8. Install LANforge, using `/var/tmp` as `--tmp_dir:` ./`./lf_kinstall.pl --lfver 5.4.9 --kver 6.11.11+ --do_all_ct --tmp_dir /var/tmp` 9. Make sure system reboots to lanforge. 10. If it does not, try rebooting to the Live Install CD and: wget www.candelatech.com/`./lf_kinstall.pl`; chmod +x `./lf_kinstall.pl` ./`./lf_kinstall.pl --regen_initrd` reboot to LANforge
11: With LANforge booted, log in as root and prepare the system for image capture: ./`./lf_kinstall.pl --do_image_prep`
12: reboot to live install CD
13: save disk image using steps listed in `--clone_lvm` feature.

--com-speed

Also `--com_speed.` Specify serial com speed (defaults to 115200)

--com_port

Specify the serial com port (defaults to ttyS0)

--create_webpage

turn this help into HTML text for publication

--debug

Also -d, `--verbose.` Enable extra output.

--disable_audit_logs

Affects kernel audit messages. Use with `--do_grub` and reboot to have this setting take effect.
0: enable kernel audit logs (auditd.service not enabled)
1: disable kernel audit logs

--disable_resolved

change NetworkManager dns=systemd-resolved to dns=default and disable systemd-resolved.service

--do_all

Enables all options except: `--xrandr, --biosdevname, --runlevel,` and `--serial` Skips the CPU burn-in test.

--do_abandoned_cleanup

create cronjob that erases systemd slices from logged out sessions every hour (might have occurred between F24-F27)

--do_biosdevname

Enable biosdevname for interface names (uses terms like enp0s1 instead of eth0). Only takes affect when `--do_grub` is enabled.
0: Disabled
1: Enabled
-1: Use current settings (default)

--do_cma

Configure cma buffer for extra VRF buffer space. Use with `--do_grub,` applies on reboot. Use these choices:
-1: do not change
0: disable
1: apply 64 megabyte value
>1: apply this value in megabytes
Example: `--do_grub --do_cma 256` This sets cma=256M in `/etc/default/grub` From `https://www.kernel.org/doc/html/v4.14/admin-guide/kernel-parameters.html` : Sets the size of kernel global memory area for contiguous memory allocations and optionally the placement constraint by the physical address range of memory allocations. A value of 0 disables CMA altogether.

--do_cpu_burn

Attemps the CPU burn task. NOTE: The `--skip_cpu_burn` flag below has precedence.
0: Do not attempt it.
1: Do it if we have not already run it on this system previously.
2: Always run it.
>10: Run CPU burn test for specified seconds.

--do_ct_st
Download and install LANforge software and kernel only. Enables 'do_lanforge do_kern do_grub do_http do_selinux=0 do_iommu=0 do_firmware' No yum update. No system settings altered, except for selinux and iommu.

--do_ct_swak
Download and install LANforge software but only update grub to point to an already installed kernel. Enables 'do_lanforge do_grub do_http do_selinux=0 do_iommu=0 do_firmware' No system settings altered, except for selinux and iommu.

--do_cve
Apply mitigations to various CVE vulnerabilities.

--do_cups_pdf
install cups-pdf package

--do_disk_test
Also: `--disk_test.` Fill and re-read disk to prove read errors?
0: Do not attempt it
1: Do it if `/home/lanforge/did_disktest` not found unless `--skip_disk_test` specified
>1: Always run it, ignoring `--skip_disk_test`

--do_elevator
Add kernel option elevator=noop (i.e. not deadline) for single SSD CFQ optimisation.
0: Disabled
1: Enabled
-1: Use current settings (default) Only takes affect when do_grub is enabled.

--do_enable_archive_baseurl
Select this option if your mirrors.fedoraproject.org URLs are unable to provide your repository because the content has been moved to archives.fedoraproject.org This option is pretty much opposite of `--do_restore_metalinks.`

--do_enable_max_zram
write `/etc/sysctl.d/70-lanforge.conf` and apply agressive zram configuration (Fedora >= 30) To undo, remove file and reboot.

--do_fedrepos_default
Select this option to use the fedrepos default command if your yum.repos.d repository URLs have become misconfigured. If fedrepos is not available, consider `--do_restore_metalinks` option.

--do_ff_homepage
updates Firefox Homepage

--do_gnome
Tweak gnome settings (enble desktop icons, etc)

--do_grub
Modify the grub config files to boot the specified kernel.

--do_gui_autostart
Start GUI in VNC server session which starts on boot. Requires LANforgeGUI of specified version to already be installed.
0: disable GUI autostart
1: enable GUI autostart

--do_hs20
Build keys, configure apache ssl and other actions to enable this system to act as an HS20-R2 server. Requires specific LANforge configuration as well before this will actually work. This option must be explicitly enabled: It is not enable as part of any of the other option groupings.

--do_http
Serve LANforge related files at `http://localhost`

--do_image_prep
Erase the network settings and dnf cache in preparation for making a disk image for a clone. Expects `/root/resize-home.sh`

--do_interop
installs LANforge server, GUI, firmware and required packages on system to sufficient to allow it to be a resource in a LANforge cluster. Right now, this focuses on Ubuntu based systems. This also will configure Networkmanager to ignore ports except the management interface. We cannot necessarily disable NM on interop equipment.

--do_iommu

Configure system to enable/disable intel_iommu. This kernel feature decreases performance, so LANforge typically wants this disabled for optimal Ethernet performance. This can also be disabled in the BIOS by disabling the VT-d option and IOMMU options.
0: Disabled (default for do_all_ct, do_all, do_ct_swak, do_ct_st)
1: Enabled
-1: Use current settings (default) Only takes affect when do_grub is enabled.
IOMMU is useful in these conditions: * virtual machine hosting * MediaTek radios (but not mtk7996 it seems) * Ath10k radios

--do_ios_tools

Installs iOS tools needed for querying iPhone device data.

--do_kmemleak

Configure kernel option for kmemleak. Requires kernel to be compiled with appropriate options to actually enable this.
0: Disabled
1: Enabled
-1: Use current settings (default) Only takes affect when do_grub is enabled.

--do_loadmon

Enable the `loadmon.pl` utility. This logs system load data to journalctl. You can read the output using journalctl `--since` "5 min ago" -t loadmon | `./scripts/parse_loadmon.pl`
0: Disable the service
1: Enable the service
-1: default behavior is to enable the service on 5.4.8, Fedora 30+

--do_loglevel

Configure kernel console logging level. Requires `--do_grub.`
0: Disabled (removes grub bootline parameter)
>0: Adds loglevel=[value] bootline parameter)
-1: Use current settings (DEFAULT) NOTE: This may be overriden by `/etc/sysrq.d/lanforge.conf` kernel.printk sysctl

--do_mgt_dev

Also `--md.` Specify the device to dedicate with management network. Use this with `--do_sys_reconfig.`

--do_noaer

Configure system to enable/disable pci error reporting. Requires `--do_grub.`
0: Disabled (removes grub bootline parameter)
1: Enabled (adds pci=noaer bootline parameter, DEFAULT)
-1: Use current settings

--do_nomitigations

Configure system to enable/disable spectre and related mitigations. We try to compile out most of these security features since LANforge is not designed to be secure and performance is more important to us. To help make sure all of these mitigations are disabled, we will also pass command-line args to the kernel on bootup to request disabling mitigations. Default is '1'.
0: Do not add the mitigations=off option
1: Do add the mitigations=off (default)
-1: Use current settings Only takes affect when do_grub is enabled.

--do_only_pkgs

Only install packages (and groups) and exit. Use when creating VMs or if you want to install all distro packages and reboot before proceeding. If you want to download everything needed, install yum packages for development imaging:
1) touch `/home/lanforge/did_cpuburn /home/lanforge/did_disktest` or touch `/root/did_cpuburn /root/did_disktest` (if `/home/lanforge` does not exist)
2) `./lf_kinstall.pl --lfver ___ --kver ___ --do_selinux=0 --skip_yum_all`
3) `./lf_kinstall.pl --lfver ___ --kver ___ --skip_yum_all --do_all_ct --force_web \`
`--tmp_dir` /home/lanforge/Downloads `--download_from http://ctdownloads/ --download_only`
4) reboot
5) `./lf_kinstall.pl --lfver ___ --kver ___ --do_only_pkgs`
6) poweroff and make your snapshot

--do_pkgs

Install packages from Internet needed by LANforge.

--do_print_label

Use the following two options to print a label with model and mac address information
1) print_host: hostname owning printer
2) print_queue: name of print queue, often 'QL-800' or 'LaserWriter-450'
3) serialno: provide the serial number for chassis, or use 'HOSTNAME'

Example: `--do_print_label --print_host 192.168.100.14:8082 --print_queue QL-800 --serialno HOSTNAME`

--do_radius

Install and configure radius server (with default values).

--do_release_mirror

for downloading install files necessary to host new releases on the system. These files are placed in `/var/www/html/downloads` and `/var/www/html/private/downloads.` In the GUI Release Mgr tab, Download From can list `http://192.168.1.101` or whatever the mananagement port IP is.

--do_restore_metalinks

Select this option if you see errors like below:
1) Repository updates-debuginfo has no mirror or baseurl set.
2) Repository updates-source has no mirror or baseurl set.
3) Repository fedora-debuginfo has no mirror or baseurl set.
4) Repository fedora-source has no mirror or baseurl set.
5) Error: Failed to synchronize cache for repo 'updates'
6) Your `/etc/yum.repos.d` repo files have had changes and are unable to reach mirrors.fedoraproject.org

--do_rfgen

removed in 5.4.8, udev rules are now created automatically

--do_runlevel

Configure system to run-level 3 or 5
0: Use current settings (do nothing)
3: Set to use runlevel 3 (non graphical login)
5: Set to use runlevel 5 (graphical login, needed for cinnamon)

--do_save_yumc

Specify:
1: Yum update then save cache.
20: Delete local cache first then update and save.

--do_selinux

Configure selinux (it conflicts with LANforge.) do_grub should also be enabled to modify the kernel boot commands.
0: Disabled (default, if do_all and related options are selected)
1: Enabled
-1: Use current settings

--do_serial

Enable serial console configuration in grub.
0: Disabled
1: Enabled
-1: Use current settings (default) Only takes affect when do_grub is enabled.

--do_services

Enable/Disable services to work well with LANforge.

--do_slub_debug

Enable/Disable SLUB memory debugging (at least on debugging kernels) Use with `--do_grub,` applies on reboot. Use these choices:
-1: do not change
0: disable
1: enable slub debugging
Example: `--do_grub --do_slub_debug 1`

--do_ssd_fstab

Modify rw behaviour for SSDs in `/etc/fstab.`

--do_sys_reconfig

Attempt to re-configure system config files. Only works on certain platforms (APU2, Jetway, Noah2, Axiomtek)

--do_udev

Create `/etc/udev/rules.d/70-persistent-net.rules` file if it does not already exist. It may still need hand-editing.

--do_vm_prep

Erase the network settings and dnf cache in preparation for making a OVA image. Expects `/root/resize-home.sh`

--do_vm_reconfig

forces `--do_sys_reconfig` to run, looking for enpX interfaces and no radios

--do_vnc

Configure VNC for user lanforge. See `--do_secureme`

--do_webui

installs and configures LANforge WebUI components. Fedora-34 and higher. Requires online access.

--do_xrandr

Add work-around to disable LVDS1 using xrandr. This works around Gnome issues on the Lanner WiFi appliances, and perhaps other systems.

--do_xrdp

should we adjust the xrdp.ini and sesman.ini files:
0: ignore files
1: adjust files

--do_yum_update

Update OS packages from Internet. Does yum `--upgrade` or dnf `--upgrade` or apt-get upgrade.

--download_from

Also: `--from, --download_host.` Specify web url to download LANforge packages from. Implies `--force_web.`

--download_only

Download files to tmp-dir, but do not install them or make other changes.

--download_videos

shortcut for downloading Candelatech videos into `/var/www/html/videos` so that they might be served for video testing. See `/usr/local/lanforge/nginx/video.inc` for stanza when enabling directory listings when using nginx.

--fix_web_root

Enable do_http and reset the `/etc/httpd/httpd.conf` DocumentRoot and Directory from `/home/lanforge/candela_cdrom` to `/var/www/html`

--force_new_certs

Re-generate the HotSpot 2.0 R2 (HS20-R2) and/or RADIUS certs, even if we have previously created them.

--force_notes

Force creating lfnotes.html

--force_osver

Override the detected OS version string with this value. EG: F36

--force_osveri

Override the detected OS version number (integer) with this value. EG: 36

--force_uname

Override the detected value of uname -a. Useful for building bundles on non-matching hardware. EG: adtran-aarch64

--force_web

Force script to use webserver. Do not use with `--source_dir.`

--hs20_server_ip

IP Address to advertise as HS20 servers. This could be IP address of management port in simple configurations, and for more realistic configurations, perhaps the IP address of something in same network as the HS20 OSEN and .1x APs.

--hwver

Specify the hardware string: CT521, CT52x-PR, CT521, CT520, LF0202, CT523, CT523c, CT314, LF0312, LF0313, CT522 Can help with html info page configuration. Leave blank if unsure.

--ignore_err

Ignore any (otherwise fatal) errors. May be useful for offline installs where some functionality is better than none.

--install_large_file_cron

Creates a crontab entry that runs `/home/lanforge/scripts/check_large_files.bash` on a daily basis. If you want to run that check more frequently, you will have to modify the crontab rules yourself.

--install_pip_lanforge_scripts

removed in 5.4.8, 'lanforge-scripts' package is no longer maintained

--install_selenium

install the selenium package using pip3 (implemented in 5.4.8)

--install_vlc

VLC video player requires RPMFusion repository. This adds the repository and then installs VLC.

--lf2100_8x

Specify adapter board used is the 8x internal splitter/combiner board, for do_sys_reconfig

--lf2103_8x

Specify adapter board used is the 8x gen-3 internal splitter/combiner board, for do_sys_reconfig

--make_ifcfg_eth0

Creates `/etc/sysconfig/network-scripts/ifcfg-eth0` from the eth0 entry found in `/etc/udev/rules.d/70-persistent-net.rules.` Fedora only. Edit 70-persistent first.

--mgt_dev

indicate what interface should be configured as the management interface. LANforge works best in cases where there is a dedicated management interface and management network (out of band management). In the case there is only one interface and it has to serve as a traffic port and a management port, that is possible (in band management). Currently this option is only used by the `--regen_nm_conf` option. If this option is not specified Specify one of these options:
1) {interface_name}: name of the interface to set
2) "existing": force the use of the mgt_dev in `/home/lanforge/config.values`

--mgt_dns

specify IP address to add to [ipv4]mgt_dev.dns value in mgt_dev.nmconnection

--mgt_ip

specify either "dhcp" or a "ip/cird/gateway" combination for mgt_dev.nmconnection:
1) mgt_ip=dhcp
2) mgt_ip=192.168.208.24/20/192.168.208.1

--no_fmirror

Uninstall yum-fastest mirror.

--nocache

Add fake URL argument to disable any HTTP caching.

--ntwk_mgr_ok

Enable NetworkManager. Enabled on Fedora 41+, otherwise disabled. Interop on Debian/Ubuntu will leave NetworkManager enabled.

--offline

Specify that the system is on an isolated network. Turns off `--do_only_pkgs --do_pkgs` Enables `--skip_fmirror --skip_installer_check --skip_pip --skip_yum_all --skip_yum_update`

--print_host

Use with `--print_label`

--print_only

Implies `--show_urls` without website check Turns off `--do_only_pkgs --do_pkgs` Enables `--skip_fmirror --skip_installer_check --skip_pip --skip_yum_all --skip_yum_update`

--print_windows

print out .bat file contents to help with downloading LANforge updates promote_lvm_mirror [drive]: Also: `--lvm_mirror.` Reformat named drive and attach partitions to the existing LVM as mirror devices. This feature is intended to be used during installation: 1. Boot the system with a live CD distro 2. Download `kinstall.pl` 3. Use `lf_kinstall.pl --resize_lvm` 4. Use `lf_kinstall.pl --lvm_mirror [blank drive]`

--rebuild_pip

this will uninstall the python pip user environments and build a new one from `scripts/requirements.txt`; if you see errors, you probably are missing newly required library packages provided by the distro. To make sure your packages are up to date, use:
Example: `./lf_kinstall.pl --do_pkgs`

--regen_https_key

regenerate the `/etc/pki/tls/$hostname.crt` and .key files so that they have F33+ 4096 bit keys, not smaller keys.

--regen_initrd

process will mount the LVM root volume and chroot into it, regenerating the Candelatech initrd file so that newly images systems can correctly reboot. *Use from a Live CD!* This step is called by `--promote_lvm_mirror` and `--resize_lvm.` You might have to recover a system image by running this command from a live USB if the newly applied image has trouble booting.

--regen_nm_conf

Also `--regen_nm_config.` Backs up `/etc/NetworkManager/NetworkManager.conf` and recreates one that specifies that no interfaces except the one with the default route be managed. Enabled by default during do_interop. NM settings you do not want modified should live in separate conf files in `/etc/NetworkManager/conf.d.` When this option is used without the `--mgt_dev` option, a new management device will be determined.

Default value is 1.
0: do not modify NetworkManager.conf
1: update NetworkManager.conf and mgt_dev.nmconnection
2: update NetworkManager.conf, mgt_dev.nmconnection, but do not restart NetworkManager

--remove_certain_pkgs

Uninstall packages that are typically noisy, problematic, or pointless for a LANforge system sold by Candelatech. This is implied by `--do_all_ct.` This is overridden by `--skip_yum_all, --download_only, --create_install_bundle.` Packages presently include: dnfdragora-updater, dnfdragora, openvswitch, spice-vdagent, open-vm-ools, setroubleshoot, virtualbox-guest-additions, thunderbird.

--remove_kern

Uninstall a LANforge kernel from `/boot` and `/etc/grub.d.` It will update the `/boot/grub2/grub.cfg.`

--remove_large_file_cron

removes the cronjob created by `--install_large_file_cron`

--remove_passwords

removes the passwords from accounts root and lanforge and reconfigures sshd to accept empty passwords. Yes...really, it IS crazy, right?

--remove_pipewire

Removes pulseaudio-pipewire packages.
0: do not remove pipewire (default)
1: remove pipewire

--reset_pip

Use when pip3 updates were installed as root and you have system pip3 package conflicts. This will reinstall the python-pip3 package and 'pip3 remove -r `requirements.txt`' to remove pip3 libraries from system folder. Follow this with `--update_pip` to get pip3 libraries into user lanforge folder.

--resize_root

resize the root (/) partition to the extent of the storage device. This is intended for Adtran LF0355_AT7 and similar AP chassis when booting from USB storage.

--save_gui_cfg

Use this to restore GUI settings on reboot. Running this a second time copies a changed `LANforgeGUI/lfcfg.txt` file to `$home` to save new changes.
1) backup: copies the `LANforgeGUI/lfcfg.txt` file to `$home.` Disables `lfcustom_gui.bash` if it exists.
2) static: implies backup, creates `lfcustom_gui.bash` that replaces `lfcfg.txt` into LANforgeGUI directory every time LANforgeServer is started.

--serialno

use with `--do_print_label,` specifies serial number on label

--set_swiotlb

Also: `--swiotlb, --do_swiotlb.` Configure IOMMU buffer size. Requires you use IOMMU setting, so use with `--do_grub --do_iommu=1`
Example: `--do_grub --do_iommu=1 --set_swiotlb=65536`

--setup_flatpak

[flatpak URL] Install and create a flatpak 1.6 runtime. Specify the URL of the flatpak to install. Flatpak requires a kernel with SECCOMP enabled to run.

--setup_snapd

[snapd URL] Also `--setup_snap.` Install snapd and the Candelatech python virtual environment. Requires F24 or Ubuntu 20.04.

--show_large_pkgs

Also: `--show_larges_pkgs, --largest_pkgs, --large_pkgs.` Show top 20 largest packages. Useful during do_image_prep if you want to reduce install footprint.

--show_urls

Show URLS for all files that should be downloaded, and exit.

--skip_cpu_burn

Don't burn-in CPU.

--skip_disk_test

avoid do_disk_test if `/home/lanforge/did_disktest` is missing

--skip_fmirror

Don't alter systems existing use of yum-plugin-fastestmirror.

--skip_grub

Don't do kernel install, even if other options would have selected it.

--skip_gui

Don't install LANforge-GUI, even if other options would have selected it.

--skip_instller_check
avoids checking MD5 sum of `lf_kinstall.pl`

--skip_ifrename
avoids renaming interfaces and rewriting 70-persistent-net. If OUIs of VMs are detected, the file `/home/lanforge/LF_NO_IFRENAME` is created. If `/home/lanforge/LF_NO_IFRENAME` is found, this option is automatically enabled.

--skip_installer_check
turn off checking md5sum of `./lf_kinstall.pl`

--skip_kern
Do not install a kernel package, suppresses do_grub, do_kern

--skip_radius
Do not attempt to reconfigure radius. Useful when attempting to speed up do_sys_reconfig on slow systems.

--skip_resume
Don't try to use HTTP resume when downloading packages.

--skip_xorp
Don't install Xorp virtual-router package, even if other options would have selected it.

--skip_yum_update
Don't execute dnf/yum `--update`

--source_dir
Specify location of installation files (must be absolute path). Implied by `--use_bundle.` Useful when downloading install packages on an isolated system (typically to `/home/lanforge/Downloads).` Example: `./lf_kinstall.pl --lfver 5.4.7 --kver 6.7.5+ --do_upgrade --source_dir /home/lanforge/Downloads --offline`

--tmp_dir
Specify the script temporary working directory and backups of system files. Typically defaults to `/var/tmp.`

--update_pip
Also `--upgrade_pip.` Upgrades pip3 userland. This calls `scripts/py-scripts/update_dependencies.py`. If there are errors from that process, please run that script as user lanforge (not root). If there is a web proxy in your environment, this might be skipped. Some Debian based environments will attempt to create a virtual environment (/home/lanforge/scripts/venv).

--use_install_bundle
Also `--use_bundle, --bundle` [bundle file] Upgrade LANforge using an install bundle file. Bundle files Sets `$source_dir, $tmp_dir` to directory containing `bundle.tar` file. See `http://www.candelatech.com/lfserver_install.php#offline_bundle` Bundle installations require the system OS matches compiled OS version in the bundle. Confirm your OS version using: "grep Y `/etc/os-release"` . Not intended for `--do_interop.` This sets flags: disable_audit_logs = 1 do_cma = cma_recommendation() if (do_cma == 1) do_firmware = 1 do_grub = 1 do_http = 1 do_kern = 1 do_lanforge = 1 do_pkgs = 0 do_upgrade = 1 do_xrandr = 0 do_yum_update = 0 is_offline = 1 skip_cpu_burn = 1 skip_fmirror = 1 skip_pip = 1 skip_xorp = 0 skip_yum_all = 1 skip_yum_update = 1 source_dir = tmp_dir You can specify `--force_osver` and `--force_osveri` to install a bundle onto a non-matching OS. For example: `--bundle` Bundle_lfver-5.4.7_kern-6.7.9+_osver-F36 `--force_osver` 36 `--force_osveri` 36 will install the F36 bundle correctly on F37, F38

--use_yum_cache
do not erase and rebuild yum cache

--wipe_raid
Also `--remove_raid --remove_lvm` [drive1,drive2...] Remove LVM volumes and signatures from specified disks. Use this before doing `--create_raid` the first time on any disk that already has a filesystem.
Example: `./lf_kinstall.pl --wipe_raid nvme0n1p1,nvme1n1p1`

Note:

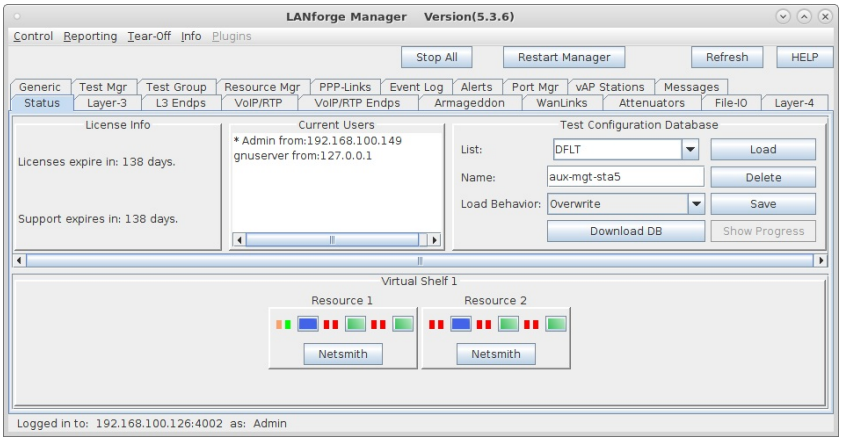
If you use commands "yum update" or "dnf update", and you need to use a kernel provided by the repository, use grub2-mkconfig to create the boot entry, or consider using `--do_interop`
Example: `grub2-mkconfig -o /boot/grub2/grub.cfg`

Configure Auxiliary Management Interfaces

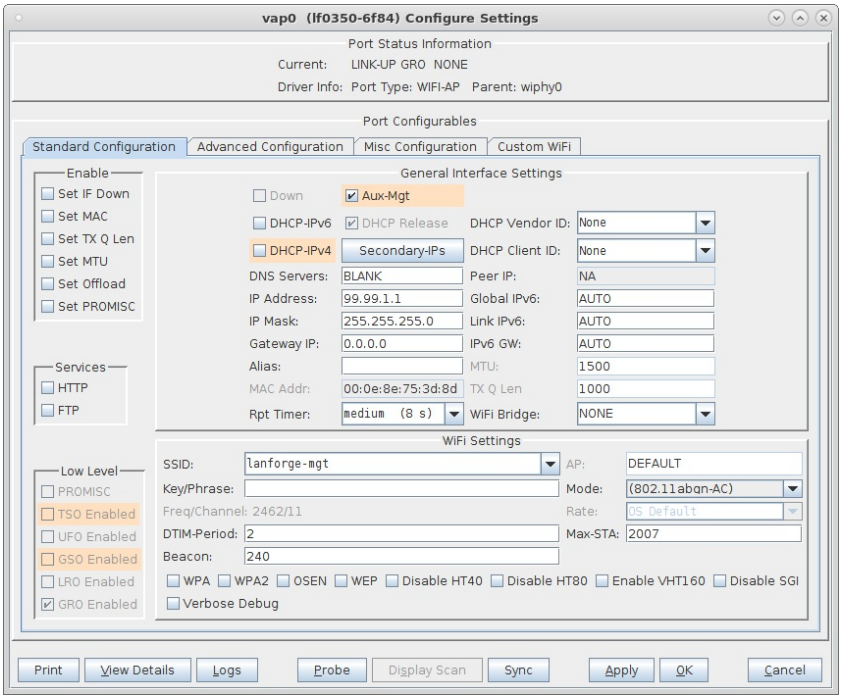
Goal: Allow LANforge to create its own wireless management network.

In cases where is is not convenient to use an existing management network, LANforge WiFi systems can be configured to provide their own WiFi management network. This may be especially useful when testing in environments where LANforge needs to be moved around or where you have no good access to existing management LANs. This example assumes that you already know how to create and configure VAP and Stations in LANforge.

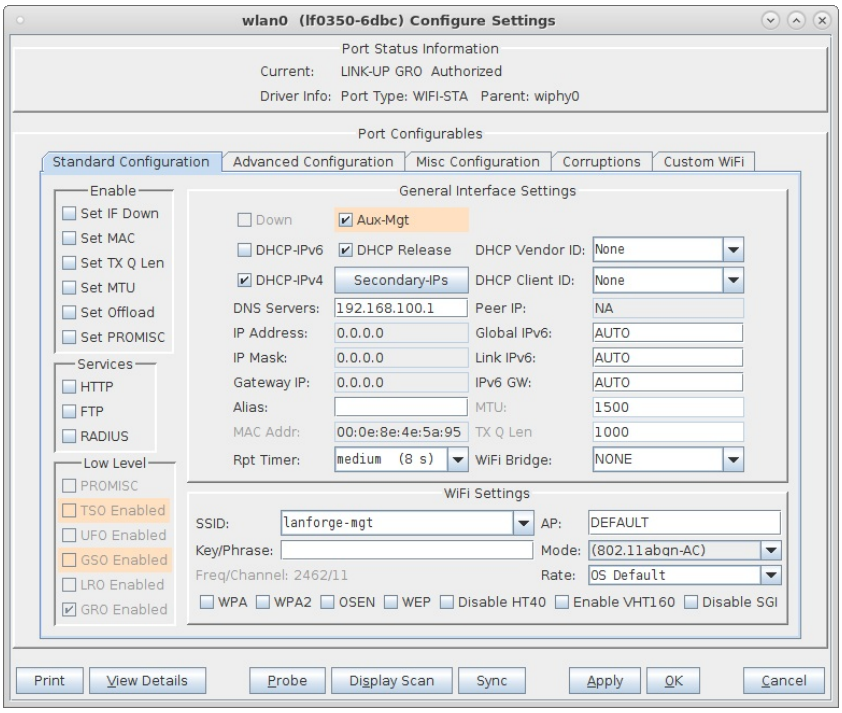
1. Configure LANforge for Auxiliary Management.
   A. Connect LANforge systems through the normal management LAN for initial configuration. The resources should be visible in the management tab



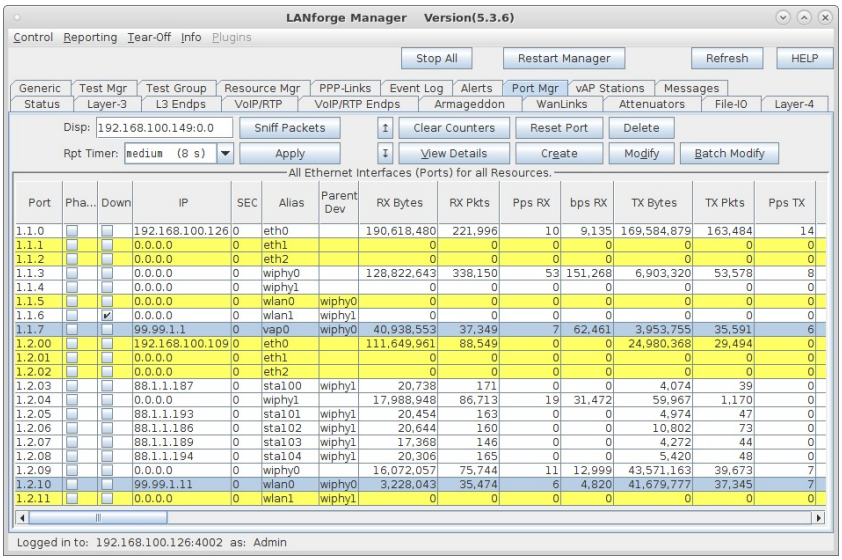
   B. In this case, we are using wiphy0 for the Aux-Mgt interfaces. On the manager system, configure wiphy0 to be on the desired channel, create a virtual AP on wiphy0, and configure it appropriately. The **Aux-Mgt** checkbox should be selected, a static IP should be assigned, and an appropriate SSID configured. The AP Aux-Mgt port will automatically serve DHCP and will try to NAT and route packets to the wired Management interface.



C. On the other resources, configure the wlanX interface to connect to the AP on the manager system, and select the **Aux-Mgt** checkbox.



D. The Port-Mgr tab should look something like this when the Aux-Management interfaces are configured.



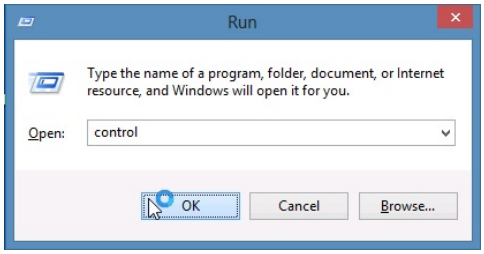
E. To test that it works properly, you can now remove the wired Manament port connection and wait about 1 minute for the old connection to time out and re-connect to the Auxiliary Management port. Or, just reboot systems with the wired ports unplugged and they should be discovered on the Aux-Mgt ports promptly.

Windows IP Addresses

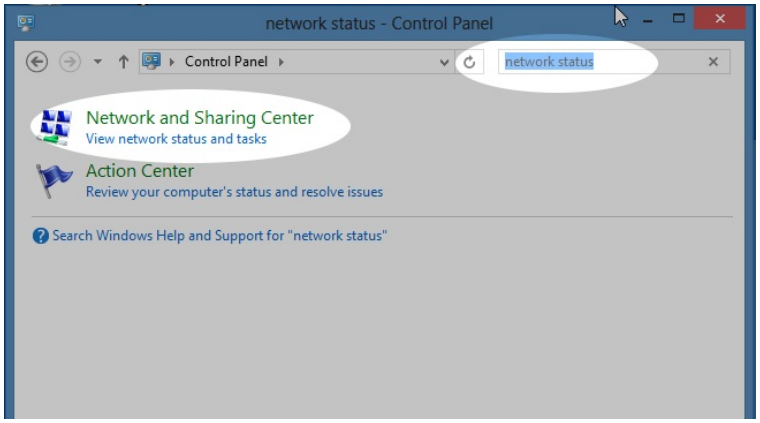
Goal: Find and change network ip addresses on Microsoft Windows.

Here are some techniques for finding and setting IP addresses on Microsoft Windows using the Control Panel and the command line.

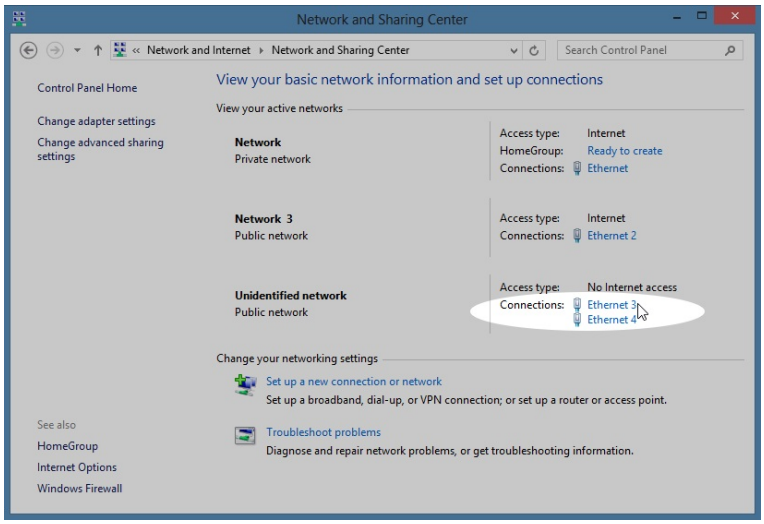
1. Find the IP Address of the Windows PC. There are two methods you can use:
    A. Using the Control Panel:
        A. Click Start, Run, `control`, [enter]



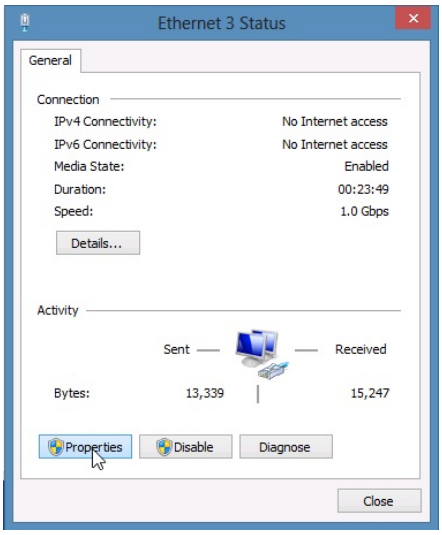
        B. Search and select Network Status and Devices



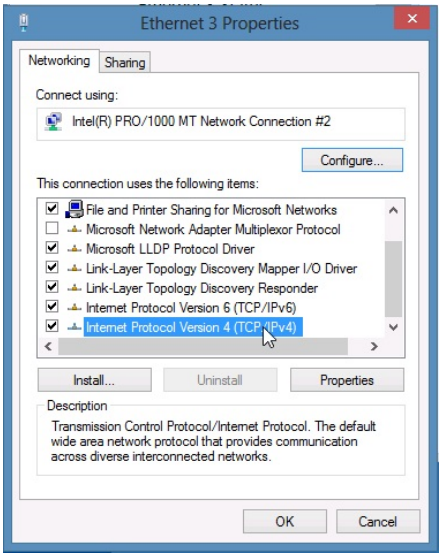
        C. We click on our device, **Ethernet 3**:



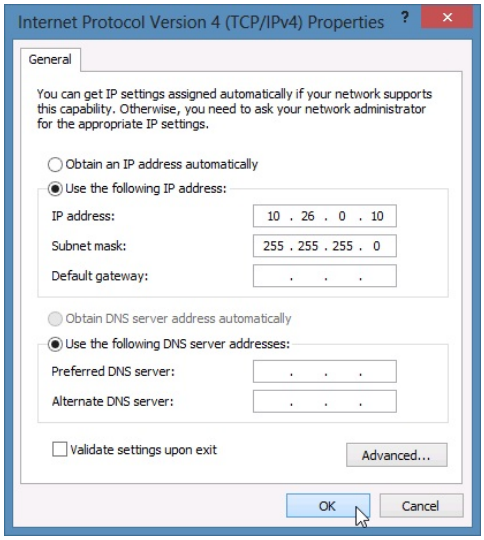
D. Find and/or set the IP address: from Status, click **Properites**



E. double click **TCP/IPv4**



F. you will see and can change the IP address.:



B. Various DOS commands to find the IP addresses on the system:

   A. `ipconfig` and `ipconfig /all`

   B. `netsh interface ipv4 show address`

C. Resetting your DHCP address via command line:

   A. `ipconfig /release`

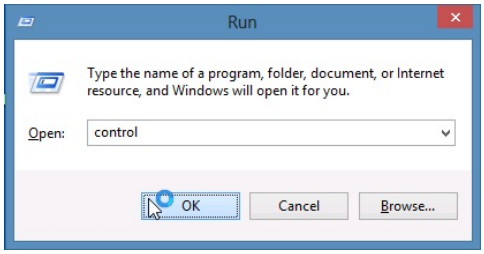
   B. `ipconfig /renew`

Windows MAC Addresses

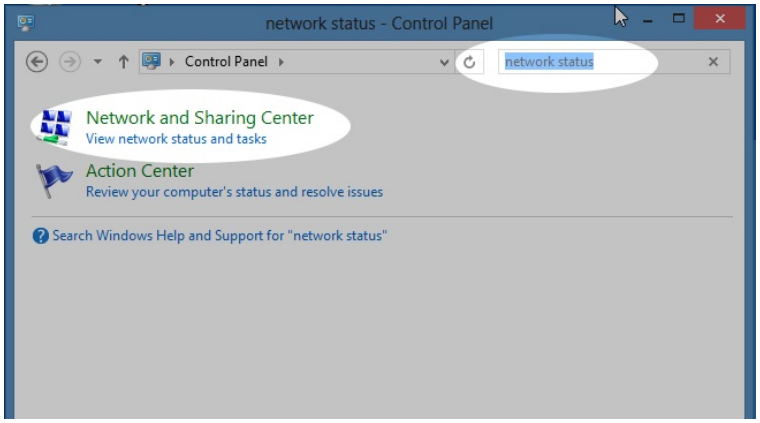
Goal: Find MAC Addresses in Microsoft Windows.

Here are some techniques for finding MAC addresses on Microsoft Windows using the Control Panel and the command line.

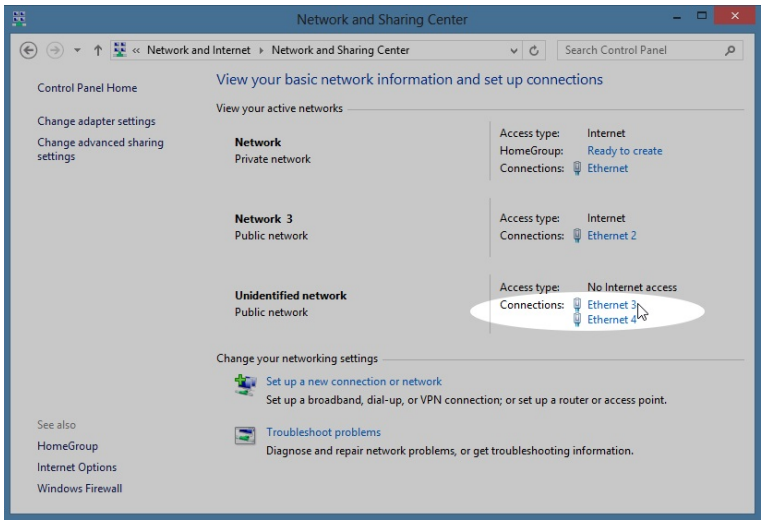
1. Find the MAC Address of the Windows PC. There are two methods you can use:
    A. **Method 1:** use the Control Panel
        A. Click Start, Run, `control`, [enter]



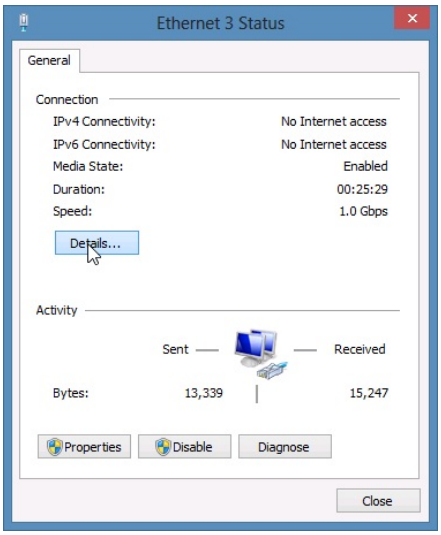
        B. Search and select Network Status and Devices



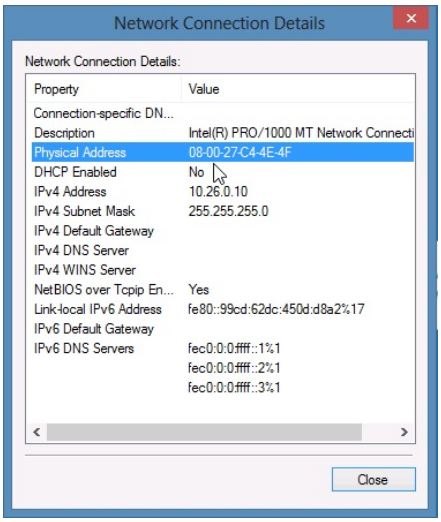
        C. We click on our device, **Ethernet 3**:



D. Click **Details...**



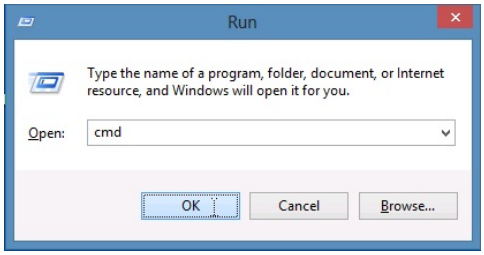
E. Details will show the MAC address (physical address):



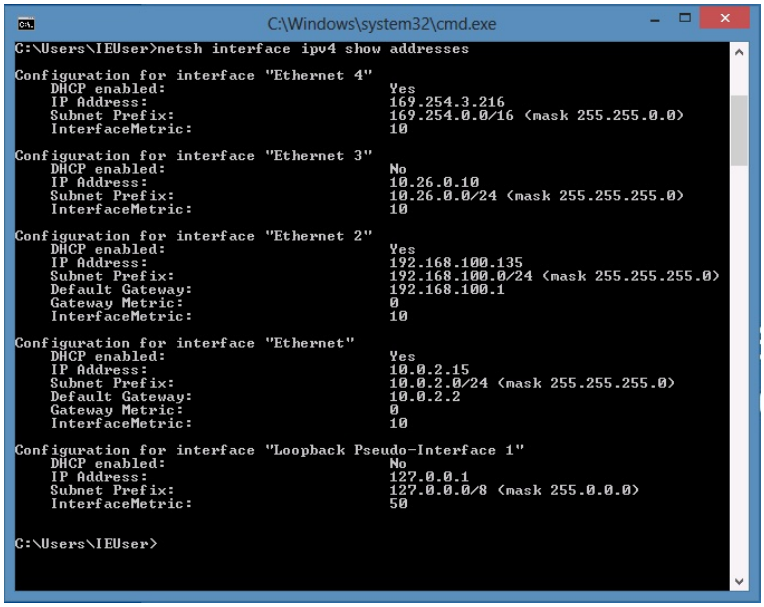
F. (Suggested) Set the IP address if you have not already. For more information see Finding Windows IP Address

B. **Method 2:** use the DOS command-line. You want to correlate the IP address and MAC address of the Windows ethernet port:

A. Click Start, Run, and type `cmd`, and press [Enter]

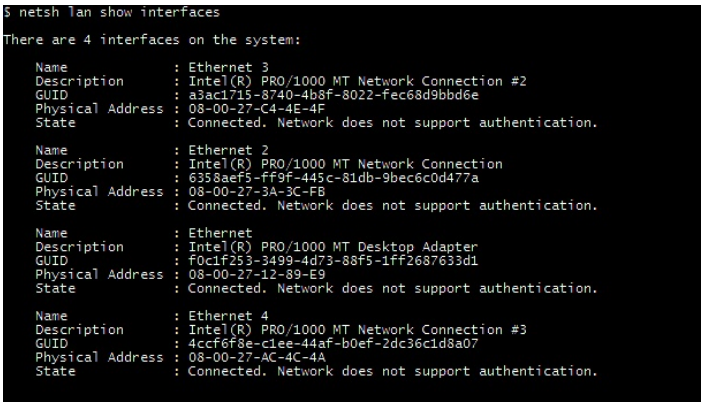


B. Show interfaces by name with the command: `netsh interface ipv4 show addresses`



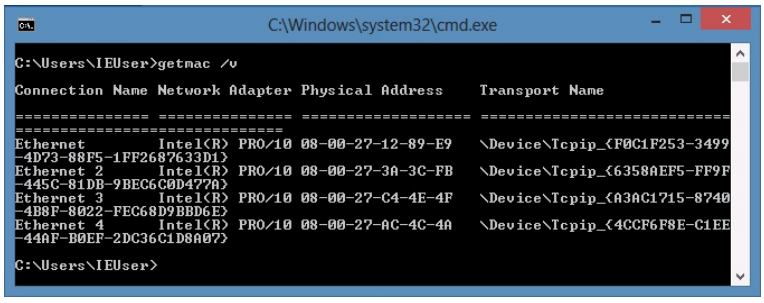
C. (Optional) if you do not see results, you might need to start the network autodiscovery service: `net start dot3svc`

D. (Optional) Depending on the edition of Windows, the command `netsh lan show interfaces` will display mac addresses.



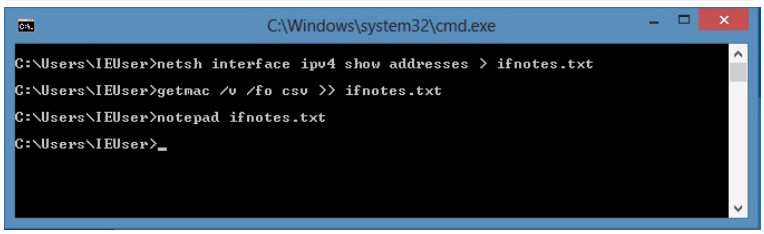
E. Show mac addresses with: `getmac /v /fo csv`

(The CSV formatted command of the command ensures that we will see the entire name of the interface which can be trimmed short in the default output format.)

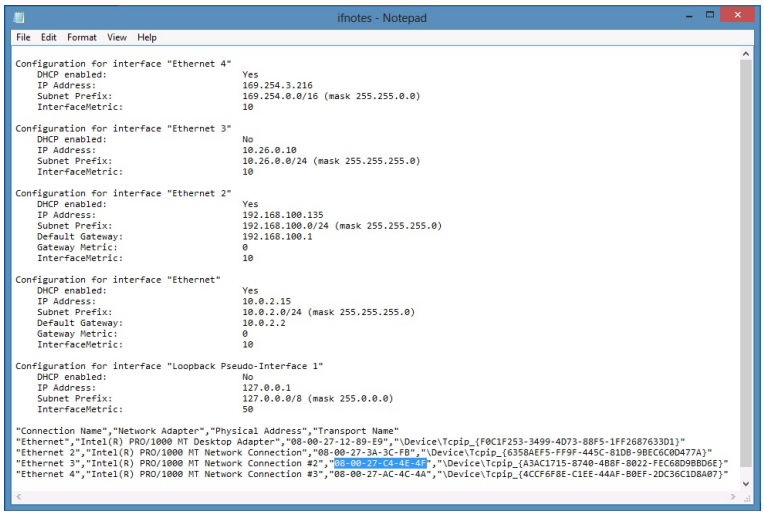


F. These commands will make it easier to copy using **notepad**:

```
netsh interface ipv4 addresses > ifnotes.txt
getmac /v /fo csv >>ifnotes.txt
notepad ifnotes.txt
```



G. Now you can easily copy the values:

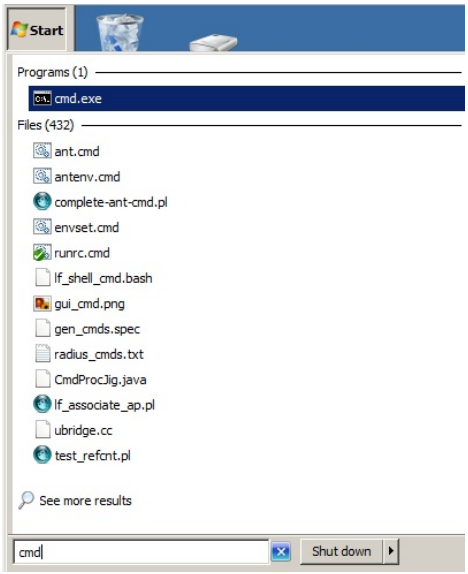


Customizing DOS Window Settings

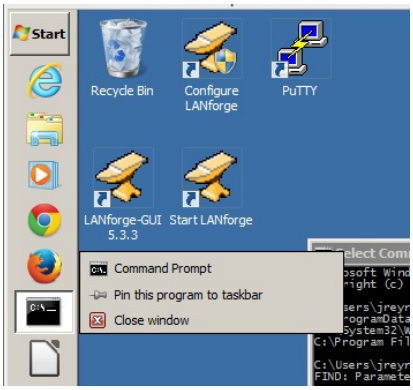
Goal: Make your DOS windows large and do cut and paste easier.

Here we review DOS window settings that will help you to work faster.

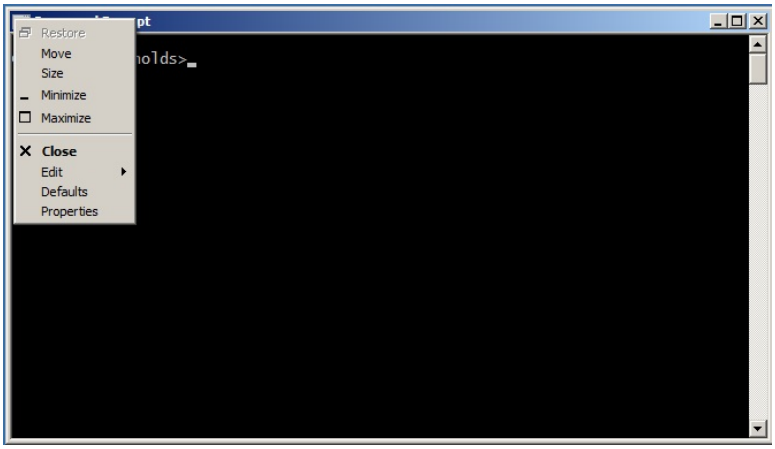
1. Customizing DOS Window Settings starts by right clicking the **Start Menu**
2. Type in `cmd` and hit Enter



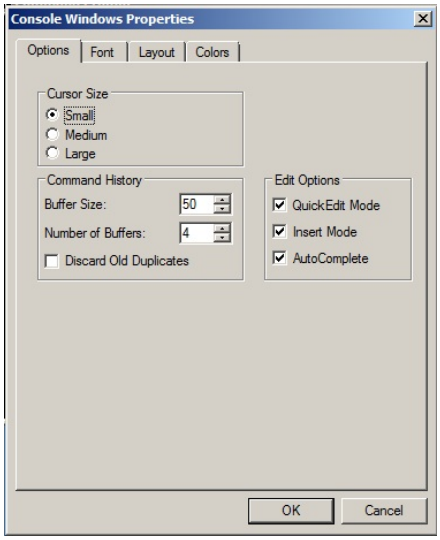
3. To get to your DOS window faster, you can pin it to your task bar. Right click the task bar CMD window icon and select **Pin this program to taskbar**



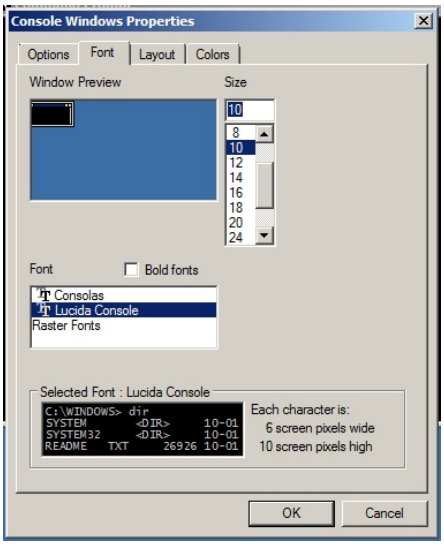
4. On the DOS window title bar, Right click and select the **Defaults** menu item



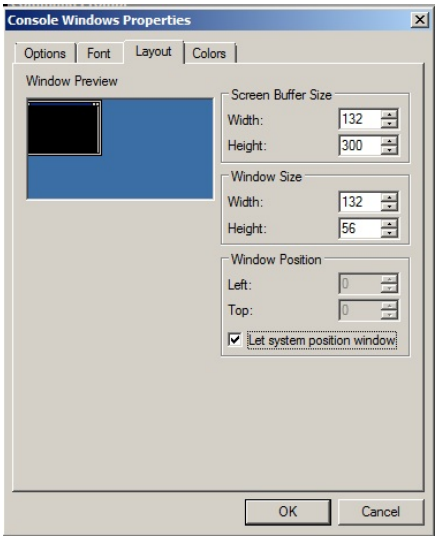
5. Select the Quick Edit Mode setting. This allows you to highlight text in the window easily.



6. In the **Font** tab, select a slimmer TrueType font, like Consolas or Lucida Console, and set the font size to 10



7. In the **Layout** tab, change the Window Size to 132 columns and 56 rows



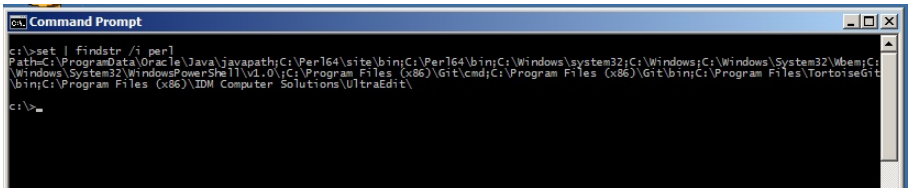
8. Click **OK** to save. The next DOS window you open will appear with your customized settings.

Quickly Inspect Your DOS Path

Goal: Find if a program or is in your %PATH%

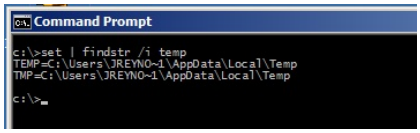
Use this technique to inspect your DOS environment variables for specific strings using `findstr`.

1. Follow this example to see if perl is installed and your %PATH% environment variables is updated. First, open up a DOS window: Windows + R `cmd` Enter
2. Type in the DOS Window: `echo %PATH% | findstr /i perl` Enter
3. If perl is installed correctly, you should have it in your path.



4. You can also use this technique to find any environment variable. E.G., find if you have a temporary directory set:

```
set | findstr /i temp
```

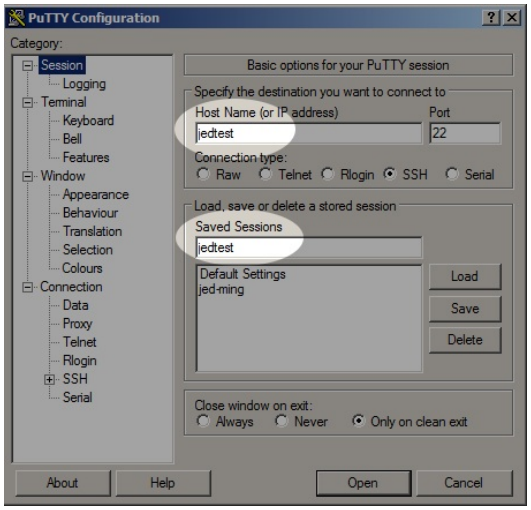


Connecting with PuTTY

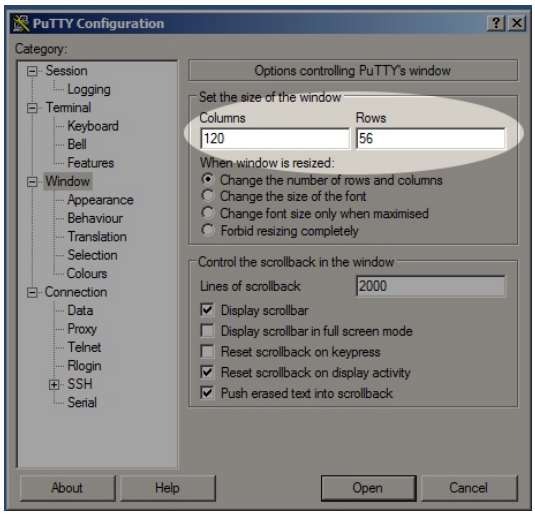
Goal: Using PuTTY on Windows to connect to LANforge Linux servers.

Lots of tasks, like scripting, can be done over SSH from your Windows desktop. Here are a few steps to help you customize your PuTTY terminal to work faster.

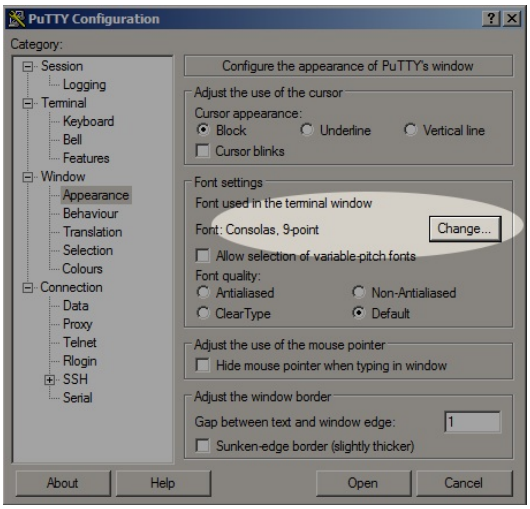
1. Configuring a PuTTY Session
   A. When you double click on the PuTTY icon and it launches, you can start customizing your session preferences. We'll name this session jedtest



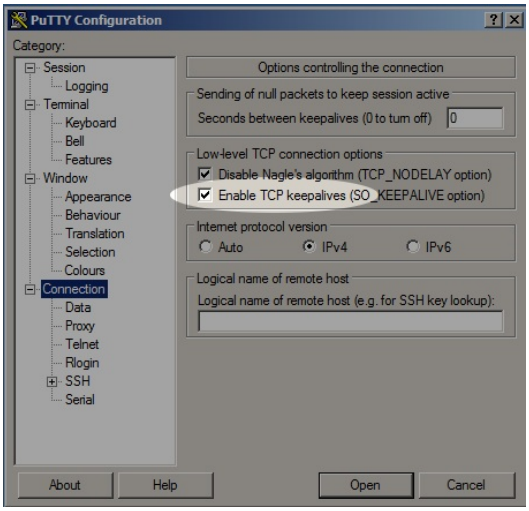
   B. Let's default the window to something large, like 120 columns and 56 rows.



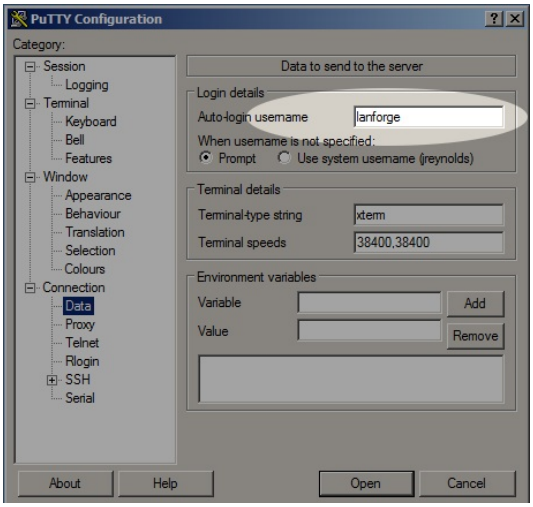
C. The Fixed font can be replaced with the Consolas font.



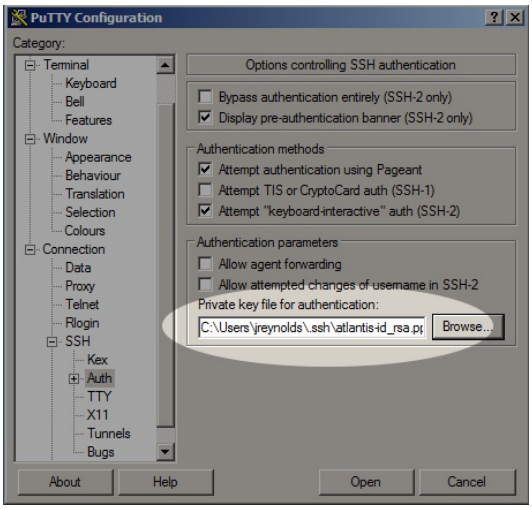
D. Let's turn on TCP Keep-alive and set IPv4 as the default networking protocol.



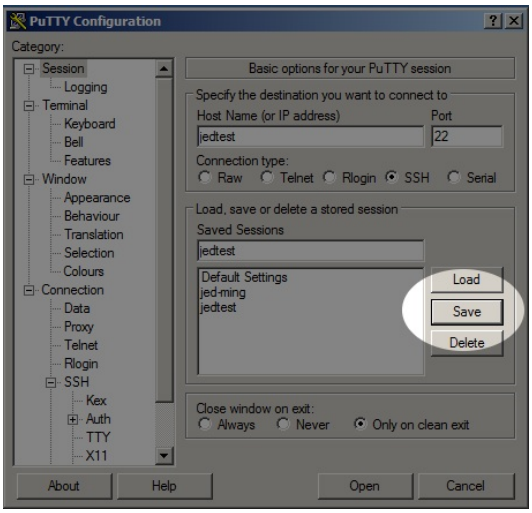
E. We login to LANforge resources with user `lanforge`



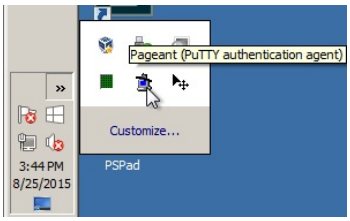
F. Generating a SSH keypair is not difficult. Let's enter the path to our public key file.



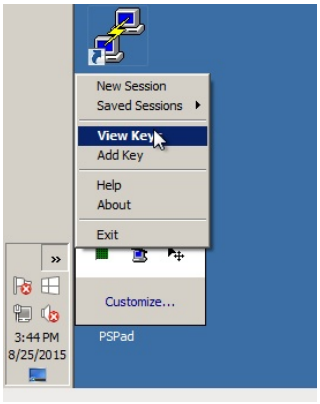
G. We have done our PuTTY config. Now back to the top **Session** screen, and click **Save**



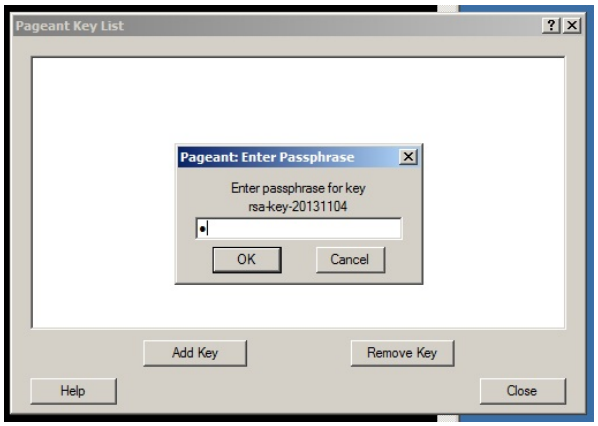
2. Configure Pagent with your public key
   A. Create your own public ssh key. For more information see WinScp Net
   B. Start Pagent. Configure it to load on startup.
   C. In the System Tray you will see the Pagent icon.



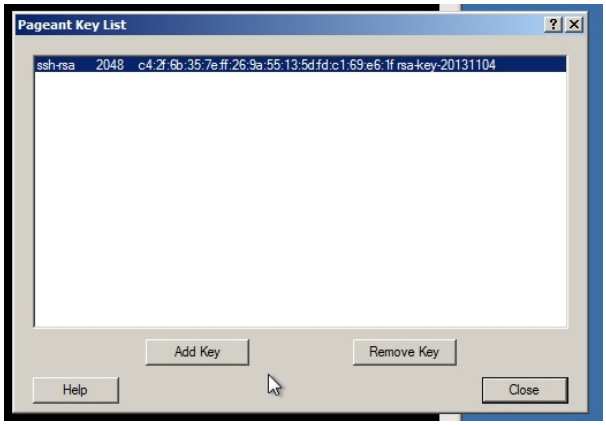
   D. **Right-click** the Pagent icon and click **Add Key** to select your key



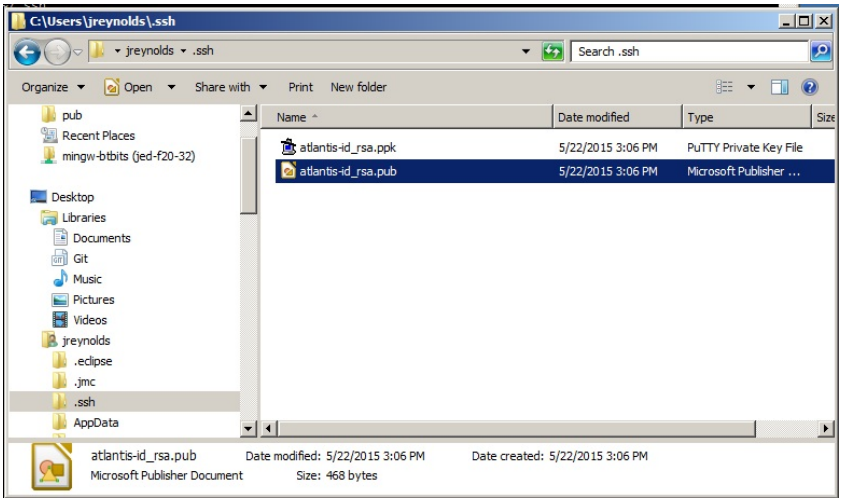
E. You will need to provide your pass-phrase to load your key



F. We see a loaded key

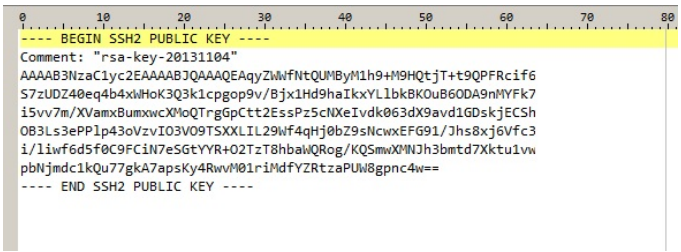


G. Here is our key, we will view the `.pub` file to copy out the public key.



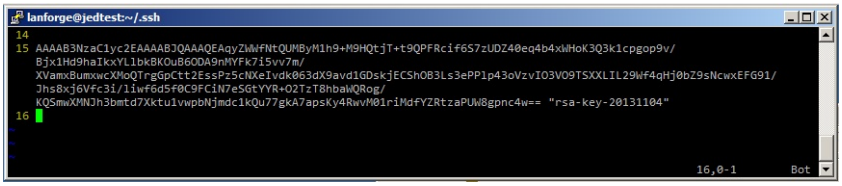
H. In a putty window you will log into your LANforge server and edit `/home/lanforge/.ssh/authorized_keys`

I. Copy the text and place the "Comment" section at the end when you paste it into your ssh

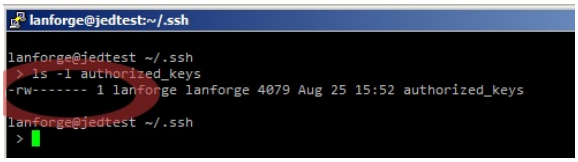


```
---- BEGIN SSH2 PUBLIC KEY ----
Comment: "rsa-key-20131104"
AAAAB3NzaC1yc2EAAAABJQAAAQEAqyZWWfNtQUMByM1h9+M9HQtjT+t9QPFRcif6
S7zUDZ40eq4b4xWHoK3Q3k1cpgop9v/Bjx1Hd9haIkxYL1bkBKOuB6ODA9nMYFk7
i5vv7m/XVamxBumxwcXMoQTrgGpCtt2EssPz5cNXeIvdk063dX9avd1GDskjECSh
OB3Ls3ePPlp43oVzvIO3VO9TSXXLIL29Wf4qHj0bZ9sNcwxEFG91/Jhs8xj6Vfc3
i/liwf6d5f0C9FCiN7eSGtYYR+O2TzT8hbaWQRog/KQSmwXMNJh3bmtd7Xktu1vw
pbNjmdc1kQu77gkA7apsKy4RwvM01riMdfYZRtzaPUW8gpnc4w==
---- END SSH2 PUBLIC KEY ----
```

J. Here is the public key string, with newlines and spaces removed. The Comment text goes at the end.



K. Check the permissions of the `authorized_keys` file. You might need to use the command `chmod 600 authorized_keys` to correct the permissions.



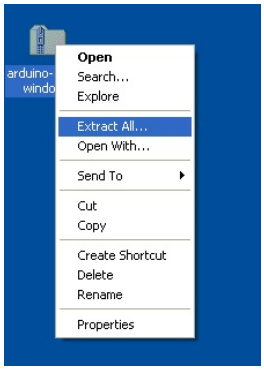
L. The next time we load the jedtest PuTTY session we should not be prompted for our password.

Installing the Arduino Mega Driver on Windows XP

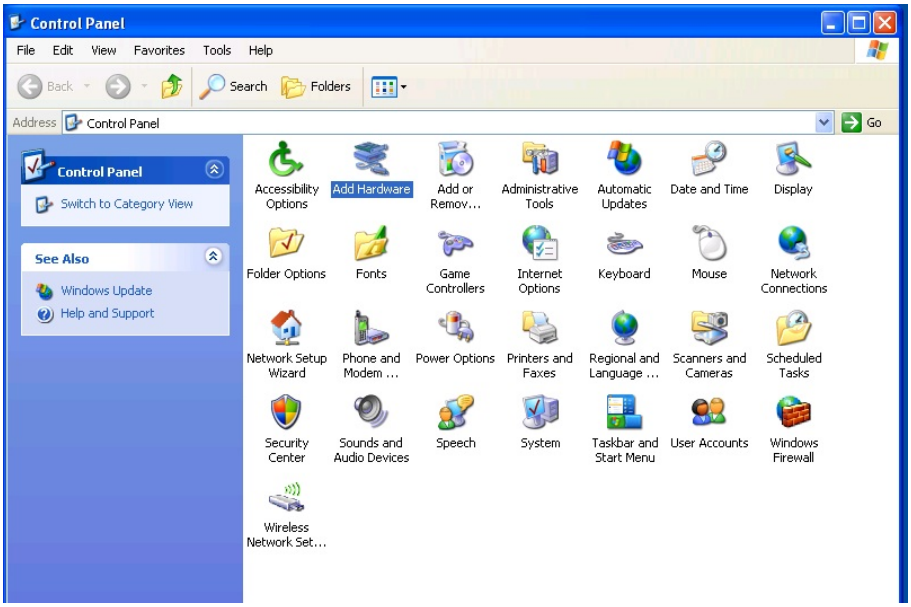
Goal: Installing the the Arduino Mega device driver on Windows XP.

The automatic driver install process for Windows XP might automatically install a Microsoft Windows version of the Arduino Mega driver. This is not the driver LANforge expects. These instructions will guide you how through uninstalling an old driver and installing the new driver.

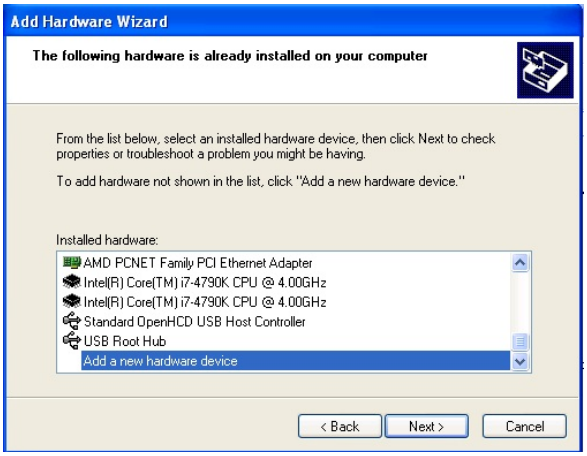
1. Follow the link to the Arduino project to download the latest driver :Download Arduino IDE For more information see Installing LANforge Server on Windows
2. Download the Arduino IDE zip file to your desktop. Use **Right-click→Extract All...** to expand the contents to a folder on your desktop.



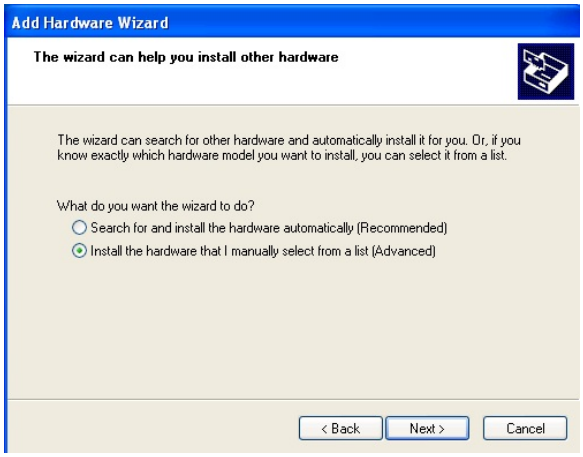
3. Connect USB cable from the Attenuator to the PC
4. Click **Start→Control Panel** and choose the **Add Hardware** option.



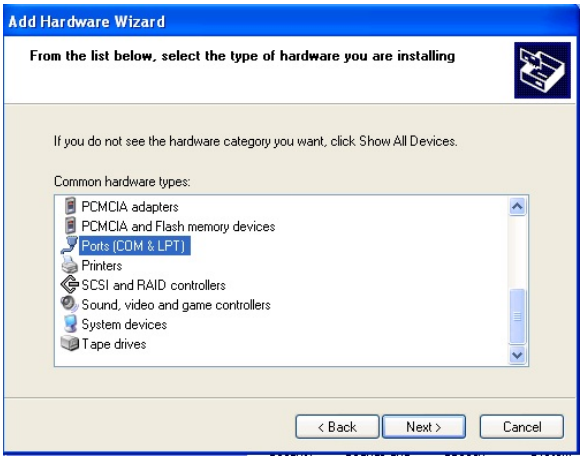
5. In the hardware list page, select Add a new hardware device, and click **Next**



6. Select the Install the hardware that I manually select option, and click **Next**

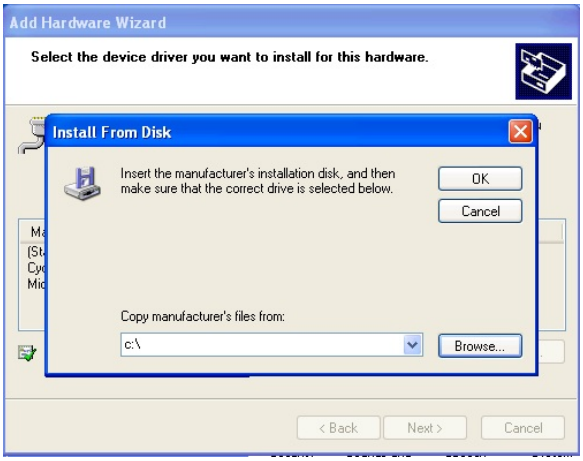


7. Select the Ports (COM & LPT) option, and click **Next**

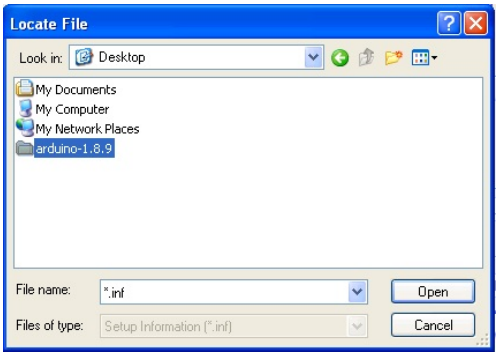


8. Select (Standard port types) option, then Communications Port and then click **Have Disk...**

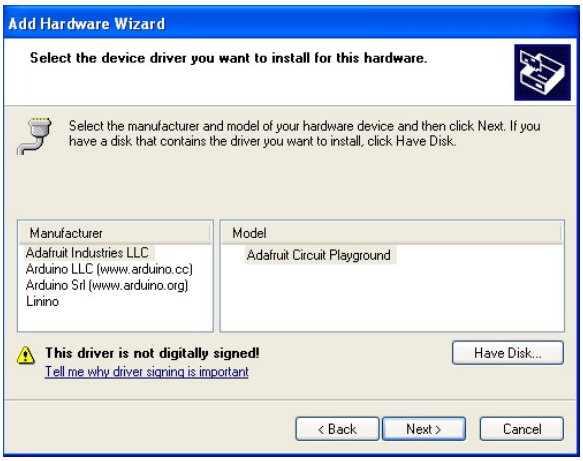
9. Click **Browse**



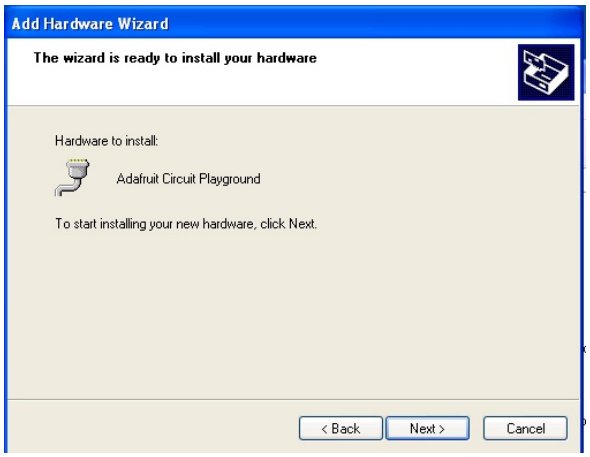
10. Navigate to your `Desktop\arduino-1.8.9\drivers` folder, and click **Open**



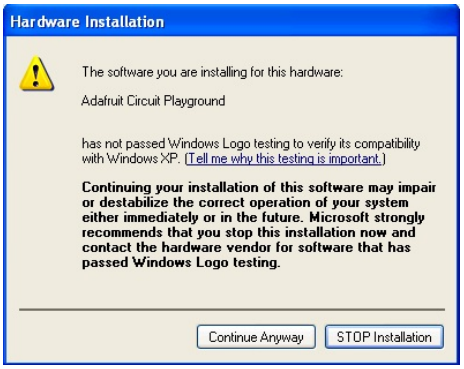
11. Click **Next**



12. Click **Next**



13. Click **Continue Anyway**



14. Click **Finish**

15. You should not need to reboot your system in order to run the Attenuator
16. For LANforge to recognize the new attenuator, restart the LANforge server on the machine that has the attenuator connected. On Windows, close the LANforge server CMD windows and then restart LANforge with using your desktop icon.

Installing the Arduino Mega Driver on Windows 7

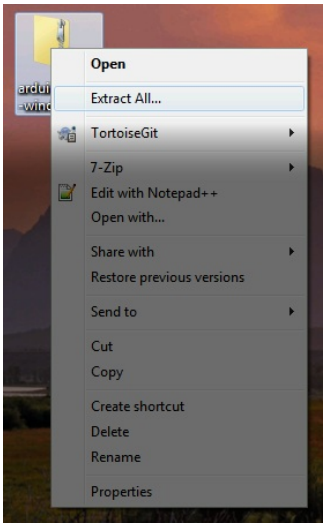
Goal: Installing the the Arduino Mega device driver on Windows 7.

LANforge CT70x attenuators require recently signed Arduino drivers. The automatic driver install process for Windows 7 might automatically install a Microsoft Windows version of the Arduino Mega driver. This is not the driver LANforge expects. These instructions will guide you how through uninstalling an old driver and installing the new driver from the Arduino website.

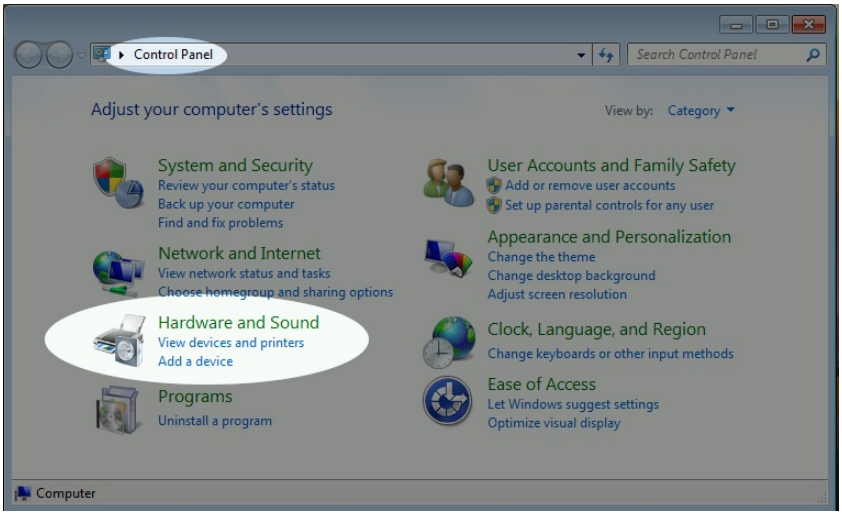
> i If you have recently removed a driver, you might need to reboot your Windows system for it to complete the driver installation process.

1. You want to install the windows version of the LANforge Server beforehand. For more information see Installing LANforge Server on Windows
2. Follow the link to the Arduino project to download the latest driver :Download Arduino IDE

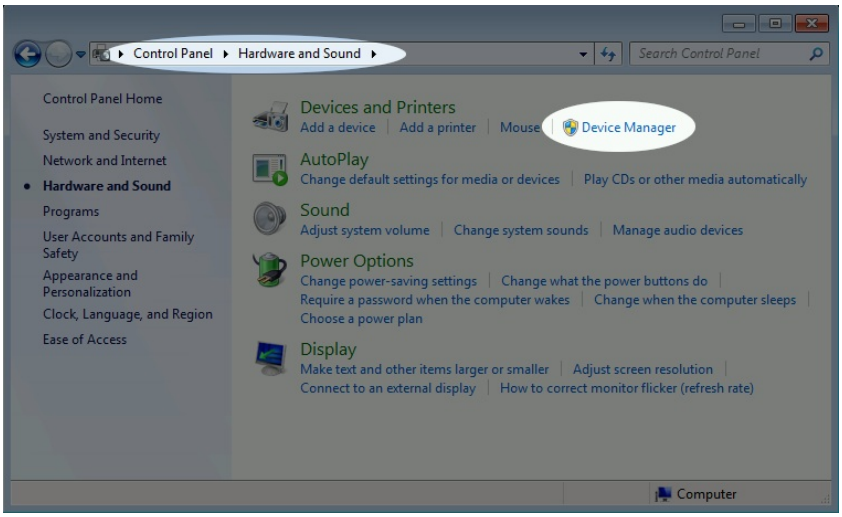
3. Download the Arduino IDE zip file to your desktop. Use **Right-click→Extract All...** to expand the contents to a folder on your desktop.



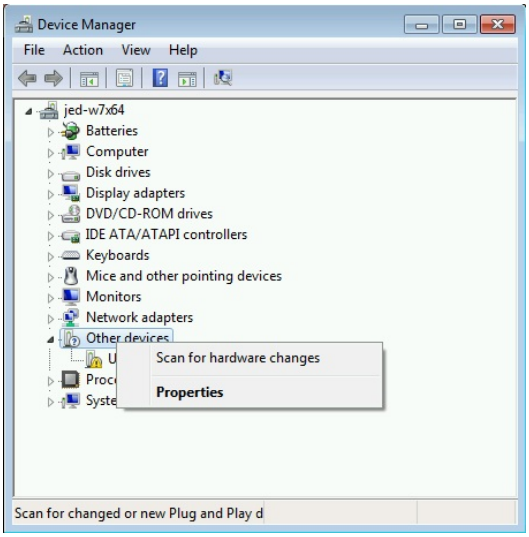
4. This process requires you to operate the Control Panel as Administrator. Some patch-levels of Windows 7 have secured this. A useful work around for this will be discussed shortly.
5. Getting to the **Device Manager**
    A. In Control Panel, select **Hardware and Sound**



    B. Select **Device Manager**



C. In the Device Manager window, right-click on the computer and select **Scan for hardware changes**

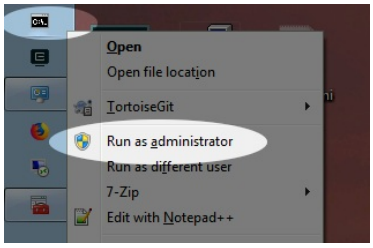


A. There will be an **Other devices→Unkown Device** entry. Right-click on it. If the options menu **only** gives you either Scan for hardware changes or Properties, you might need to restart your control panel as Administrator, that is discussed next.

B. **Using the Run as Administrator option to start the Control Panel in administrator mode.**

I. This works best with a **CMD** window pinned to the task bar. You can do that using Start Menu→ **cmd** ENTER ; and then right-click→ **Pin to Task Bar** option on the task bar icon for the cmd.exe window.

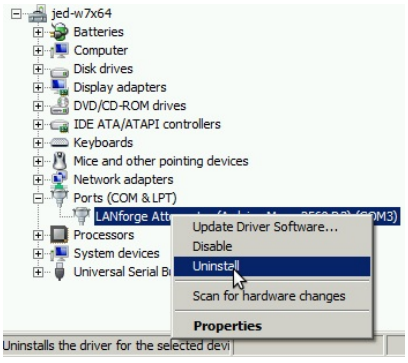
II. Then right-click→ **Run as Administrator** on the **CMD** taskbar icon



III. Repeat your navigation steps to get to the **Device Manager**

6. **Uninstall Old Driver**
If you find a previously installed driver, uninstall it. Especially if this is labeled **Windows Arduino Mega**

A. Right-click → **Uninstall**



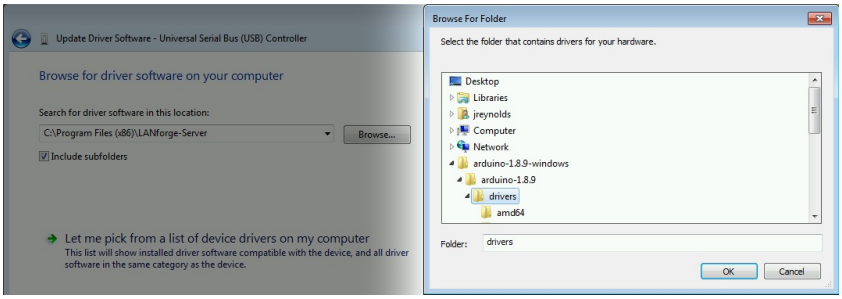
B. Select Delete the driver software for this device, and click **OK**

C. Right-click on the computer, and select **Scan for Hardware Changes**

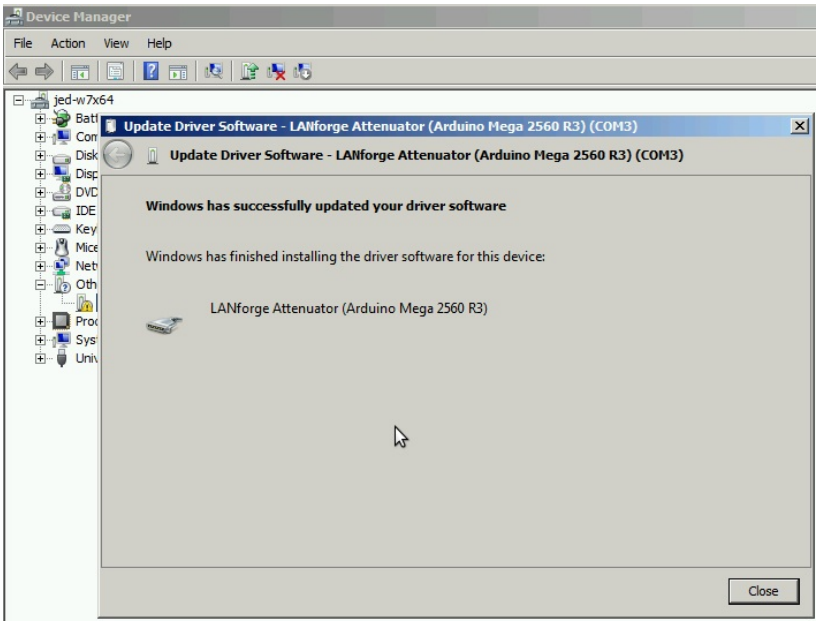
D. You might need to un-plug and plug-in your Attenuator.

E. If the right-click options menu does not allow you to change drivers, reboot your system.

7. **Install new driver**
   Select **Browse my computer for driver software**
   A. Browse to `Desktop\arduino-1.8.9\drivers` and click **Next**



   B. You will see the Update Driver Software confirmation. Click **Close**.



8. You should not need to reboot your system in order to run the Attenuator.

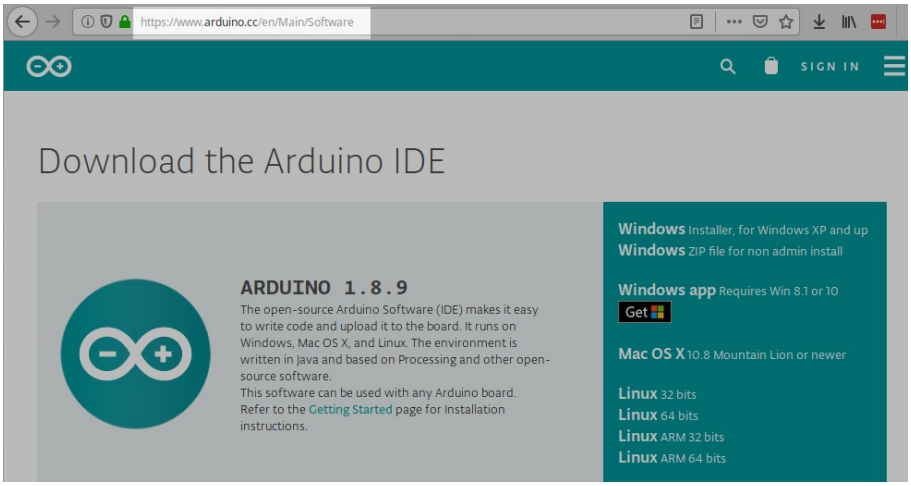
Installing the Arduino Mega Driver on Windows 10

Goal: Installing the the Arduino Mega device driver on Windows 10.

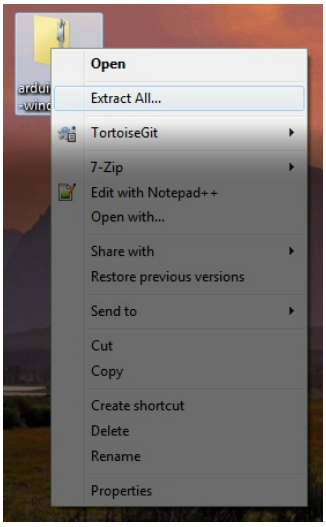
LANforge CT70x attenuators require recently signed Arduino drivers. The automatic driver install process for Windows 10 might automatically install a Microsoft Windows version of the Arduino Mega driver. This is not the driver LANforge expects. These instructions will guide you how through uninstalling an old driver and installing the new driver from the Arduino website.

> i If you have recently removed a driver, you might need to reboot your Windows system for it to complete the driver installation process.

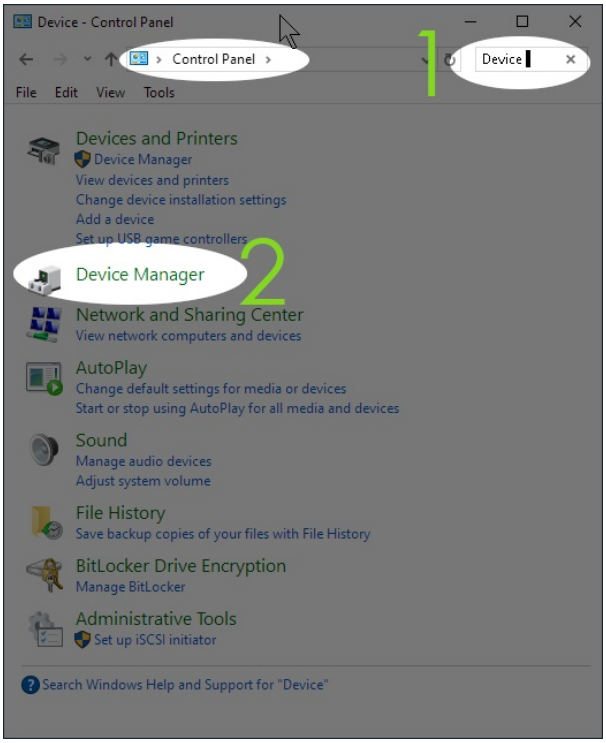
1. You want to install the windows version of the LANforge Server beforehand. For more information see Installing LANforge Server on Windows
2. Follow the link to the Arduino project to download the latest driver :Download Arduino IDE



3. Download the Arduino IDE zip file to your desktop. Use **Right-click→Extract All...** to expand the contents to a folder on your desktop.

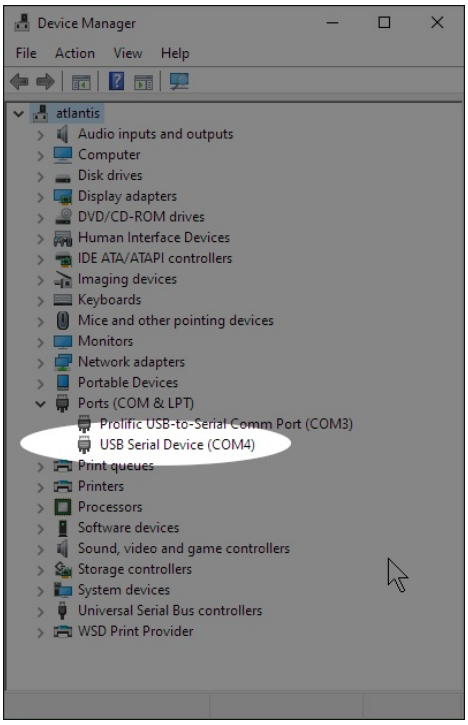


4. This process requires you to operate the Control Panel as Administrator.
5. Getting to the **Device Manager**
   A. Type Control-F for Find
   B. Search for `Device`



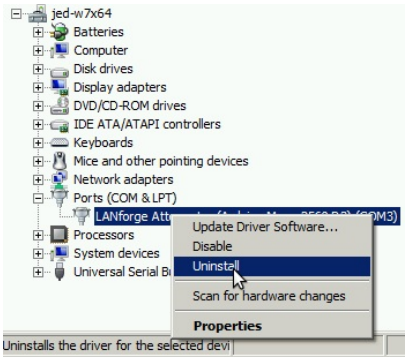
   C. Select **Device Manager**

D. In the Device Manager window, right-click on the computer and select **Scan for hardware changes**



6. If you find a previously installed driver, uninstall it. Especially if this is labeled **Windows Arduino Mega**

A. Right-click → **Uninstall**



B. Select Delete the driver software for this device, and click **OK**

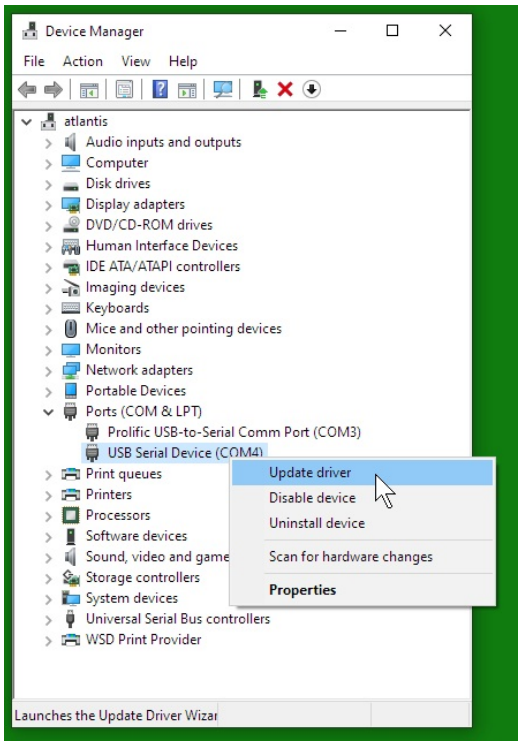
C. Right-click on the computer, and select **Scan for Hardware Changes**

D. You might need to un-plug and plug-in your Attenuator.

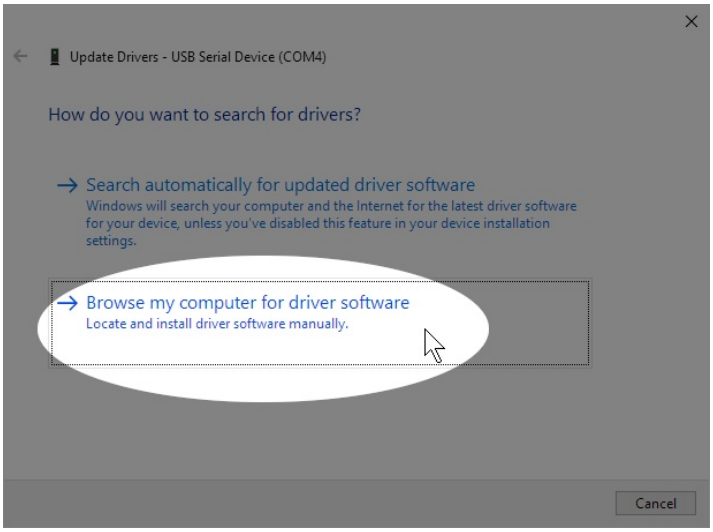
E. If the right-click options menu does not allow you to change drivers, reboot your system.

7. **Install the Arduino IDE Driver**

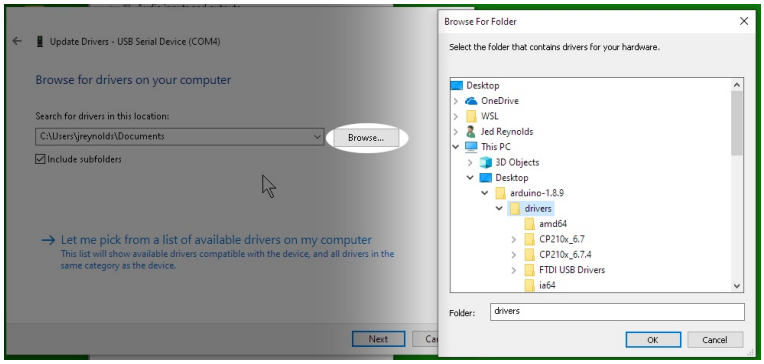
A. In **Device Manager**, you want right-click on the **Unknown Device** and select **Update Driver Software...**



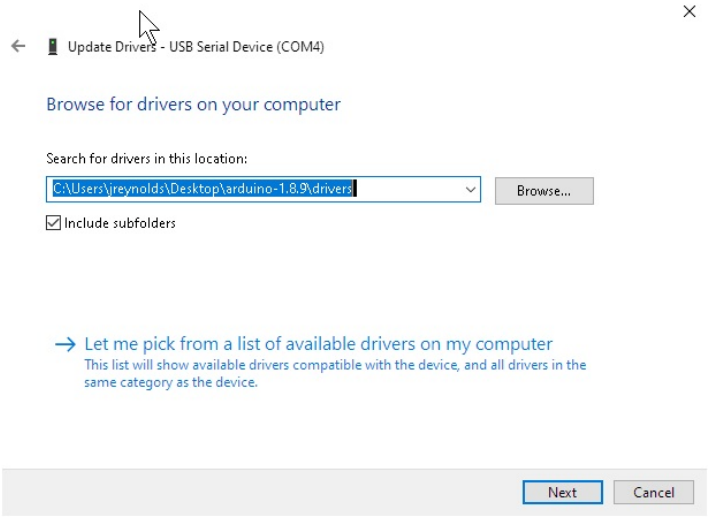
B. Select **Browse my computer for driver software**:



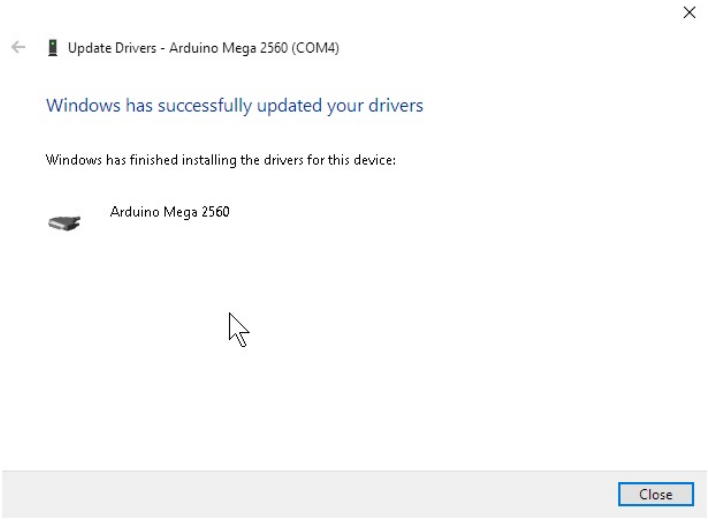
A. Browse to `Desktop\arduino-1.8.9\drivers` and click **OK**



B. Click **Next**



C. You will see the Update Driver Software confirmation. Click **Close**.



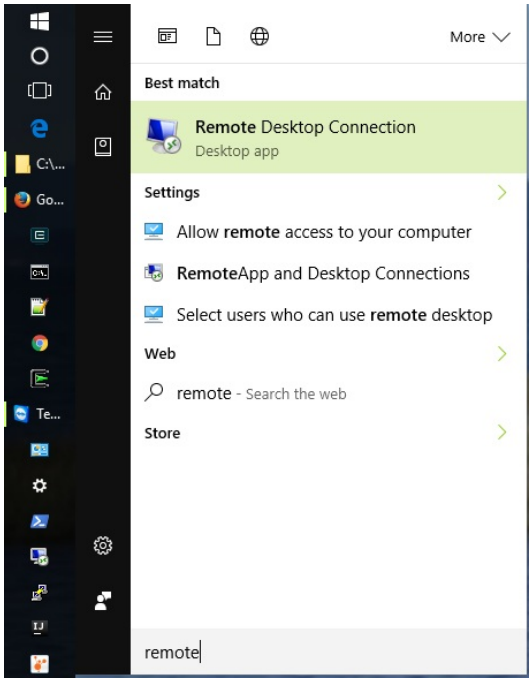
C. You should not need to reboot your system in order to run the Attenuator.

Connect to LANforge using Remote Desktop

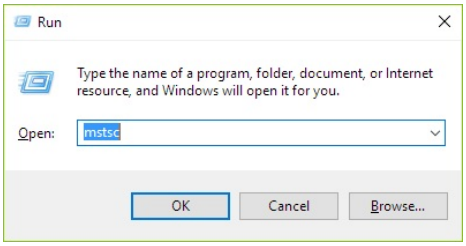
Goal: Operate your LANforge's Linux desktop by accessing it with Windows Remote Desktop utility.

LANforge computers on Intel hardware are typically installed with a full Linux desktop. You can use the LANforge GUI, do traffic sniffing, open terminal windows, and office software to look at report data over remote desktop. LANforge computers are pre-configured with RDP and VNC desktop services.

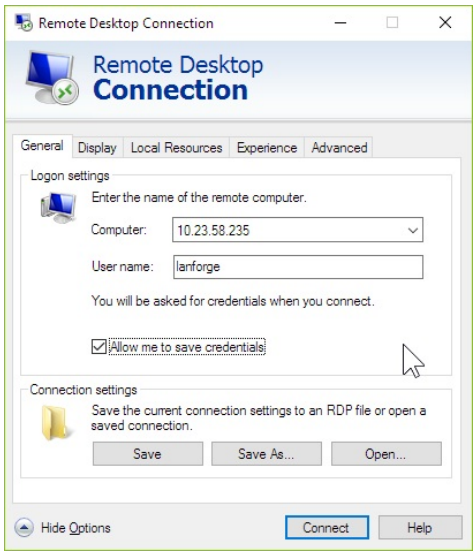
1. From your Windows Start Menu, type "remote" and **Remote Desktop Connection** should be an option.



2. If you are using the `Start→Run` menu, type `mstsc` Enter



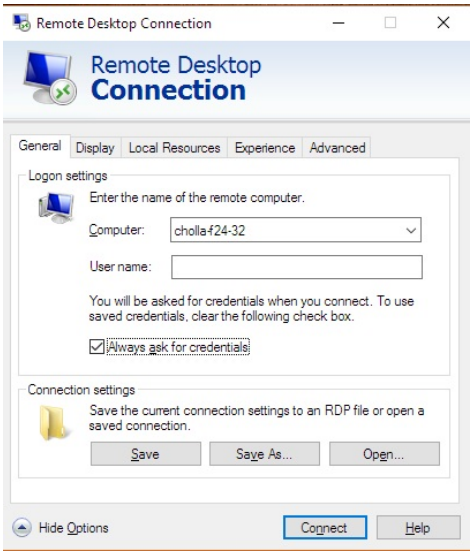
3. If you want to create a desktop shortcut, explore the folder `C:\windows\system32` and right-click `mstsc.exe`
4. Configure your connection:
    A. Fedora version 24 and 25 have a bug in the vncserver triggered by xrdp. The effective way to use rdesktop on those systems is to select an Xorg session for connecting (not a Xvnc session).
    B. When connecting to Fedora 14-23 systems:
        A. User Name: `lanforge`



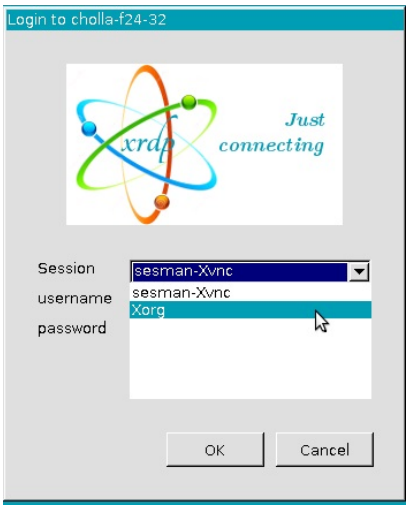
        B. You will not need to fill out the xrdp login screen.

C. When connecting to Fedora 24-25 systems:

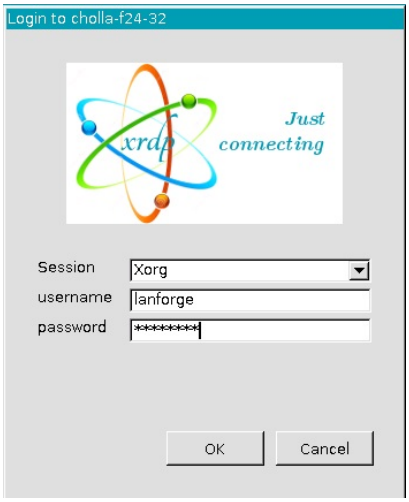
A. **Do not specify a user name**, and select **Always ask for credentials**.



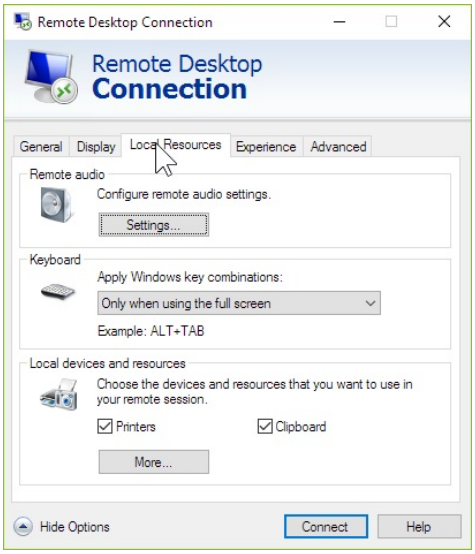
B. Select **Xorg** as the session type



C. Specify username `lanforge` and password `lanforge`



D. Local Resources

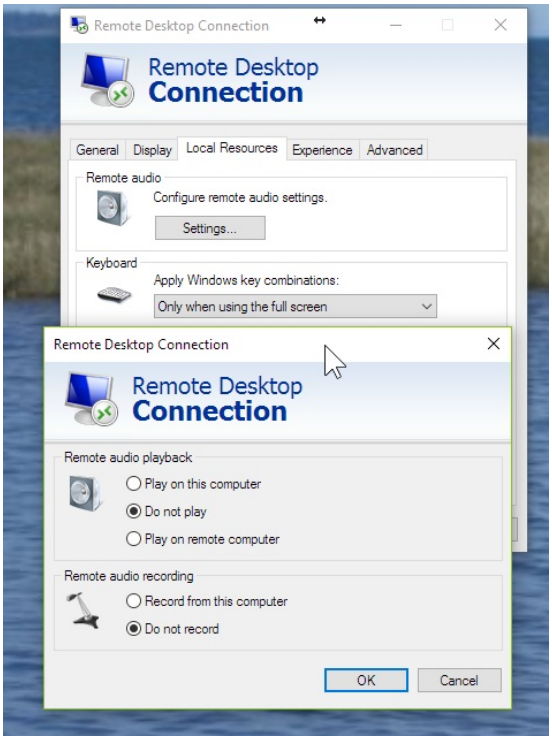


A. **If your rdesktop session immediately closes**, you might have hit the xrdp clipboard bug. If so:

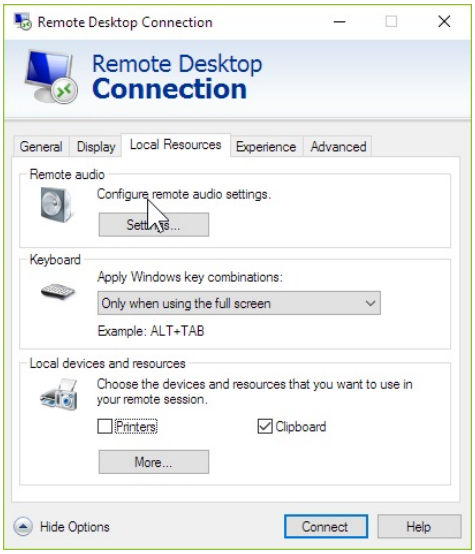
B. For Windows Remote Desktop (mstsc.exe): unselect **Local Devices→Clipboard**

C. For Linux `rdesktop`, use the command: `rdesktop -a16 -r cliboard:off -u lanforge [machine-name]`

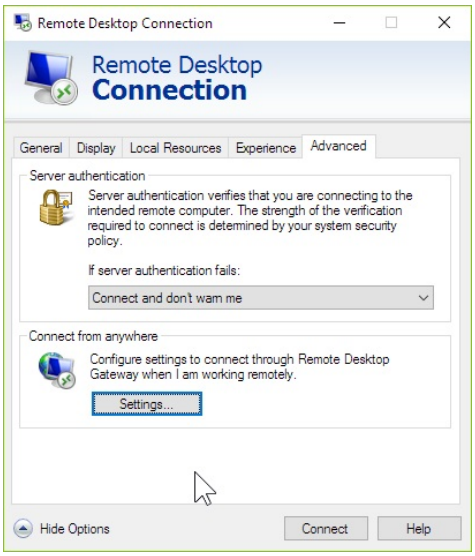
E. Disable remote audio settings



F. Disable local printers

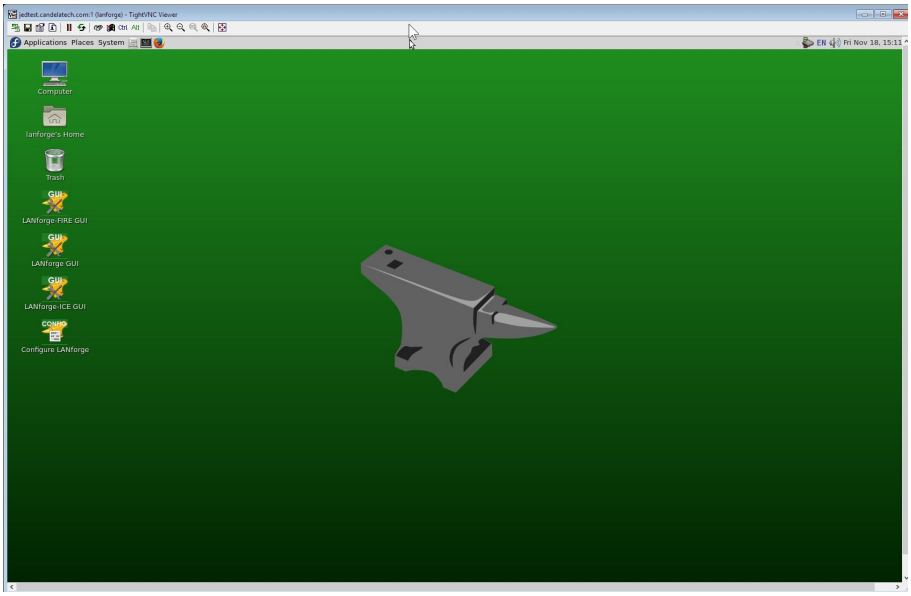


G. Set Server authentication to **Connect and do not warn**

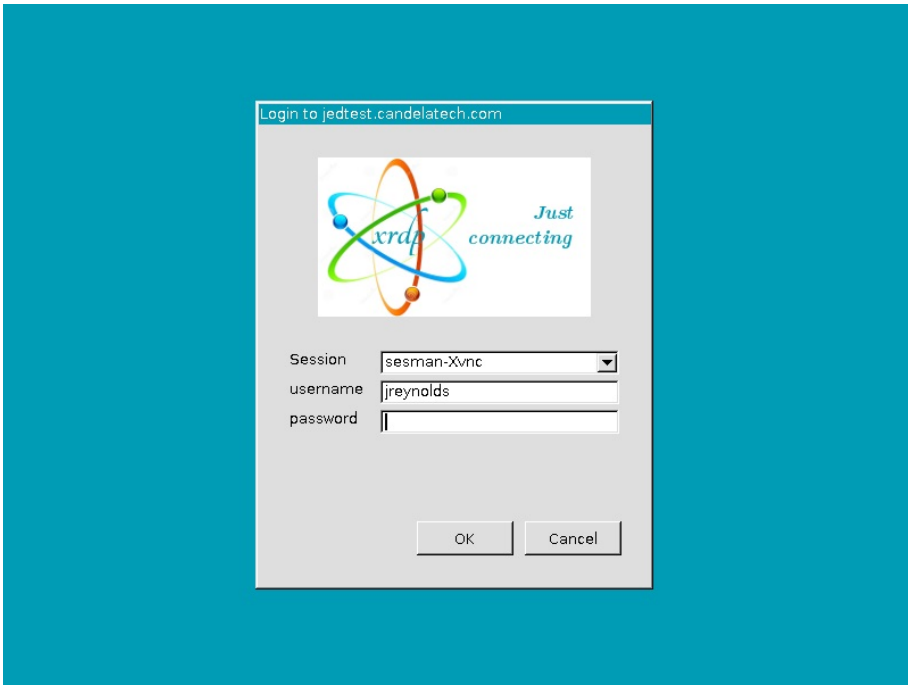


H. Connection quality can be 16-bit (millions of colors)

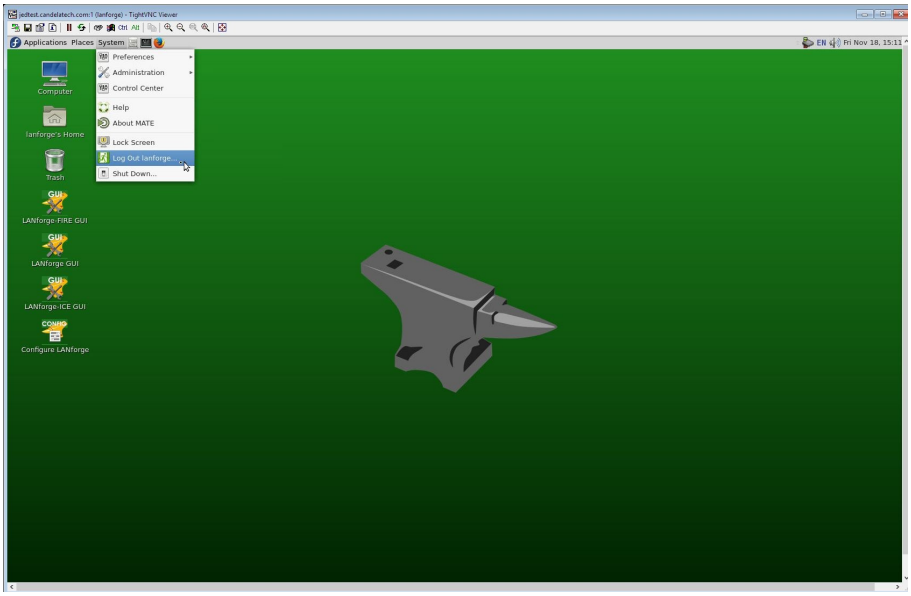
5. Click **Connect** to connect to the default desktop, the default password is `lanforge`



6. When you are DONE with your connection, you may close the Remote Desktop window. You will not be logged out. However, if you log in without setting the Username option, you will be logged into a new session alongside your old session. If you see this screen below, you are starting a new desktop session:



7. To reconnect to your previous desktop session, make sure you use the Username `lanforge` in your connection settings.
8. To logout of the desktop session, select **System→Log Out** from the top window of the Linux desktop.



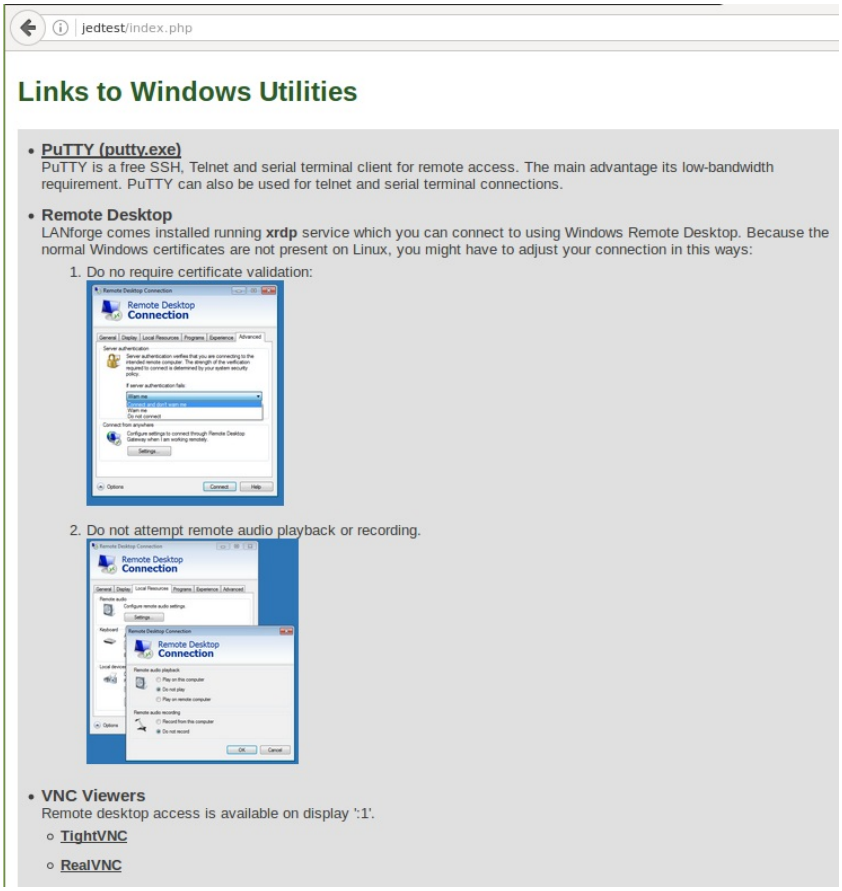
Connect to LANforge using VNC Viewer

Goal: Operate your LANforge's Linux desktop by accessing it with the VNC Viewer utility.

LANforge computers on Intel hardware are typically installed with a full Linux desktop. You can use the LANforge GUI, do traffic sniffing, open terminal windows, and office software using a VNC Viewer program. LANforge computers are pre-configured with RDP and VNC desktop services.

1. You can download a variety of viewers:

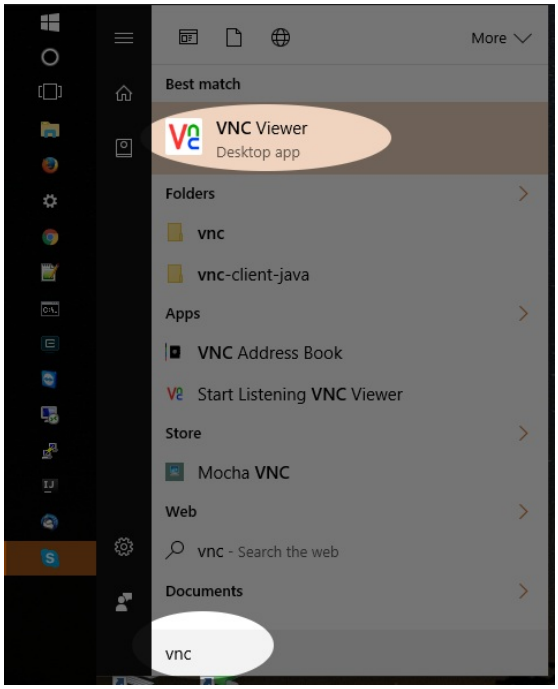
A. Check for viewer packages on your LANforge web page: http://192.168.1.101/



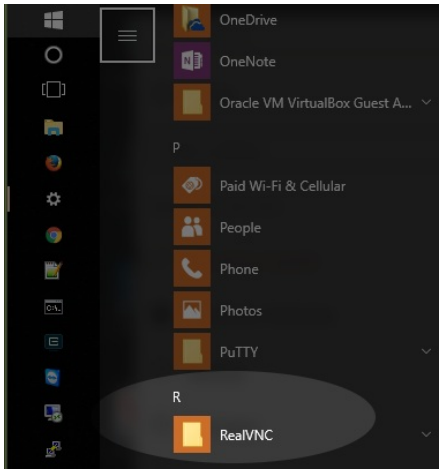
B. or download RealVnc

C. or download TightVnc

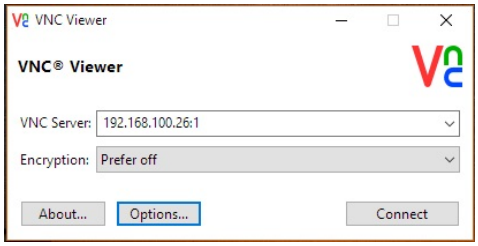
2. From your Windows Start Menu, type "vnc" and **VNC viewer** should be an option.



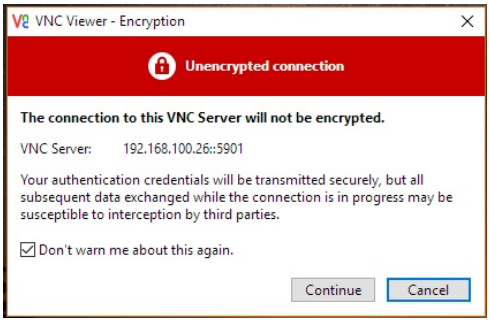
3. If you are using the start menu, it will be under either in All Programs > **RealVNC** or **TightVNC**



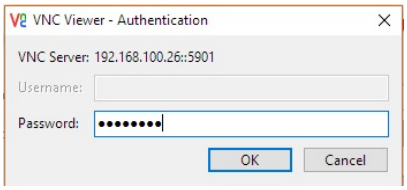
4. Double click the vnc icon and it will ask you for the IP address. You want to set the Encryption option to **off** because we presume you are connected directly to the LANforge.



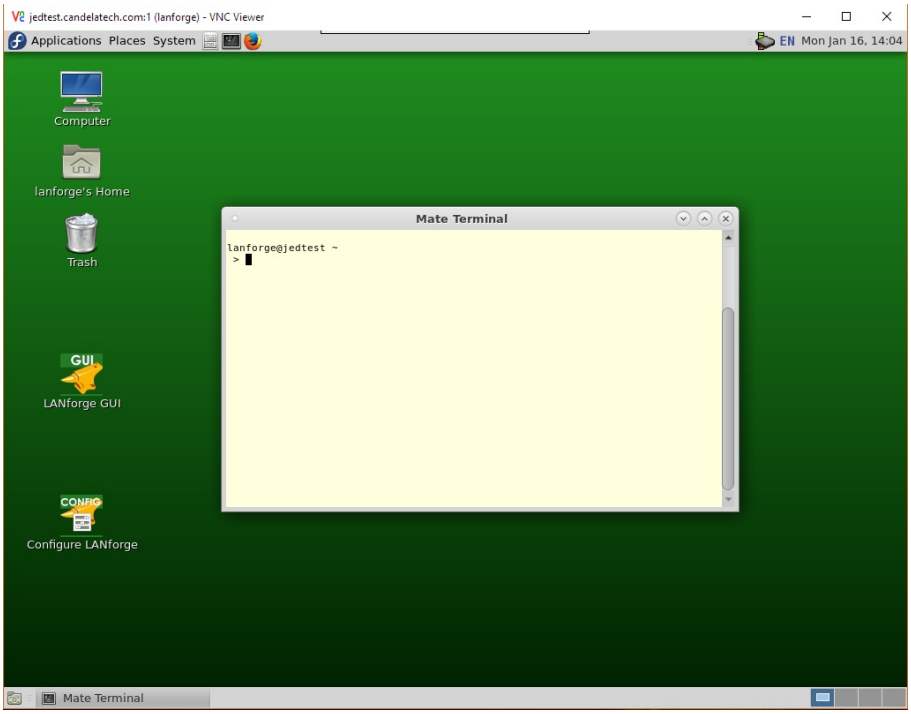
5. VNC Viewer might warn you about connecting without encryption. This is a valid warning if you are connecting across public networks.



6. The password is `lanforge`.



7. You will see the LANforge Linux desktop. This is not the same desktop that is actually running on the console if you have a monitor and keyboard connected.



8. When you are done with your connection, you may close the VNC viewer window. You will not be logged out. When you connect using VNC viewer again, it show the current state of that desktop. connect you to the last used VNC session.
9. To restart the vnc desktop session, select you can issue either of these two commands. You start using ssh (PuTTY et. al.) to connect as `lanforge` to the LANforge machine, and:
   A. `sudo systemctl restart "vncserver@:1.service"`
   B. or
   C. `sudo vncserver -kill :1`

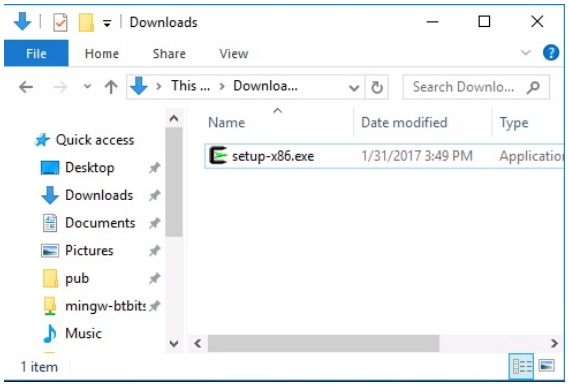
Display WireShark Using Cygwin

Goal: We will display the WireShark application on Windows using Cygwin when we press Sniff Packets which actually runs WireShark on the Linux LANforge machine.

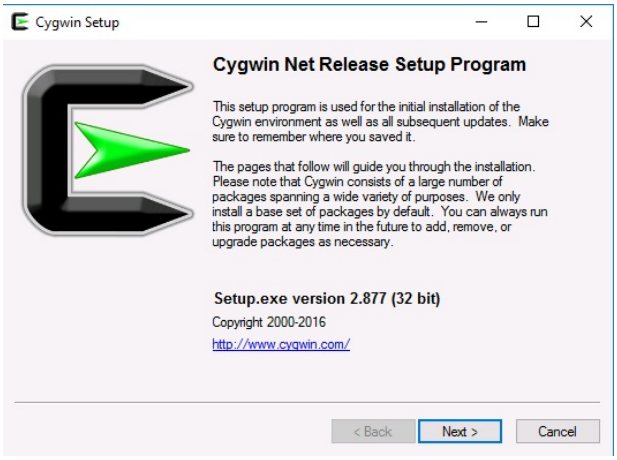
The native display protocol for Linux (and Unix) is the X Display Protocol. The Cygwin.org project provides Linux software that runs natively on Windows. You can run an X display server on Windows that accepts connection from LANforge. We will walk through setting up Cygwin and configuring an X display.

1. Installing Cygwin and the X display components
2. We will start at Cygwin.org and download the Cygwin installer.

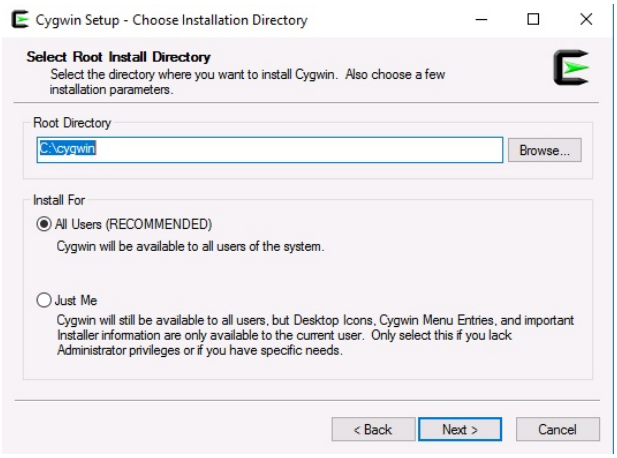
3. Download `setup-x86.exe` or `setup-x86_64.exe` as appropriate. Go to your Downloads folder and double start the program.



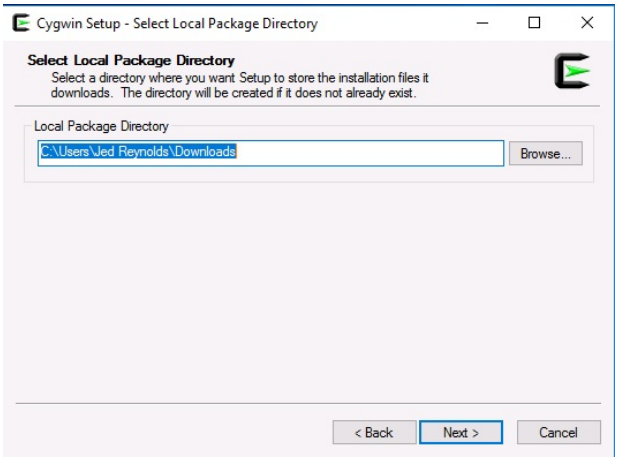
4. Next



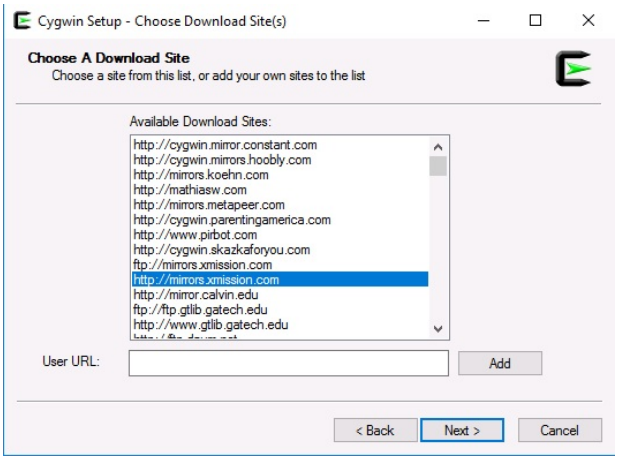
5. Next



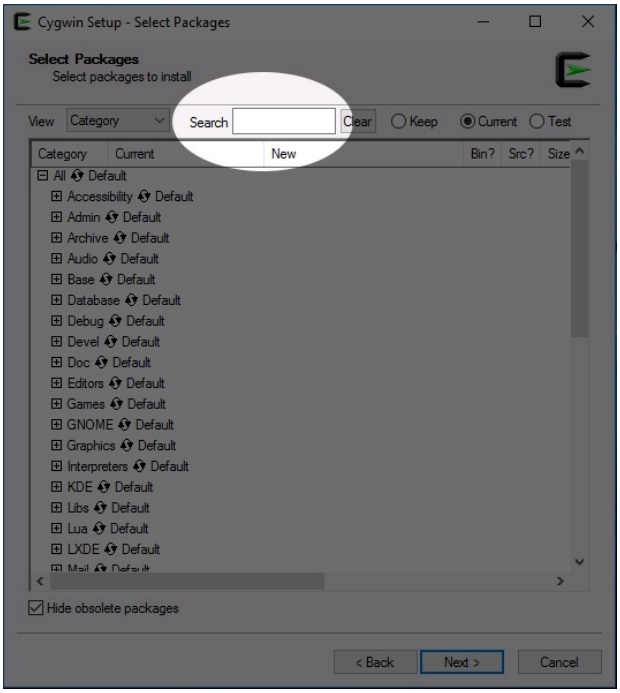
6. Next



7. Choose a mirror that might be close to you, click Next

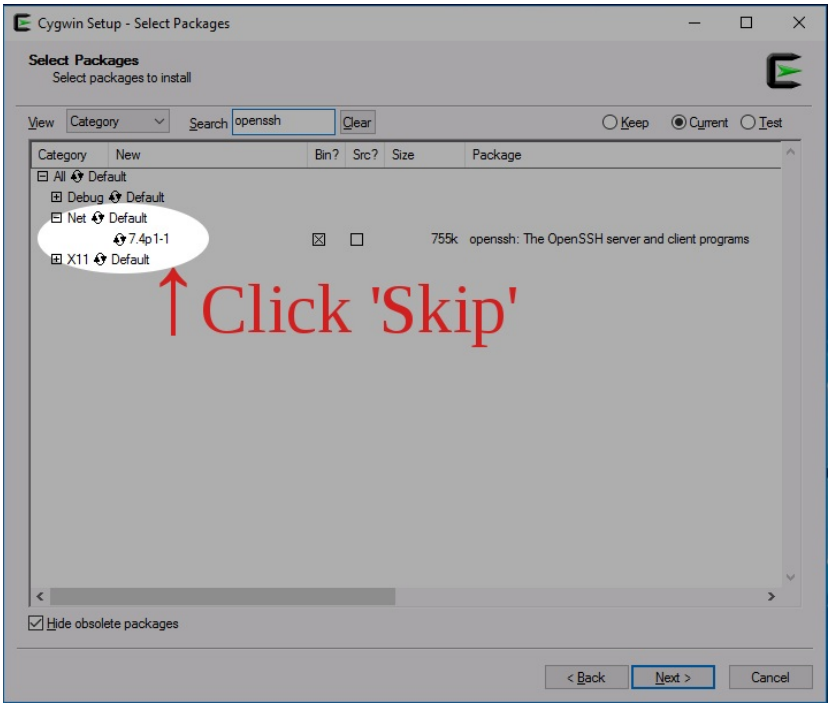


8. Now you see a the software selection screen, sorted by category. Some of these entries appear two or more times, because they belong to multiple categores. Try using the search box in upper middle above the software list to search for the packages listed below.

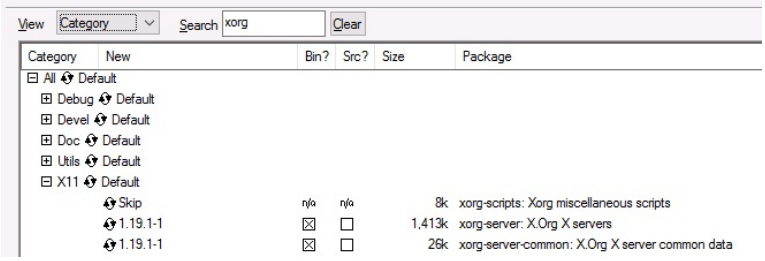


9. The items you want to search for are
    - openssh
    - xorg-server
    - xinit
    - rxvt
    - xlaunch

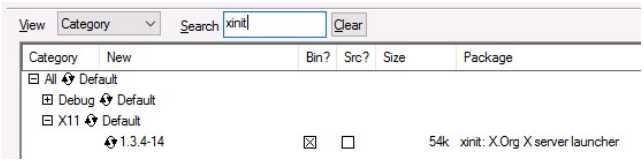
    A. Search for `openssh` and click the Skip property once to change it to the most recent version to set it to install.



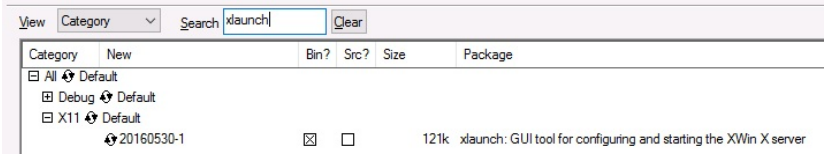
    B. `xorg-server` provides the X display system



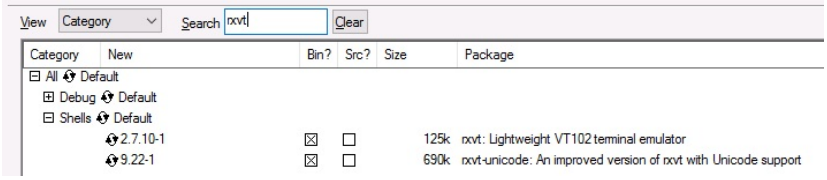
C. `xinit` helps the X system launch



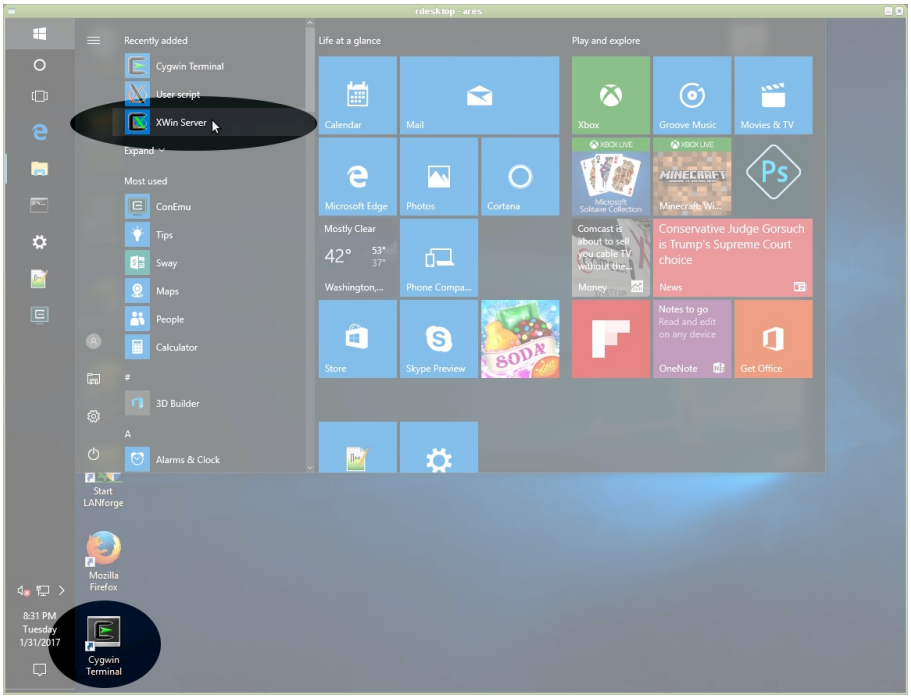
D. `xlaunch` is what you will drag to your task bar to launch your Cygwig X server



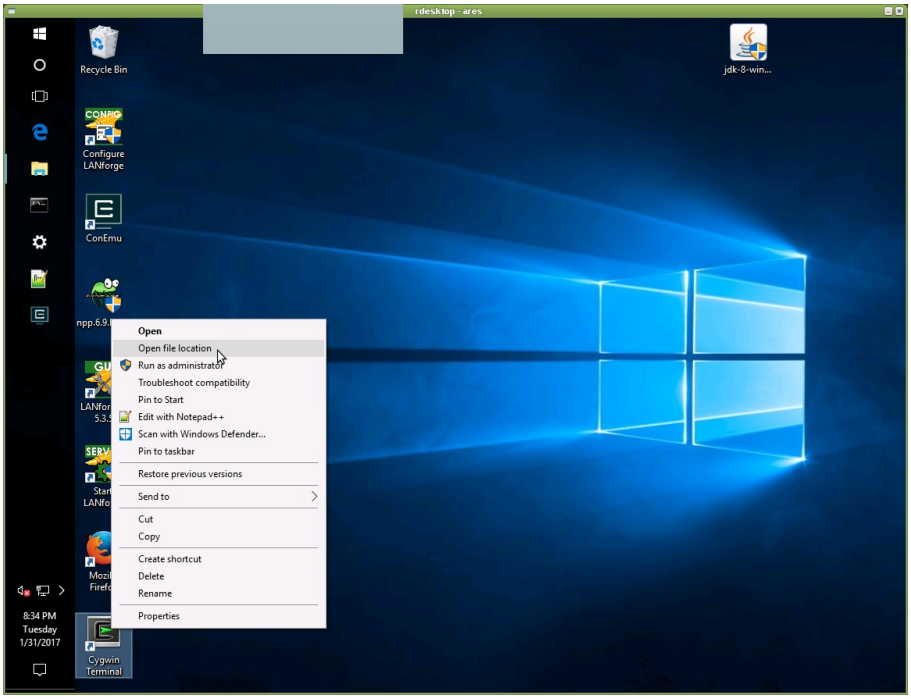
E. `rxvt` and `rxvt-unicode` are more useful terminals than the `minterm` program that Cygwin provides by default.



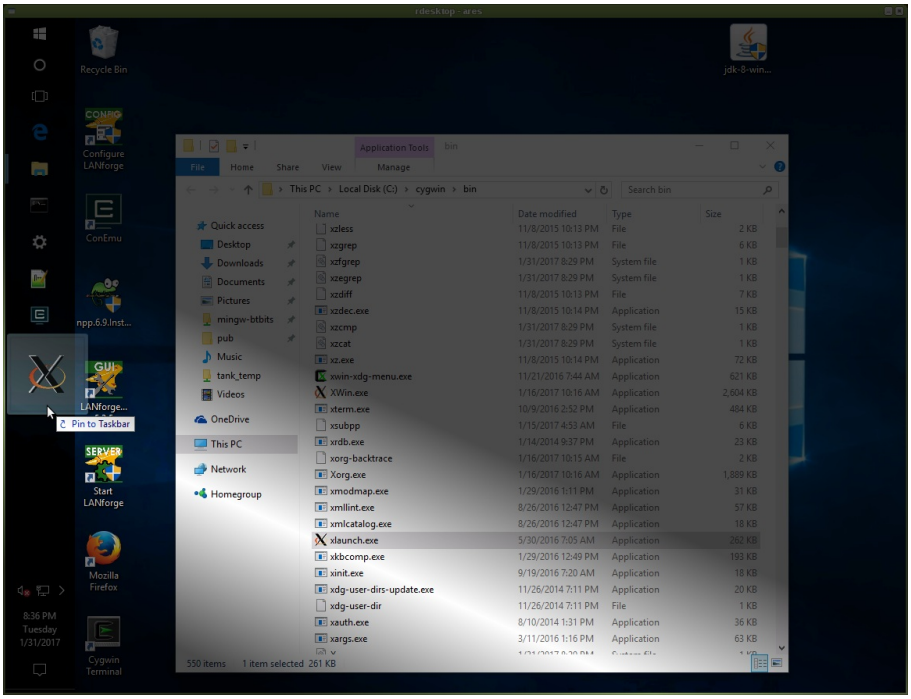
10. Click Next and let the installer finish the installation of the Cygwin packages. You will see a Cygwin Terminal icon appear on your desktop and new Cygwin icons in your Start menu.



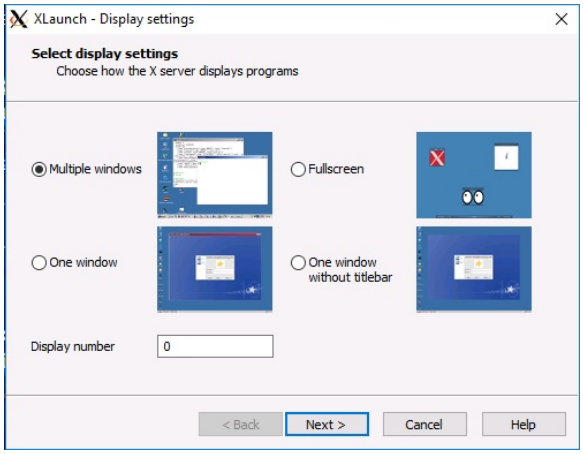
11. Next we will **right-click** on the Cygwin Terminal icon and select Open File Location



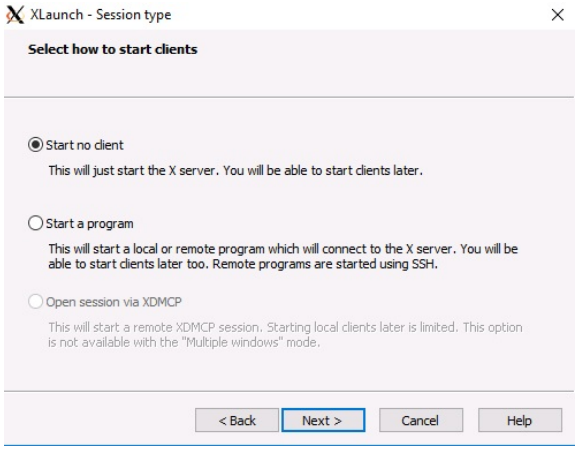
12. In the Explorer window, scroll to find `xlaunch.exe`, and drag it to the Task Bar



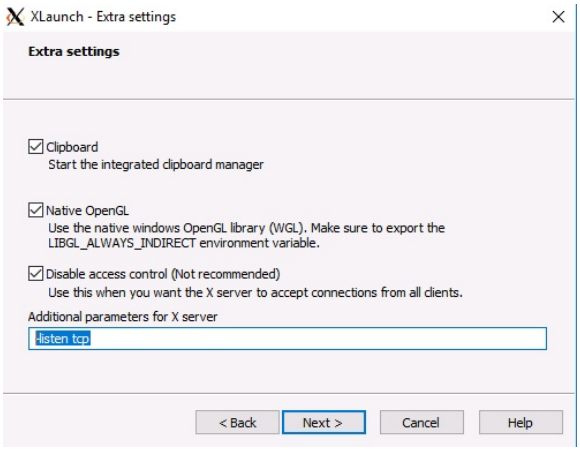
13. Click the `xlaunch` icon on the task bar, and click Next



14. Next

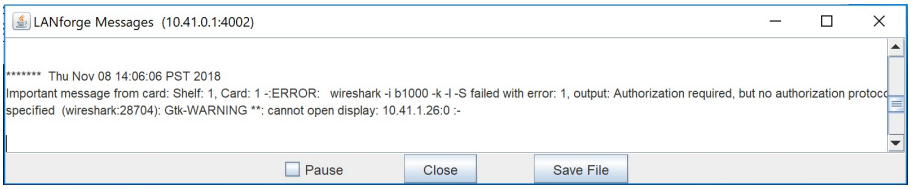


15. Check Disable Access Control and add the option: `-listen tcp`. Click Next

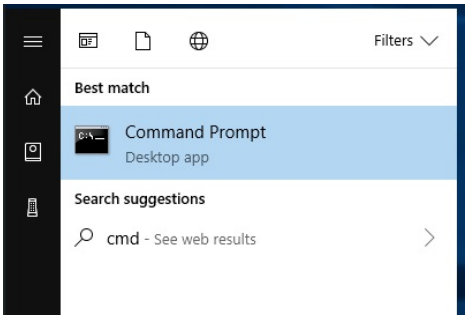


16. Firewall, Click Allow Access

17. If the LANforge Messages window reports 'No Access', you might need to use `xhost.exe` to grant X11 access.



A. Open a CMD window

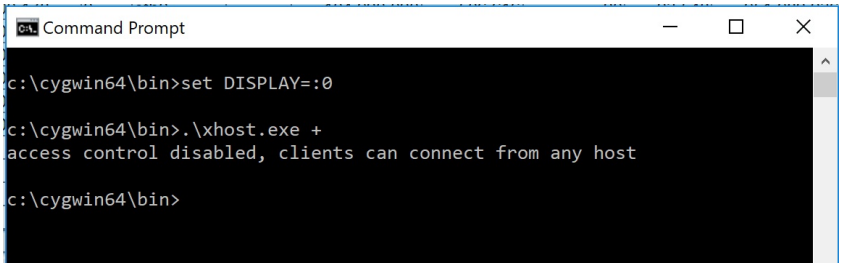


B. Go to the `cygwin\bin` folder:

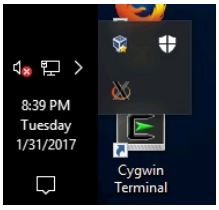
```
C:\> cd \cygwin\bin
```

C. Use xhost.exe to open permissions:

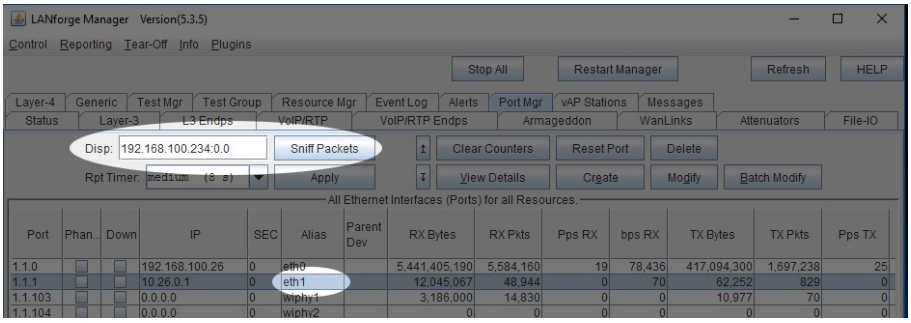
```
C:\> .\xhost.exe +
```



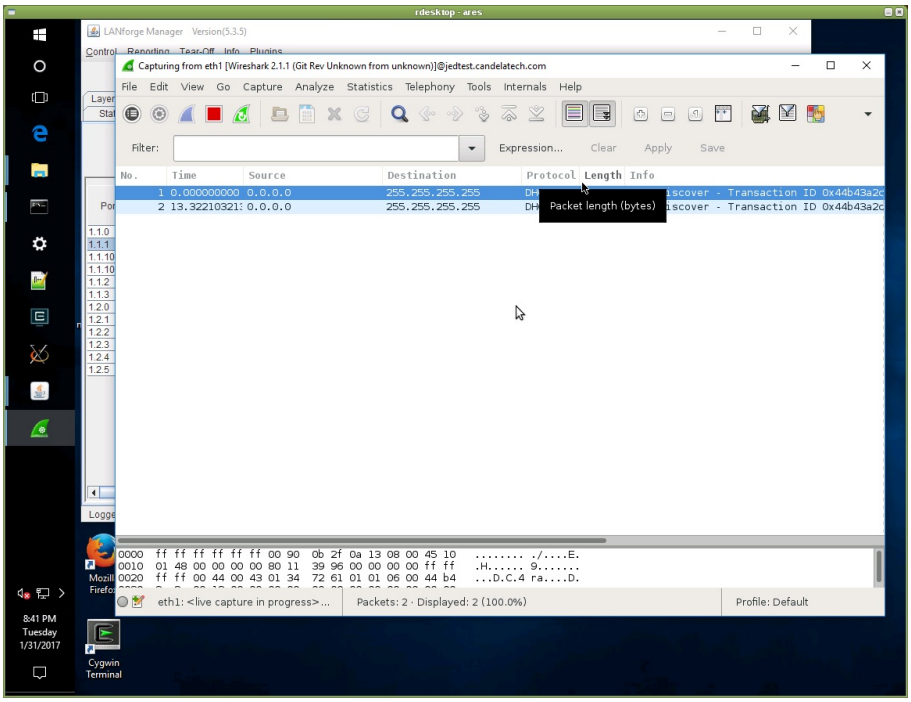
18. Now your X display service is running. You can check that it's running by clicking into the System Tray and seeing if the icon is there.



19. Launch the LANforge GUI from your desktop. Select a port from the Port Mgr tab. Notice how the **Disp** field has your laptop's LAN address. This is the display address the remote machine will display the Wireshark window to.



20. You will see WireShark



21. Resources and other Documentation:

A. http://unix.stackexchange.com/questions/227889/cygwin-on-windows-cant-open-display

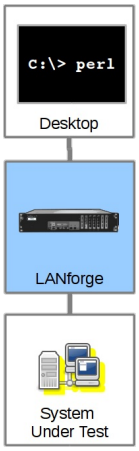
B. https://www.cs.virginia.edu/~csadmin/wiki/index.php/Using_Cygwin_for_X11_Forwarding

C. http://www.arsc.edu/arsc/knowledge-base/ssh-and-x11-forwarding-us/index.xml

Finding LANforge Report Data

Goal: Properly configured, the LANforge server or the LANforge GUI can collect connection performance information in CSV format.

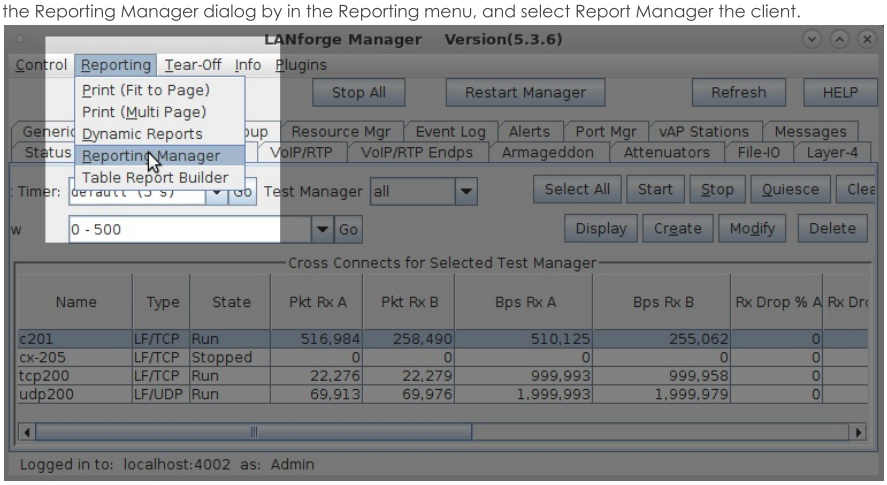
By default, your LANforge server and your LANforge client do not save the data on connection and port performance. When you configure the save destination for this data, you can use it with any other tool that can read a CSV file.



Finding LANforge Report Data

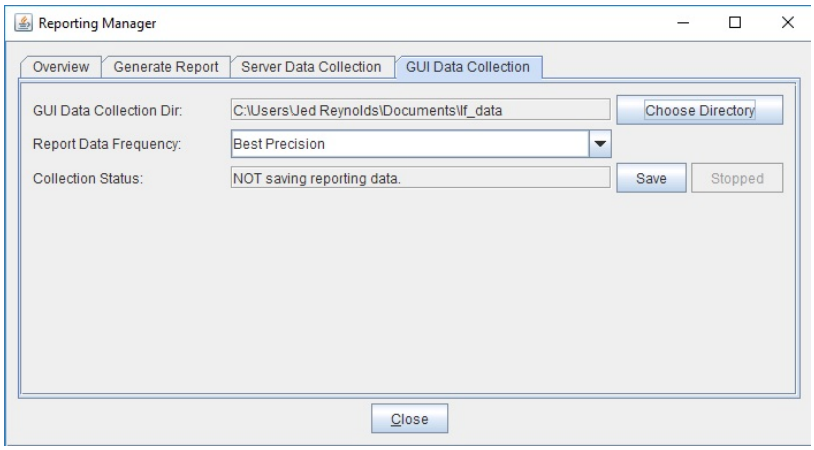
Select your Save Location

You can tell the LANforge server to save data to a directory locally on the management machine, and you can configure your workstation running the the LANforge GUI to save data to a local desktop folder. First, find the Reporting Manager dialog by in the Reporting menu, and select Report Manager the client.



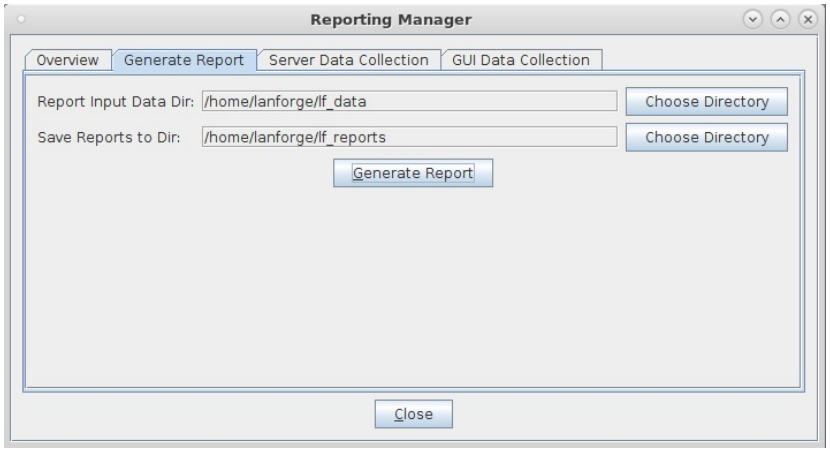
GUI Data Collection (Desktop Folder)

Collecting data on your local workstation is very convenient if you can leave the GUI running for the duration of your test scenario. The format of the data here should be similar to the format of the data saved to the server directory. The folders for collecting data are relative to the folder you start your GUI from. If you type in `lf_data` that probably means `C:\Users\mumble\AppData\Local\LANforge-GUI\lf_data`. You probably want to put in a fully qualified path thats more intuitive, like `C:\Users\mumble\Documents\lf_data`.



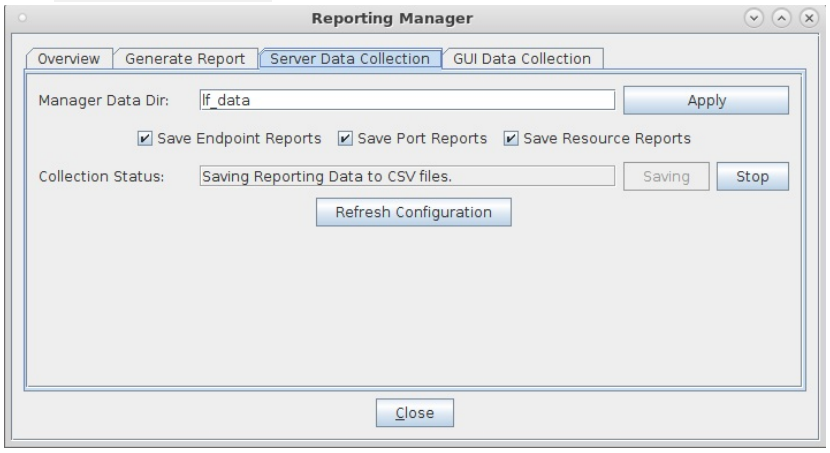
Generate Report

The Report Generator uses the local data files. In that dialog shows the Report Input Directory field is a local folder where the CSV files collect. The Save Reports to Directory field is where HTMl and PDF files should collect.



Server Data Collection (Server Directory)

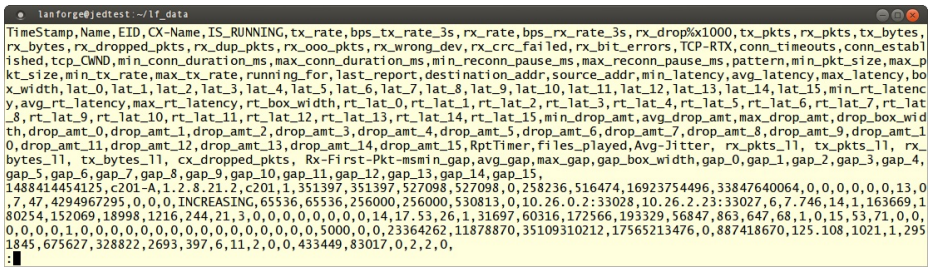
If your test scenario runs longer than your GUI can be up, you can configure the LANforge server to collect the data. The directory is relative to the `/home/lanforge` directory, so if you enter `lf_data`, you would find the CSV files in `/home/lanforge/lf_data`.



You can take a look at the data files easily. Here is a server data collection directory:

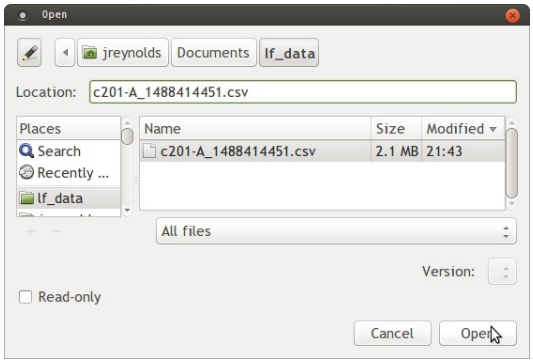
```
lanforge@jedtest ~/lf_data
 > r
total 2628
-rw-r--r-- 1 root root  31465 Mar  1 16:52 wlan2_1.1.7_1488414451.csv
-rw-r--r-- 1 root root  31465 Mar  1 16:52 wlan1_1.1.6_1488414451.csv
-rw-r--r-- 1 root root  31465 Mar  1 16:52 wlan0_1.1.5_1488414451.csv
-rw-r--r-- 1 root root  90889 Mar  1 16:52 wiphy2_1.1.4_1488414451.csv
-rw-r--r-- 1 root root 125299 Mar  1 16:52 wiphy1_1.1.3_1488414451.csv
-rw-r--r-- 1 root root 101801 Mar  1 16:52 wiphy0_1.1.2_1488414451.csv
-rw-r--r-- 1 root root 138049 Mar  1 16:52 udp200-B_1488414451.csv
-rw-r--r-- 1 root root 137626 Mar  1 16:52 udp200-A_1488414451.csv
-rw-r--r-- 1 root root 160328 Mar  1 16:52 tcp200-B_1488414451.csv
-rw-r--r-- 1 root root 158351 Mar  1 16:52 tcp200-A_1488414451.csv
-rw-r--r-- 1 root root  26376 Mar  1 16:52 resource_jedtestcandelatechcom_1.1_1488414451.csv
-rw-r--r-- 1 root root 114505 Mar  1 16:52 eth1_1.1.1_1488414451.csv
-rw-r--r-- 1 root root  43937 Mar  1 16:52 eth0_1.1.0_1488414451.csv
-rw-r--r-- 1 root root 168161 Mar  1 16:52 c201-B_1488414451.csv
-rw-r--r-- 1 root root 169329 Mar  1 16:52 c201-A_1488414451.csv
-rw-r--r-- 1 root root  27937 Mar  1 16:52 wlan2_1.2.7_1488414451.csv
-rw-r--r-- 1 root root  27937 Mar  1 16:52 wlan1_1.2.6_1488414451.csv
-rw-r--r-- 1 root root  27937 Mar  1 16:52 wlan0_1.2.5_1488414451.csv
-rw-r--r-- 1 root root  83629 Mar  1 16:52 wiphy2_1.2.4_1488414451.csv
-rw-r--r-- 1 root root 114613 Mar  1 16:52 wiphy1_1.2.3_1488414451.csv
-rw-r--r-- 1 root root 100485 Mar  1 16:52 wiphy0_1.2.2_1488414451.csv
-rw-r--r-- 1 root root 327241 Mar  1 16:52 vap0_1.1.8_1488414451.csv
-rw-r--r-- 1 root root  40057 Mar  1 16:52 sta205_1.2.10_1488414451.csv
-rw-r--r-- 1 root root  48097 Mar  1 16:52 sta200_1.2.8_1488414451.csv
-rw-r--r-- 1 root root  39289 Mar  1 16:52 sta100_1.2.9_1488414451.csv
-rw-r--r-- 1 root root  21691 Mar  1 16:52 resource_kedtest_1.2_1488414451.csv
-rw-r--r-- 1 root root 105065 Mar  1 16:52 eth1_1.2.1_1488414451.csv
-rw-r--r-- 1 root root  40789 Mar  1 16:52 eth0_1.2.0_1488414451.csv
```

And using a utility like `notepad`, `vi`, `more` or `less` you can look at the file contents:

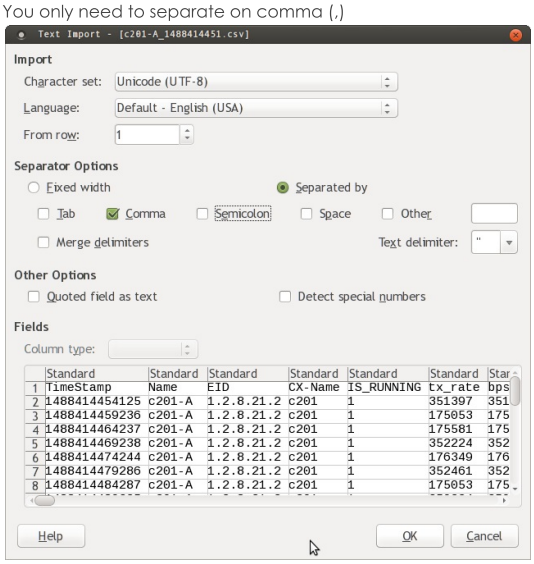


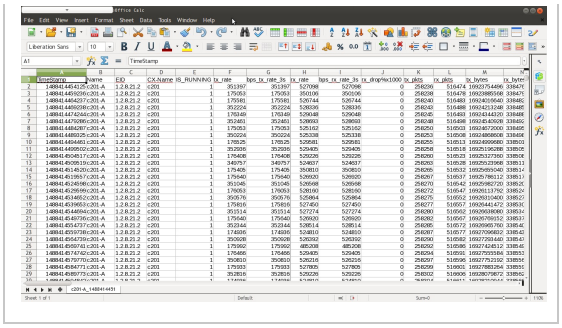
Using Libre Office

Importing the file into a spreadsheet like LibreOffice Calc is simple:



You only need to separate on comma (,)





The timestamp column

Libre Office does not have a builtin formula to do this, but it has been discussed here. And the solution is a formula that looks like this:

```
=(A2/86400)+25569
```

and then you format the column as Date.

Scripting with Bash

There are a number of ways to collect an dort the data with shell utilities. The first utility to consider is `cut`, then `awk`. The first column of the endpoint file we are going to read is the timestamp, the 14th is the rx bytes.

Reading the Data and RX Bytes

--Converting Unix Date

```
 $ head -n2 c201-A_1488414451.csv | cut -d, -f1
TimeStamp
1488414454125
 $ date -d @1488414454125
Mon Dec 23 19:28:45 PST 49135
```

--Using bash

```
 $ head -n2 c201-A_1488414451.csv | (while IFS=, read -a L; do echo ${L[13]}; done)
rx_bytes
33847640064
```

--Using cut

```
 $ head -n2 c201-A_1488414451.csv | cut -d, -f14
rx_bytes
33847640064
```

--Using awk

```
 $ head -n2 c201-A_1488414451.csv | awk -F, '{print $14}'
rx_bytes
33847640064

head -n2 c201-A_1488414451.csv | awk -F, '{print $1 "\t" $14}'
TimeStamp       rx_bytes
1488414454125   33847640064
```

Scripting with Perl

It is a lot easier to do math with a perl script than a bash or an awk script. You can pipe things into perl or perl will read the last argument of the `-ne` switches as an input file.

```
 $ head -n2 c201-A_1488414451.csv \
      | perl -ne '@v=split(/,/,$_); print "$v[0]\t$v[13]\n";'
TimeStamp      rx_bytes
1488414454125  33847640064

perl -ne 'BEGIN{$tt=0;@tstamps=();@rxb=();} \
  {@v=split(/,/,$_); push(@tstamps, $v[0]); push(@rxb, $v[13]);} \
  END{$dt=$tstamps[$#tstamps] - $tstamps[1]; $db=$rxb[$#rxb] - $rxb[1]; \
    print "Time: $dt,  Total:$db\n";}' \
    c201-A_1488414451.csv
Time: 18959363,  Total:1213399040
```

Not everthing you do in perl is going to be a one-liner. Here's an example of the same script as a more properly formatted perl file:

```
#!/usr/bin/perl
my $tt=0;
my @tstamps=();
my @rxb=();
while(<>) {
  @v = split(/,/, $_);
```

```
  push(@tstamps, $v[0]);
  push(@rxb, $v[13]);
}
$dt = $tstamps[$#tstamps] - $tstamps[1];
$db = $rxb[$#rxb] - $rxb[1];
print "Time: $dt,  Total:$db\n";
```

Writing Disk Images on Windows

Goal: Copy an installed OS file-system image onto a drive that you will install into a LANforge system that lacks display hardware.

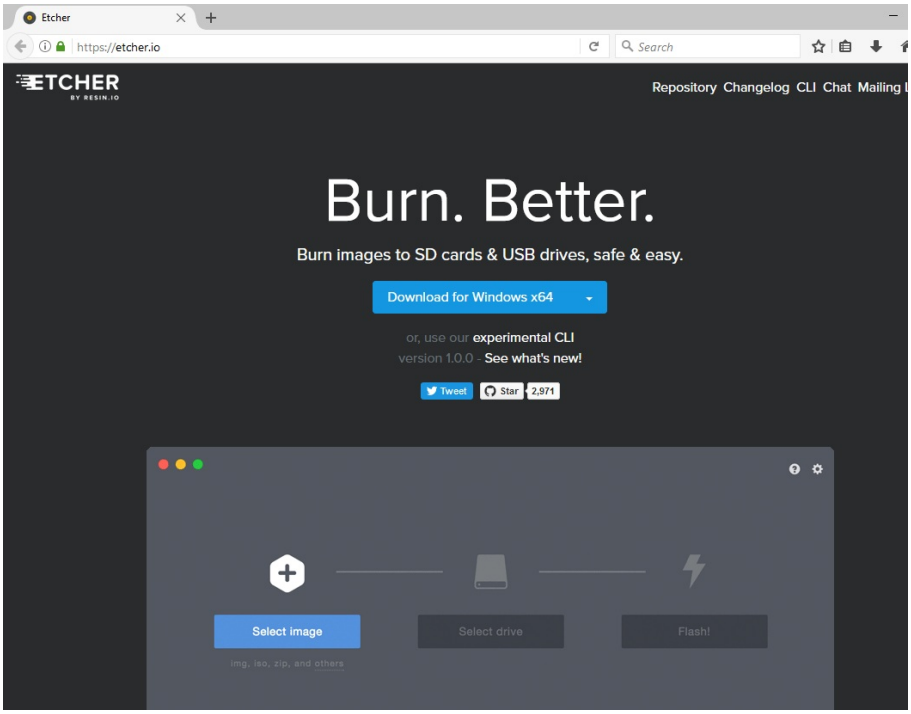
Many LANforge ICE WAN emulator machines are embedded systems that lack display hardware. Installing an OS using only the serial console can be very inconvenient. The easy solution is to perform the installation on similar hardware that does have display hardware, and then move the drive to the embedded device. Here, we learn how to use Etcher on Windows to write a compressed disk image to an mSata drive plugged into a USB3 adapter.

1. Here we're using Etcher which handles compressed file system images without any trouble. There are other programs (like Win32 Disk Imagaer or dd for windows) but those are more complex to use.
2. Items we'll want:
   A. 30GB or larger mSATA drive

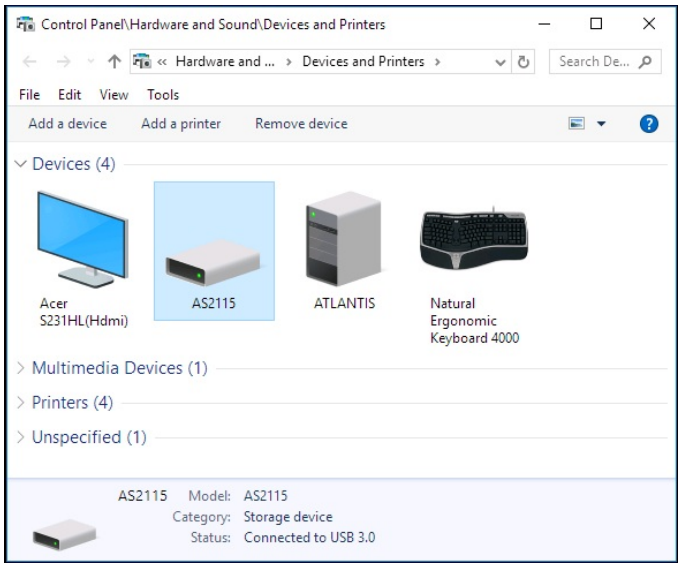
   B. USB3 mSATA drive adapter

   C. The image writing program Etcher

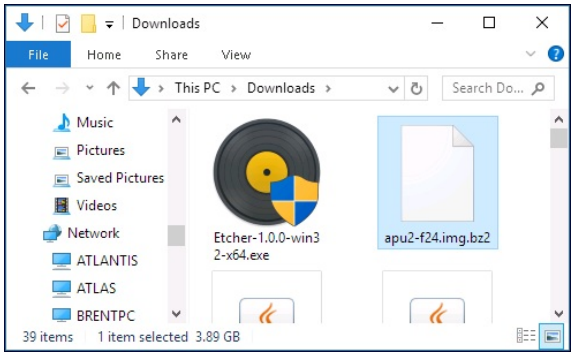
3. Download and install Etcher



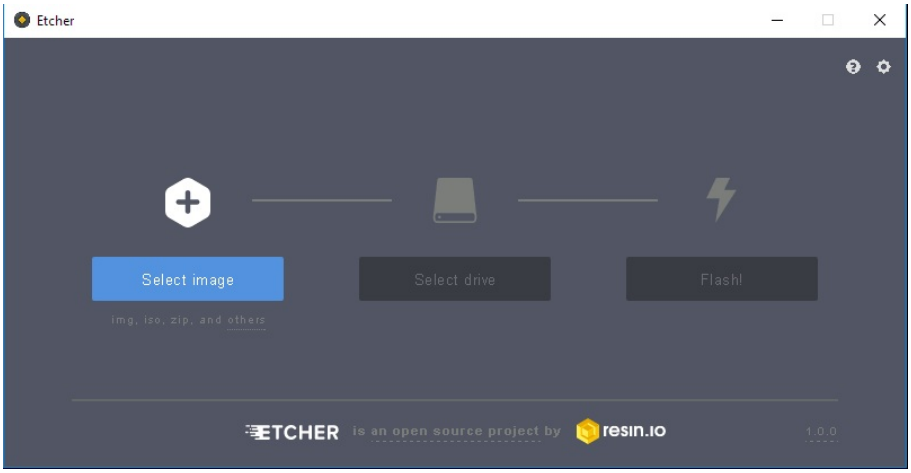
4. Identify your drive in **Control Panel → Hardware and Sound → Hardware and Printers**.



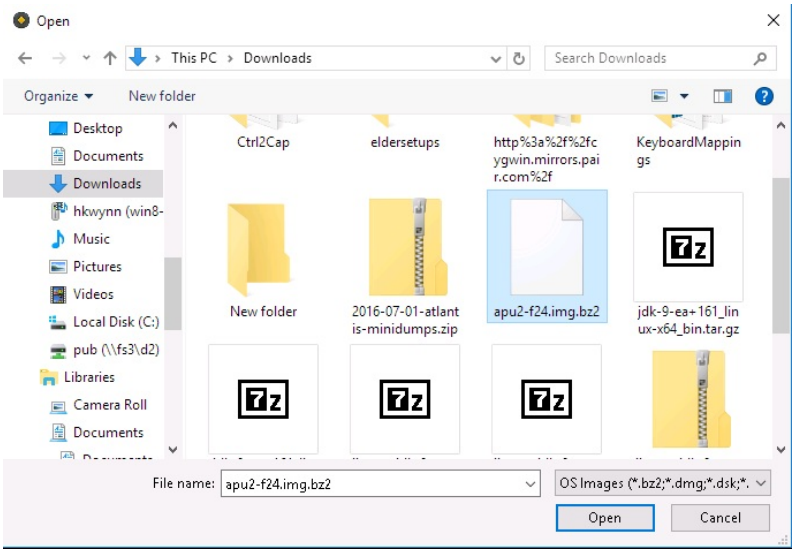
5. Download your image file:



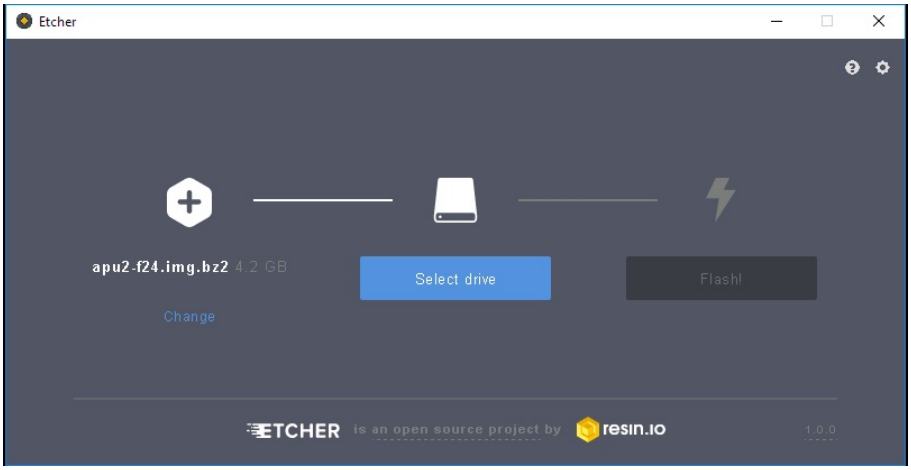
6. Start Etcher



7. Select the compressed image:

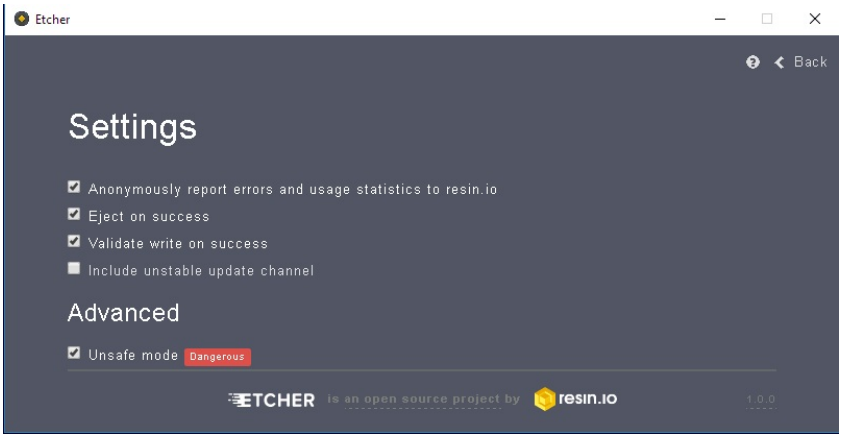


8. Select the removable drive

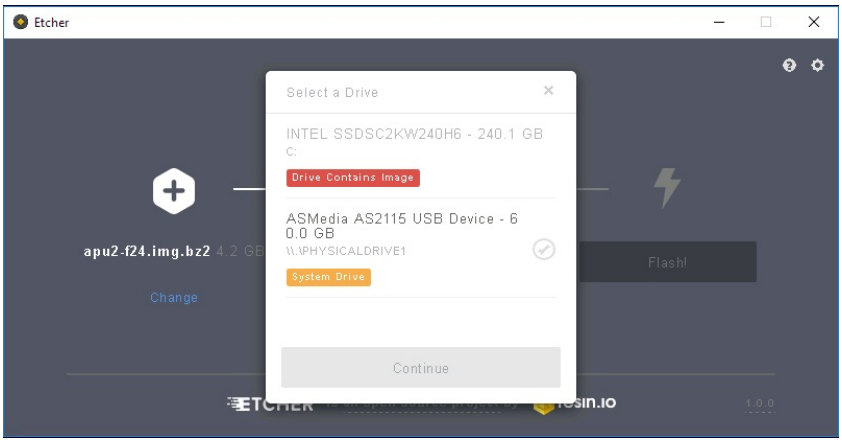


9. You might have to enable unsafe mode if the drive you plugged in has previously been used

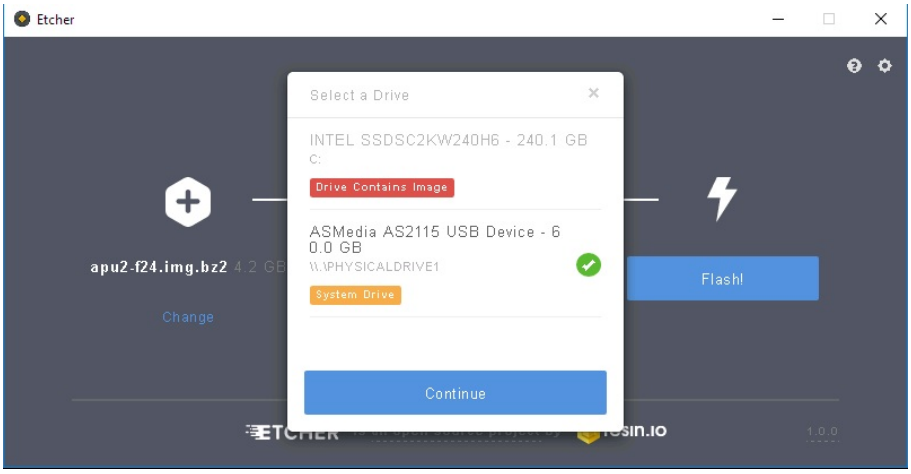
A. in Settings, enable **Unsafe mode**



B. Select the removable drive

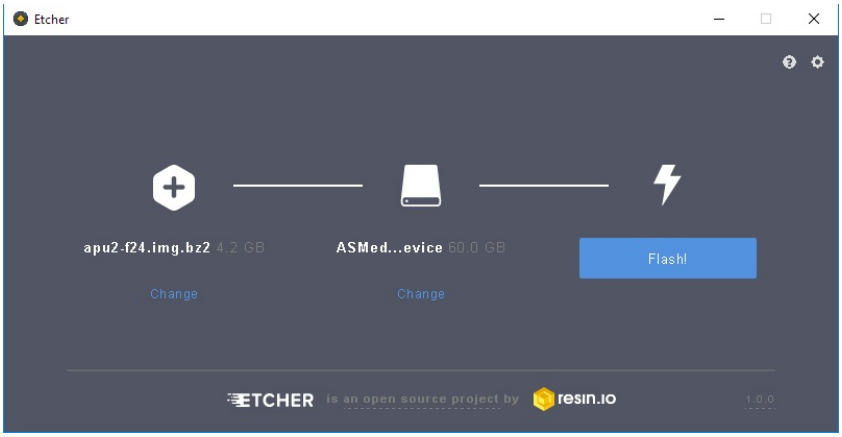


10. Select the removable drive

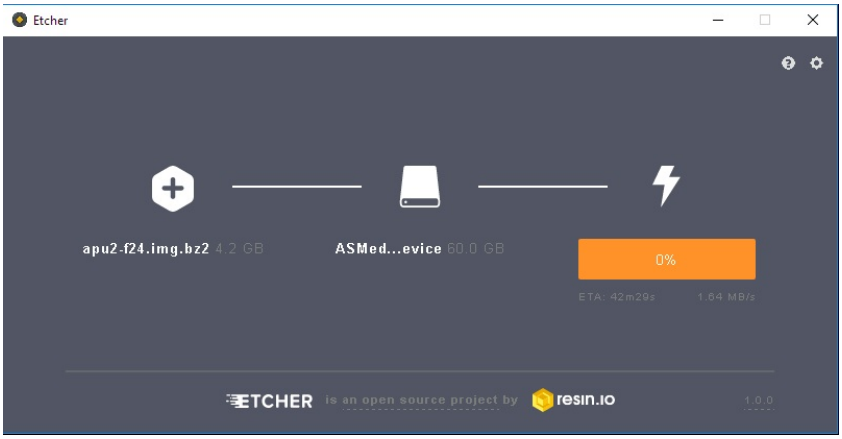


11. Write image.

A. click **Flash**

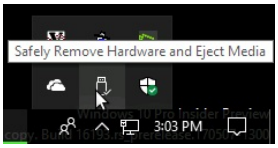


B. It might take 20 minutes to write a 20GB (uncompressed) image.

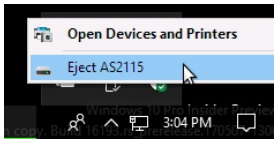


12. Make coffee.

13. When the image is finished writing, close etcher and use the Safely Eject Thing dialog in the system tray.
    A. right click



    B. select device

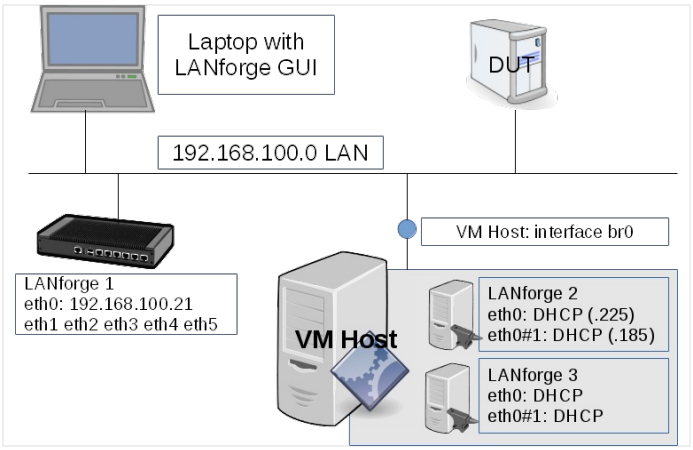


14. Unplug your drive from the computer, remove the msata drive drive from the USB caddy and then install into your embedded device

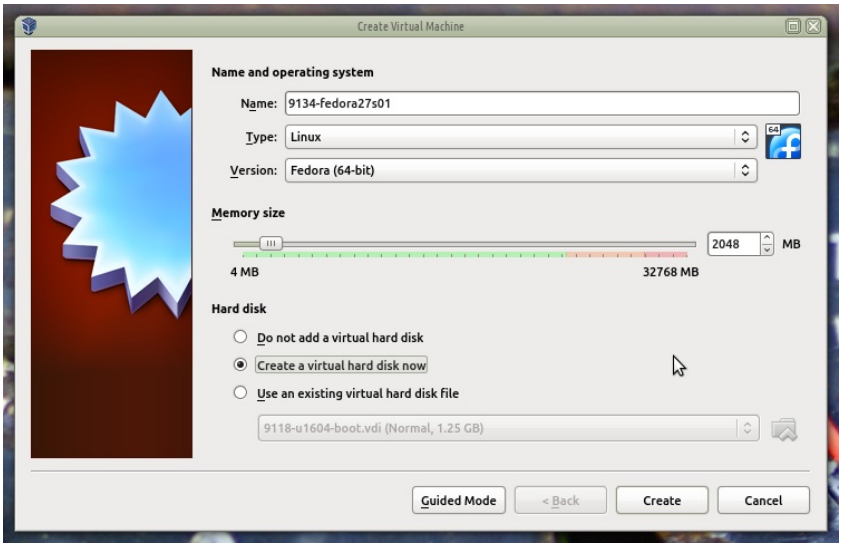
Adding a LANforge Virtual Machine

Goal: Add a virtual machine running LANforge to a LAN with a physical LANforge manager.

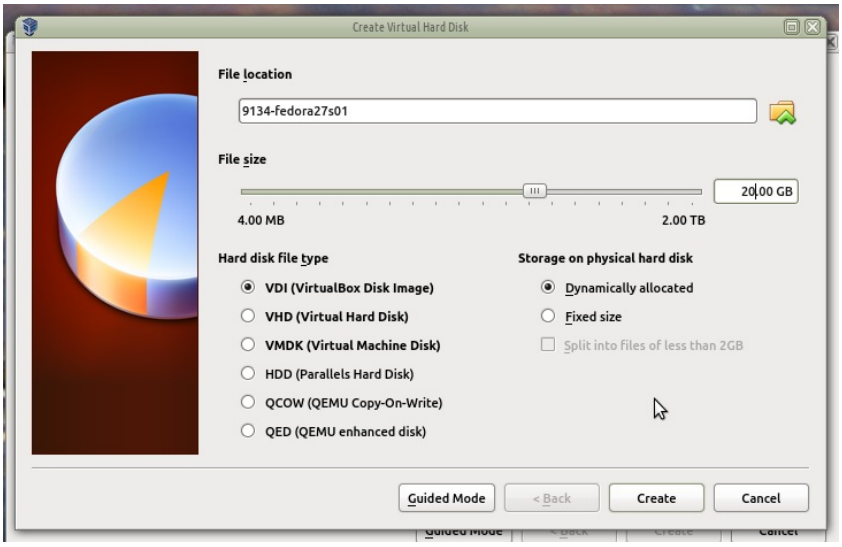
We review the configuration steps necessary to add a virtual LANforge resource. The guest instances will be configured to export MAC-VLAN ports to run traffic on their physical management port. The example here uses VirtualBox 5.2.10 and Fedora 27 Server edition, but our current recommendation for virtual machine platforms is actually **libvirtd/kvm**.



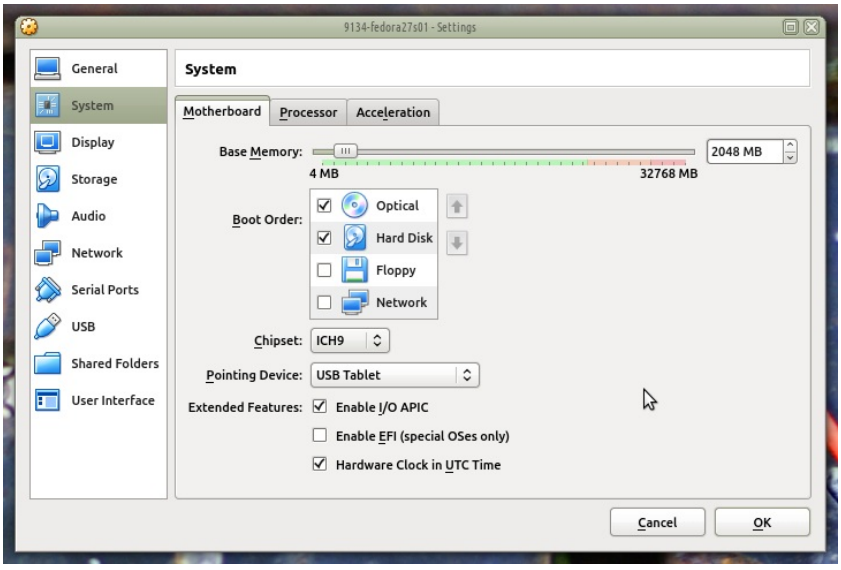
1. Create a new guest instance.
    A. When creating the guest, we should use 2 GB of RAM:



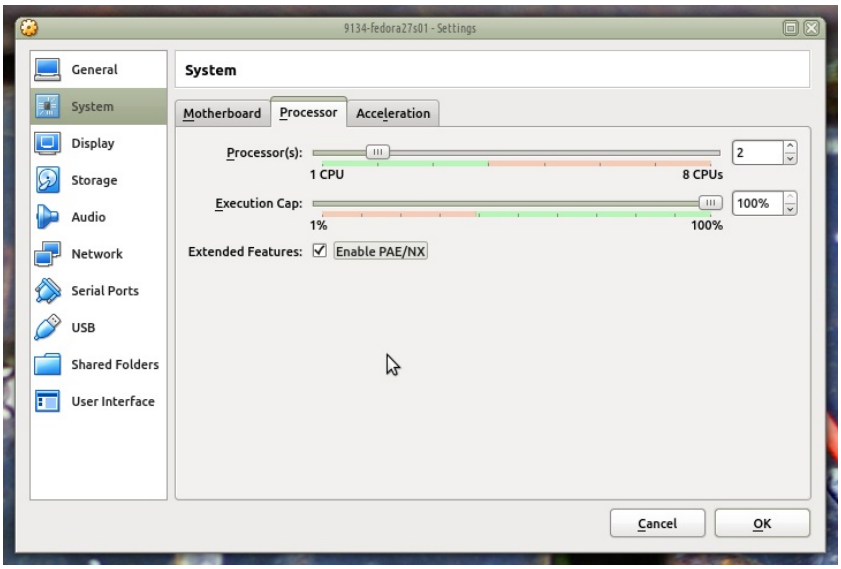
    B. **60 GB** of disk:



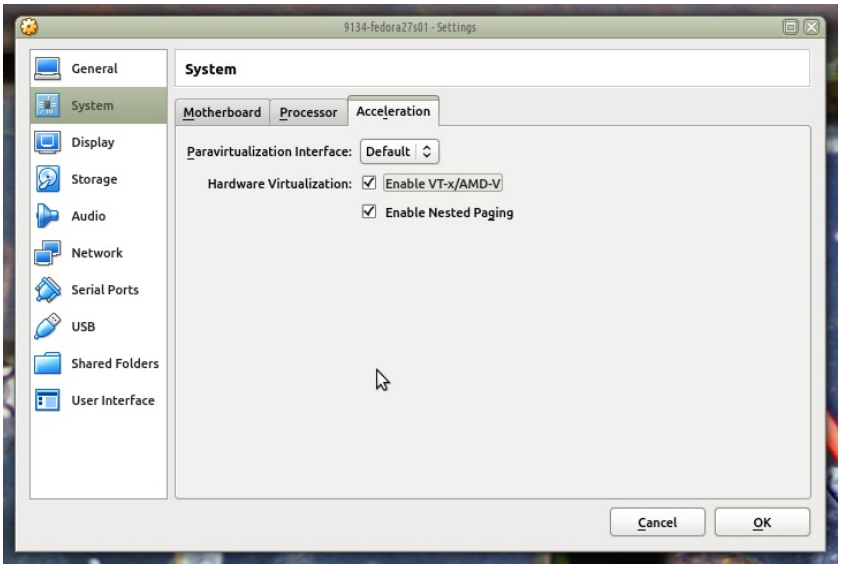
    C. Omit a floppy drive, use a USB table as pointing device:



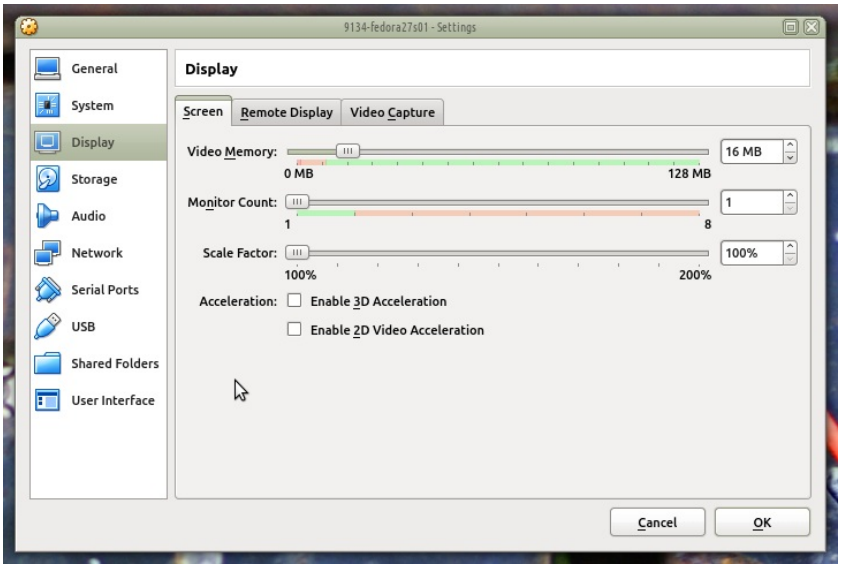
D. Allocate two or more cores and PAE/NX:



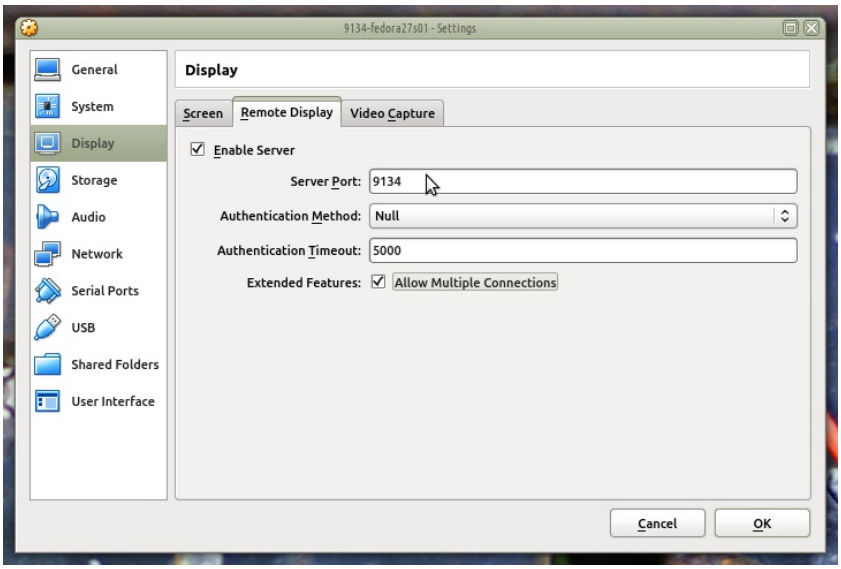
E. And the usual virtual processor features:



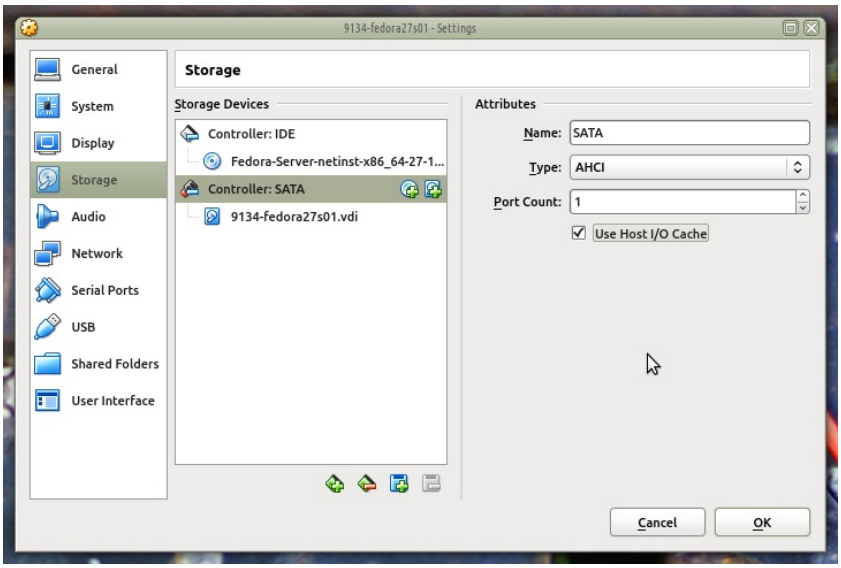
F. We don't need graphics on these nodes, so use minimum graphics memory:



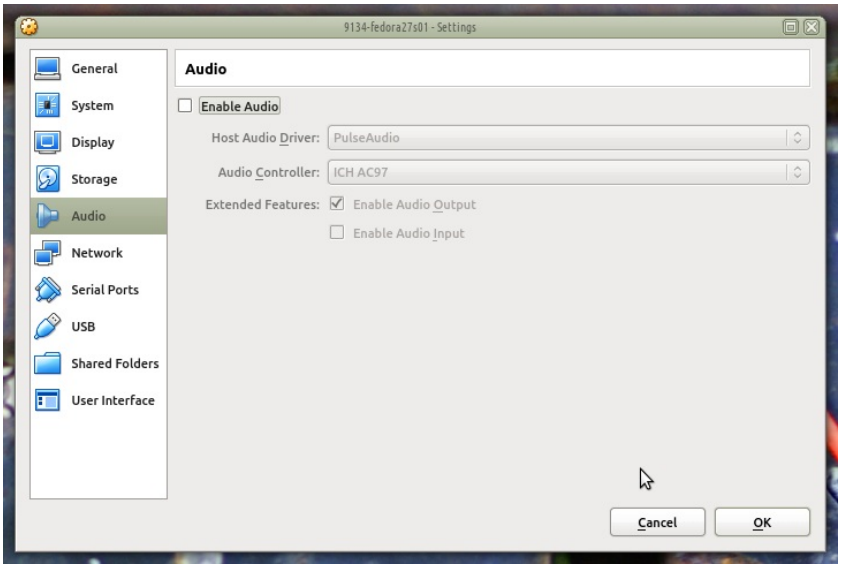
G. Enable RDP access, that is useful. It might be a good habit to allocate separate RDP ports per host, we'll use 9134 for the first guest, 9135 for the second



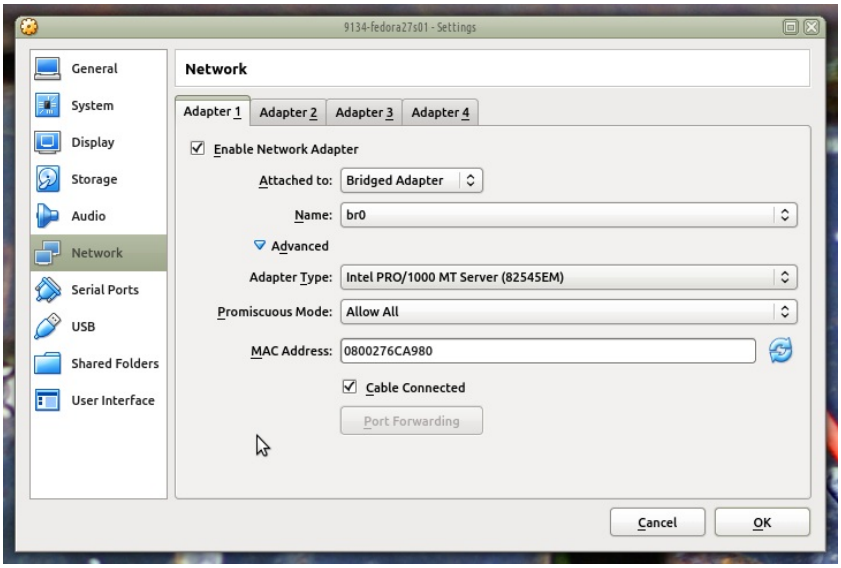
H. Enable Host I/O caching for your SATA device. Specify the Fedora 27 Server ISO image as the DVD:



I. Disable Audio

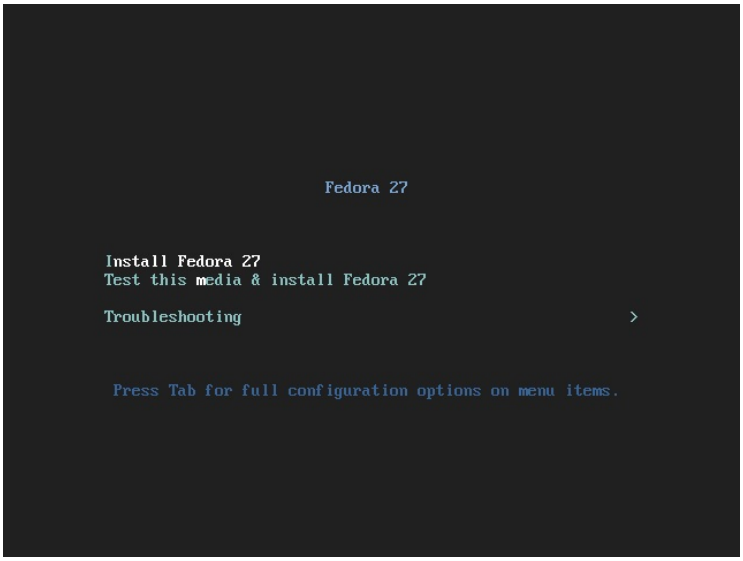


J. Configure the network adapter to:

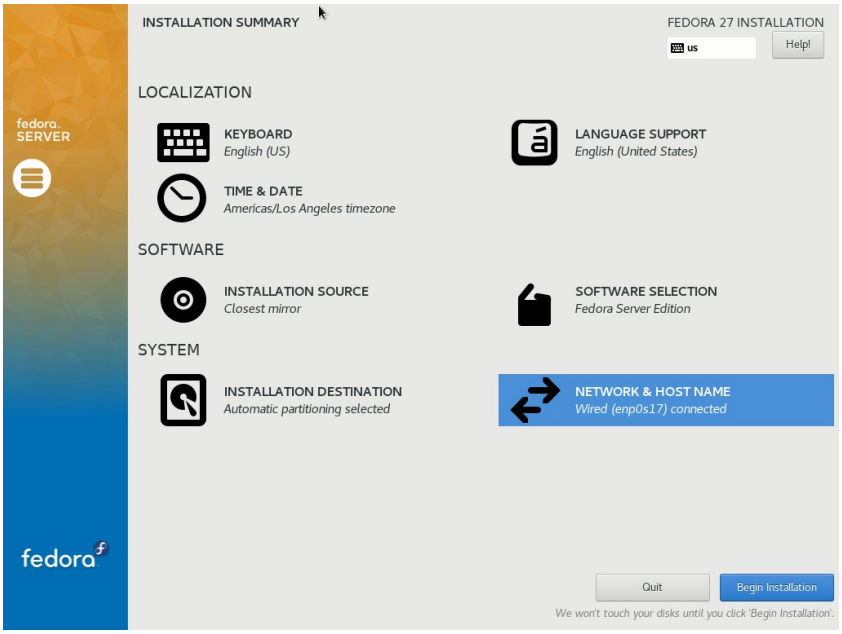


A. Use the LAN bridged adapter `br0`
B. Use a server adapter driver
C. Enable Promiscuous Mode to allow sniffing

K. Start the installation

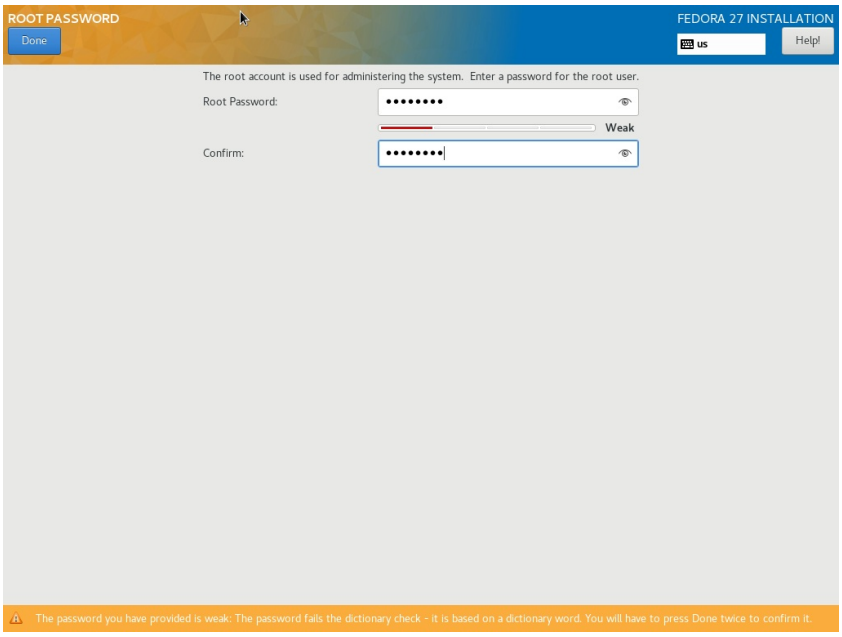


L. Under **System->Installation Destination** please manually partitioning is necessary.

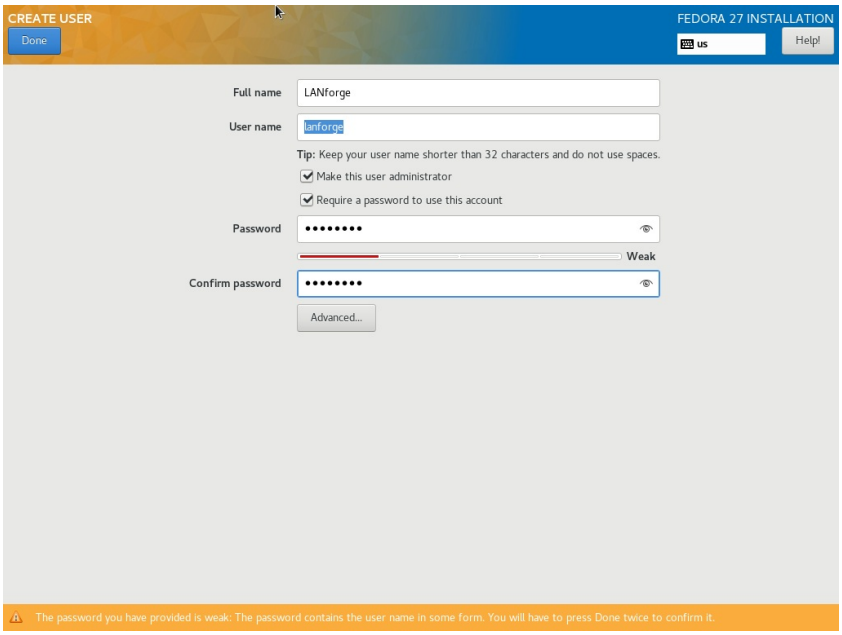


A. **Avoid selecting XFS or BTRFS file systems formats**.
B. Create a 1GB partition for `/boot`, select **ext4** filesystem format.
C. Use the remainder of the drive space for `/`
D. If you want to separate the `/` and `/home` partions select 35GB for `/` partition.

M. Set the **root** password to `lanforge`. Click **Done** twice.



N. Add user LANforge:



A. Make user **lanforge** an Administrator
B. Set password to `lanforge`
C. Click **Done** twice

O. When installation finishes, reboot. You will see a login prompt:

```
Fedora 27 (Server Edition)
Kernel 4.16.5-200.fc27.x86_64 on an x86_64 (tty1)

Admin Console: https://192.168.100.225:9090/ or https://[fe80::77e1:eb75:c3e8:962b]:9090/

localhost login: _
```

P. Login as `root`. Do updates:
```
# dnf update -y
```

Q. Install perl:
```
# dnf install -y perl
```

R. Set guest's hostname:
```
# hostnamectl --static set-hostname atlas-fedora27s01
```

S. Reboot:
```
# shutdown -r now
```

2. Install LANforge on the guest instance. Start by logging in as `root`:

```
Fedora 27 (Server Edition)
Kernel 4.16.5-200.fc27.x86_64 on an x86_64 (tty1)

Admin Console: https://192.168.100.225:9090/ or https://[fe80::77e1:eb75:c3e8:962b]:9090/

localhost login: root
Password:
[root@localhost ~]# which wget
/usr/bin/wget
[root@localhost ~]# which curl
/usr/bin/curl
[root@localhost ~]# wget http://www.candelatech.com/lf_kinstall.txt
--2018-05-03 15:08:19--  http://www.candelatech.com/lf_kinstall.txt
Resolving www.candelatech.com (www.candelatech.com)... 208.74.158.171
Connecting to www.candelatech.com (www.candelatech.com)|208.74.158.171|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 259852 (254K) [text/plain]
Saving to: 'lf_kinstall.txt'

lf_kinstall.txt          100%[=================================>] 253.76K  --.-KB/s    in 0.08s

2018-05-03 15:08:19 (3.02 MB/s) - 'lf_kinstall.txt' saved [259852/259852]

[root@localhost ~]#
```

A. Use wget (or curl) to download `lf_kinstall.txt`:
B.
```
# cd /root
```
C.
```
# wget http://www.candelatech.com/lf_kinstall.txt
```
D.
```
# chmod +x lf_kinstall.pl
```
E. You don't need to do a burn in, so turn off the disk check:

F.
```
# touch /home/lanforge/did_cpuburn
```

G. Install LANforge:
```
# ./lf_kinstall.pl --lfver 5.3.7 --kver 4.13.16+ --do_all_ct
```

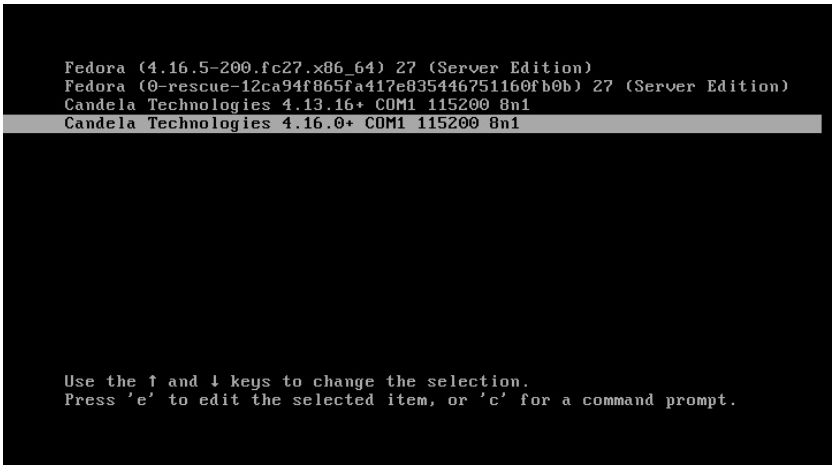
H. You can disable the VNC Server and Xrdp services on these guests:
```
# systemctl stop vncserver@\:1 xrdp.service
```
```
# systemctl disable vncserver@\:1 xrdp.service
```
```
# systemctl daemon-reload
```

```
[root@localhost lanforge]# systemctl stop vncserver@\:1.service xrdp.service
[root@localhost lanforge]# systemctl disable vncserver@\:1.service xrdp.service
Removed /etc/systemd/system/multi-user.target.wants/xrdp.service.
Removed /etc/systemd/system/multi-user.target.wants/vncserver@:1.service.
Removed /etc/systemd/system/vncserver@:1.service.
[root@localhost lanforge]# systemctl daemon-reload
[root@localhost lanforge]#
```

```
# shutdown -r now
```

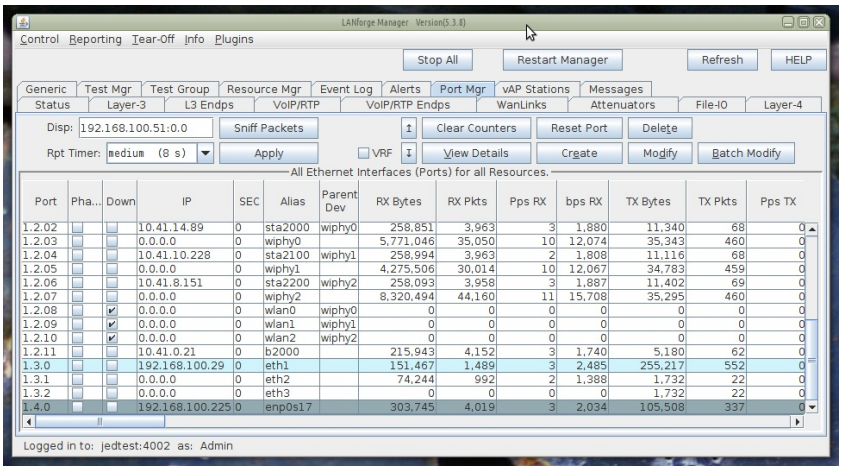
I. When installation finishes, reboot:

J. On next boot, you will see a LANforge kernel option, it should be automatically selected:



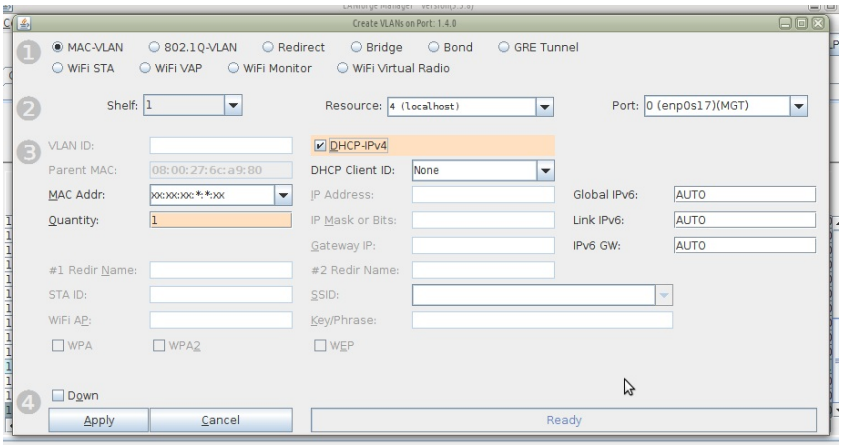
3. From your LANforge GUI, configure a MAC-VLAN the on default Ethernet port.

A. In the LANforge GUI, choose the Port Mgr tab, and highlight the new `enp0s17` port:



B. Click the **Create** button

C. create one MAC-VLAN port



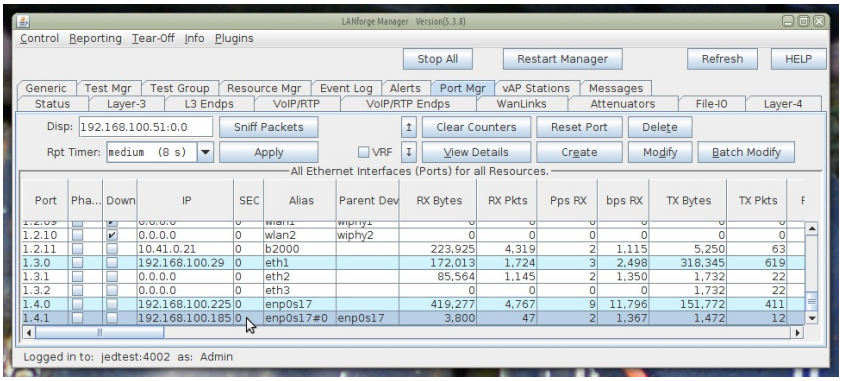
A. Select **MAC-VLAN**

B. Quantity: 1

C. Select **DHCP-IPv4**

D. Click **Apply**

D. You will see the new port in the GUI:




```
# ip -br a show
```

E. In the guest VM, you will also see the new port:

```
[root@localhost lanforge]# df -h
Filesystem              Size  Used Avail Use% Mounted on
devtmpfs                971M     0  971M   0% /dev
tmpfs                   992M     0  992M   0% /dev/shm
tmpfs                   992M  868K  991M   1% /run
tmpfs                   992M     0  992M   0% /sys/fs/cgroup
/dev/mapper/fedora-root   15G  8.3G  6.8G  55% /
tmpfs                   992M   20K  992M   1% /tmp
/dev/sda1               976M  190M  720M  21% /boot
tmpfs                   199M     0  199M   0% /run/user/1000
[root@localhost lanforge]# ip a show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: enp0s17: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 10
00
    link/ether 08:00:27:6c:a9:80 brd ff:ff:ff:ff:ff:ff
    inet 192.168.100.225/24 brd 192.168.100.255 scope global dynamic enp0s17
       valid_lft 84783sec preferred_lft 84783sec
    inet6 fe80::a00:27ff:fe6c:a980/64 scope link
       valid_lft forever preferred_lft forever
3: enp0s17#0@enp0s17: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue master _vrf1 state UP
 group default qlen 1000
    link/ether 08:00:27:c5:b9:80 brd ff:ff:ff:ff:ff:ff
    inet 192.168.100.185/24 brd 192.168.100.255 scope global enp0s17#0
       valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fec5:b980/64 scope link
       valid_lft forever preferred_lft forever
4: _vrf1: <NOARP,MASTER,UP,LOWER_UP> mtu 65536 qdisc noqueue state UP group default qlen 1000
    link/ether 12:51:bc:d9:ca:a7 brd ff:ff:ff:ff:ff:ff
[root@localhost lanforge]#
```

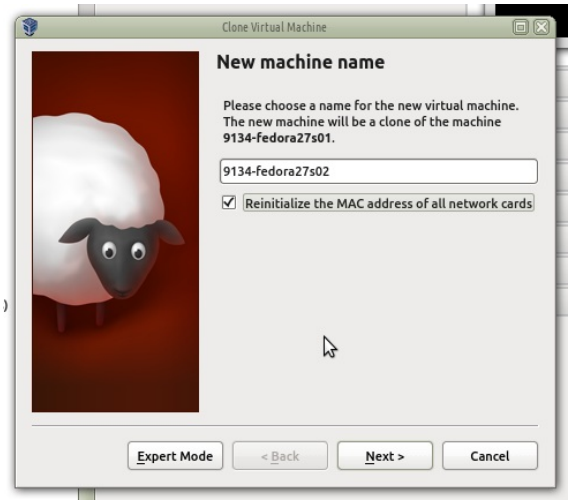
4. Add a second VM

A. Shut down the previous VM:

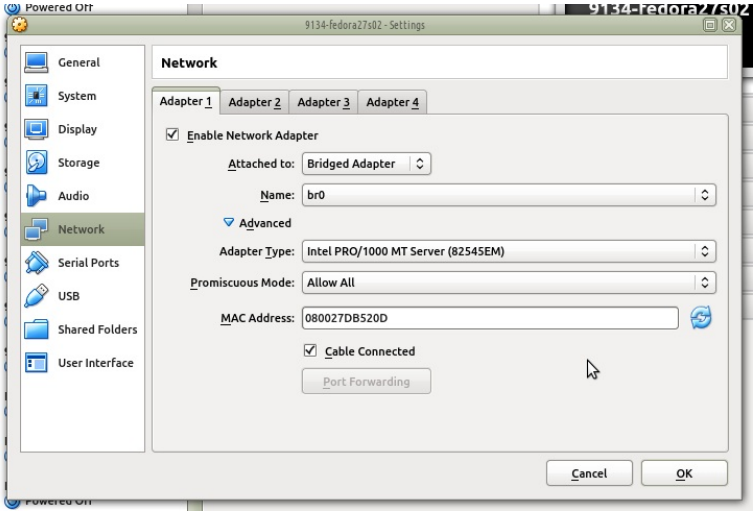
```
# shutdown -r now
```

B. clone the VM

A. Select the Reinitialize MAC addresses choice, these machine will operate simultaneously.



B. Verify the MAC address of the new guest is set



C. Boot the second guest

C. Change the hostname of the second guest:

```
# [root@localhost]# echo 'atlas-fedora27s02' > /etc/hostname
```

```
[root@localhost ~]# hostnamectl --static set-hostname atlas-fedora27s02
```

D. Make sure that the MAC address of the second guest is not listed in the `ifcfg-enp0s17` file.

```
[root@localhost systemd]# cd /etc/sysconfig/network-scripts/
[root@localhost network-scripts]# ls
ifcfg-enp0s17  ifdown-ipv6    ifdown-Team      ifup-eth    ifup-post      ifup-tunnel
ifcfg-lo       ifdown-isdn    ifdown-TeamPort  ifup-ippp   ifup-ppp       ifup-wireless
ifdown         ifdown-post    ifdown-tunnel    ifup-ipv6   ifup-routes    init.ipv6-global
ifdown-bnep    ifdown-ppp     ifup             ifup-isdn   ifup-sit       network-functions
ifdown-eth     ifdown-routes  ifup-aliases     ifup-plip   ifup-Team      network-functions-ipv6
ifdown-ippp    ifdown-sit     ifup-bnep        ifup-plusb  ifup-TeamPort
[root@localhost network-scripts]# cat ifcfg-enp0s17
TYPE=Ethernet
PROXY_METHOD=none
BROWSER_ONLY=no
BOOTPROTO=dhcp
DEFROUTE=yes
IPV4_FAILURE_FATAL=no
IPV6INIT=yes
IPV6_AUTOCONF=yes
IPV6_DEFROUTE=yes
IPV6_FAILURE_FATAL=no
IPV6_ADDR_GEN_MODE=stable-privacy
NAME=enp0s17
UUID=01539fff-8a66-3a66-b056-473b36c7357e
ONBOOT=yes
AUTOCONNECT_PRIORITY=-999
DEVICE=enp0s17
[root@localhost network-scripts]# _
```

A. Compare the adapter to the file:

B.
```
# cd /etc/sysconfig/network-scripts
```

C.
```
# cat ifcfg-enp0s17
```

D. If it is listed, change it or remove it.

E. LANforge changes the `/etc/udev/rules.d/70-persistent-net.rules` file.Edit tht file those as to match the value of your mac address:

```
# cd /etc/udev/rules.d
# ip li show enp0s17
# cat 70-persistent-net.rules
```

F. Stop LANforge and change the resource ID for this guest:

```
# service lanforge stop
# cd /home/lanforge
# ./lfconfig
Your command: resource 5
Your command: config
```

```
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: resource 5

Interfaces: _vrf1 enp0s17#0 enp0s17
Resource interface assignment:
  Resource 5:  _vrf1 enp0s17#0
Specified Resource Addresses:

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]                    26
resource          [1-511]                    5
mgt_dev           [ethernet device]          enp0s17
mode              [resource, manager, both]  resource
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: config
```

```
# shutdown -r now
```

G. Reboot the second guest:

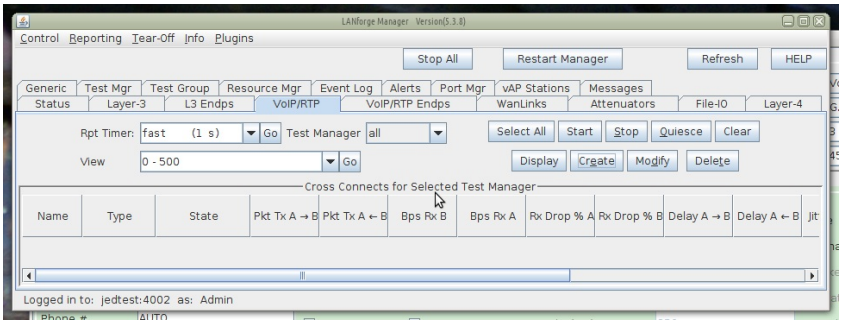
H. Start up your first guest (resource 4)

I. In your LANforge GUI, you should see your two VMs.

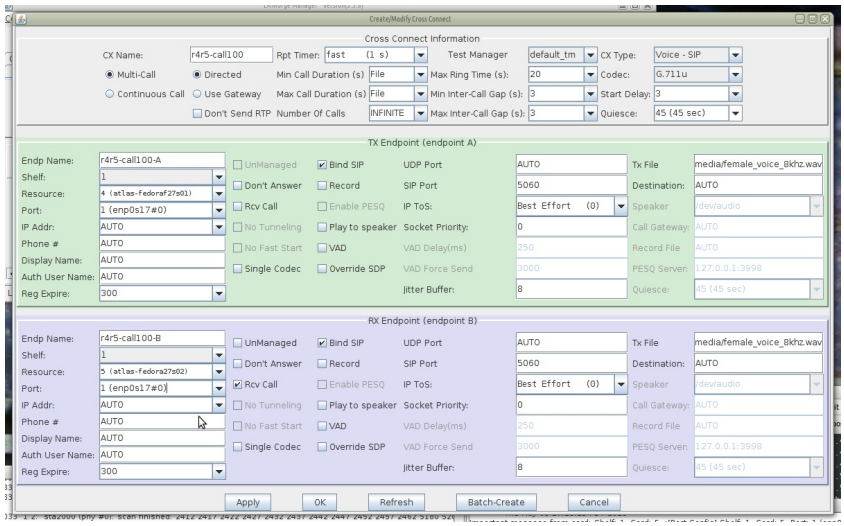
J. Create a MAC-VLAN port for the second guest

5. Create a VOIP connection between the two guests.

A. In the VOIP tab, click **Create**



B. You configure:

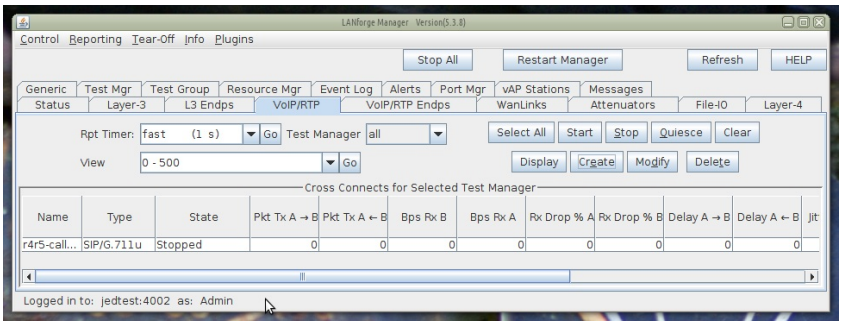


A. Side-A will be resource 3

B. Side-B will be resource 4

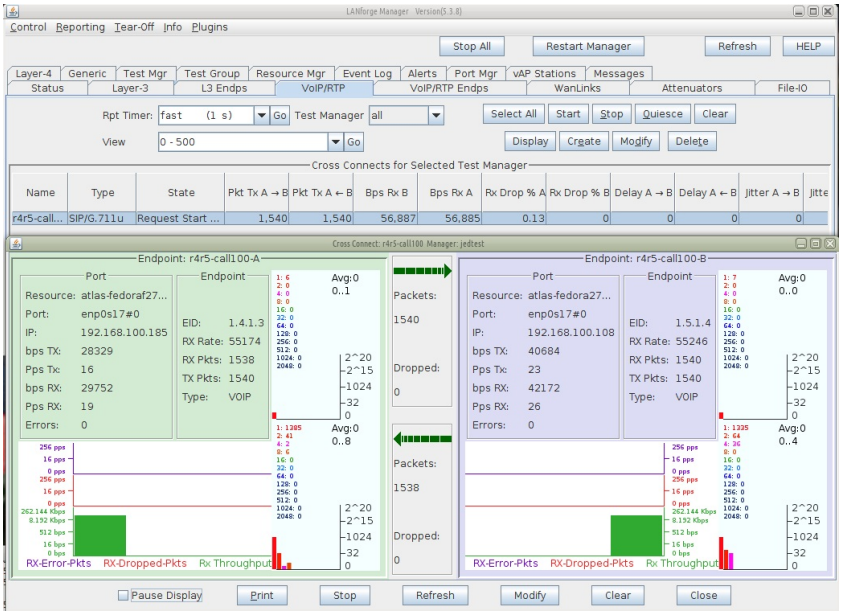
C. Click **Apply**

C. See the newly created connection:



D. In the VOIP/RPT tab, click **Start**

E. Monitor traffic on the connection with the Modify->View button



Configuring Serial Connection to LANforge

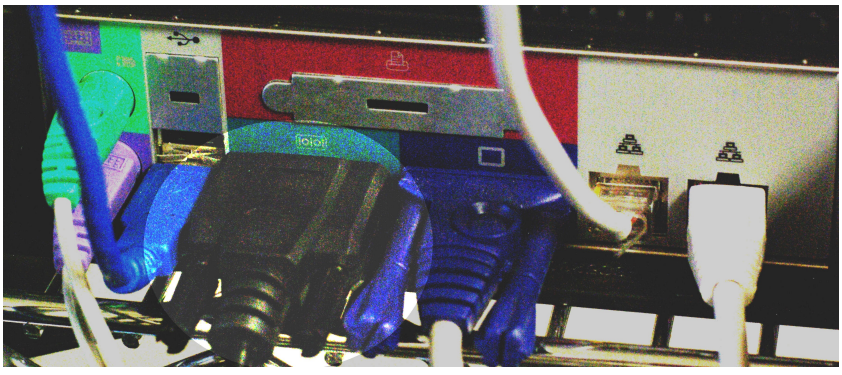
Goal: Using a serial cable and terminal emulator on Windows to connect to LANforge.

If you experience crashes or system misconfiguration, a network link to LANforge can become unavailable. LANforge machines are shipped with a serial cable for just this possibility. Most LANforge servers come with standard RS232 DB9 pin serial ports, other models have a special RJ45 style connector. You might need a USB to Serial adapter to connect your laptop to the serial cable.

1. Connect Serial Cable to LANforge
   A. We will use a CT525 for our example There are two different types of CT525, some have a I/O shield with colors, others do not. Both have DB9 serial ports:
   B. Picture of an unmarked I/O plate:

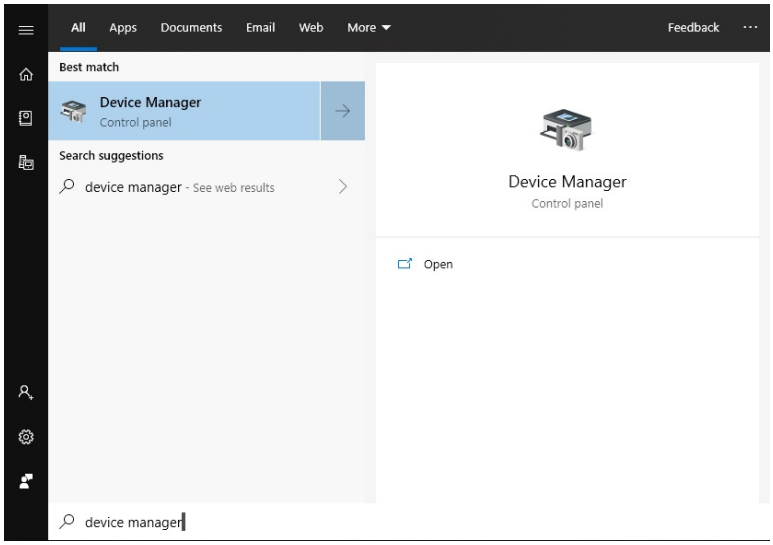
   C. Picture of a colorized I/O plate:

   D. Picture of a colorized I/O plate plugged in:

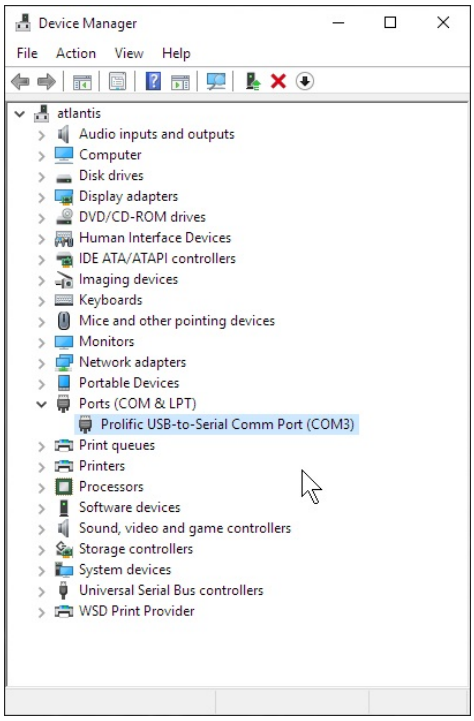


   E. Other LANforge chassis models can have either RJ45 or DB9 serial ports.

2. Connect Serial Cable to Windows
    A. Chances are you will be connecting a USB to Serial adapter to your laptop.
    B. Typically, right after you connect the cable to your USB port, you will see a message from Windows letting you know a new drive has been installed.
    C. Windows will map this USB adapter to a COM port. Use Device Manager to discover the new COM port:
        A. Press the Windows key and type `device manager`



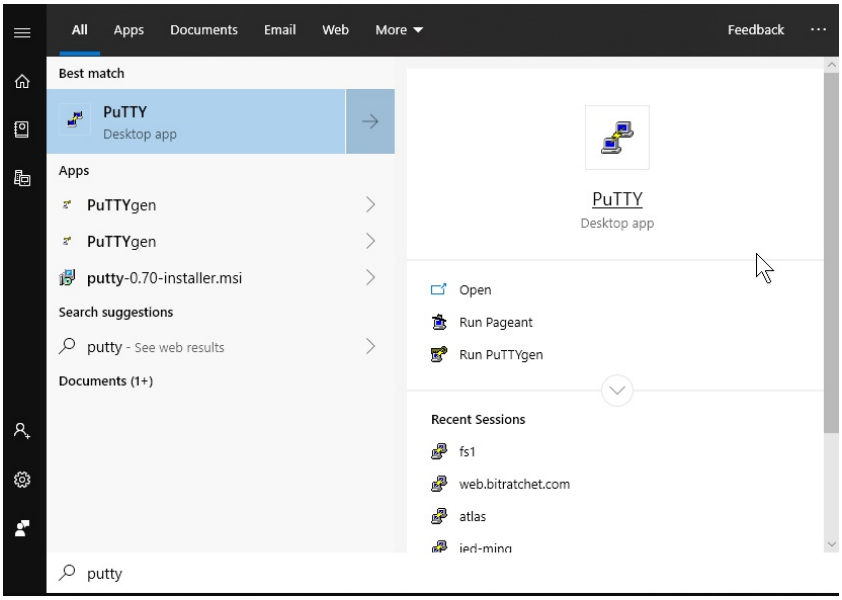
        B. Hit **Enter** to open the Device Manager
        C. In Device Manager, select **Ports**



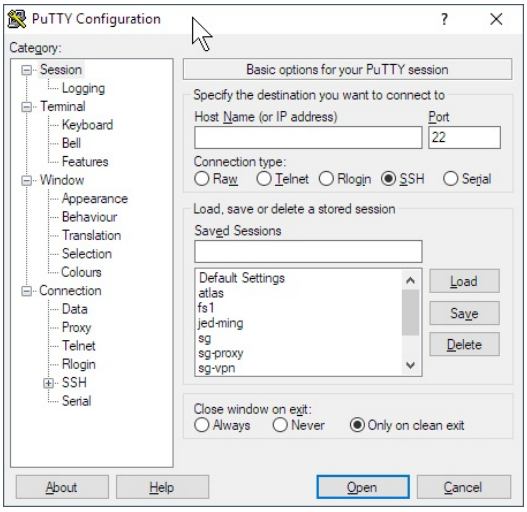
        D. In this example, we see that our new USB device was assigned `COM3`.

3. Configure PuTTY to connect to serial port

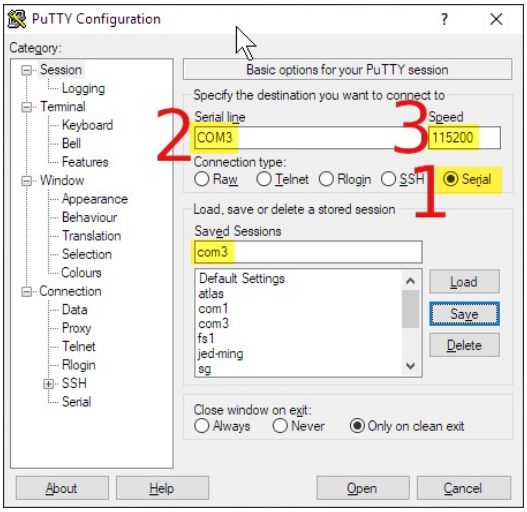
A. Press the Windows key and search for `putty`



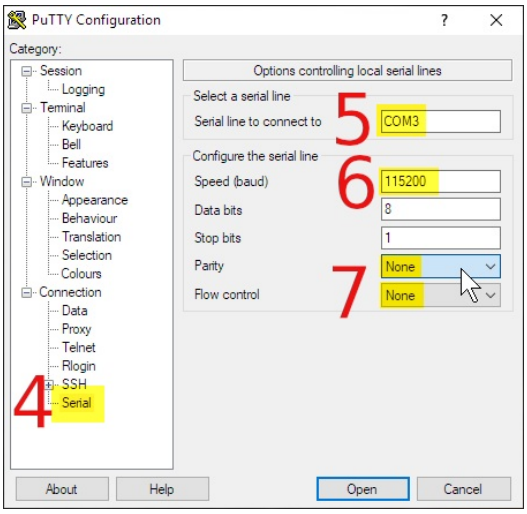
B. When you double click on the PuTTY icon and it launches, you can start customizing your session preferences



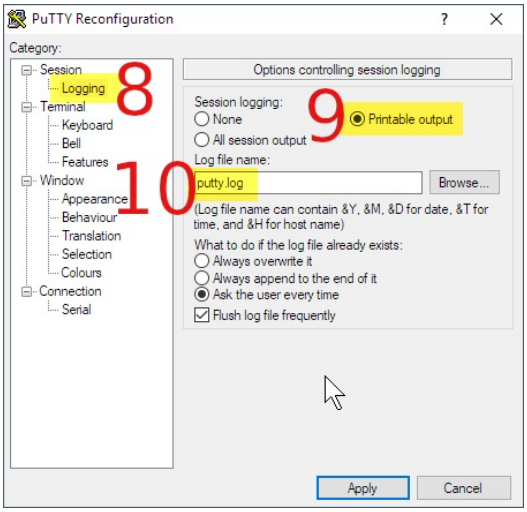
C. Start by setting your connection type (serial), serial device (com3) and speed (115200). Name your session 'com3'



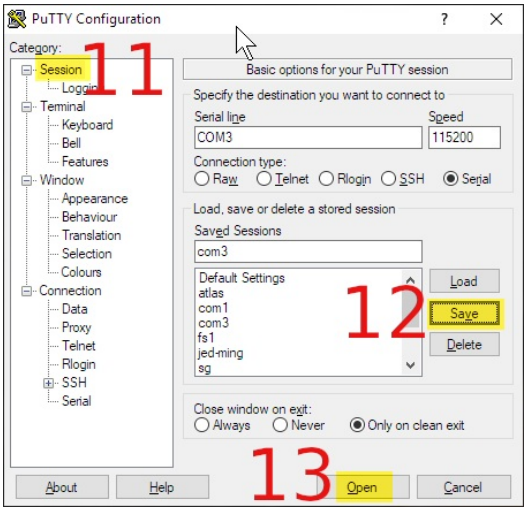
D. Select category Serial, specify the Serial Line **COM3**, speed (115200) and set both Parity and Flow Control to **None**.



E. Select the **Session→Logging** category, select Printable Output and name set the Log file name as you prefer. This allows you to collect your commands as notes for later.



F. Select the **Session** category, save the `com3` profile and click **Save**

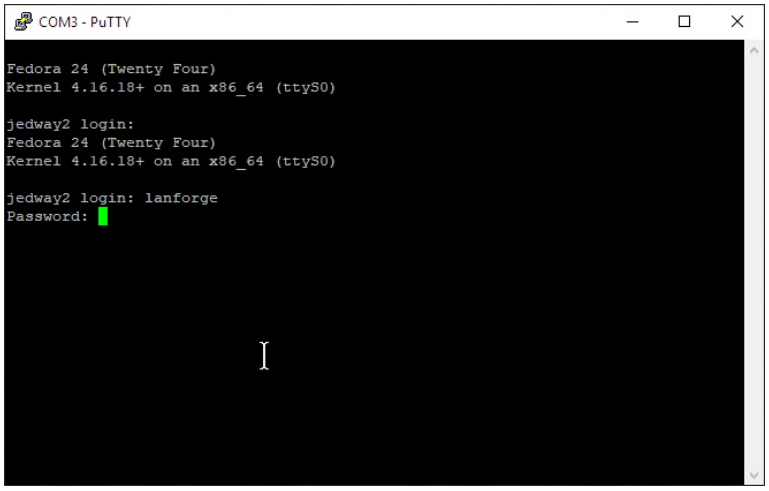


G. Click the **Open** button. You will see a terminal window appear.

4. Use PuTTY to Log In over COM3

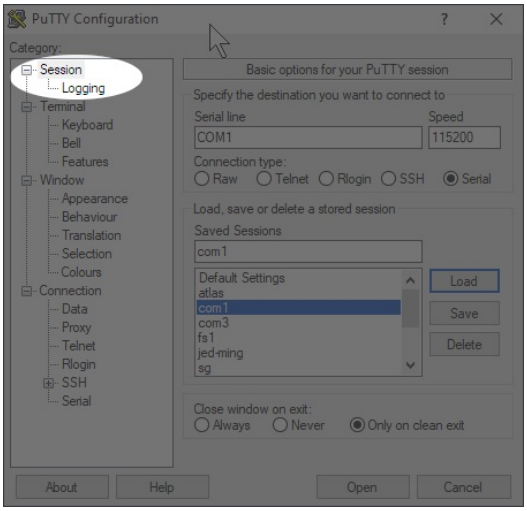
A. If the screen is blank, hit Enter to see a login prompt.

B. Enter username `lanforge` Enter , password `lanforge` Enter

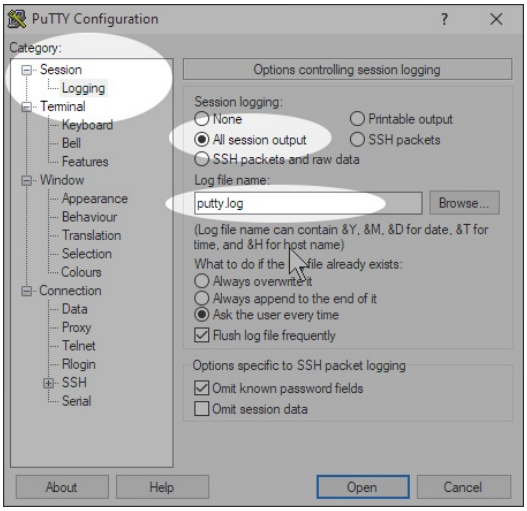


5. **Collect console output to a logfile**

A. step 1



B. step 1



6. **Common Commands Cheat Sheet**: Hit Enter after all commands

A. `pwd` Enter : print current directory

B. `ls` Enter : list items in directory

C. `cd` Enter : change to your Home Directory

D. `cd /home/lanforge` Enter : go to LANforge home directory

E. `cd /root` Enter : go to root user's home directory

F. `sudo ./serverctl.bash restart` Enter : Restart LANforge service

G. `sudo reboot` Enter : reboot machine

H. `ip a show` Enter : show interface addresses

I. `df -h` Enter : show disk usage

J. `mv script.sh.txt /home/lanforge/scripts/script.sh` Enter : move file to new name

K. `dos2unix script.sh` Enter : Remove DOS/Windows CRLF style line endings

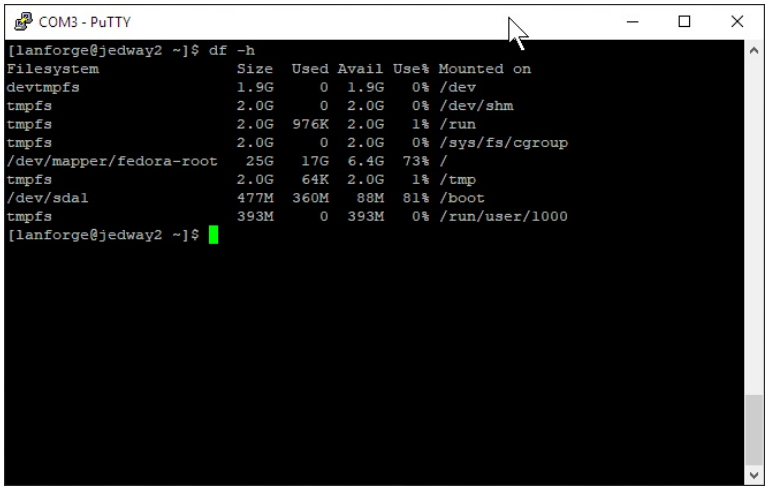
L. `chmod +x script.sh` Enter : Turn script executable

M. `./script.sh` Enter : Run script in current directory

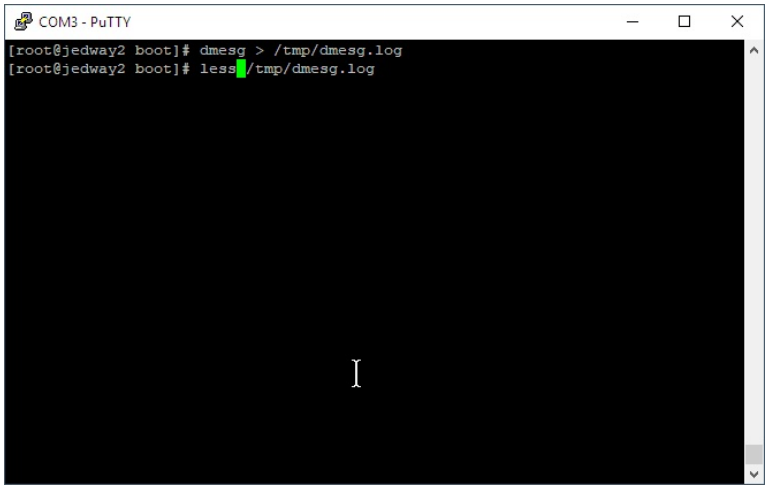
7. Example of clearing disk space on a LANforge machine

   A. One common problem with any LANforge machine is cleaning out old kernels. This is an example that shows you how to check disk space and how to remove unused kernels.

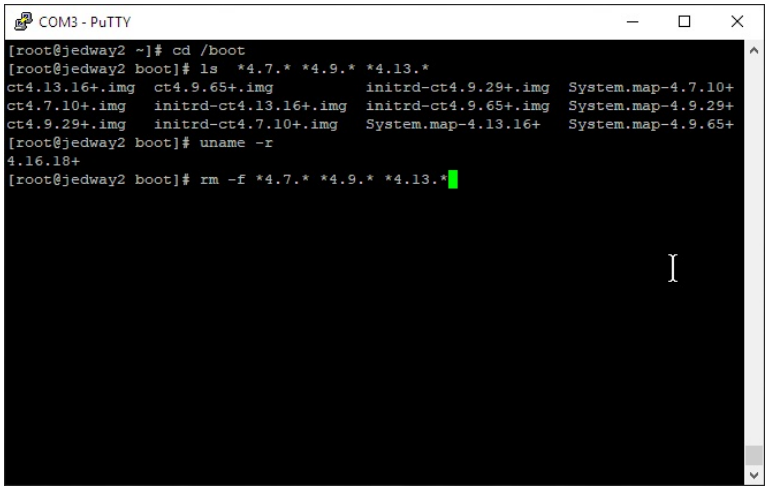
   B. Check disk space with the `df -h` command



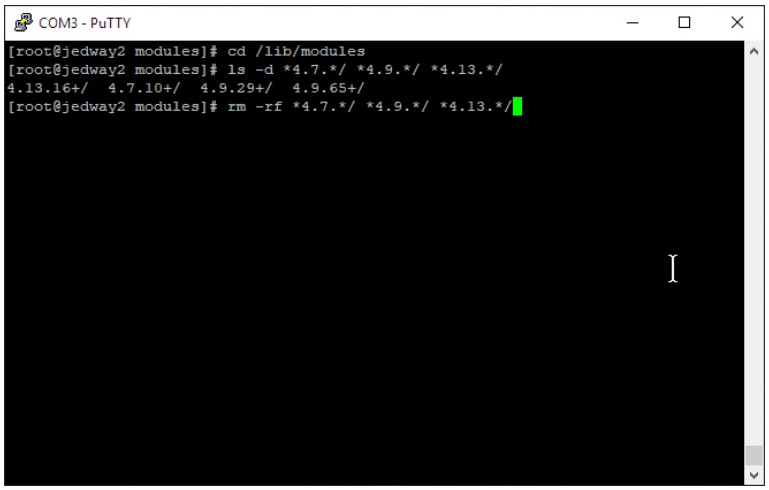
   C. Use the `dmesg` command to see if there are system warning.



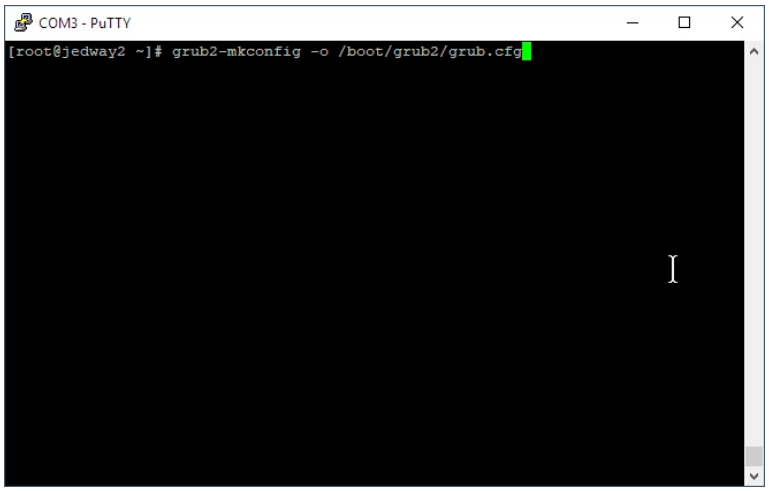
   D. go to the /boot directory. The `uname -r` command tells you which kernel you are currently running. You may remove old **ct** kernels.



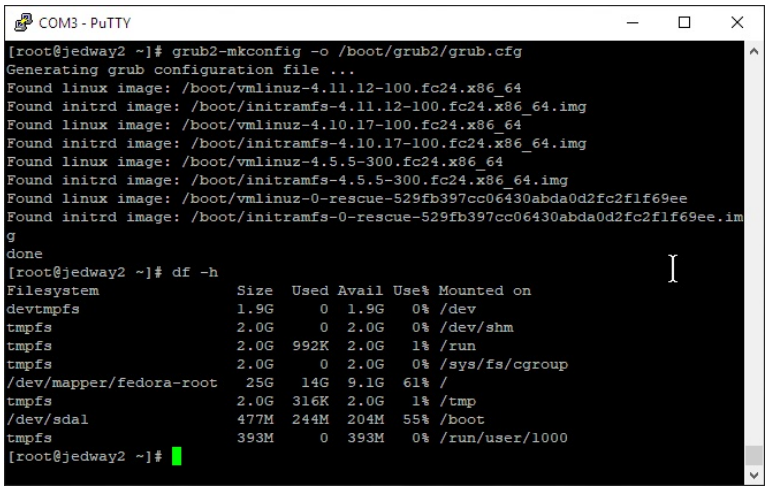
E. In addition to removing old kernels, you can remove modules that correspond to those kernels



F. After old kernels and modules have been removed, we re-run `grub2-mkconfig` to regenerate the boot menu:



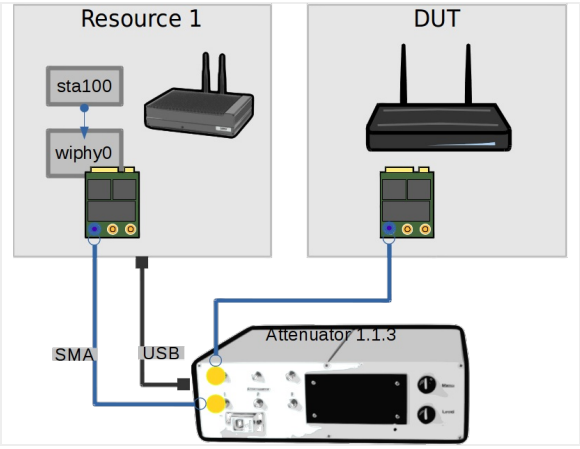
G. the results will look like this:



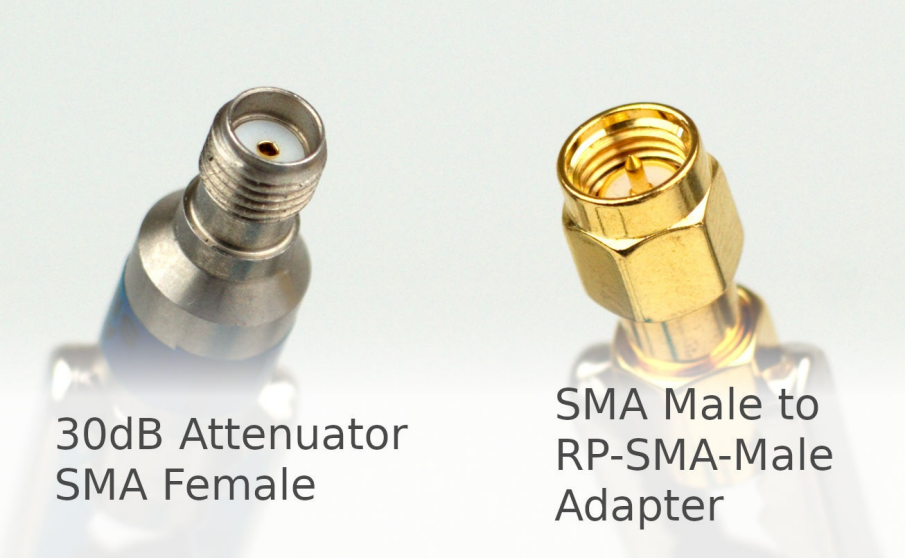
Connecting SMA Cables to LANforge

Goal: Connect the antennas of your device under test to LANforge using SMA cables and a fixed attenuator.

Many WiFi testing scenarios benefit from some amount of WiFi isolation. Connecting the radios of the Device Under Test (DUT) to LANforge's radios using SMA cables can improve connection quality. Using a fixed attenuator can reduce a direct signal so that it is heard by the radios without distortion.



1. The polarities of the cables must match



2. Begin by connecting the SMA Female end of the fixed attenuator to the SMA adapter.

3. We see that the exposed end of the sma_adapter is RP-SMA-Male. RP means Reverse Polarity.

4. Connect the attached attenuator and adapter to the LANforge radio antenna. This exposes the SMA Male end of the attenuator. Your DUT might not have adequate space to mount a fixed attenuator to it, so we suggested connecting it to the LANforge.

5. The polarities of the cable end must match the end of the fixed attenuator. The cable end for this side is SMA-Female.

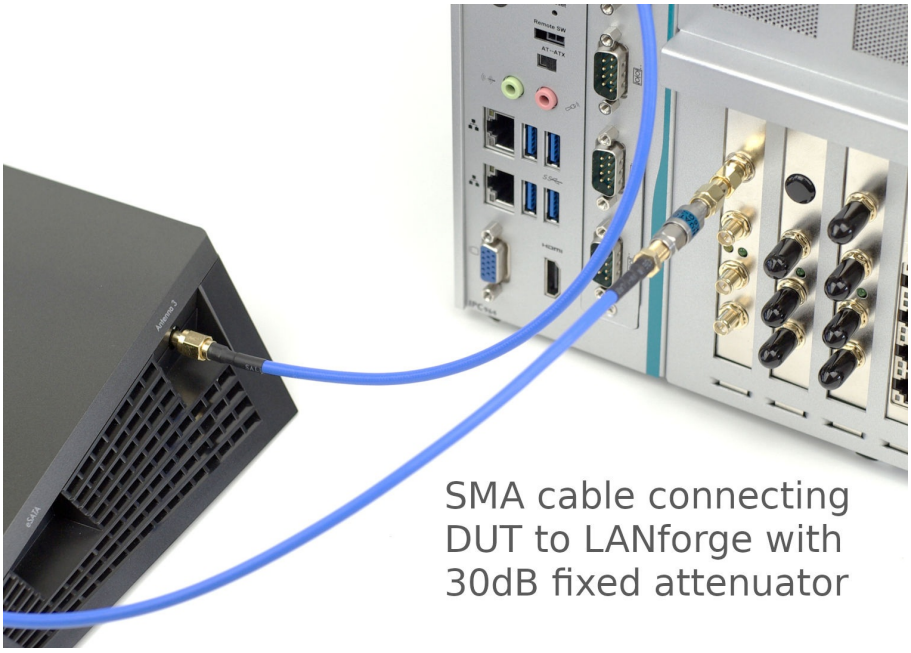
6. See how the cable connected to the lanforge has both the adapter and the attenuator. It should be safe to use the attenuator and adapter anywhere along a SMA path.

SMA Cable attached to attenuator connected to LANforge

7. Connect the other end of the cable to the Device Under Test (DUT). Your DUT might use different antennas so you might need to use another adapter.

SMA-RP-Male cable end attaches to SMA-Male DUT radio

8. We have connected one antenna of our DUT to the one antenna of our LANforge. Repeat this for multiple antennas.



Diagnose Problems with GUI on Windows

Goal: Learn how to diagnose problems running LANforge client on Windows.

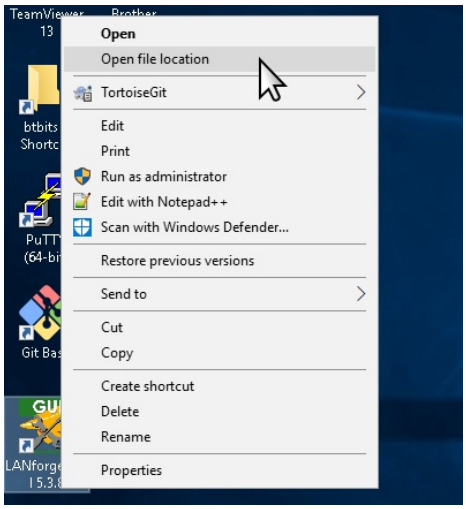
The LANforge client (GUI) can encounter variety of difficulties depending on the amount of RAM and version of Java running on your desktop. Read this guide to learn steps to take to collect error messages and how to fix out of memory problems.

> The LANforge client can be both the GUI running interactively, or in headless HTTP mode.

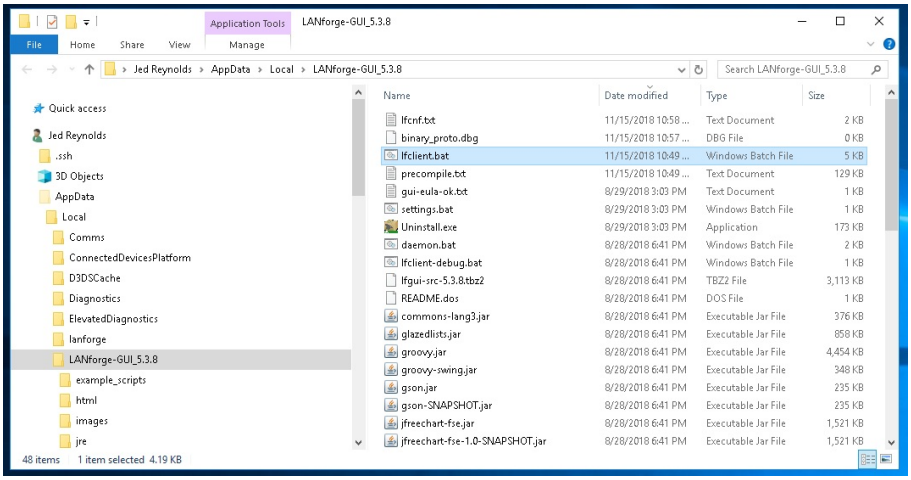
---

1. ## Run the client from a CMD window

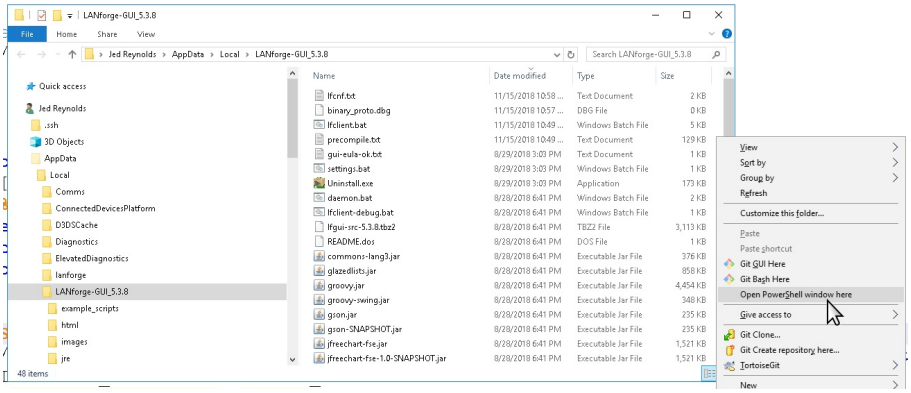
2. Right click on LANforge GUI icon and select Open File Location



3. You will see the folder wher the LANforge client is installed

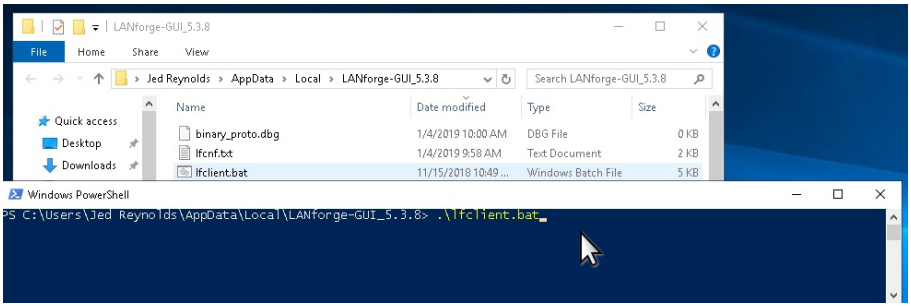


4. Right click on folder area to right of files, and select Run CMD here or Run PowerShell here. This might require that you Shift-Click on anything that might be selected in the directory to un-select it.



5. You will see a terminal window open

6. Start the client using the command `.\lfclient.bat` ENTER



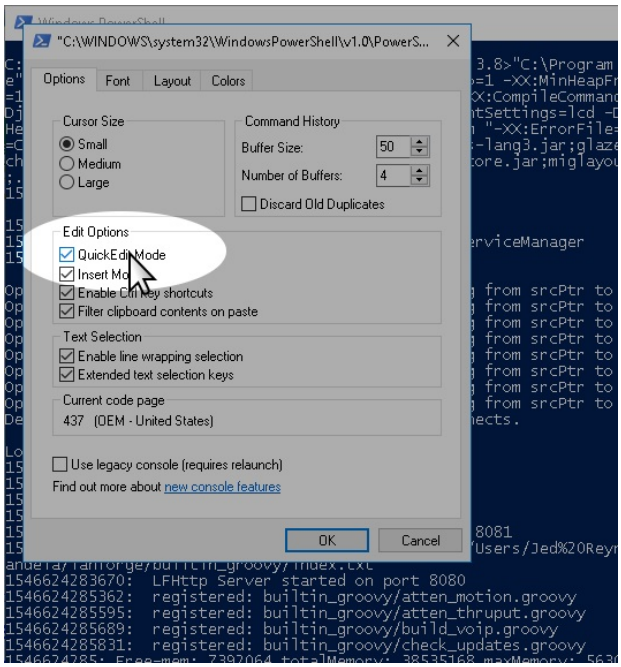
> Double-clicking **`lfclient.bat`** in the Windows Explorer window will start the client in a CMD window, but the window will disappear when the client quit/exits/leaves.

7. **Be Aware of Quick Edit**

   A. Quick Edit allows you to highlight text quickly with the mouse; it is a feature of both the CMD and PowerShell windows. CMD windows have the distinct drawback of halting execution while text is highlighted.

   > Press ESC to clear text selection

C. You can change the setting by clicking in the upper left corner, selecting Preferences, then look for Qui,ck Select.



For more information see Windows Server 2016 Features

8. ## Copy an Error

9. Candelatech introduces features into LANforge quickly, and discovering a problem in the LANforge Client occasionally happens--and we want to hear when it does! You can help by copying the terminal output and emailing it to us (at support@candelatech.com). Various kinds of errors leave messages we can find in the terminal like when the LANforge client:

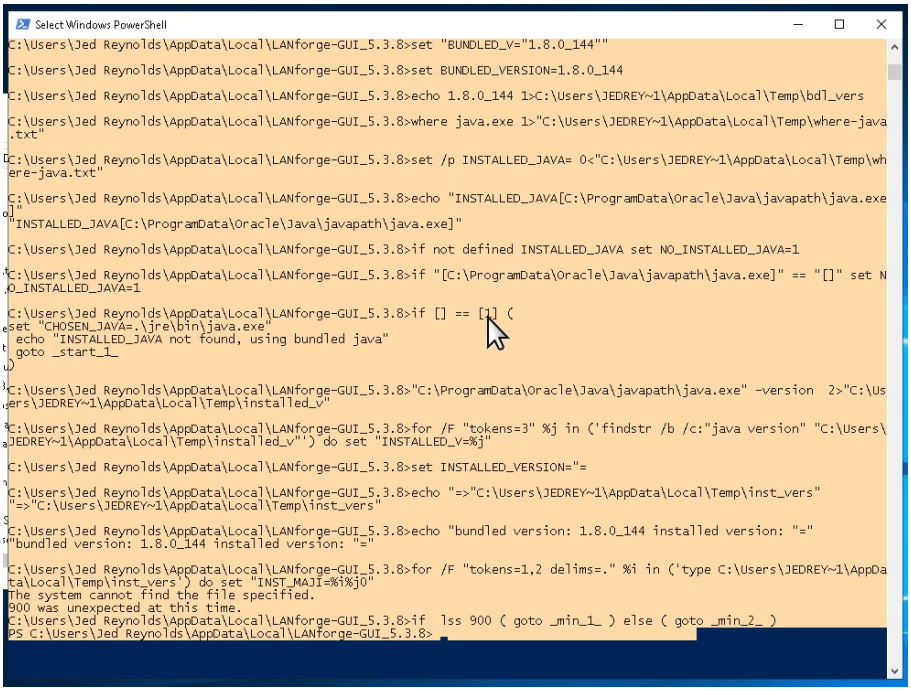
   A. ...**will not start** after double clicking the icon. This might be caused by a missing or mismatched version of the Java runtime, an error in the start-up script, or a program error.

   B. ...**unexpectedly quits**. Probably a program error.

   C. ...**does not respond**. Possibly a program error, caused often you will see many exceptions printed to the terminal.

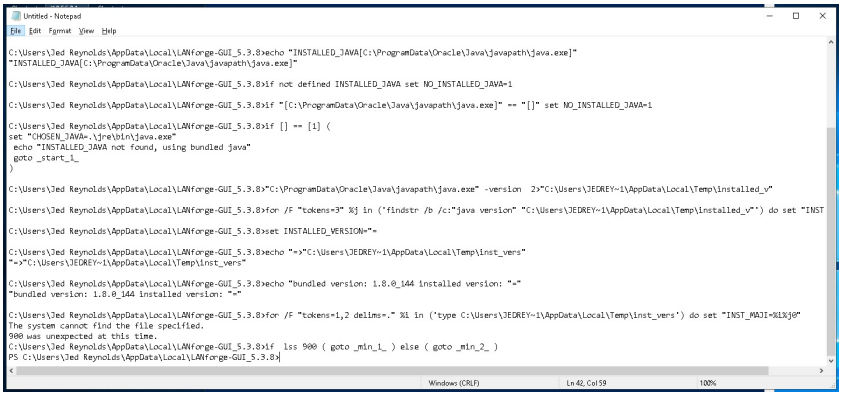
10. A Java exception is a rather long list of method calls (a stack trace) that starts with the exception message. Sometimes the exception message is `IllegalArgumentException`, sometimes it is `null` (a null pointer exception)

11. Scroll the terminal window to see the top of the exception and highlight the exception message and as much of the stack trace as possible. Below is a picture of a condition where the LANforge client script has an error and will not start.



A. Pressing Enter after highlighting the text copies the text into your clipboard.

B. The laptop might not have an email client installed. In that case, open `notepad.exe` or `wordpad.exe` from via the Start menu, and paste your stack trace into your text editor.



C. If your circumstances don't allow highlighting, copying and pasting, you can take a **screen capture**, usually by pressing Alt + PrtScr shortcut.

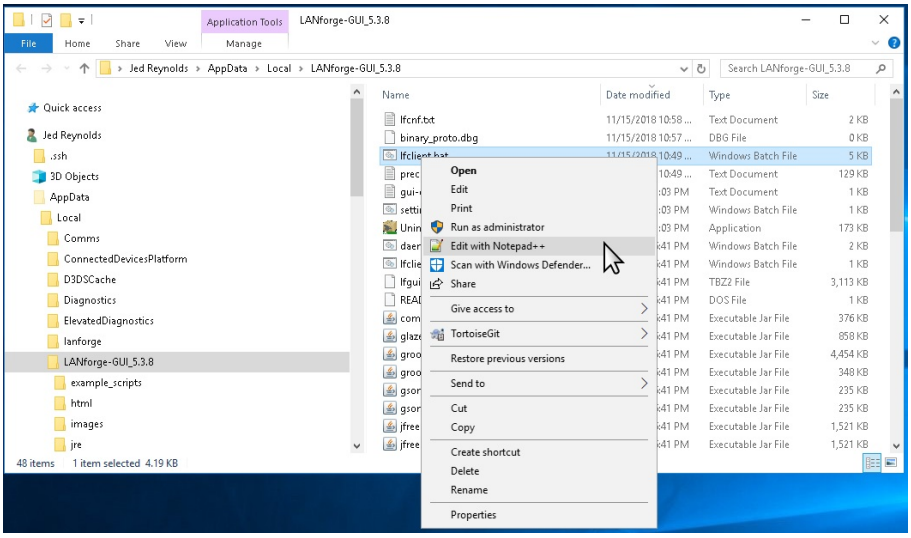
D. When contacting us, please describe the steps you took to reach this error. We need to be able to reproduce the error in order to fix it.

12. ## Out of Memory Conditions

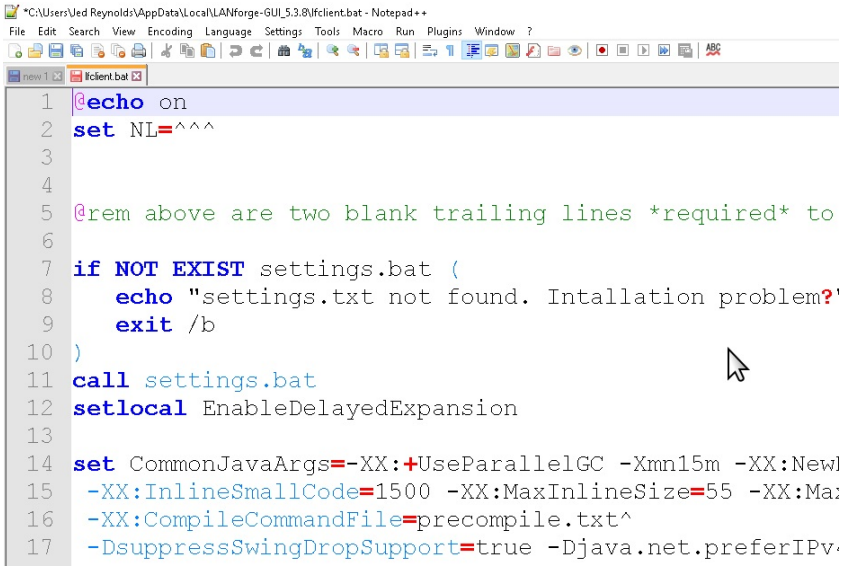
13. Candelatech provides a 32-bit and a 64-bit version of the LANforge client. We generally suggest people use the 64-bit client, because most recent laptops are running 64-bit operating systems. This is a common fix for running out of memory. For more information see LANforge Downloads
14. When running a WiFi Capacity Test, the generated report consumes significantly more memory than a mere HTML or PDF version of the report does. If you have multiple WiFi Capacity Test reports open, we suggest you save them and close the report windows.
15. Running tests for longer periods of time (like days) can also consume significant memory. By default, the LANforge client will only allocate up to two-thirds (2/3s) of the system memory it detects available at start-up. If there are programs like Chrome, Outlook and possibly Electron based applications open, those can be using most of your laptop's memory to begin with. You might need to exit other programs in Windows and restart the LANforge client in order allow it to have more memory.
16. You can also edit the start-up script to configure the maximum memory permitted to the Java runtime. That is discussesd next.

17. ## Edit the start-up script

18. While it is possible to edit files with `notepad.exe`, that text editor has few conveniences. Please consider using Notepad++ if you don't already have a text editor available. For more information see Download Notepad++
19. Right click on the `lfclient.bat` startup script, and select Edit with Notepadd++



A. The file opens in the editor at the top. You will want to jump to the end of the file.



B. At the end of the file, notice the `-Xmx` option for the java program. You will edit this to the maximum amount of memory you want to allow the program.

```
128
129 "%CHOSEN_JAVA%" -Xmx%half%m^
130  %CommonJavaArgs% ^
131 set "AddModules=--add-modules java.base,java.
132
133 :_start_1_
134 "%CHOSEN_JAVA%" -Xmx%half%m^
135  %CommonJavaArgs% %AddModules% ^
136  %ExtraJavaArgs% -cp %LFGUI_CP%^
137  candela.lanforge.lfclient -httpd 8080 %*
138 goto _exit_
139
140 :_exit_
141 exit /b
142
```

C. In this example, we've edited the start up script to request 2GB of memory. If you request more than the system will give you, the Java will give you an error and quit.

```
133 :_start_1_
134 "%CHOSEN_JAVA%" -Xmx2g^
135  %CommonJavaArgs% %AddModules% ^
136  %ExtraJavaArgs% -cp %LFGUI_CP%^
137  candela.lanforge.lfclient -httpd 8080 %*
138 goto _exit_
139
140 :_exit_
141 exit /b
142
```

For more information see Tuning Java Machines

20. **Email support@candelatech.com if you have questions or need help.**

Recovering Filesystems

Goal: Recover a LANforge system that boots into Emergency Mode

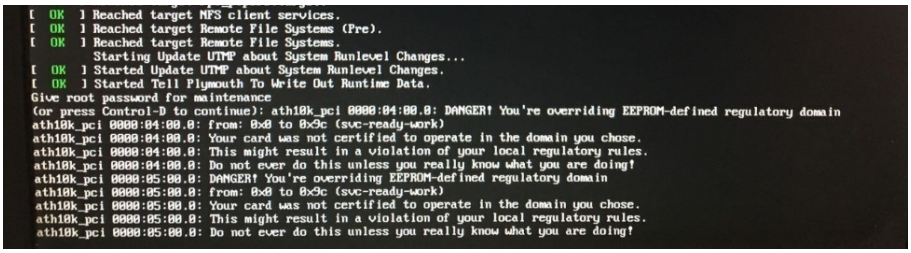
If your LANforge boots into Emergency Mode, your system is experiencing file-system corruption. Follow these instructions to check the filesystems. This process will require a monitor and keyboard or a serial cable connected to the LANforge.

> i File system corruptions are caused by power-off events without properly shutting down the system

---

1. The emergency mode prompt looks similar to this:

```
Give root password for maintenance
(or type Control-D to continue):
```



   A. The messages beforehand that begin with `[ OK ]` can be ignored.
   B. Messages beginning with `ath10k_pci` can be ignored.

> i We assume you'll press the Enter (↵) key when executing the commands in further examples.

3. Provide the root password: `lanforge`
4. The we next need to determine where our filesystems are mounted. You might have filesystems on partitions, or on LVM volumes. Use the command `mount | grep ext4` to find your partitions:

```
# mount | grep ext4 ↵
```

```
/dev/sda2 on / type ext4 (rw,relatime,nodelalloc)
/dev/sda4 on /home type ext4 (rw,relatime,nodelalloc)
/dev/sda1 on /boot type ext4 (rw,relatime,nodelalloc)
```

This example shows partitions.

> i Note that inspecting `/etc/fstab` often does not show you device partitions, rather it shows you volume or partition UUIDs.

5. Example of filesystems on volumes:

```
# mount | grep ext4 ↵
```

```
/dev/mapper/fedora-root on / type ext4 (rw,relatime,nodelalloc)
/dev/mapper/fedora-home on /home type ext4 (rw,relatime,nodelalloc)
/dev/sda1 on /boot type ext4 (rw,relatime,nodelalloc)
```

Notice that `/boot` is typically not a LVM volume.

6. ### Issuing the `fsck` commands

7. For each of those **filesystems** in the partition example above, you will execute the below commands:
   A. `# fsck -fy /dev/sda2 ↵` (for /)
   B. `# fsck -fy /dev/sda4 ↵` (for /home)
   C. `# fsck -fy /dev/sda1 ↵` (for /boot)

8. For the **volumes** example above, you will execute the below commands:
   A. `# fsck -fy /dev/mapper/fedora-root ↵` (for /)
   B. `# fsck -fy /dev/mapper/fedora-home ↵` (for /home)

C. `# fsck -fy /dev/sda1` (for /boot)

9. ### Configuring Filesystems Check on Reboot

10. The commands below involve setting the 'mount count' parameter to 1. Every time the filesystem is mounted, it will perform a check. The following examples ensure that full journaling is enabled on the filesystem. This ensures the most amount of recovery. And after that, modern versions of Fedora have metadata checksumming available. Older LANforge systems do not have this.

    A. #### Filesystem Check on Every Mount

    The filesystems do not need to be unmounted to set this parameter. Only the partition example is shown, the volumes example uses similar commands.

    A. `# touch /forcefsck` (this technique works with any model of filesystem)
    B. `# tune2fs -c 1 /dev/sda2` (for /)
    C. `# tune2fs -c 1 /dev/sda4` (for /home)
    D. `# tune2fs -c 1 /dev/sda1` (for /boot)

    B. #### Tune the Filesystem for Full Journaling

    The filesystems do not need to be unmounted to set this parameter. The commands for the volumes version is similar to the partition example below.

    A. `# tune2fs -o journal_data /dev/sda2` (for /)
    B. `# tune2fs -o journal_data /dev/sda4` (for /home)
    C. `# tune2fs -o journal_data /dev/sda1` (for /boot)

    C. **Note:** Inspect `/etc/fstab` for conflicting mount options. The folling example shows mount options applied in the `fstab` file:

    ```
    $ mount | grep ext4
    /dev/sda2 on / type ext4 (rw,relatime,nodelalloc)
    /dev/sda4 on /home type ext4 (rw,relatime,nodelalloc)
    /dev/sda1 on /boot type ext4 (rw,relatime,data=writeback)
    ```

    ```
    $ grep data= /etc/fstab
    UUID=1c1b4732-653f-47dd-a106-ae17cf5b12a9 /boot ext4 data=writeback  1 2
    ```

    Notice the fstab entry for `/boot`? It has overridden the data journaling mode. Erase that setting from the `fstab` mount options.

    D. #### Enable Metadata Checksumming (optional)

    It is only practical to apply metadata checksumming in the below conditions. You will not be able to apply it to the root filesystem `/` because it cannot be unmounted when you boot the system.

    A. Fedora 27 or more recent
    B. tune2fs 1.43 or more recent
    C. crc32c or libcrc32c modules loaded
    D. you can unmount the filesystem.

    E. To Boot into Emergency Mode, follow these steps:

    A. Reboot system into Emergency Mode by appending the word `emergency` at the end of your grub boot option.
    B. `# umount -f /home`
    C. `# umount -f /boot`
    D. `# fsck -fD /dev/sda1` (remember that's /boot)
    E. `# fsck -fD /dev/mapper/fedora-home`
    F. `# tune2fs -O metadata_csum /dev/sda1`
    G. `# tune2fs -O metadata_csum /dev/mapper/fedora-home`

F. **Disable Drive Write Caching (optional)**

Drives typically ship with write caching enabled for a performance boost. SSDs have this as well. By turning it off you trade some performance for increased data safety. LANforge systems do not ship with write caching disabled. To make this setting enabled every boot, it needs to be added to `/etc/rc.local`. LANforge systems have `rc-local.service` enabled by defualt.

> i Only disable write caching if your machine powers off without shutdown frequently

A.
```
# vi /etc/rc.local
```

B. Add the line `/sbin/hdparm -W0 /dev/sda`

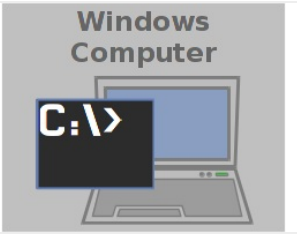
C. Save the file.

D. Reboot, or issue the command for this booted session:
```
# /sbin/hdparm -W0 /dev/sda
```

Automatically Start LANforge GUI

Goal: Configure LANforge to automatically start LANforge GUI on boot or login.

Follow these steps to Configure LANforge to automatically start LANforge GUI on boot or login. Requires version 5.4.1 or greater.



1. Quick Start
   A. Open a terminal or connect to your lanforge machine via ssh:
   B.
   ```
   $ cd /home/lanforge/LANforgeGUI_5.4.1
   $ cp LANforge-auto.desktop ~lanforge/.config/autostart
   $ sudo systemctl restart vncserver@:1.service
   ```
   C. If you were connected via VNC, your session will close. When you reconnect via VNC, you will see a LANforge GUI running on the desktop. This will now start again every reboot.

Configuring OpenVPN on Ubuntu

Goal: Connect your laptop to a VPN with the provided keys and configuration file.

Connecting to the office network remotely requires you to install the openvpn package and place the config files in the correct places. You can start and stop the VPN using simple commands at a terminal.

1. ## Install OpenVPN

2. Open a terminal and see if you already have openvpn installed:
   ```
   $ which openvpn
   /usr/sbin/openvpn
   ```
   This means you have OpenVPN installed.
3. Installing openvpn is a simple command:
   ```
   $ sudo apt install openvpn
   ```
4. ## Add your Config Files
5. You should be provided with these files:

A. `your-laptop.key` ← This is your private key

B. `your-laptop.crt` ← This is your certificate

C. `ca.crt` ← This is the VPN server certificate

D. `candelatech.conf` ← The config file for the connection

You will place these files in `/etc/openvpn`. The files should be owned by root, so become root and copy them with this technique:

```
 $ sudo -s
[/home/amelia] # cd /etc/openvpn
[/etc/openvpn] # cp ~amelia/Downloads/your-laptop.key .
[/etc/openvpn] # cp ~amelia/Downloads/your-laptop.crt .
[/etc/openvpn] # cp ~amelia/Downloads/ca.crt .
[/etc/openvpn] # cp ~amelia/Downloads/candelatech.conf .
```

6. ### Starting and Stoping the VPN Connection

7. In a terminal, cd to /etc/openvpn and start the connection as root:

```
 $ cd /etc/openvpn
 $ sudo openvpn candeltech.conf
```

Press Control-C in that window to stop the VPN connection.

8. ### Example Config File

9.
```
client
dev              tun1
proto            udp
remote           firewall.candelatech.com 1194
#remote          firewall.candelatech.com 443
script-security  2
resolv-retry     infinite
nobind
persist-key
persist-tun
verb             3
ca               ca.crt
cert             laptop-dell.2019-08-13.jreynolds.candelatech.com.crt
key              laptop-dell.2019-08-13.jreynolds.candelatech.com.key
comp-lzo
cipher           AES-256-CBC
```

Configuring OpenVPN on Windows

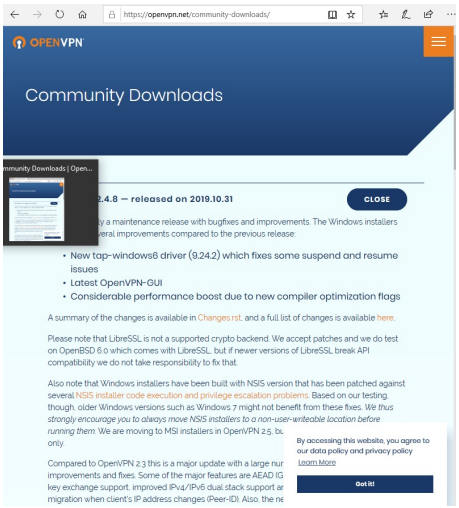
Goal: Connect your laptop to a VPN with the provided keys and configuration file.

Connecting to the office network remotely requires you to install the openvpn package and place the config files in the correct places. You can start and stop the VPN using simple commands at a terminal.

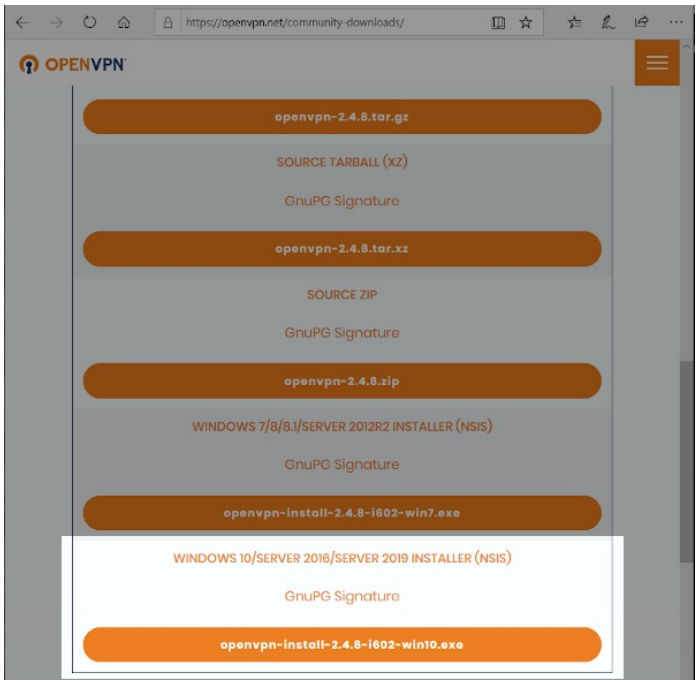
---

1. ### Install OpenVPN

2. Download and install the latest version of OpenVPN GUI on windows.

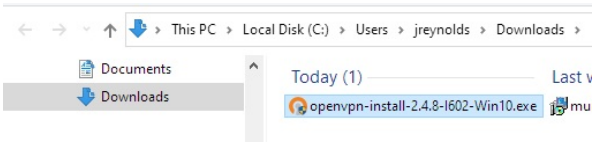


The list of packages to download is at the bottom of the page:

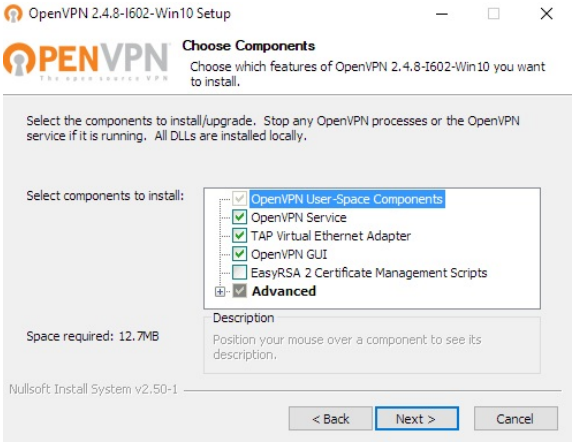


For more information see Openvpn Community Downloads

3. In your Downloads folder, double click to start the installer.

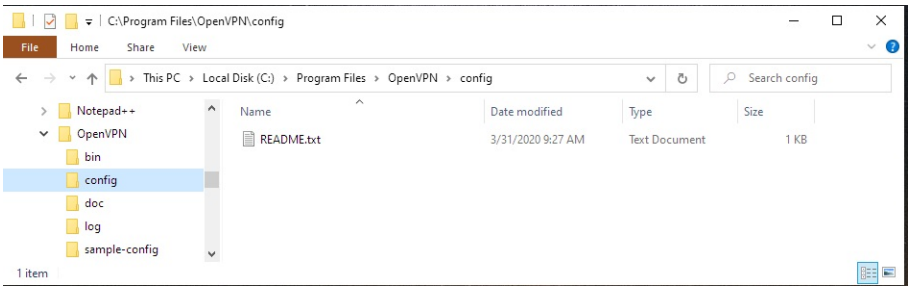


4. When the installer asks you what components to choose, you just need those necessary for being a client. You do no need to install the EasyRSA script package.



5. ## Add your Config Files

6. OpenVPN keeps configuration files in `C:\Program Files\OpenVPN\config`. Open this folder with Windows Explorer.

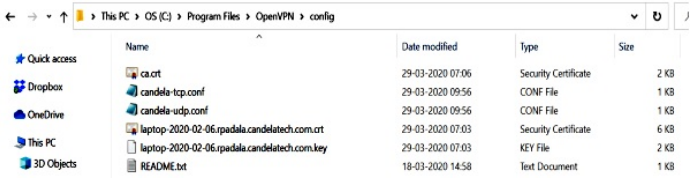


7. You should be provided with these files:
   A. `ca.crt` ← This is the VPN server certificate
   B. `your-laptop.key` ← This is your private key
   C. `your-laptop.crt` ← This is your certificate

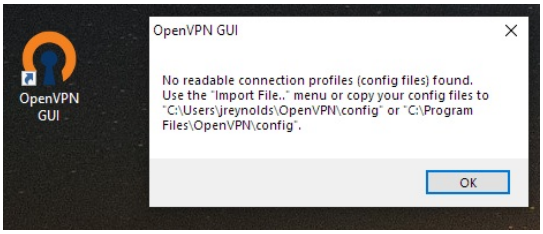
D. `candelatech-udp.conf` ← The config file for establishing a UDP connection. This is the faster type of connection.

E. `candelatech-tcp.conf` ← The config file for establishing a TCP connection. TCP OpenVPN connections do not perform as well, and are useful if you are in an environment that only allows outbound TCP port 443.

You will place these files in `C:\Program Files\OpenVPN\config`. you will probably be asked to give your password because the folder is owned by Administrator.



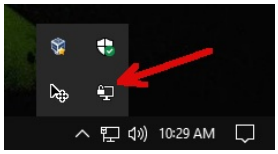
8. Double click the **OpenVPN GUI** icon. If you see a warning message about no configuration files found, we're about to fix that in the next step. Click **OK**.



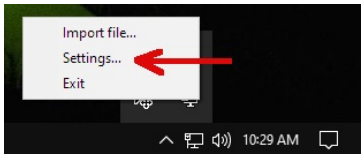
9. ## Configuring OpenVPN

10. When the OpenVPN software starts, it places an icon in the system tray.

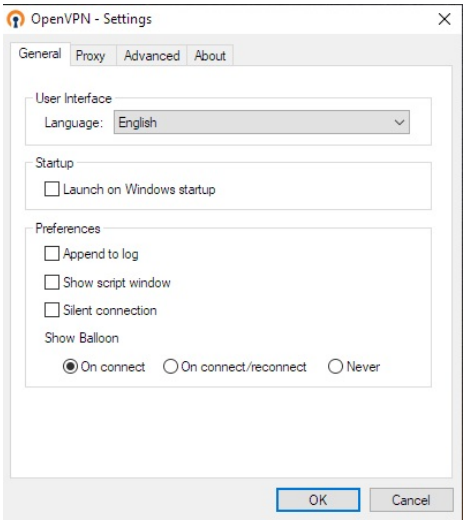
> Click on Taskbar up arrow ^ to see hidden taskbar items



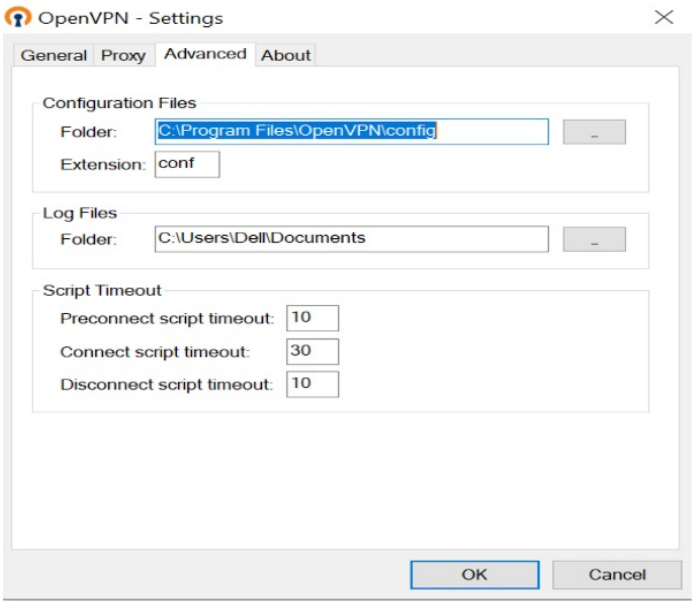
11. Right click the Screen with Padlock icon to see the menu. Select **Settings**.



12. You will see the Settings→General tab. Here you can set OpenVPN to start automatically if you desire.



13. Click on the Advanced tab. You will alter these settings:



A. Change the Configuration Files→Folder value to where you saved your config files.

B. Change the Configuration Files→Extension value to `conf`.

C. Change the Log Files→Folder value to where you want to find your connection logs.

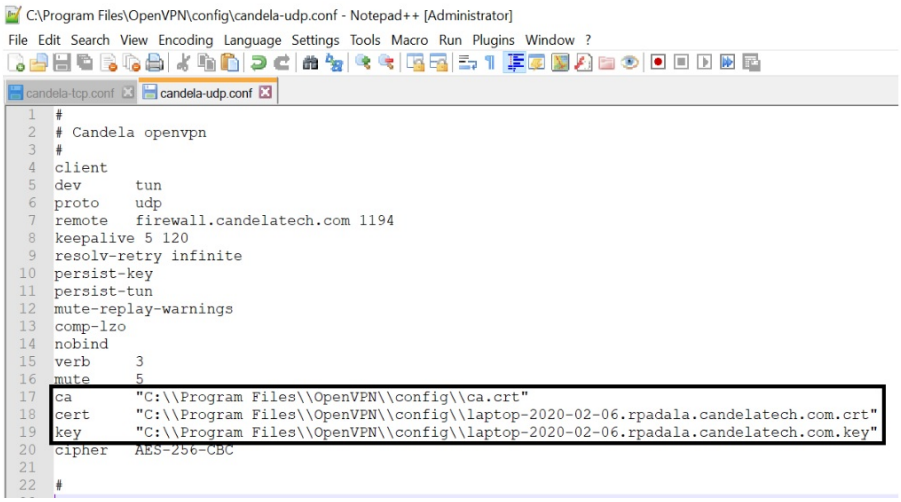
D. Click **OK**

14. ## Editing your Config File

15. The `candela-udp.conf` configuration file is going to be formatted for a Linux machine. You will need to change the location of the certificates to absolute Windows paths.

> i Backslashes `\` need to be escaped: `\\`

> i Any paths with spaces need to be `"` double-quoted `"`;.

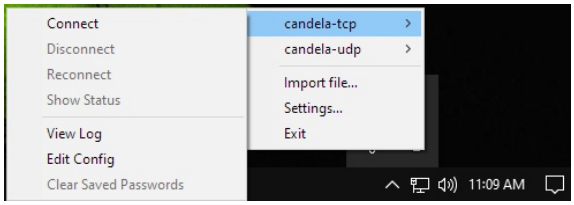


16. Here is an example file you can highlight and copy:

```
client
dev                tun1
proto              udp
remote             firewall.candelatech.com 1194
#remote            firewall.candelatech.com 443
script-security    2
resolv-retry       infinite
nobind
persist-key
persist-tun
verb               3
ca                 ca.crt
cert               "C:\\Program Files\\OpenVPN\\config\\laptop-dell.2019-08-13.jreynolds.cande
key                "C:\\Program Files\\OpenVPN\\config\\laptop-dell.2019-08-13.jreynolds.cande
comp-lzo
cipher             AES-256-CBC
```

17. ## Starting and Stoping the VPN Connection

18. After saving your config files, return to the taskbar to start an openvpn connection:



A. Click on Taskbar up arrow ^
B. Right click on the Computer with Padlock
C. Select your connection name
D. Select Connect

CI/CD Lights-Out Chamber Setup

Goal: Assemble a LANforge and a device under test (DUT) to operate in an unattended lab setup.

The CI/CD lights-Out chamber is composed of a CT840a chamber, a CT523c LANforge and a test-controller[1], that connects to them via serial and Ethernet.

1) A test controller is a Linux system that can be remotely accessed, and does not need LANforge installed.

Inside the chamber we have:

- a remotely controlled power switch
- a powered USB hub for connecting serial ports of the LANforge and DUT
- a LED lamp
- a USB camera connected to the LANforge machine
- a short table to place above the LANforge for the DUT
- the LANforge machine
- the DUT

Once assembled, this setup can perform a battery of connectivity and traffic tests that do not require a programmable attenuator. Requires LANforge 5.4.2.

1. ## Parts review

Let's review the parts the chamber setup requires:

A. Cables include:

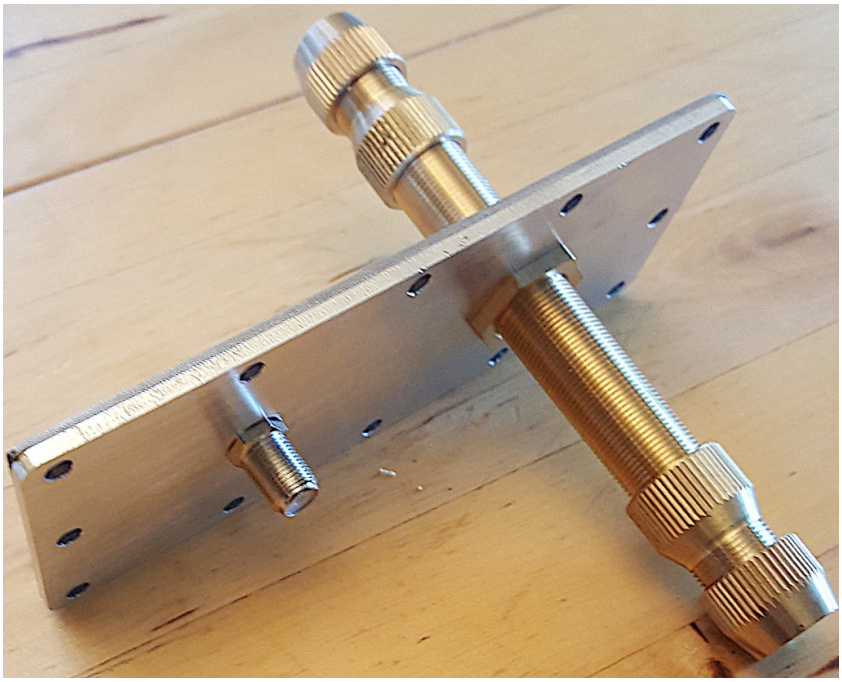
A. 3 cat5e cables
B. 2 cat6 cables
C. 1 USB serial adapter
D. 1 DB9 female-female cable
E. Also shown are annenas, with-pin

B. You will also get two small monitor stands and a network power switch. You will be using the legs of both, but discarding one of the stand tops.

C. You will be getting a LED lamp, a USB camera, 8 port network switch, USB hub, camera clamp, USB A-A cables.

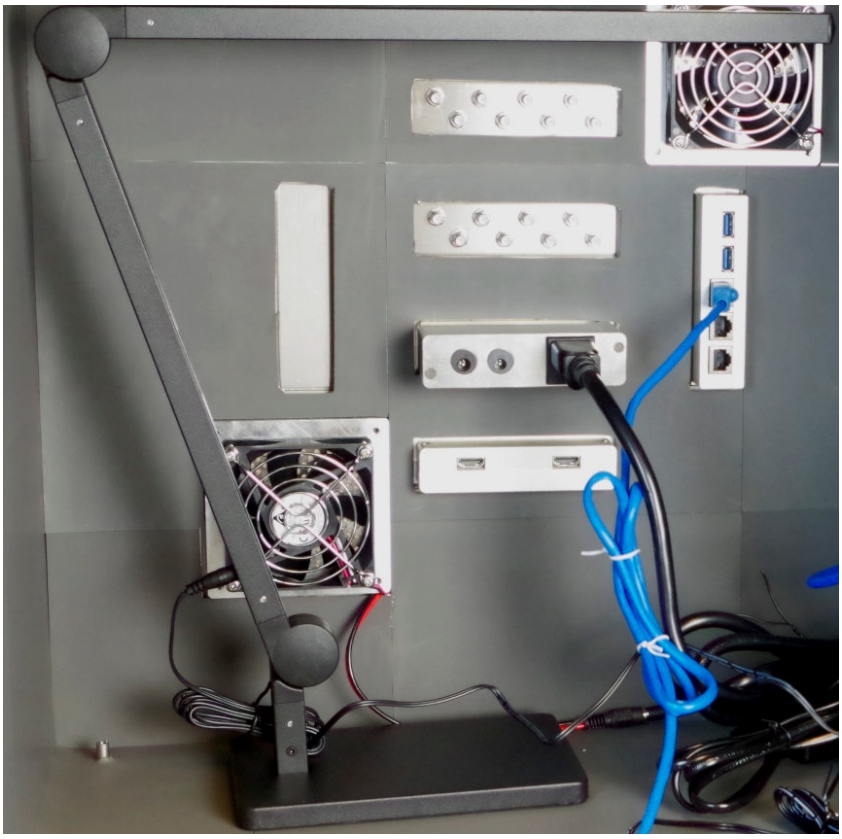
D. Your chamber will come with a universal power strip, AC power cord, fan AC-DC power adapter, and a printed test report. This assembly guide does not use the universal power strip. You might find a use for it.

E. Your chamber will also come with a brass pipe mounted to a steel plate. This is a fiber tube that you can pass fiber optic cabling through. For this setup, **you can refrain from installing the fiber-pipe**. It is not necessary because we are using copper Ethernet cabling.



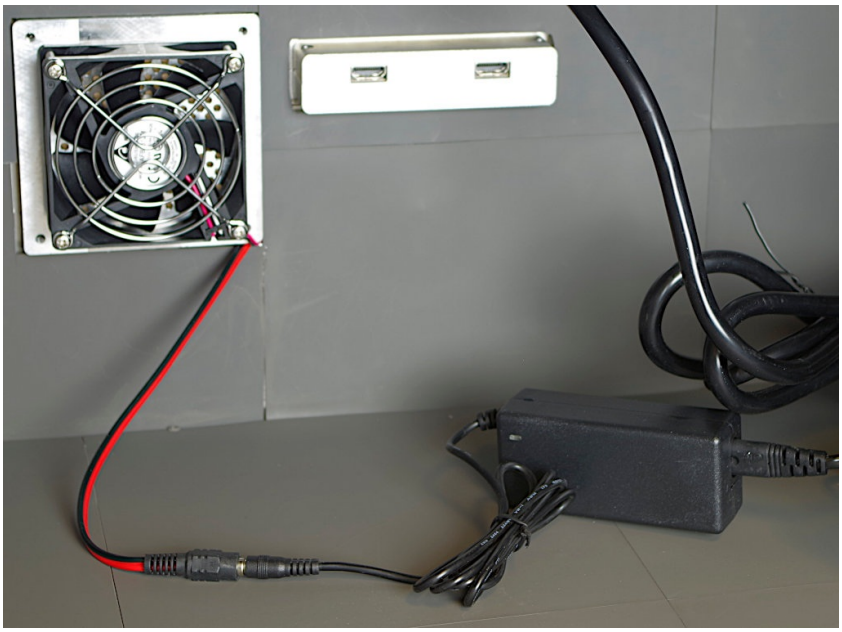
2. ## First items

A. Place the lamp in the chamber



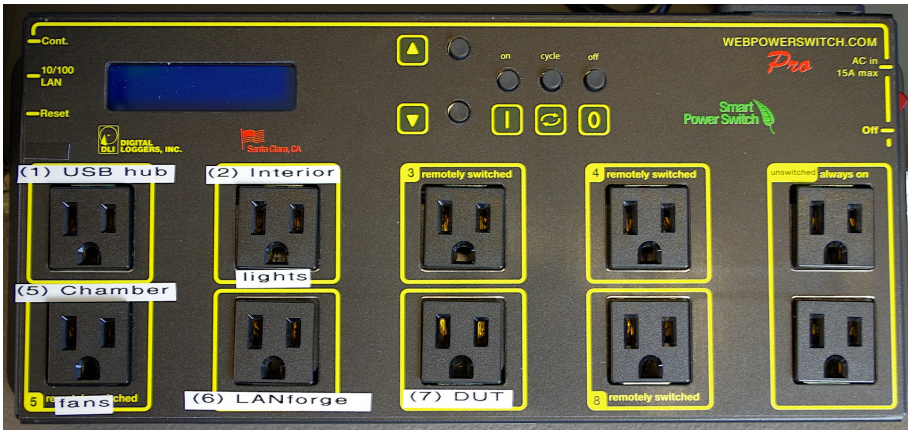
B. Place the power distribution unit (PDU) in the chamber on it's side.

C. Plug the DC barrel connector for the fans into the fan power supply



D. Plug the USB hub USB cable into back of the chamber. The bottom USB port is chamber `USB 1` near the top ethernet filter port `3` . The top USB port is chamber `USB 2` .

3. ## Power Switch



A. Port 1: USB Hub
B. Port 2: Interior Light
C. Port 5: 5 Chamber Fans
D. Port 6: LANforge system
E. Port 7: DUT
F. Others are un-labeled. If you want to add an Ethernet switch in here, we suggest plugging it into one of the **always on** ports on the right side.

4. ## Assemble the USB camera

A. Your camera clamp and USB camera. Your USB camera might be manual-focus.

B. Screw the bolt of the clamp into the tripod mount of the camera

C. Tighten the clamp to the arm of the lamp near the top joint. The USB cable should be plugged into the LANforge when it is added. If you plug it into the USB hub, only the test-controller will be able to use it.

5. **Check espresso levels in human system**

6. **Power cables**

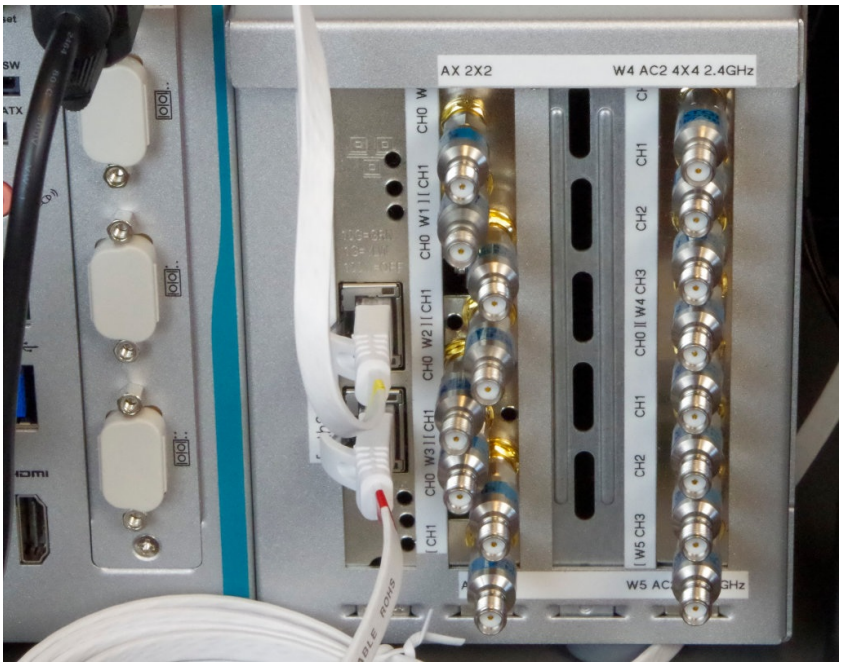
A. Plug the PDU cable into the rear of the chamber
B. Plug the USB hub power into port 1
C. Plug the lamp cable into port 2
D. Plug the chamber fan AC cable into port 5
E. Plug the LANforge power-supply into port 6
F. You will probably plug in your DUT power supply last, into port 7

7. **Inline Attenuators**

A. This is an SMA connector chart. Make sure your antennas and in-line attenuators have the correct pins

B. Your 16 LANforge SMA terminals are SMA-Female.

C. Screw 16 SMA-Male/SMA-Female inline attenuators onto your CT523c.



8. ## Antennas

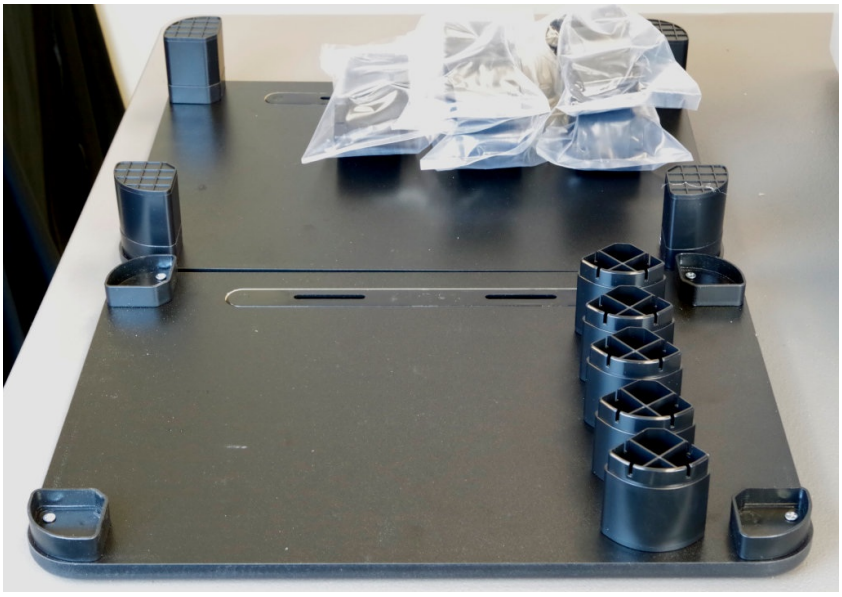
A. Check that you have SMA-Male antennas (antennas are with-pin).

B. Screw on your antennas. You will not leave them straight like this.

C. Bend the antennas various ways to ensure they provide diversity. Not providing diverse antenna orientation means your equipment will not reach desired MCS rates.

9. ## Shelf for DUT

A. You are provided two monitor stand kits as to combine into a shelf for the DUT to rest above the LANforge CT523c. You are going to use the legs from the second kit to extend the legs of the first kit.



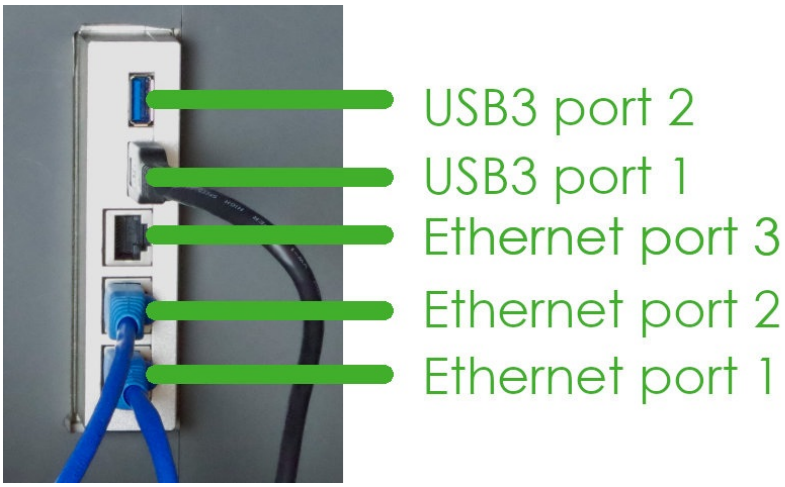
B. Use a utility knife or a screw driver to separate any feet from legs sections you do not need.

C. Here is a shelf with five segments per leg. Depending on the size of the rubber feet on your CT523c, it might be just tall enough. The other photos show a table with six segments per leg. Looks like Batman likes my work.

D. This table clears the LANforge unit well.

Network and Serial Cables

A. The network ports on the chamber are passive Ethernet RF filters. The do not have activity lights, they do not require power.

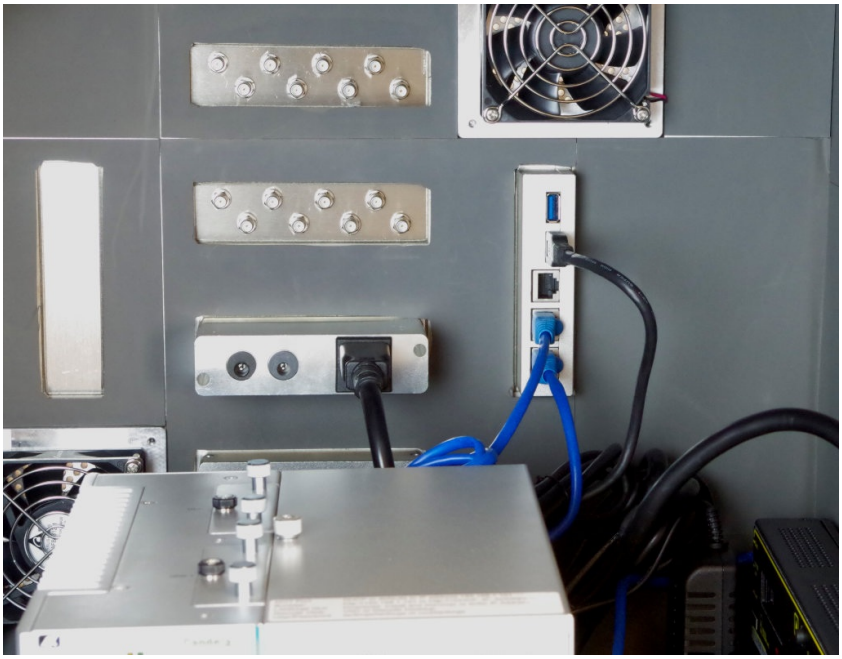


   A. The top USB3 port is [USB 2]
   B. The bottom USB3 port is [USB 1]
   C. The top Ethernet port is [3]
   D. The middle Ethernet port is [2]
   E. The bottom Ethernet port is [1]

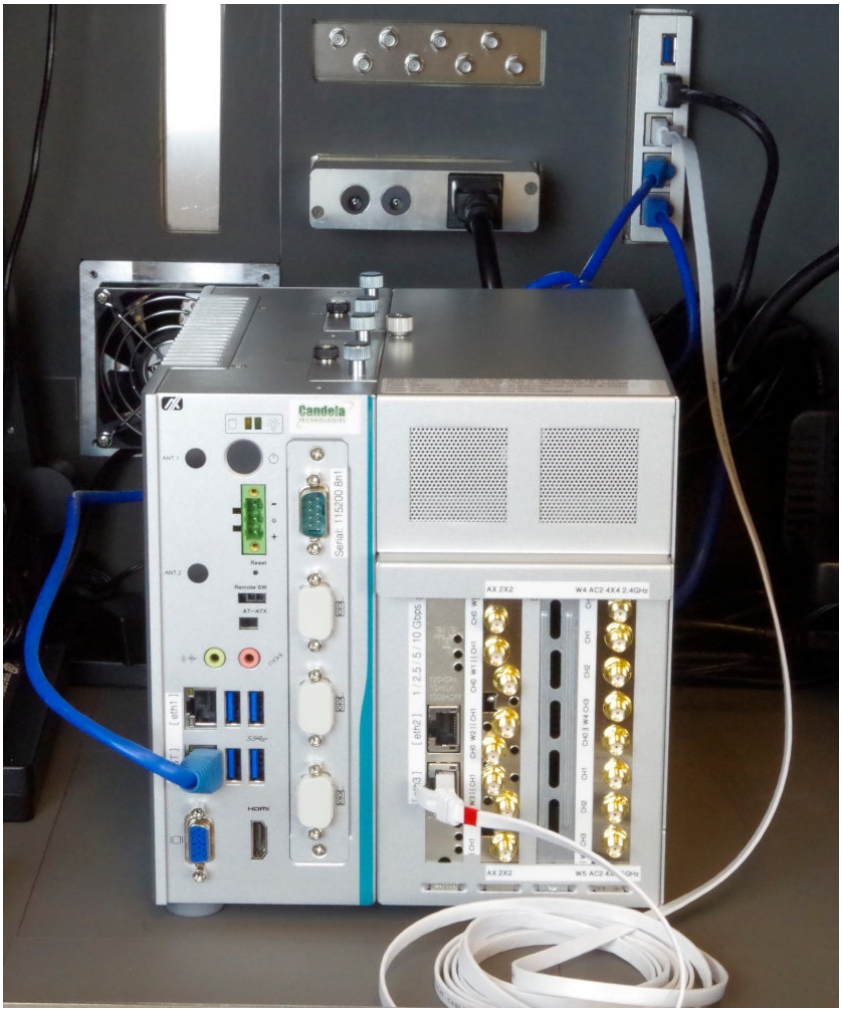
B. Cable the PDU network to chamber Ethernet port [1]

C. Place the LANforge CT523c in the chamber and attach a CAT5e cable to the management port labeled `[ MGT ]`

D. Plug the management port cable into the chamber port 2



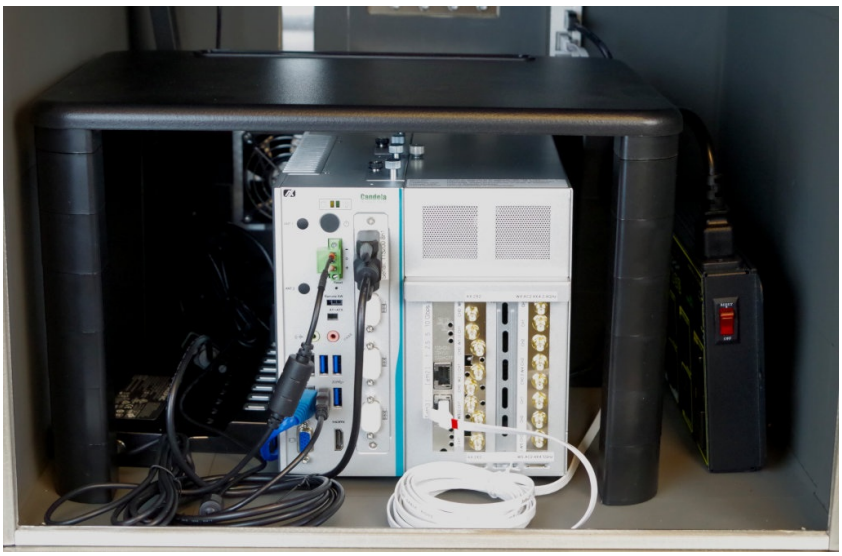
E. Use a CAT6 cable to connect the LANforge `[ eth3 ]` port to the chamber `3` port. This represents your WAN connection.



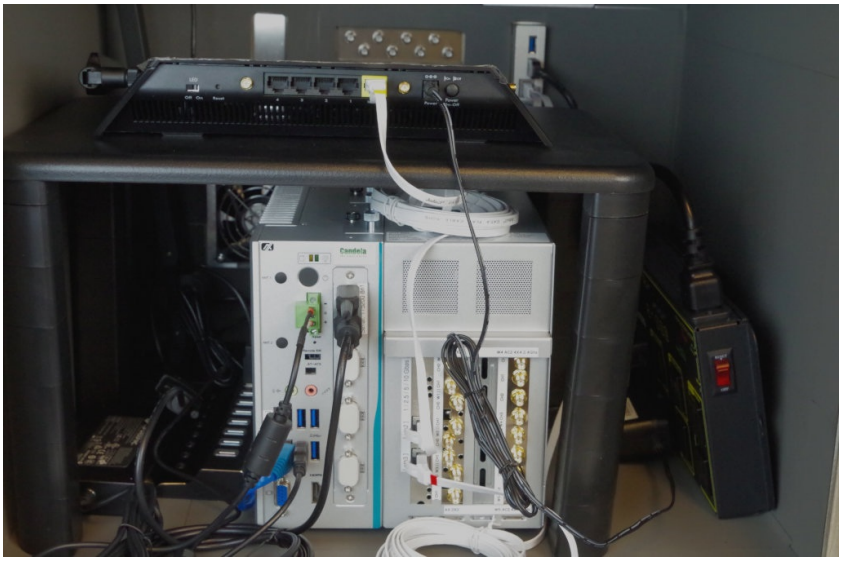
F. Connect the DB9 female-female serial cable to the CT523c serial port. It is labled `Serial: 115200 8n1`. Connect the USB serial adapter to the other end of the DB9 cable.

G. Plug the USB end of the USB serial adapter into the USB hub. Your test controller will be able to login to the LANforge for network configuration and debugging.

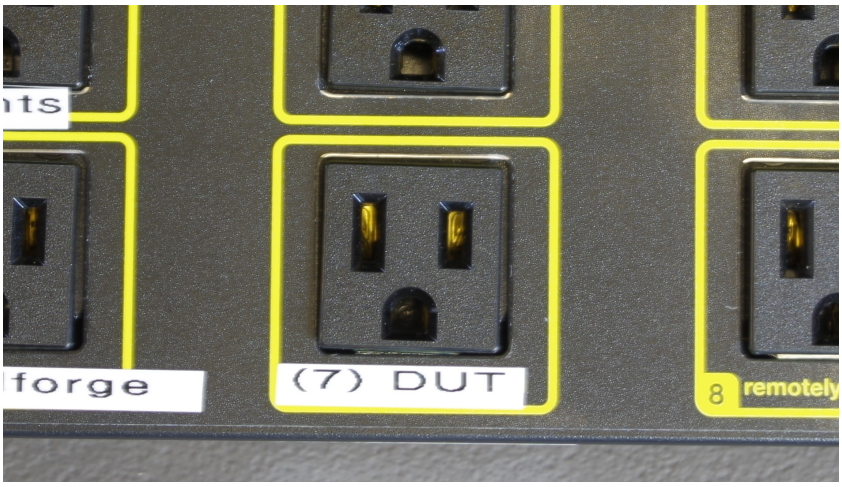
H. Plug in power to the CT523c. It is a green DC connector. Place the table over the CT523c.



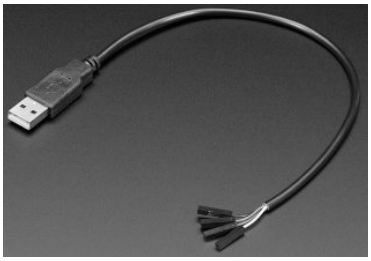
I. You may place the DUT on the table. Use a CAT6 cable to connect the DUT to the LANforge `[ eth2 ]` port. LANforge will serve DHCP on `[ eth2 ]` for the DUT and its connected stations, and will NAT and route packets out of `[ eth3 ]`.



J. Plug your DUT power to into PDU port 7



K. Your DUT probably has a serial connector. Cable your DUTs serial cable into the USB hub.



11. ## Controller Setup

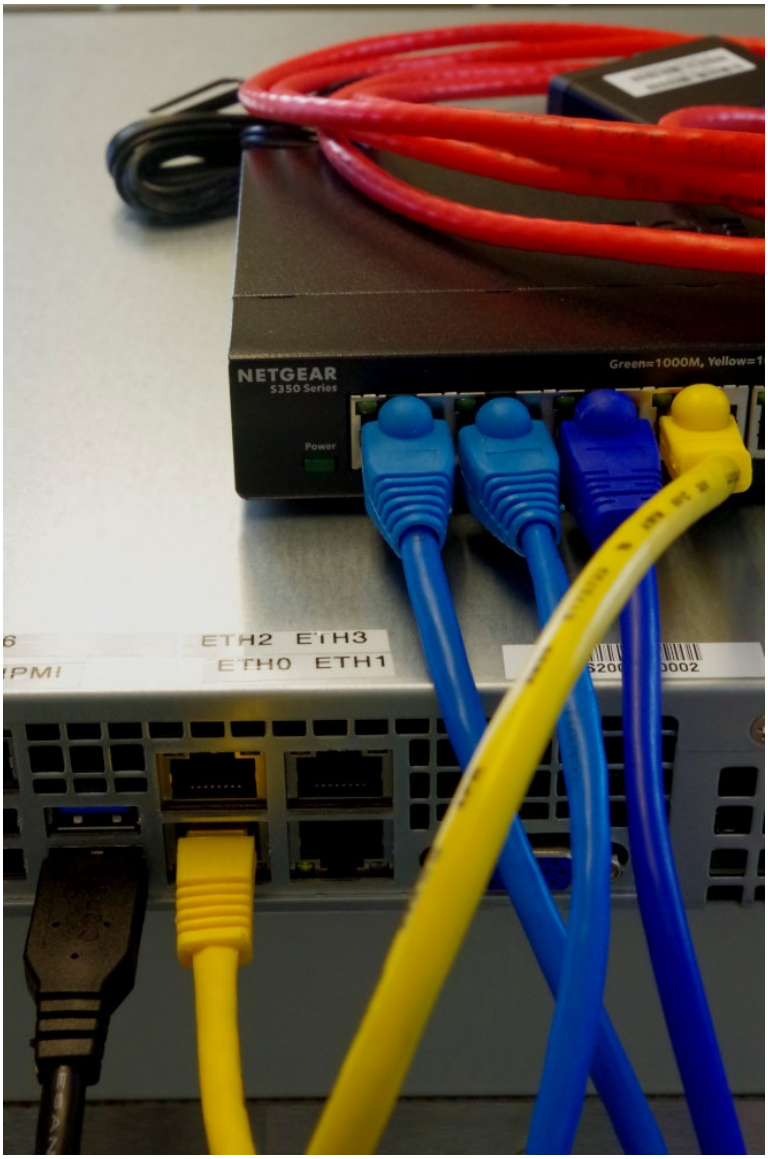
A. The test controller (aka Jump Host) pictured here is a 1U rack unit.

A. Your rack KVM will use the left USB2 ports and VGA port of the test-controller.
B. Connect chamber port `USB 1` to a USB3 port on the test-controller.
C. You might have to use an extra USB3 hub to control more than two CT820a chambers.
D. Cable chamber ethernet `1` to switch, this is your PDU
E. Cable chamber ethernet `2` to switch, this is your LANforge management port.
F. The picture shows chamber ethernet `3` connected to the switch. This connection is at your discretion. You might have a different WAN upstream network to attach to chamber ethernet `3`
G. The USB ports may be renamed each time the system restarts. To fix this, you can create an **/etc/udev/rules.d/81-usb-serial.rules** file that defines the USB ports by name using the serial-number of the USB cable if it supports it, or the path (effectively port to which the USB cable is connected).

```
#LF on cable with serial number
SUBSYSTEM=="tty", ENV{ID_SERIAL_SHORT}=="AK066NLY", SYMLINK+="ttyLF1",
MODE="0666"
# AP
# In case we have something w/out a serial number
SUBSYSTEM=="tty", DEVPATH=="1-2.1.4", SYMLINK+="ttyAP1", MODE="0666"
```

You can find the appropriate information with the **udevadm info -n /dev/ttyUSB0** command.

B. In the picture the red cable represents the control network. The yellow cable is your connection to your test controller `ETH0`

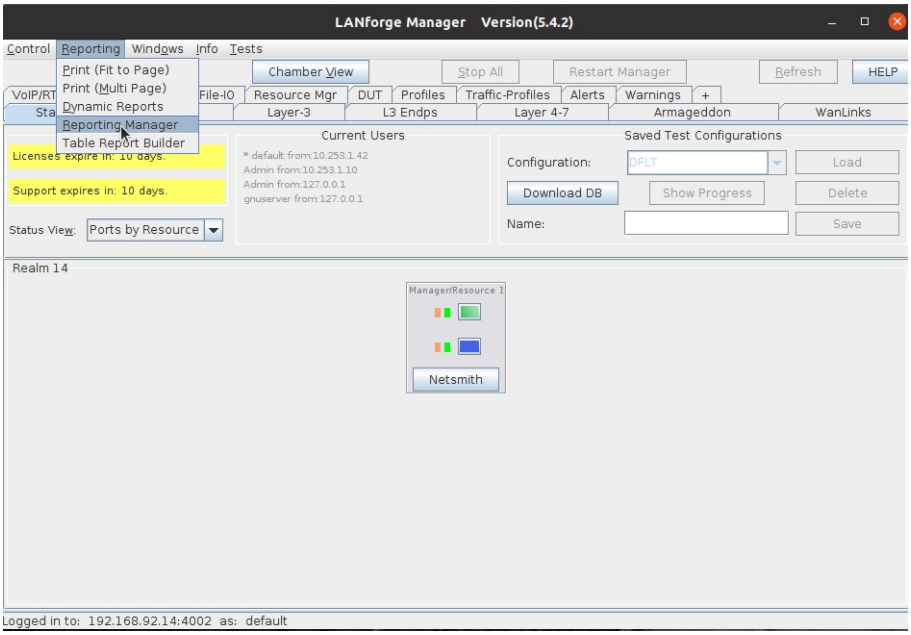


Changing the logo generated in GUI reports

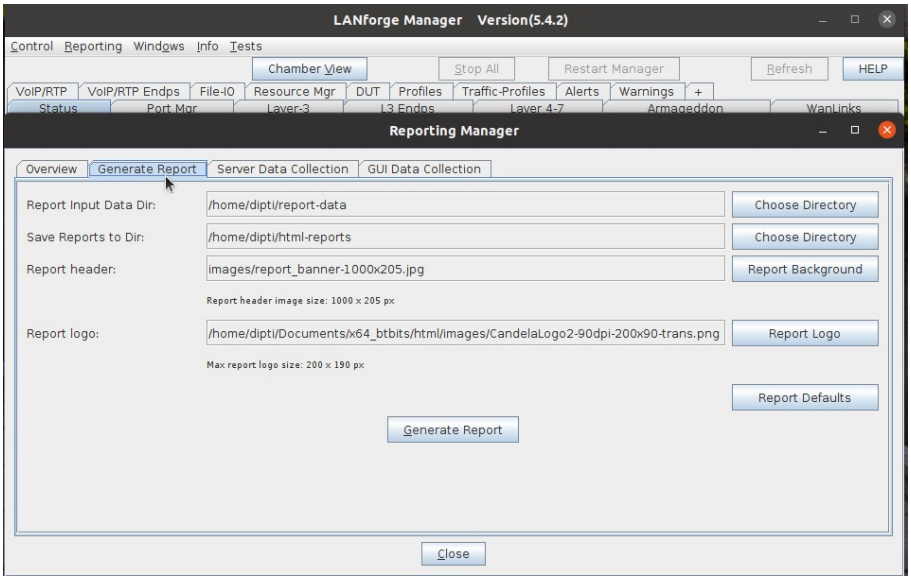
Goal: Correctly access and change the logo displayed at the top of GUI-generated reports in your local Lanforge GUI.

It is possible to provide your own logo and report header graphics.

1. Open your LANforge GUI, click on Reporting, and Reporting Manager

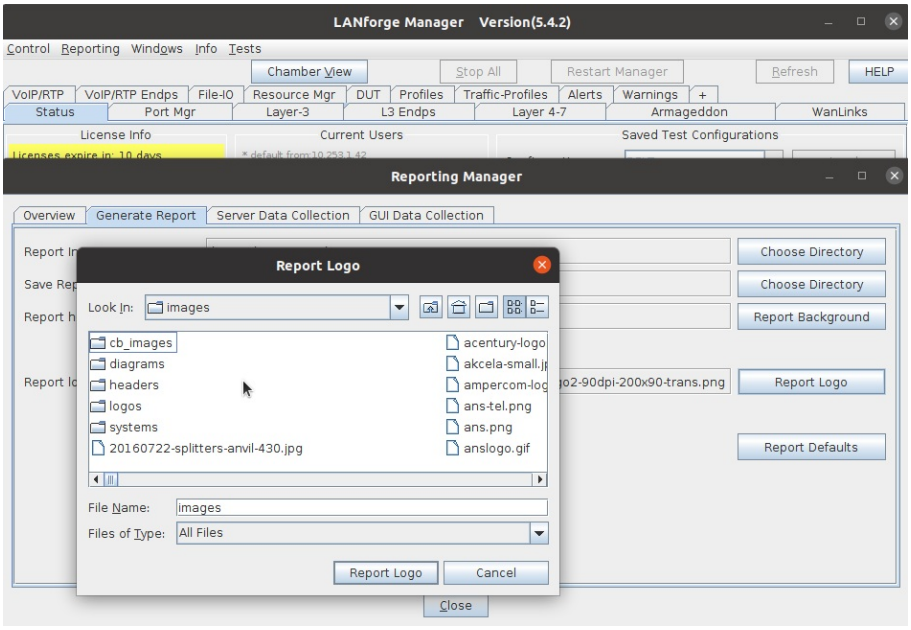


2. Click on Generate Report



3. Find a desired image instead of the default report logo that fits the report logo size (within 200 x 90 px size range) and save the image into the html/images/ path within the bt_bits directory.

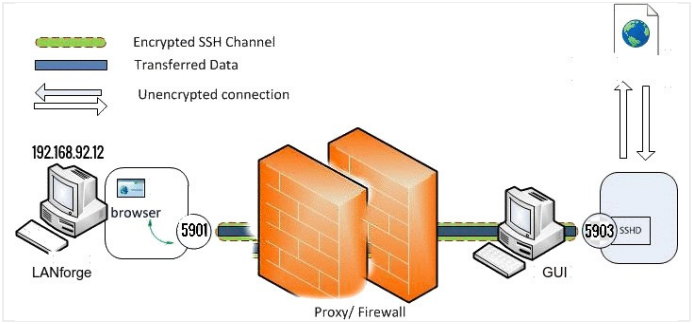
4. Once the desired image is within the appropriate images folder, scroll over back to the **Reporting Manager** tab, click on **Report Logo** and select the image (and image path) to be placed in the Report logo path. Then select **Report Logo**. Now, once a user generates a report, the new report should print out with a different logo at the top.



Set up an SSH-tunnel on Windows, Linux, or Mac

Goal: Connect to a LANforge Linux system via a compressed tunnel connection

When connecting to your remote LANforge hardware (presumably accessible over a VPN) you will notice poor response time and lag in your LANforge GUI or your VNC connection. Many VPN connections are based on UDP protocols and packet loss might be affecting your connection quality. Below we explain how to set up SSH tunnels that increase the quality of your connection.



1. **Linux SSH Tunnel Setup**

A. Forwarding a Single Port

A. The ssh option -L is takes an argument **local-port:remote-ip:remote-port**. The remote-ip parameter does not have to match the destination host (but it may). VNC display **:1** uses the port 5901. When VNC is in **localhost** mode, it binds to 127.0.0.1:5901.
The local-port parameter is the port on the local computer. It probably won't correspond to the remote port.
The resulting command looks like: `ssh -L 5900:localhost:5901 user@remotehost`.
When connecting a VNC browser to localhost:0 (or localhost::5900) it will forward packets to **remotehost**, and the SSH service on **remotehost** will forward them to the localhost:5901 port.If you are forwarding multiple LANforge VNC ports to your laptop, you will want to **make a plan** for what local ports you want to use.
Multiple remote VNC sessions would be forwarded using multiple ssh sessions:

```
$ ssh -CnNL 5901:localhost:5901 lanforge@ct523c-8a33
$ ssh -CnNL 5902:localhost:5901 lanforge@ct523c-fc30
$ ssh -CnNL 5903:localhost:5901 lanforge@ct521a-110b
$ ssh -CnNL 5904:localhost:5901 lanforge@ct523-3231
```

Using the above set of commands, you can connect your VNC viewers multiple X11 display ports on your laptop:

- localhost:1
- localhost:2
- localhost:3
- localhost:4

B. **Other SSH Parameters**

```
124 alias    FreyaTunnel="ssh -CnNv -L 5903:192.168.92.13:5901  -L 4131:192.168.92.13:4001   -L 4132:192.168.92.13:4002
    lanforge@192.168.92.13"
```

I. `-C`: Requests compression of data. This is desirable for slower connections. **Recommended**.

II. `-n`: redirects stdin from `/dev/null`. Required when SSH is running in the background.

III. `-N`: do not execute a remote command, useful when forwarding ports.

IV. `-v`: Verbose mode. Causes SSH to print debugging messages about its progress.

V. `-L local-ip:local-port:remote-host:remote-port`.
Use this flag multiple times to forward multiple ports with one command.

VI. Usually the `-L` forward uses three parameters, as seen above. Ask support if you need to forward a remote port to only one of your laptop network interfaces.

For more information see Please visit the SSH man page for further flags and switches

B. Multiple Forwards to One Host

A. SSH can support multiple port forward per remote host.
`ssh -L localport:ipaddress:remoteport user@remotehost`.
Below are ports that you probably want to forward:

I. `4001` -- perl scripts use this for ascii connection to LANforge server

II. `4002` -- GUI uses this for binary connection to LANforge server

III. `5901` -- VNC port for display :1

IV. `8080` -- REST API port provided by remote GUI

B. These can be combined into multiple command line arguments. The example below forwards all LANforge ports to your laptop:

```
$ ssh -CnNv -L 4001:localhost:4001 \
-L 4002:localhost:4002 \
-L 5900:localhost:5901 \
user@192.168.100.1
```

Notice that in a secure VNC and secured LANforge configuration, this will forward the remote hosts localhost bound ports to your laptop.

C. Indirect Host Access

A. Your laptop might **not have direct ssh access to the LANforge machine**. Instead, you might have ssh access a gateway or jump host machine that is a firewall between the LANforge and your laptop. This can present itself in two ways:
a) you can ssh to the jump host, but not beyond it
b) you cannot ssh to the firewall, but it provides port forwards for LANforge services

B. **You can ssh to a jump host**

I. You still need to know what the remote LANforge IP is.

II. Your ssh command would look like:

III. `ssh -CnN -L4001:lanforgeip:4001 user@jumphost`

C. **You cannot ssh to the firewall**
In this case, ssh will not be useful. You will have to point the GUI or python script on your laptop to the remote port on the firewall.

I. The firewall forwards port 34002 to `lanforge-1:4002`

II. Connect your GUI to `firewall:34002`

III. Your firewall administrator will need to share the port forwards on the firewall.

D. Updating your shell aliases

A. From the computer that you are trying to connect your SSH tunnel from, open the `.bashrc` file from `/home/user/`. The `.bashrc` file can be opened via gedit, vim, or nano. This `.bashrc` file is where the alias will be setup to properly invoke your ssh.

B. Once the `.bashrc` file is open, type in your alias in any blank spot (that is not within another for-loop or definition).

C. Further example ssh aliases include:

I. `alias FreyaTunnel="ssh -CnNv -L 5903:192.168.0.6:5901 \`
`-L 4131:192.168.0.6:4001 \`
`-L 4132:192.168.0.6:4002 \`
`lanforge@192.168.0.6"`

II. `alias SaltTunnel="ssh -CnN -L 4001:192.168.200.18:4001 salt@10.253.1.6"`

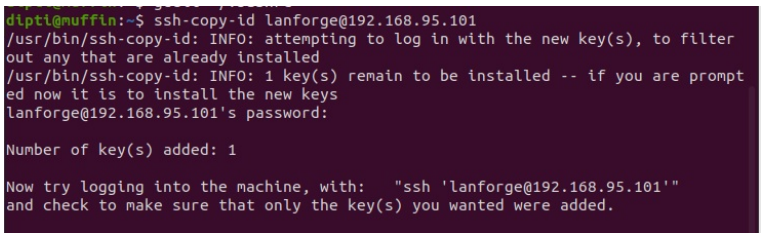
D. After editing your `.bashrc` file, source the file to apply the changes:

E. In order for our machine to remember certain passwords and access configurations, some additional edits in the ssh config file.This will be in your ,,~/.ssh/config `file (or` $HOME/.ssh/config,,).

E. SSH Keys

A. The ssh connection might require an ssh key. This means that one needs to be generated. The private key and public key of the key pair must be saved to the local computer. The public key of the pair should be copied to the remote computer.

B. Add your SSH key to the device being forwarded. Finally, add your public key that you generated earlier via SSH. This can be done by typing in `ssh-copy-id user@ipaddress` (see below example).



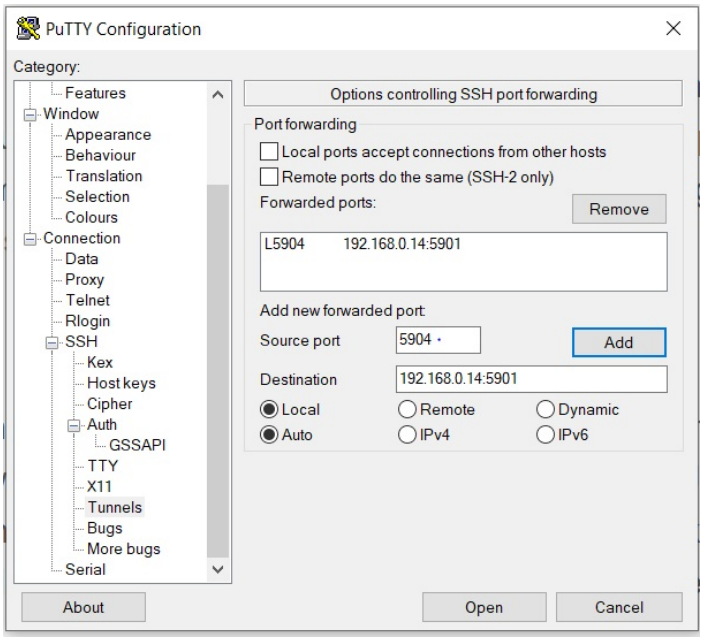
C. Once the alias is added to .bashrc file and the ssh key is added to the remote device, open any terminal and simply type in the alias name. This will initiate the tunnel. For example, "FreyaTunnel" in this example would be the alias typed into any terminal. This should incur an instance of your tunnel.

2. Windows SSH tunnel Setup

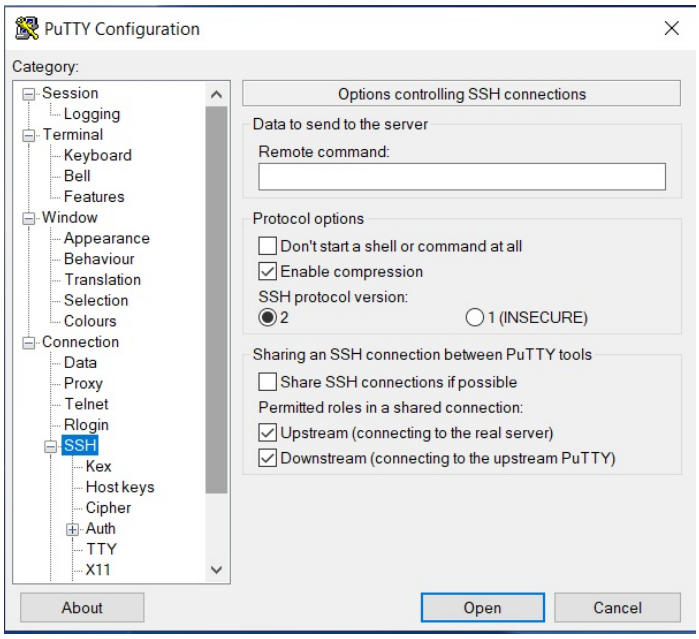
A. There are many ways to set up an SSH tunnel, however, this cookbook will utilize PuTTy.

B. Once PuTTY is downloaded, configure the SSH connection before adding the tunnel. For more information see Connecting with PuTTy.

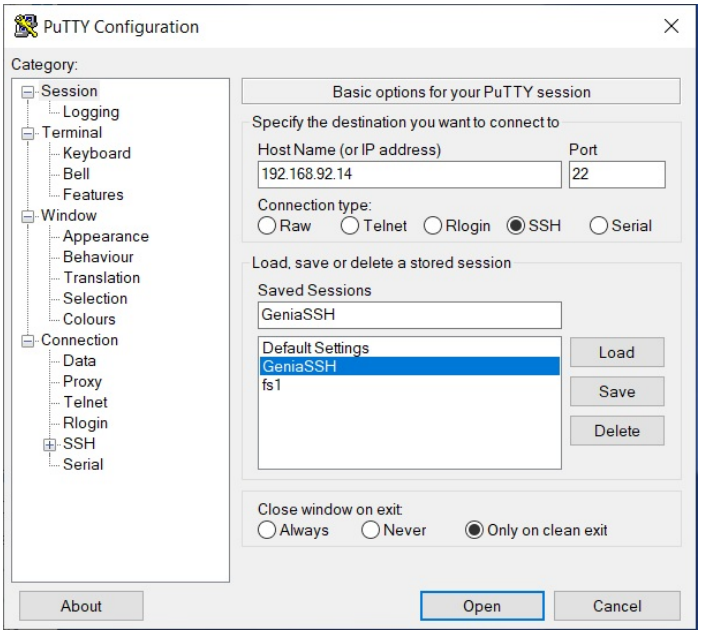
C. Once your session is setup, select your session that was just saved from the last cookbook, then on the left-hand panel, select Connection -> SSH -> Tunnels.



D. After setting up the tunnel, select SSH and enable compression. This will ensure that the tunnel uses data compression.



E. Once all the settings desired are configured, select Session, highlight the session again in Saved Sessions and hit Save for the new session settings. This will make sure that the next time logged in will include all the settings here.

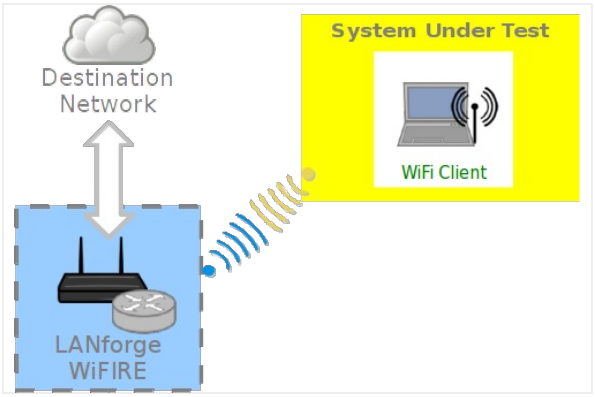


F. Now, the session is saved and can be opened by clicking Open

Understanding VRF Devices

Goal: Understand and inspect private VRF routing tables.

VRF devices are a Linux kernel networking driver that allows private routing tables for individual ports in the system. The examples below show how to find these routes. Requires version 5.3.9 or greater.



1. ## VRF Driver

LANforge has been using the Virtual Routing and Forwarding driver since around 2018. This allows private routing tables for each LANforge managed interface. VRF provides specific networking benefits to LANforge:

A. **Virtual stations gain authentic routing as delivered from the AP's DHCP service.** IP sockets bound to that station will not send DNS requests out the host's default gateway, for instance. This helps accurately test captive portal and HS2.0 web requests that should never know about the management network.

A.

B. **Multiple identically numbered networks can be modeled in parallel.** Emulating a peer-to-peer VPN tunnel between two STA devices that both are on 10.0.0.0/24 networks separated by a WAN.

2. ## Disabling VRF

This does make it more difficult to monitor the routes per port.

3. If this feature is undesirable, you can use the following command to disable VRF:

A. `$ touch /home/lanforge/LF_NO_USE_VRF`

B. `$ sudo reboot`

4. ## Finding VRF private routes

To find the routes, you want to use these commands for any particular vrf device:

A. Look for the station's master device:

```
$ ip a show wlan3
wlan3:  mtu 1500 qdisc noqueue master _vrf6 state DOWN mode DEFAULT group default qlen 1000
link/ether 00:0e:8e:44:07:a1 brd ff:ff:ff:ff:ff:ff promiscuity 0 minmtu 256 maxmtu 2304
```

B. When you know the master device you can display that specific routing table:

A. A routing table with a gateway:

```
$ ip route show vrf _vrf10
default via 10.40.0.1 dev br0
10.40.0.0/20 dev br0 scope link src 10.40.0.21
```

B. With no default gateway:

```
$ $ ip route show vrf _vrf15
unreachable default
```

Use FireFox with a virtual station to Browse a DUT

Goal: Use FireFox with a virtual station to Browse a DUT

Access points used as a DUT in a wireless-mesh scenario might not have an ethernet port available to be able to access their management screen. Rather, they require a station to associate to the DUT to access the management console. LANforge virtual stations operate in the context of a VRF (virtual routing) device that protects them from the default routing table of the system. This makes using a browser over a station unintuitive; special commands are required to do this. Requires LANforge 5.3.9 or later.

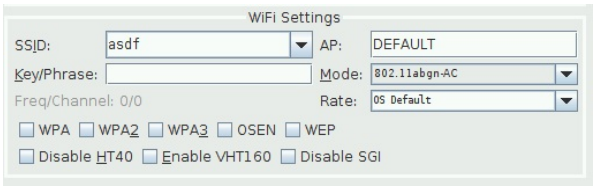
---

1. ## Associate a station to your DUT

A. Create a station as necessary or use the `wlan0` device

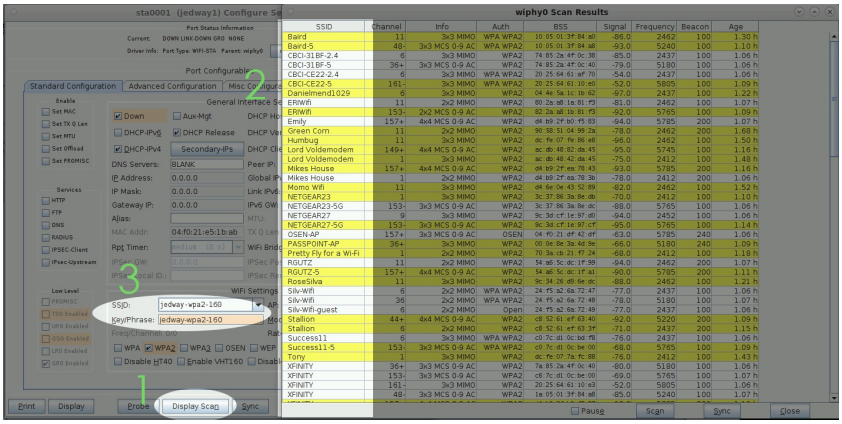
A. if you know the SSID credentials, enter those.

B. If you need to discover the SSID, enter anything into the SSID box, like `asdf` so you can start a scan.



For more information see Create stations

B. Scan for your DUT SSID.



C. Configure your station to use the DUT SSID credentials and DHCP.

2. ### Use the `vrf_exec.bash` script to start Firefox

   The `vrf_exec.bash` script changes the networking context for the browser so it can use your station.

   A. Open a terminal

   B. Become root:
   ```
   $ sudo -s
   ```

   C. Go to the LANforge directory:
   ```
   $ cd /home/lanforge
   ```

   D. Start firefox:
   ```
   $ ./vrf_exec.bash wlan0 firefox http://10.0.0.1/
   ```

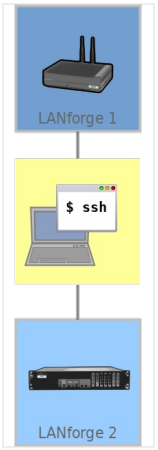
3. ### Possible difficulties

   If you have just rebooted your LANforge system and are jumping to step 2 without starting the LANforge GUI, you might have difficulty getting Firefox to display. By starting the GUI, it runs the `xhost +` command and relaxes some basic X11 security settings to let other users display windows on the desktop.

Backing Up and Migrating LANforge Data

Goal: Learn what directories under `/home/lanforge` are important to backup and transfer to a new LANforge.

Most of the data that LANforge produces lives in the directory `/home/lanforge`. Not all the files and directories under there are useful to backup or migrate to a new LANforge machine. This guide relates to Linux based LANforge machines.
We will assume for this cookbook during a restore situation you have the two LANforge systems connected on the same management network.



1. LANforge data lives in various directories under `/home/lanforge`, and this is a brief explanation of the directories you will want to transfer.

   > i LANforge scenario data for a realm is saved on the manager (typically resource 1).

   > i The LANforge client (GUI) can save reports on various machines where it is running. It does not save scenario data.

2. Below are listed the important sub-directories from `/home/lanforge,`. Each has a note about how important it is to back up. Directories not listed are unlikely to contain LANforge related data.

   > i When in doubt backing up the entire /home/lanforge directory is OK

   A. `DB/`
   YES this is were all your scenarios are saved

   B. `Desktop/`
   only if you save things here

   C. `Documents/`
   only if you save things here

   D. `Downloads/`
   only if you save things here

   E. `html-reports/`
   yes if you want the reports

   F. `lf_reports/`
   yes if you want the data

   G. `local/`
   unlikely unless you customize strongswan

   H. `report-data/`
   yes if you want the data

I. `scripts/`
only if you have modified or custom scripts in here

J. `trb_entities/`
`trb_profiles/`
Table Report Builder saved settings only necessary if you use TRB frequently

K. `vr_conf/`
only if you save virtual router settings, nginx configs or want to save dhcp lease files

L. `wifi/`
only if you have customized wpa_supplicant.conf or hostapd.conf files

3. ## Archiving Data

Starting on your old LANforge machine, use the tar command to archive data. Add directories you want to archive to the end of the command.

```
$ cd /home/lanforge
$ tar cjf /home/lanforge-bu.tar.bz2 DB html-reports lf_reports report-data
```

ℹ If you run out of space, try using `/home/lanforge/check_large_files.bash` to help clear room.

4. ## Copy the Archive

Copy the archive to the new LANforge:

```
$ scp /home/lanforge-bu.tar.bz2 lanforge@your-new-machine-ip:/var/tmp
```

5. ## Restore the Data

On the new machine:

```
$ cd /home/lanforge
$ tar xvf /var/tmp/lanforge-bu.tar.bz2
$ sudo service lanforge restart
```

CT714B Stand Assembly

Goal: Fully assemble a stand for CT714B attenuators.

The CT714B attenuator can be assembled in a stack with a base and threaded rods.

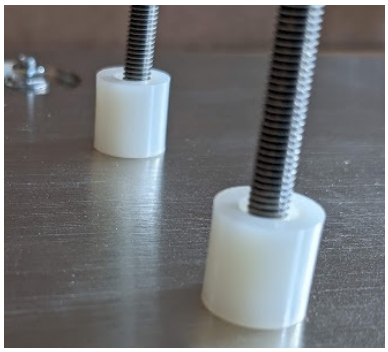
1. Insert rods until they stick out a bit through the bottom.

2. Bottom view:

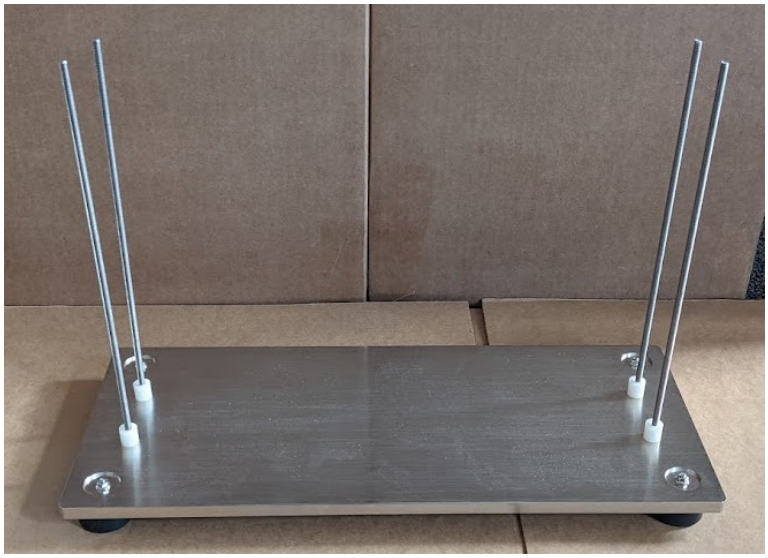
3. Add nuts to all four rods on bottom side of plate. Hand tighten.

4. Full view:

5. Add one spacer to each rod.



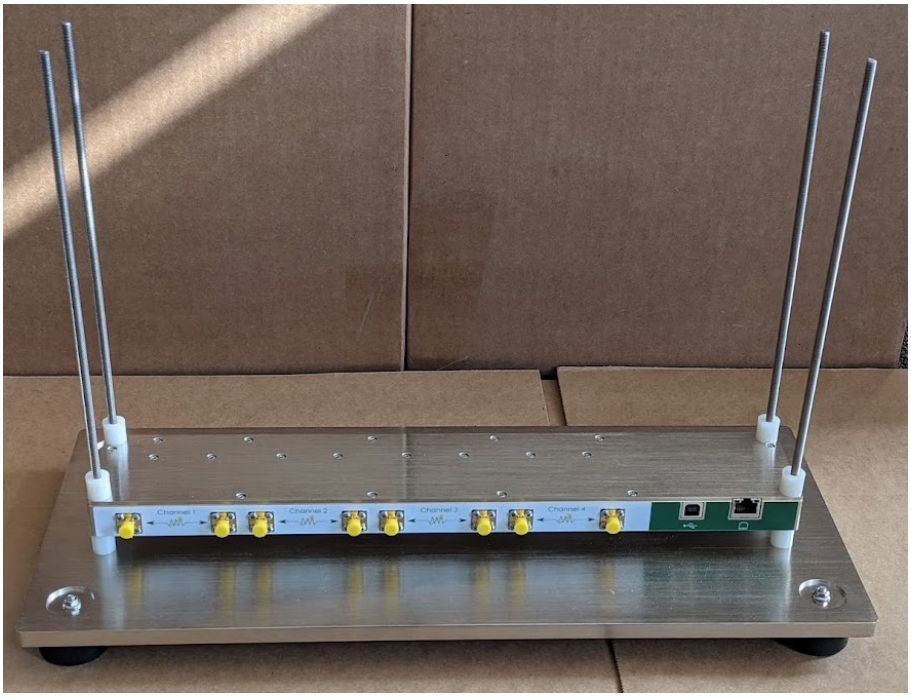
6. Full view.



7. Add the first CT714B.

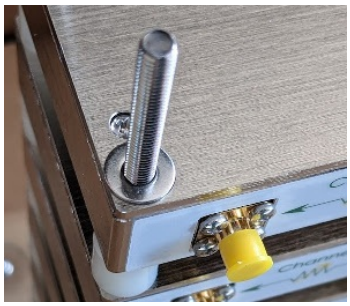
8. Add another set of spacers.

9. Full view.



10. Repeat steps 4 and 5 until all CT714Bs are stacked.

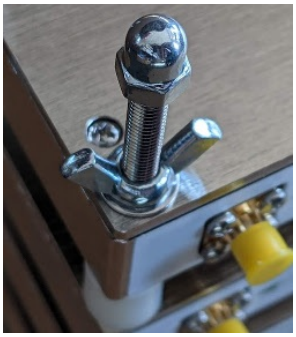
11. Add washers to all rods.



12. Add wing nuts to all rods.

13. Full view.

14. Add caps to all rods.



15. Full view.

16. The nuts on the bottom can easily come loose during assembly. Tighten again as needed.

Testing the CT840a Turntable

Goal: Use the lf_chamber.pl script to interact with chamber door sensor, lights and turntable.

The CT840a chamber has a Modbus interface that can provide telemetry about the the door-closed sensor, light control, and turntable control and position. In order to have access to the Modbus protocol, you need a Modbus package installed on your system. The modbus controller in these chambers is simple and does not understand IP routing. **You have to be connected on the same network as the modbus system.**

---

1. ## Using LANforge on Linux

2. Test your connection to the chamber with the `/home/lanforge/lf_chamber.pl` script. This will verify you can reach the modbus controller.
   Available here: https://www.candelatech.com/downloads/lf_chamber.pl
   A. Source the `lanforge.profile` script:
      `$ source /home/lanforge/lanforge.profile`
   B. Use the command:
      `$ ./lf_chamber.pl --targ 192.168.100.10 --status 1`
      Expect output similar to:
      `Current-Angle: 3599 Door-Open: 0 Table-Moving: 0 Lights: 0 Fan: 1 Jog-Speed: 3 Return-Speed: 3 Absolute-Speed: 3 Jog Angle: 0`

3. Use the `chamber-test.sh` script to test all the chamber features.
   Availble here: https://www.candelatech.com/downloads/chamber-test.sh
   A.
```
$ ./chamber-test.sh 192.168.3.123
   The desktop linux is 192.168.3.64, remember to use Alt-F2, 'mate-terminal' to get a shell.
   Testing chamber at 192.168.3.123
   Please close door.
   Current-Angle: 3599 Door-Open: 0 Table-Moving: 0 Lights: 0 Fan: 1 Jog-Speed: 3 Return-Speed: 3 Absolute-Speed:
   check output if door is closed: door == 1
   Please open door.
   Current-Angle: 3599 Door-Open: 0 Table-Moving: 0 Lights: 0 Fan: 1 Jog-Speed: 3 Return-Speed: 3 Absolute-Speed:
   check output if door is closed: door == 0
   Toggle lights
   Did lights turn on?
   Current clockwise angle: 3599  counter-clockwise-angle: 1  new-angle: 450
   Did platform rotate 45 degrees?
   Did platform rotate another 45? It should be at 90
   Current clockwise angle: 2978  counter-clockwise-angle: 622  new-angle: 1
   Did platform rotate back to zero?
   Did fan turn on?
   Toggle fan
   Did fan turn off?
   Toggle lights
   Did lights turn off?
   Current-Angle: 2700 Door-Open: 0 Table-Moving: 0 Lights: 0 Fan: 0 Jog-Speed: 3 Return-Speed: 3 Absolute-Speed:
   You may close the chamber.
```

4. ## Using Linux without LANforge

5. ### You will want to download

   :

   A. LANforgeServer that matches your version of Fedora. For example, Fedora 30 would be LANforgeServer-5.4.5_Linux-F36-x64.tar.gz
   B. The modprobe interface script: lf_chamber.pl
   C. The chamber test script: chamber-test.sh

6. ### Setup

   : This setup is intended for versions of Fedora that LANforge has been compiled for. The version of mbpoll bundled with the Server archive is specific to the **glibc** version the Fedora distro is built with. You do not have to run the lf_kinstall.pl script or use the `install.bash` script in the LANforgeServer directory.

   A. Create the following directories:
      `sudo mkdir -p /home/lanforge/local/lib`
      `sudo mkdir -p /home/lanforge/local/bin`
   B. Chown the directories to your current user:
      `sudo chown -R $USER: /home/lanforge`

C. Expand the LANforgeServer archive in `/home/lanforge`:
`tar xf LANforgeServer-5.4.5_F30-x64.tar.gz`

D. Copy the mbpoll files to the new directories:
,,cp -r LANforgeServer/local/lib/* /home/lanforge/local/lib,,
`cp -r LANforgeServer/local/bin/mbpoll /home/lanforge/local/bin`

7. **Run the scripts**

: These scripts require the mbpoll libraries in the **LD_LIBRARY_PATH**. The example below uses the address 192.168.0.3 as the address of the CT840a chamber. Please do not confuse this with the IP of the LANforge that might be in or attached to the chamber.

A.
```
$ export LD_LIBRARY_PATH='/home/lanforge/local/lib:/usr/lib64'
$ export PATH="/home/lanforge/local/bin:$PATH"
$ ./lf_chamber.pl --targ 192.168.0.3 --status 1
```

8. ## Using Windows without LANforge

9. Not at this time.

Remove old Reports and Data

Goal: Find and remove old reports and test data.

Running tests on LANforge for long periods of time can leave a lot of data behind. The `check_expired_data.bash` script can find old files to delete.This file is similar to `check_large_files.bash` but looks at the age of files.Introduced in LANforge 5.4.5.

---

1. ## Download the script

Download the script if it is not in `/home/lanforge/scripts` already. If you need to download the script, use the following commands:

A.
```
$ cd /home/lanforge/scripts
```

B.
```
$ wget https://raw.githubusercontent.com/greearb/lanforge-scripts/master/check_expired_data.bash
```

C.
```
$ chmod +x check_expired_data.bash
```

2. ## Find the script help

```
$ ./check_expired_data.bash -h
```

```
-d  Find data within this directory (required)
-t    Find data this many days old or older (required)
-f          Delete files (not a default option)
-v          Print files

See the files you would delete:
./check_expired_data.bash -d /home/lanforge/report-data -t 11 -v

Actually delete the files:
./check_expired_data.bash -d /home/lanforge/report-data -t 11 -f

You may create a script in /etc/cron.daily like this:
 ----- ----- ----- ----- ----- ----- ----- ----- -----
#!/bin/bash
LF='/home/lanforge'
E='/home/lanforge/scripts/check_expired_data.bash'
$E -d $LF/report-data -t 11 -f
$E -d $LF/html-reports -t 11 -f
 ----- ----- ----- ----- ----- ----- ----- ----- -----
```

3. ## Running the script is likely places

Places we would expect large amounts of files to be saved include:

A. /home/lanforge/Documents

B. /home/lanforge/lf_data

C. /home/lanforge/report-data

D. /home/lanforge/html-reports
E. /home/lanforge/Downloads

4. **Survey where your data**

You can use the `df` command to get an idea where data is accumulating. Example:

```
$ df -s * | sort -n | tail
```

```
 12736    interop-5.4.5.apk
 22164    btserver
 23500    MonkeyRemote-0.4-shaded.jar
 39500    gua.64
116536    local
190444    LANforgeServer-5.4.4
210004    LANforgeServer-5.4.5
262628    LANforgeGUI_5.4.4
267344    backup-lanforge-gui.tar
269196    LANforgeGUI_5.4.5
```

5. **Please Avoid...**

Please avoid running the script in the `/home/lanforge` directory itself. A command like `./check_expired_data.bash -d /home/lanforge -t 10 -f` would **delete** your LANforge Server, LANforge GUI and your saved scenarios.

Packet Capture Files

If you are saving PCAP files, please save them in `/home/lanforge/Documents` or `/home/lanforge/report-data`. Please do not save them in `/home/lanforge`. The `check_expired_data.bash` script should not be run with `-d /home/lanforge` it is **too destructive**.

Also avoid:

A. `/`
B. /boot
C. /etc
D. /home
E. /lib
F. /opt
G. /run
H. /usr
I. /root
J. /var/log
K. /var/cache
L. /var/spool
M. /var/www
N. /var/run

6. **Creating a cronjob**

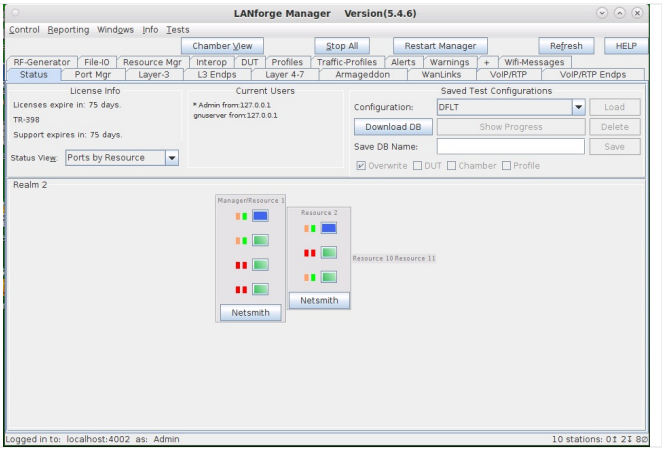
As the help text indicates, you can copy those lines into a cron job task that can run daily.

A.
```
$ sudo -s
```
B.
```
$ cd /etc/cron.daily
```
C.
```
$ nano expired_data.bash
```
D. Copy in your script data and adjust:
```
#!/bin/bash
LF='/home/lanforge'
E='/home/lanforge/scripts/check_expired_data.bash'
$E -d $LF/report-data -t 11 -f
$E -d $LF/html-reports -t 11 -f
```
E.
```
$ chmod +x expired_data.bash
```
F. Check for errors by running it by hand:
G.
```
$ ./expired_data.bash
```

Clustering multiple LANforge systems together

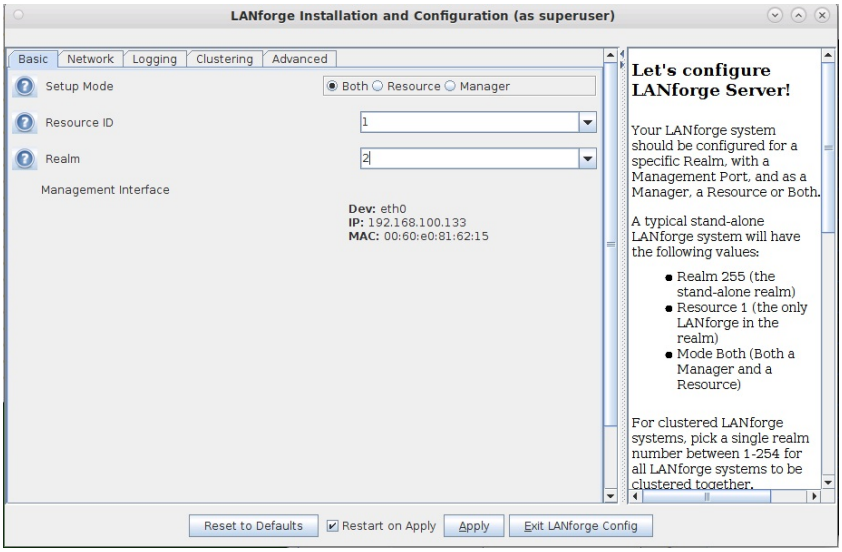
Goal: Cluster multiple LANforge systems together to use while Wifi network testing. Clustering enables multiple LANforges to act as one large LANforge.

Multiple LANforge machines can be used as a group with one **manager** LANforge.



1. An unclustered LANforge is both 'Manager' and 'Resource'. In a cluster (with multiple LANforges), there is one LANforge that is a 'Manager' and 'Resource' and there are other LANforges that are only 'Resources'. The LANforges that are only a 'Resource' use the first LANforge as their 'Manager'. There are two ways to cluster. One way is via the command line, second is via the User Interface. This cookbook demonstrates how to cluster via the User Interface. First, configure the first LANforge (which is typically both a 'Resource' and 'Manager')
   A. Open a VNC/RDP window to the LANforge wished to be used as the 'Manager' and 'Resource' of the final cluster. Click on the Configure LANforge icon located on the VNC session desktop.

   B. Once the 'LANforge Installation and Configuration (as superuser)' window opens, click on the Basic tab. Set the Setup Mode to Both, Resource ID to 1, and pick a realm 1-254 (example below is realm 2). Realm 255 means the LANforge is un-clustered.

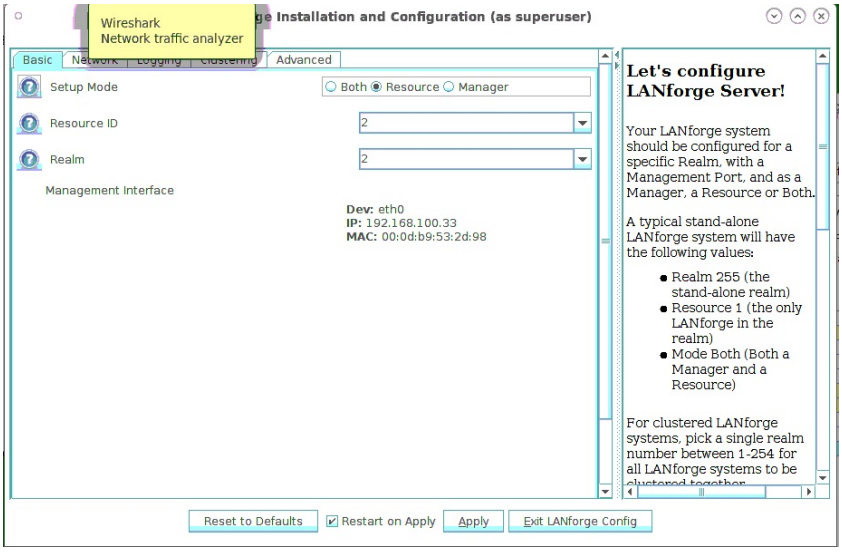


   C. Click on Apply and Exit LANforge Config to save settings.

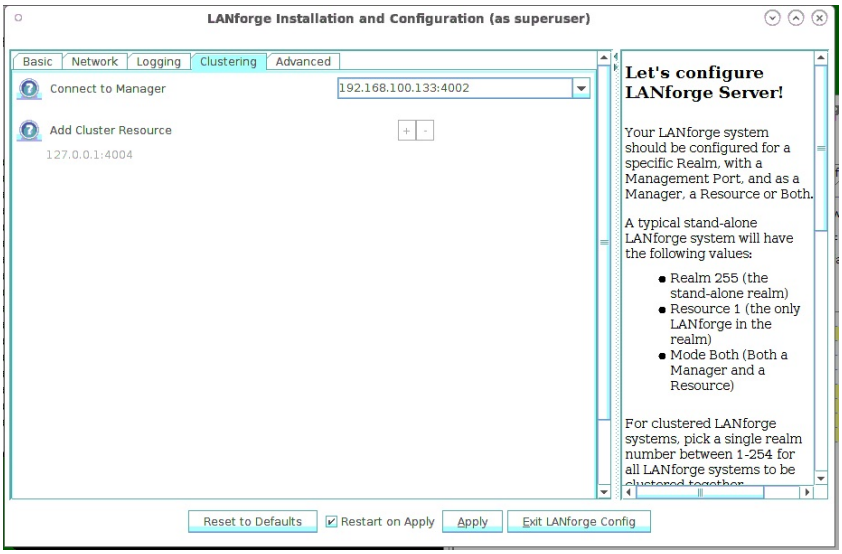
2. Next, configure the following LANforges to cluster to the first LANforge. These LANforges will be only Resources.

A. Open a VNC/RDP window to the LANforge wished to be used as the 'Manager' and 'Resource' of the final cluster. Click on the Configure LANforge icon located on the VNC session desktop.

B. Once the 'LANforge Installation and Configuration (as superuser)' window opens, click on the Basic tab. Set the Setup Mode to Resource, Resource ID to 2 or what the next unused Resource number is, and pick the same realm as the manager LANforge (in our example, realm 2).

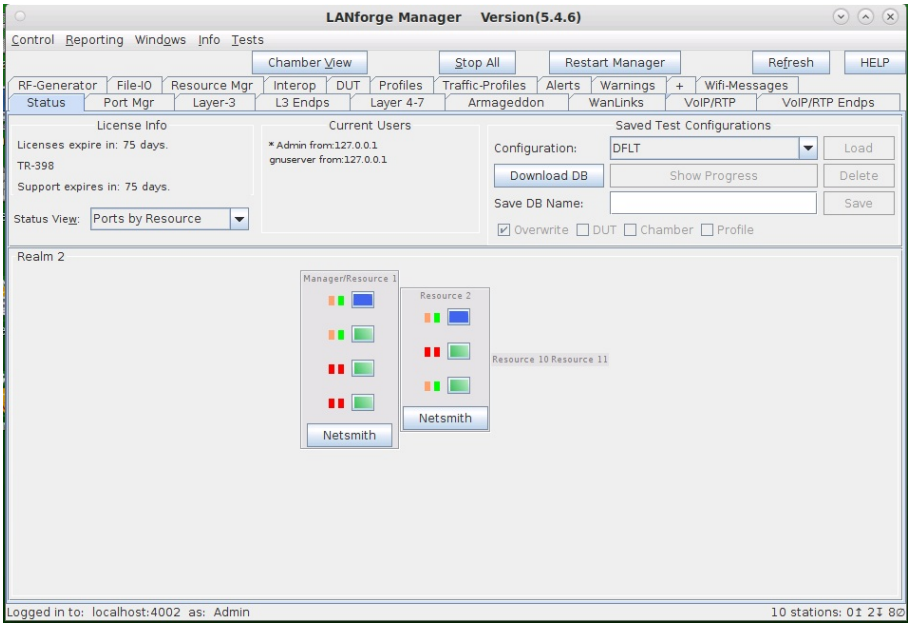


C. Click on the Clustering tab and in the Connect to Manager input box, put in the Manager's IP address followed by a ':4002'



D. Click on Apply and Exit LANforge Config to save settings.

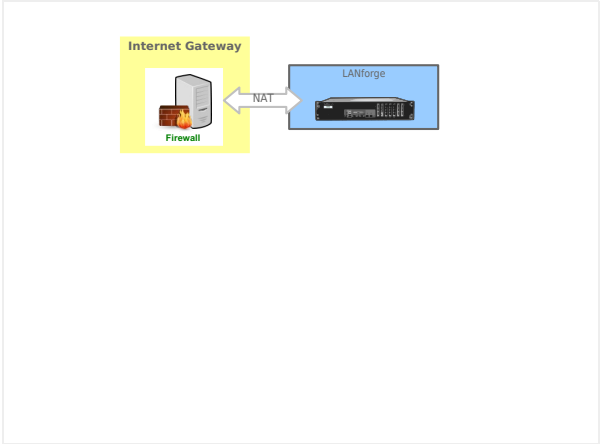
3. Restart LANforge Manager on all LANforges of cluster. The 'Status' tab of 'the Manager' of the clustered systems should show multiple resources now, as shown in the example below. If systems are not clustering and LANforge version build dates are too far apart between systems in cluster, LANforges may need to be upgraded so build version dates are closer to each other. Please contact support@candelatech.com for assistance.



Configure a Remote LANforge

Goal: Configure LANforge to be securely accessed via an Internet accessible gateway.

Follow these guidelines to configure a LANforge server so that it is less abusable if accessible via the Internet. Ideally the only method of access is via SSH. Remember that LANforge systems are designed for isolated environments and convenient usability. Never connect a LANforge system directly to the Internet. It is not secure. Requires version 5.4.6



---

1. ## Prepare the Gateway

   The internet gateway would want the LANforge system management address plugged into it. The following steps assume the gateway is configured to provide DHCP on the LAN and the LANforge management port (eth0) is using DHCP. Use the LANforge Configuration tool or `lfconfig` as necessary.

   A. We do not suggest placing the LANforge in a full DMZ network where all public requests are forwarded to the LANforge. That is not secure.

   B. Just forward the SSH port (`22/tcp`) to the LANforge

   C. Disable Universal Plug-n-Play (UPnP)

   D. Disable WAN administration ports (those are never secure)

2. ## Prepare the LANforge

   We will configure the LANforge server to change the management port and to not manage the default ethernet interface. The server should not accept LANforge protocol commands on every interface, making it much more secure. For this discussion, we will use the `lfconfig` script because that is always easy to access from an SSH connection. Also, we will assume that the LANforge GUI will **NOT run on this machine.**

A. **Stop the GUI and disable the autostart GUI feature**

A.
```
$ killall lfclient.bash
```
B.
```
$ killall java
```
C.
```
$ rm -f /home/lanforge/.config/autostart/LANforge-auto.desktop
```

B. **Configure LANforge server to use loopback as management port**

A.
```
$ sudo -s
```
B.
```
# cd /home/lanforge
```
C.
```
# ./serverctl.bash stop
```
D.
```
# ./lfconfig
```
E. Typical screen:
```
Interfaces: eth0
Resource interface assignment:
  Resource 1:
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
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:
```
F. Your command: `mgt_dev lo`

G. Your command: `bind_mgt 1`

H. Your command: `dev_ignore eth0`

I. Your command: `show_all`

J.
```
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]          lo
mode             [resource, manager, both]  both
log_file_len     [0-2G]                     0
bind_mgt         [0-1]                      1
shelf            [1-8]                      1
dev_ignore       [eth0 eth1 ... ethN]       eth0
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
**************************************************
```
K. Your command: `config`

L.
```
# ./serverctl.bash restart
```

3. ## Other Security Considerations

The fewer services listening on all ports on the LANforge the safer it will be.

> i Check `netstat -ntulp` to find services listening on address **0.0.0.0**

You might want to disable or reconfigure services that could reduce your security posture, such as:

A. `nfs-server.service` (only useful for NFS testing)

B. `radiusd.service` (used in 802.1x roaming testing)

C. `rpc-bind.service` (only useful for NFS testing)

D. `rpc-mountd.service` (only useful for NFS testing)

E. `rpc-statd.service` (only useful for NFS testing)

F. `vncserver@:1.service` (if no local GUI needs to run, should only need ssh)

G. `xrdp.service` (because it can be logged in multiple times)

4. ## Connect via SSH

   > i SSH not only does port forwarding, but it can compress the data stream between a GUI and a LANforge Server.

   A. **Using PuTTY**

   B. See other cookbook

   C. **Using OpenSSH**

   D. OpenSSH is available on Linux, MAC OS X and Windows

      A. The SSH **-L** option specifies `[local-port]:[remote-host]:[remote-port]`

      ```
      $ ssh -L 4002:127.0.0.1:4002 -CnNv lanforge@gateway-host
      ```

      B.

      C. Leave that connection running.

   E. **Using public keys**
   You can install a public key to your LANforge and use to avoid typing passwords. Those keys usually reside in your `$HOME/.ssh` directory.

      A.
      ```
      $ ssh-keygen -t ed25519
      ```

      B.
      ```
      $ ssh-copy-id lanforge@gateway-host
      ```

      > i It is possible to specify the ssh key to avoid copying the wrong one

      D.
      ```
      $ ssh-copy-id -i $HOME/.ssh/id_ed25519 lanforge@gateway-host
      ```

      E.
      ```
      $ ssh -CnNv -i $HOME/.ssh/ed25519 -L 4002:127.0.0.1:4002 gateway-host
      ```

   F. **Using Your `.ssh/config` File**
   Edit the hostname and IP configuration for the host:
   ```
   $ ssh -vnN lanforge-a1
   ```

5. ## Connect the LANforge GUI your Forwarded Connection

6. After starting your SSH connection to **gateway-host**, start your Local GUI and connect to `localhost:4002`

   > i If you cannot connect, you might need to edit your `/etc/hosts` file.
   > It might be listing `::1 localhost` or no localhost entry at all.

7.
   ```
   # cat /etc/hosts
   ```

   ```
   ::1 localhost6.localdomain6 localhost6
   192.168.1.101 lanforge.localnet lanforge.localdomain
   # Loopback entries; do not change.
   # For historical reasons, localhost precedes localhost.localdomain:
   # See hosts(5) for proper format and other examples:
   # 192.168.1.10 foo.mydomain.org foo
   # 192.168.1.13 bar.mydomain.org bar
   ###-LF-HOSTNAME-NEXT-###
   127.0.0.1 localhost localhost.localdomain vm-a490 vm-a490-local
   ```

Configure NTP Chronyd on Fedora

Goal: configure an NTP time source for a customer Fedora system

Some customer systems are in offline labs that are unable to reach the Internet, and without that connection, NTP will not continue to adjust the system time. Below are examples of how to configure the chrony service to look at the manager system of a LANforge realm to get time updates. The resulting times will be more consistent with respect to the whole realm of machines, but times will still be different than global time sources.

Background

It is possible to configure chronyd on Fedora to look at specific local servers for time synchronization, and to configure a LANforge to be a NTP time server. For more reference, see https://docs.fedoraproject.org/en-US/fedora/latest/system-administrators-guide/servers/Configuring_NTP_Using_the_chrony_Suite/

In the examples below, we will consider two systems:

- manager 192.168.1.101
- resource 192.168.1.102

Maintenance: Adjusting the time

```
sudo -s
chronyc tracking    # display the details about how far off the system is from NTP time
chronyc sources     # display the releationship to the sources
chronyc makestep    # force a catch-up to the NTP server
chronyc tracking    # to see the resulting time difference.
```

Configure a Server

Use the allow directive to provide access to the NTP protocol from the management network:

```
rtcsync
hwtimestamp *
allow 192.168.1.0/24
local stratum 9
```

Configure a Client

Edit the `/etc/chrony.conf` file and add a these lines:

```
server 192.168.1.101 iburst auto_offline
local stratum 10
hwtimestamp *
rtcsync
```

Apply Changes

Restart the chronyd service to apply:

```
systemctl restart chronyd.service
```

Check journalctl for anything wrong.

All that other stuff in the file

There's plenty of notes in the chrony.conf file. The two network time source directives of interest are:

```
pool pool.ntp.org iburst maxsources 4
server 0.pool.ntp.org iburst auto_offline
```

- pool refers to a whole network of time servers that are listed in a DNS group that rotates their definition very quickly. You can use `host pool.net.org` repeatedly to see what IPs are being provided.
- server points at just one IP

If you are in an offline setting, you might consider commenting out the remote pool/server directives, but the consequence of that is the next time the system is placed on a routable network, it will never try to look for NTP time sources again and hence never attempt to re-set the system hardware clock. It is harmless to leave those directives un-commented.

Upgrading Offline LANforge Systems

Goal: upgrade a LANforge system that does not have access to the Internet.

LANforge systems are often in off-line or isolated test environments where the only updates they get can be brought to them on a laptop that can taken to the isolated network manually. Candelatech provides Bundle upgrades that contain all the files necessary for performing the equivalent of a lf_kinstall.pl --do_lanforge upgrade action. It is also possible to create a mirror of the software that LANforge systems can query. Offline bundle files were introduced in 5.4.1. Offline upgrade by listing files from lf_kinstall.pl was introduced in 5.3.3.

Proxy from Controller Method

Given a network gateway that allows one-way access to LANforge systems, an outside management laptop can be used to upgrade the offline LANforge systems. There is no need to mirror everything, because your LF systems do not span all combinations. **You don't want to mirror everything.** It's over 13GB. Also, If you do not have ssh-keys installed between bizproxy and the LF systems, this technique will prompt you for passwords!

Mirror Packages Proxy option

If the proxy has a web server URL on the management LAN where LF files can be cached, follow these steps

to update the bundles on the proxy and upgrade the LF systems. This option mirrors the LANforge tar archives and not the bundles. For this example the proxy system will have these properties:

- hostname: bizproxy, 192.168.10.1
- management LAN: 192.168.10.0/24
- required disk space: **10GB**
- file system web folder: `/var/www/html/lanforge/r5.4.6`
- LAN URL: `http://192.168.10.1/lanforge/r5.4.6/`
- Apache Directory config example:

```
Alias /private/downloads /var/www/html/lanforge
Alias /private/downloads/ /var/www/html/lanforge/
Alias /lanforge /var/www/html/lanforge
Alias /lanforge/ /var/www/html/lanforge/
<Directory /var/www/html/lanforge>
  Require ip 192.168.10.0/24
  Options +Indexes +FollowSymLinks
  IndexOptions FancyIndexing FoldersFirst NameWidth=*
  AllowOverride all
</Directory>
```

- Nginx example:

```
location /lanforge/ {
    root /var/www/html/lanforge;
    autoindex on;
    allow 192.168.10.0/24;
    deny all;
}
```

1. On bizproxy, mirror files from www.candelatech.com to bizproxy. Below something close to the commands you would need to put into a shell script.
2. Size of the files files you would expect to mirror is about **8GB**
3. **mirror.bash**:

```
#!/bin/bash
VER="5.4.6"
OSV=F36
CT="https://www.candelatech.com/private/downloads/r${VER}"
cd /var/www/html/lanforge/r$VER
curl -s -o lf kinstall.pl ${CT}/lf_kinstall.pl
curl -s -o list.html ${CT}/
perl -ne '/a href="([^"]+)"/ && print "$1\n";' list.html > list.txt
rm -f list2.txt
perl -ne '/^((ath|board|ct[56]|firmware|interop-|LANforge-Server-).*)/ && print "$1\n"' list.txt > list2.txt
perl -ne '/(LANforge-?GUI[- ]5.*)/ && print "$1\n"' list.txt >> list2.txt
grep "[Lx].*[-]${OSV}" list.txt >> list2.txt
mapfile -t URLS < list2.txt
for file in "${URLS[@]}"; do echo "${CT}/${file}" ; done > urls.txt
wget -i urls.txt
```

4. After running mirror.bash, you now have a copy of the LANforge packages you want on bizproxy.
5. From bizproxy, the below script can use the first argument as the IP of the system to upgrade.
   web_upgrade.bash:

```
#!/bin/bash
LFHOST=${1:-}
if [ -z $LFHOST ]; then echo "Please specify hostname or ip"; exit 1; fi
VER=5.4.6
# specify a kernel version in parameter 2:
KV=${2:=5.19.17+}
BIZ="http://192.168.10.1/"
scp lf kinstall.pl root@${LFHOST}:/root/lf kinstall.pl
ssh root@${LF HOST} "chmod +x /root/lf kinstall.pl"
ssh root@${LF HOST} "/root/lf_kinstall.pl \
    --lfver $VER --kver $KV \
    --do lanforge --skip yum_all --skip_pip --skip_installer_check \
    --download from $BIZ \
    --tmp_dir /home/lanforge/Downloads"
```

   Example: `./web_upgrade.bash 192.168.10.2 6.2.4+`

SSH Copy Packages Option

If the LANforge cannot reach the proxy controller because of firewall or routing reasons, the proxy controller can copy the files to the LF system and use a local-only install with the lf_kinstall.pl --source_dir option.

1. Use the above mirror script for mirroring the LANforge packages.
2. Use a script like the one below to query and copy the correct files to the LF system:

```
#!/bin/bash
cd /var/www/html/lanforge/r5.4.6
LFHOST=${1:-}
if [ -z $LFHOST ]; then echo "Please specify hostname or ip"; exit 1; fi
# specify a kernel version in parameter 2:
```

```
KV=${2:=5.19.17+}
OSV=$(ssh lanforge@$LFHOST "awk -F\= '/VERSION ID/{print \$2}' /etc/os-release")
scp lf kinstall.pl root@${LFHOST}:/root/lf kinstall.pl
ssh root@${LF HOST} "chmod +x /root/lf kinstall.pl"
ssh root@{$LF HOST} "/root/lf kinstall.pl --print_only --show_urls \
    --skip pip --skip yum all --do upgrade \
    --lfver $VER --kver $KV | grep '# http' > /tmp/lf_list.txt"
scp root@${LF HOST}:/tmp/lf list.txt /tmp
mapfile -t urlz < /tmp/lf list.txt
for url in "${urlz[@]}"; do
    file="${url##*/}"
    scp $file root@${LFHOST}:/home/lanforge/Downloads/
done
scp md5.txt root@${LFHOST}:/home/lanforge/Downloads/
ssh root@${LFHOST} "/root/lf kinstall.pl --offline \
    --lfver $VER --kver $KV --do lanforge \
    --source dir /home/lanforge/Downloads \
    --tmp_dir /var/tmp --skip_yum_all --skip_pip"
```

SSH Copy Bundles Option

This option is for mirroring the Bundle files only. This is useful if the default kernel version is acceptable.

1. On bizproxy, mirror files from http://www.candelatech.com to bizproxy. Below something close to the commands you would need to put into a shell script. Sizes of the bundle files you would expect to mirror:

```
$ ls Bundle*F{27,30,34,36}* | xargs du -shc
1.7G    Bundle lfver-5.4.6 kern-5.19.17+ osver-F27-i-27 x64.tar.xz
1.7G    Bundle_lfver-5.4.6_kern-5.19.17+_osver-F30-i-30_x64.tar.xz
1.7G    Bundle lfver-5.4.6 kern-5.19.17+ osver-F34-i-34 x64.tar.xz
1.7G    Bundle_lfver-5.4.6_kern-5.19.17+_osver-F36-i-36_x64.tar.xz
6.7G    total
```

2. We'll call this "bundle_mirror.bash":

```
#!/bin/bash
VER="5.4.6"
CT="https://www.candelatech.com/private/downloads/r${VER}/"
cd /var/www/html/lanforge/r$VER
curl -s -o lf kinstall.pl ${CT}/lf_kinstall.pl
curl -s -o list.html ${CT}/
perl -ne '/a href="([^"]+)"/ && print "$1\n";' list.html > list.txt
perl -ne '/^(Bundle.*?(F(27|3[046])).*)/&& print "/$1\n"' list.txt > urls.txt
wget -i urls.txt
```

3. From bizproxy, the below script can use the first argument as the IP of the system to upgrade. **scp_bundle_upgrade.bash**:

```
#!/bin/bash
cd /var/www/html/lanforge/r5.4.6
LFHOST=${1:-}
if [ -z $LFHOST ]; then echo "Please specify hostname or ip"; exit 1; fi
OSV=$(ssh lanforge@$LFHOST "awk -F\= '/VERSION ID/{print \$2}' /etc/os-release")
BNAME="Bundle lfver 5.4.6 kern-5.19.17+ osver-F${OSV}-i-${OSV}_x64.tar.xz"
scp $BNAME lanforge@${LFHOST}/home/lanforge/Downloads/
scp lf kinstall.pl root@${LFHOST}:/root/lf kinstall.pl
ssh root@${LF_HOST} "chmod +x /root/lf_kinstall.pl"
ssh root@${LF_HOST} "./lf_kinstall.pl --use_bundle /home/lanforge/Downloads/$BNAME"
```

Example: `./scp_bundle_upgrade.bash 192.168.10.2`

Bundle method

The bundle upgrade is a standard manner of doing an offline upgrade.

Interop

Windows

Offline Windows lfserver upgrades will require a place to download the windows lanforge update zip from. The existing offline Bundle_lfver_X tar file does not include these files. Rather this requires the LANforge-Server-5.4.6-upgrade.zip file.

1. on the Fedora lanforge, configure a test-network port to serve HTTP.
2. edit the resulting `vr_conf/nginx_eth3.conf` to add the Downloads directory:

3.
```
# Remove the first line '# Autogenerated by ...' and edit the file as
# desired for a custom config file.

worker processes        1;
error_log logs/br1000_error.log;
pid             /home/lanforge/vr_conf/nginx_br1000.pid;
events {
    worker_connections  1024;
}
```

```
http {
    include       /usr/local/lanforge/nginx/conf/mime.types;
    default type  application/octet-stream;
    access log  logs/br1000_access.log;
    sendfile            on;
    keepalive_timeout  65;

    server {
        listen       10.40.0.1:80 bind_dev=br1000;
        server name  localhost;
        access_log  logs/br1000_host.access.log;

        location / {
            root   html;
            index  index.html index.htm;
        }
        error page   500 502 503 504  /50x.html;
        location = /50x.html {
            root   html;
        }
        location /Downloads {
           root   /home/lanforge/;
           autoindex on;
        }
    }
}
```

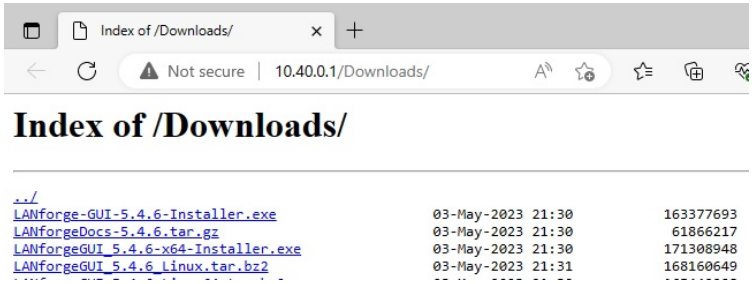
Notice the:

1. ```
   location /Downloads {
       root   /home/lanforge;
       autoindex on;
   }
   ```
2. and of course: remove the top line of the file

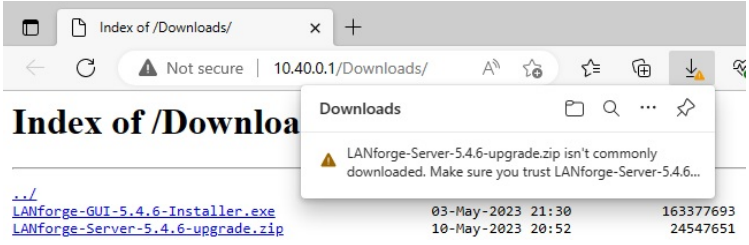
4. reset the port to make the changes take effect
   1. first, tail the logfile:

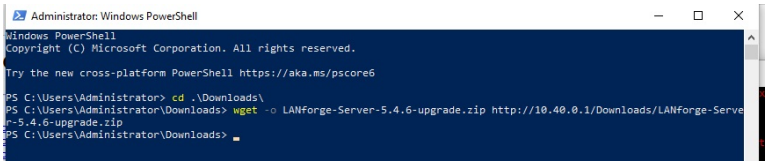
      ```
      [lanforge@ct523-jedway1 logs]$ pwd
      /usr/local/lanforge/nginx/logs
      [lanforge@ct523-jedway1 logs]$ tail -F br1000_error.log
      ```

   2. next **down and up the port.** A simple port reset does not restart nginx
5. check on the Windows system to make sure you can browse the url:



6. Get the correct files into Fedora `/home/lanforge/Downloads`:
   1. `wget https://www.candelatech.com/private/downloads/r5.4.6/LANforge-Server-5.4.6-upgrade.zip`
   2. check that you did not create LANforge-Server-5.4.6-upgrade.**zip.1**
7. Download on windows, or use posh wget:
   1. Using Edge: click on the **[...]** dots, select **Keep**, on next card select **Extra Options → Keep**





   2. `wget -o LANforge-Server-5.4.6-upgrade.zip http://10.40.0.1/Downloads/LANforge-Server-5.4.6-upgrade.zip`
      ```

8. Stop LANforge on the windows system
9. Extract the zip file:
    1. `cd %env:PROGRAM<TAB><TAB>` tab complete to get to `cd 'C:\Program Files (x86)\LANforge-Server\'`
    2. `Expand-Archive -Path $HOME\Downloads\LANforge*upgrade.zip -Dest .`
10. run the upgrade_lfconfig script:
    1. `.\upgrade_lfconfig.ps1`
    2. click OK
    3. The server will have started
11. Check the LANforge manager system to check it has re-regeistered
    1. In the Resources tab, you should see the host-name has returned
    2. check the Build Date column to check the version is recent.

Multiplexed REST Access via Nginx Proxy

Goal: Configure an NGINX proxy to allow REST traffic to a variety of isolated LANforge machines

It is possible to configure a Nginx proxy in a manner to allow remote REST clients access to multiple isolated LANforge systems. This leverages the proxy_pass feature in Nginx. There are multiple ways to configure proxy access.

For the example below, we will assume these values:

- public proxy hostname is bizproxy, 10.39.0.44
- bizproxy is running Nginx
- Isolated LAN with LF machines: 192.168.92.0/24
- Example LANforge machines:
    - 192.168.92.10 ct523-jedway1
    - 192.168.92.11 ct522-jedway3
- the LANforge machines need to have GUIs configured to start automatically

LANforge GUI HTTP Processing

The HTTP library that the LANforge GUI incorporates is very simple. It is not configured to parse Host: headers. There is no need to rewrite the Host header when proxying to port 8080.

Proxying to Apache on LANforge (mgt_ip, port 80) **is different.** If you want to proxy requests to a LF Apache instance on port 80, you should incorporate Host header rewriting. (No examples below, sorry.)

Proxy Request Rewriting

Three ways of making proxy requests include:

- **Port Rewriting**. Works best with our python libraries.
- Hostname Rewriting, more difficult, but still works with python libraries.
- URL (path-name) Rewriting: this does NOT work well with our python libraries.

Port Rewriting

This manner of proxying just translates different server listening ports to the target machines. It is another easy transformation, but it opens up quite a number of high-numbered ports on bizproxy.
Nginx config:

```
server {
   listen 1910;
   server name  ;
   root /usr/share/nginx/html;

    location / {
       rewrite            /(.*) /$1 break;
       proxy pass         http://192.168.92.10:8080;
       proxy redirect     off;
       proxy set header   Host $host;
       proxy set header   X-Real-Ip $remote addr;
       proxy_set_header   X-Forwarded-For $remote_addr;
    }
}
```

```
server {
   listen 1911;
   server name  ;
   root /usr/share/nginx/html;

    location / {
       rewrite            /(.*) /$1 break;
       proxy pass         http://192.168.92.11:8080;
       proxy redirect     off;
       proxy set header   Host $host;
       proxy set header   X-Real-Ip $remote addr;
       proxy_set_header   X-Forwarded-For $remote_addr;
    }
}
```

Use curl to test access:

```
curl -sqv -H 'Accept: application/html' http://bizproxy:1910/port/1/1/list
```

Example script usage:

```
./scenario.py --mgr bizproxy --mgr port 1910 \
    --load BLANK --action overwrite
```

Hostname Rewriting

It is possible to rewrite hostnames and host headers to isolated LF systems. This is **complicated** rewrite because the DNS names need to be present at the developer's workstation. (It is unlikely that the the headers in the HTTP request can be manipulated to add the Host header.) Ideally, the non-isolated LAN DNS can be configured to return the return the IP of bizproxy.corp.me when hostnames like ct523-jedway1.bizproxy.corp.me are requested.

On the developer workstation, this is possible with extra effort on the user side by manipulating the `/etc/hosts` file on a workstation:

```
# etc/hosts
10.39.0.44    ct523-jedway1.bizproxy.corp.me    ct523-jedway1
```

Nginx config:

```
server {
    listen 80;
    server_name ct523-jedway1;
    root /usr/share/nginx/html;

    location / {
        rewrite            /(.*) /$1 break;
        proxy_pass         http://192.168.92.10:8080;
        proxy_redirect     off;
        proxy_set_header   Host $host;
        proxy_set_header   X-Real-Ip $remote_addr;
        proxy_set_header   X-Forwarded-For $remote_addr;
    }
}
```

Check the URL access using curl:

```
# check by IP:
$ curl -sqv \
    -H 'Host: ct523-jedway1' \
    -H 'Accept: application/json' \
    http://10.39.0.44/port/1/1/list

# check by hostname
$ curl -sqv \
    -H 'Accept: application/json' \
    http://ct523-jedway1.bizproxy.corp.me/port/1/1/list
```

Example script usage:

```
./scenario.py --mgr ct523-jedway1 --mgr_port 80 \
   --load BLANK --action overwrite
```

Logging HTTP Access

The bizproxy logs should be located in `/var/log/nginx`. In LF 5.4.6, the GUI can send messages to syslog. Messages from the GUI would look like:

```
1685573102952:  ip[192.168.92.1] sess[] GET url[/port/1/1/list]
```

Appendix

URL Rewriting is mentioned here so the reader can understand what not to configure.

URL Rewriting

Below is an example permitting REST access to LF hosts by way of a URL prefix. For example, the URL http://bizproxy/92.11/port/1/1/list becomes the URL http://192.168.92.11:8080/port/1/1/list . This is not the best kind of proxy rewriting, but it is the easiest. Using a URL prefix is less ideal because it inherently conflicts with the LANforge python libraries provided.
Nginx config:

```
server {
    listen       80;
    server name   ;
    root         /usr/share/nginx/html;

    # Load configuration files for the default server block.
    include /etc/nginx/default.d/*.conf;

    location /92.10 {
       rewrite            /92.10/(.*) /$1 break;
       proxy pass         http://192.168.92.10:8080;
       proxy redirect     off;
       proxy set header   Host biz lflab5 9210;
       proxy set header   X-Real-Ip $remote addr;
       proxy_set_header   X-Forwarded-For $remote_addr;
    }
    location /92.11 {
       rewrite            /92.11/(.*) /$1 break;
       proxy pass         http://192.168.92.11:8080;
       proxy redirect     off;
       proxy set header   Host $host;
       proxy set header   X-Real-Ip $remote addr;
       proxy_set_header   X-Forwarded-For $remote_addr;
    }
}
```

Use curl to query the REST endpoint:

```
$ curl -sqv -H 'Accept: application/json' http://bizproxy/92.10/port/1/1/list
```

This is not compatible with the py-scripts library.