

# **Sdn And Nfv Simplified A Visual Guide To Understanding Software Defined Networks And Network Function Virtualization**

Leverage the best SDN technologies for your OpenStack-based cloud infrastructure About This Book Learn how to leverage critical SDN technologies for OpenStack Networking APIs via plugins and drivers Champion the skills of achieving complete SDN with OpenStack with specific use cases and capabilities only covered in this title Discover exactly how you could implement cost-effective OpenStack SDN integration for your organization Who This Book Is For Administrators, and cloud operators who would like to implement Software Defined Networking on OpenStack clouds. Some prior experience of network infrastructure and networking concepts is assumed. What You Will Learn Understand how OVS is used for Overlay networks Get familiar with SDN Controllers with Architectural details and functionalities Create core ODL services and understand how OpenDaylight integrates with OpenStack to provide SDN capabilities Understand OpenContrail architecture and how it supports key SDN functionality such as Service Function Chaining (SFC) along with OpenStack Explore Open Network Operating System (ONOS) – a carrier grade SDN platform embraced by the biggest telecom service providers Learn about upcoming SDN technologies in OpenStack such as Dragonflow and OVN In Detail Networking is one the pillars of OpenStack and OpenStack Networking are designed to support programmability and Software-Defined Networks.

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OpenStack Networking has been evolving from simple APIs and functionality in Quantum to more complex capabilities in Neutron. Armed with the basic knowledge, this book will help the readers to explore popular SDN technologies, namely, OpenDaylight (ODL), OpenContrail, Open Network Operating System (ONOS) and Open Virtual Network (OVN). The first couple of chapters will provide an overview of OpenStack Networking and SDN in general. Thereafter a set of chapters are devoted to OpenDaylight (ODL), OpenContrail and their integration with OpenStack Networking. The book then introduces you to Open Network Operating System (ONOS) which is fast becoming a carrier grade SDN platform. We will conclude the book with overview of upcoming SDN projects within OpenStack namely OVN and Dragonflow. By the end of the book, the readers will be familiar with SDN technologies and know how they can be leveraged in an OpenStack based cloud. Style and approach A hands-on practical tutorial through use cases and examples for Software Defined Networking with OpenStack.

5G, edge computing and IoT are driving a once-in-a-generation network transformation for communications service providers that will completely change how network services are built and operated. At the same time, open source projects, that have played a critical role in enterprise IT systems to-date, are now transforming how network services and next-generation applications are developed, deployed, and scaled. The open source Linux Foundation ONAP project orchestrates and manages these next generation network services based on Network Functions Virtualization (NFV) and Software Defined Networking (SDN) to bring agility, higher customer satisfaction and lower costs. This book provides the basics of NFV and SDN, an introduction to The Linux Foundation ONAP project, a discussion on the the challenges ONAP solves, and an overview of the ONAP project's architecture, subprojects and blueprints. If your

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organization is embarking on an SDN/NFV transformation journey, you believe open source software will play a critical role in this journey, and you are unclear how to manage and orchestrate network services for your SDN/NFV use case then this book is for you. This book is designed to provide a high-level understanding and business perspective of the ONAP project and a guide for navigating, participating, and benefiting from the ONAP community. The book is also meant for vendors that wish to determine how to position or sell their products into the ONAP ecosystem.

Foundations of Modern Networking is a comprehensive, unified survey of modern networking technology and applications for today's professionals, managers, and students. Dr. William Stallings offers clear and well-organized coverage of five key technologies that are transforming networks: Software-Defined Networks (SDN), Network Functions Virtualization (NFV), Quality of Experience (QoE), the Internet of Things (IoT), and cloudbased services. Dr. Stallings reviews current network ecosystems and the challenges they face—from Big Data and mobility to security and complexity. Next, he offers complete, self-contained coverage of each new set of technologies: how they work, how they are architected, and how they can be applied to solve real problems. Dr. Stallings presents a chapter-length analysis of emerging security issues in modern networks. He concludes with an up-to date discussion of networking careers, including important recent changes in roles and skill requirements. Coverage: Elements of the modern networking ecosystem: technologies, architecture, services, and applications Evolving requirements of current network environments SDN: concepts, rationale, applications, and standards across data, control, and application planes OpenFlow, OpenDaylight, and other key SDN technologies Network functions virtualization: concepts,

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technology, applications, and software defined infrastructure Ensuring customer Quality of Experience (QoE) with interactive video and multimedia network traffic Cloud networking: services, deployment models, architecture, and linkages to SDN and NFV IoT and fog computing in depth: key components of IoT-enabled devices, model architectures, and example implementations Securing SDN, NFV, cloud, and IoT environments Career preparation and ongoing education for tomorrow's networking careers Key Features: Strong coverage of unifying principles and practical techniques More than a hundred figures that clarify key concepts Web support at [williamstallings.com/Network/](http://williamstallings.com/Network/) QR codes throughout, linking to the website and other resources Keyword/acronym lists, recommended readings, and glossary Margin note definitions of key words throughout the text

Software-Defined Networks (SDN) are transforming the Internet by replacing bundled, proprietary hardware and control software. SDN is being embraced by cloud providers, telcos, and enterprises, as it enables a new era of innovation in networking. This book provides a comprehensive introduction to SDN from the perspective of those who are developing and leveraging the technology. Book Features: Describes a complete SDN stack, illustrated with example open source software. Emphasizes underlying concepts, abstractions, and design rationale. Describes both fixed-function and programmable switching chips. Describes the P4-based toolchain for programming and controlling switches. Describes a range of SDN use cases: enterprises, datacenters, access networks. Includes hands-on programming exercises, downloadable fro GitHub.

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This book describes the concept of a Software Defined Mobile Network (SDMN), which will impact the network architecture of current LTE (3GPP) networks. SDN will also open up new opportunities for traffic, resource and mobility management, as well as impose new challenges on network security. Therefore, the book addresses the main affected areas such as traffic, resource and mobility management, virtualized traffics transportation, network management, network security and techno economic concepts. Moreover, a complete introduction to SDN and SDMN concepts. Furthermore, the reader will be introduced to cutting-edge knowledge in areas such as network virtualization, as well as SDN concepts relevant to next generation mobile networks. Finally, by the end of the book the reader will be familiar with the feasibility and opportunities of SDMN concepts, and will be able to evaluate the limits of performance and scalability of these new technologies while applying them to mobile broadband networks. Explore the emerging definitions, protocols, and standards for SDN—software-defined, software-driven, programmable networks—with this comprehensive guide. Two senior network engineers show you what's required for building networks that use software for bi-directional communication between applications and the underlying network infrastructure. This vendor-agnostic book also presents several SDN use cases, including bandwidth scheduling and manipulation, input traffic and triggered actions, as well as some interesting use cases around big data, data center overlays, and network-function virtualization. Discover how enterprises and service providers alike are pursuing SDN as it continues to evolve. Explore the current state of the OpenFlow model and centralized network control Delve into distributed and central control, including data plane generation Examine the structure and capabilities of commercial and open source controllers Survey the available technologies for network programmability

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Trace the modern data center from desktop-centric to highly distributed models Discover new ways to connect instances of network-function virtualization and service chaining Get detailed information on constructing and maintaining an SDN network topology Examine an idealized SDN framework for controllers, applications, and ecosystems

Gain the edge with SDN, NFV, network virtualization, and networking on clouds About This Book Navigate through the complexities of delivering modern networking services with practical techniques and solutions Build robust software defined networks and solve real-world problems involving challenges with next generation networks Discover the best practices used by top industry professionals for network-related architecture, services, and applications and secure your networks Who This Book Is For This book is for Network Engineers and Network Administrators who are taking their first steps when deploying software-defined networks. Network Architects will also find this book useful when designing and building modern networks. What You Will Learn Understand Traditional Network Challenges to match modern applications requirements Find out all about Next Generation Networks (NGN) Explore the different APIs used to control NGN devices Understand the different software controllers available to manage NGN hardware Design a next generation network In Detail As IT infrastructures become more software-defined, networking operations tend to be more automated with falling levels of manual configuration at the hardware level. Building Modern Networks will brush up your knowledge on the modern networking concepts and help you apply them to your software-defined infrastructure. In this book you'll gain the knowledge necessary to evaluate, choose, and deploy a next generation network design. We will cover open and closed network operating systems (NOS) along with the protocols used to control

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them such as OpenFlow, Thrift, Opflex, and REST. You will also learn about traffic engineering and security concepts for NGNs. You will also find out how to fine-tune your network using QoS and QoE. By the end of the book, you'll be well versed in simplifying the way you design, build, operate, and troubleshoot your network. Style and Approach This practical tutorial shows you real-world solutions to design and build network services through cutting edge research. Nowadays, the Internet plays a vital role in our lives. It is currently one of the most effective media that is shifting to reach into all areas in today's society. While we move into the next decade, the future of many emerging technologies (IoT, cloud solutions, automation and AI, big data, 5G and mobile technologies, smart cities, etc.) is highly dependent on Internet connectivity and broadband communications. The demand for mobile and faster Internet connectivity is on the rise as the voice, video, and data continue to converge to speed up business operations and to improve every aspect of human life. As a result, the broadband communication networks that connect everything on the Internet are now considered a complete ecosystem routing all Internet traffic and delivering Internet data faster and more flexibly than ever before. This book gives an insight into the latest research and practical aspects of the broadband communication networks in support of many emerging paradigms/applications of global Internet from the traditional architecture to the incorporation of smart applications. This

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book includes a preface and introduction by the editors, followed by 20 chapters written by leading international researchers, arranged in three parts. This book is recommended for researchers and professionals in the field and may be used as a reference book on broadband communication networks as well as on practical uses of wired/wireless broadband communications. It is also a concise guide for students and readers interested in studying Internet connectivity, mobile/optical broadband networks and concepts/applications of telecommunications engineering.

Over 90 recipes to gain the critical skills needed to deploy and manage OpenDaylight-based solutions About This Book This book will help you to build intelligent SDN networks that save your company time, money, and resources From eminent authors, learn to address real-world challenges and troubleshoot day-to-day scalability and performance problems faced in OpenDayLight deployments This is the only book that offers you quick fixes to create your own branded OpenDaylight Who This Book Is For This book is for experienced network administrators and IT professionals who are using or deploying SDN/OpenDaylight and are looking to gain expertise in building SDN solutions for organizations. What You Will Learn Grasp the fundamentals of OpenDaylight Customize, authenticate, & authorize in OpenDaylight Analyse network access



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control and policy Manage datacenter optimization Integrate OpenDaylight with third-party frameworks Deploy, configure, and tune OpenDaylight-based solutions In Detail OpenDaylight is an open source platform to program and build Software-Defined Networks (SDN). Its aim is to accelerate the adoption of SDN and NFV. With above 90 practical recipes, this book will help you to solve day-to-day problems and maintenance tasks surrounding OpenDaylight's implementation. This book starts with the OpenDaylight fundamentals. In this book, you will gain a sound understanding of the methods and techniques when deploying OpenDaylight in production environment. Later on, you will learn to create a Service Chain using SFC. This book will address common problems and day-to-day maintenance tasks with OpenDaylight. We'll also will teach you how to interact with OpenDaylight APIs and use the necessary tools to simulate networks. You will also explore how to create your own branded OpenDaylight along with authorising and authenticating users using OpenDaylight Identity Manager. By the end of this book, you will have the necessary skills to operate an OpenDaylight SDN environment. Style and approach With a diverse range of topics, this will be a guide which will help the readers gain the necessary skills needed to deploy and operate OpenDaylight in your organisation through practical recipes.

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ICT technologies have contributed to the advances in wireless systems, which provide seamless connectivity for worldwide communication. The growth of interconnected devices and the need to store, manage, and process the data from them has led to increased research on the intersection of the internet of things and cloud computing. The Handbook of Research on the IoT, Cloud Computing, and Wireless Network Optimization is a pivotal reference source that provides the latest research findings and solutions for the design and augmentation of wireless systems and cloud computing. The content within this publication examines data mining, machine learning, and software engineering, and is designed for IT specialists, software engineers, researchers, academicians, industry professionals, and students.

Like sysadmins before them, network engineers are finding that they cannot do their work manually anymore. As the field faces new protocols, technologies, delivery models, and a pressing need for businesses to be more agile and flexible, network automation is becoming essential. This practical guide shows network engineers how to use a range of technologies and tools—including Linux, Python, JSON, and XML—to automate their systems through code. Network programming and automation will help you simplify tasks involved in configuring, managing, and operating network equipment, topologies, services, and

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connectivity. Through the course of the book, you'll learn the basic skills and tools you need to make this critical transition. This book covers: Python programming basics: data types, conditionals, loops, functions, classes, and modules Linux fundamentals to provide the foundation you need on your network automation journey Data formats and models: JSON, XML, YAML, and YANG for networking Jinja templating and its applicability for creating network device configurations The role of application programming interfaces (APIs) in network automation Source control with Git to manage code changes during the automation process How Ansible, Salt, and StackStorm open source automation tools can be used to automate network devices Key tools and technologies required for a Continuous Integration (CI) pipeline in network operations This book highlights the importance of security in the design, development and deployment of systems based on Software-Defined Networking (SDN) and Network Functions Virtualization (NFV), together referred to as SDNFV. Presenting a comprehensive guide to the application of security mechanisms in the context of SDNFV, the content spans fundamental theory, practical solutions, and potential applications in future networks. Topics and features: introduces the key security challenges of SDN, NFV and Cloud Computing, providing a detailed tutorial on NFV security; discusses the issue of trust in SDN/NFV environments,

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covering roots of trust services, and proposing a technique to evaluate trust by exploiting remote attestation; reviews a range of specific SDNFV security solutions, including a DDoS detection and remediation framework, and a security policy transition framework for SDN; describes the implementation of a virtual home gateway, and a project that combines dynamic security monitoring with big-data analytics to detect network-wide threats; examines the security implications of SDNFV in evolving and future networks, from network-based threats to Industry 4.0 machines, to the security requirements for 5G; investigates security in the Observe, Orient, Decide and Act (OODA) paradigm, and proposes a monitoring solution for a Named Data Networking (NDN) architecture; includes review questions in each chapter, to test the reader's understanding of each of the key concepts described. This informative and practical volume is an essential resource for researchers interested in the potential of SDNFV systems to address a broad range of network security challenges. The work will also be of great benefit to practitioners wishing to design secure next-generation communication networks, or to develop new security-related mechanisms for SDNFV systems. Software Defined Networks: A Comprehensive Approach, Second Edition provides in-depth coverage of the technologies collectively known as Software Defined Networking (SDN). The book shows how to explain to business decision-

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makes the benefits and risks in shifting parts of a network to the SDN model, when to integrate SDN technologies in a network, and how to develop or acquire SDN applications. In addition, the book emphasizes the parts of the technology that encourage opening up the network, providing treatment for alternative approaches to SDN that expand the definition of SDN as networking vendors adopt traits of SDN to their existing solutions. Since the first edition was published, the SDN market has matured, and is being gradually integrated and morphed into something more compatible with mainstream networking vendors. This book reflects these changes, with coverage of the OpenDaylight controller and its support for multiple southbound protocols, the Inclusion of NETCONF in discussions on controllers and devices, expanded coverage of NFV, and updated coverage of the latest approved version (1.5.1) of the OpenFlow specification. Contains expanded coverage of controllers Includes a new chapter on NETCONF and SDN Presents expanded coverage of SDN in optical networks Provides support materials for use in computer networking courses This book provides readers insights into cyber maneuvering or adaptive and intelligent cyber defense. It describes the required models and security supporting functions that enable the analysis of potential threats, detection of attacks, and implementation of countermeasures while expending attacker

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resources and preserving user experience. This book not only presents significant education-oriented content, but uses advanced content to reveal a blueprint for helping network security professionals design and implement a secure Software-Defined Infrastructure (SDI) for cloud networking environments. These solutions are a less intrusive alternative to security countermeasures taken at the host level and offer centralized control of the distributed network. The concepts, techniques, and strategies discussed in this book are ideal for students, educators, and security practitioners looking for a clear and concise text to avant-garde cyber security installations or simply to use as a reference. Hand-on labs and lecture slides are located at <http://virtualnetworksecurity.thothlab.com/>. Features

- Discusses virtual network security concepts
- Considers proactive security using moving target defense
- Reviews attack representation models based on attack graphs and attack trees
- Examines service function chaining in virtual networks with security considerations
- Recognizes machine learning and AI in network security

A Visual Guide to Understanding Software Defined Networks and Network Function Virtualization The simple, visual, at-a-glance guide to SDN and NFV: Core concepts, business drivers, key technologies, and more! SDN (Software Defined Networks) and NFV (Network Function Virtualization) are today's hottest

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areas of networking. Many executives, investors, sales professionals, and marketers need a solid working understanding of these technologies, but most books on the subject are written specifically for network engineers and other technical experts. SDN and NFV Simplified fills that gap, offering highly visual, “at-a-glance” explanations of SDN, NFV, and their underlying virtualizations. Built around an illustrated, story-telling approach, this answers the questions: Why does this technology matter? How does it work? Where is it used? What problems does it solve? Through easy, whiteboard-style infographics, you’ll learn: how virtualization enables SDN and NFV; how datacenters are virtualized through clouds; how networks can also be virtualized; and how to maximize security, visibility, and Quality of Experience in tomorrow’s fully-virtualized environments. Step by step, you’ll discover why SDN and NFV technologies are completely redefining both enterprise and carrier networks, and driving the most dramatic technology migration since IP networking. That’s not all: You’ll learn all you need to help lead this transformation. Learn how virtualization establishes the foundation for SDN and NFV Review the benefits of VMs, the role of hypervisors, and the management of virtual resources Discover how cloud technologies enable datacenter virtualization Understand the roles of networking gear in virtualized datacenters See VMWare VMotion and VXLAN at work in the

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virtualized datacenter Understand multitenancy and the challenges of “communal living” Learn how core network functions and appliances can be virtualized Ensure performance and scalability in virtualized networks Compare modern approaches to network virtualization, including OpenFlow, VMWare Nicera, Cisco Insieme, and OpenStack Walk through the business case for SDN, NFV, and the Cloud Discover how the Software Defined Network (SDN) solves problems previously left unaddressed Understand SDN controllers—and who’s fighting to control your network Use SDN and NFV to improve integration and say goodbye to “truck rolls” Enforce security, avoid data leakage, and protect assets through encryption Provide for effective monitoring and consistent Quality of Experience (QoE) Learn how SDN and NFV will affect you—and what’s next

The goal of this book is to describe new concepts for Internet next generation. This architecture is based on virtual networking using Cloud and datacenters facilities. Main problems concern 1) the placement of virtual resources for opening a new network on the fly, and 2) the urbanisation of virtual resource implemented on physical network equipment. This architecture deals with mechanisms capable of controlling automatically the placement of all virtual resources within the physical network. In this book, we describe how to create and delete virtual networks on the fly. Indeed, the system is able to create any



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new network with any kind of resource (e.g., virtual switch, virtual routers, virtual LSRs, virtual optical path, virtual firewall, virtual SIP-based servers, virtual devices, virtual servers, virtual access points, and so on). We will show how this architecture is compatible with new advances in SDN (Software Defined Networking), new high-speed transport protocol like TRILL (Transparent Interconnection of Lots of Links) and LISP (Locator/Identifier Separation Protocol), NGN, IMS, Wi-Fi new generation, and 4G/5G networks. Finally, we introduce the Cloud of security and the virtualisation of secure elements (smartcard) that should definitely transform how to secure the Internet.

SD-WAN is an advanced networking approach that creates hybrid networks to integrate broadband or other network services into the corporate WAN, not only just handling general business workloads and traffic, but also being capable of maintaining the performance and security of real-time and sensitive applications. This book posits that Software Defined (SD) WAN is the answer to questions such as what changes can be made to the networking sector? What innovations can make WAN, which plays a vital integrated part of the cloud ecosystem, more cost effective, performance robust, provisioning efficient, and operation intelligent?

Master OpenFlow concepts to improve and make your projects efficient with the

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help of Software-Defined Networking. About This Book Master the required platforms and tools to build network applications with OpenFlow Get to grips with the updated OpenFlow and build robust SDN-based solutions An end-to-end thorough overview of open-source switches, controllers, and tools Who This Book Is For If you are a network/system administrator or a system engineer and would like to implement OpenFlow concepts and take Software-Defined Networking on your projects to the next level, then this book is for you. If you are aware of broad networking concepts, and are familiar with the day-to-day operation of computer networks, you will find this book very beneficial. What You Will Learn Explore Software-Defined Networking and activities around SDN/OpenFlow including OpenFlow messages Hardware and software implementations of OpenFlow switches and experiment with Mininet GUI Learn about the role of OpenFlow in cloud computing by configuring and setting up the Neutron and Floodlight OpenFlow controller plugins Simulate and test utilities, and familiarize yourself with OpenFlow soft switches, controllers, virtualization, and orchestration tools Enhance and build environments for Net App development by installing VM's and tools such as Mininet and Wireshark Learn about hardware and software switches and get a feel for active open-source projects around SDN and OpenFlow In Detail OpenFlow paves the way for an

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open, centrally programmable structure, thereby accelerating the effectiveness of Software-Defined Networking. Software-Defined Networking with OpenFlow, Second Edition takes you through the product cycle and gives you an in-depth description of the components and options that are available at each stage. The aim of this book is to help you implement OpenFlow concepts and improve Software-Defined Networking on your projects. You will begin by learning about building blocks and OpenFlow messages such as controller-to-switch and symmetric and asynchronous messages. Next, this book will take you through OpenFlow controllers and their existing implementations followed by network application development. Key topics include the basic environment setup, the Neutron and Floodlight OpenFlow controller, XORPlus OF13SoftSwitch, enterprise and affordable switches such as the Zodiac FX and HP2920. By the end of this book, you will be able to implement OpenFlow concepts and improve Software-Defined Networking in your projects. Style and approach This book is an easy-to-follow and pragmatic guide networking. Each topic adopts a logical approach and provides hints to help you build and deliver SDN Solutions efficiently.

Master OpenFlow concepts to improve and make your projects efficient with the help of Software-Defined Networking. About This Book\* Master the required

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platforms and tools to build network applications with OpenFlow\* Get to grips with the updated OpenFlow and build robust SDN-based solutions\* An end-to-end thorough overview of open-source switches, controllers, and toolsWho This Book Is ForIf you are a network/system administrator or a system engineer and would like to implement OpenFlow concepts and take Software-Defined Networking on your projects to the next level, then this book is for you. If you are aware of broad networking concepts, and are familiar with the day-to-day operation of computer networks, you will find this book very beneficial.What You Will Learn\* Explore Software-Defined Networking and activities around SDN/OpenFlow including OpenFlow messages\* Hardware and software implementations of OpenFlow switches and experiment with Mininet GUI\* Learn about the role of OpenFlow in cloud computing by configuring and setting up the Neutron and Floodlight OpenFlow controller plugins\* Simulate and test utilities, and familiarize yourself with OpenFlow soft switches, controllers, virtualization, and orchestration tools\* Enhance and build environments for Net App development by installing VM's and tools such as Mininet and Wireshark\* Learn about hardware and software switches and get a feel for active open-source projects around SDN and OpenFlowIn DetailOpenFlow paves the way for an open, centrally programmable structure, thereby accelerating the effectiveness of

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Software-Defined Networking. Software-Defined Networking with OpenFlow, Second Edition takes you through the product cycle and gives you an in-depth description of the components and options that are available at each stage. The aim of this book is to help you implement OpenFlow concepts and improve Software-Defined Networking on your projects. You will begin by learning about building blocks and OpenFlow messages such as controller-to-switch and symmetric and asynchronous messages. Next, this book will take you through OpenFlow controllers and their existing implementations followed by network application development. Key topics include the basic environment setup, the Neutron and Floodlight OpenFlow controller, XORPlus OF13SoftSwitch, enterprise and affordable switches such as the Zodiac FX and HP2920. By the end of this book, you will be able to implement OpenFlow concepts and improve Software-Defined Networking in your projects. Style and approach This book is an easy-to-follow and pragmatic guide networking. Each topic adopts a logical approach and provides hints to help you build and deliver SDN Solutions efficiently.

Network infrastructures are growing rapidly to meet the needs of business, but the required repolicing and reconfiguration provide challenges that need to be addressed. The software-defined network (SDN) is the future generation of

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Internet technology that can help meet these challenges of network management. This book includes quantitative research, case studies, conceptual papers, model papers, review papers, and theoretical backing on SDN. This book investigates areas where SDN can help other emerging technologies deliver more efficient services, such as IoT, industrial IoT, NFV, big data, blockchain, cloud computing, and edge computing. The book demonstrates the many benefits of SDNs, such as reduced costs, ease of deployment and management, better scalability, availability, flexibility and fine-grained control of traffic, and security. The book demonstrates the many benefits of SDN, such as reduced costs, ease of deployment and management, better scalability, availability, flexibility and fine-grained control of traffic, and security. Chapters in the volume address: Design considerations for security issues and detection methods State-of-the-art approaches for mitigating DDoS attacks using SDN Big data using Apache Hadoop for processing and analyzing large amounts of data Different tools used for attack simulation Network policies and policy management approaches that are widely used in the context of SDN Dynamic flow tables, or static flow table management A new four-tiered architecture that includes cloud, SDN-controller, and fog computing Architecture for keeping computing resources available near the industrial IoT network through edge computing The impact of

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SDN as an innovative approach for smart city development More. The book will be a valuable resource for SDN researchers as well as academicians, research scholars, and students in the related areas.

Design your networks to successfully manage their growing complexity Network professionals have often been told that today's modern control planes would simplify their networks. The opposite has happened: Technologies like SDN and NFV, although immensely valuable, are exacerbating complexity instead of solving it. Navigating Network Complexity is the first comprehensive guide to managing this complexity in both deployment and day-to-day operations. Russ White and Jeff Tantsura introduce modern complexity theory from the standpoint of the working network engineer, helping you apply it to the practical problems you face every day. Avoiding complex mathematical models, they show how to characterize network complexity, so you can understand it and control it. The authors examine specific techniques and technologies associated with network control planes, including SDNs, fast reroute, segment routing, service chaining, and cloud computing. They reveal how each of these affects network design and complexity and help you anticipate causes of failure in highly complex systems. This book is intended for any professional interested in gaining greater insight into the terms, concepts, and issues related to the ongoing evolution of security

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and networking. It has been developed for a range of readers: the executive seeking to understand how their business is changing, the IT leader responsible for driving the transition, and the technologist designing and implementing change. Upon conclusion of the book, the reader should have a better and deeper understanding of:

- The state of enterprise technology today - legacy systems and networks, cloud compute and service providers, hybrid operating models-The ongoing evolution to hybrid models, bringing together disparate data center and cloud components under a single policy and security management umbrella.
- The individual components that makeup networking and security ecosystems and how they come together to form an intrinsic security solution.
- The path to move enterprise networking and security blueprint towards SASE architecture.
- How the integration of SD-WAN and SASE will address latency, performance, and global policy-As a team at the forefront of SD-WAN technology, we are uniquely positioned to help IT transform WAN into SASE as we lead the evolution in its implementation and deployment.
- Market trends that have contributed to this movement, the challenges that it poses, and its value to both individual users and the broader enterprise.
- In the realms of implementation and deployment, we will cover SASE network flow, design principles and operation practices, the role of Artificial Intelligence and Machine Learning



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(AIOps/ML) in the SASE platform, and the necessary preparatory steps to ensure effective Day-0 through Day-N operations and management. This technical book has 100+ diagrams to simplify the concept. Get started on your SASE Journey. This open access book was prepared as a Final Publication of the COST Action IC1304 "Autonomous Control for a Reliable Internet of Services (ACROSS)". The book contains 14 chapters and constitutes a show-case of the main outcome of the Action in line with its scientific goals. It will serve as a valuable reference for undergraduate and post-graduate students, educators, faculty members, researchers, engineers, and research strategists working in this field. The explosive growth of the Internet has fundamentally changed the global society. The emergence of concepts like SOA, SaaS, PaaS, IaaS, NaaS, and Cloud Computing in general has catalyzed the migration from the information-oriented Internet into an Internet of Services (IoS). This has opened up virtually unbounded possibilities for the creation of new and innovative services that facilitate business processes and improve the quality of life. However, this also calls for new approaches to ensuring the quality and reliability of these services. The objective of this book is, by applying a systematic approach, to assess the state-of-the-art and consolidate the main research results achieved in this area. This work was published by Saint Philip Street Press pursuant to a Creative

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Cisco Networking Simplified Second Edition Master today's world of Cisco networking with this book's completely updated, fully illustrated visual approach Easy enough for novices, substantive enough for networking professionals Covers the latest networking topics--from network architecture to secure wireless, unified communications to telepresence In Full Color Jim Doherty - Neil Anderson - Paul Della Maggiora Now 100 percent updated for the latest technologies, this is today's easiest, most visual guide to Cisco(R) networking. Even if you've never set up or managed a network, Cisco Networking Simplified, Second Edition, helps you quickly master the concepts you need to understand. Its full-color diagrams and clear explanations give you the big picture: how each important networking technology works, what it can do for you, and how they all fit together. The authors illuminate networking from the smallest LANs to the largest enterprise infrastructures, offering practical introductions to key issues ranging from security to availability, mobility to virtualization. What you always wanted to know about networking but were afraid to ask! How networks and the Internet work How to build coherent, cost-effective network infrastructures How to design networks for maximum reliability and availability What you need to know about

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data center and application networking How to secure networks against today's threats and attacks How to take advantage of the latest mobility technologies How virtualizing networks can help businesses leverage their network investments even further How to combine messaging, calendaring, telephony, audio, video, and web conferencing into a unified communications architecture This book is part of the Networking Technology Series from Cisco Press(R), the only authorized publisher for Cisco(R). Category: Cisco Covers: General Networking

Your complete guide to designing, deploying, and managing OpenStack-based clouds in mid-to-large IT infrastructures  
About This Book\* Design and deploy an OpenStack-based cloud in your mid-to-large IT infrastructure using automation tools and best practices\* Keep yourself up-to-date with valuable insights into OpenStack components and new services in the latest OpenStack release\* Discover how the new features in the latest OpenStack release can help your enterprise and infrastructure  
Who This Book Is For This book is for system administrators, cloud engineers, and system architects who would like to deploy an OpenStack-based cloud in a mid-to-large IT infrastructure. This book requires a moderate level of system administration and familiarity with cloud concepts.  
What You Will Learn\* Explore the main architecture design of

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OpenStack components and core-by-core services, and how they work together\* Design different high availability scenarios and plan for a no-single-point-of-failure environment\* Set up a multinode environment in production using orchestration tools\* Boost OpenStack's performance with advanced configuration\* Delve into various hypervisors and container technology supported by OpenStack\* Get familiar with deployment methods and discover use cases in a real production environment\* Adopt the DevOps style of automation while deploying and operating in an OpenStack environment\* Monitor the cloud infrastructure and make decisions on maintenance and performance improvement

In Detail

In this second edition, you will get to grips with the latest features of OpenStack. Starting with an overview of the OpenStack architecture, you'll see how to adopt the DevOps style of automation while deploying and operating in an OpenStack environment. We'll show you how to create your own OpenStack private cloud. Then you'll learn about various hypervisors and container technology supported by OpenStack. You'll get an understanding about the segregation of compute nodes based on reliability and availability needs. We'll cover various storage types in OpenStack and advanced networking aspects such as SDN and NFV. Next, you'll understand the OpenStack infrastructure from a cloud user point of view. Moving on, you'll develop

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troubleshooting skills, and get a comprehensive understanding of services such as high availability and failover in OpenStack. Finally, you will gain experience of running a centralized logging server and monitoring OpenStack services. The book will show you how to carry out performance tuning based on OpenStack service logs. You will be able to master OpenStack benchmarking and performance tuning. By the end of the book, you'll be ready to take steps to deploy and manage an OpenStack cloud with the latest open source technologies.

This book constitutes the refereed proceedings of the 12th IFIP WG 12.5 International Conference on Artificial Intelligence Applications and Innovations, AIAI 2016, and three parallel workshops, held in Thessaloniki, Greece, in September 2016. The workshops are the Third Workshop on New Methods and Tools for Big Data, MT4BD 2016, the 5th Mining Humanistic Data Workshop, MHDW 2016, and the First Workshop on 5G - Putting Intelligence to the Network Edge, 5G-PINE 2016. The 30 revised full papers and 8 short papers presented at the main conference were carefully reviewed and selected from 65 submissions. The 17 revised full papers and 7 short papers presented at the 3 parallel workshops were selected from 33 submissions. The papers cover a broad range of topics such as artificial neural networks, classification, clustering, control

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systems - robotics, data mining, engineering application of AI, environmental applications of AI, feature reduction, filtering, financial-economics modeling, fuzzy logic, genetic algorithms, hybrid systems, image and video processing, medical AI applications, multi-agent systems, ontology, optimization, pattern recognition, support vector machines, text mining, and Web-social media data AI modeling. A practical guide to building programmable networks using OpenDaylight About This Book Learn and understand how SDN controllers operate and integrate with networks; this book's step-by-step tutorials will give you a strong foundation in SDN, NVF, and OpenDayLight. Learn how to map legacy Layer 2/3 networking technologies in the SDN world Add new services and capabilities to your infrastructure and quickly adopt SDN and NFV within your organization with OpenDayLight. Integrate and manage software-defined networks efficiently in your organization. Build innovative network applications with OpenDayLight and save time and resources. Who This Book Is For This book targets network engineers, network programmers and developers, administrators, and anyone with some level of networking experience who'd like to deploy OpenDayLight effectively. Familiarity with the day-to-day operations of computer networks is expected What You Will Learn Transition from legacy networking to software-defined networking Learn how SDN controllers work and manage a network

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using southbound and northbound APIs Learn how to deploy the OpenDayLight SDN controller and integrate it with virtual switches Understand the basic design and operation of the OpenDaylight platform Build simple MD-SAL OpenDaylight applications Build applications on top of OpenDayLight to trigger network changes based on different events Integrate OpenStack with OpenDayLight to build a fully managed network Learn how to build a software-defined datacenter using NFV and service-chaining technologies In Detail OpenDaylight is an open source, software-defined network controller based on standard protocols. It aims to accelerate the adoption of Software-Defined Networking (SDN) and create a solid foundation for Network Functions Virtualization (NFV). SDN is a vast subject; many network engineers find it difficult to get started with using and operating different SDN platforms. This book will give you a practical bridge from SDN theory to the practical, real-world use of SDN in datacenters and by cloud providers. The book will help you understand the features and use cases for SDN, NFV, and OpenDaylight. NFV uses virtualization concepts and techniques to create virtual classes for node functions. Used together, SDN and NFV can elevate the standards of your network architecture; generic hardware-saving costs and the advanced and abstracted software will give you the freedom to evolve your network in the future without having to invest more in costly

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equipment. By the end of this book, you will have learned how to design and deploy OpenDaylight networks and integrate them with physical network switches. You will also have mastered basic network programming over the SDN fabric. Style and approach This is a step-by-step tutorial aimed at getting you up-to-speed with OpenDayLight and ready to adopt it for your SDN (Software-Defined Networking) and NFV (Network Functions Virtualization) ecosystem.

Cloud Networking: Understanding Cloud-Based Data Center Networks explains the evolution of established networking technologies into distributed, cloud-based networks. Starting with an overview of cloud technologies, the book explains how cloud data center networks leverage distributed systems for network virtualization, storage networking, and software-defined networking. The author offers insider perspective to key components that make a cloud network possible such as switch fabric technology and data center networking standards. The final chapters look ahead to developments in architectures, fabric technology, interconnections, and more. By the end of the book, readers will understand core networking technologies and how they're used in a cloud data center.

Understand existing and emerging networking technologies that combine to form cloud data center networks Explains the evolution of data centers from enterprise to private and public cloud networks Reviews network virtualization standards for



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multi-tenant data center environments Includes cutting-edge detail on the latest switch fabric technologies from the networking team in Intel

A straightforward, graphic-based reference for securing your home network Set up a firewall Secure your wireless network Stop adware and spyware Keep your children safe from online threats Prevent a virus outbreak Avoid Internet scams Phishing. Malware. Spyware. Trojan horses. Firewalls. Parental controls. If you have a home computer connected to the Internet, you need to understand these security terms. If that connection is high-speed (always on) or you run a wireless network, your need—your vulnerability—is that much greater. Now, with Home Network Security Simplified, you can get illustrated, easy-to-digest information written specifically for your needs. For each class of security threat, Home Network Security Simplified provides a tutorial—including tricks and tools that hackers use, a primer on network security design fundamentals, and step-by-step instructions on implementing security solutions. The authors also offer tips for monitoring your network and show what to do in the event of a security breach. Specifically, you will learn how to: Home Network Security Simplified features engaging four-color illustrations throughout, as well as informative security tips and pointers to other resources for more advanced information. Use this book to find the peace of mind that comes with knowing that your home network and your

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information are secure. Jim Doherty is the director of marketing and programs with Symbol Technologies' industry solutions group. Prior to joining Symbol, Jim worked at Cisco Systems, where he led various marketing campaigns for IP telephony and routing and switching solutions. Jim has 17 years of engineering and marketing experience across a broad range of networking and communications technologies. Jim is a coauthor of the Networking Simplified series, including Cisco Networking Simplified, Home Networking Simplified, and Internet Phone Services Simplified. He is also the author of the "Study Notes" section of CCNA Flash Cards and Exam Practice Pack (CCNA Self-Study, Exam #640-801), Second Edition. Jim is a former Marine Corps sergeant; he holds a bachelor's degree in electrical engineering from N.C. State University and a master's degree in business administration from Duke University. Neil Anderson is the senior manager of enterprise systems engineering at Cisco Systems. Neil has more than 20 years of engineering experience including public telephone systems, mobile phone systems, Internet, and home networking. At Cisco, Neil's focus is large corporate customers in the areas of routing and switching, wireless, security, and IP communications. Neil is a coauthor of the Networking Simplified series, including Home Networking Simplified and Internet Phone Services Simplified. Neil holds a bachelor's degree in computer science. This book is part

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of the Networking Technology Series from Cisco Press®, the only authorized publisher for Cisco Systems.

This book constitutes the proceedings of the 9th International Conference on Testbeds and Research Infrastructures for the Development of Networks and Communities, TridentCom 2014, held in Guangzhou, China, in May 2014. The 49 revised full papers presented were carefully selected out of 149 submissions. The conference consisted of 6 symposia covering topics such as testbed virtualization, Internet of Things, vehicular networks, SDN, NDN, large-scale testbed federation, mobile networks, wireless networks.

Network Function Virtualization provides an architectural, vendor-neutral level overview of the issues surrounding the large levels of data storage and transmission requirements needed for today's companies, also enumerating the benefits of NFV for the enterprise. Drawing upon years of practical experience, and using numerous examples and an easy-to-understand framework, authors Tom Nadeau and Ken Gary discuss the relevancy of NFV and how it can be effectively used to create and deploy new services. Readers will learn how to determine if network function virtualization is right for their enterprise network, be able to use hands-on, step-by-step guides to design, deploy, and manage NFV in an enterprise, and learn how to evaluate all relevant NFV standards, including

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ETSI, IETF, Openstack, and Open Daylight. Provides a comprehensive overview of Network Function Virtualization (NFV) Discusses how to determine if network function virtualization is right for an enterprise network Presents an ideal reference for those interested in NFV Network Service Chaining, NSC network address translation (NAT), firewalling, intrusion detection, domain name service (DNS), caching, and software defined networks Includes hands-on, step-by-step guides for designing, deploying, and managing NFV in the enterprise Explains, and contrasts, all relevant NFV standards, including ETSI, IETF, Openstack, and Open Daylight

Network Functions Virtualization (NFV) will drive dramatic cost reductions while also accelerating service delivery. Using NFV with SDN, network owners can provision new functions rapidly on demand, improve scalability, and leverage microservices. Benefits like these will make NFV indispensable for service providers, mobile operators, telcos, and enterprises alike. Network Functions Virtualization (NFV) with a Touch of SDN is the first practical introduction to NFV's fundamental concepts, techniques, and use cases. Written for wide audiences of network engineers, architects, planners, and operators, it assumes no previous knowledge of NFV architecture, deployment, or management. The authors first explain how virtualization, VMs, containers, and related technologies establish the foundation for the NFV transformation. Next, they show how these concepts and technologies can be applied to virtualize network functions in the cloud, data centers, routing, security, and the

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mobile packet core. You'll discover new tools and techniques for managing and orchestrating virtualized network devices, and gain new clarity on how SDN and NFV interact and interrelate. By the time you're done, you'll be ready to assess vendor claims, evaluate architectures, and plan NFV's role in your own networks. Understand NFV's key benefits and market drivers Review how virtualization makes NFV possible Consider key issues associated with NFV network design and deployment Integrate NFV into existing network designs Orchestrate, build, and deploy NFV networks and cloud services Maximize operational efficiency by building more programmable, automated networks Understand how NFV and SDN work together Address security, programmability, performance, and service function chaining Preview evolving concepts that will shape NFV's future

By containerizing applications and network services, you can achieve unprecedented levels of network agility and efficiency. Cisco IOS-XE, IOS-XR, and NX-OS Architecture have been augmented with compute virtualization capabilities to accommodate both native and third-party container hosting, empowering organizations to containerize and instantiate any application or network service. Direct from Cisco, Containers in Cisco IOS-XE, IOS-XR, and NX-OS: Orchestration and Operation is the complete guide to deploying and operating "containerized" application and network services in Cisco platforms. The authors begin by reviewing the virtualization and containerization concepts network professionals need to know, and introducing today's leading orchestration tools. Next, they take a deep dive into container networking, introducing Cisco architectural support for container infrastructures. You'll find modular coverage of characteristics, configuration, and operations for each key Cisco software platform: IOS-XE, IOS-XR, and NX-OS. A full chapter on developer tools and resources shows

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how to build container images with Docker, and introduces Cisco's toolkits, APIs, NX-SDK or Open Access Containers (OAC), telemetry, Nexus Data Broker, management tools, Puppet, Chef, Ansible, and more. The authors conclude with multiple use cases, showing how users in diverse markets can drive value with containers.

How can you make multivendor services work smoothly on today's complex networks? This practical book shows you how to deploy a large portfolio of multivendor Multiprotocol Label Switching (MPLS) services on networks, down to the configuration level. You'll learn where Juniper Network's Junos, Cisco's IOS XR, and OpenContrail, interoperate and where they don't. Two network and cloud professionals from Juniper describe how MPLS technologies and applications have rapidly evolved through services and architectures such as Ethernet VPNs, Network Function Virtualization, Seamless MPLS, Egress Protection, External Path Computation, and more. This book contains no vendor bias or corporate messages, just solid information on how to get a multivendor network to function optimally. Topics include: Introduction to MPLS and Software-Defined Networking (SDN) The four MPLS Builders (LDP, RSVP-TE, IGP SPRING, and BGP) Layer 3 unicast and multicast MPLS services, Layer 2 VPN, VPLS, and Ethernet VPN Inter-domain MPLS Services Underlay and overlay architectures: data centers, NVO, and NFV Centralized Traffic Engineering and TE bandwidth reservations Scaling MPLS transport and services Transit fast restoration based on the IGP and RSVP-TE FIB optimization and egress service for fast restoration This book provides security analyses of several Software Defined Networking (SDN) and Network Functions Virtualization (NFV) applications using Microsoft's threat modeling framework STRIDE. Before deploying new technologies in the production environment, their

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security aspects must be considered. Software Defined Networking (SDN) and Network Functions Virtualization (NFV) are two new technologies used to increase e.g. the manageability, security and flexibility of enterprise/production/cloud IT environments. Also featuring a wealth of diagrams to help illustrate the concepts discussed, the book is ideally suited as a guide for all IT security professionals, engineers, and researchers who need IT security recommendations on deploying SDN and NFV technologies.

This book offers readers an idea of what embedded Linux software and hardware architecture looks like, cross-compiling, and also presents information about the bootloader and how it can be built for a specific board. This book will go through Linux kernel features and source code, present information on how to build a kernel source, modules, and the Linux root filesystem. You'll be given an overview of the available Yocto Project components, how to set up Yocto Project Eclipse IDE, and how to use tools such as Wic and Swabber that are still under development. It will present the meta-realtime layer and the newly created meta-cgl layer, its purpose, and how it can add value to poky.

This book explores the challenges and opportunities in exploiting cloud technologies for 5G, ranging from radio access network (RAN) to the evolved packet core (EPC). With a specific focus on cloud RAN and EPC, the text carefully explains the influence of recent network technologies such as software defined networking (SDN), visualization, and cloud technologies in the evolution of architecture for future mobile networks. The book discusses the causes, benefits and challenges of cloud RAN and its interplay with other evolving technologies for future mobile networks. Researchers and professionals involved in mobile technology or cloud computing will find this book a valuable resource. The text is also suitable for advanced-level

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students studying all types of networking.

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