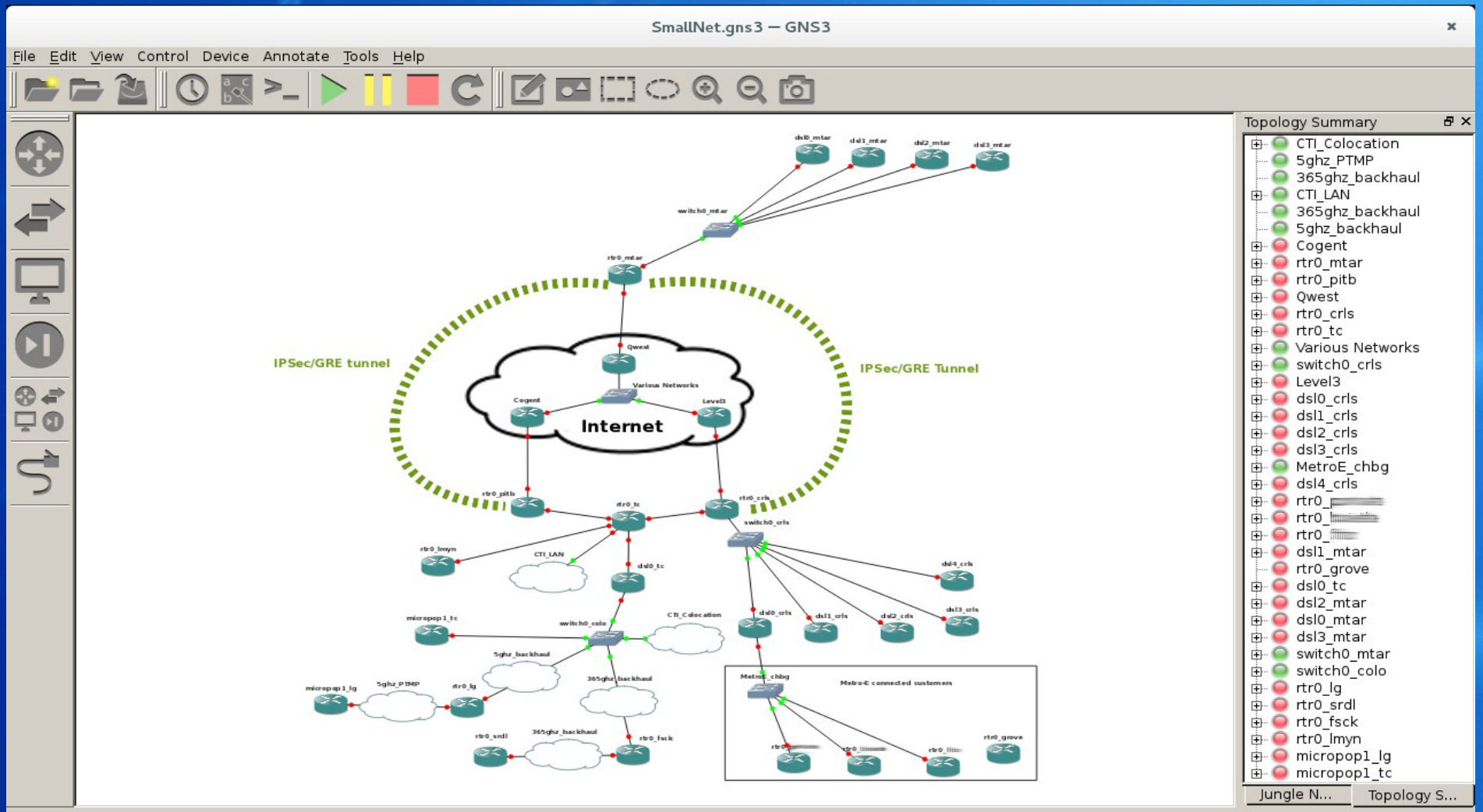
GNS3: The Graphical Network Simulator



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.

Old GNS3 vs New GNS3

	Current Version	New Version
VirtualBox Support		
Qemu/KVM Support		
VMware Support		
On-demand cloud support		
Offical lab packs		
Web GUI		
Integration of network management/optimization tools		
More features to play with the topologies and create scenarios (e.g. drop packets, shutdown a link etc.)		
Load balancing		
Scripting		
Grading/teaching functionalities		
"out of the box" operating systems when installing		
Security functionalities		
Support for other emulator/simulator and third party vendors (HP, Huawei etc.)		
Connection to real networks		
Non-blocking GUI (asynchronous)		
Topology files (.net)		
Error reporting and monitoring		
Integrated training/tutorial within the software		
Switching support		

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
  - 11/23/13 - 13:31MST - $150,023
  - 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

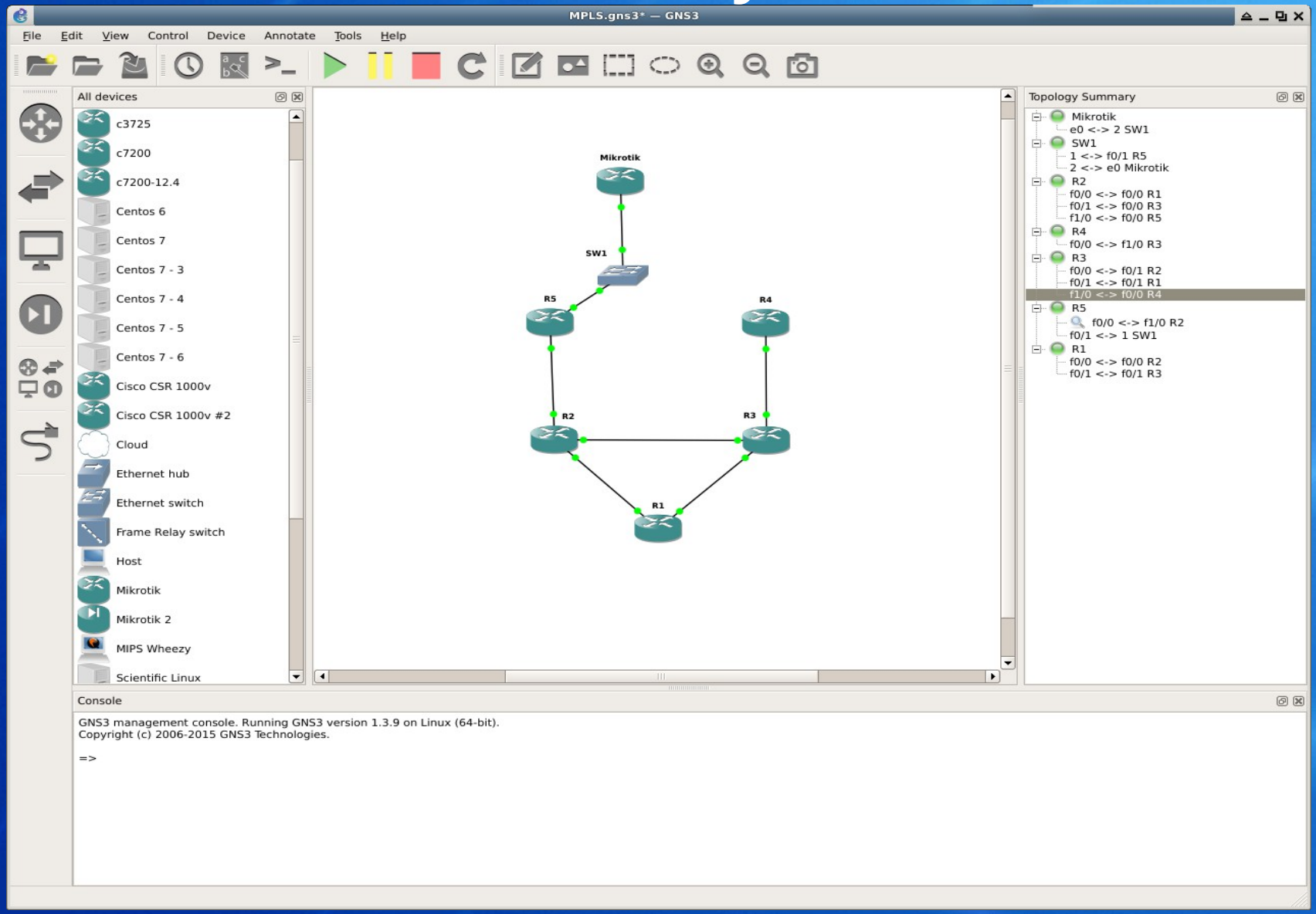
Requirements

- 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.

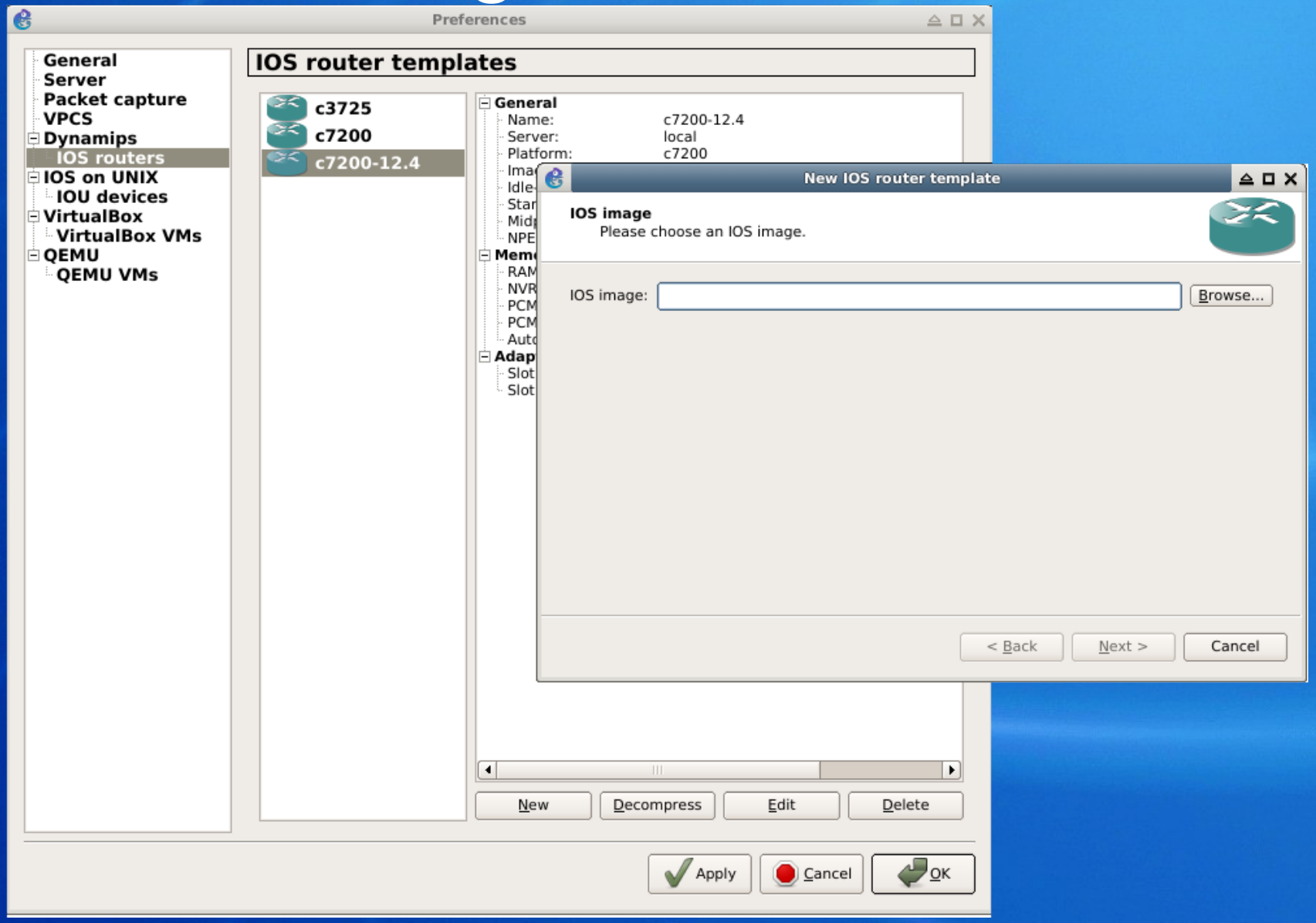
Initial Setup

- 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

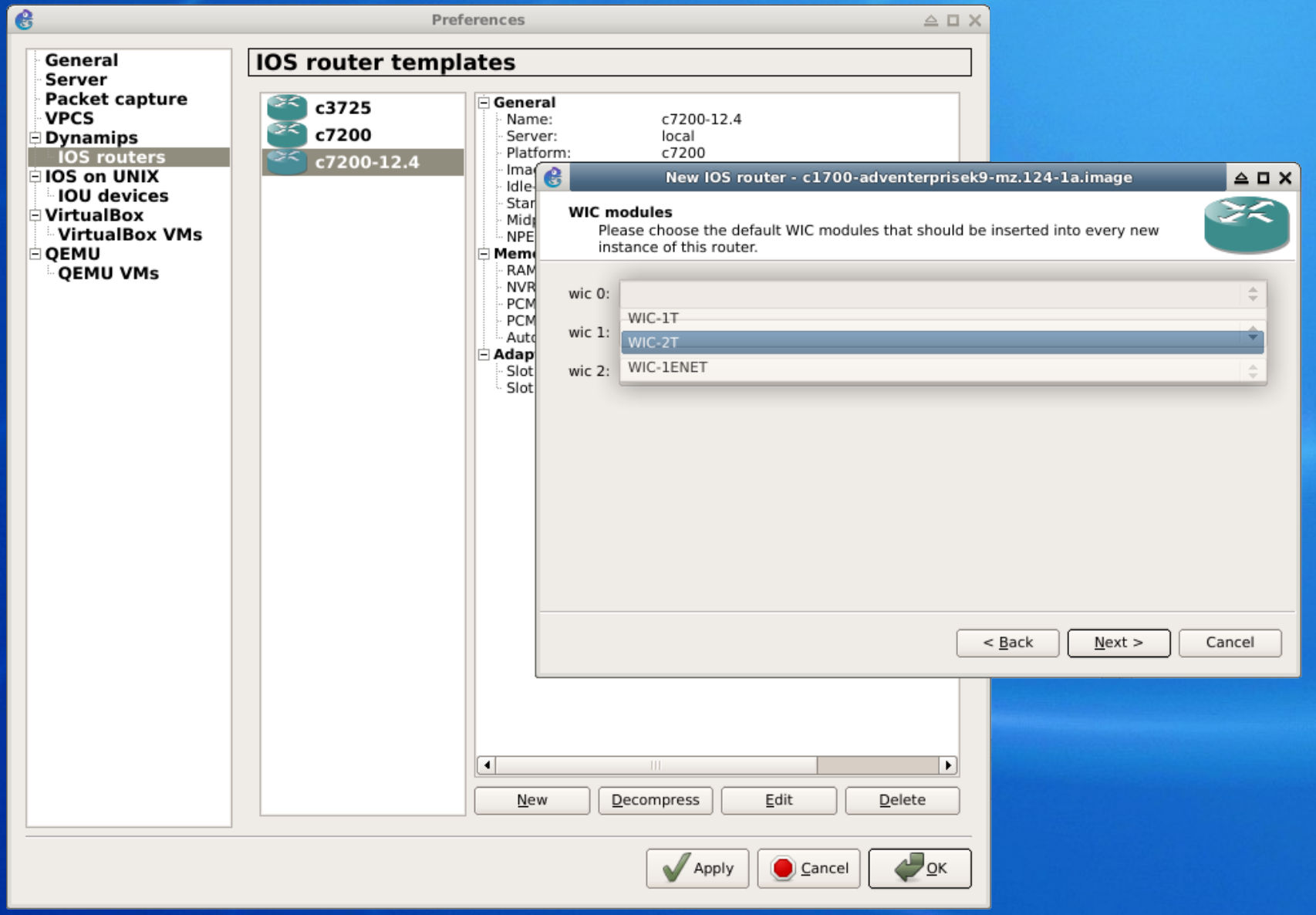
GUI Layout


MPLS.gns3* — GNS3
File
Edit
View
Control
Device
Annotate
Tools
Help
All devices
c3725
c7200
c7200-12.4
Centos 6
Centos 7
Centos 7 - 3
Centos 7 - 4
Centos 7 - 5
Centos 7 - 6
Cisco CSR 1000v
Cisco CSR 1000v #2
Cloud
Ethernet hub
Ethernet switch
Frame Relay switch
Host
Mikrotik
Mikrotik 2
MIPS Wheezy
Scientific Linux
Mikrotik
SW1
R5
R4
R2
R3
R1
Topology Summary
Mikrotik
e0 <-> 2 SW1
SW1
1 <-> f0/1 R5
2 <-> e0 Mikrotik
R2
f0/0 <-> f0/0 R1
f0/1 <-> f0/0 R3
f1/0 <-> f0/0 R5
R4
f0/0 <-> f1/0 R3
R3
f0/0 <-> f0/1 R2
f0/1 <-> f0/1 R1
f1/0 <-> f0/0 R4
R5
f0/0 <-> f1/0 R2
f0/1 <-> 1 SW1
R1
f0/0 <-> f0/0 R2
f0/1 <-> f0/1 R3
Console
GNS3 management console. Running GNS3 version 1.3.9 on Linux (64-bit).
Copyright (c) 2006-2015 GNS3 Technologies.
=>

IOS image installation

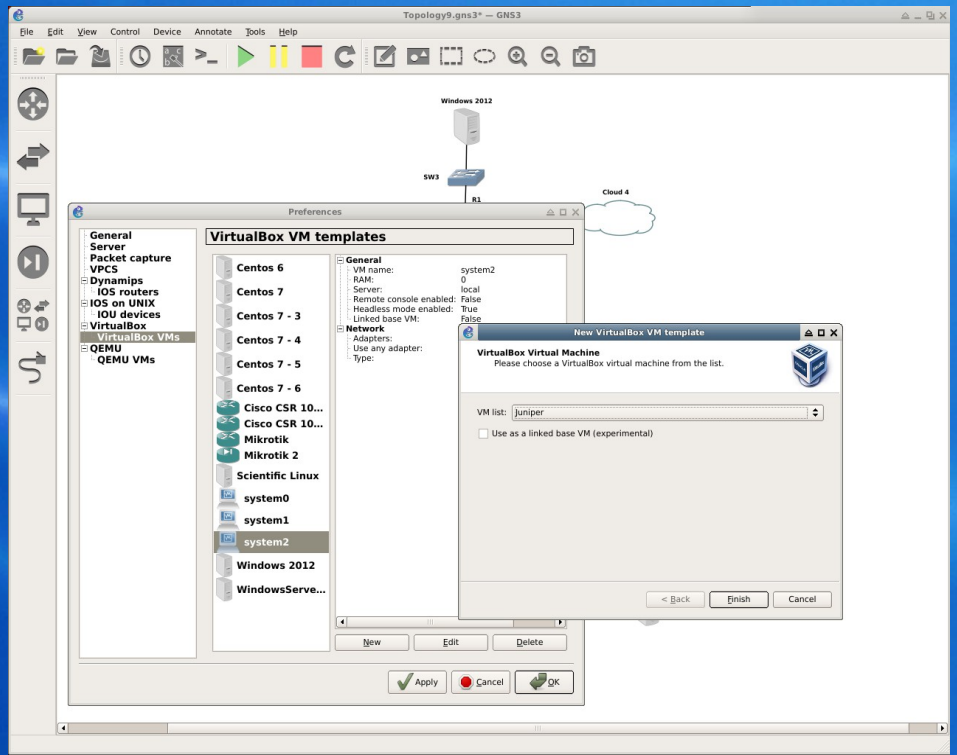


IOS Image Setup



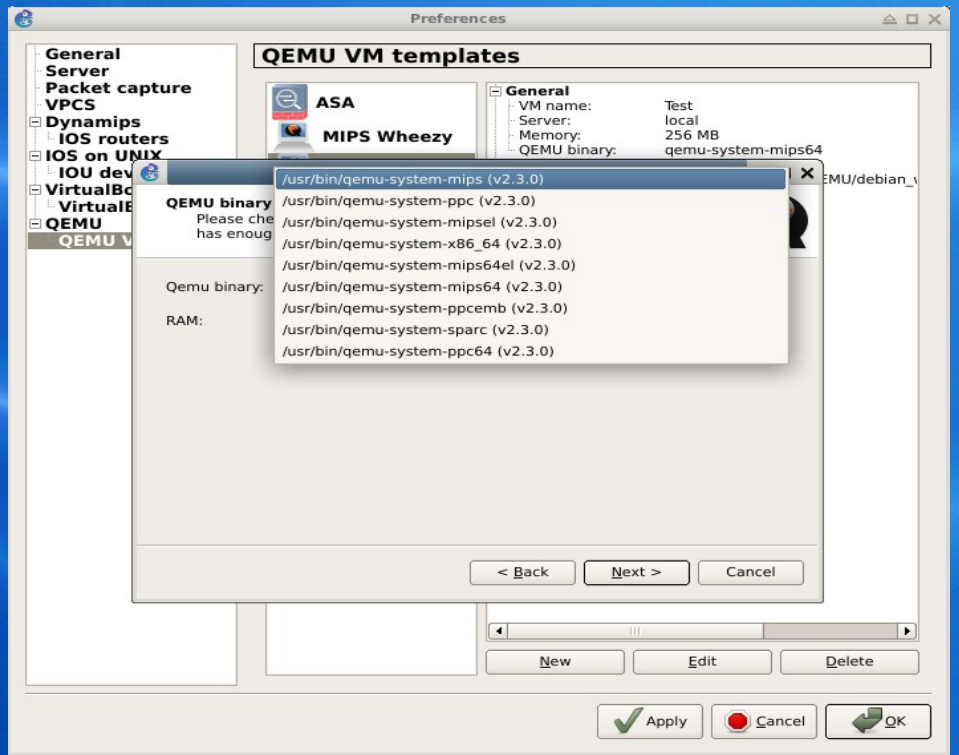
VirtualBox

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



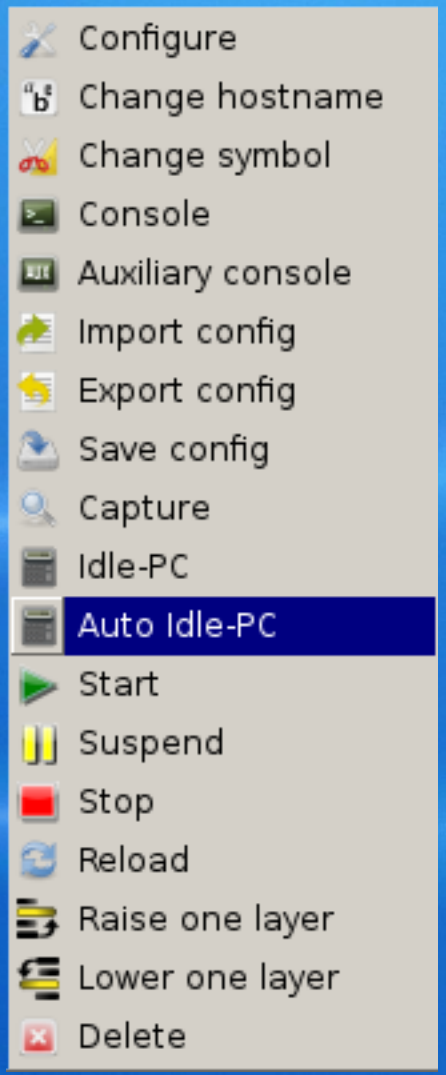
QEMU/KVM

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



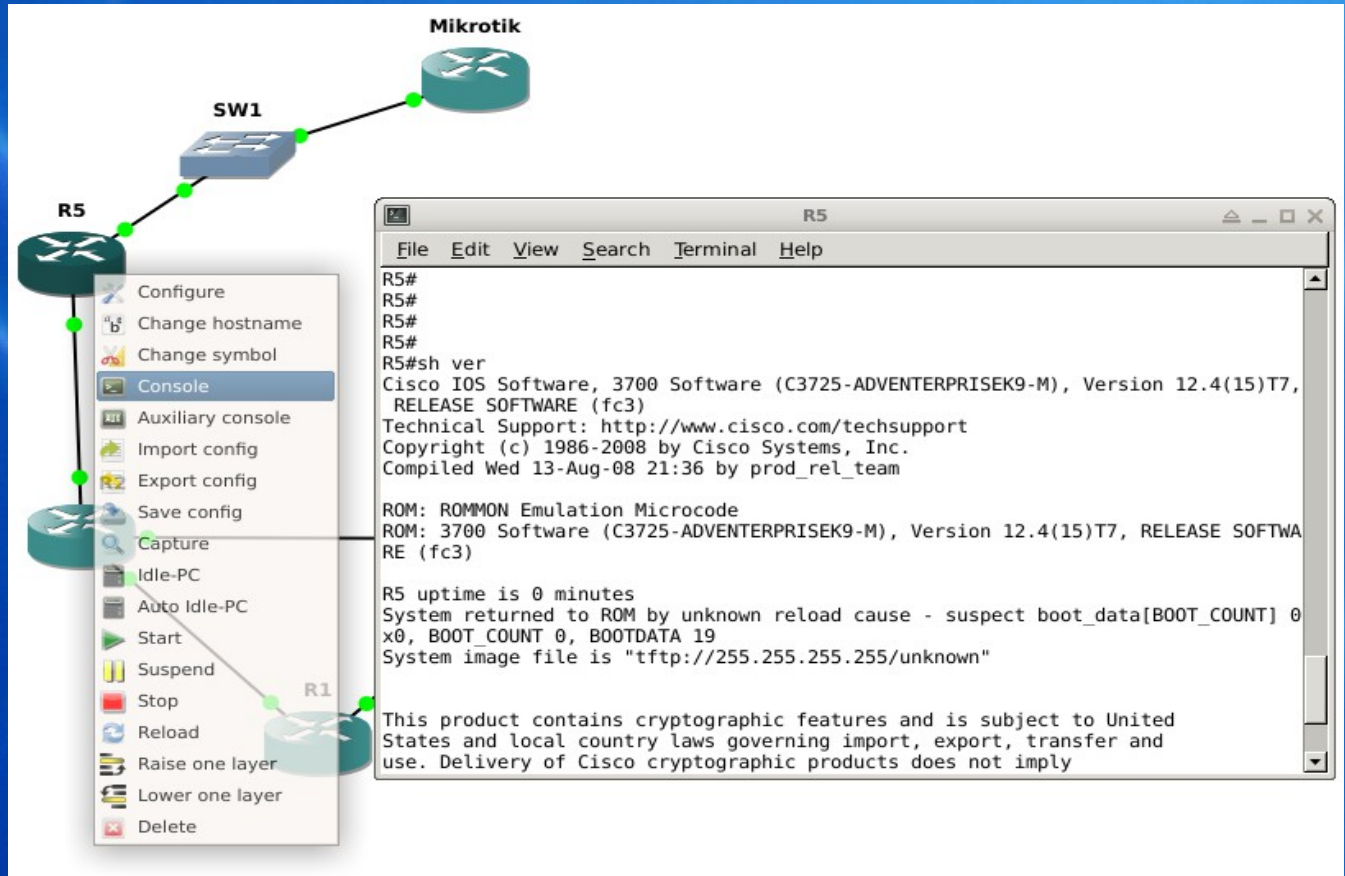
High CPU utilization?

- 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.



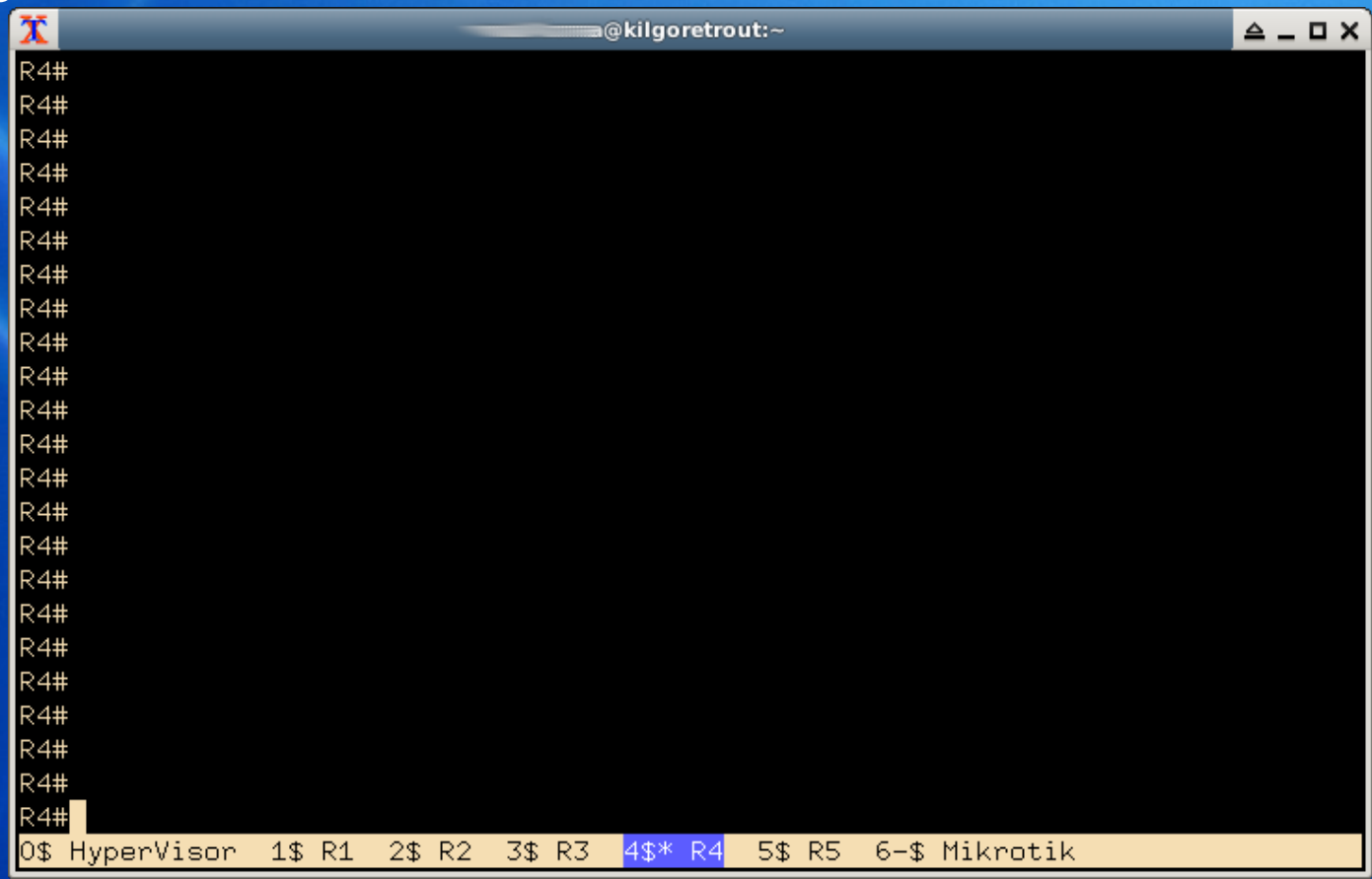
Router Console Access

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



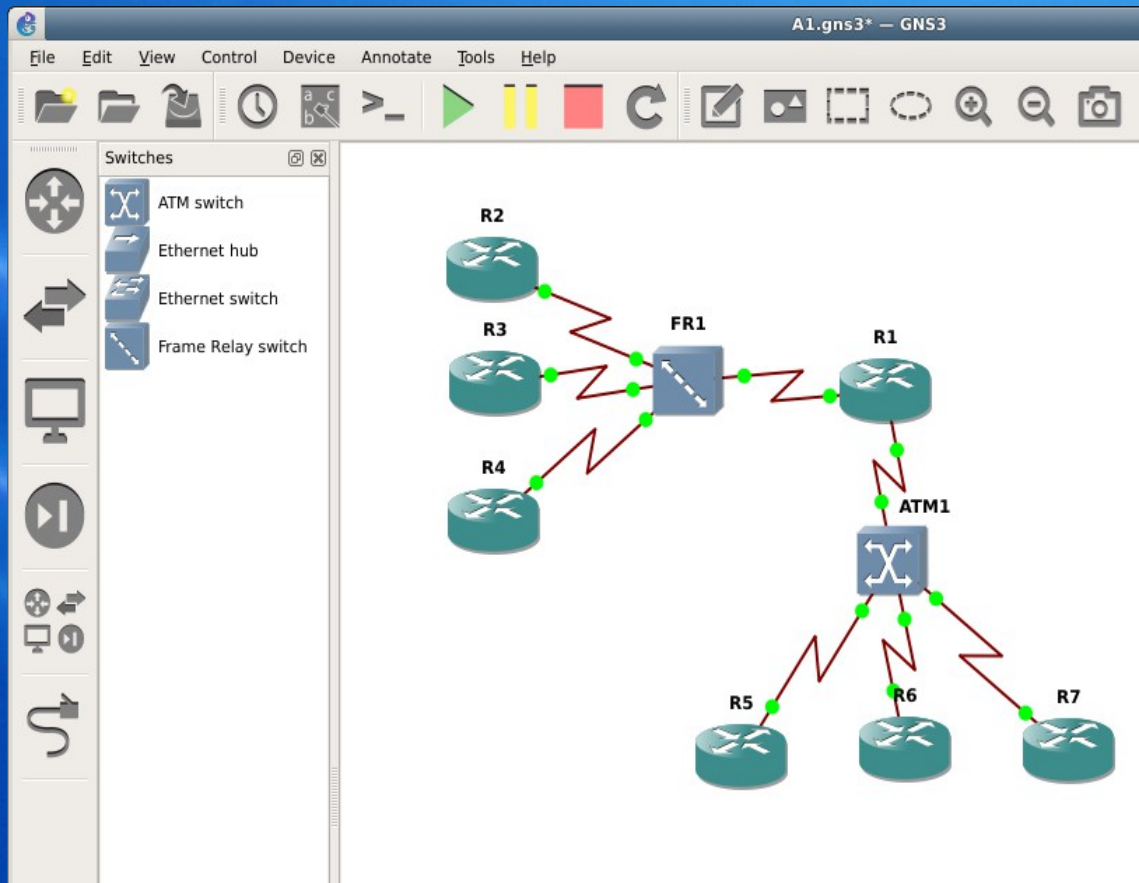
Router Console Access

- You can also customize your own TMUX or Screen layouts to connect to each of the consoles.



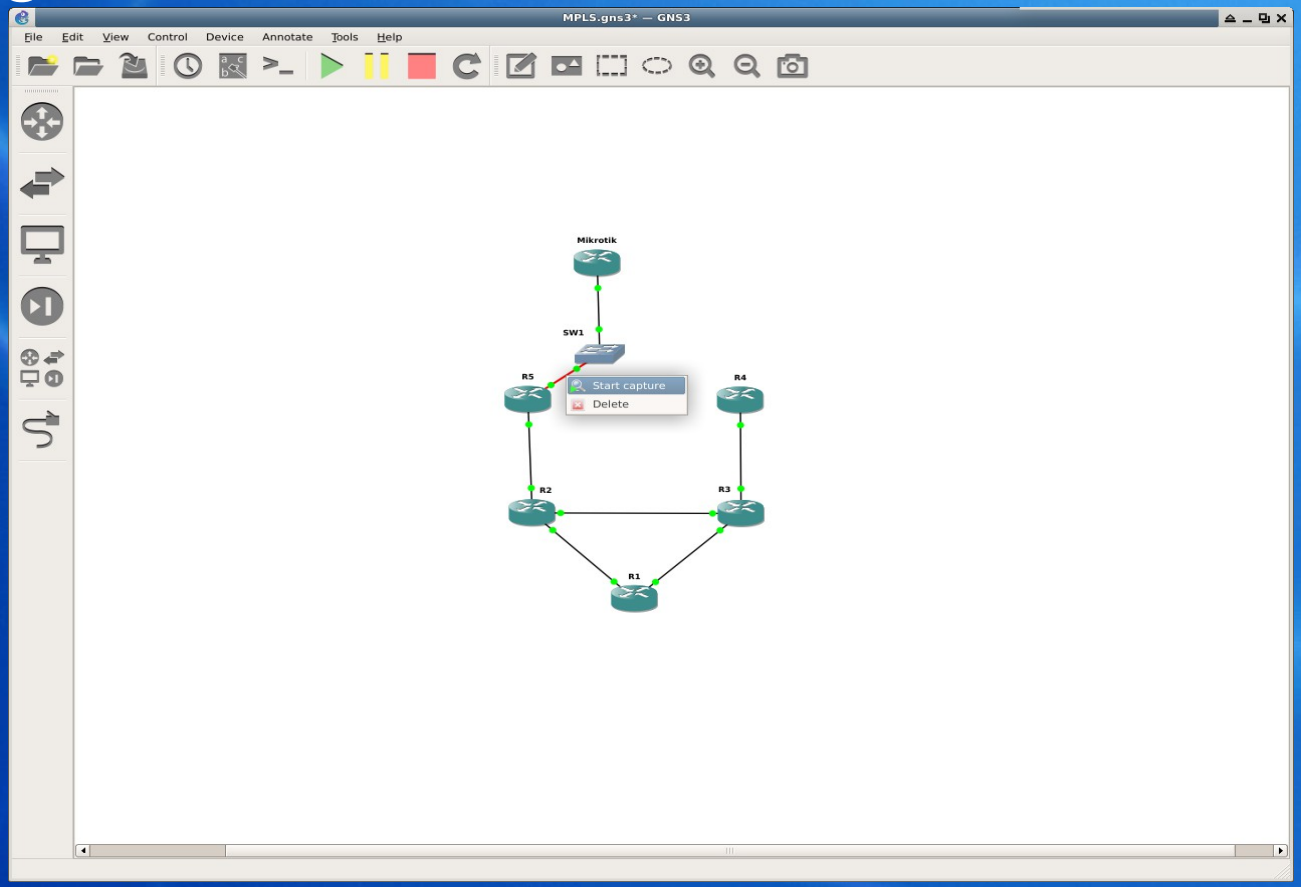
Emulated Frame-Relay and ATM

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

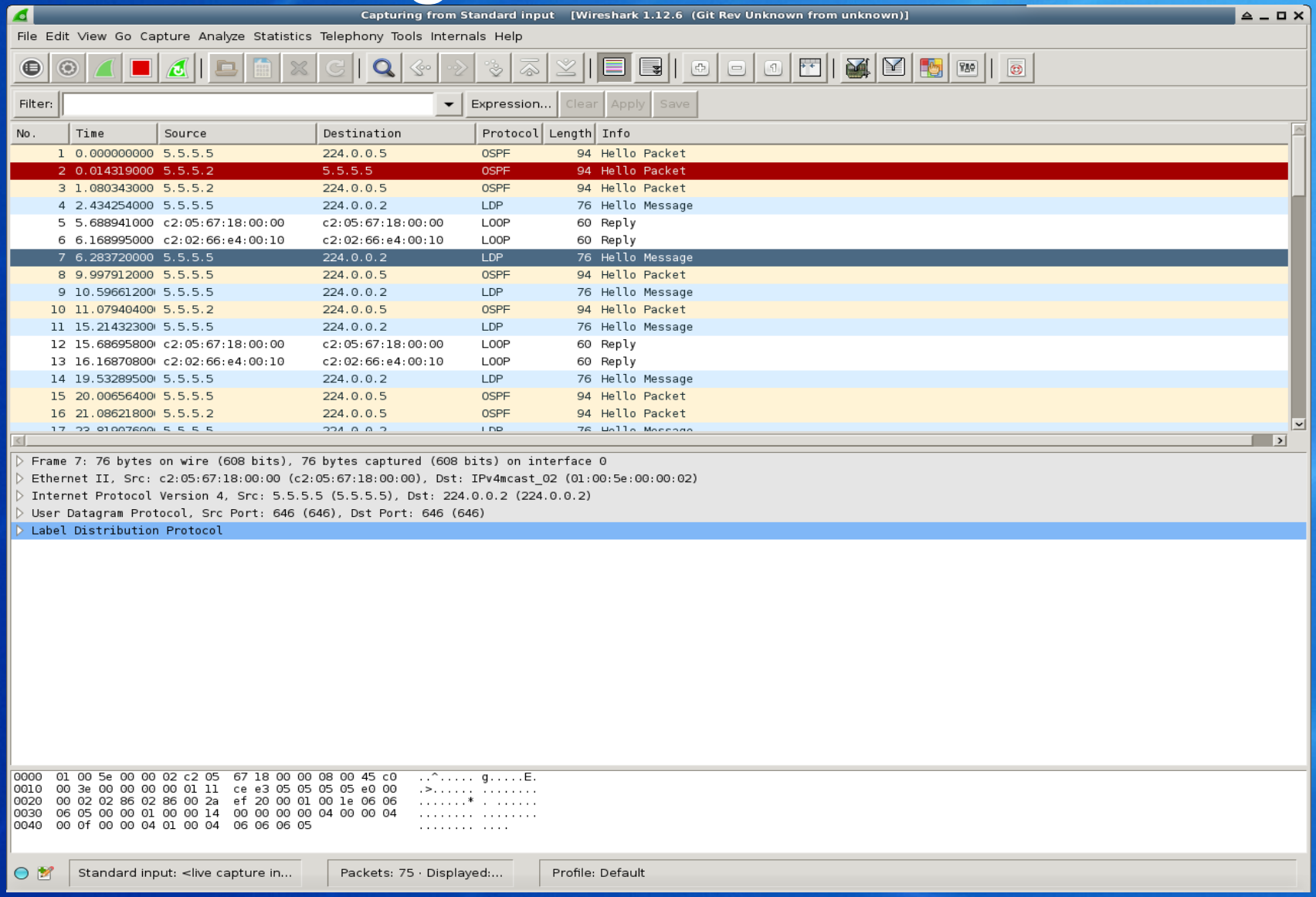


Integrated Wireshark

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

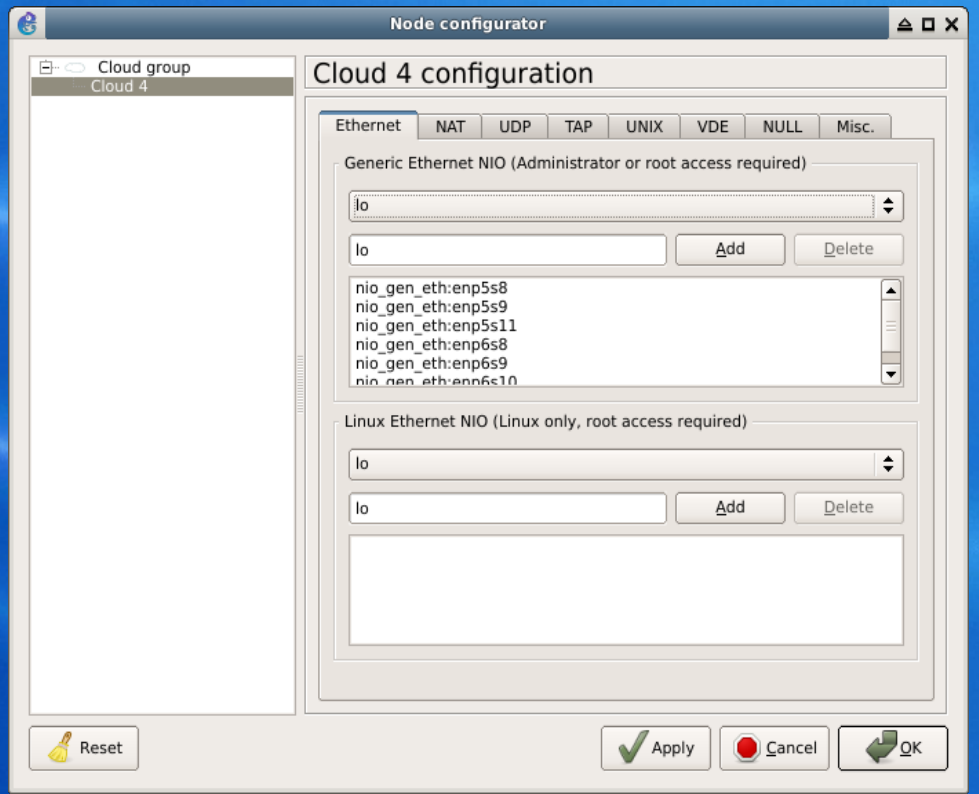


Integrated Wireshark



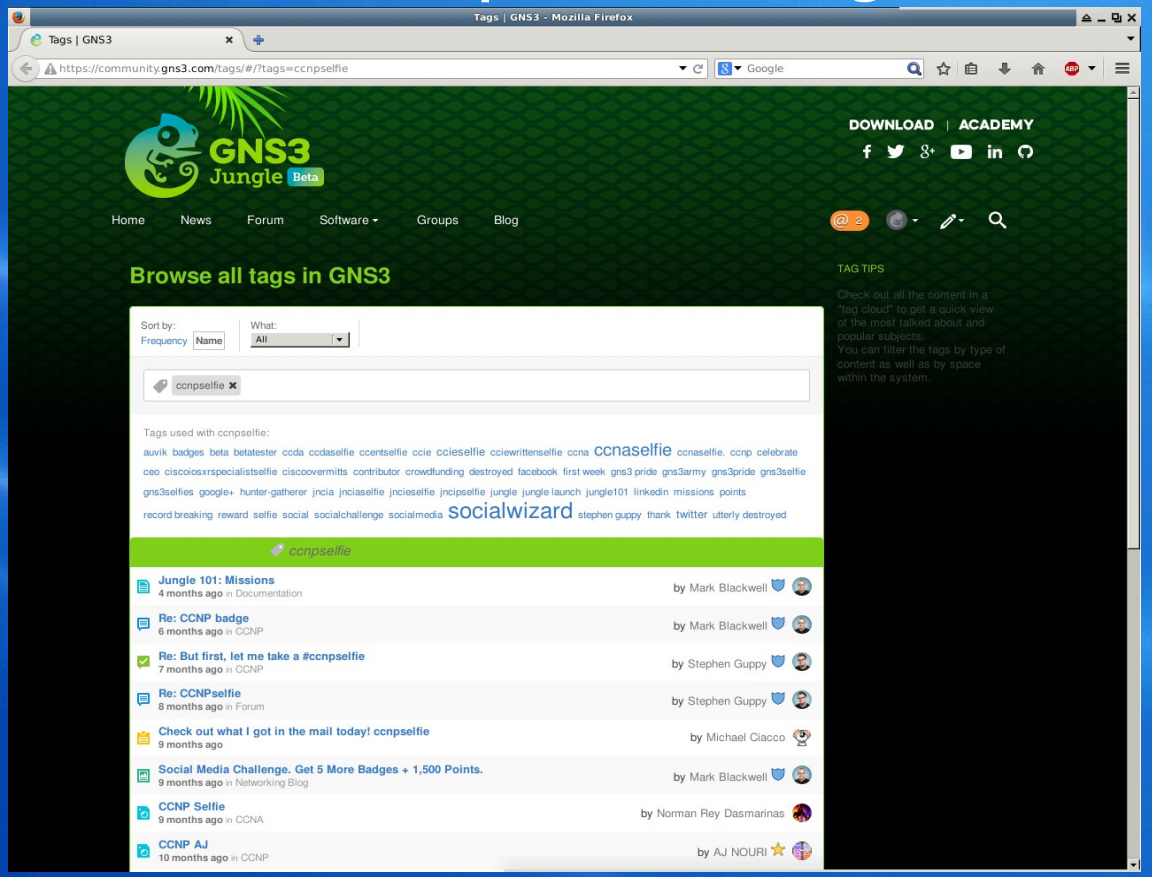
Connecting GNS3 to the Real World

- 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



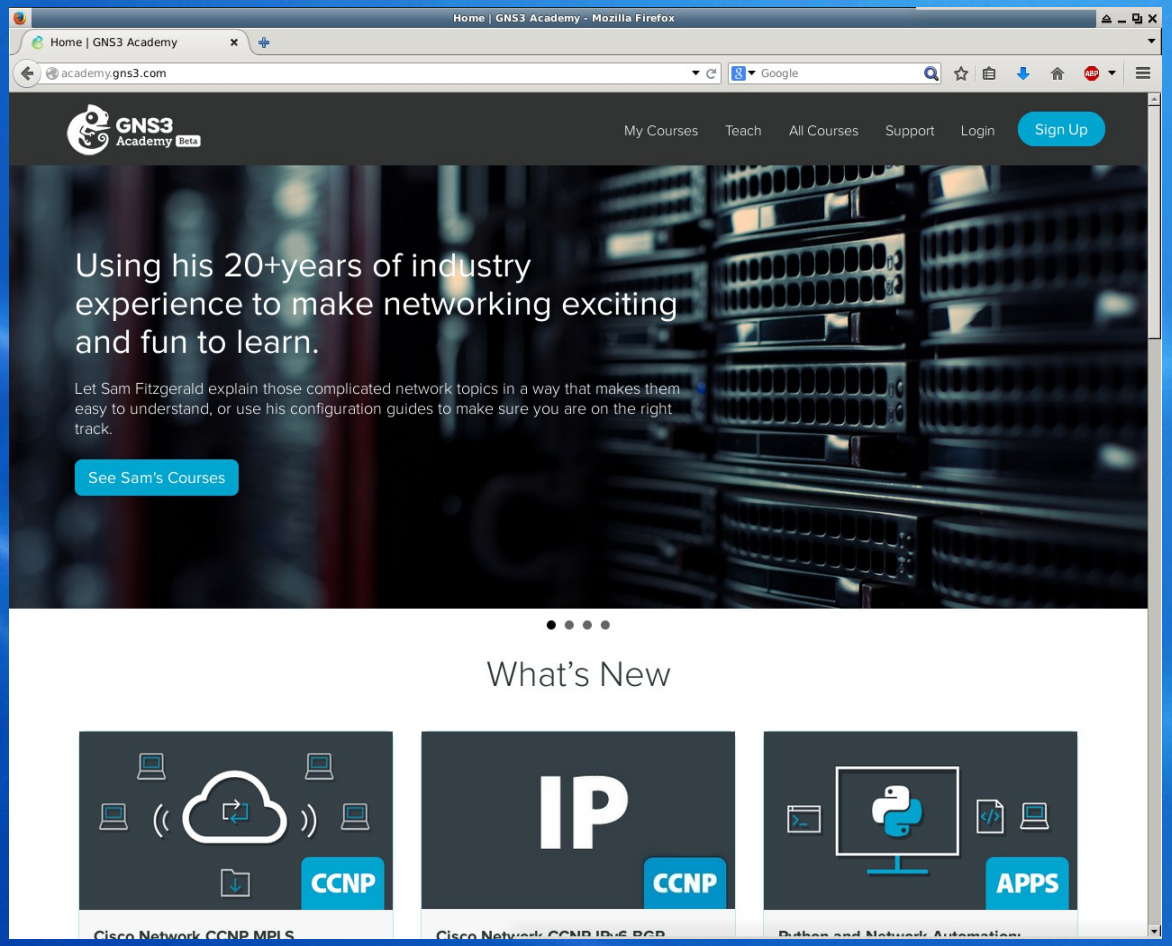
GNS3 Jungle

- 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
  - http://wiki.mikrotik.com/index.php?title=Manual:License&redirect=no

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://www8.hp.com/us/en/products/networking
- 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 dyamips 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