



HOW TO GUIDE INSTALLING AND INTEGRATING NETWORK PERFORMANCE MONITOR & GNS3





HOW-TO GUIDE INSTALLING AND INTEGRATING GNS3 AND NPM

IT'S ALL IN YOUR MIND (OR ON YOUR LAPTOP)

Using GNS3 and SolarWinds® to create a completely virtualized monitoring environment.

This guide provides detailed step-by-step instructions for setting up GNS3, creating a network, and then setting up a virtual machine running the SolarWinds Network Performance Monitoring solution.

INTRODUCTION

About GNS3

GNS3 is a tool that lets you create virtual network devices that act like real network devices. Why would you want to do this? Well, for years, GNS3 has been the go-to solution for people who wanted to pass their network certification exams (without having to drop thousands of dollars on actual network gear), and creative-but-frugal network professionals who wanted to mock up and test their network designs before rolling them out in a real production environment.

About SolarWinds Network Performance Monitor (NPM)

NPM is the flagship product from SolarWinds, Inc. It monitors devices for availability (up/down), performance, capacity, and more using agentless techniques, including SNMP and WMI. Devices which can be monitored include servers running Windows[®], Linux[®], UNIX[®], and MacOS[®] network devices like routers, switches, and wireless access points, and any device with an IP address.

GNS3 + SolarWinds = Awesome

With a relatively recent update, GNS3's support of virtual PCs (and servers) via Oracle[®] and their open source VirtualBox[®] tool, a whole new class of IT pro has a reason to be really excited. Monitoring engineers who want to test new software and/or versions can now set up an entire "fake" network, which could include servers, routers, switches, and more, and perform test monitoring against that network.

ABOUT THIS GUIDE

Monitoring engineers might be unfamiliar with setting up networks (in GNS3 or otherwise). Also, GNS3 users might be unfamiliar with the conventions of monitoring solutions like SolarWinds NPM.

Which is where this guide comes in.

This document provides step-by-step, command-by-command, show-me-with-pictures instructions for installing GNS3, setting up a network, installing NPM, and adding the GNS3 network devices to NPM for monitoring. This guide assumes (almost) nothing about the reader's background and expertise and provides detailed instructions for all processes.

So, if you are a GNS3 guru and can set up a hybrid OSFP-BGP-EIGRP-RIP network before your morning coffee, you can probably skip ahead to the NPM part. And if you are a veteran SolarWinds expert who has installed NPM so many times that you have the screens memorized, you can probably stop reading once you get your network installed.

For those of you who likely fall somewhere in the middle, I hope this guide helps you to get to the part that's actually useful—testing your network and/or monitoring changes in a safe environment before rolling them out to your production environment.



Let's get started:

Here's an overview of what we're going to do:

- 1. Download everything.
- 2. Install PuTTY™.
- 3. Install VirtualBox[®].
- 4. Install GNS3.
- 5. Configure GNS3.
- 6. Set up a simple network.
- 7. Add a virtual server to the network.
- 8. Install Windows® on the virtual server.
- 9. Install NPM on the virtual server.
- 10. Configure NPM to monitor the devices.

Before you start, verify your hardware

You may be wondering, "What am I installing all this stuff on?"

The answer is "whatever you want, really." But, of course, we all know there are a few requirements:

- You should have at least a quad-core processor on the machine because you will be running at least one virtual machine along with a few virtual network devices—not to mention your host operating system.
- You should probably have over 4GB of RAM. You can run with 4, but things are going to be pretty slow for the same reasons as the CPU requirement above.
- Disk space is less of an issue, given today's standards. GNS3 needs only about 100MB, but you also need to allow for the network device images, plus at least one Windows virtual machine running SolarWinds NPM. So you should figure your disk needs to have 200GB to 300GB free.

Step 1: Download everything

NOTE: You'll need to create an account for the GNS3 community before the download link will work. This is a Very Good Thing™ and I strongly recommend you do that anyway. (See instructions below.)

- GNS3: https://community.gns3.com/community/software/download
- PuTTY: http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html
- VirtualBox: https://www.virtualbox.org/wiki/Downloads
- NPM: http://www.solarwinds.com/network-performance-monitor.aspx
- A copy of Windows
- The "images" of the network device operating system (Cisco® IOS® or other)
 - 1. Create an account at GNS3, and download the package from here: https://gns3.com/software/download





Next, grab a copy of VirtualBox: https://www.virtualbox.org/wiki/Downloads. On that same page, you can download the extensions. While you don't have to have them, they're good to help normalize the hardware interactions, which is worth the extra 10-second download.

Of course, you'll need the 30-day demo of SolarWinds NPM: http://www.solarwinds.com/networkperformance-monitor.aspx

Finally, to make your life easier, make sure you have PuTTY (or a similar telnet/ssh utility) installed: http:// www.chiark.greenend.org.uk/~sgtatham/putty/download.html

Another item you need to have handy is a copy of Windows. SolarWinds NPM will install on any version of Windows from Win7 up (although, server versions are better, and 64-bit server versions are best) so make sure you have that ready to go.

You'll also need IOS images to create routers and switches within GNS3. For my example, I'm limiting myself to using an image for a Cisco[®] 3600 router, using the image "c3640-ik9s-mz.124-25b.image."

Before you get on my back about NOT providing a link here, I would like to point you to this section of the GNS3 For Windows Getting Started Guide:

Step 3 - Defining Cisco IOS files

As mentioned earlier, due to licensing issues, you must provide your own Cisco IOS and license for IOU to use with GNS3.

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 Cisco 7200, 3600 series (3620, 3640, and 3660), 3700 series (3725 and 3745), and 2600 series (2610 to 2650XM and 2691).

What this means is if you have a Cisco support contract, you can download images from the Cisco.com

website. There are probably other sources for IOS images on the Internet. However, that is beyond the scope of this document and is left to the resourcefulness and ethics of the reader.

Step 2: Install PuTTY

And by "install," I mean unzip the package and put the executables someplace in your path.

Step 3: Install VirtualBox (and extensions)

I'm going to start by installing VirtualBox so GNS3 can detect it when I install it next. But I'm not going to set up the NPM server just yet.

There's really nothing special about the VirtualBox install. Follow the prompts, accept the defaults, and let it rip.

Once the main installer finishes, start VirtualBox, and install the extension pack (you DID download the extension pack, right?).

- 1. Go to File, Preferences, Extensions, and click the Add new package button (the blue box with the yellow arrow on the right).
- 2. Select the extension pack, and click Open.
- 3. Accept the license agreement.
- 4. Follow the prompts until everything is installed.

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Step 4: Install GNS3

- 1. Double-click the GNS3 installer.
- 2. If you have User Access Control on, confirm that you REALLY want to start the GNS3 installer.
- 3. Click Next on the splash screen.



4. Accept the license agreement.





5. Select the Start menu location where GNS3 programs should appear.

	GNS3 1.4.1 Setup	
hoose Start M Choose a Start N	enu Folder Menu folder for the GNS3 1.4.1.shortcuts.	
	Menu folder in which you would like to create the pr name to create a new folder.	ogram's shortcuts. You
GNS3		
		^
Evernote Google Chrome Intel		Ŷ
Intel		Vext > Cancel

6. And select the GNS3 elements.

HINT: TAKE ALL OF THEM!!!!

0	GNS3 1.4.1 Setup	×
Choose Components Choose which features of GNS	31.4.1. you want to install.	
Check the components you wa install, Click Next to continue.	nt to install and uncheck the comp	ponents you don't want to
Select components to install:	WinPCAP 4.1.3 Wireshark 1.12.7 SolarWinds Response Dynamips 0.2.14 QEMU 2.4.0 & 0.11.0 V VPCS 0.6.1 Cpulimit	Description Position your mouse over a component to see its description.
Space required: 172.1MB	GNS3	
Nullsoft Install System v3.0b1 —		
	< Back	Next > Cancel



7. Select the directory where GNS3 will be installed.

Choose Install Location Choose the folder in which to install GNS3 1. Setup will install GNS3 1.4.1 in the following and select another folder. Click Install to sta	folder. To install i		t folder, di	ck Bro	NSE
Setup will install GNS3 1.4.1 in the following	folder. To install i		t folder, di	ck Bro	wse
			t folder, di	ck Bro	Nse
Destination Folder					
C:\Program Files\GN83			Browse.		
Space required: 172.1MB					
Space available: 330,0GB					
Julisoft Install System v3,0b1					
	< Back	Instal		Cance	el

8. And finally, click Install.

×
Welcome to the WinPcap 4.1.3 Setup Wizard
This Wizard will guide you through the entire WinPcap installation. For more information or support, please visit the WinPcap home page.
http://www.winpcap.org
Install > Cancel



9. During the install,

	GNS3 1.4.1 Setup	
Installing Please wait while	e GNS31.4.1.is being installed.	
Downloading Wir	reshark-win64-1, 12, 4, exe	1
1	1976kB (41%) of 29136kB @ 748.5kB/s (23 seconds rem	aining)
1	1976kB (41%) of 29136kB @ 748.5kB/s (23 seconds rem	
1	1976kB (41%) of 29136kB @ 748.5kB/s (23 seconds rem	
Luisoft Install Syst	Cance	

the sub modules (WinPCAP, Wireshark, SolarWinds Response Time Viewer, etc.) you selected have their own installer.

Go ahead and click through those as well, selecting the defaults, unless you have a compelling reason not to do so. Note that some of the sub-installers will pop under the main screen, so you should probably minimize all open windows and keep an eye out for new items on the taskbar just so you aren't waiting for a confirmation box which is hidden somewhere on the desktop.

Certain items, such as WinPCAP, may attempt to install twice (once because it's in the GNS3 list of installers, and again because it's part of the Wireshark install, which GNS3 also installs).

10. Also note that from time to time GNS3 bundles in offers of free software from other vendors. As with all installers, a modicum of common sense is always advisable. Although, the offer pictured below is a GREAT deal!

0	GNS3 1.4.1 Setup	- 🗆 ×
Solarwinds Standard Tool Exclusive for GNS3 users	set	
	Would you like to get y Solarwinds Standard	
		Toolset F.A.Q
Nollsoft Install System v3.0b1 -	< <u>B</u> ack	ext > Cancel



Step 5: Start and configure GNS3

Once the GNS3 installer ends, there is a checkbox to start GNS3. Go ahead and check that box and click Finish.

After a brief bit of screen splashing, you'll be in the main GNS3 screen, and will be prompted to start a new project. Go ahead and name your project, and click OK.

	New project	5 ×
Project		_
Name:	SWProj1	
Location:	C:\Users\leon.adato\GNS3\projects\SWProj1	Browse
Type:	Local	
Open a pro	ject Recent projects OK	Cancel

Before you do anything else, let's check some configuration settings by going to Edit, Preferences, and looking at the General tab:

1		Preferences			? >
General	Genera	l preference	s		
Server Packet capture VPCS	General Local pa	Console applications	Topology view	Miscellaneous	1
Dynamips	My proje	ects:			
IOS routers	C:\Use	s Veon. adato \GNS3 \proje	ects		Browse
4 IOS on UNIX	My bina	y images:			

Note the location of binary images. That's where your IOS images need to go. Go ahead and copy them into that directory (create it if you need to).

NOTE: Although we have mentioned and used Cisco IOS throughout the document, GNS3 can also emulate a number of other vendor hardware products. For a comprehensive list of hardware that can be emulated using GNS3, check the supported hardware documentation page or the GNS3 community page.

Now, you need to add images to the list of available routers. Click down to the IOS routers option on the left, and click New. Click the browse button, and go to the location where you just placed all your IOS images. Select an image, and click Open.

3			Preferences			3 ×			
General		IOS router tem	plates				y Summary		
Server Packet ca	pture	省 c1700	4 General Name:	c1700					
VPCS ⁴ Dynami	6	New	OS router temple	ate	? ×				
IOS ro IOS on	105 image Please d	hoose an IOS image.			24	OS\c1700- ing\GNS3\			
IOU de	IOS image:				Browse				
Virtua		6			Select an IOS ima	ge			>
▲ QEMU QEMU		۲	🔻 🕆 🌡 🕨 Ada	ito, Leon → GNS	3 ⊧ images	✓ C Si	earch images		,p
		Organiz	e 🔻 New folder					## • 🔟	0
		🚖 Fav	orites	Name	*	Date n	nodified	Туре	
		💻 D	esktop	IOS		7/13/2	015 5:31 PM	File folder	
		🚺 D	ownloads	asa831-k8.k	pin	10/11/	2012 4:26 AM	BIN File	
		Ja S	olarWinds	asa842-k8.k	pin	10/30/	2012 3:56 PM	BIN File	
			ork	c1700-advi	pservicesk9-mz.124-25b	bin 12/3/2	009 6:15 PM	BIN File	
			ebwork		pservicesk9-mz.124-25b		12.9:37 PM	IMAGE File	
		💝 D	ropbox	c2691-advi	pservicesk9-mz.124-25b	image 8/1/20	12 9:38 PM	IMAGE File	



Follow the prompts, taking the default options unless you have a compelling reason to change them. Repeat this process until have added all IOS images.

Step 6: Create your network

For the following example, I'm setting up three Cisco 3600s connected via EIGRP. This is a very simple setup intended for readers who may not have much experience configuring a network. If you want to set up something different, be my guest.

Here are some notes about what this will look like when we're done. A downloadable version of this project (which may require some updates depending on your installation of GNS3) is available at:

GNS3 Sample Network

Complete these steps to create your network:

1. From the main screen, click the router icon, and drag a 3600 router onto the main page.

TRICK: To get all three routers at once, press SHIFT-drag. You'll get a popup asking for the number of routers and you'll be done.



2. Right-click the R1 router, and choose Configure.

	Nod	e configurato	r		2
 Router c3600 group Summer 	Summer c	onfigurati	ion		
	General Men	nories and disks	Slots	Advanced	
	Name:	Spring			
	Platform: Chassis:	c3600 3640			
	IOS image path:	c3640-ik9s-mz.12	24-25b.im	nage	Browse
	Console port:	2001			•
	Aux port:	0			•

- a. On the General tab, set the name to Spring.
- b. On the Slots tab, set slots 0 and 1 to NM-4T (serial).
- c. Set slot 2 to NM-1FE-TX (FastEthernet).
- 3. Click OK to finish, and repeat these steps for Routers 2 and 3, naming them Summer and Fall, respectively.

Now that the routers are all placed and provisioned, we need to configure them. We're going to set up three network connections on each router, and then connect each of the routers together using the EIGRP protocol. The remaining (FastEthernet) interface is going to be on a "management" network, which is how monitoring will be done.



INSTALLING AND INTEGRATING GNS3 AND NPM

First, a picture:



And here's a description of the interfaces on each device:

Router 1 name: Spring

- Interface 1 (serial):
 - 10.1.1.1/24 (i.e.: gateway 255.255.255.0)
 - Connects to Summer
- Interface 2 (serial):
 - 10.1.2.1/24
 - Connects to Fall
- Interface 3 (FastEthernet):
 - 10.1.100.1/24
 - Will be default gateway for management network

Router 2 name: Summer

- Interface 1 (serial):
 - 10.1.2.2/24
 - Connects to Spring
- Interface 2 (serial):
 - 10.1.3.1/24
 - Connects to Fall
- Interface 3 (FastEthernet):
 - 10.1.100.2/24
 - Connects to management network

Router 3 name: Fall

- Interface 1 (serial):
 - 10.3.1.2/24
 - Connects to Summer
- Interface 2 (serial):
 - 10.1.2.2/24
 - Connects to Spring
- Interface 3 (FastEthernet):
 - 10.1.100.3/24
 - Connects to management network



With that design in mind, let's get to configuring.

- 1. Click the Connection button.
- 2. Click Spring, and select interface Serial0/0.
- 3. Click Summer, and select interface Serial 0/0.



- 4. Continue to connect routers as follows:
 - a. Spring, Serial1/0 to Fall, Serial0/0
 - b. Summer, Serial1/0 to Fall, Serial0.0
- 5. Click the switch icon and drag an "Ethernet switch" onto the screen.
- 6. Click the connector icon again and connect each router's FastEthernet2/0 interface to the switch.
- 7. Now let's turn it on. Click the "play" button to ensure that all your devices are running.





8. Right-click Spring and choose Console to open a telnet/ssh terminal. Press ENTER a couple of times, if necessary, to get things moving.



- 9. Set up SNMP:
 - a. Type this to enter config mode: configure terminal
 - b. Type this to set up a SNMP read-only string so you can monitor with NMP: snmp-server community GNS3plusSWrocks ro

10. Set up the interfaces:

a. Type this to edit the first interface:

```
interface SO/O
```

- b. Type these commands to set up the first interface: ip address 10.1.1.1 255.255.255.0 no shutdown
- c. Exit back to interface mode. exit
- d. Type these commands to set up the second interface: int S1/0
 - ip address 10.1.2.1 255.255.255.0 no shutdown
- e. Exit back to interface mode.

```
exit
```

f. Type these commands to set up the third (FastEthernet) interface: int ${\rm Fa2}/0$

```
ip address 10.1.100.1 255.255.255.0
no shutdown
```

g. Exit back to interface mode, and set up EIGRP routing.

```
exit
router EIGRP 1
network 10.1.1.0 0.0.0.255
network 10.1.2.0 0.0.0.255
h. Exit all the way out, and save your configuration.
exit
exit
write memory
```



- 11. Set up EIGRP on the other two routers.
 - a. Right-click on the router "Spring" and open a console, then enter the following commands: configure terminal

```
snmp-server community GNS3plusSWrocks ro
interface SO/O
ip address 10.1.1.2 255.255.255.0
no shutdown
exit
int S1/0
ip address 10.1.3.1 255.255.255.0
no shutdown
exit
int Fa2/0
ip address 10.1.100.2 255.255.255.0
no shutdown
exit
router EIGRP 1
network 10.1.1.0 0.0.0.255
network 10.1.3.0 0.0.0.255
exit
exit
write memory
```

b. Right-click on the router "Fall" and open a console, then enter the following commands:

```
configure terminal
snmp-server community GNS3plusSWrocks ro
interface SO/O
ip address 10.1.2.2 255.255.255.0
no shutdown
exit
int S1/0
ip address 10.1.3.2 255.255.255.0
no shutdown
exit
int Fa2/0
ip address 10.1.100.3 255.255.255.0
no shutdown
exit
router EIGRP 1
network 10.1.2.0 0.0.0.255
network 10.1.3.0 0.0.0.255
exit
exit
write memory
```



- 12. Ensure that your network is working by issuing the following commands on all three routers:
 - ping 10.1.1.1 ping 10.1.1.2 ping 10.1.100.1 ping 10.1.2.1 ping 10.1.2.2 ping 10.1.100.2 ping 10.1.3.1 ping 10.1.3.2 ping 10.1.100.3

You should see the following type of response each time:

```
Spring#
Spring#ping 10.1.3.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.3.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/11/20 ms
Spring#
```

13. If you receive failure messages, you will need to review your configuration and make the necessary changes.

CONGRATULATIONS!! You now have a functioning network that you can use for all manner of processes. Here's the one we're going to use:

Step 7: Create a virtual machine

- 1. Start VirtualBox.
- 2. Click New to create a new system.
- 3. In the next screen, provide a name (we're using NPMdemo), and select the operating system you intend to install.

NOTE: NPM will install on any 64-bit version of Windows from Windows 7 and later. But a server version is best if this is going to be anything but a small test.

- 4. Determine how much RAM, CPU, and disk space you wish to allocate.
- 5. Complete your new virtual machine.
- 6. If you have a physical copy of Windows, insert it in your computer. If not:
 - a. Go to Settings, Storage, and select the Empty CD/DVD drive. Then navigate to your copy of Windows.





7. Go to Settings, Shared Folders, and add a new folder that points to where you have the NPM installation files.



- 8. Back at the main screen, click Start to fire up your new virtual machine.
- 9. At this point, the Windows installer should kick in. I'm just going to leave the instructions here with this bit of sage advice: "Install Windows."

TIP: You'll probably need to restart the computer a few times during installation and patching. To send Ctrl-Alt-Del to the virtual machine, use the "hostkey"+Del combination, where "hostkey" is usually the right Ctrl key.

Step 8: Install NPM

NPM installation is straightforward.

1. After clicking the installer, enter your email address, and click Next.



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2. On the welcome screen, confirm the installation of NPM.

NOTE: If this machine (the host machine or the VM) does not have Internet access, use the link at the bottom of the screen to download the offline version of the installer and use that instead.

install	Your Chosen Products	2
	Network Performance Monitor Version 11.5.2 Network fault, availability, & performance monitoring	(j)

3. On the next screen, select Express Install.

HINT: the advanced install is used if you use a separate SQL server for database storage. In most cases, for this kind of test environment, the Express install (which installs a local copy of SQLExpress) is sufficient.

4. Select your preferred language.

SolarWinds Orion Setup	
 ✓ Select Products Select Settings 	Product Language Preference Which language do you want the software to use? <u>How will this selection affect the software? >></u> Please note that your language selection cannot be changed later.
 Install Method Global Settings 	English is my preferred language.
License Agreement Enable QoE Install	Deutsch ist meine bevorzugte Sprache. 優先言語は日本語です。
	Choose Destination Location Setup will install SolarWinds Orion in the following folder.
	To install to the folder, click Next. To install to a different folder, click Browse and select another folder.
	C:\Program Files (x86)\SolarWinds\Orion\
	Browse



5. Accept the license agreement (the checkbox at the bottom of the screen) and click Next.



In this example, we won't be testing the Quality of Experience monitoring, so select the Enable later radio button, and click Next.

SolarWinds Orion Setup	
✓ Select Products	Enable Quality of Experience (QoE) Traffic Monitoring The new QoE feature allows you to monitor and analyze application traffic and identify traffic bottlenecks. >> Learn more about QoE
Select Settings	
* Install Method	C Enable QoE traffic monitoring now on your Orion server Installs an agent that gathers QoE traffic data on your Orion server. The agent is limited so it will not affect
Global Settings	Orion's performance. Recommended for eval and test deployment.
License Agreement	
Enable QoE	C Enable QoE later, after Orion has been installed
Install	Advanced configuration for QoE traffic monitoring, Deploy QoE via an agent to a Windows server to monitor traffic locally, or on a dedicated node monitoring a SPAN / mirror interface.

7. One final confirmation to click Next past...

SolarWinds Orion Setup	
✓ Select Products ✓ Select Settings	Start Copying Files Setup has enough information to start copying the program files. If you want to review or change any settings, click Back. If you are satisfied with the settings, click Next to begin copying files.
e beleur berungs	The following products will be installed:
• Install	Setwork Performance Monitor Version 11.5.2
Confirmation	The following third-party pre-requisites will be installed:
Install Progress	Microsoft .NET Framework 3.5
arranter a pra	Microsoft .NET Framework 4.5.1
	Microsoft Visual C++ 2008 SP1
	Microsoft Visual C++ 2010
	Microsoft Visual C++ 2012
	Microsoft Visual C++ 2013
	Microsoft SQL Server Express 2008 R2



8. The installer should proceed without any other confirmations.



9. Once the installation is complete, you will see this confirmation dialogue:



10. At that point, your default browser will start up, and the SolarWinds[®] Orion[®] login page will display:

	solarwinds	
	1 product in evaluation. » Details	
User name:	admin	You can log in with the username admin and no password. To change the Admin password after you log in, click
	Enter domain/usemame or usemame@domain for windows accounts	Settings > Manage Accounts.
Password:		
	LOGIN	

Congratulations! NPM is now installed and ready to go.

In order to add this new virtual machine into GNS3, shut down the VM.



Step 9: Add the new virtual machine to GNS3

At this point, all of the required software is installed and ready to go. The next stage is to add the new virtual machine into the GNS3 environment. This section will run best if you start while running both GNS3 and VirtualBox (although with no virtual machines open).

1. Back in GNS3, go to Edit, Preferences, and choose VirtualBox VMs from the sidebar, then click New.

6			SWProj1.gns3* — GNS3	
Eile Ed	it View Control Device Ann	6	Preferences ?	×
	End devices 6 × Cloud Host VPCS	General Server Packet capture VPCS Dynamips IOS routers IOS on UNIX IOU devices VirtualBox VMs QEMU VMs	VirtualBox VM templates	
-	Console		- Carlos - C	
5	GNS3 management console. Running G Copyright (c) 2006-2015 GNS3 Technol =>		New Edit Delete OK Cancel Apply	

2. Select your NPM virtual machine from the list, and click Finish. Then click OK to exit the Preferences dialogue.

8	New VirtualBox VM template	? ×
	Box Virtual Machine ase choose a VirtualBox virtual machine from the list.	
VM list:	NPMDemo	•
Use	as a linked base VM (experimental)	
	< Back Fin	ish Cancel



3. Back on the main GNS3 screen, click the End Devices button, and then drag the NPM virtual machine into the main area.



4. Right-click the NPMDemo machine and choose Configure. Select the NPM Demo machine on the left-hand list, and click the Network tab. Finally, check the box that says Allow GNS3 to use any configured VirtualBox adapter, and click OK.

8	Node configurator	; ×
VirtualBox VM group	NPMDemo configuration	
	General settings Network	
	Adapters: 1	-
	Type: Intel PRO/1000 MT Decktop (82540EM)	*
	Allow GNS3 to use any configured VirtualBox adapter	

5. Use the connector icon to create a connection from port 4 on the switch (SW1) to the Ethernet 0 on the NPMDemo machine. Then cross your fingers, click the "play" button, and see what happens!



If everything is set up correctly, all the routers will start up, AND the VirtualBox machine will start.



Step 10: Configure NPM to monitor the devices within the GNS3 environment

Now that everything is installed, configured, connected, and running, go back to the NPMDemo machine. Before we can add devices, we have to make sure the NPM server is able to connect to the routers. Normally, this would all be handled by DHCP and DNS. But because we're in a small test environment, we have to set it manually.

Remember how we set up the third adapter on each router to be on the 10.1.100.x network? That's what we're using for management.

Set your NPM server's network card with the following information:

- IP Address: 10.1.100.100
- Subnet Mask: 255.255.255.0
- Default Gateway: 10.1.100.1 (the Spring router)

Once you've done that, test your settings by running the following commands at a DOS prompt (yes, it IS called a DOS prompt, you whipper snapper!).

ping 10.1.100.100 ping 10.1.100.1 ping 10.1.100.2 ping 10.1.100.3

All four commands need to work before we move on. Troubleshoot as needed.

Now we'll fire up the NPM portal and add our routers.

NOTE: NPM is an extremely powerful tool which can monitor not only SNMP devices, but also Windows servers via WMI, as well as Cisco UCS[®], VMware[®], and Microsoft[®] devices via their specific APIs. All of that is beyond the scope of this guide, so some of the steps below are extremely abbreviated in order to move us to the primary goal: monitoring the routers Spring, Summer, and Fall. I leave it to the curious readers to explore all the other amazing features of NPM at their leisure.

- 1. Start your browser, and go to either http://<machinename>:8787/ or http://localhost:8787.
- 2. Log in using the default credentials.
- 3. If NPM is running for the first time, you will automatically end up at the Add new devices page. If not, use the Discover My Network button on the main screen.





4. On the first screen, we need to add the proper SNMP credentials. This would be GNS3plusSWrocks if you were following the directions back at the start of this document. If not, add whatever SNMP or string your devices use. You can also remove unneeded strings (like "private") from the list before clicking Next to proceed.

Network Sonar Wizard			
	DISCOVERY SETTINGS	DISCOVERY SCHEDULING	
SNMP Credentials Enter the SNMP credentials used on your network. The Discovery to use for each network device. Credentials are used in the order		Illy determines the community s	tring and SNMP version
Add New Credential			
SNMP Version:			
SNMP v1 or v2c 💌		Version	Actions
Choose Credential:		SNMP v1 or v2c	合马 🧨 🗙
<new credential=""> V</new>		SNMP v1 or v2c	습무 🥖 💥
SNMP Community String:			
GNS3plusSWrocks ×			NEXT CANCEL
ADD CANCEL			

- 5. Because none of our devices are using agents, you can click Next to move past that screen.
- 6. Similarly, we aren't monitoring any virtual machines, so on the next screen, un-check Poll for VMware, and click Next.
- 7. And, once again, no Windows servers will be monitored as part of this exercise, so click Next past the screen where you would add your Windows credentials.
- 8. The next screen lists several ways to add devices (scanning subnets, using a seed router, etc.). In the name of expediency, we're going to list the specific IPs to add. Click Specific Nodes and add the IPs of the three routers before clicking Next to continue.

	selection methods to define the portion of your network on which the devices you want to discove	er
Discovering IPv6	Addresses? Use the Specific Nodes method to add a list of IPv6 nodes.	
SELECTION METHOD	One IP address or hostname per line	
IP Ranges	10.1.100.1	
Subnets	10.1.100.2 10.1.100.3	
Specific Nodes		
		_
	Validate	
		_
	BACK	NEXT

The following screen has settings (timeouts, etc.) which are useful in a production environment, but shouldn't make a difference to us here.

- 9. Click "Next" to proceed.
- 10. On the final screen, we don't need to change any scheduling options. Simply click Discover to get the show on the road.

11. The discovery shouldn't take long.

Discovering Network.		
Hop 0: Inventory: 10.1.10).3	
Overall Progress:		
Current Phase:		
Nodes Discovered:	3	
Subnets Discovered:	0	
		CANCEL

You will see the results page, which should include three Cisco 3600 routers (or whatever your network is made up of, if you did something different).

12. Click Next to confirm the changes.

Vetw	ork S	Sonar	Results V	Niza	rd				
DEVIC	ES	INTERFAC	CES VOLU	MES	IMPORT PREVIEW	RESULTS			
Devi Sele	ce Ty ct the c Count	pes to I levice ty	mport pes to moni Device Type	itor.					
2	3	ands	Cisco 3640						
								NEXT	CANCEL

13. On the next screen, you can select the interfaces to monitor.

By default, all interfaces that are Up are selected. Once you've adjusted your choices, click Next.

NOTE: While NPM requires an IP address to monitor a device, non-routable interfaces (i.e.: interfaces that do NOT have IPs assigned) can still be monitored for availability, bandwidth, and more. In our example, you probably want to choose all the interfaces.

properties						
	Port Mode 🕕	Hardware				
y up	Trunk	Physical				
y down	Access	Virtual				
ely shutdown	Unknown	Unknown	n			
			Group by: Interface	Туре	Show:	All
ailable) Interface	е Туре					
गुगु Ether	net					
🔄 💉 Seria	te					
(It Other	n					
	3) गा Ether 24) Seria	Port Mode ① y up y up Trunk y down Access vely shutdown Unknown on options Unknown Interface Type Interface Type Interface Type S FT Ethernet Interface Serial	Port Mode i Hardware y up Image: Trunk Physical y down Image: Access Image: Virtual yely shutdown Image: Unknown Image: Unknown on options Image: Comparison of the second seco	Port Mode Hardware y up Trunk Physical y down Access Virtual vely shutdown Unknown Unknown on options State State	Port Mode i Hardware y up I Trunk Physical y down Access Virtual vely shutdown Unknown Unknown on options Unknown Unknown	Port Mode i Hardware y up I Trunk Physical y down Access Virtual vely shutdown Unknown Unknown on options State State Group by: Interface Type allable) Interface Type Serial



- 14. Because there are no volumes (disks) on this device, you can click Next to move past that screen.
- 15. On the final preview screen, make sure your devices are listed, and click Import.

nport Preview - WIN-UMFPQ6T90SM	
elect devices, interfaces, and volumes that you wish to ignore or import. All ignored items will be rem iring any future network discovery, manual or scheduled. If you wish to ignore items, do so before im	
Polling IP Address Name Machine Type Volumes Pol	ling Method Interfaces Count
V 10.1.100.1 Spring Cisco 3840 SN	MP 4
V	MP 4
🗹 🚈 10.1.100.3 Fall Cisco 3640 SN	MP 4

16. Once the import completes, click Finish.

DEVICES INTERFACES VOLUMES IMPORT PREVIEW INFORMATION INFORMATIONI INFORMATII INFORMATION INFORMATII INFORMATICI INFORMATICI I	ESULTS
Node Spring, Import Status: added to the Orion DB.	
Node Fail, Import Status: added to the Orion DB. Interface FastEthernet2/0 - Fa2/0, Parent Node: Spring, Import Stat Interface FastEthernet2/0 - Fa2/0, Parent Node: Spring, Import Stat Interface Serial/00 - Se0/0, Parent Node: Spring, Import Stat Interface Nullo - Nu0, Parent Node: Spring, Import Status: a Interface Serial/00 - Se0/0, Parent Node: Summer, Import Status: Interface Serial/10 - Se0/0, Parent Node: Summer, Import Status: Interface Serial/10 - Se0/0, Parent Node: Summer, Import Status Interface FastEthernet2/0 - Fa2/0, Parent Node: Summer, Import Status Interface Serial/10 - Se0/0, Parent Node: Summer, Import Status Interface Serial/10 - Se0/0, Parent Node: Fail, Import Status Interface Serial/10 - Se1/0, Parent Node: Fail, Import Status Interface Serial/10 - Se1/0, Parent Node: Fail, Import Status Interface Serial/10 - Se1/0, Parent Node: Fail, Import Status Interface Nullo - Nu0, Parent Node: Fail, Import Status: adde Import finished	tus: added to the Orion DB, tus: added to the Orion DB, ddded to the Orion DB. status: added to the Orion DB. status: added to the Orion DB. sadded to the Orion DB. t Status: added to the Orion DB. t Status: added to the Orion DB. s: added to the Orion DB. s: added to the Orion DB.

17. Click Home to get back to the main screen.

SHAKE, CHILL, AND SERVE

18. Congratulations! You're now up and running with a completely virtualized network that is monitored by a completely virtualized instance of SolarWinds NPM.





Appendix 1: Using SolarWinds® Network Performance Monitor

As mentioned earlier, exploring all the nooks and crannies of NPM is outside the scope of this document. However, here are a few items to whet your appetite for exploring the monitoring data available:

On the main screen, under "all nodes," you can click any of the routers to get to the Node Details page:



This includes detailed information about each interface:

Percent Utilizati Radial Gauges		THRESHOLDS EDIT HELP	Min	Max/Aver	age bps In/Out		THE .		EXPORT	EDIT HELP
toolal Gauges						Serial	0/0 - Se0/0			
						21 2015, 10:36	- 14 21 2016	2.22		
41 40		-45 85						1.00 00		
		(Zi	oom 1h 12h 24h	6 C				
20	85.5	20 0%								
0 %	1	and the second sec								
-	100	100	0	150 Bps						
			Brts PER SECOND							
			音	T00 bps						
RECV % Utiliza	ation	XMIT % Utilization	웃							
			5	30 bps						
		Edr.								
nterface Details	5	EDIT HELP								
	/ Edi	Interface 🔐 Ummanage		0 bps	10.30 AM	TE:00 AM	11.30 AM	12:00 PM	12:30 PM	1.00 PM
Management	SF Pa	ilers 😯 Poll New			14.44 144	11.49.54	11.144.000	10,000	14.94.14	
		discovery			12:00 PM				6	B
	-			1.	12:00 PM		21 Jul		-	0 4
Status		Up								
Name		Serial00 - Se00		Average R	eceive bps Spring - Sa	Dick? - Dicking				
Alias				Average R	leceive bps Spring - Se	erial0.0 - Se0.0 Tre	nd			
Index		2	I	Average R	leceive bps Spring - Se	mailoiti - Secio Pe	centile 20%			
Interface Type	1	Senal		Min Max R	leceive bos Spring - Se	erial0/0 - Se5/0				
MAC Address		Unknown		Average T	ransmit bps Spring - S	enat00 - Se00				
IP Address		10.1.1.1			ransmit bos Spring - S					

66 We decided to use SolarWinds based on it being a tool that was vendor agnostic and easy to use. **99**

Daniel Cleary Network program leader Deakin University

...as well as other elements on each box.

Under the Network tab, the Network Top 10 menu shows a variety of elements and data points that are useful to the network professional.

	p 10								
Top 10 Interfaces by Percent Utilization				Top 10 Wireless Clients by Traffic					EDIT HELP
NODE I	NTERFACE RECEIVE	TRAN	SMIT	IP ADDRESS	SSID	CONNECTED	DATA RATE	TRANSMIT	RECEIVE
Top 10 Inte	erfaces by Traffic		EDIT HELP	Top 10 Wireless	s APs by (Clients Count	1011		EDIT HELP
NODE	INTERFACE	RECEIVE	TRANSMIT	AP NAME		IP ADDRESS	CLIEN	TS COUNT	
Spring	👩 FastEthernet2/0 - Fa2/0	324.16 bps	665.53 bps						
g Summer	FastEthernet2/0 - Fa2/0	299.05 bps	355.44 bps				1001		Interior Party
Fall	FastEthernet2/0 - Fa2/0	287.83 bps	344.38 bps	Top 10 Nodes by Current Response Time					EDIT HELP
6 Summer	3 Serial0/0 - Se0/0	171.05 bps	172.0 bps	NODE		CURRENT RESPONSE TIME		PERCENT	
Spring	8 Serial1/0 - Se1/0	170.79 bps	172.0 bps	B Summer		23 ms		0 %	
🕖 Summer	🕤 Serial1/0 - Se1/0	171.73 bps	171.05 bps	6 Fall		23 ms		0.96	
🕖 Fall	👩 Serial1/0 - Se1/0	172.0 bps	170.78 bps	Spring		2 ms		0 %	
Fall	😁 Serial0/0 - Se0/0	171.99 bps	170.78 bps						
Spring	👩 Serial0/0 - Se0/0	171.06 bps	171.06 bps	Concernance of			(1011)		
😧 Fall	📵 Null0 - Nu0	0.0 bps	0.0 bps	Top 10 Nodes b	y Percent	Packet Loss			EDIT HELP
				NODE		PERCENT LOSS			
Top 10 Err	ors & Discards Today		EDIT HELP	-					
TOP TO LIN		and the second	forward transmitte	Top 10 Nodes b		CPILLoad			EDIT HELP
NODE INTER	FACE RECEIVE RECEIVE ERRORS DISCARDS	TRANSMIT	DISCARDS		, menug				and free
				NODE		AVERAGE CPU LOAD			

66 We have a high level of visibility of each device and recent changes made to it. The visibility helps us to understand the root cause of each incident.

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SUMMARY

Obviously, this is only scratching the surface of what you can do.

For more help getting started with NPM, check out these resources:

- NPM Interactive Demo
- NPM Core Training
- Administrator Guide

With regard to SolarWinds, it's entirely possible to install additional SolarWinds modules, such as Network

Configuration Manager (NCM), Server & Application Monitor (SAM), and even NetFlow™ Traffic Analyzer (NTA) to test each of those capabilities within a safe sandbox environment.

On the GNS3 side, as long as you have images, you can add a wide variety of routers, switches, ASAs, and IDSs from Cisco, as well as Jupiter[®] M-series boxes. This lets you mimic a significant aspect of most production networks.

Finally, VirtualBox will permit you to create VMs for practically any version of Windows and Linux, which also opens the door to a variety of appliances built on those OSs.

Enjoy enhancing and exploring this new option for creating reliable test environments for both your network and your monitoring solutions.

TOP 5 NETWORK TROUBLESHOOTING & MONITORING TOOLS

Network Performance Monitor

- Speeds network troubleshootingMonitors response time, availability,
- and performanceCalculates network latency
- Automatically discovers and maps
 network devices

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