THE OFFICIAL

GETTING STARTED GUIDE

BY THE GNS3 ASSIST TEAM

GETTING STARTED GUIDE

Contents

GETTING STARTED GUIDE

1 GETTING STARTED

Welcome to our official guide for the release of GNS3 1.0. The topics include the following:

- Introduction to GNS3
- GNS3 Quick Start Guide for Windows Users
- GNS3 Quick Start Guide for Linux and MAC Users
- Creating the simplest topology
- Using terminal programs with GNS3
- Packet Capture using Wireshark
- Adding hosts to your Topologies
- Switching simulation in GNS3
- A Brief Overview of IOU
- How to Configure IOU in GNS3 on Windows

Remember, even if GNS3 is about simulation, it actually emulates most of the devices in order to provide an accurate simulation. Please see the complete list of hardware emulated by GNS3.

Finally, Don't forget about two other very important aspects of GNS3 support: our community portal and GNS3 Assist.

1.1 COMMUNITY PORTALS

Users who are looking for help or want to report bugs can post in our new Jive community which is located at https://GNS3.jiveon.com/welcome.

1.2 GNS3 ASSIST

If you have difficulty with Getting Started, our GNS3 Assist Support Service is here to help you get GNS3 setup in your environment so you can focus beginning your journey. For more information about GNS3 Assist Support please go to the following location: https://gns3.jiveon.com/community/support/gns3-assist

1.3 CONTRIBUTIONS

We want to reward and engage you during your experience using our product. A Community badging system is in place to honor your achievements in our community, the GNS3 Jungle. Each time you contribute and join in the process of improving our efforts, additional points are accumulated and will be used to honor you.

2 INTRODUCTION TO GNS3

GNS3 is a Graphical Network Simulator that allows emulation of complex networks. You may be familiar with VMWare, VirtualBox or Virtual PC that are used to emulate various operating systems in a virtual environment. These programs allow you to run operating systems such as Windows XP Professional or Ubuntu Linux in a virtual environment on your computer.

GNS3 allows the same type of emulation using Cisco Internetwork Operating Systems. It allows you to run a Cisco IOS in a virtual environment on your computer. Dynamips is the core program that allows IOS emulation. GNS3 runs on top of Dynamips to create a more user friendly, graphical environment.

GNS3 supports other emulation programs, namely QEmu and VirtualBox. This bundle of software, are used to emulate, for instance, Cisco ASA, Cisco IDS, Juniper routers as well as hosts (Linux, Windows, Mac OS X, FreeBSD etc.)

GNS3 allows these to work together and allow you, for example, to have your Cisco router talking to your Linux host.

GNS3 allows the emulation of Cisco IOSs on your Windows, Linux and Mac OS X based computer. Emulation is possible for a long list of router platforms and other devices. Using an EtherSwitch card in a router, switching platforms may also be emulated to the degree of the card's supported functionality. This means that GNS3 is an invaluable tool for preparing for Cisco certifications such as CCNA, CCNP and CCIE.

There are a number of network simulators on the market, but they are limited to the commands that the developer chooses to include. Usually, there are commands or parameters that are not supported when working on a practice lab. In these simulators, you are only seeing a representation of the output of a simulated network system.

The accuracy of that representation is only as good as the developer makes it. With GNS3 you are running an actual Cisco IOS, so you will see exactly

what the IOS produces and will have access to any command or parameter supported by them; that includes the bugs in IOS as well.

In addition, GNS3 is an open source, free program for you to use. **However, due to licensing restrictions, you will have to provide your own Cisco IOS's and IOU, to use with GNS3**. Also, GNS3 will provide around 1,000 packets per second throughput in a virtual environment. A normal router will provide a hundred to a thousand times greater throughput.

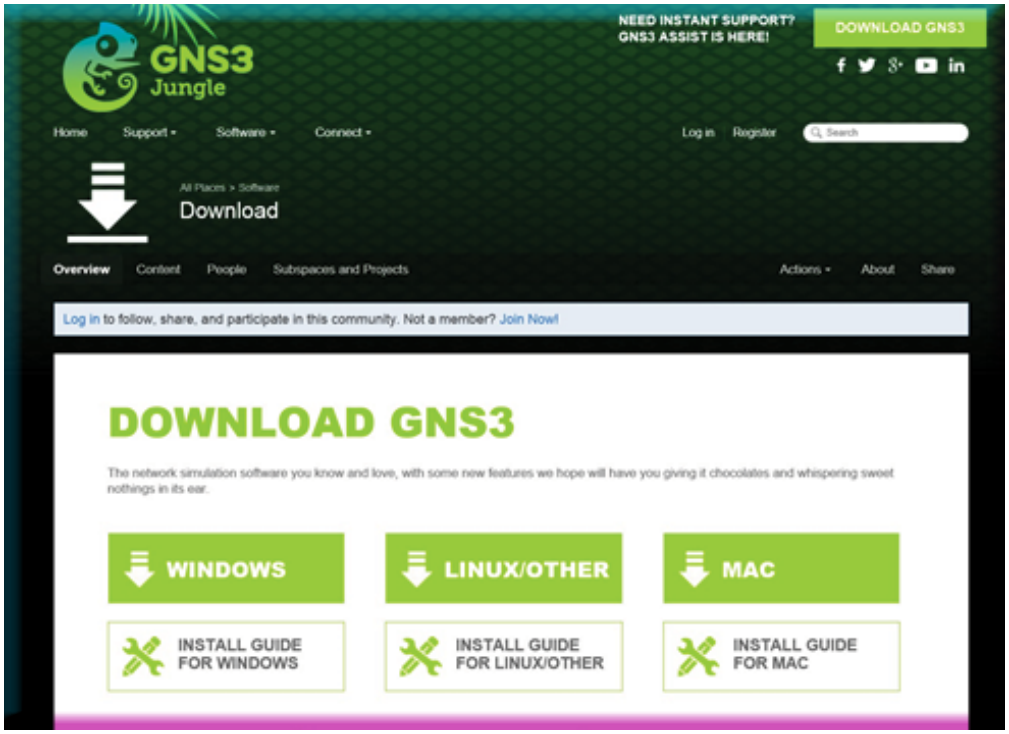
GNS3 does not take the place of a real router, but is meant to be a tool for learning and testing in a lab environment. GNS3 makes a great tool for demonstrating Proofs of Concept (POC) prior to hiring a networking contractor. You can also use GNS3 to validate new configuration changes post-installation as well as:

For experimenting and testing

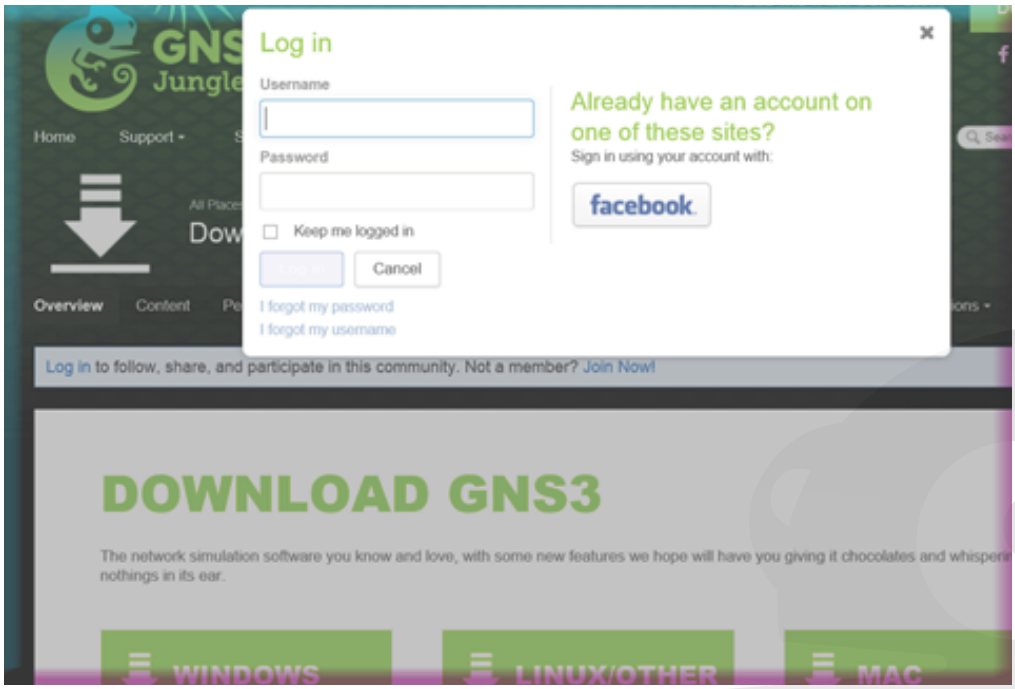
Defining proof of concepts

Validation of new changes in network environments

Now it's time to set up GNS3 on Windows, Mac OS X or Linux to start enjoying the fascinating world of simulation! We recommend creating a GNS3 community account and going here for the latest download: https://community.gns3.com/community/software/download.



Create an account at https://gns3.jiveon.com/login.jspa



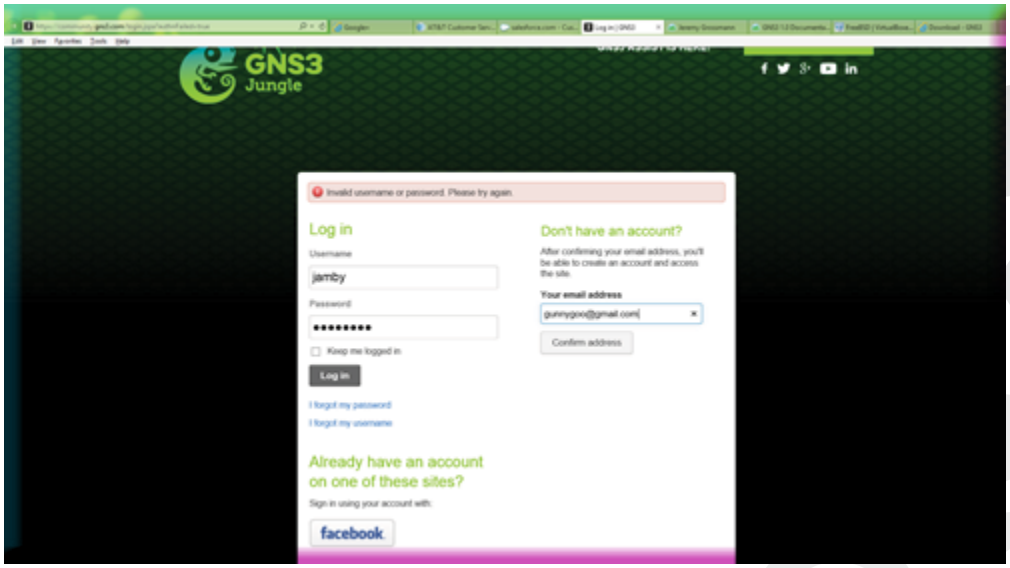
In the previous screenshot, you'll see three download links depending on your HOST machine. Your host machine is the machine you will be installing GNS3 on. We currently support Windows, Mac OS X and Linux. **The actual Getting Started guide is the same.**

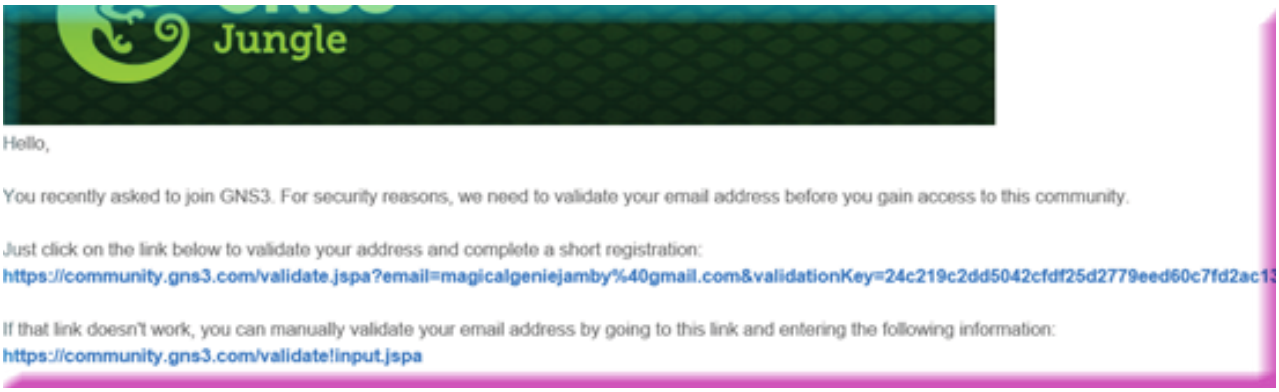
3 INSTALLATION FOR WINDOWS USERS

This document will take you through the steps to get started with GNS3 in a Windows environment. All of the critical and most important things to know will be covered, but for an in-depth discussion, see other Getting Started Documents. If you use Linux, there is an installation section for Linux users and the equivalent for Mac OS X users. The first part of this guide is for a user getting to the new release from our new website.

Step 1 – Download GNS3

As stated in the previous screenshot, after you have created the account, click on the download link and download the Windows All-In-One installer.





Jungle

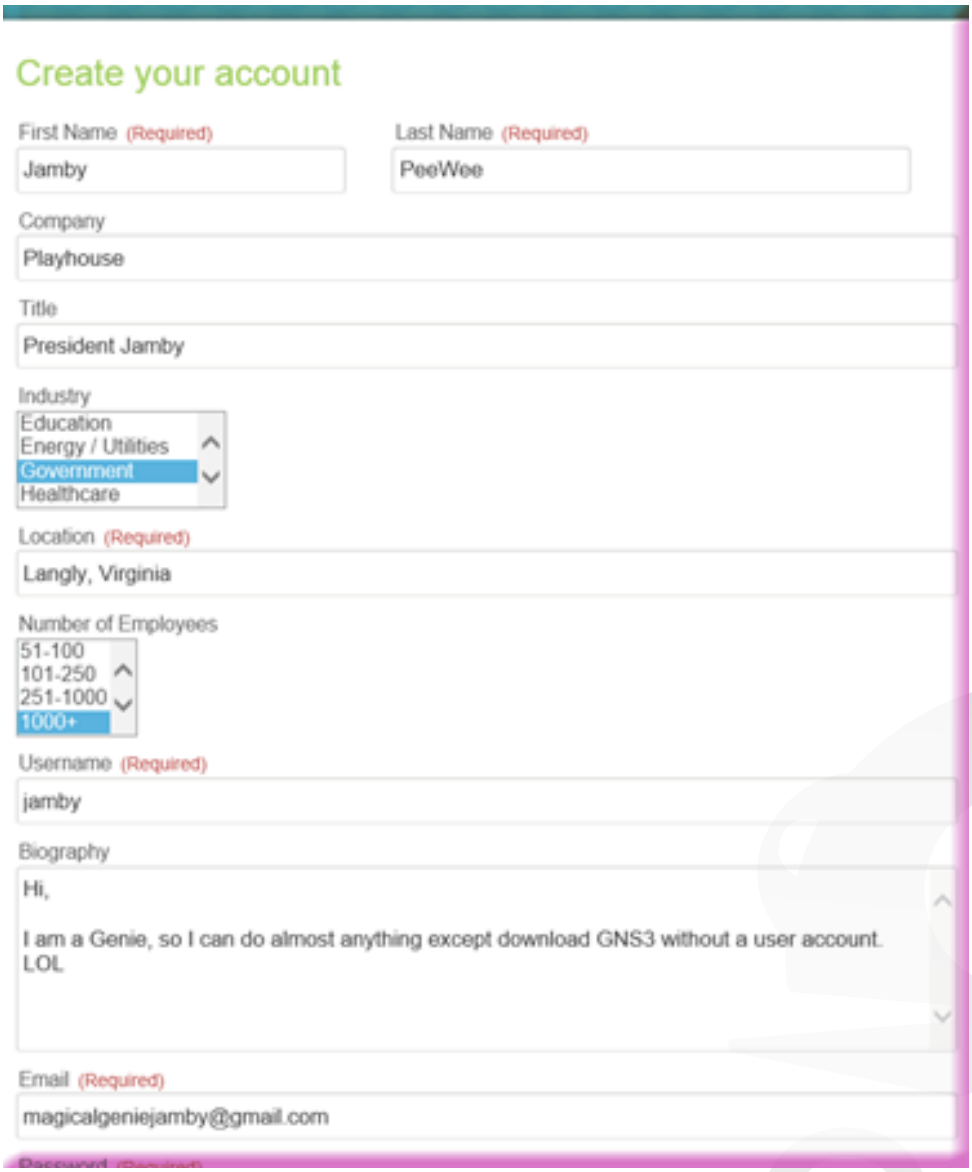
Hello,

You recently asked to join GNS3. For security reasons, we need to validate your email address before you gain access to this community.

Just click on the link below to validate your address and complete a short registration:
https://community.gns3.com/validate.jspa?email=magicalgeniejamby%40gmail.com&validationKey=24c219c2dd5042cfdf25d2779eed60c7fd2ac1

If that link doesn't work, you can manually validate your email address by going to this link and entering the following information:
https://community.gns3.com/validate!input.jspa

Then you get the create account window:



Create your account

First Name (Required) Jamby

Last Name (Required) PeeWee

Company: Playhouse

Title: President Jamby

Industry: Education / Energy / Utilities / Government / Healthcare

Location (Required): Langly, Virginia

Number of Employees: 51-100 / 101-250 / 251-1000 / 1000+

Username (Required): jamby

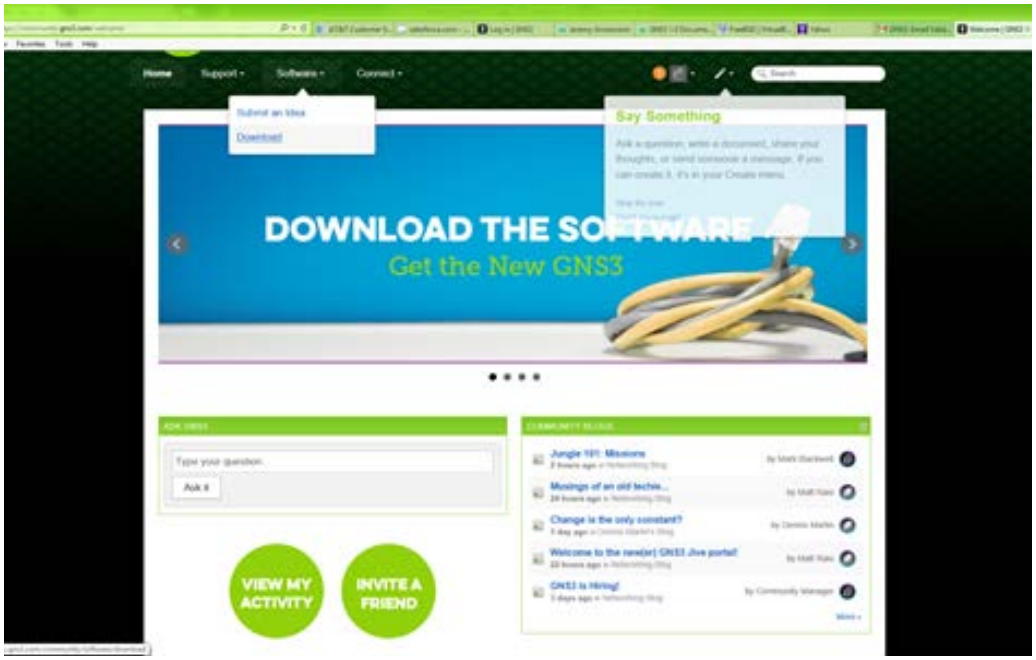
Biography:
Hi,

I am a Genie, so I can do almost anything except download GNS3 without a user account.
LOL

Email (Required): magicalgeniejamby@gmail.com

Password (Required)

Okay, now you are in to the portal.

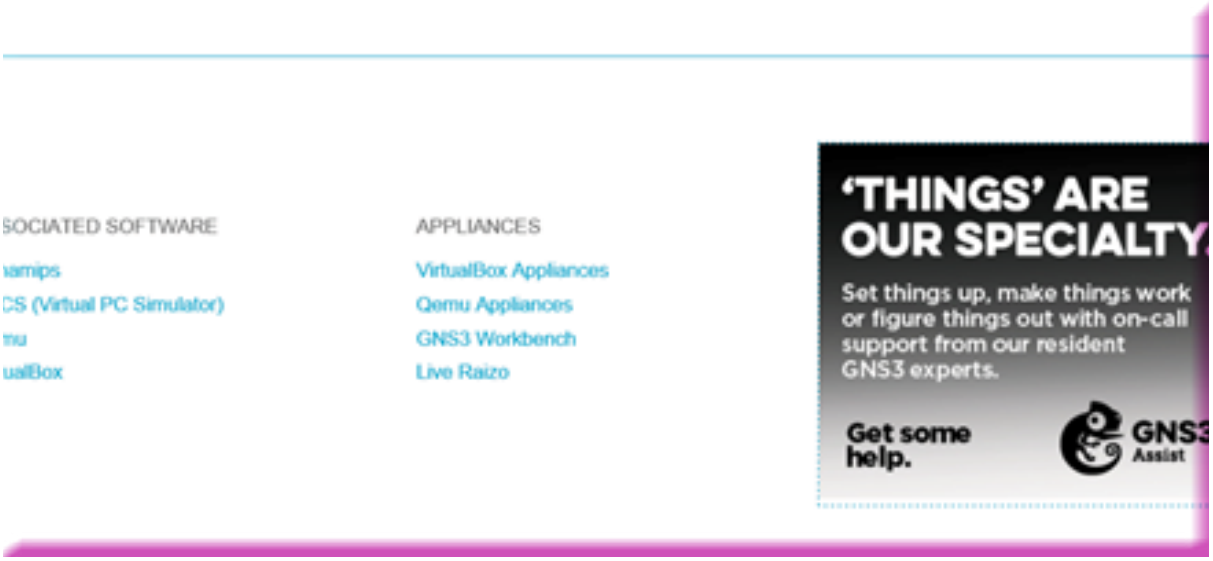


Click on the Software button and click Download in the menu.

The next screen should look familiar.

At this point, you can start the download process.

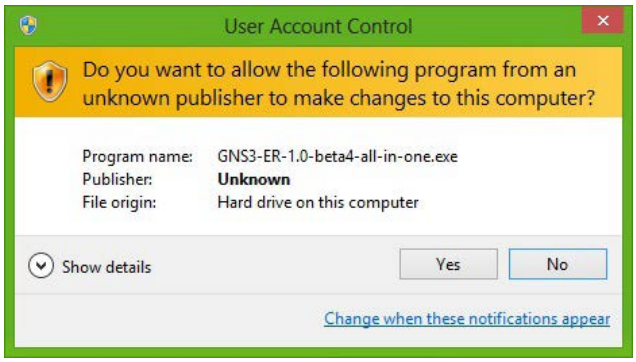
Also note the bottom part of the screen here:



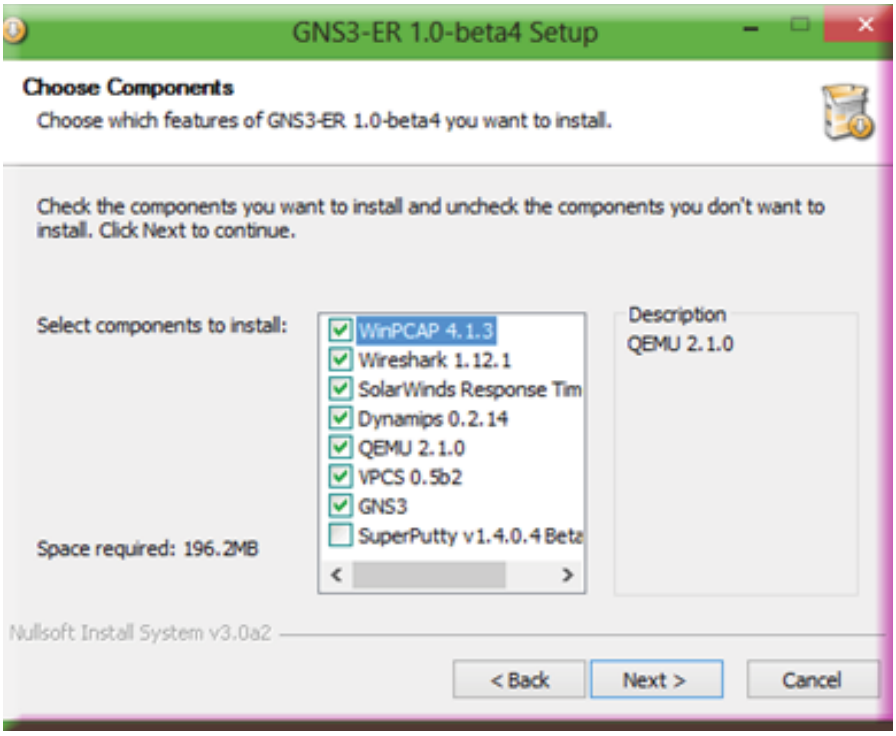
This is a really simplified way to obtain all those other appliances once you have gotten GNS3 downloaded and installed.

Step 2 – Install GNS3

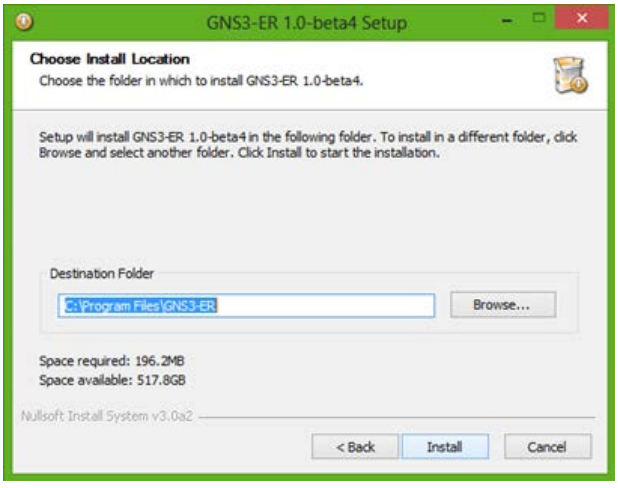
Find the file you downloaded and double-click on it to begin installing GNS3. The GNS3 Setup Wizard will begin. Everything else is a matter of clicking on next buttons.



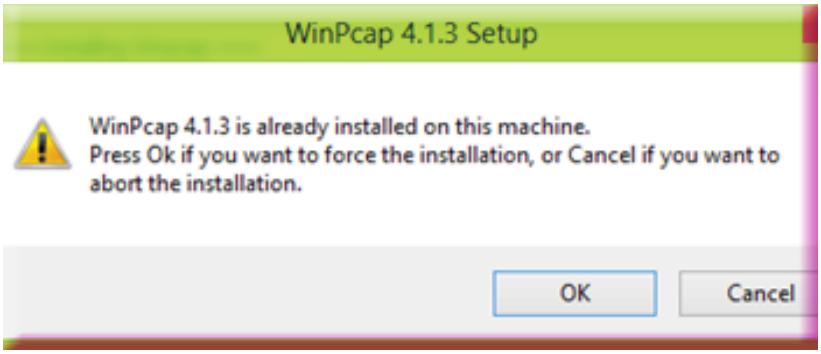
Locate your GNS3 download and double click on it. The GNS3 Setup Wizard will begin. Everything else is a matter of clicking on next buttons. Most experienced Windows users know to click ‘next’ and ‘accept the user license’. The interesting thing about this installation from the other ones is many of the other appliances needed (like Winpcap, WireShark, Dynamips) are already checked marked.



An astute user will start clicking off the boxes. Please don’t do that. Unless you absolutely know you have a newer version, just click on to the next screen. A deeper discussion of what all this is will be provided. Hit the Install Button:

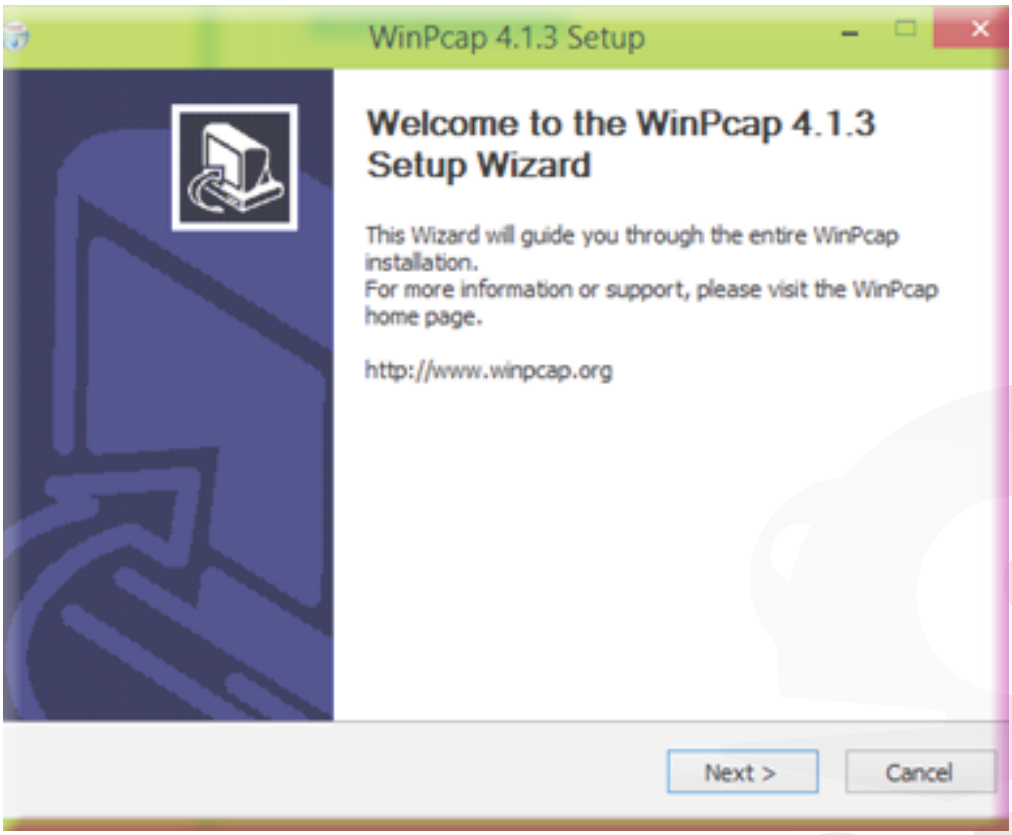


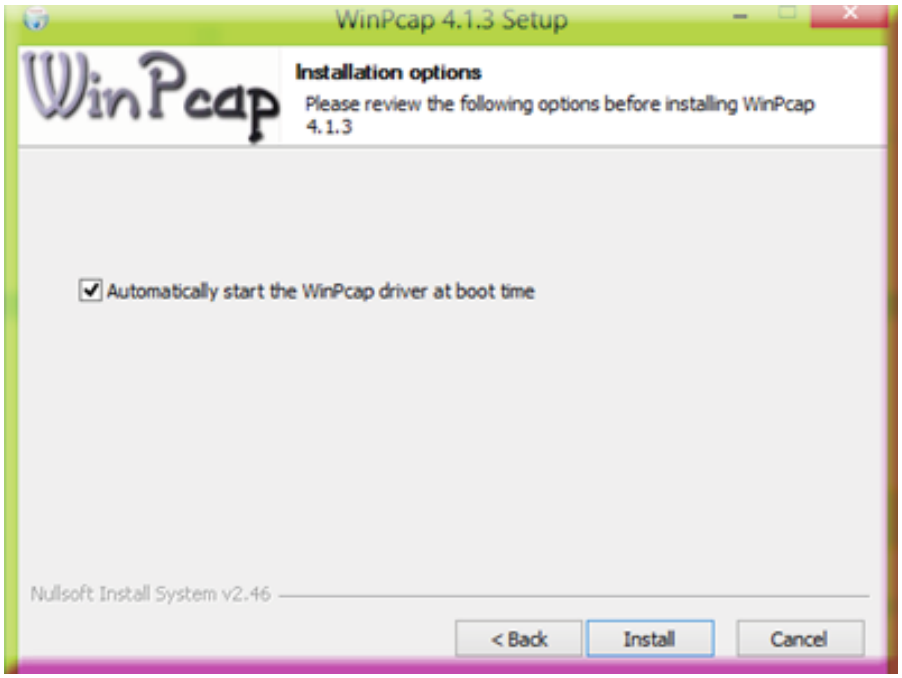
Note that if needed, WinPcap Setup Wizard will be launched for you to install, this dependency is required for GNS3 to communicate with real networks through a physical network internal controller.

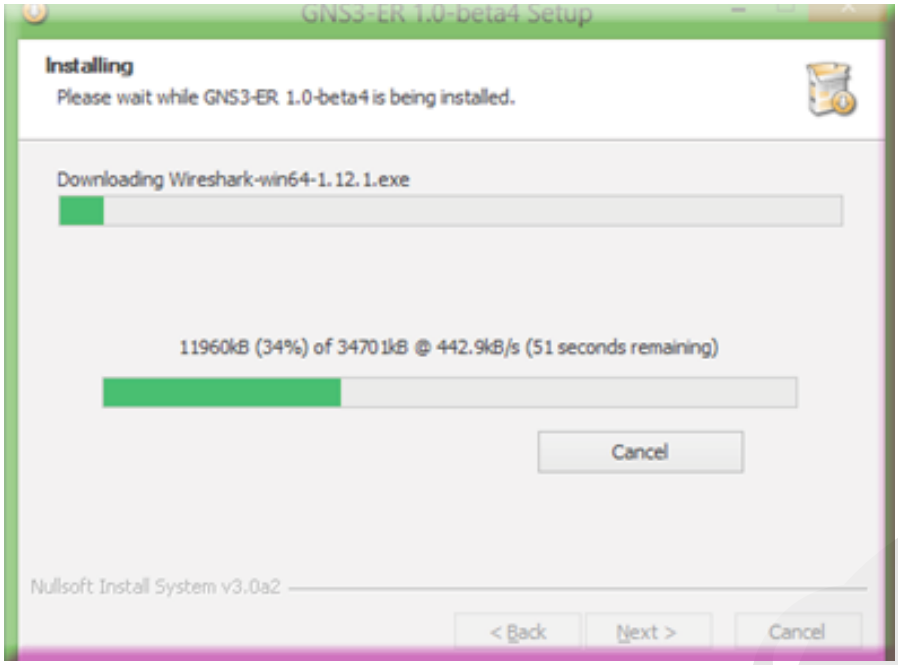


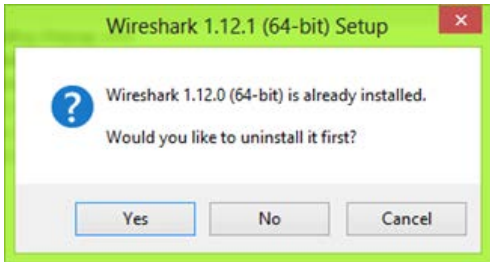
The installation for WinPcap will then begin. However, if you have a previous version of WinPcap on your computer, the installer will ask to remove the older version and will then install the newer version.

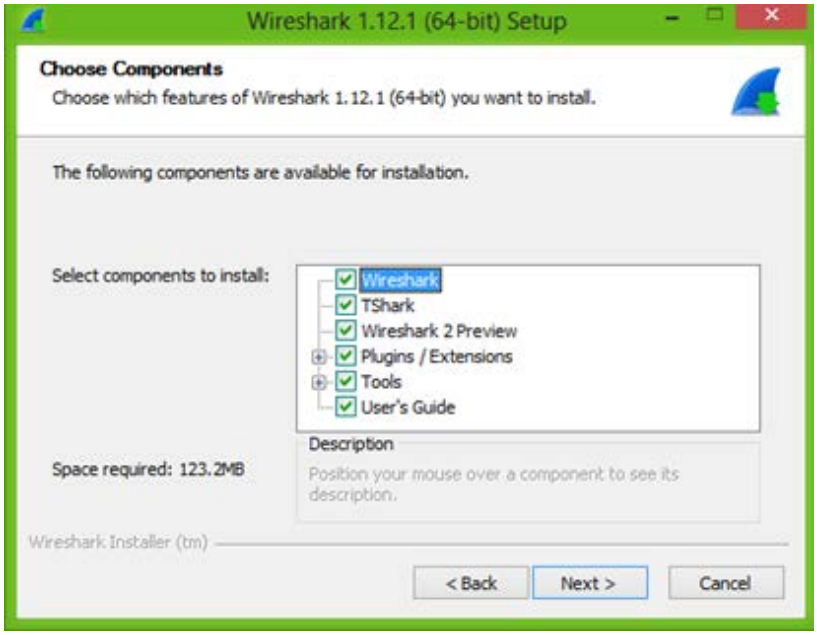
I hit okay so that you can see you are now in the WinPcap installer:

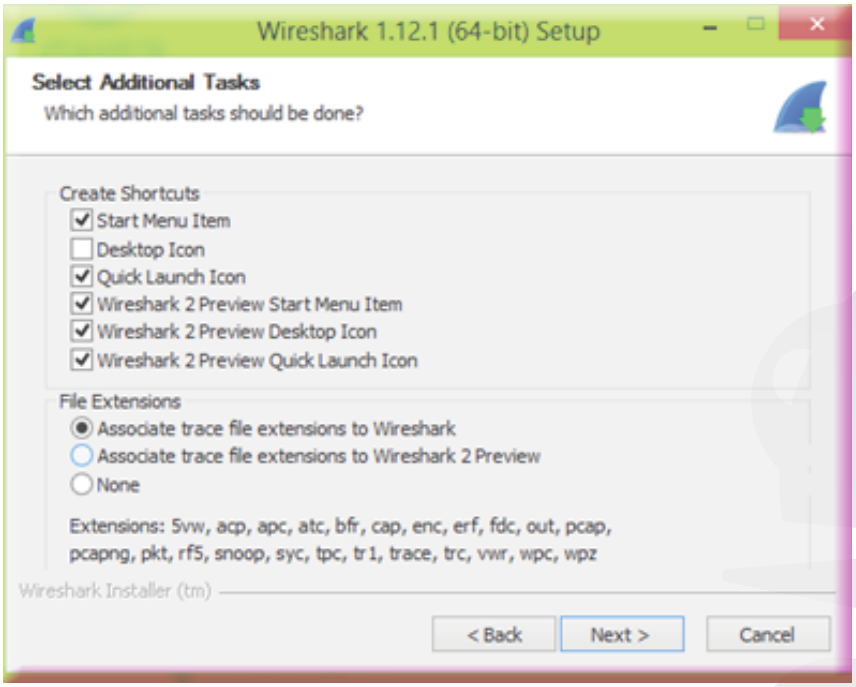


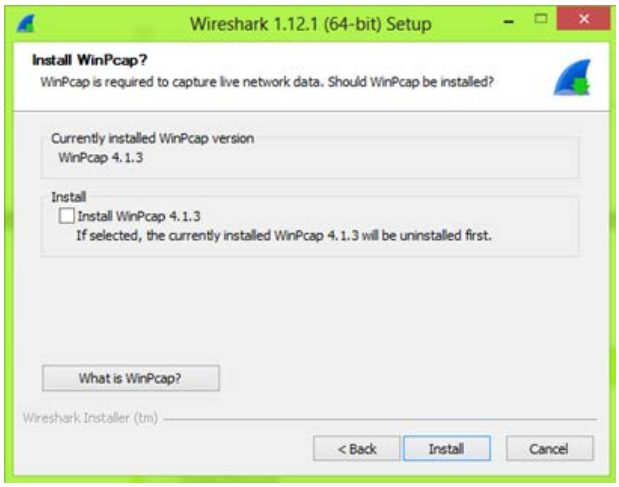


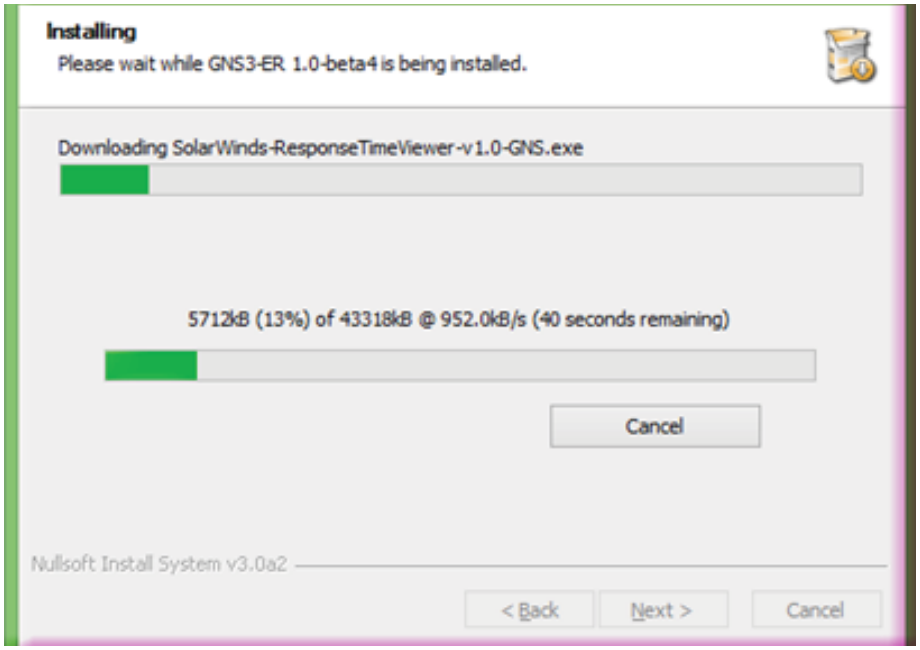






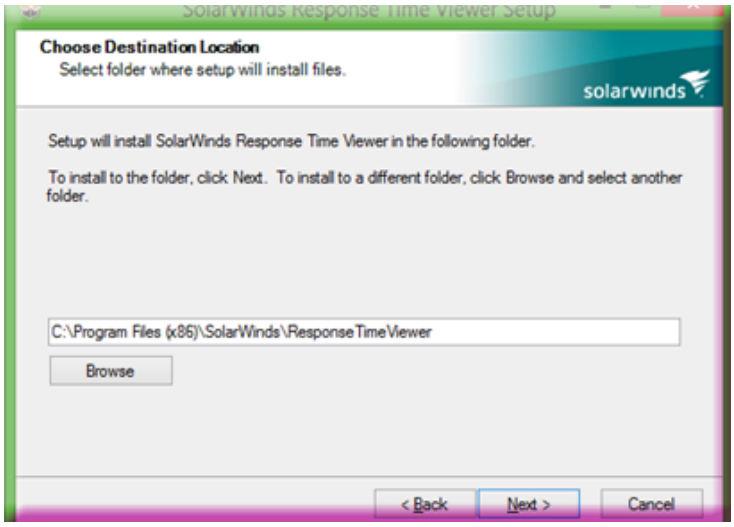


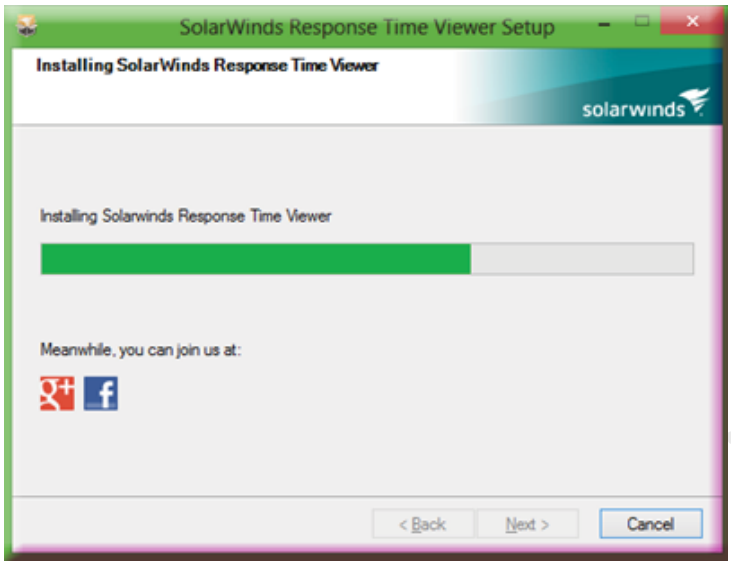


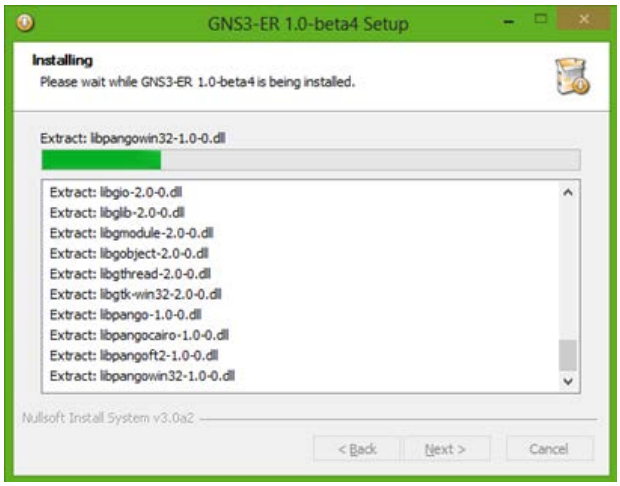


After WireShark, you then get ported to another installer. Only this time, it has SolarWinds Response Timer Viewer! What? Free? Yup!

Enter your best email into the SolarWinds Response Time Viewer install.







Once the installation is completed, you should see a snazzy little icon on your desktop that looks like a blue chameleon.

Click on that and you can now begin configuring GNS3 to include the following:

1. You Cisco IOS image.

2. Where Dynamips is located.

3. Where QEmu is located.

4. Any IOU images.

5. Advanced settings for your ASA security appliance.

6. Advanced settings to point to an IOU license key.

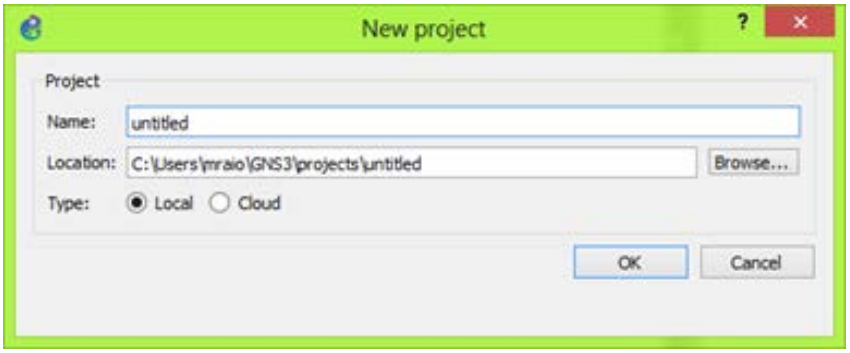
Step 3 – Defining Cisco IOS files

As mentioned earlier, you must provide your own Cisco IOS and IOU image to use with GNS3 due to licensing issues. GNS3 is meant to be used in a lab environment for testing and learning. Once you have obtained your own copy of a Cisco IOS for one of the supported platforms, you are ready to continue.

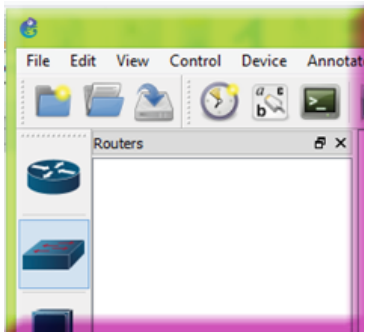
Supported platforms are the following: Cisco 7200, 3600, 3620, 3640 and 3660, 3700, 3725, 3745, 2600 series (2610 to 2650XM & 2691) and 1700 series (1720 to 1760).

If haven't already launched your GNS3 program from the previous step, please do so.

You are presented to create a project by entering a name for the project:



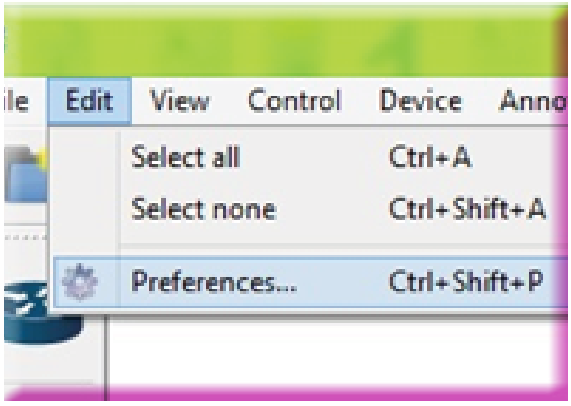
Click on the icon that looks like an Antacid pill, or a blue aspirin. In the networking world, that is the icon used in topologies as a Router or switch.



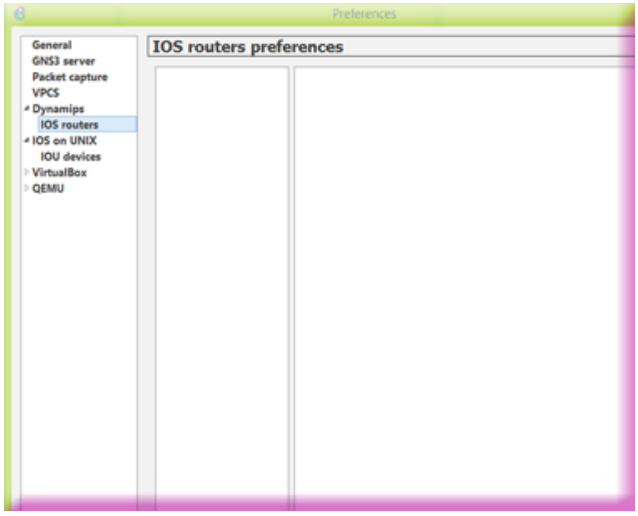
A panel slides open and it is blank. We need to add Router Images first before using the routers.

At this point, suffice it to say, that you would have to know how to obtain a Cisco IOS image. These images are available by contacting a Cisco provider, or if you work with Cisco devices, you can obtain an IOS based on the production machines you have available. You need to be compliant with licensing restrictions. GNS3 Technologies is not responsible for providing you with free IOS images. If you don't have an IOS, I suggest contacting a solution provider of Cisco equipment to get you connected to purchase an IOS.

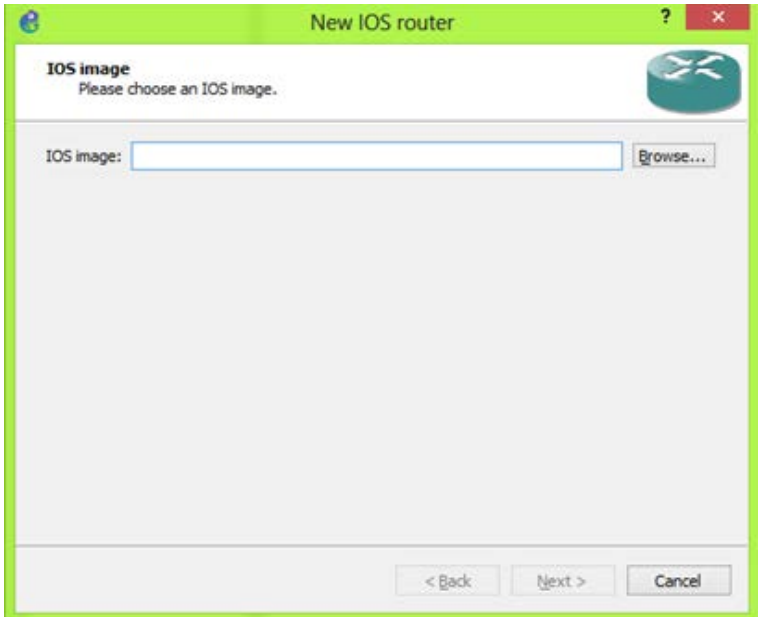
Click on Edit in the upper left hand corner.



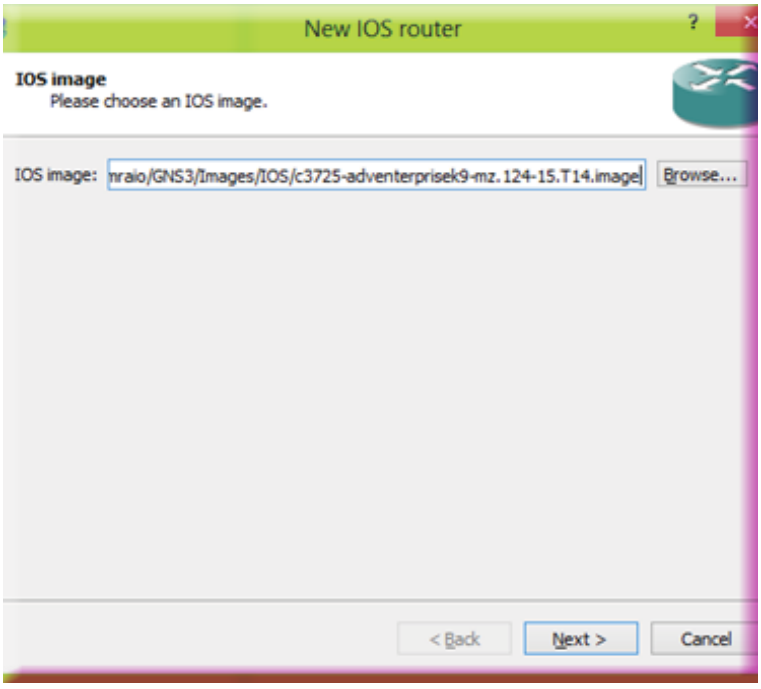
From here, click on Dynamips -> IOS routers



Click on New

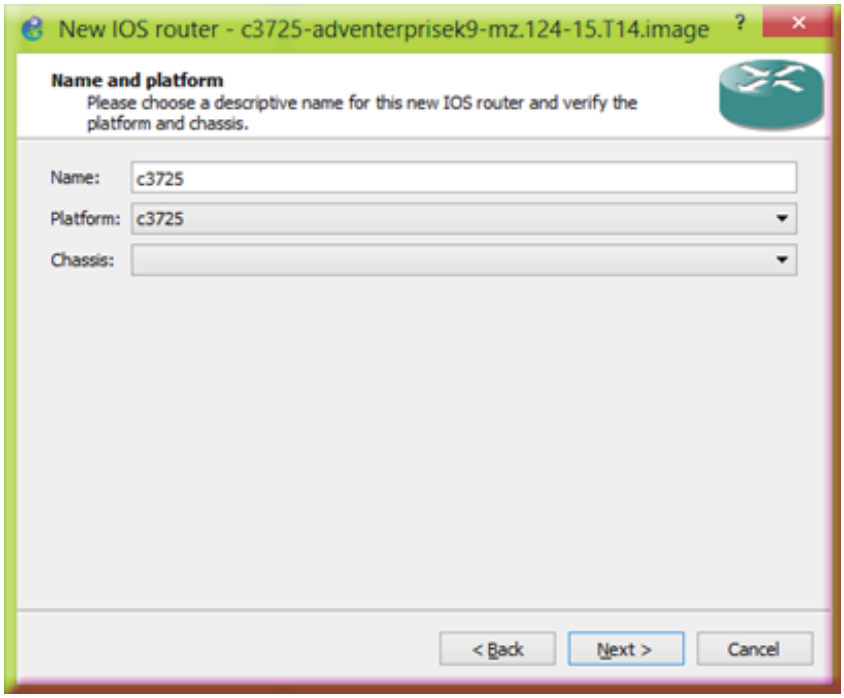


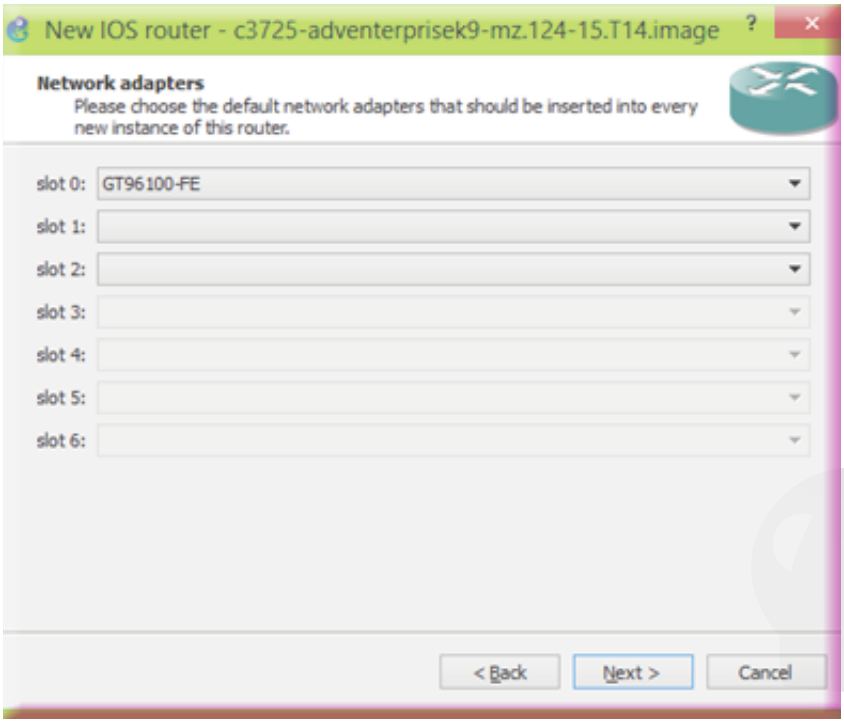
Click on Browse



Click Next

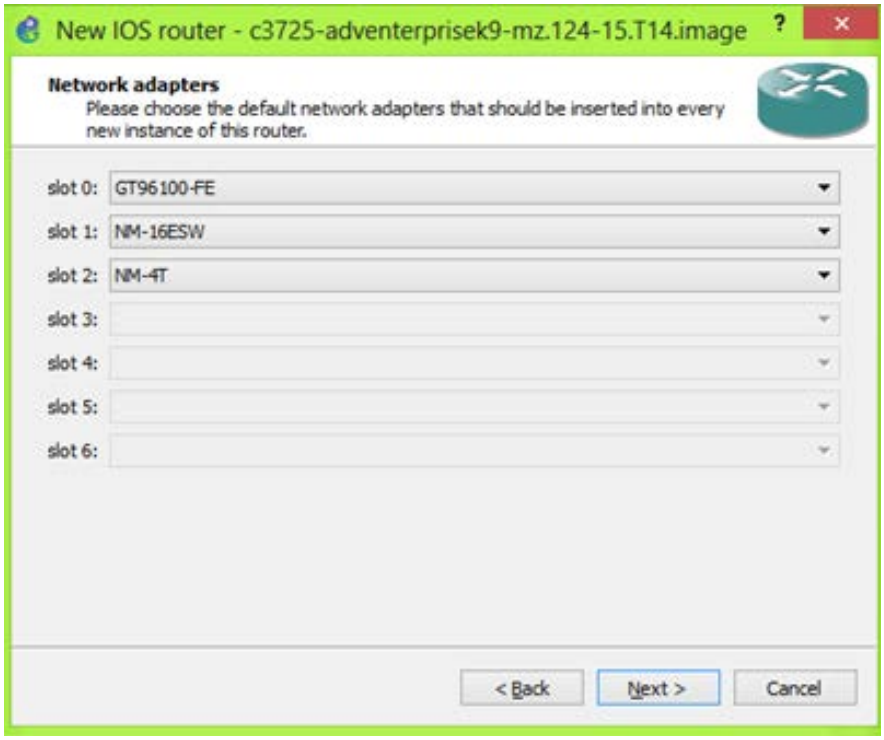
The next screen shows that GNS3 detected the router platform, and named it according to the platform.



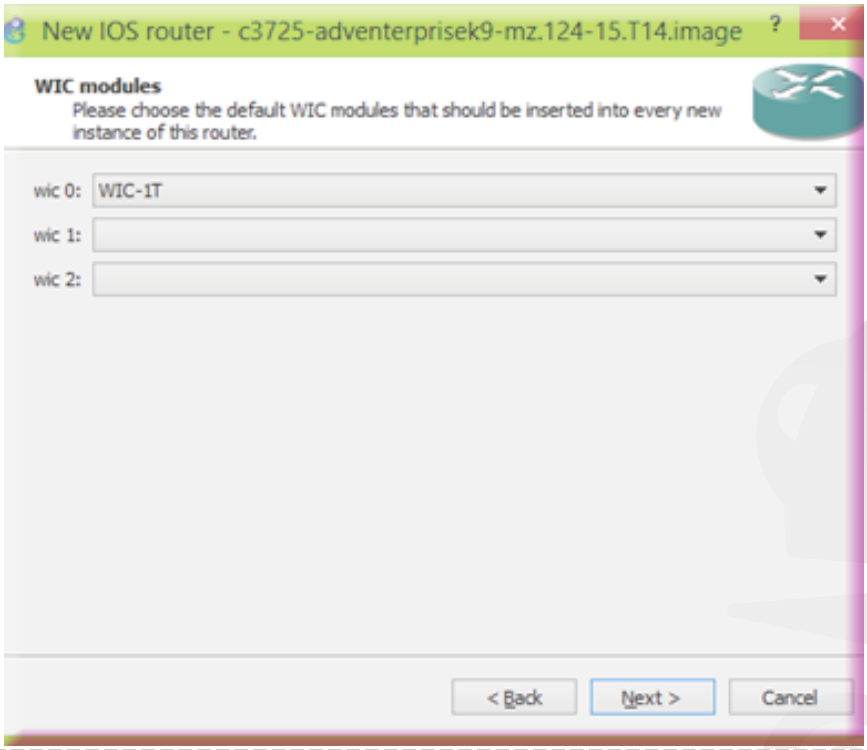


Here is where you can configure your modules. A little comment on Cisco devices, they are modular. Meaning, you can add modules based on what type of network you want. Notice on this

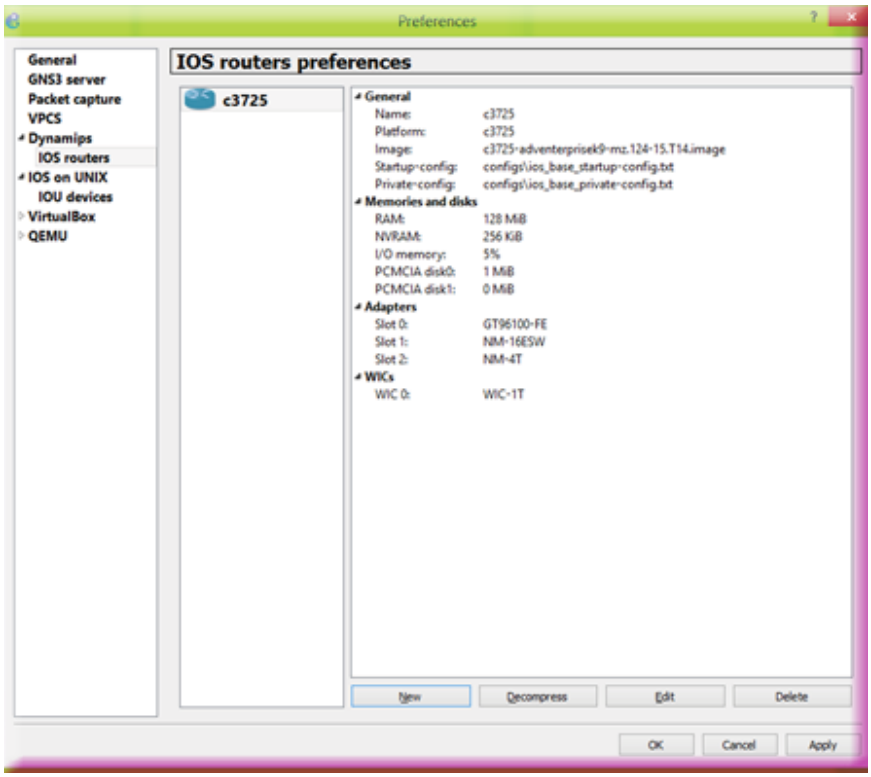
3725 platform, you have three slots. Slot 0 already has a FastEthernet module. You can configure slot 1, to have a 16 port Ethernet switch. Let's do that here. And while we are at it, let's add a serial module as well.



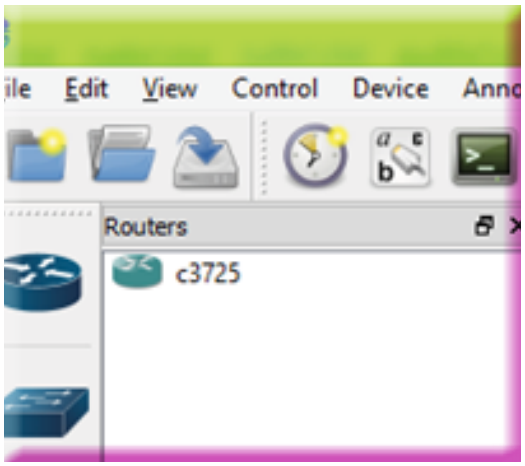
You can also add WIC modules!



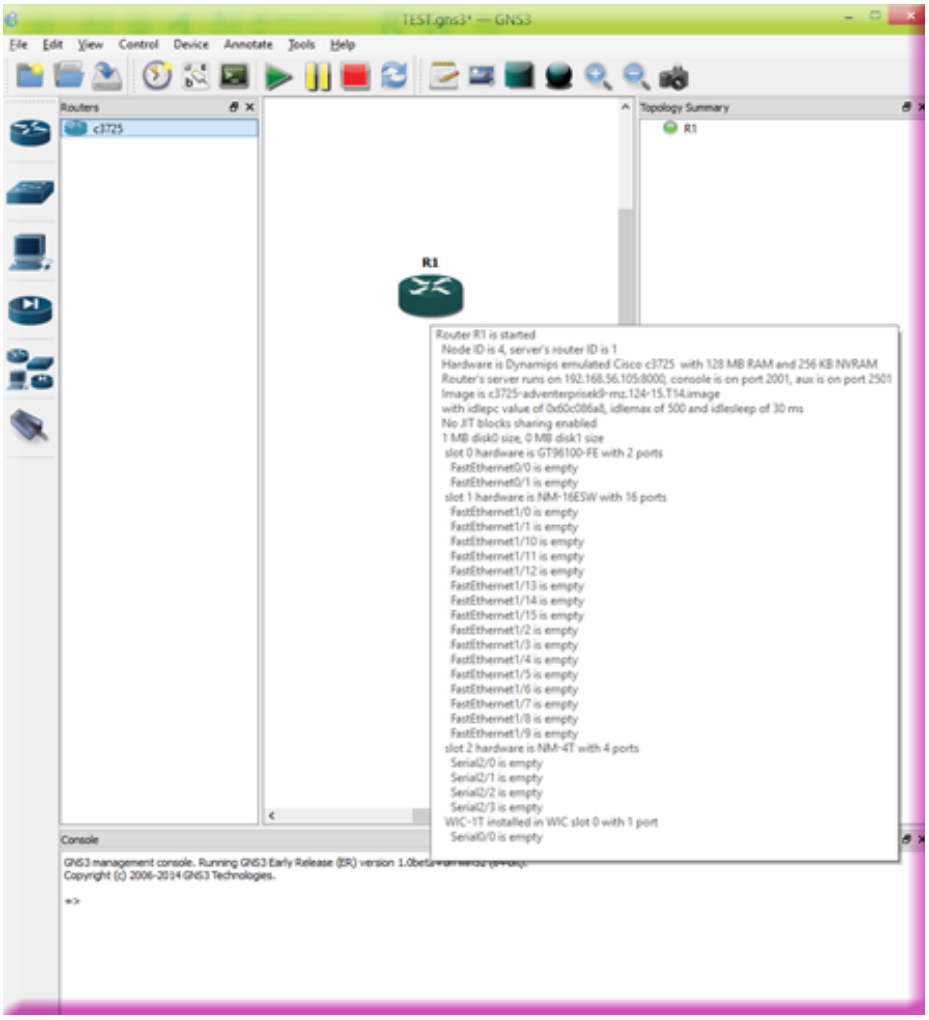
Finally, you can set the IDLE PC setting. It's recommended to leave that. You will now be given a status page summarizing the options selected in the IOS routers preferences.



Hit Apply in the lower right hand corner. Then hit Okay. Now click on the blue aspirin or the Router Icon again.



You now have an available router. Hold down the left mouse button and drag and drop this onto the main panel which is where you will configure your topology.



You now need to start the router by either right clicking on the router and selecting start, or clicking on the right pointing start arrow located in the header area that will then start all devices selected and configured that allow a startup.

Special Tip: In this screenshot, after you moved the Router in the middle pane, which is the topology panel, in the right pane, you see a green light next to R1. That indicates the device is powered on since you can't see the actual device. On that note, if you let the mouse hover over the router, a nice pop up window shows you everything about this router. Use these two items extensively to keep your interfaces connected correctly. At this point the installation is done. You have configured a Router IOS and you have started the device.

If you didn't have an account before, it will prompt you to another page to enter your e-mail address.

You will now have to check your e-mail.

After you have checked your email, you will be prompted for a confirmation.

4 INSTALLATION FOR LINUX USERS

Let's turn our focus to Linux users now. Our examples will use Ubuntu. Anyone can download Ubuntu from www.ubuntu.com for free – it just may take a while since it's a large file. One of the big reasons to download Linux involves performance. Performance is somewhat better in a Linux environment with GNS3. That may sound a bit biased, but another great thing about Linux distributions is they are free and you can create great virtual machines with Linux distros.

Why would anyone want to build a bunch of virtual machines? You can now use the VirtualBox option in GNS3 to run these machines within your topologies! Now that a person is not hampered with licensing issues, learning Linux may prove profitable and worth the time to learn. But if you just don't want to learn Linux, GNS3 Assist understands, and will be implementing a new distro pre-loaded with everything in Linux for our paid support users! For now, you have to have certain skills like how to unpack a tar file (a zipped file). You also have to be real comfortable in reading the READ ME files for each dependent piece of software needed to get GNS3 to work in Linux. Essentially, you are combing the Internet to find all the dependent software that is already bundled in the All-In-One for Windows Installs. In fact, many screens in the Windows installation with respects of how to setup an IOS in GNS is 90 percent the same.

Step 1 – Install GNS3

GETTING STARTED GUIDE

There are two ways to install GNS3. Involving Ubuntu, there is a synaptic package manager that can search for the bundled GNS3 software and you might not have to do an installation from the sources. At the time of this Getting Started Guide, there is no bundle of GNS3. So if you're really into getting the latest and greatest features because you have worked with GNS3 before AND you're pretty good with Linux go ahead and proceed to install GNS3 from the sources.

This option is obtaining the sources and manually unzipping them all, count all the dependencies (bits of software required), and install them from a command line. This option is time consuming and not for the faint of heart.

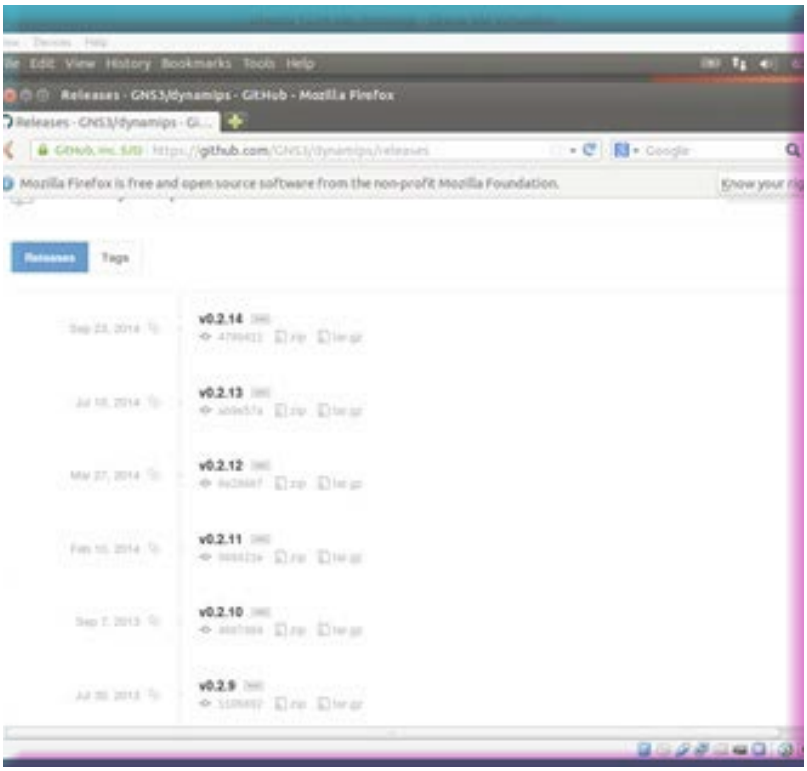
In addition, you would have to be quite familiar spending gobs of time in front of a screen and reading README text files. Linux users are quite adept to that mode. A casual Windows or MAC user may find the following option daunting. Never-the-less, if you want cutting edge builds and new releases, learning to unzip tarballs and getting around a command line will be par for the course. Oh, and you really have to be into reading. Personally, I am NOT into reading.

1 - Install Dynamips

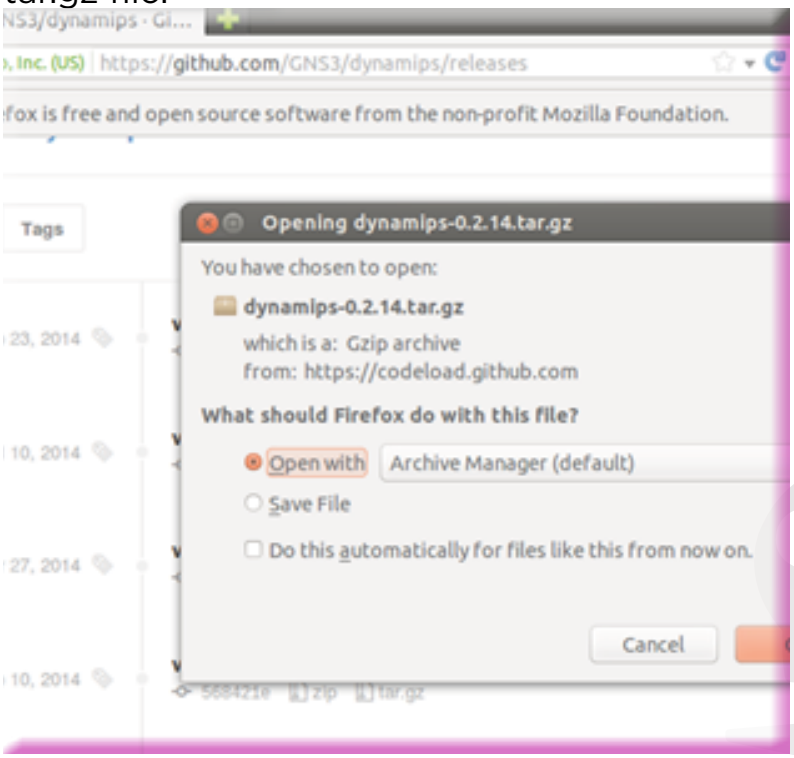
Screenshots are taken off of a virtual machine downloaded from Virtualbox.org.

It's the Ubuntu 13.04 x86 (running) – Oracle VM VirtualBox

Download the Dynamips zip file for the latest release from https://github.com/GNS3/Dynamips/releases

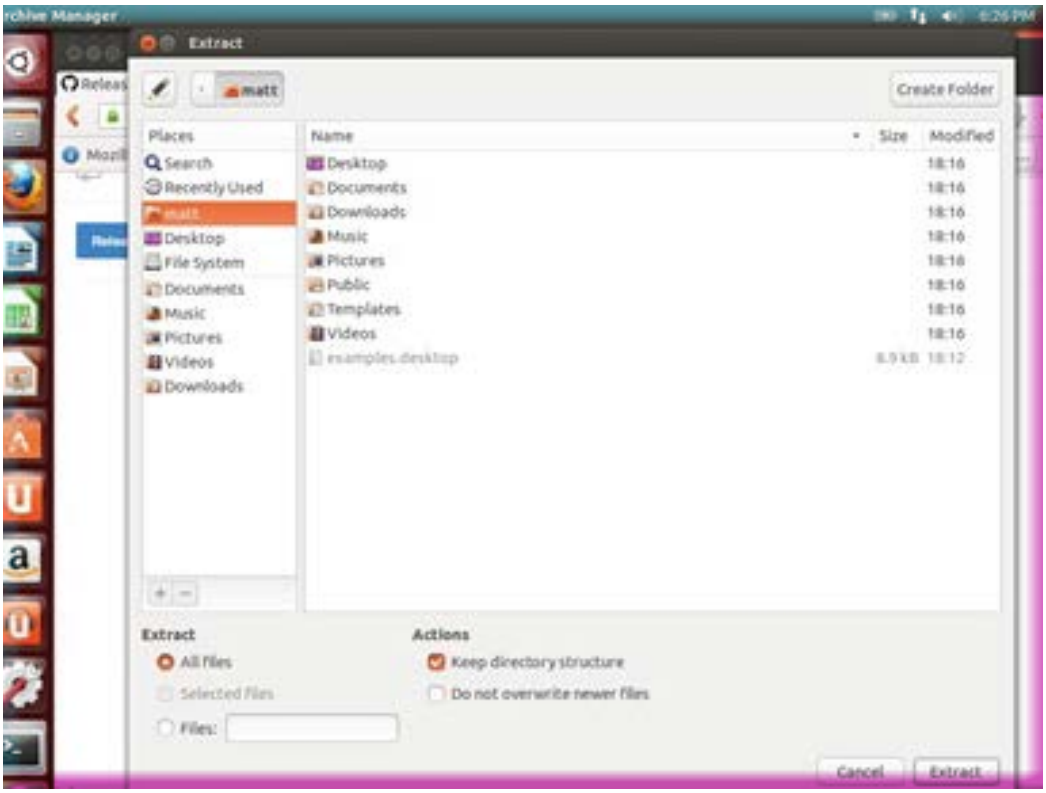


In this screenshot, the v.0.2.14 is dated Sept. 23, 2014. Let's try to download the tar.gz file.

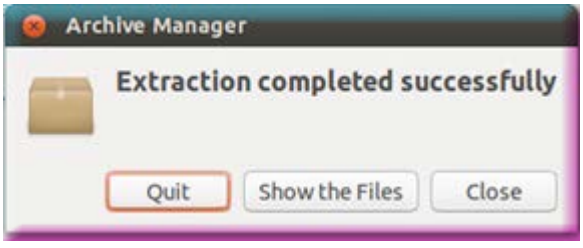


The Archive Manager will open your downloaded zip file. Click Okay.

See where it opened a window? There is an “Extract” button. Click on that.

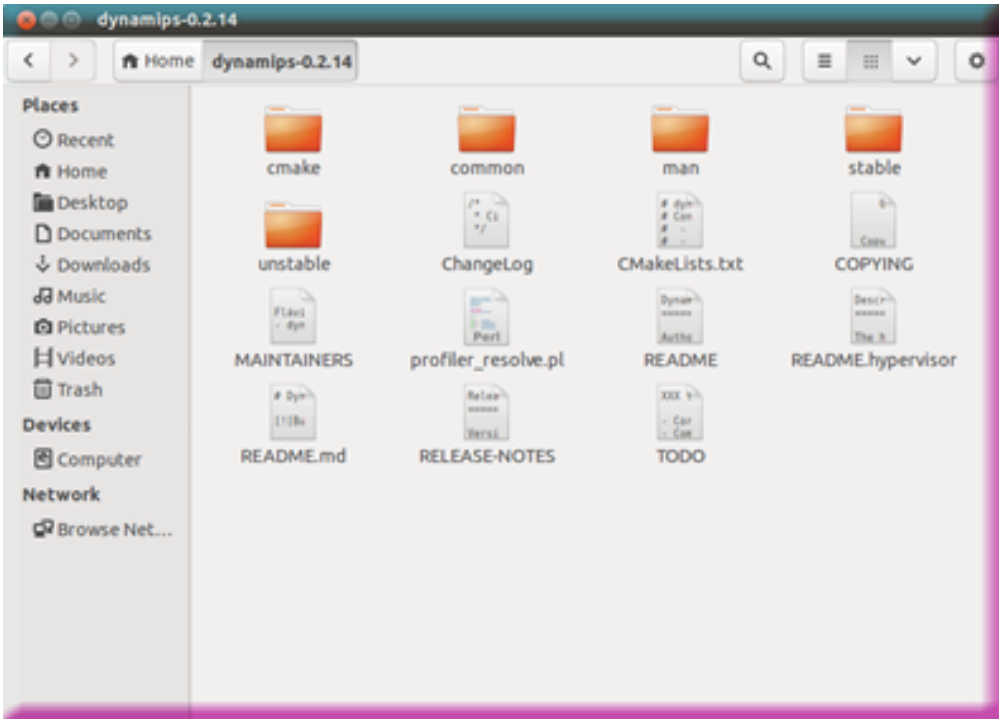


Okay, so my home folder is called matt. Your home folder will be called something else. The point is, when you hit the “Extract” button in the lower right hand corner, the Archive Manager will drop an extracted folder right inside here.



Archive Manager successfully extracted the TARBALL into a folder by the same name. I like to hit “Show the Files” to validate where I put this folder.

At this point, you are looking at the directory of your Home folder. Notice the "Dynamips-0.2.14" folder? That's good. Get used to this, because you are going to be downloading all the dependency software and putting them somewhere to extract them. For the sake of being consistent, just extract the downloaded tarballs in one place. You will be navigating in the terminal to this directory and creating temporary directories and unzipping using different commands. First, let's get familiar with some of the files downloaded in Dynamips:



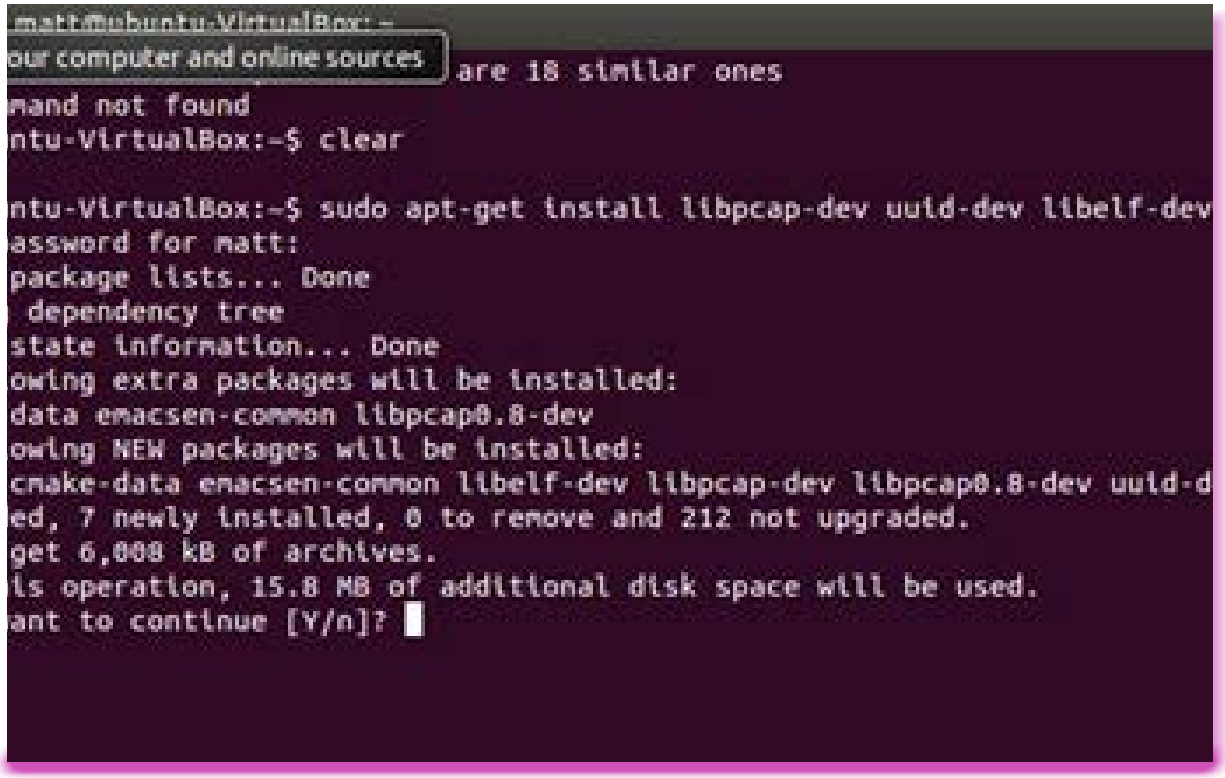
Here are the files used to install Dynamips. I am not going into all the folders and files. I just wanted to point out the README file. If you ever get lost in your steps installing dependencies, use the README file to get direction on what you need to do for each install. Now let's move on with the dependencies installation.

Install Dynamips Dependencies

From this point, if you copy and paste these commands, you should get results:

$ **sudo apt-get install libpcap-dev uuid-dev libelf-dev cmake**

The last command goes out and obtains a package called libpcap-dev, uuid-dev libelf-dev and installs it into cmake.



Before executing the command, you will be prompted with a password for the admin user. In this example, matt has a password. The password was entered and the command executed.

The command found cmake-data, emacsen-common and libpcap0.8-dev. Then it shows the new packages to be installed. Ultimately, it will ask for confirmation before performing the update. Type “Y” and press Enter.

If you run into any issues and the packages are not available in the Ubuntu archive, the README file will point you to the actual location of where to download each and every dependency and install that into your Ubuntu.

And just like cooking shows where there is a dutch oven off camera, with a perfect lavender-infused beurre blanc; voila! All Dynamips dependencies are installed. Now it’s time for Dynamips.

Now let's install Dynamips itself.

$ **unzip Dynamips-x.zip**

$ **cd Dynamips-x**

$ **mkdir build**

$ **cd build**

$ **cmake ..**

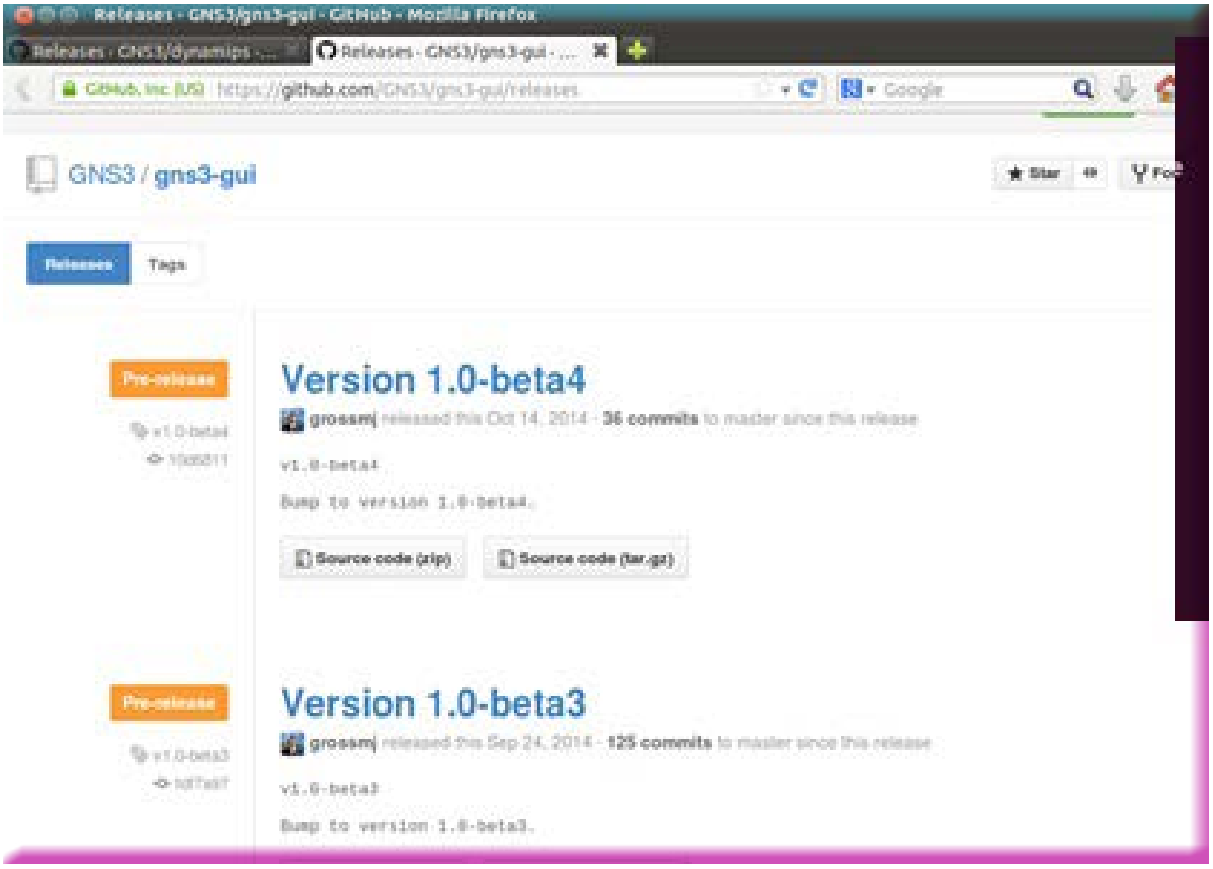
$ **make**

$ **sudo make install**

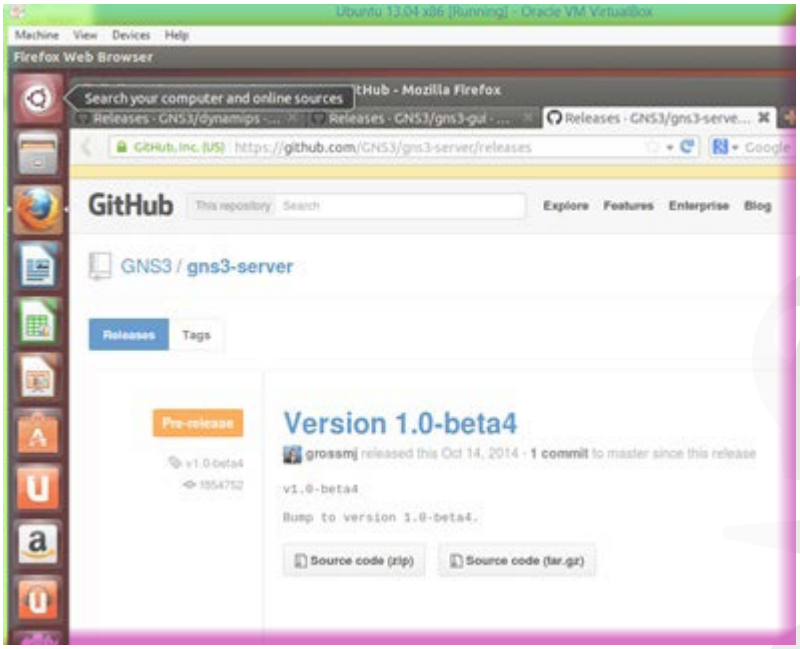
Get all that? Good! Now let's move on to installing GNS3.

2 Install GNS3

Download both the GNS3 GUI and server zip files for the latest release respectively from https://github.com/GNS3/gns3-gui/releases and https://github.com/GNS3/gns3-server/releases



The screenshot above is the location of the gui release.



And the location above shows the gns3-server release. Pay attention to the actual build number. That is going to be needed for some of the following commands.

Install more dependencies

$ **sudo apt-get install python3-setuptools python3-pyqt4 python3-ws4py python3-netifaces python3-zmq python3-tornado**

Then install the GNS3 GUI and GNS3 Server.

$ **unzipgns3-server-x.zip**

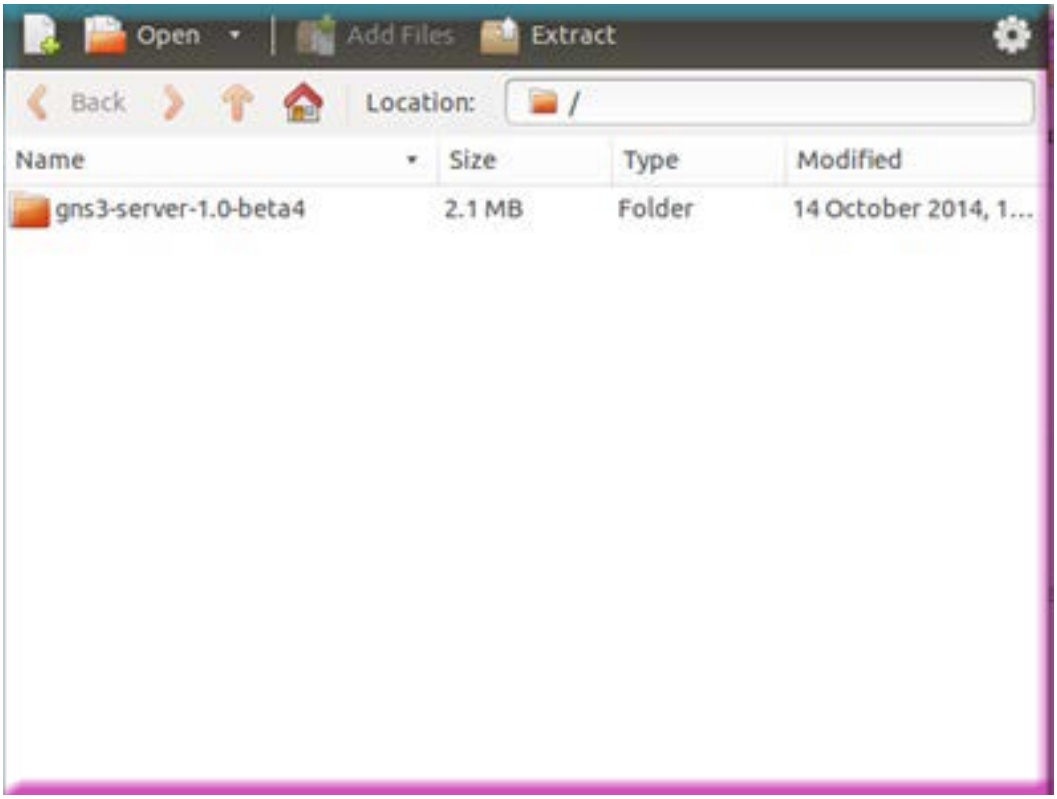
$ **unzip gns3-gui-x.zip**

To complete the install, run the GNS3 setup script for each application. This step requires elevated root level privileges, so have your root password handy. Start with the GNS3 server.

$ **cd gns3-server-x**

$ **sudo python3 setup.py install**

Where ‘x’ represents the build you downloaded (see screenshot for example)



Next, install the GNS3 GUI application.

$ **cd gns3-gui-x**

$ **sudo python3 setup.py install**

Important: As already stated above, ‘x’ should be replaced by the version number.

If you have any questions, please post a discussion in the new Community Portal now that you have a snazzy new account.

Here is a quick note about the history of GNS3. It is the "love child" of many contributors over the years to which we here at GNS3 Technologies are extremely grateful for. Having said that, in regards to older versions of GNS3, it's totally possible to install an older version of GNS3 and create topologies right away. However, if you want to tap into the new features with 1.0, you will want to get involved in our community portal and also read up on the new documentation geared for this major release. This document is intended to serve the new community portal in connection with the new GNS3 1.0 release.

3 – Configuring GNS3

So whether you are a Windows, Mac, or a Linux user, please continue to the next document for creating a simple topology. We have often used screen shots from Windows when describing GNS3 usage, but the screen shots from Linux would look identical except for the title area.

In this getting started guide, it is intended to cover all types of GNS3 installs. As a Linux user finishes this document, he or she will have now effectively completed what the Windows All-In-One Installer did. At this point, all users both Windows and Linux users will be learning the same steps in creating simple to complex topologies to help you understand deep networking concepts, or to improve your value and impress your boss. Whatever the motivation, we are here to help and look forward to working with you in our community.

5 INSTALLATION FOR MAC USERS

This section will walk you through the steps to get started with GNS3 in a MAC environment.

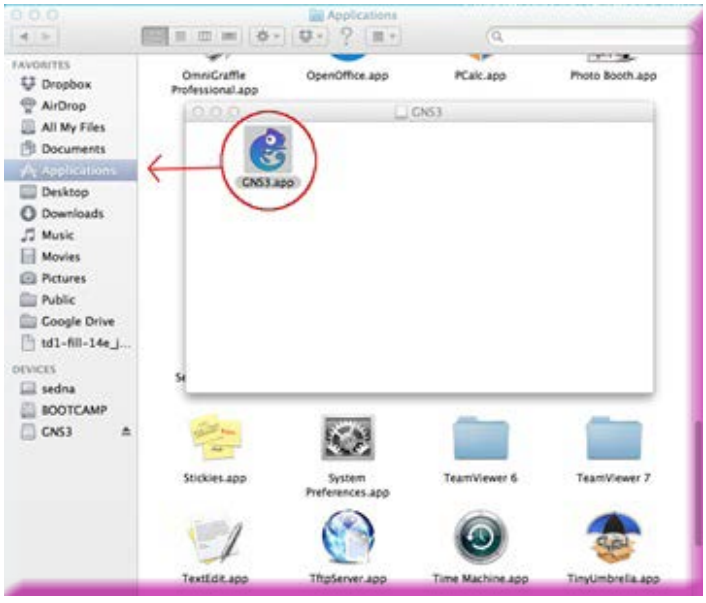
Step 1 – Download GNS3

The MAC installer is pretty painless. You locate a copy of GNS3 from our website for MACs.

Step 2 – Install GNS3

A downloaded MAC file will have the DMG package.

- Enter “Command + N”
- Go to your Application Folder
- and drag the DMG file to the “Applications” area within your MAC



Once the GNS3 Icon is available in your Application Folder, you can now drag that Icon to your Dock for ease of launching GNS3.

NOTE: On older versions of GNS3, there will be a note that this DMG package depends on Python 2.7.x.

A newer version of Python is not backward compatible. Check your MAC to

6 CREATING THE SIMPLEST TOPOLOGY

We describe how to build a more complex topology later, but for now, let's just learn how to:

- Place one router on the desktop,
- Start it, and
- Console into it.

This is a very important step. When an IOS is running, it will consume up to 100% of your CPU time. This will cause your computer to become very sluggish and will prevent building more complex topologies.

However, if we use an idlepc value, we can reduce CPU usage dramatically. It puts the IOS into a sleep state when it is not in active use and wakes it up only when it is necessary. A more technical explanation will be given later.

The GNS3 window is divided into four panes by default. The left-most pane lists the types of nodes available. You will see router icons for the various platforms: PIX and ASA firewalls, Ethernet switch, ATM Bridge, ATM switch, Frame Relay switch, Cloud, Qemu and VirtualBox guests etc.

The right-most pane will provide a topology summary that will be better understood when we built more complex topologies. For now, just know that the pane exists.

The middle section contains two panes. The top pane is your work area where a topology may be graphically built. The bottom pane, called the Console, shows Dynagen at work. Dynagen, as you recall, is the text-based front end to

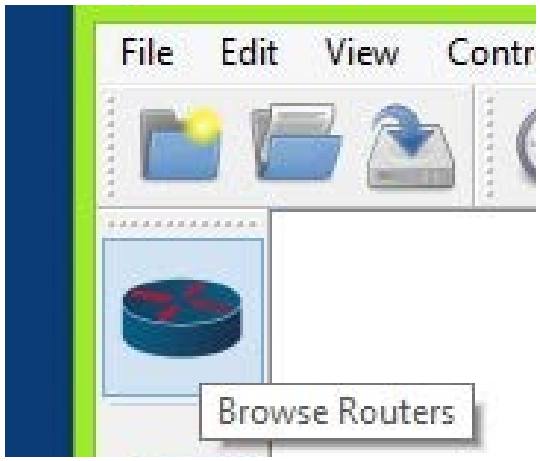
Dynamips. It is the core emulator being used. Learning how to use Dynagen is like learning how to use DOS the first time, so we will not get into that here. However, we will use a very few simple but useful commands in the Dynagen pane.

6.1 Configuring a router

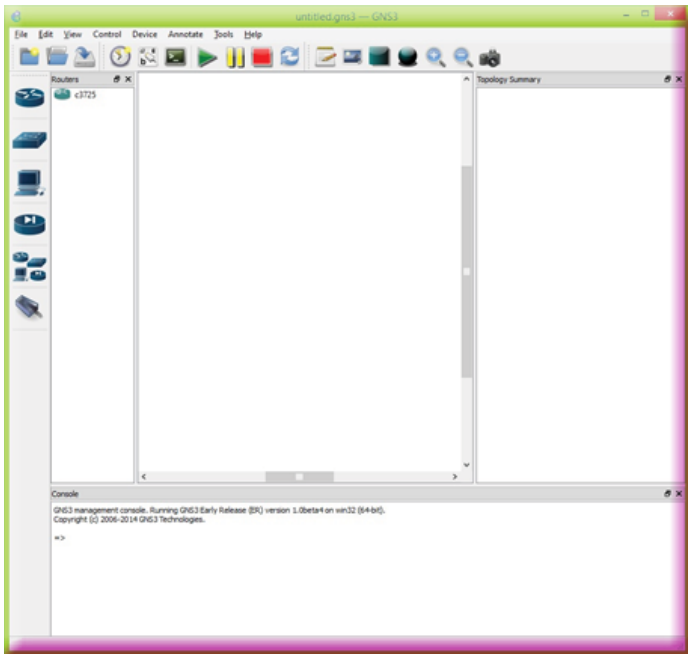
Click on a router icon under Nodes Types corresponding to the IOS platform you are using. In our example, we are using a 3725 platform. Drag an appropriate router node type over to the workplace pane in the middle and let go. We now have a router ready to configure.

First Browse for your router

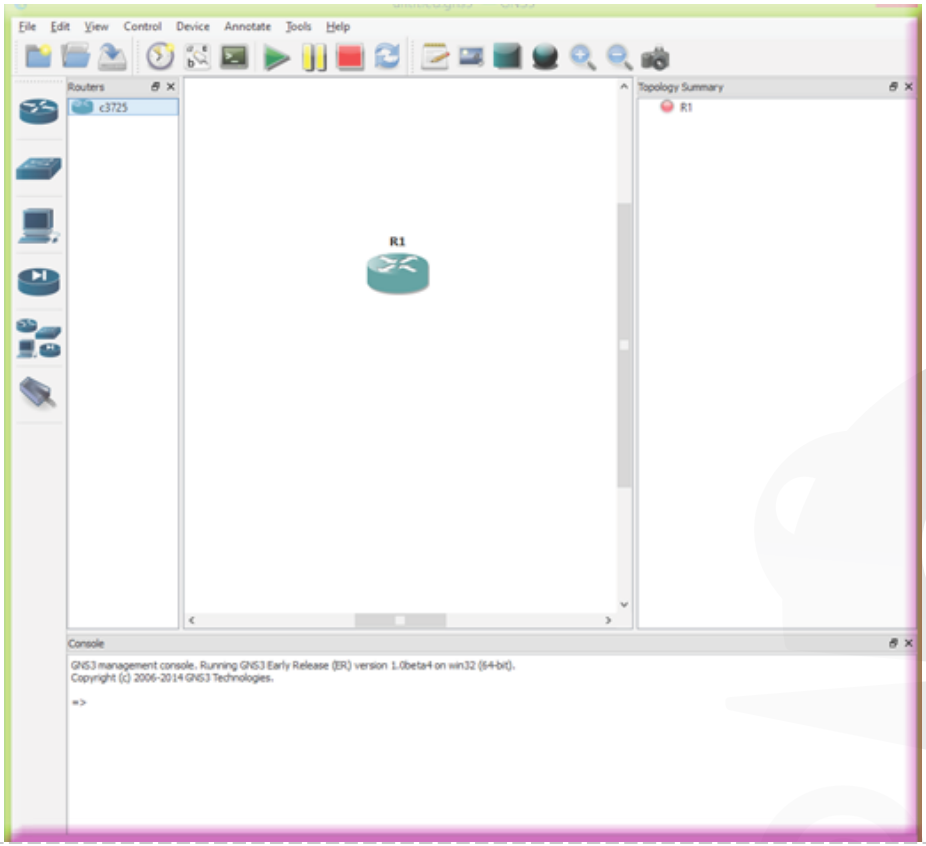
Left click on the Router Icon



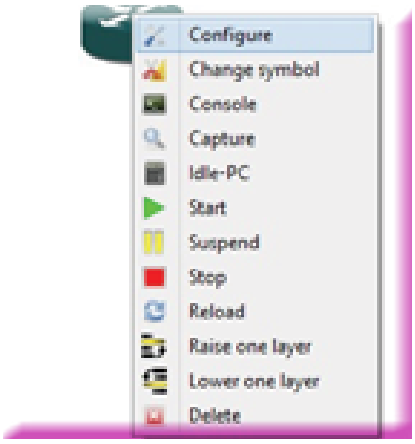
A panel will slide out from the left side.



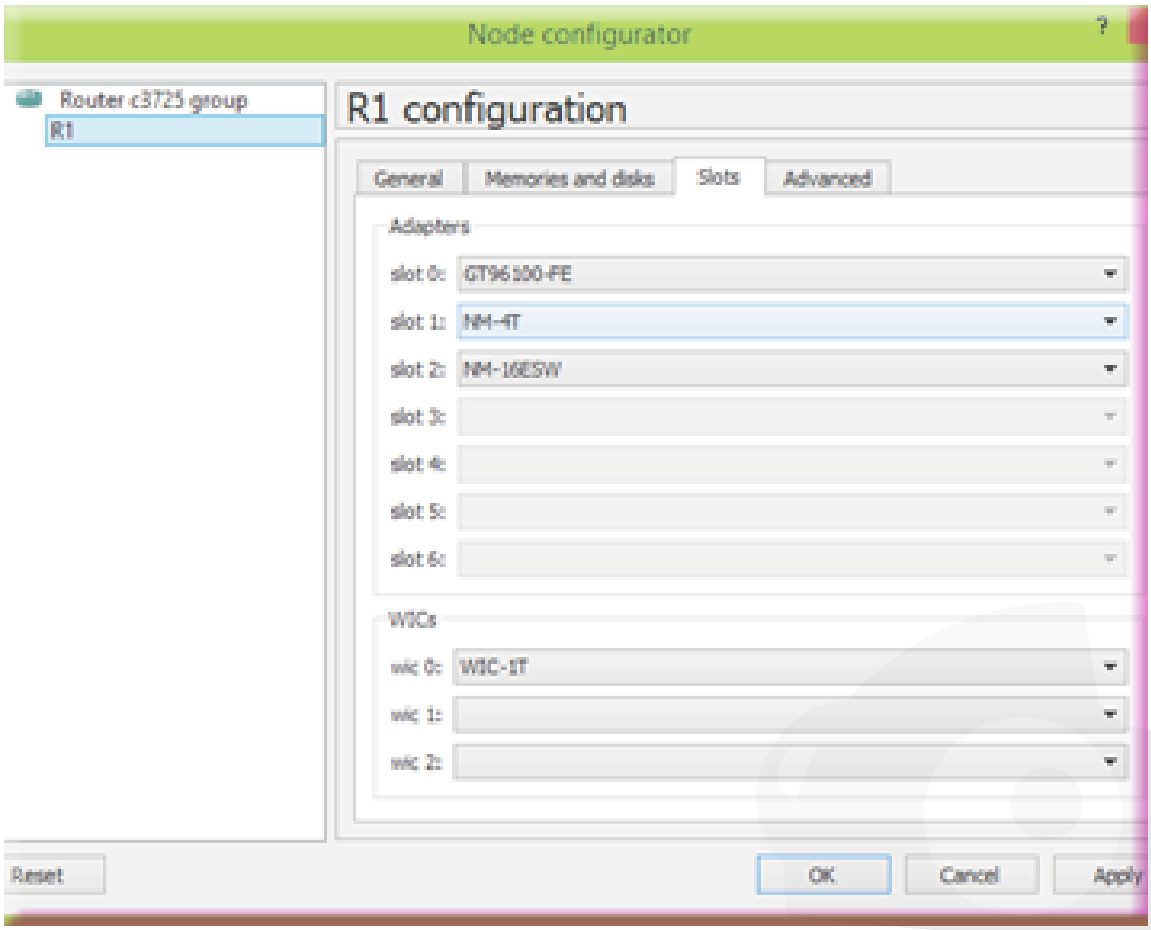
Move your mouse over the new Router labeled “c3725”. Hold down the left mouse button and drag and drop it into the center panel. The center panel is your “topology” panel. The router should be in the topology panel.



Right-click the router and choose configure.



Click on R1 and then the Slots tab.



Click the drop-down arrow next to slot0 and choose an adapter that includes FE in its description.

This will add a FastEthernet adapter to the router.

Next, click the drop-down arrow next to slot1 and choose NM-4T and NM-16ESW The NM-4T installs SERIAL connections and the NM-16ESW sets up a 16 port Ethernet switch module.

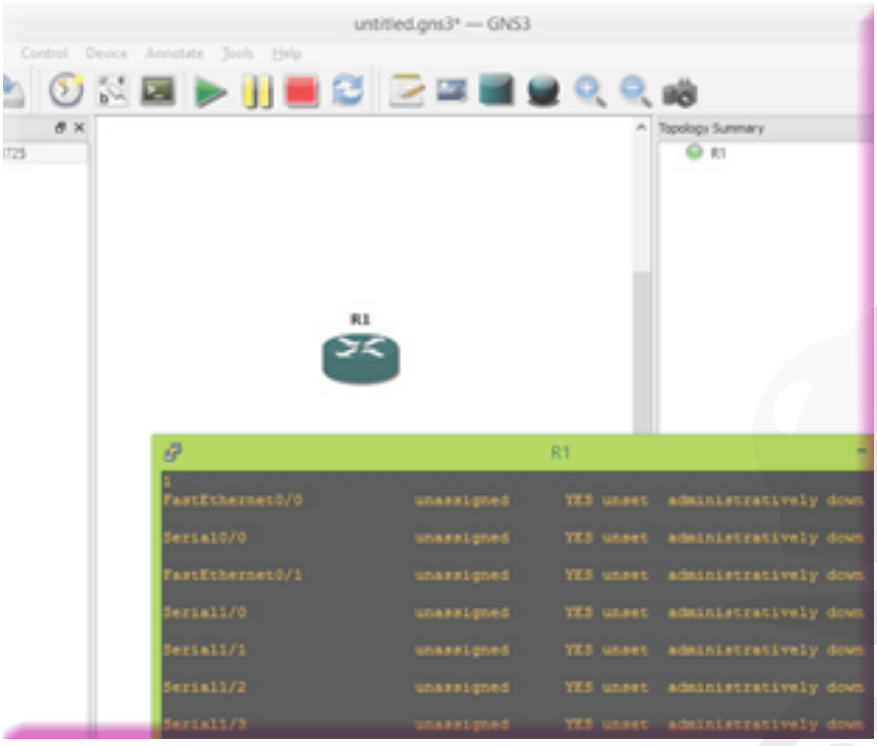
Click OK

On the Topology panel, right-click the router and choose Start.

The router starts up and goes into a boot process.

Right-click the router again and choose Console. A Putty console opens up.

You may need to press enter once initially in the console window. After a few seconds, your virtual router should have started.



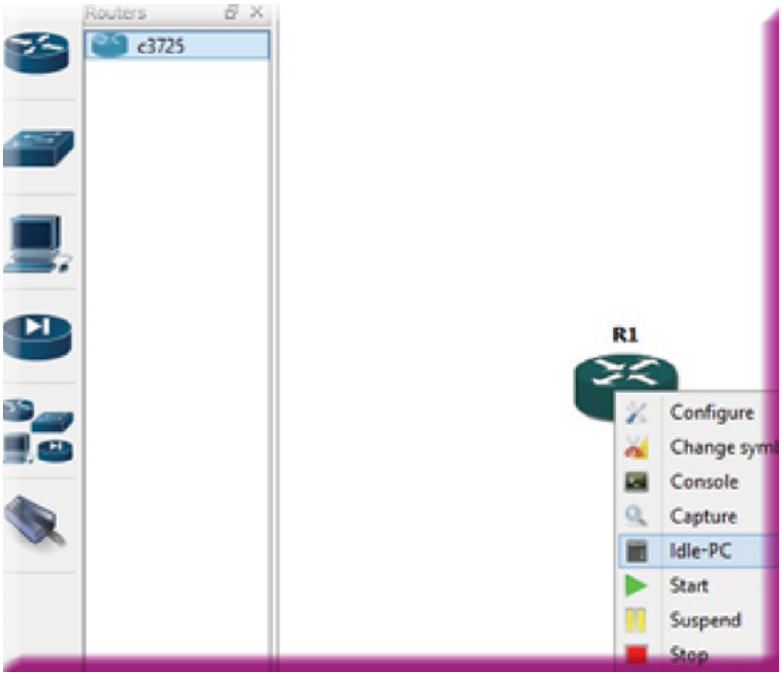
6.2 Apply an idlepc value

Now it's time to choose an Idle-PC value. The "Idle-PC" command performs analysis on a running IOS to determine the most likely points in the code that represent an idle loop in the IOS process. Once applied, Dynamips "sleeps" the virtual router occasionally when this idle loop is executed. This significantly reduces CPU consumption on the host without diminishing the virtual router's capacity to perform real work.

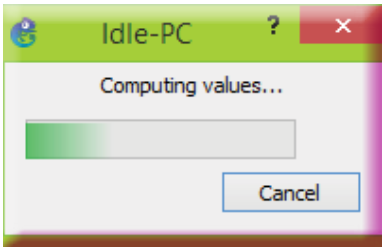
Now be sure you can see the prompt of your router in the Putty window. Finding the right Idle-PC value is a trial and error process, consisting of applying different values and monitoring the CPU usage. Best Idle-PC values are usually obtained when IOS is in idle state, the following message being displayed in the console: Hostname con0 is now available ... Press RETURN to get started.

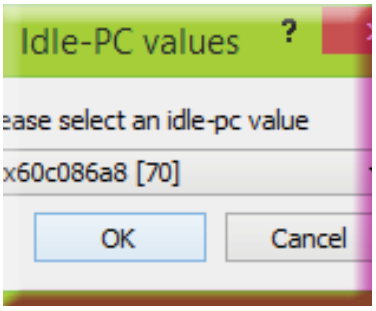
Right-click R1 and choose Idle PC.

GNS3 will spend a moment calculating an Idle-PC value before presenting the screen to the right. If you click the drop-down arrow, you see a list of possible Idle-PC values. Potentially, better Idle-PC values are the ones with the highest values between the brackets. Choose one of the values with an asterisk (in our example, we will choose number 1) and click OK.



Choose one of the values with the highest number and click OK.





Once you click ok, the value chosen will be used for that router.

You may repeat this process to find the value that reduces CPU usage the most, but this time use the Apply button so you can instantly see the effect of an Idle-PC value while observing the CPU usage.

To observe CPU usage in Windows;

- Press Ctrl+ALT+DEL and choose Task Manager.

- Click on the Performance tab to view CPU usage.

NOTE: In Ubuntu, choose System Monitor under Administration on the System menu. Click the Resources tab.

You will observe that without an idlepc value, CPU usage will be at or near 100%, but with an idlepc value, CPU usage will drop to a very low value.

Enjoy using your router!

You may now return to your Putty window to use your router. You are actually running the Cisco IOS that you chose.

Please note that Idle-PC values are particular to an IOS image. They will be different for different IOS versions, and even for different feature-sets of the same IOS version. However, Idle-PC values are not particular to your host PC, operating system, or to the version of Dynamips that GNS3 is using. It is possible that Dynamips will not be able to find and Idle-PC value for an image, or that the values it does find do not work. If this happens, try repeating the process again.

All commands supported by the IOS are available. Remember earlier we chose a FastEthernet adapter and a four-port serial adapter. If you issue the show ip interface brief command as shown, you'll see the designations for these four ports on the router. In our example, they are fa0/0, s1/0, s1/1, s1/2, and s1/3 (in abbreviated form).

Ok but a single device is not so useful to create a virtual network! Let's build a more complex topology. From this point, you are now ready to look at other Cookbooks and forum discussions tailored to specific topologies and routing protocols. Happy Hunting!

Although a single router is useful to get familiar with commands, it would be nice to build more complex topologies.

With GNS3 very complex topologies may be built. Just as performance when running virtual machines within VMware or Virtual PC depends on your computer resources, running many router instances will affect the performance of your computer. The faster your CPU and the more RAM that you have, the better. However, IDOL PC does a lot to help with CPU usage. Ghostios and Sparsemem are two additional utilities that will help with RAM usage. Ghostios is enabled by default in GNS3. These will be discussed in detail in the section on Memory Usage. As an example, with 2 Gigabytes of RAM and a 2.5 GHz processor, you should have no problems running a lab with good performance with a half a dozen routers and several workstations.

6.3 Creating the topology

Let's build the topology shown with three routers.

- Start GNS3

- Drag three routers (here we are using Router c3640) running an IOS you have configured into the workspace.

  Select the 3 routers, right-click and choose Configure.

- Click on Routers c3600, and then the Slots tab.

- Choose a NM-4T serial adapter for slot0. This should have configured a NM-4Tnetwork module in slot0 for all the routers.

Now we're ready to connect the routers together. Click the Add a link button on the toolbar at the top. Choose Manual from the drop-down menu. Your cursor will change to a cross, and the icon will change to a red stop sign with an X.

- Click on R1 and select s0/0.

o Slide your mouse over to R2, and then click on R2 and select s0/0.

o Click on R2 again and select s0/1. Slide your mouse over to R3,

o Click on R3 and select s0/0.

Now click the Add a link button again. (It looks like a red Stop sign with an X. After clicking on it, the icon will change back to a connector look.

6.4 Starting the routers

Notice the right-pane called Topology Summary. Your connections are now available for viewing by clicking the plus next to each router.

GNS3 gives each router a default name beginning with R (#). If you would like to change the router name, right-click on a router and choose change the Hostname. For this example, we will continue to use the default names.

The links are all red. Let's start the routers by clicking the Start/Resume all devices button on the toolbar. A box will pop up indicating the routers are being started, and the links will turn green. If we click the Console to all devices

button, we may observe the boot-up process of each router. A separate console window will open for each router.

6.5 Configuring the routers

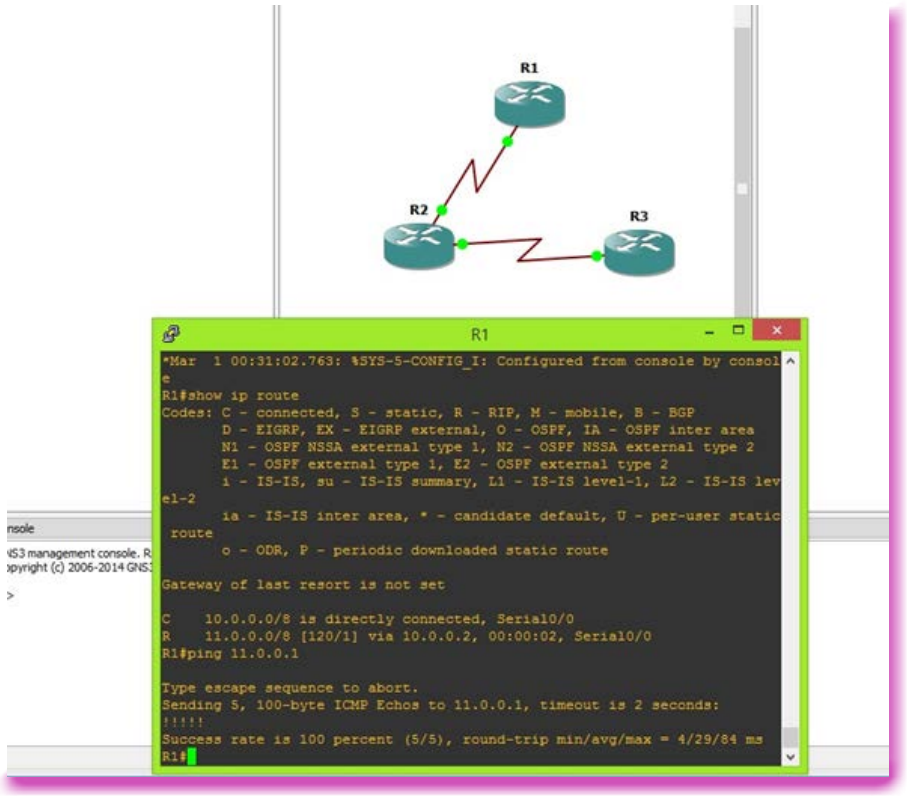
You may now configure each router. In our example, we will assign IP addresses, enable RIP (a routing protocol) and finally test connectivity by using pings.

- **R1>en**
- **R1#conf t**
- **R1(config)#int s0/0**
- **R1(config-if)#ip add 10.0.0.1 255.0.0.0**
- **R1(config-if)#no sh**
- **R1(config-if)#router rip**
- **R1(config-router)no auto-summary**
- **R1(config-router)version 2**
- **R1(config-router)network 10.0.0.0**
- **R1(config-router)exit**
- **R1(config)#exit**

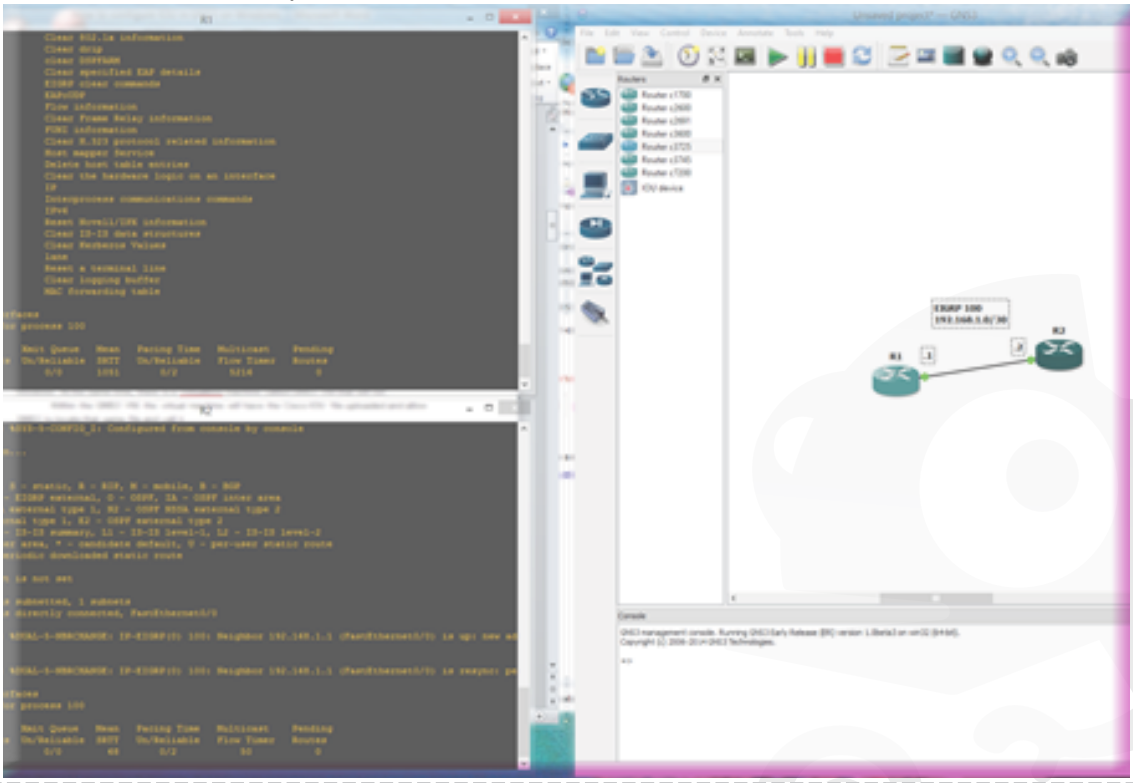
- R2>en
- R2#conf t
- R2(config)#int s0/0
- R2(config-if)#ip add 10.0.0.2 255.0.0.0
- R2(config-if)#no sh
- R2(config-if)#int s0/1
- R2(config-if)#ip add 11.0.0.2 255.0.0.0
- R2(config-if)#no sh
- R2(config-if)#router rip
- R2(config-router)no auto-summary
- R2(config-router)version 2
- R2(config-router)#net 10.0.0.0
- R2(config-router)#net 11.0.0.0
- R2(config-router)#exit
- R2(config t)exit

- **R3>en**
- **R3#conf t**
- **R3(config)#int s0/0**
- **R3(config-if)#ip add 11.0.0.1 255.0.0.0**
- **R3(config-if)#no sh**
- **R3(config-if)#router rip**
- **R2(config-router)no auto-summary**
- **R2(config-router)version 2**
- **R3(config-router)#net 11.0.0.0**
- **R3(config-router)#exit**
- **R2(config t)exit**

As you can see, R1 can ping R3 which verifies connectivity from end-to-end. You may also see that R1 has the 11.0.0.0/8 network in its routing table.



Another simple topology shows two 3725 emulators with EIGRP configured with a 192.168.1.0/30.



7 USING TERMINAL PROGRAMS WITH GNS3

By default, GNS3 uses Putty on Windows, xterm on Linux and Terminal on Mac OS X. But if using Windows for instance, you may prefer to use TeraTerm or SecureCRT (used in CCIE labs). Just download the terminal program you prefer and install it on your computer.

Inside GNS3, choose Preferences under the Edit menu.

Choose General in the left panel then terminal settings.

To save you time, GNS3 comes with pre-configured terminal commands. When choosing one of those pre-configured terminal commands, your detailed commands will appear in a box when you launch the terminal program. What this does is allow you to adjust, if necessary, the commands that point to the location where the program is installed.

The current pre-configured terminal commands are:

- Putty (Windows 64 bits)
- Putty (Windows 32 bits)
- Putty (Windows, included with GNS3)
- SecureCRT (Windows 64 bits)
- SecureCRT (Windows 32 bits)
- TeraTerm (Windows)

- Telnet (Windows)
- xterm (Linux/BSD)
- Putty (Linux/BSD)
- Gnome Terminal (Linux/BSD)
- KDE Konsole (Linux/BSD)
- Terminal (Mac OS X)
- iTerm (Mac OS X)

Please note that since Windows Vista, the telnet client is not automatically installed as in previous versions of Windows. To activate it, click on the Start sphere and choose Control Panel.

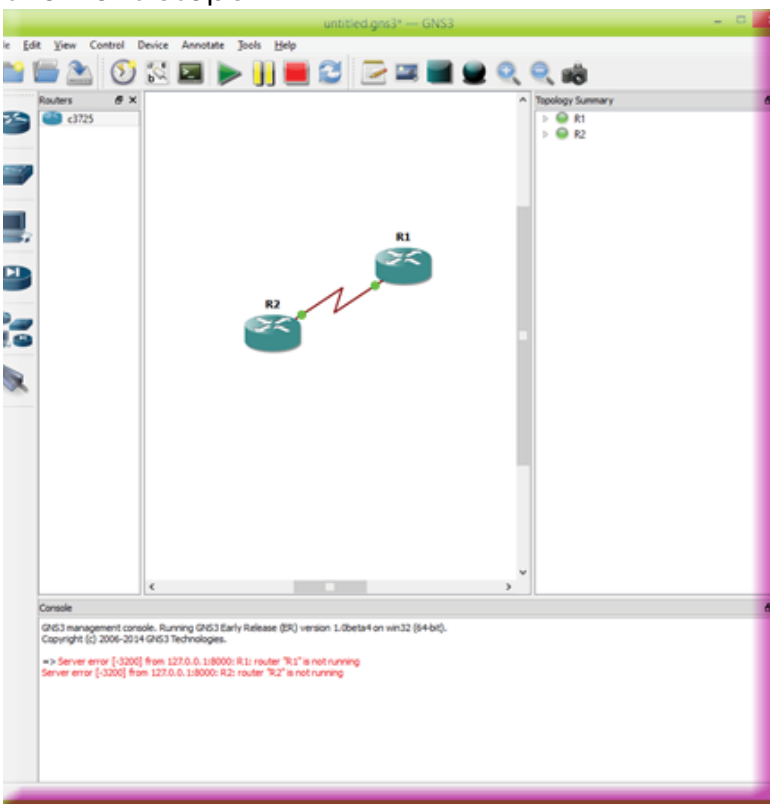
- Click on Programs.
- Under Programs and Features, click on Turn Windows features on or off.
- Click next to Telnet Client to place an x in the box.
- Click OK.

Please contact GNS3 Assist to add new preconfigured terminal commands in GNS3.

8 PACKET CAPTURE

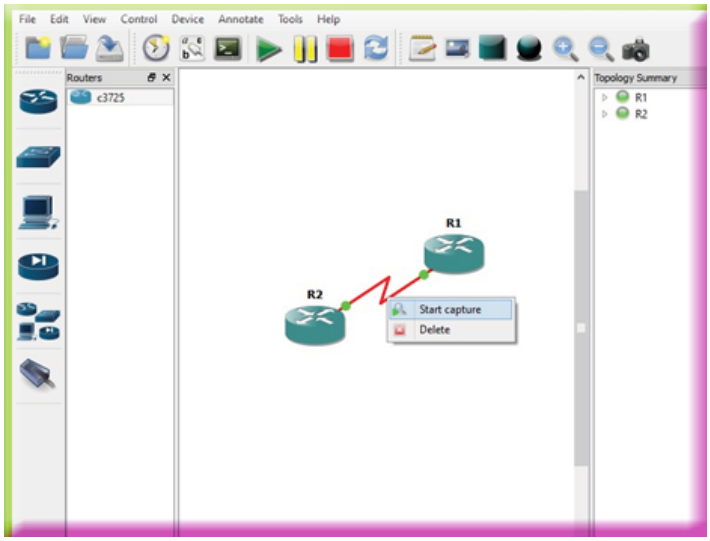
GNS3 can capture packets on virtual Ethernet or serial interfaces! It will write the captured output to a libpcap file that may be viewed using WireShark. WireShark may be downloaded on http://www.wireshark.org. This is also a great way to hone your skills with Wireshark while not interrupting production network traffic.

For example: Suppose we want to capture packets passing through the Serial interface on R2 (s0/0). You will need to have a simple topology ready to use for the next steps.



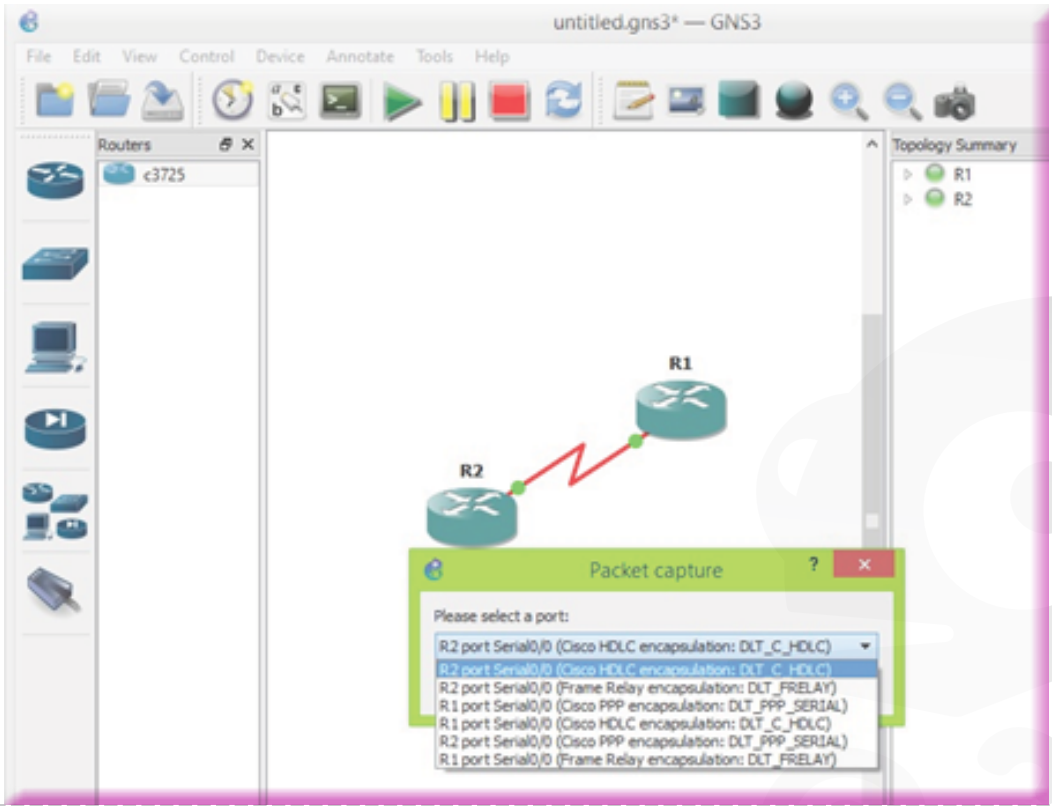
Note: I created two routers with a simple /30 subnet. That means there are only two possible IP addresses within the subnet, 192.168.1.1 and 192.168.1.2. Since you cannot use a broadcast and subnet address (192.168.1.4 and 192.168.1.0 respectively). This is a perfect way to test the ability to send and receive simple ICMP (ping) tests.

Next, right-click somewhere along the line representing the link between R1 and R2.



- Choose Start Capture.

The drop-down arrow will allow you to choose which interface to monitor (R1 s0/0 or R2 s0/0). WireShark will automatically start, provided it has been configured under the Preferences window.



Notice that we can also choose the encapsulation type for serial interfaces.

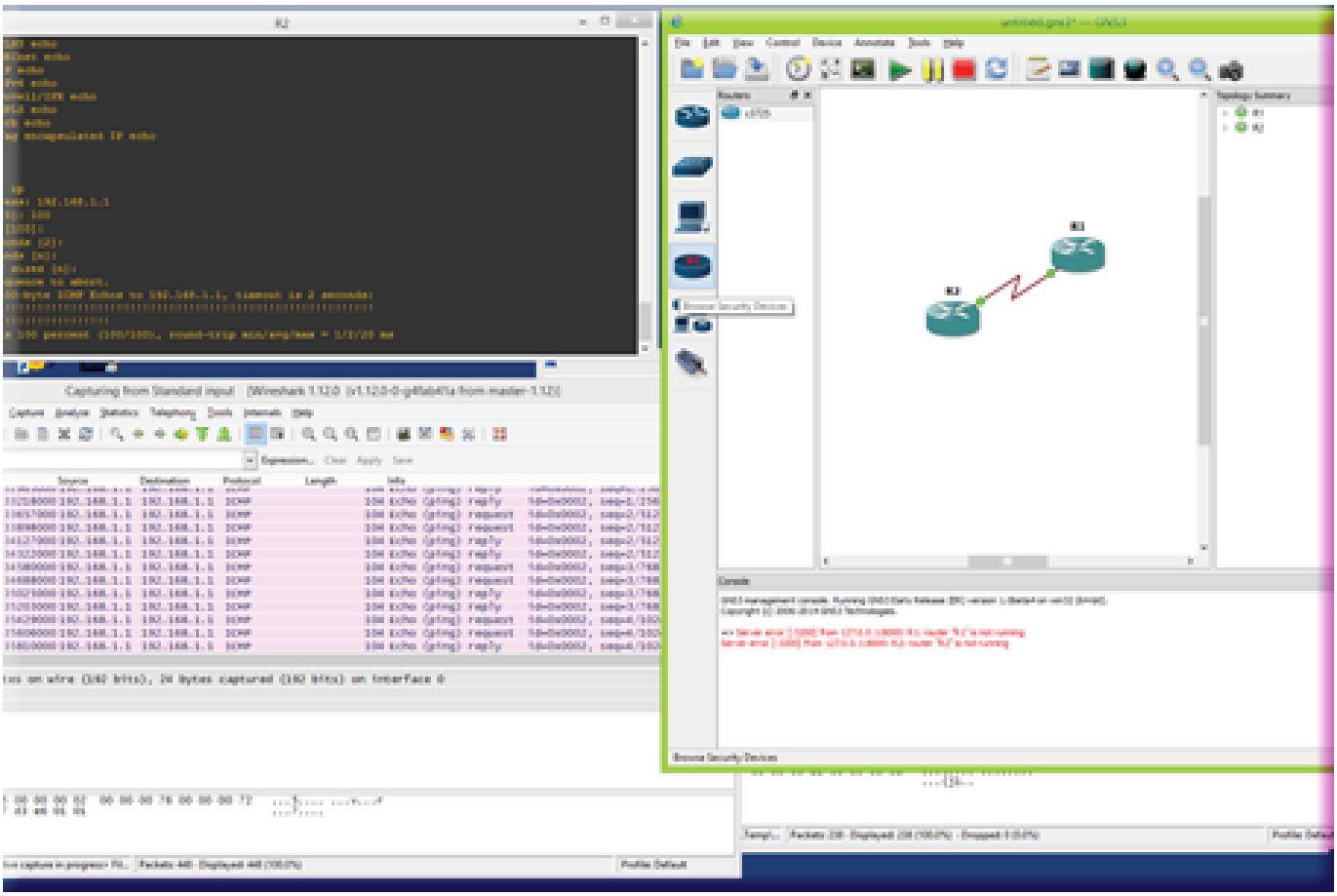
Choices are HDLC, PPP and Frame-Relay. The default encapsulation for Cisco serial interfaces is HDLC. There are great discussions within the CCNA course that goes into whether you should or should not use either HDLC or PPP. That is beyond the scope. Just know since we are using Cisco IOS, the default is HDLC.

I have configured the S0/0 interface in both routers to connect, so I will choose the first option. Setting the appropriate encapsulation is a key step to a number of topics that ensure connectivity between two routers. But for the sake of this discussion with WireShark, we will monitor this interface using the appropriate encapsulation to read packets.

WireShark will then launch and present you with hopefully a familiar interface. (If WireShark is kind of new to you, I highly recommend spending time listening to Sharkfest '13 from Youtube to get a better understanding of the power of WireShark). This is a welcome addition to GNS3. Sometimes the Cisco certification track will hammer in the concept of using commands to check connectivity, but how much simpler is it when you have WireShark telling you what it sees coming across the link.

In real working environments, we can fabricate all kinds of interfaces to 'prove' something is connected. With WireShark as a third party, the packets have all kinds of information proving the legitimacy of network connections. I used WireShark extensively to other agencies that believe issues that arise in the network are my team's fault. WireShark time and again has saved my 'bacon'.

Getting back to the example, start a ping test between the two devices to see if you get a reply. The command line does its job, but WireShark does a better job representing the type of traffic in a nice GUI display for further analysis.



Now let's generate some traffic to test our capture. Ping R2 from R1.

Scroll down to see the ICMP request and reply packets as a result of the ping. Packets are being captured whether we refresh the window or not. In the screenshot, I used the 'ping' command and specified the number of times (100) to fill the WireShark window with ICMP type packets.

Let's back up and talk about the preferences for capturing packets in GNS3. Choose Preferences from the Edit menu in GNS3. Then click on Capture in the left pane. Now you may specify the working directory for capture files, the command to use to start WireShark, and whether to automatically start WireShark when you choose to capture.

9 ADDING HOSTS TO YOUR TOPOLOGIES

There are four possible ways to add a computer to your topology. If you just need to check for connectivity using ping or traceroute, the best way is to use the Virtual PC Simulator or (VPCS).

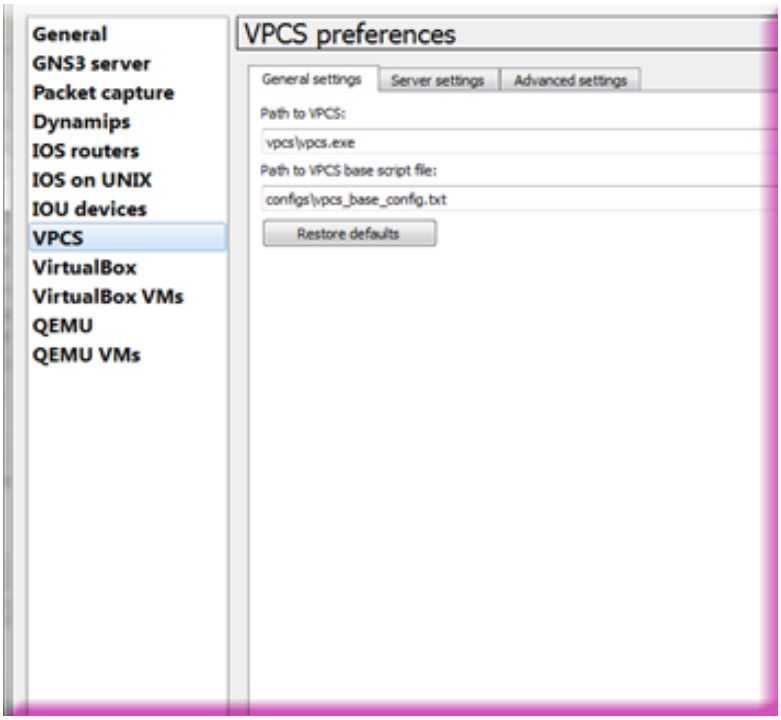
The second way is to use a Qemu or VirtualBox guest. Qemu and VirtualBox support are integrated into GNS3!

Third way is adding another router but configure it to act like a PC.

Finally, you may use your real PC as described in the Connecting GNS3 to real networks tutorial.

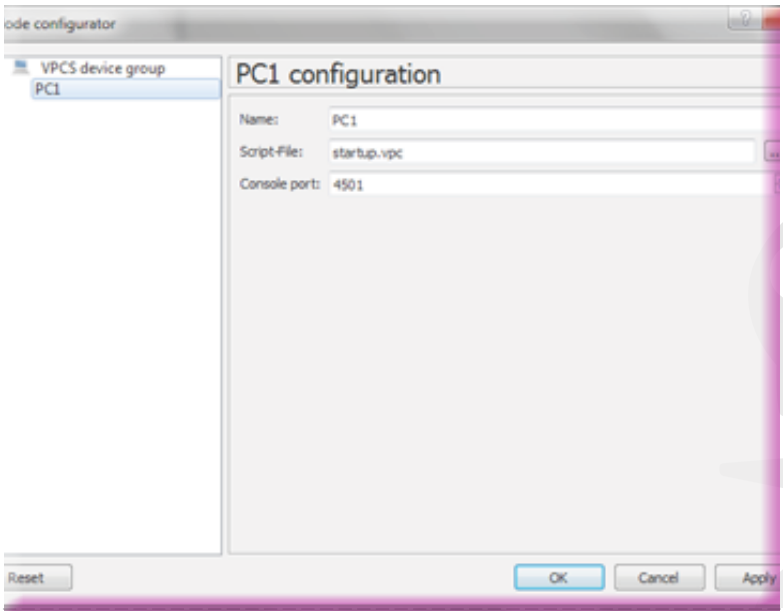
9.1 Using the Virtual PC Simulator (and the Symbol Library)

The Virtual PC Simulator (VPCS) is now integrated with GNS3 1.0. It provides and acts as a platform for basic network operations including Ping and Traceroute used for testing out configurations or perhaps providing some basic loading of a network path.



Once you have verified that your installation looks like this you can drag and drop a VPCS device on to your project work area. The default device name is PC1 and as you add other VPCS devices that name becomes PC2 etc.

When you right click and configure your VPCS device you get a basic configuration that looks like this:

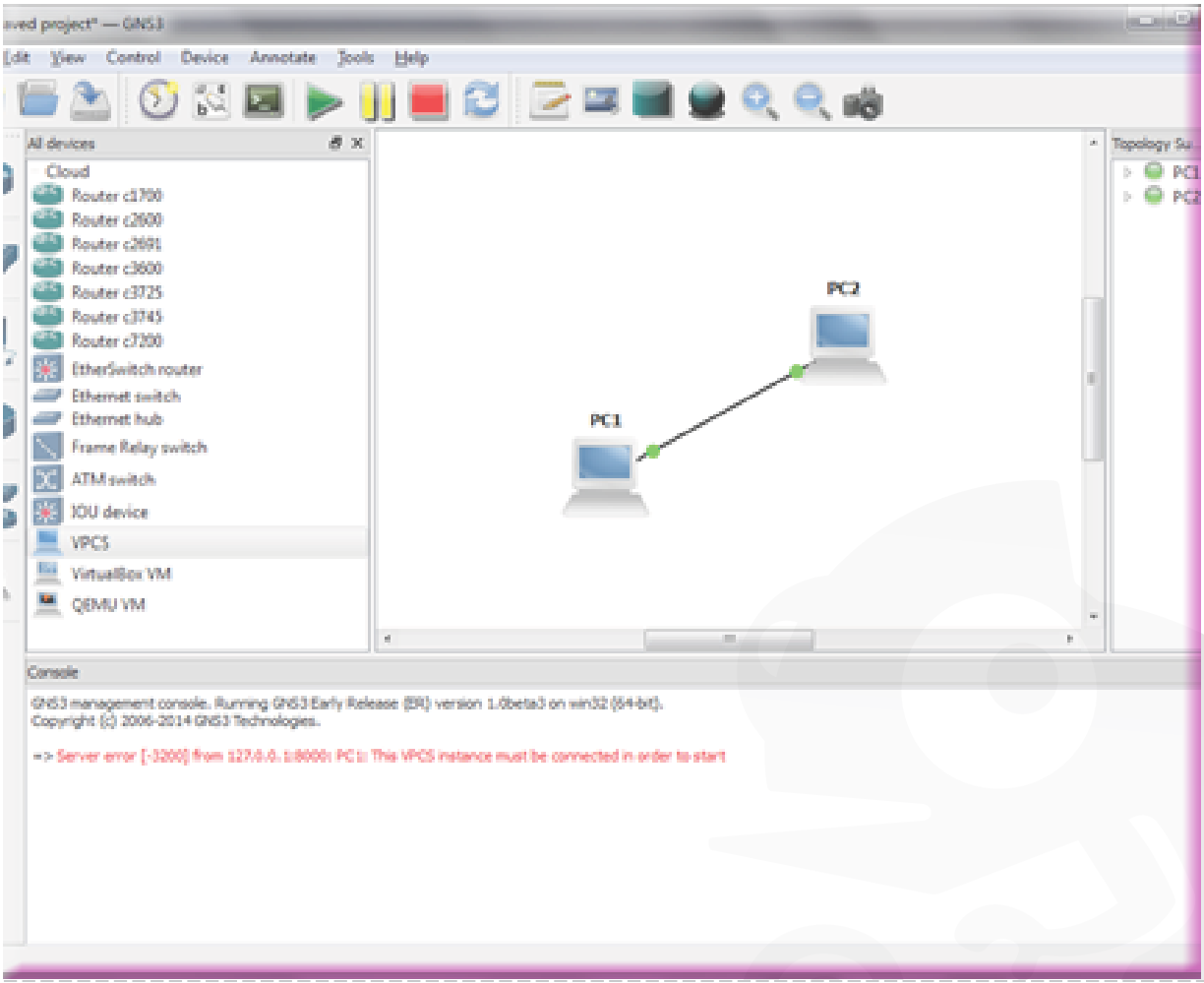


You must connect your first VPCS in order to start it up. So a simple way to accomplish this is to drag another VPCS device out to your work area and you would get a project that now has two VPCS devices and looks like this:

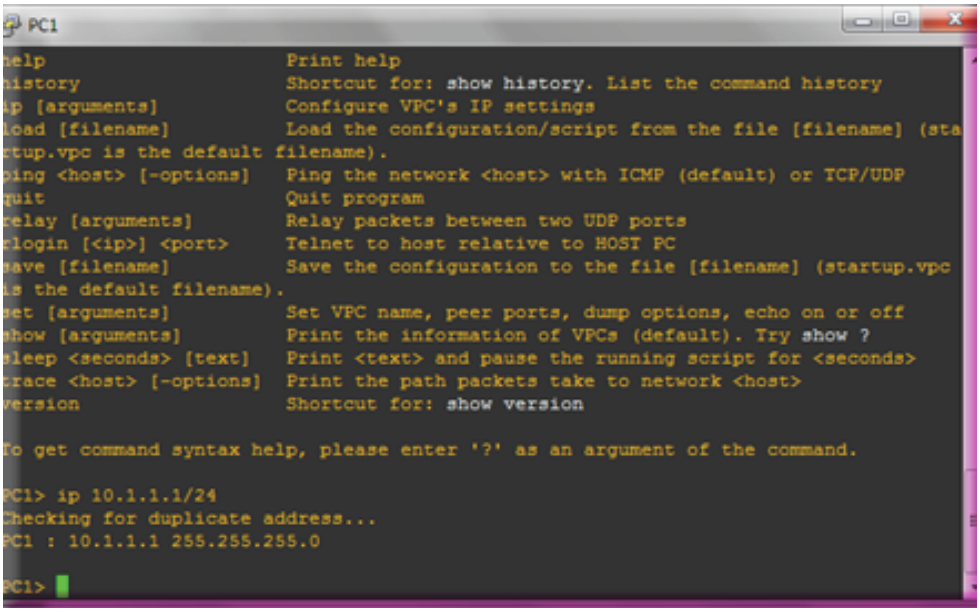
To connect the VPCS devices select the link or RJ45 ICON and drag over a connection tool. Once you hover over the VPCS device you can select the default network device to use and a network interface is provided. All you need to do is click that device and draw over to the next VPCS device to setup up the link. Click the RJ45 ICON to close out that connection operation.

You will note that both VPCS devices are not started so now is the time start them by right- clicking on them and clicking start on each one.

Once this is done you will have a project that looks like this:



Once you are OK with the basic configuration you can establish a console operation and setup a network IP address for your network devices. Simply right click the now running VPCS devices and select or highlight console and you get a console pop up that looks like this:

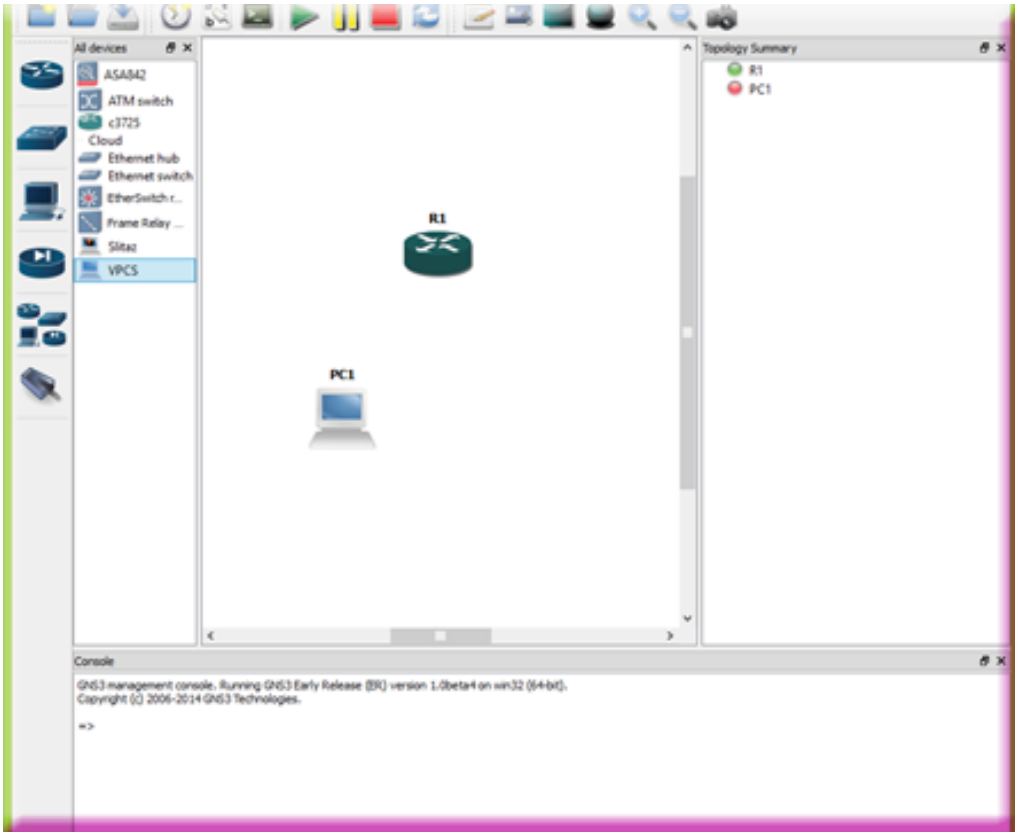


Notice the commands that are possible but the commands you will need are IP and perhaps Trace as mentioned. The IP command format is PC1> ip 10.1.1.1/24 for example to setup the address 10.1.1.1 with a 255.255.255.0 sub-net mask.

From this point you can treat the VPCS device as a PC sitting on your test network ready to issue commands from and perhaps to use for load testing.

Now it's time to configure your router to act as a gateway for your PCs.

Please review the topology below:



With every good topology, there has to be some decisions made:

What is the purpose of this scenario?

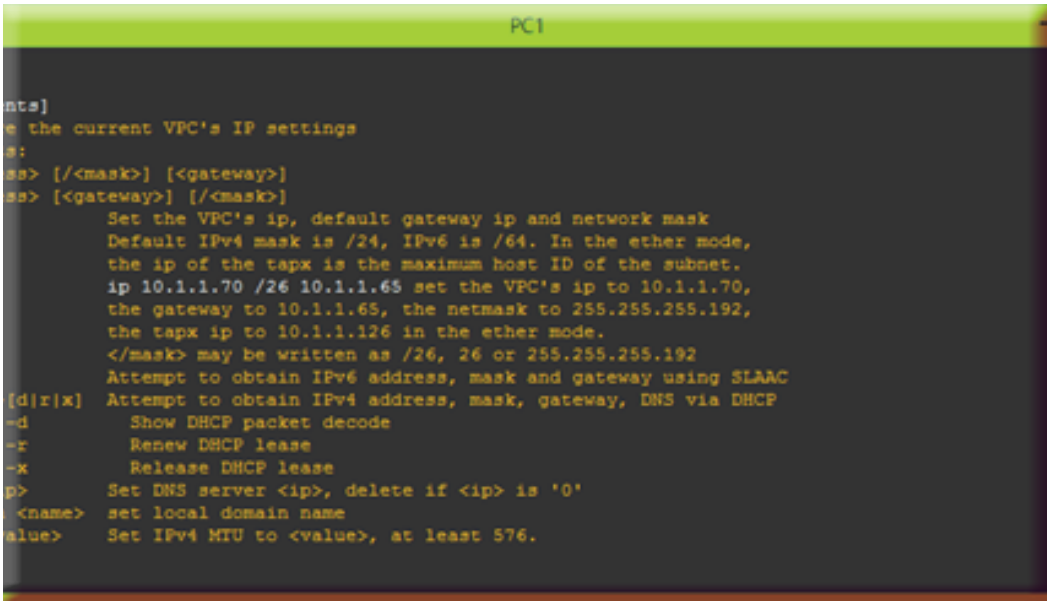
The answer: to connect one VPCS to a router, make the router a gateway to the local network and perform a ping test.

First, connect your Ethernet cable from the VPCS to FastEthernet0/0 interface of the router.

- On PC1, right click and select start.

- Console to PC1.

With VPCS, the syntax is a little different. If you need help setting up your IP address, subnet mask and gateway, type: IP ? or question mark.



For this example, we are going to use a class C subnet mask of 255.255.255.0 or /24.

The router will take the first available ip address in the 192.168.3.0 network. Therefore, the IP address will be 192.168.3.1.

The VPCS will take the last available ip address in the 192.168.3.0 network. Therefore, it will take the 192.168.1.254 address.

So with that in mind, let's configure the vpcs first.

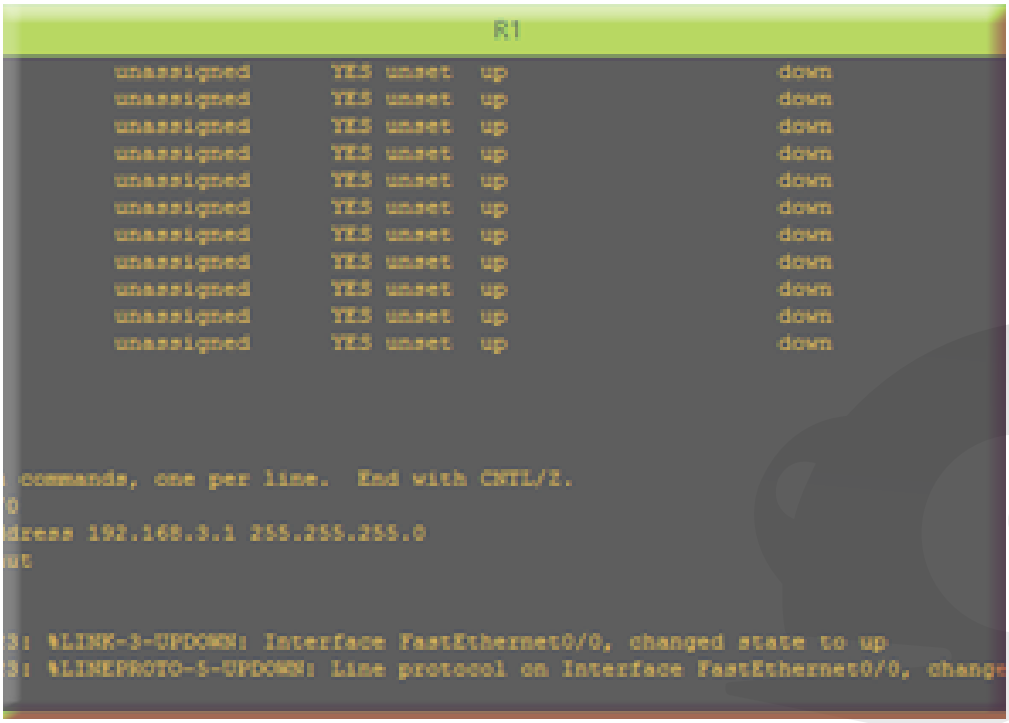
Type: ip 192.168.3.254 /24 192.168.3.1

VPCS will return looking for a duplicate address. If there are no duplicates, it will save that setting. You are now ready to configure the gateway router to match what you entered into the VPCS for the field "[<gateway>]".

If not already done, start R1 now.

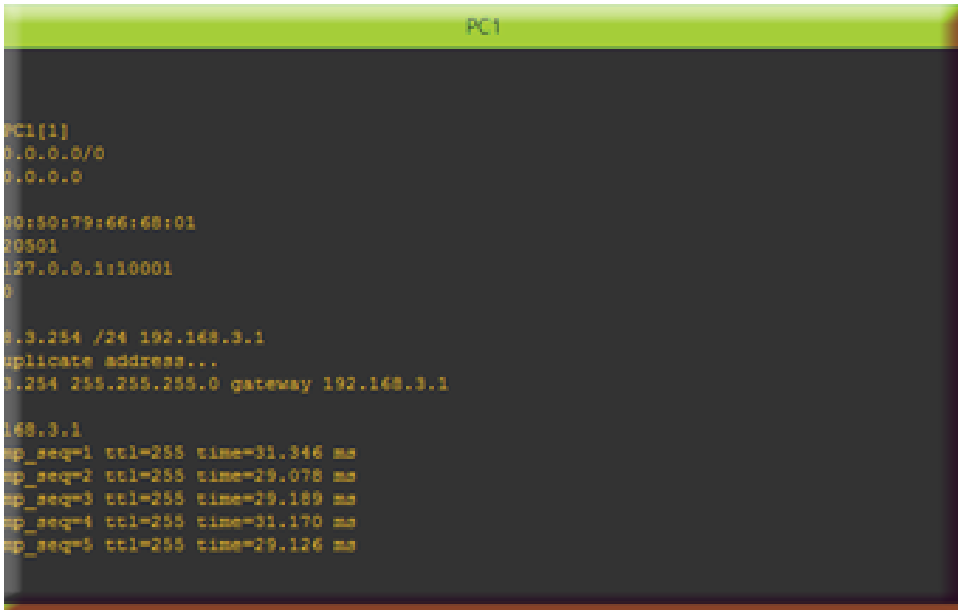
Console into R1 and enter this information:

- R1>en
- R1#conf t
- R1(config)#int fa0/0
- R1(config-if)#ip add 192.168.3.1 255.255.255.0
- R1(config-if)#no shut

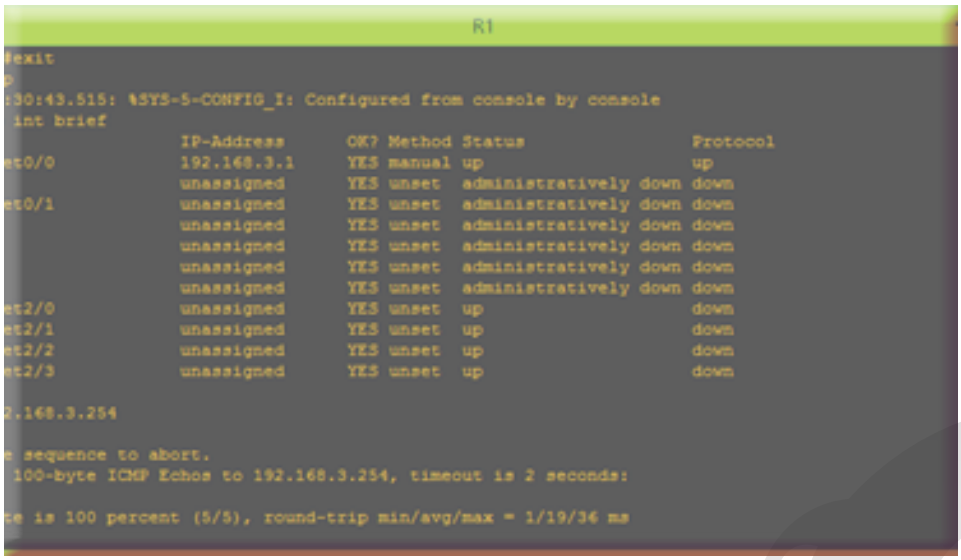


Notice as soon as you configured the other end of this connection to VPCS, there is a new status reported that the connection is up. NOTE: if you are not sure where you actually have connected the interface in the router, you can verify through the GNS3 topology, by hovering your mouse over the router to look at where it is connected.

If you can ping the other interface's address, you have successfully configured your VPCS and your gateway router interface. There is still much to do with this router like configuring a static route and or configuring routing protocols, but that is beyond this section.



This ping originated from PC1.



This ping originated off of the R1 console. Notice I checked the status of the interface by typing in the 'show ip interface brief' command to make sure my settings have been saved. I then doubled checked my settings are correct in the VPCS. A common issue with new users is the habit of not checking and double checking the interfaces are in an UP and UP state. Once you get into the habit of that, it will resolve A LOT of issues.

9.2 Using a Router that Acts Like a PC

You may also simply add another router to your topology and configure it to act like a PC. This method would use more memory and processor cycles than the previous method, so I would only recommend this method as a secondary choice. At all possible, use the VPCS. But if you find using the VPCS does not meet all your needs for a test host machine, you can improvise with these steps.

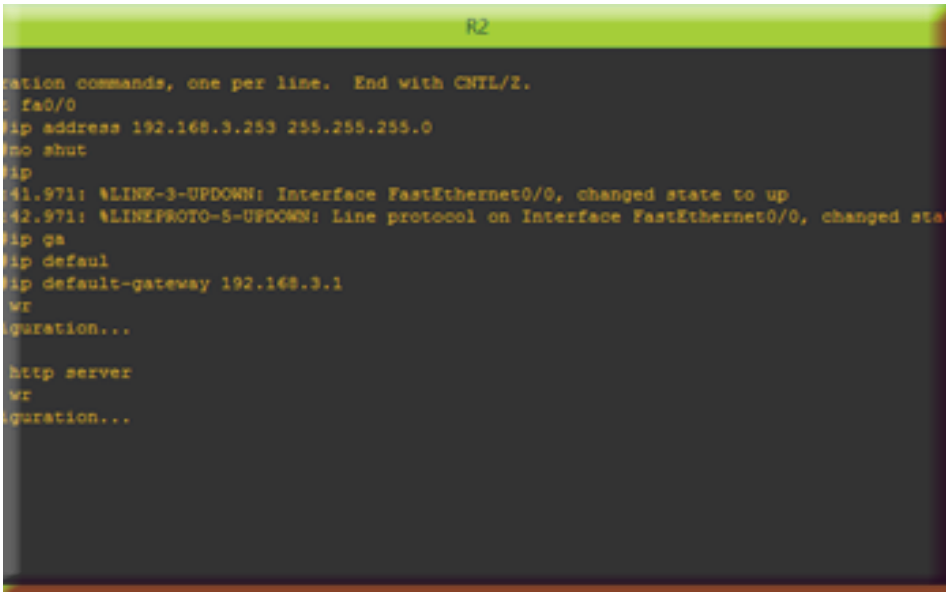
Repeat the same steps in moving a router to the Topology window as found in section 6.1.

The variation is in the configuration of the actual router.

Just add a router and enter the following commands:

- **Router(config)# no ip routing**
- **Router(config)# interface fa0/0**
- **Router(config-if)# ip address address subnet_mask**
- **Router(config-if)# no shutdown**
- **Router(config-if)# exit**
- **Router(config)# ip default-gateway gateway_address**
- **Router(config)# ip http server**

Let's explain what happened here: The router gets assigned an IP address on an interface. You then tell the router that it has a default gateway, much like a PC would have a gateway and you add the command ip http server.

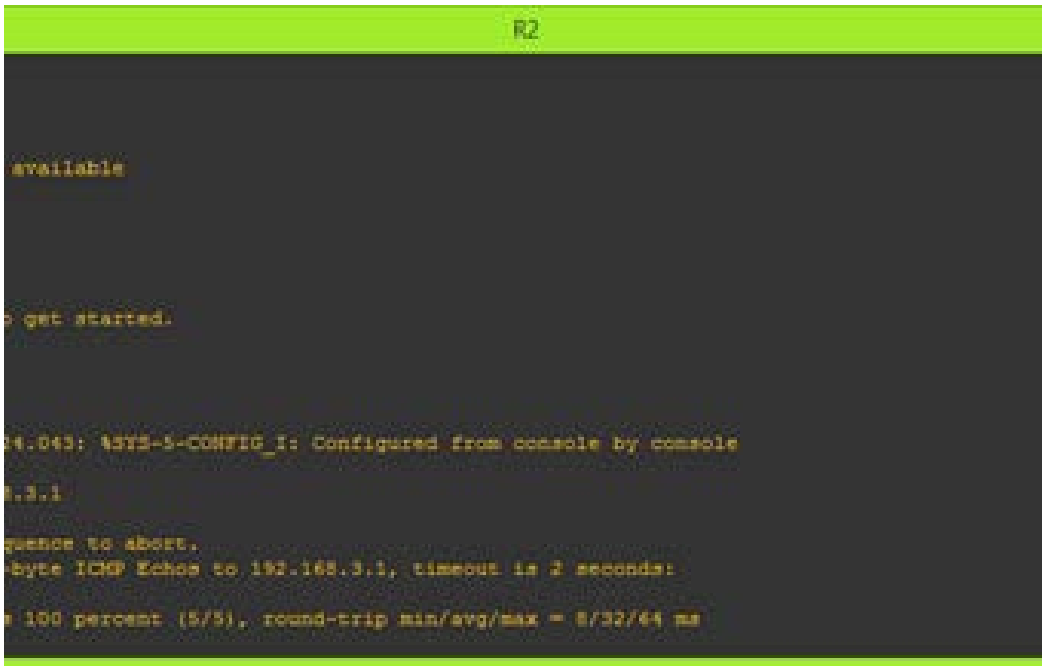


Note: the 'do wr' in the pic means I just wanted to save my config. Saving your config frequently is a best practice.

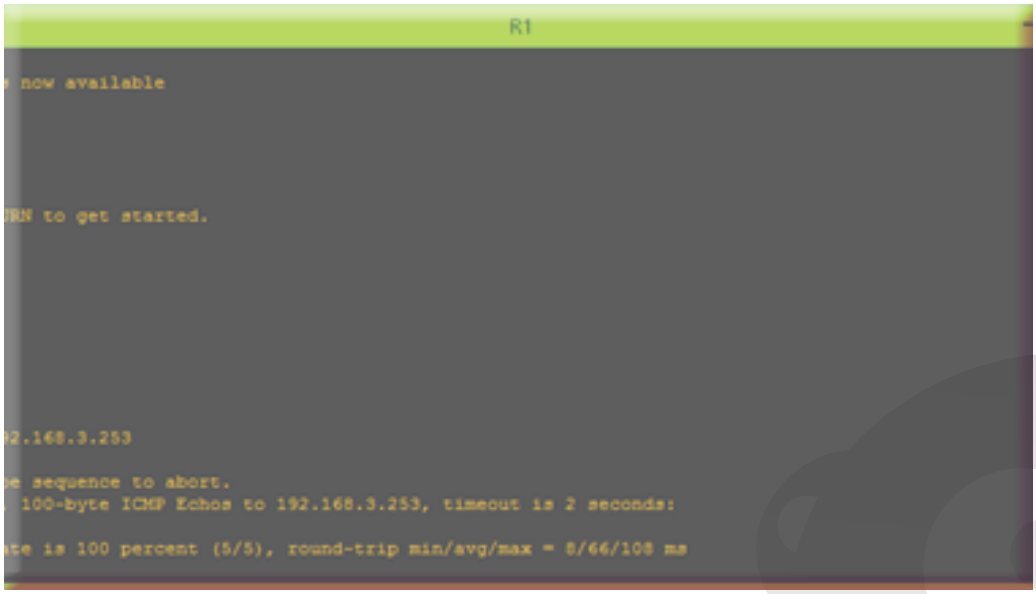
Connect the router (acting as a PC) to the rest of your topology.

I decided to use the previous example in section 9.1 and added a 3725 router. I deleted the VPCS and connected the R2 to the same interface on R1. Remember, we are testing the ability to use R2 as a PC. I then configured the IP address in R2 as 192.168.3.253. That address is in the same subnet of the already configured gateway.

These slight modifications and adaptations is a critical ability for Network Professionals. We substituted one client PC with another and enforced the topology. The following is a screenshot of the results from the Router As A PC, R2:



And the gateway router R1 is able to ping back:

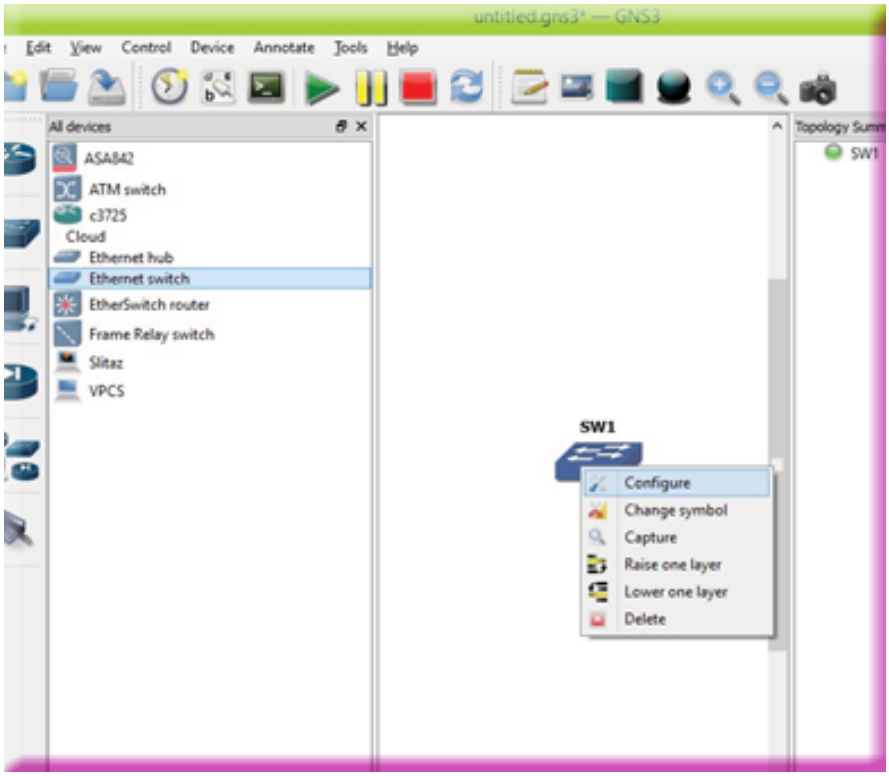


Again, R1 has not been configured to route, nor is the interface really suitable for VLANs. Configuring vlan interfaces and implementing a routing protocol will be included in future Configuration Books.

10 SWITCHING SIMULATION IN GNS3

10.1 Ethernet switching devices

GNS3 with Dynamips help integrates an Ethernet switch that supports VLANs with 802.1q trunking. Trunk ports trunk all VLANs known to the switch – no VLAN pruning here. It is just a basic virtual switch with limited functionality that provides the very basics you'd want in a switch. You can find these types of devices in the GNS devices panel here:



If you drag an Ethernet switch onto the workspace, right-click it and choose Configure, you'll see the options you may set.

At this point, you should be familiar with the GNS3 controls to know you can configure this simple switch. Use this if only to place a switch between routers to focus on forwarding packets from one router to another. We recommend to get the most of switching, to use an Ethernet Switch module "NM-16ESW" for accomplishing multiple VLANS and ether-channel testing. Another option is to use the coveted "IOU" devices for switching. Basically, the IOU on UNIX emulates a layer 2 or layer 3 switch. We will get into more about that later in the

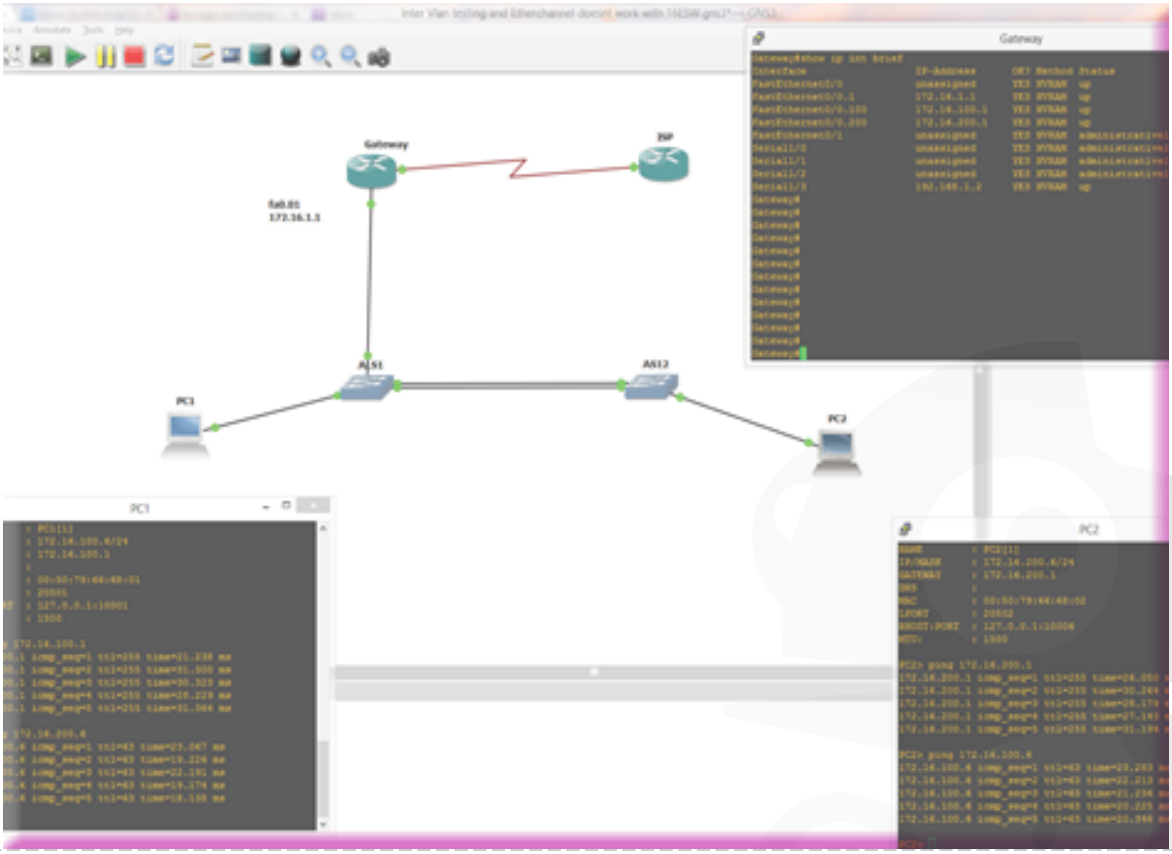
Getting Started Guide.

By default, there are 8 ports in VLAN 1 configured as access ports. However, you may in theory have up to 10,000 ports and up to 10,000 VLANs. You are limited to either access ports or dot1q trunking ports.

If want greater functionality that the virtual Ethernet switch provides that is integrated into GNS3, then you'll need to add a router with an EtherSwitch card.

10.2 EtherSwitch Cards

You can buy an EtherSwitch card that may be inserted into a router. The card will function similar to a switch. In GNS3 you may also insert an EtherSwitch card into a router slot. That is why the 3725 with an Ethernet Switch card is recommend as a stable platform to test basic to intermediate switching concepts. See screenshot below:



There are a number of steps to complete to get to this point, but this example shows the following facts:

1. Both the switches and the routers represented here are the same 3725 with a 16 port Ethernet Switch that can be configured. I then changed the two ICONS to switches to remind me that these are to function only as switches. No routing protocols were configured.

2. The Gateway and the ISP Routers are given two static routes. No routing protocols are used.

3. Sub-interfaces were created on the Gateway. Due to the version of the IOS, I was able to create a sub-interface 0/0.1 for VLAN 1, 0/0.100 for VLAN 100 and finally 0/0.200 for VLAN 200. The terminal in the upper right corner is Gateway's terminal.

4. The PC in vlan 100 can ping to the PC in vlan 200 and vice versa. The gateway is correctly routing the packets to each vlan sub-inteface.

The 7200 series routers do not support this adapter but many of the router platforms available in GNS3 do. The EtherSwitch card that is supported is the NM-16ESW. Here is a list of some of the features supported by the NM-16ESW card.

- Layer 2 Ethernet interfaces
- Switch Virtual Interfaces (SVI)
- VLAN Trunk Protocol (VTP): domains, all modes (server, client and transparent), pruning and passwords.
- Trunking: 802.1Q only, no ISL, no dynamic auto or dynamic desirable

mode.

- EtherChannel: no LACP and Pagp support. Manual configuration supported

- Spanning Tree Protocol: simple STP supported but no MSTP, RSTP or other advanced stuff.

- Cisco Discovery Protocol

- Switched Port Analyzer (SPAN)

- Quality of Service: mls qos commands and mls qos maps are supported.

- IP Multicast Support

- Storm Control

- Flow Control

However keep in mind that this module works differently than a real Cisco switch and doesn't support all the features of a Cisco Catalyst Switch.

At this moment, it is not possible to emulate Catalyst switches with Dynamips/GNS3. This is due to the impossibility to emulate ASIC processors used in those types of devices. Please see the hardware emulated page for a complete list of missing features for EtherSwitch module.

Not all commands that exist on an actual switch are supported by the NM-

16ESW card, but as you can see, using an EtherSwitch card gives you a lot more features than the integrated virtual switch. If you wish to use this card, I recommend that you download the documentation from Cisco's official EtherSwitch module page.

Only vlan database mode is possible (not the newer global configuration mode) and the show vlan command is show vlan-switch, for example.

To use the card, just add a router and include the NM-16ESW adapter or the EtherSwitch router device if you have configured a c3725 IOS image in GNS3.

10.3 Connecting real Cisco switches

Another solution, which is used by people studying for CCIE R&S, is to connect real Cisco Catalyst switches to your virtual GNS3 topology. A special document is dedicated to this topic.

11 A BRIEF OVERVIEW OF IOU

Prerequisites for IOU:

Obtain or download the following:

VirtualBox

GNS3 1.0

a specific virtual machine called GNS3 VM

a Cisco IOU image

a Cisco IOU license key file

If you are missing any of these items, please stop and get them. Note: VirtualBox, GNS3 and the special virtual machine called GNS3 VM is free. There is a fee for obtaining a Cisco IOU image file as well as a Cisco IOU license key file. Please ensure you are in compliance with these files before proceeding.

11.1 IOU on Windows

Examine the picture showing how the IOU works in Windows:

Note the following:

The outer box in the above illustration represents the HOST operating system. In this example the Windows Operating system is selected. The next inner box shows GNS3 running within Windows. At the same time, there is a VirtualBox machine called GNS3 VM that will run.

Within the GNS3 VM, the virtual machine will have the Cisco IOU file uploaded and allow GNS3 to locate that same file and call it.GNS3 will then also call the IOU license file, which can be stored in your Windows directory structure.

So there are a lot of “moving parts” in this picture. It is recommended to follow this guide as closely as possible to avoid confusion. Some steps require you to locate and upload files and make reference to the GNS3 VM directory. Other locations require you to locate files within the Windows directory. Skimming through the instructions may confuse a user as to where all the files belong.

12 HOW TO CONFIGURE IOU IN GNS3 ON WINDOWS

1 - Install VirtualBox.

Download VirtualBox and install it. Virtual box for the most part is a straight install. Accept all the defaults and Virtual box will load all the files needed to import the GNS3 VM later.

2 - Install the GNS3 IOU VM.

The GNS3 IOU VM is a Linux appliance that we provide. It contains all dependencies for IOU to work. BUT IT DOES NOT CONTAIN THE CISCO IOU ITSELF. This is an incredibly useful (and time saving) option.

3- Download the GNS3 IOU VM.ova appliance from

http://sourceforge.net/projects/gns-3/files/IOU%20VMs/GNS3%20IOU%20VM.ova/download.

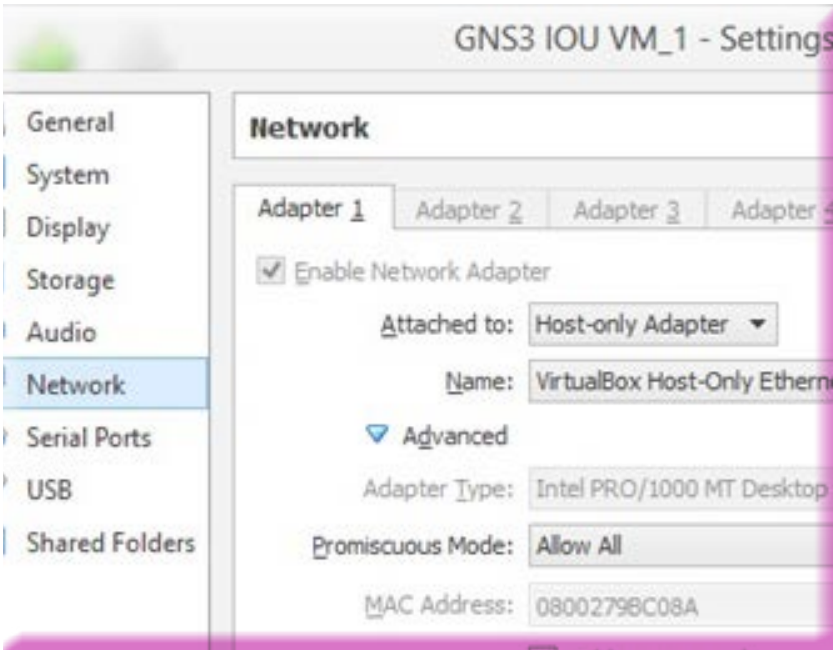
Note: Sometimes the downloaded file will be corrupted and have issues. It is recommended to pay close attention to the file size of the download and to use a mirror site that is close to your location. It has been experienced that downloading the GNS3 VM looks like it completed, but did not run very well. If you encounter issues running your VM, it is recommended to re-download the image and verify the correct file size at time of download.

Import the VM in VirtualBox.

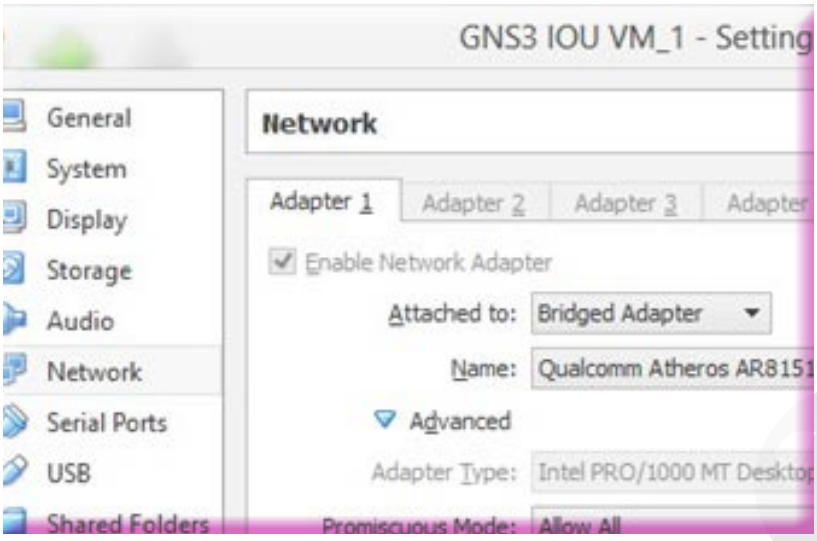
IMPORTANT: the VM contains the latest GNS3 server version, you can update the server directly from the VM using the following command (username: root password: cisco to log on). Make sure the VM has Internet access first by switching the network adapter to NAT or Bridged adapter.

$ **pip3 install gns3-server==1.0beta2**

Some experience changing the network card within Virtual Machine is a required task. To perform this update within your newly downloaded Virtual Machine, you have to be comfortable configuring the network card in VirtualBox from a local, “Host Only Adapter”, to a bridged adapter that has access to your internet connection using your Windows OS as an effective bridge to the Internet. Please look at the two network settings to get familiar with switching between the two types of network interface settings:



Use this setting when you want this machine to be on the local topology within your PC. This will make the device available only within your HOST. Therefore, when a server is running, it will be available to your HOST network within your computer. See following screenshot:



Use this setting when you want your virtual machine access to the outside Internet by bridging this adapter to the network card you know has Internet access. In this example, I chose to use my Qualcomm Atheros (wifi) network card. Use this setting (or something similarly equivalent to this) when you want your VM machine to receive updates. You can run updates on the server in the

aforementioned IMPORTANT notice.

4 - Configure the VM in VirtualBox.

Make sure the first VM adapter is set “VirtualBox Host-Only Ethernet Adapter”. You may have to add one in VirtualBox preferences -> Network -> Host-only Networks.

To be more specific, refer to the first screenshot above that shows the “Host-Only Adapter Settings”. The reason for this is because there is an http service that runs on this VM we want accessible to upload files from our Windows System. We use HTTP to allow us to upload files from one OS to another that is in a Virtual Machine. It’s a pretty cool skill to master.

5 - Start the VM.

Once started you should see the VM IP address. If not log on with username root and password cisco and use the “ifconfig” command. Assume “192.168.56.101” is the server address configured within the GNS3 VM for the rest of the instructions.

As a matter of fact, some familiarity with Linux bash commands would help. For those not familiar with this, you can verify the server is running and test the validity of this GNS3 VM download by running a couple commands in the ensuing steps.

To test the GNS3 VM machine is running correctly...

Logon at the prompt

- Username is: root

- Password is: cisco

After the logon, check the ip address of this “remote server”

- **ifconfig eth0**

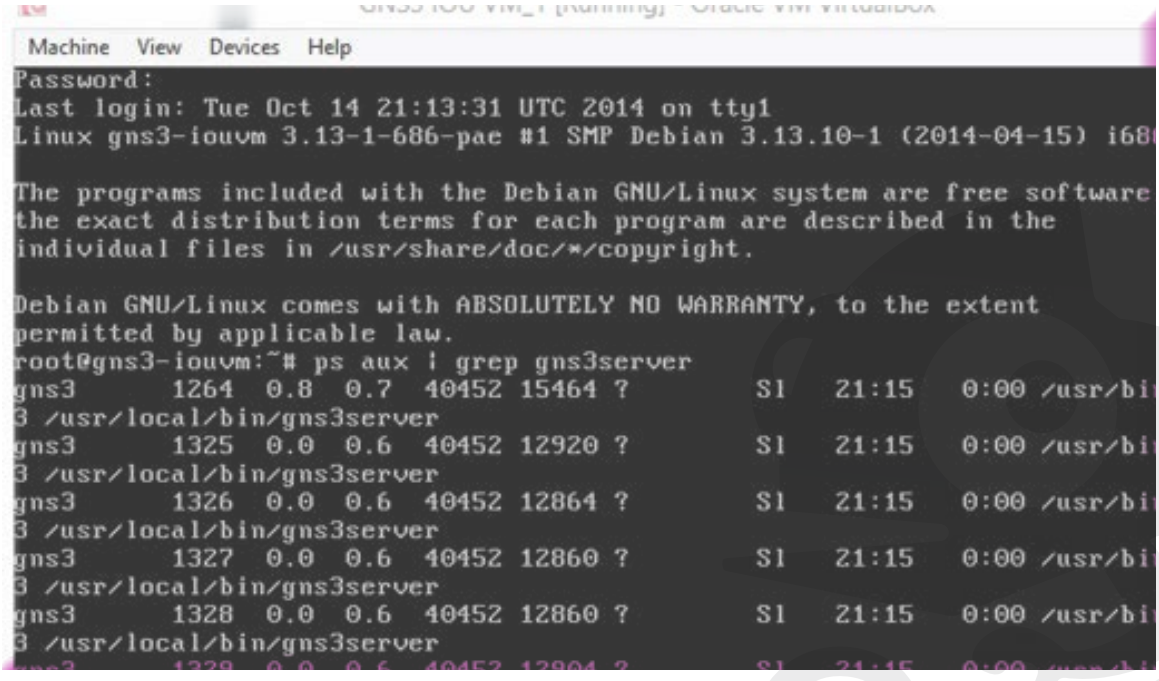
You should see a status of an ip address assigned to eth0 of “192.168.56.101”

That is the ip address of the remote server you will configure in GNS3.

Then check that the gns3server service is running:

At the prompt, type this command: ps aux | grep gns3server

You should see a number of services running. Use the screen shot below to validate your gns3server is running:



If you don't see these settings, the downloaded GNS3 VM machine is no good. It is recommended to download the GNS3 VM machine from an alternate mirror and repeat these steps until you see this. You are now ready to upload the Cisco IOU image to this server.

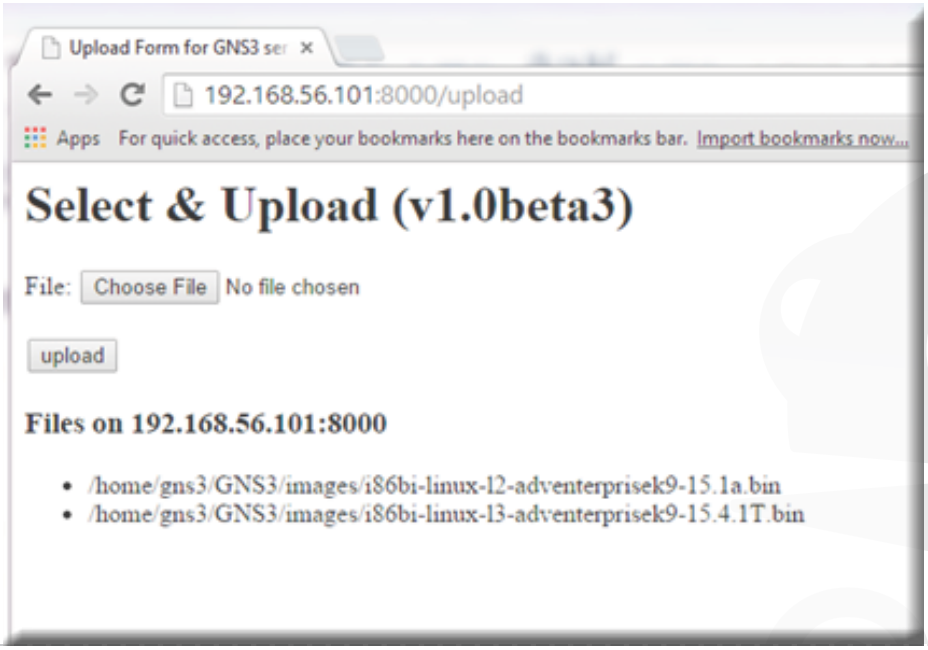
6 - Upload an IOU image

Open a web browser and go to http://192.168.56.101:8000/upload and upload your IOU image. Remember the file path, e.g. /home/gns3/Documents/GNS3/images/i86bi_Linux-ipbase-ms-12.4.bin

This requires some explanation:

If your GNS3 server is working, you should have no issues opening a browser in your HOST machine (Windows) and typing in the url: http://192.168.56.101:8000/upload.

Some issues with Windows may cause problems with regard to Windows Firewall. If you have difficulty, you may have to create a rule to allow port 8000 through your anti-virus or firewall.You should see something like this:



Note a couple things in this snapshot:

The 192.168.56.101:8000/upload is resolved to the gns3server that is running an http service in your VM. There is a simple “Choose File” button which will allow you to browse your local Windows machine for the important .bin file.

AFTER you find the file, click UPLOAD

There will be a bulleted listing of all files that were uploaded to the server.

In this screenshot, the two .bin files uploaded are “i86bi-Linux-12-adventerprisek9-15.la.bin” and “i86bi-Linux-13-adventerprisek9-15.4.1T.bin”. Also pay attention to the path. The path listed is NOT in Windows. This is the actual path in the GNS3 VM machine. You can simply copy the text and paste it into GNS3 later.

7 - Create a file with an IOU license key

This key is imperative. Your image and all the steps up to this point will fail without license key to validate this IOU. You will get really nasty messages in GNS3 stating stuff like “cannot locate IOU” or you will get another error message in the lower panel (Dynagen) stating the key is invalid. The following sub set of instructions detail how to create the file...not the actual key.

How to create an IOU License text file.

Create a text file named “iourc”. Unfortunately, you will have to find that number by yourself

Format the text like this:

[license]

gns3-iouvm = xxxxxxxxxxxxxxx;

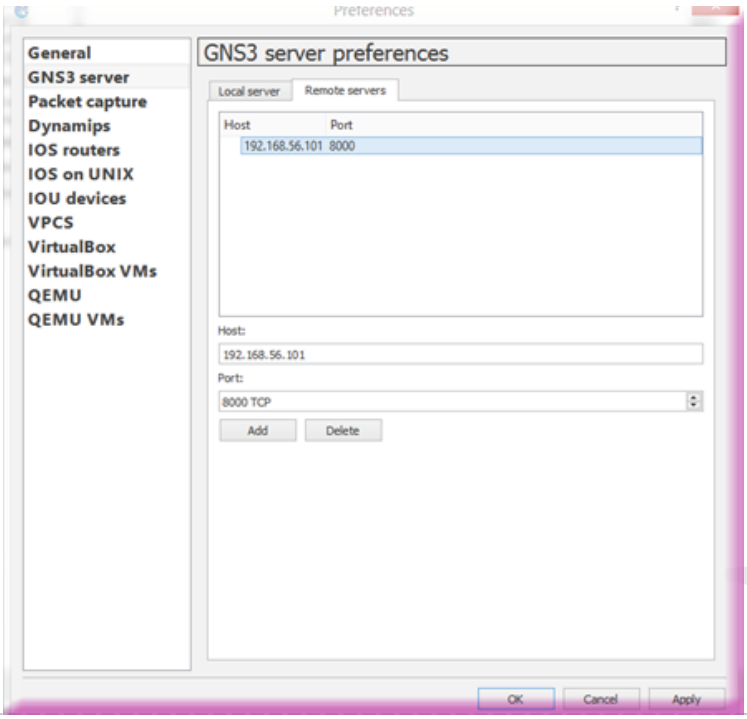
Where “xxxxxxxxxxxxx” is the actual number you received when getting your licensed copy of IOU right?

Save the file as “iourc.txt”. Make a note of the path as to where you saved it in Windows.You will need this path and file name when you configure an area in GNS3.

8 – Putting it all together:

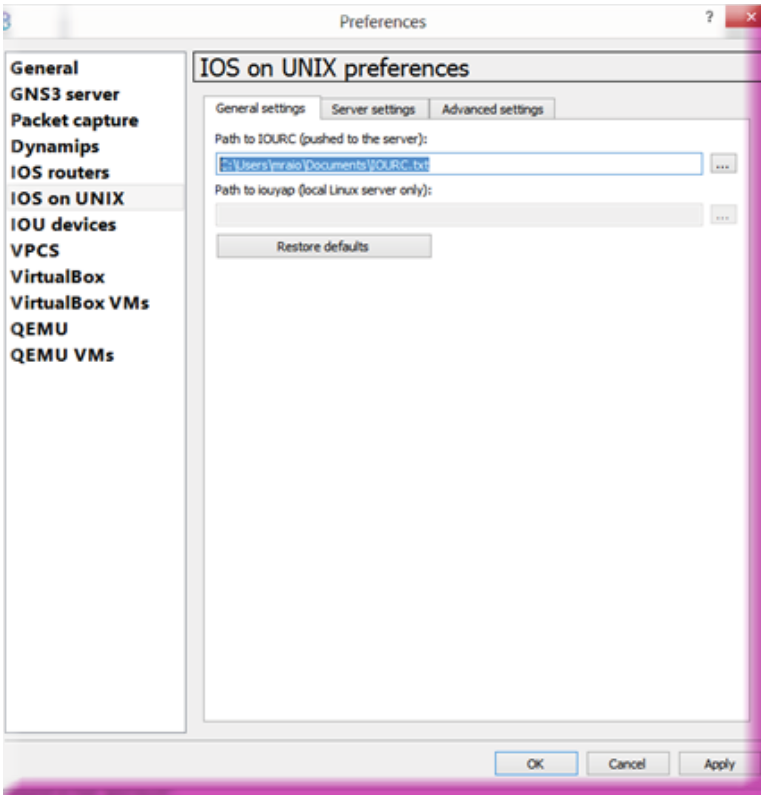
Configure the Linux VM in GNS3

Start GNS3, go to Preferences -> Server -> Remote servers and add the VM IP address, 192.168.56.101 in this example, click on Apply.



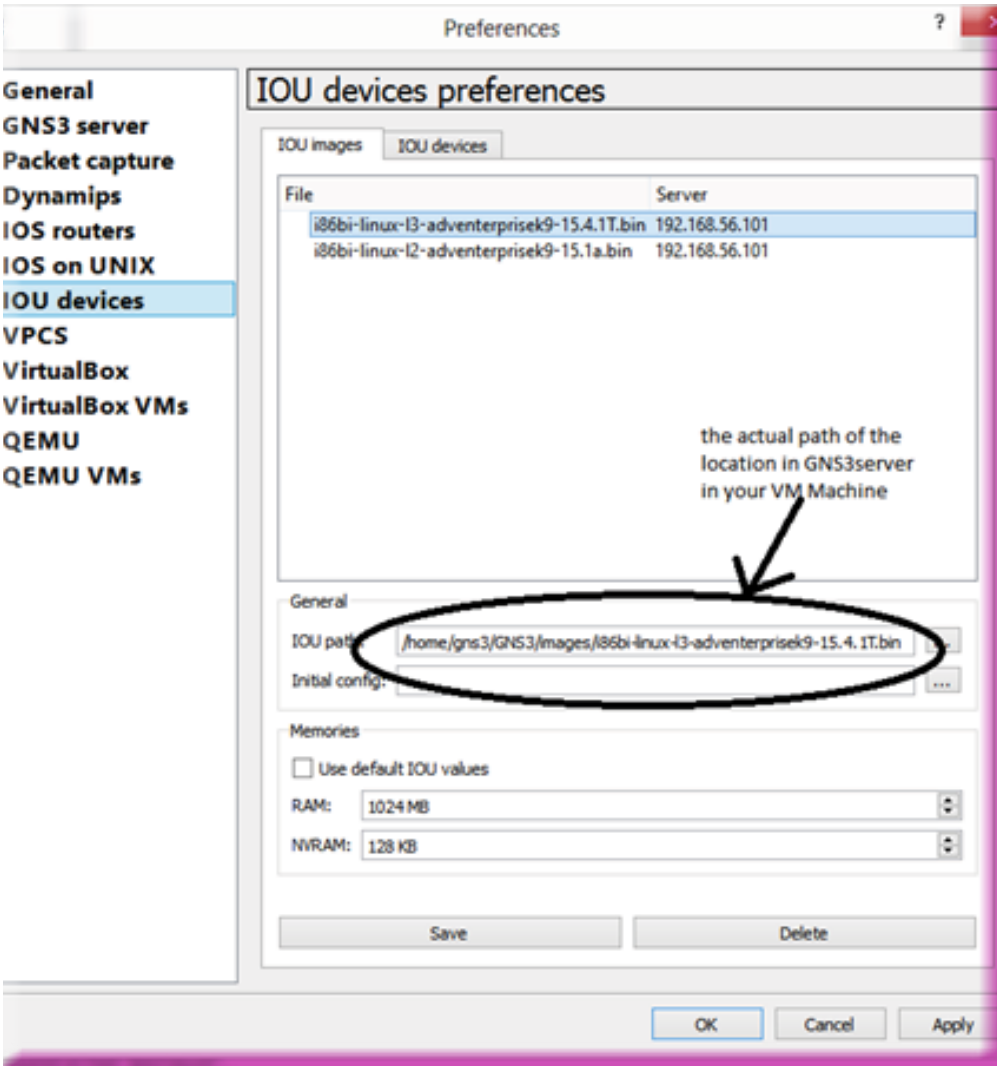
9 - Add the IOU license key file

Go to IOS on UNIX preferences, set the path to IOURC to the file created in step 8.



10 - Add the IOU image

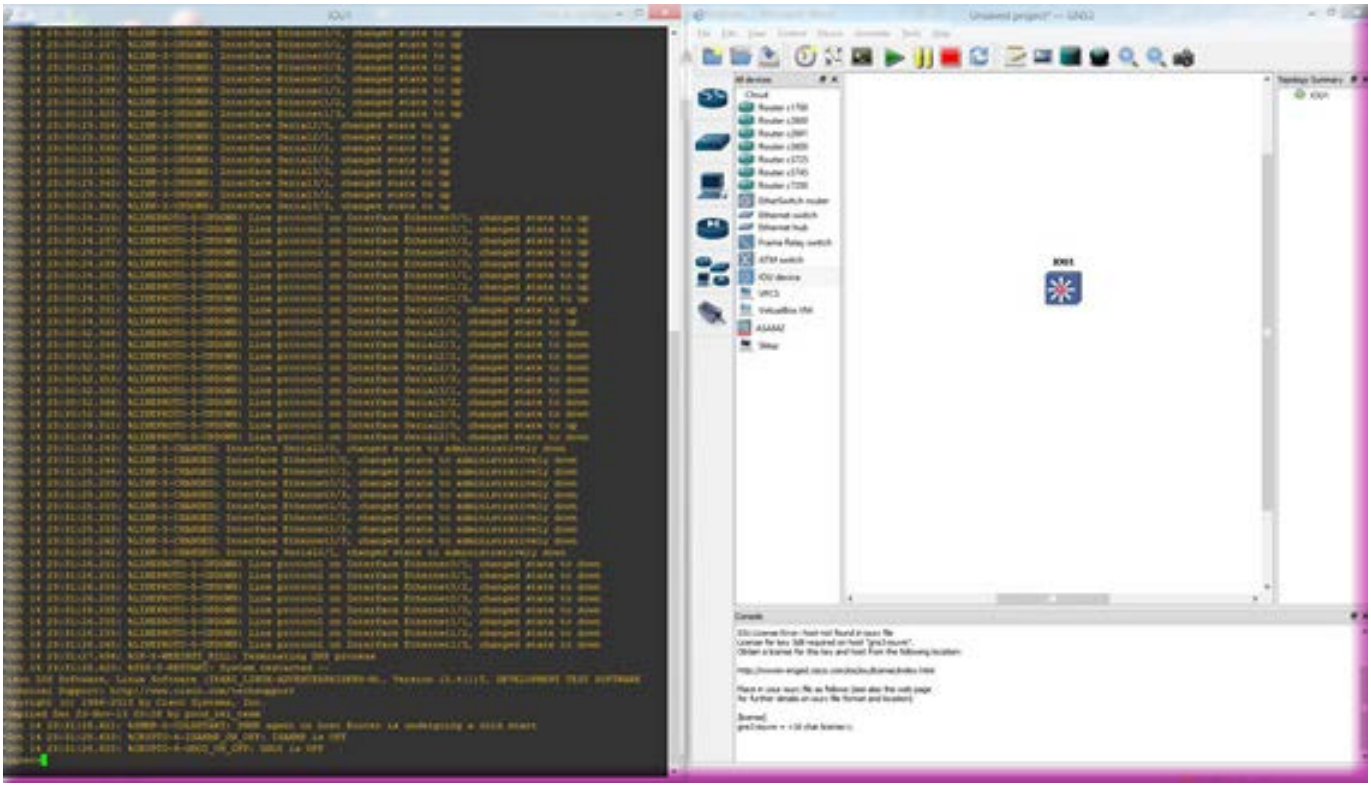
Go to IOU devices and add the path from the browser window that shows your uploaded files to the GNS3Server, click on Save.



Note: There is a “Save” button. Click that and then “Okay” at the bottom.

11. The moment of truth: Testing your IOU image.

The following is a screenshot of the IOU image on the GNS3 main panel:



The left side shows the actual console, and the right is the highly prized and coveted Layer 3 IOU that many GNS-ers have long waited for.

Congratulations on getting this far! This concludes the getting started guide.

IN CLOSING:

The GNS3 Getting Started Guide is for the beginner who wants to get more familiar with the software that has ignited the networking world on fire!

Do you think you've got what it takes to master the CCNA concepts? After you have read this Getting Started Guide, we hope you realize, there is A LOT more topics to discuss.

We would like to help new people, or people who have been around for 5, 10, 15 (or lord help you, 20) years in the 'biz'. to round out or let you go nuts on concepts you have always wanted to play with but couldn't because it was too expensive to run your own personal lab OR your company is allergic to people experimenting with their production network ;)

And because GNS3 is changing the way network professionals learn networking concepts, we welcome partnerships across many verticals.

The GNS3 Assist team has a combined experience in the industry of over 75 years! We revamped many passages from the GNS3.net website and built out explanations and screenshots. Something that was also missing was a central "voice" for what GNS3 is all about. GNS3 is about collaboration, experimentation and working with talented people from over 190 countries.

We welcome you to join us! Please join the Community Portal and start sharing! We look forward to working with all of you in this most auspicious of occasions.

Sincerely,

THE GNS3 ASSIST TEAM