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AXBZD2 - JENNINGS NELSON

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 from GitHub.

SOFTWARE DEFINED NETWORKS Software defined networking suggests an alternative worldview, one that comes with a new software stack to which this book is organized, with the goal of presenting a top-to-bottom tour of SDN without leaving any significant gaps that the reader might suspect can only be filled with magic or proprietary code. Software defined networking (SDN) is an architecture designed to make a network more flexible and easier to manage. SDN has been widely adopted across data centers, WANs, and access networks and serves as a foundational element of a comprehensive intent-based networking (IBN) architecture. Although SDN has so far been limited to automated provisioning and configuration, IBN now adds "translation" and "assur-

ance" so that the complete network cycle can be automated, continuously aligning the network to business needs. In 14 chapters, this book provides a comprehensive understanding of an SDN-based network as a scalable distributed system running on commodity hardware. The reader will have a one-stop reference looking into the applications, architectures, functionalities, virtualization, security, and privacy challenges connected to SDN. Audience Researchers in software, IT, and electronic engineering as well as industry engineers and technologists working in areas such as network virtualization, Python network programming, CISCO ACI, software defined network, and cloud computing.

The legacy networks that are typically in use by organizations today have an infrastructure that is typically a mix of multiple vendor solutions, platforms and protocol solutions. This makes the ultimate goal of creating an integrated network ecosystem a difficult if not impossible process for many organizations. The arrival of Software Defined Networking (SDN) is an approach to building networks using open protocols, such as OpenFlow, that allow globally aware software control to be applied at the edges of the network in order to access network switches and routers that typically would use closed and proprietary firmware. What You'll Find Inside: THE IMPORTANCE OF SDN HOW TELECOM SERVICE PROVIDERS VIEW SDN THE DEVELOPER AND THE NETWORK EXAMPLES OF NETWORKED APPLICATIONS THAT CAN ONLY BE OFFERED IN AN SDN NETWORK GOOGLE AND SDN Software Defined Networking (SDN) is not a revolutionary new technology. Instead, it is better to think of this as being a new way of organizing com-

puter network functionality. SDN allows the network to be virtualized. That's where the real power of SDN comes from and that's what we'll be exploring in this book.

Software Defined Networking is revolutionizing the networking world. While the industry transitions to a software-centric architecture, a clear definition of SDN remains murky at best. This book clarifies the current industry confusion about what SDN is, why it's important, and most importantly the protocols and use cases that define SDN. OpenFlow (OF) is a critical piece of the SDN puzzle. While SDN solutions exist that do not require OF, it is undeniable that OF helped spur the innovation in SDN. The history of OF, its current and future status, and the associated use cases will be explained in detail in this book. Lastly, the book attempts to lay out SDN deployments that are real and current today, and apply practicality to the vast world of SDN architectures.

This book provides comprehensive discussion on key topics related to the usage and deployment of software defined networks (SDN) in Internet of Everything applications like, healthcare systems, data centers, edge/fog computing, vehicular networks, intelligent transportation systems, smart grids, smart cities and more. The authors provide diverse solutions to overcome challenges of conventional network binding in various Internet of Everything applications where there is need of an adaptive, agile, and flexible network backbone. The book showcases different deployment models, algorithms and implementations related to the usage of SDN in Internet of Everything applications along with the pros and cons of the same. Even more, this book provides deep insights into the

architecture of software defined networking specifically about the layered architecture and different network planes, logical interfaces, and programmable operations. The need of network virtualization and the deployment models for network function virtualization is also included with an aim towards the design of interoperable network architectures by researchers in future. Uniquely, the authors find hands on practical implementation, deployment scenarios and use cases for various software defined networking architectures in Internet of Everything applications like healthcare networks, Internet of Things, intelligent transportation systems, smart grid, underwater acoustic networks and many more. In the end, design and research challenges, open issues, and future research directions are provided in this book for a wide range of readers

An essential guide to the modeling and design techniques for securing systems that utilize the Internet of Things Modeling and Design of Secure Internet of Things offers a guide to the underlying foundations of modeling secure Internet of Things' (IoT) techniques. The contributors—noted experts on the topic—also include information on practical design issues that are relevant for application in the commercial and military domains. They also present several attack surfaces in IoT and secure solutions that need to be developed to reach their full potential. The book offers material on security analysis to help with in understanding and quantifying the impact of the new attack surfaces introduced by IoT deployments. The authors explore a wide range of themes including: modeling techniques to secure IoT, game theoretic models, cyber deception models, moving target defense models, adversarial machine learning models in military and commercial domains, and empirical validation of IoT platforms. This important book: Presents information on game-theory analysis of cyber deception Includes cutting-edge research finding such as IoT in the battlefield, advanced persistent threats, and intelligent and rapid honeynet generation Contains contributions from an international panel of experts Addresses design issues in developing secure IoT including secure SDN-based network orchestration, networked device identity management, multi-domain battlefield settings, and smart cities Written for researchers and experts in computer science and engineering, Modeling and Design of Secure Internet of Things contains expert contributions to provide the most recent modeling and design techniques for securing systems that utilize

Internet of Things.

The objective of this book is to teach what IoT is, how it works, and how it can be successfully utilized in business. This book helps to develop and implement a powerful IoT strategy for business transformation as well as project execution. Digital change, business creation/change and upgrades in the ways and manners in which we work, live, and engage with our clients and customers, are all enveloped by the Internet of Things which is now named "Industry 5.0" or "Industrial Internet of Things." The sheer number of IoT(a billion+), demonstrates the advent of an advanced business society led by sustainable robotics and business intelligence. This book will be an indispensable asset in helping businesses to understand the new technology and thrive.

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 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

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, 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/ 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 Networking (SDN) promises to accelerate the deployment of new Internet technologies and services, reduce network access costs, and improve resource utilization. SDN is already being implemented by Google, key carriers, and pioneering data center managers, and it is rapidly gaining mindshare amongst mainstream service providers and enterprises. SDN Distilled: A Brief Guide to Software Defined Networking is the first complete, up-to-date introduction to SDN technology for both decision-makers and technologists. Leading network technology expert Susan Hares helps you understand how SDN works and what has motivated its development, and guides you through objectively assessing its potential value in your own environment. Hares illuminates SDN's impact at every level of the classic 7-layer OSI

networking stack, covering all this, and more: Application layer, cloud, and Big Data OS virtualization layer, cloud platforms, and hypervisors Transport layer virtualization in the data center and WAN Network layer virtualization: NFV, OpenFlow, and new IETF routing functions/interfaces Link layer virtualization in virtual switches Virtualization of layer 2 network services (EVPNs) VLAN (VxLAN, NvGRE, STT, NV03) Physical layer virtualization at the optical layer (GMPLS/Transport optical) and virtualized radios for LTE and WiFi You'll discover what early adopters have (and have not) achieved through their SDN initiatives to date, and get practical checklists for assessing and planning SDN implementation at your own site. Whether you're just beginning to explore SDN technology or you're well underway with deployment, SDN Distilled brings together authoritative, objective knowledge you can't afford to do without.

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 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 Software Defined Networking: Design and Deployment provides a comprehensive treatment of software defined networking (SDN) suitable for new network managers and experienced network professionals. Presenting SDN in context with more familiar network

services and challenges, this accessible text: Explains the importance of virtualization, particularly the impact of virtualization on servers and networks Addresses SDN, with an emphasis on the network control plane Discusses SDN implementation and the impact on service providers, legacy networks, and network vendors Contains a case study on Google's initial implementation of SDN Investigates OpenFlow, the hand-in-glove partner of SDN Looks forward toward more programmable networks and the languages needed to manage these environments Software Defined Networking: Design and Deployment offers a unique perspective of the business case and technology motivations for considering SDN solutions. By identifying the impact of SDN on traffic management and the potential for network service growth, this book instills the knowledge needed to manage current and future demand and provisioning for SDN.

The key parameter that needs to be considered when planning the management of resources in futuristic wireless networks is a balanced approach to resource distribution. A balanced approach is necessary to provide an unbiased working environment for the distribution, sharing, allocation, and supply of resources among the devices of the wireless network. Equal resource distribution also maintains balance and stability between the operations of communication systems and thus improves the performance of wireless networks. Managing Resources for Futuristic Wireless Networks is a pivotal reference source that presents research related to the control and management of key parameters of bandwidth, spectrum sensing, channel selection, resource sharing, and task scheduling, which is necessary to ensure the efficient operation of wireless networks. Featuring topics that include vehicular ad-hoc networks, resource management, and the internet of things, this publication is ideal for professionals and researchers working in the field of networking, information and knowledge management, and communication sciences. Moreover, the book will provide insights and support executives concerned with the management of expertise, knowledge, information, and organizational development in different types of work communities and environments. Summarizes the current state and upcoming trends within the area of fog computing Written by some of the leading experts in the field, Fog Computing: Theory and Practice focuses on the technological aspects of employing fog computing in various application domains, such as smart healthcare, industrial process control

and improvement, smart cities, and virtual learning environments. In addition, the Machine-to-Machine (M2M) communication methods for fog computing environments are covered in depth. Presented in two parts—Fog Computing Systems and Architectures, and Fog Computing Techniques and Application—this book covers such important topics as energy efficiency and Quality of Service (QoS) issues, reliability and fault tolerance, load balancing, and scheduling in fog computing systems. It also devotes special attention to emerging trends and the industry needs associated with utilizing the mobile edge computing, Internet of Things (IoT), resource and pricing estimation, and virtualization in the fog environments. Includes chapters on deep learning, mobile edge computing, smart grid, and intelligent transportation systems beyond the theoretical and foundational concepts Explores real-time traffic surveillance from video streams and interoperability of fog computing architectures Presents the latest research on data quality in the IoT, privacy, security, and trust issues in fog computing Fog Computing: Theory and Practice provides a platform for researchers, practitioners, and graduate students from computer science, computer engineering, and various other disciplines to gain a deep understanding of fog computing.

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 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.

Big Data Analytics and Software Defined Networking (SDN) are helping to drive the management of data usage of the extraordinary increase of computer processing power provided by Cloud Data Centres (CDCs). This new book investigates areas where Big-Data and SDN can help each other in delivering more efficient services.

Master OpenFlow concepts to improve and make your projects effi-

cient with the 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 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 OF13-SoftSwitch, 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 logi-

cal approach and provides hints to help you build and deliver SDN Solutions efficiently.

This book introduces the software defined system concept, architecture, and its enabling technologies such as software defined sensor networks (SDSN), software defined radio, cloud/fog radio access networks (C/F-RAN), software defined networking (SDN), network function virtualization (NFV), software defined storage, virtualization and docker. The authors also discuss the resource allocation and task scheduling in software defined system, mainly focusing on sensing, communication, networking and computation. Related case studies on SDSN, C/F-RAN, SDN, NFV are included in this book, and the authors discuss how these technologies cooperate with each other to enable cross resource management and task scheduling in software defined system. Novel resource allocation and task scheduling algorithms are introduced and evaluated. This book targets researchers, computer scientists and engineers who are interested in the information system softwarization technologies, resource allocation and optimization algorithm design, performance evaluation and analysis, next-generation communication and networking technologies, edge computing, cloud computing and IoT. Advanced level students studying these topics will benefit from this book as well.

Today, cloud computing, big data, and the internet of things (IoT) are becoming indubitable parts of modern information and communication systems. They cover not only information and communication technology but also all types of systems in society including within the realms of business, finance, industry, manufacturing, and management. Therefore, it is critical to remain up-to-date on the latest advancements and applications, as well as current issues and challenges. The Handbook of Research on Cloud Computing and Big Data Applications in IoT is a pivotal reference source that provides relevant theoretical frameworks and the latest empirical research findings on principles, challenges, and applications of cloud computing, big data, and IoT. While highlighting topics such as fog computing, language interaction, and scheduling algorithms, this publication is ideally designed for software developers, computer engineers, scientists, professionals, academicians, researchers, and students.

This book constitutes the refereed proceedings of the 4th International Conference on Soft Computing, Intelligent Systems, and Information Technology, ICSIT 2015, held in Bali, Indonesia, in

March 2015. The 34 revised full papers presented together with 19 short papers, one keynote and 2 invited talks were carefully reviewed and selected from 92 submissions. The papers cover a wide range of topics related to intelligence in the era of Big Data, such as fuzzy logic and control system; genetic algorithm and heuristic approaches; artificial intelligence and machine learning; similarity-based models; classification and clustering techniques; intelligent data processing; feature extraction; image recognition; visualization techniques; intelligent network; cloud and parallel computing; strategic planning; intelligent applications; and intelligent systems for enterprise, government and society.

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.

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 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 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.

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 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 (smart-card) that should definitely transform how to secure the Internet.

"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-makers 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 south-bound 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 controllersIncludes a new chapter on NETCONF and SDN Presents expanded coverage of SDN in optical networks Provides support materials for use in computer networking courses

Master OpenFlow concepts to improve and make your projects efficient with the 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 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 OF13-SoftSwitch, 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.

This book constitutes the proceedings of the 19th Nordic Conference on Secure IT Systems, held in Tromsø, Norway, in October 2014. The 15 full papers presented in this volume were carefully reviewed and selected from 42 submissions. They are organized in topical sections named: information management and data privacy; cloud, big data and virtualization security; network security and logging; attacks and defenses; and security in healthcare and biometrics. The volume also contains one full-paper invited talk.

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. 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.

This thesis focuses on the design and use of software defined networking (SDN) in residential Internet service providers (ISPs), as well as innovative operational models that can be incorporated in broadband ecosystems. Though SDN addresses the challenges for bundled best-effort service provided by broadband operators for users, it does not distinguish between the different types of applications (video streaming, web-browsing, and large file transfers), nor does it cater to the varying needs of different household devices (entertainment tablets, work laptops, or connected appliances). This is a problem for end-users, who want to differentiate between applications and devices; for content providers (CPs), who want to exercise control over streams of high monetary value; and for Internet service providers (ISPs), who have to accommodate growing traffic volumes without additional revenues. This

book develops a series of solution techniques that use SDN to find an optimal balance between the competing requirements of end-users, ISPs, and CPs. In addition to the design and discussions of various architectures, it provides technical details on real-world system implementations and prototypes. As such, it offers a valuable resource for researchers, network architects, network strategists, developers, and all other readers seeking to learn more about the practical value of SDN in future ISP networks.

This book offers a comprehensive overview of Software-Defined Network (SDN) based ad-hoc network technologies and exploits recent developments in this domain, with a focus on emerging technologies in SDN based ad-hoc networks. The authors offer practical and innovative applications in Network Security, Smart Cities, e-health, and Intelligent Systems. This book also addresses several key issues in SDN energy-efficient systems, the Internet of Things, Big Data, Cloud Computing and Virtualization, Machine Learning, Deep Learning, and Cryptography. The book includes different ad hoc networks such as MANETs and VANETs, along with a focus on evaluating and comparing existing SDN-related research on various parameters. The book provides students, researchers, and practicing engineers with an expert guide to the fundamental concepts, challenges, architecture, applications, and state-of-the-art developments in the field. Presents Software-Defined Network (SDN) based ad-hoc network technologies with a focus on emerging technologies; Presents SDN requirements over traditional networking, followed by an elaboration on the fundamental architecture and its layers; Covers the effect of the SDN paradigm along with implementation problems in contact with ad hoc networks and examines probable use cases based on the SDN paradigm.

With the continuous development of computer networking, a flexible network architecture will likely have to adapt to the recent growth of Internet-based systems, such as Cloud-based systems, the Internet of Things (IoT), and the Fifth-Generation (5G) cellular networks. Software-Defined Networking (SDN) is a new paradigm that simplifies the organization of data communications, facilitates the evolution of computer networking, and paves the way to absorb the potential requirements of future network changes. SDN aims to decouple the control function from the end network devices (i.e., routers) and provide an external centralized entity for all the network's control activities. However, currently the SD-

N's control capabilities are limited to the performance of a single controller. Our research aims to provide potential solutions addressing SDN's control limitations. To improve network performance, we introduce several models to address the interaction between the SDN controller and the network switches. The core contribution of this research includes the introduction of assistant switches, edge controllers, and self-routing traffic flows. The goal of the introduced models is to alleviate the controller's burden and improve its processing efficiency. To demonstrate the effectiveness of the proposed techniques, we implement a simulated SDN-based network using Mininet and the NOX network software platform with one controller connected to 10-32 switches that carry and route traffic flows among multiple end-hosts. The results of the simulation studies show a significant improvement in performance, including more than a 30% decrease in the amount of data transmitted by the SDN controller, up to 45% decrease in bandwidth usage, and up to 29% decrease in controller response time. The proposed methods can be extended to explore and develop more methods of collaboration to address some of the major issues associated with the centralized controlling architecture.

This SpringerBrief provides essential insights on the SDN application designing and deployment in distributed datacenters. In this book, three key problems are discussed: SDN application designing, SDN deployment and SDN management. This book demonstrates how to design the SDN-based request allocation application in distributed datacenters. It also presents solutions for SDN controller placement to deploy SDN in distributed datacenters. Finally, an SDN management system is proposed to guarantee the performance of datacenter networks which are covered and controlled by many heterogeneous controllers. Researchers and practitioners alike will find this book a valuable resource for further study on Software Defined Networking.

Software-defined networking (SDN) technologies powered by the OpenFlow protocol provide viable options to address the bandwidth needs of next-generation computer networks. And, since many large corporations already produce network devices that support the OpenFlow standard, there are opportunities for those who can manage complex and large-scale networks using these technologies. Network Innovation through OpenFlow and SDN: Principles and Design explains how you can use SDN and OpenFlow to build networks that are easy to design, less expensive to

build and operate, and more agile and customizable. Among the first books to systematically address the design aspects in SDN/OpenFlow, it presents the insights of expert contributors from around the world. The book's four sections break down basic concepts, engineering design, QoS (quality-of-service), and advanced topics. Introduces the basic principles of SDN/OpenFlow and its applications in network systems Illustrates the entire design process of a practical OpenFlow/SDN Addresses the design issues that can arise when applying OpenFlow to cloud computing platforms Compares various solutions in QoS support Provides an overview of efficient solutions to the integration of SDN with optical networks Identifies the types of network attacks that could occur with OpenFlow and outlines possible solutions for overcoming them Supplying a cutting-edge look at SDN and OpenFlow, this book gives you the wide-ranging understanding required to build, deploy, and manage OpenFlow/SDN products and networks. The book's comprehensive coverage includes system architectures, language and programming issues, switches, controllers, multimedia support, security, and network operating systems. After reading this book you will understand what it takes to make a smooth transition from conventional networks to SDN/OpenFlow networks.

Software defined networking (SDN) is one of the most promising recent developing in the networking. Together with network function virtualization (NFV) it has the potential to automate the networking tasks in a seamless manner. This book introduces the reader to this burgeoning field and explains the basic concepts within a historical context. It should be useful to senior undergraduates, beginning graduate students, and also to anyone curious about this topic.

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 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 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

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-makers 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 south-bound 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

Document from the year 2020 in the subject Computer Science - Technical Computer Science, grade: 15, , course: COMPUTER NETWORKS, language: English, abstract: SDN need can be explained with the help of real life analogy corresponding to water supply system. Water reservoir has pipes (data cables) attached to it to carry water (data) to the destination. Water regulation is done with the help of numerous valves (routers and switches). Plumber (network admin) is the in charge of addition, up gradation of pipes and valves. As the pipe changes, corresponding valves need to be changed. This is costly and time consuming process, which causes lot of overhead in case of frequent infrastructural updates as the valves need individual-manual intervention. Bulk updation may cause installation errors or are more likely to faulty installations. Considering the above scenario it is desirable to have remotely controlled updation (increased width, new connections, extensions etc) regarding the pipe (data cables) & valves (switches and routers). So if this analogy is applied to real networking scenario, the SDN concept comes in picture. SDN provides programmable switches & routers which can be controlled remotely and will not require any manual intervention.

The advancement of technology is a standard of modern daily life, whether it be the release of a new cellphone, computer, or a self-driving car. Due to this constant advancement, the networks on which these technologies operate must advance as well. Innovations in Software-Defined Networking and Network Functions Virtualization is a critical scholarly publication that observes the advances made in network infrastructure through achieving cost efficacy while maintaining maximum flexibility for the formation and operation of these networks. Featuring coverage on a broad selection of topics, such as software-defined storage, openflow con-

troller, and storage virtualization, this publication is geared toward professionals, computer engineers, academicians, students, and researchers seeking current and relevant research on the advancements made to network infrastructures.