Software Defined Networking (SDN): Anatomy of OpenFlow

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Preface

Software Defined Networking, just a few short years ago, was mostly speculation. Sure there were academics doing research with it, and there were some hyper-scale networks like Google and Amazon using it. But those places were crawling with programmers and developers. Most people running normal sized networks viewed it with curiosity, but not much else. They certainly didn't have the resources to build SDN architectures in-house. And many – perhaps even one or more authors of this book – scoffed at the idea that SDN would turn the networking world on its head.

What a difference a few years make. Almost every vendor now has an SDN story. New vendors are popping up everywhere with SDN products. Solutions are being deployed and new use cases are presented regularly. You can find an SDN conference somewhere in the world every few weeks, and it's a central topic of major industry conferences from Cisco Live and VMWorld to Interop and Cloud Expo. Network engineers are beginning to reassess the skill sets they will need over the next ten years or so.

SDN is quickly proving to be every bit as disruptive as it was predicted to be.

Why Did We Write This Book?

For all the attention SDN is getting, it remains a vague concept for many people. Products are still young, and standards are still being developed. All three of the authors have had the experience of having to define SDN to our customers before being able to discuss it with them.

This book is the first in a planned series on SDN, intended to help you navigate the many protocols and technologies comprising the SDN family of architectures. Future topics will cover Network Function Virtualization, orchestration, and SDN in the WAN.

Why Start with OpenFlow?

More than a few of our friends in the industry, when we've said we're writing a book on OpenFlow, have said, "Really? Why OpenFlow? Isn't it teetering on obsolescence?"

Well, no it isn't. Some vendors have gone other directions with their controller-to-switch protocols. And OpenFlow is evolving from its original mission of only building flow tables in switches to now specifying configurations, security, and policy. But there is still wide interest in and support for the protocol, and the Working Groups establishing OpenFlow standards are among the most well established in the industry. It will be around for a long time.

So OpenFlow, as a proven and open SDN protocol sitting in the middle of all the action between controllers and switches, is an excellent subject for beginning a study of SDN architectures.

Is This Book for You?

You're reading this preface, so you obviously are curious enough about SDN to have picked up or downloaded the book. It is our opinion that yes, that's enough to say this book is for you. We've organized the book so that you can skim it for an introduction to SDN and a quick overview of how SDN uses OpenFlow as a foundation protocol, or you can use the book for a deep dive into the protocol and its use.

We've written the book with data center architects, engineers, troubleshooters, and students in mind. We hope you get as much out of reading it as we got out of writing it.

Schedule of the Book Series

As you know if you are following or involved in SDN, things are changing at an accelerated pace. Innovation cannot be held back! Volume I provides the needed background and baseline of SDN, for which Volume II expands on with NFV and other emerging technologies. Some of the use cases in Volume I might be old news but they provide the proper background and basis for understanding how things are rapidly evolving as SDN moves forward.

Volume II will be published in 2015 and Volume III will be published in late 2015 or early 2016.

Author: Jeff Doyle

Specializing in IP routing protocols, SDN, data center fabrics, MPLS, and IPv6, Jeff Doyle has designed or assisted in the design of large-scale IP service provider networks in 26 countries over 6 continents. He worked with early IPv6 adopters in Japan, China, and South Korea, and now advises service providers, government agencies, military contractors, equipment manufacturers, and large enterprises on best-practice IPv6 deployment.

Jeff is the author of *CCIE Professional Development: Routing TCP/IP*, Volumes I and II; *OSPF and IS-IS: Choosing an IGP for Large-Scale Networks*; and is an editor and contributing author of *Juniper Networks Routers: The Complete Reference*. He also writes blogs for both Network World and for Network Computing. Jeff is one of the founders of the Rocky Mountain IPv6 Task Force and is an IPv6 Forum Fellow.

Author: Doug Marschke

Doug Marschke is an engineering graduate from the University of Michigan and founder of SDN Essentials. He is a writer of various Juniper certification exams and co-writer of the JNCIE Enterprise Exam. He has also authored the *JUNOS Enterprise Routing* book, and *JUNOS Enterprise Switching.*

Doug currently spends his time working with both service providers and enterprises to optimize their IP networks for better performance, cost and reliability. He also flies around the word and back sharing his knowledge in a variety of training classes and seminars with topics ranging from troubleshooting, design and certification preparation. In Doug's free time he is an entrepreneur of sorts as he owns two restaurants in San Francisco, Taco Shop at Underdogs and Tacko. He also has dabbled into the world of film with his production company, Funny How Films.

Author: Pete Moyer

Pete Moyer is an old timer IP/MPLS consulting engineer who has turned his focus toward SDN in recent years. He is currently employed by Brocade and has multi-vendor experience in IP networking; he earned the first awarded JNCIE in the early 2000's and he earned his CCIE in the late 1990's. He was previously with Juniper for approximately 10 years. He is a co-author and technical editor of several IP networking books. His current focus is on large-scale data center and service provider networks, including the Research & Education Network (REN) market. He holds a BS, CMIS from the University of Maryland.

Technical Editor:

Chris Jones is an SDN Engineer with SDN Essentials, certified with Juniper as JNCIE-ENT #272, and with Cisco Systems as CCIE #25655 (R&S). He has over a decade of industry experience with both Cisco and Juniper products and solutions, designing and building networks for both small and large enterprises as well as for major service providers. Chris is the author of the Proteus Networks *JNCIE-ENT Preparation Workbook*, as well as the Juniper Networks Day One book *Junos for IOS Engineers*.

Graphics Editor:

Gregg Martin currently leads Solutions Arcitecture for Fishnet Security. Gregg has over 18 years of experience in Information Technology, and over 15 years of experience in Enterprise Networking. Prior to joining Fishnet Security, Gregg was with PricewaterhouseCoopers ("PwC") for 10 years and worked as a Network Engineer and Network Architect, responsible for the architecture of all network and security technologies for the entire firm. Gregg's delivered the built out of numerous data centers and well versed in the design, implementation, and operations of network and security technologies for data centers. In addition, Gregg has conducted audits and reviews of data of several well known industry data centers

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