GNS3: The Graphical Network Simulator
Who am I?

- Matthew Gillespie
- CTI Networks
- RHCSA Redhat 7
- CCNA/CCNP Route Switch
- UWCA
- braindeadprojects.com
What is GNS3?

• GNS3 grew out of a Masters thesis by Jeremy Grossman
• It's a Python suite of tools that glue together a Cisco emulator with virtualization platforms in an easy to use GUI. Emphasis is on network design.
• It's an evolution from the early days when you had to edit dyamips/dynagen text configs by hand.
What can it run?

- Cisco IOS (dyamips)
- Cisco IOU (IOS on Unix)
- Cisco PIX OS (Cisco ASA)
- Virtualbox Machines
- QEMU/KVM Machines
- VMWare Machines (new in version 1.4)
- VPCs, etc.
Cisco Emulation

- Handled by dynamips.
- Can emulate 1700, 2600, 2691, 3600, 3725, 3745, and 7200 series platforms.
GNS3 Crowdfunder

• 2013 Crowdfunder.com event, hoping to earn $35,000.00 to improve the software.
GNS3 Crowdfunder Success

- They met their goal within 3.5 hours.
- They had additional rewards already established...
- The contributions wouldn't stop.
- So... they added more rewards.
Victim of their own success?

- Goals Met:
  - 11/20/13 - 04:19MST - $38,007
  - 11/20/13 - 13:40MST - $90,037
  - 11/21/13 - 14:26MST - $122,387
  - 11/28/13 - 14:08MST - $180,078

- At one point they stopped the event, but were asked to keep it open...
  - 11/30/13 - 12:06MST - $200,194
  - 12/02/13 - 11:52MST - $221,869
  - 12/06/13 - 11:38MST - $273,927
  - ...

- In the end, they raised $600,000.00+
Getting Started

• http://www.gns3.com
• zipfile currently has 5 components
  • GNS3 GUI
  • GNS3 Server
  • Dynamips (Cisco emulator)
  • IOUYAP (Bridge utility for IOU)
  • VirtualPC Simulator (VPCS)
• OR use Python PIP or your distro's package manager to install
Requirements

- Python 3.3 (Python3.4 for GNS3 >=1.4)
- PyQt4 (PyQt5 for GNS3 >=1.4)
- Python SIP
- Python Setup-Tools
- Python-netifaces
- Jsonschema
- Etc, etc.... all documented in Readme.rst, but check both server and GUI packages.
Initial Setup

• Consider a “local” or “GNS3 VM” method for IOU
  • The VM method supplies a VM for Virtualbox or VMware that runs IOU appliances.
• Set dynamips binary location
• Set Virtualbox/VMware wrapper locations
• Set VPCs location
• Set IOUYAP location
• Install IOS images
IOS image installation
VirtualBox

- The VirtualBox wrapper will pull in any guests that you have configured.
- You have to create the guest machines outside of GNS3.
QEMU/KVM

- QEMU hosts can be configured inside GNS3. Select system type, RAM, point to a disk image and name the host.
High CPU utilization?

- Dynamips doesn't know when the emulated router is idle.
- Idle-PC is a memory location of an idle loop. Without a good value, dynamips will consume 100% of the available CPU.
- This needs to be calculated on each router.
Router Console Access

- Each device can be accessed via serial port by right clicking and selecting “Console”
Router Console Access

• You can also customize your own TMUX or Screen layouts to connect to each of the consoles.
Emulated Frame-Relay and ATM

- While they're not as common anymore, GNS3 can emulate basic ATM and Frame Relay networks.
Integrated Wireshark

- Traffic over each link can be viewed real-time using Wireshark
Integrated Wireshark

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<th>No.</th>
<th>Time</th>
<th>Source</th>
<th>Destination</th>
<th>Protocol</th>
<th>Length</th>
<th>Info</th>
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</table>
```

Frame 7: 76 bytes on wire (698 bits), 76 bytes captured (688 bits) on interface 0
Ethernet II, Src: 21:05:67:18:00:00 (c2:05:67:18:00:00), Dst: IP4:cast_02 (01:09:fe:00:88:02)
Internet Protocol Version 4, Src: 5.5.5.5 (5.5.5.5), Dst: 224.0.6.2 (224.0.6.2)
User Datagram Protocol, Src Port: 646 (646), Dst Port: 646 (646)
Label Distribution Protocol

0000 01 06 5e 00 00 00 02 02 05 67 18 00 00 00 00 00 45 0  ....... g ...... E.
0010 00 03 00 00 00 00 00 01 11 c5 e3 05 06 05 05 05 05 40  ...... . ...... 
0020 00 02 02 02 00 00 00 0a 0f 20 00 01 01 16 06 06 04 04 00 00 00 04 04 00 00 00 04 00 00 00 00 00 00 00 14 00 00 00 00 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00 04 00 00 00
```
Connecting GNS3 to the Real World

• The “Cloud” element provides the ability to connect interfaces to the real world.
  • Generic Ethernet & Linux NIO interfaces
  • NAT interfaces
  • UDP tunnels
  • TAP interfaces
  • UNIX sockets
  • VDEs
  • NULL interface
GNS3 Jungle

- The GNS3 Jungle is the online forum with announcements, feature requests, bug reports, etc.
GNS3 Academy

- Online collaboration for learning and teaching.
Router OSes

• Lots of options
• The GNS3 community has tons of feedback and HOWTO's on integrating various vendors.
Mikrotik

- http://www.mikrotik.com/download
- 24 hour demo license, no dynamic routing
- Level 1 free routing license
Vyatta (VYOS)

• Free Community-based version of Vyatta, which is used behind the scenes in Ubiquiti's EdgeRouter platform, etc
• http://vyos.net/wiki/Main_Page
Juniper JUNOS

• “Olive Routers”
• Packages install on FreeBSD VMs
HP VSR 1000's

- Another Linux based router VM
- http://lkhill.com/hp-vsr1000-getting-started/
Cisco CSR 1000v

- Yet Another Linux based router VM
- Runs IOS XE software
- www.cisco.com
Limitations?

• Certainly Plenty of them.
• Some IOS images won't pass multicast
• Some features in IOU images will configure, but don't actually seem to work (Dynamic ARP inspection, Private VLANs, etc)
Quirks

• Plenty of them
  • You can't connect a VM device directly to a cloud, you have to connect it to a GNS3 switch and THEN to a cloud.
  • You can connect VM to VM and dynamips system to VM directly.
• Speed and duplex issues on interfaces... usually it's best to hardcode settings.
• Stoping a VirtualBox machine is a “poweroff” command, so ensure you shut the OS down gracefully before hitting STOP.
Questions?

GNS3