

Chapter 14

Hands-On Network Device Virtualization With VRF (Virtual Routing and Forwarding)

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ABSTRACT

Virtual Routing and Forwarding (VRF) is a technology that allows multiple instances of IP (Internet Protocol) routing table to co-exist within the same Router at the same time. The routing instances are independent, allowing the same or overlapping IP addresses to be used without conflict. Using VRF technology, users can virtualize a network device from a Layer 3 standpoint of creating different “Virtual Routers” in the same physical device. Internet Service Providers (ISP) often use VRF technology to create separate routing table in a single physical Router which are completely isolated one from the others. This chapter discusses about the configuration of VRF-Lite in GNS3 (Graphical Network Simulator-3) on RIP/v2, EIGRP and OSPF protocols.

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INTRODUCTION

Network Virtualization isolates physical network resources through Virtualization and hold multiple independent and programmable logical networks. Network Virtualization also implements multiple network architectures and services on top of isolated logical networks. According to the study “The Future of the Internet Innovation and Investment in IP Interconnection” by Pankert, Faggiano and Taga (2014, May) by “2020, more than 50% of the world’s population will be online” i.e. there will around 5.0 billion online populations. The study further forecasts that, by 2025, there will be 50 billion connected “Internet of Things” devices. The study argues that by 2030, machine-to-machine (“M2M”) communication is likely to constitute more than 50% of IP traffic. Hence the network will also grow accordingly to handle the growing IP traffic. In this chapter, we will discuss about the Network Device Virtualization with Virtual Routing and Forwarding (VRF).

VIRTUAL PRIVATE NETWORK

A Virtual Private Network (VPN) is an IP network infrastructure delivering private network services over a public infrastructure using layer 3 backbone. MPLS is used within the backbone to switch packets, hence no need of full routing.

MultiProtocol Label Switching (MPLS) is a simple way of labeling each network layer packet. MPLS decouples forwarding from routing, enabling Multi-protocol support without requiring changes to the basic forwarding paradigm. MPLS improves the scalability of hop-by-hop routing and forwarding for providing traffic engineering capabilities for better network provisioning.

MPLS

- Provides an efficient and scalable tunneling mechanism
- Provides an efficient and scalable mechanism for extending IP routing with explicit routes

GNS3 is an open source software (under GPL) that permits users to design complex network topologies. A user can run simulations or configure devices include Cisco routers and firewalls, Juniper routers and frame-relay. It is based on Dynamips, Pemu/Qemu and Dynagen. Like VMware or Virtual PC that are used to emulate various operating systems in a virtual environment. GNS3 allows the same type of emulation using Cisco Internetwork Operating Systems (IOS). GNS3 is a graphical front end to a product called Dynagen. Dynamips is the core program that allows

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