

# CONTENTS IN DETAIL

**FOREWORD by Jeremy Grossmann** **xiii**

**ACKNOWLEDGMENTS** **xv**

**INTRODUCTION** **xvii**

Who This Book Is For . . . . . xvii  
What's in This Book . . . . . xviii  
    My Approach . . . . . xviii  
    Book Overview . . . . . xviii

**1**  
**INTRODUCING GNS3** **1**

Why Use GNS3? . . . . . 2  
    Emulated Hardware . . . . . 2  
    Simulated Operating Systems . . . . . 2  
    Scalability with the GNS3 Server . . . . . 3  
    Virtual Connectivity . . . . . 3  
Open Source Integration . . . . . 5  
    The Dynamips Hypervisor . . . . . 5  
    QEMU and VirtualBox . . . . . 5  
A Few Limitations . . . . . 5  
    Some Assembly Required . . . . . 5  
    Limited Emulation . . . . . 6  
    Hamstrung Network Performance . . . . . 6  
Final Thoughts . . . . . 6

**2**  
**INSTALLING A BASIC GNS3 SYSTEM** **7**

General Requirements . . . . . 8  
Installing on Microsoft Windows . . . . . 8  
Installing on OS X . . . . . 10  
Installing on Ubuntu Linux . . . . . 11  
    Installing GNS3 from Packages . . . . . 11  
    Installing GNS3 from Source Code . . . . . 11  
GNS3 Appliances . . . . . 14  
    A Few Pros and Cons . . . . . 15  
    GNS3 WorkBench . . . . . 15  
    Installing GNS3 WorkBench . . . . . 16  
Final Thoughts . . . . . 17

<b>3</b>	<b>CONFIGURATION</b>	<b>19</b>
	Acquiring an IOS Image . . . . .	19
	Setting Up Your First IOS Router. . . . .	21
	Configuring Dynamips. . . . .	21
	Adding IOS Images to GNS3. . . . .	23
	Setting a Manual Idle-PC Value. . . . .	26
	Final Thoughts . . . . .	29
<b>4</b>	<b>CREATING AND MANAGING PROJECTS</b>	<b>31</b>
	Project Management Overview . . . . .	31
	Terminology . . . . .	32
	Screen Layout . . . . .	32
	Using the GNS3 Toolbar . . . . .	34
	First Toolbar Group . . . . .	34
	Second Toolbar Group . . . . .	34
	Third Toolbar Group . . . . .	35
	Fourth Toolbar Group . . . . .	35
	Using the Devices Toolbar. . . . .	37
	Creating Your First Project. . . . .	37
	Working with Routers . . . . .	38
	Creating Links Between Your Routers . . . . .	39
	Configuring Virtual Hardware. . . . .	40
	Starting, Stopping, and Pausing Routers. . . . .	41
	Logging On to Routers. . . . .	41
	Ethernet Switch Nodes . . . . .	44
	Changing Symbols and Organizing Your Devices . . . . .	45
	Final Thoughts . . . . .	46
<b>5</b>	<b>INTEGRATING HOSTS AND USING WIRESHARK</b>	<b>47</b>
	Virtual PC Simulator . . . . .	47
	Installing VPCS . . . . .	48
	VPCS Commands . . . . .	48
	VPCS IP Addressing. . . . .	49
	VirtualBox. . . . .	50
	Installing on Windows. . . . .	50
	Installing on OS X. . . . .	51
	Installing on Linux . . . . .	51
	Importing Appliances. . . . .	51
	VirtualBox Preferences . . . . .	52
	VirtualBox Virtual Machine Settings . . . . .	53
	Using VirtualBox Hosts in a Project . . . . .	55
	Linking VirtualBox Host Nodes to Other Devices . . . . .	56
	Simple VirtualBox Project Using a Linux Virtual Machine . . . . .	57
	Wireshark. . . . .	58
	Installing on Windows. . . . .	58
	Installing on OS X. . . . .	59

Installing on Linux . . . . .	59
Capturing Packets in GNS3 . . . . .	59
Final Thoughts . . . . .	62

## **6 JUNIPER OLIVE AND VSRX FIREFLY 63**

Installing QEMU on Windows and OS X . . . . .	63
Installing QEMU on Linux . . . . .	64
Introducing Juniper . . . . .	65
Installing Juniper . . . . .	66
Process Overview . . . . .	66
Acquiring FreeBSD . . . . .	67
Acquiring Juniper Olive Software . . . . .	67
Creating a Juniper Olive CD Image File . . . . .	67
Creating an ISO in Windows . . . . .	67
Creating an ISO in OS X . . . . .	68
Creating an ISO in Linux . . . . .	68
Installing and Configuring FreeBSD Using QEMU . . . . .	69
Preparing Your Build Directory . . . . .	69
Installing a Junos-Friendly FreeBSD System . . . . .	69
Installing the Juniper Olive Package in FreeBSD . . . . .	78
Getting Your Olive Up and Running . . . . .	78
Backing Up Juniper Olive . . . . .	80
Configuring a Juniper Router in GNS3 . . . . .	81
Adding the Juniper Virtual Machine to GNS3 . . . . .	82
Adding Ethernet Interfaces . . . . .	82
Testing a Juniper Router . . . . .	83
Running Juniper vSRX Firefly . . . . .	84
Creating a Firefly Virtual Machine with VirtualBox . . . . .	85
Giving Your Virtual Machine More Processors . . . . .	87
Adding vSRX Firefly to GNS3 . . . . .	87
Creating a Project with a Zone-Based Firewall . . . . .	88
Final Thoughts . . . . .	91

## **7 DEVICE NODES, LIVE SWITCHES, AND THE INTERNET 93**

Built-in Device Nodes . . . . .	94
Node Configurator . . . . .	94
Ethernet Hub . . . . .	95
EtherSwitch Router . . . . .	96
Frame Relay Switch . . . . .	97
Simple Frame Relay Hub and Spoke Configuration . . . . .	98
Creating a Frame Relay Switch Using IOS . . . . .	101
ATM Switch . . . . .	102
Cloud Nodes . . . . .	104
Connecting GNS3 Devices to Physical Hardware . . . . .	105
Dynamips Permissions . . . . .	105
Preparing Your PC for a Bridge . . . . .	106
Using a Loopback Adapter on Windows . . . . .	106

TUN/TAP Drivers on OS X . . . . .	108
TUN/TAP Drivers on Ubuntu Linux . . . . .	109
Connecting to Live Switches . . . . .	109
Configuring a Standard 802.1Q Trunk . . . . .	109
Creating the Elusive Breakout Switch . . . . .	112
Optional Breakout Switch Configuration . . . . .	117
Using Multiple Adapters in Your PC . . . . .	119
Connecting GNS3 Devices to the Internet . . . . .	120
Configuring Windows . . . . .	120
Configuring Unix-Based Systems . . . . .	120
Creating a Simple Network . . . . .	120
Final Thoughts . . . . .	121

## **8**

### **CISCO ASA, IDS/IPS, AND IOS-XRV** **123**

Cisco Configuration Professional . . . . .	124
Project Configuration . . . . .	124
CCP Installation . . . . .	125
Running CCP . . . . .	125
Cisco ASA Firewall . . . . .	126
Acquiring an Image . . . . .	127
Prepping the ASA Image for GNS3 . . . . .	127
Configuring GNS3 for ASA . . . . .	127
Testing an ASA in GNS3 . . . . .	131
ASDM Installation . . . . .	132
Cisco IDS/IPS . . . . .	135
Acquiring an IDS/IPS Image . . . . .	135
Creating a QEMU-Ready IDS/IPS System . . . . .	135
Hijacking the Hardware . . . . .	137
Testing IDS/IPS (or Patience Is a Virtue) . . . . .	141
Configuring GNS3 for IDS/IPS . . . . .	141
Verifying IDS/IPS in GNS3 . . . . .	143
Cisco IOS-XRv . . . . .	144
Configuring GNS3 for IOS-XRv . . . . .	144
Creating a Simple IOS-XR Project . . . . .	146
Final Thoughts . . . . .	149

## **9**

### **CISCO IOS ON UNIX AND NX-OSV** **151**

Cisco IOU . . . . .	151
What IOU Means to GNS3 . . . . .	152
Switching, Switching, and More Switching! . . . . .	152
IOU Images . . . . .	153
Things to Know Before Installing IOU . . . . .	153
Setting Up IOU on a Linux PC . . . . .	154
Installing IOU . . . . .	154
Creating a License File . . . . .	155
Configuring GNS3 . . . . .	156

Using the GNS3 IOU Virtual Machine on Windows and OS X . . . . .	160
Importing the GNS3 IOU Virtual Machine into VirtualBox . . . . .	160
Uploading IOU Image Files . . . . .	162
Configuring GNS3 for IOU . . . . .	163
IOU in Action . . . . .	167
NX-OSv . . . . .	168
Importing NX-OSv into VirtualBox . . . . .	169
Configuring GNS3 for NX-OSv . . . . .	170
NX-OSv in Action . . . . .	171
Final Thoughts . . . . .	175

## **10 COOL THINGS TO DO ON A RAINY DAY 177**

Managing Devices from an Access Server . . . . .	177
Installing the Virtual Interface . . . . .	178
Preparing the GNS3 Server . . . . .	180
Creating a Virtual Access Server in GNS3 . . . . .	181
Configuring a Cisco IP Hostname Table . . . . .	184
Seeing the Virtual Access Server in Action . . . . .	186
Deploying Configurations to Real Hardware . . . . .	187
Exporting GNS3 Configurations to Cisco Routers . . . . .	187
Importing Cisco Router Configurations into GNS3 . . . . .	188
Copying GNS3 Projects Between Platforms . . . . .	189
IOS-Only Projects . . . . .	189
Projects with IOU Devices . . . . .	189
Projects with VirtualBox Devices . . . . .	190
Exploring the GNS3 Console . . . . .	190
Creating Projects Using Multiple PCs . . . . .	191
A Dynamips Client/Server Setup . . . . .	192
Creating a GNS3 Uberlab . . . . .	198
Nerdy Labs for Fun and Profit . . . . .	199
Preparing for Cisco Exams . . . . .	199
Securing Your Networks . . . . .	199
Practicing Real-World Scenarios . . . . .	200
Final Thoughts . . . . .	201

## **A HELP! I'VE FALLEN AND I CAN'T GET UP 203**

Identifying the Problem . . . . .	203
Sudden Problems . . . . .	204
Stopping Dynamips Crashes . . . . .	204
When IOS Images Fail to Load . . . . .	204
Resolving IOS Memory Errors . . . . .	206
Resolving Network IO Errors . . . . .	207
Correcting Console Problems . . . . .	208
Feature Problems . . . . .	210
Configuration Issues . . . . .	210
Using Unsupported IOS Images . . . . .	211

The Nuclear Option . . . . .	211
Overburdened Hardware . . . . .	212
Resolving Port Number Conflicts . . . . .	212
Troubleshooting an ASA . . . . .	213
Conserving Resources . . . . .	214
Select Devices Carefully . . . . .	214
Optimize Idle-PC Values . . . . .	214
Backing Up Your Projects . . . . .	214
Welcome to the Jungle . . . . .	215
Final Thoughts . . . . .	216

**B**  
**CISCO HARDWARE COMPATIBLE WITH GNS3** **217**

Supported Cisco Hardware . . . . .	217
IOS Compatibility . . . . .	220

**C**  
**NM-16ESW AND IOU L2 LIMITATIONS** **223**

Unsupported NM-16ESW Features . . . . .	223
Unsupported Features in Cisco IOU L2 Images . . . . .	226

**GLOSSARY** **227**

**INDEX** **233**