

Software Defined Networking

Microsoft

This is a monumental reference for the theory and practice of computer security. Comprehensive in scope, this text covers applied and practical elements, theory, and the reasons for the design of applications and security techniques. It covers both the management and the engineering issues of computer security. It provides excellent examples of ideas and mechanisms that demonstrate how disparate techniques and principles are combined in widely-used systems. This book is acclaimed for its scope, clear and lucid writing, and its combination of formal and theoretical aspects with real systems, technologies, techniques, and policies. 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

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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

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 controller, 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.

Leverage the best SDN technologies for your OpenStack-based cloud infrastructure About This Book Learn how to leverage critical SDN technologies for OpenStack

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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

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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 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.

This book provides readers insights into cyber

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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

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

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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 replicating 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

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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.

A horizontal view of newly emerged technologies in the field of network function virtualization (NFV), introducing the open source implementation efforts that bring NFV from design to reality This book explores the newly emerged technique of network function virtualization (NFV) through use cases, architecture, and challenges, as well as standardization and open source implementations. It is the first systematic source of information about cloud technologies' usage in the cellular network, covering the interplay of different technologies, the discussion of different design choices, and its impact on our future cellular network. Network Function Virtualization: Concepts and Applicability in 5G Networks reviews new technologies that enable NFV, such as Software Defined

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Networks (SDN), network virtualization, and cloud computing. It also provides an in-depth investigation of the most advanced open source initiatives in this area, including OPNFV, Openstack, and Opendaylight. Finally, this book goes beyond literature review and industry survey by describing advanced research topics such as service chaining, VNF orchestrations, and network verification of NFV systems. In addition, this resource: Introduces network function virtualization (NFV) from both industrial and academic perspectives Describes NFV's usage in mobile core networks, which is the essence of 5G implementation Offers readers a deep dive on NFV's enabling techniques such as SDN, virtualization, and cloud computing Network Function Virtualization: Concepts and Applicability in 5G Networks is an ideal book for researchers and university students who want to keep up with the ever-changing world of network function virtualization.

Software Defined NetworksA Comprehensive ApproachMorgan Kaufmann

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

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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. 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

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management of expertise, knowledge, information, and organizational development in different types of work communities and environments.

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?

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. 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

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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.

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

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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.

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

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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 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

File Type PDF Software Defined Networking Microsoft

(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 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. 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

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(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.

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

With the intriguing development of technologies in several industries, along with the advent of ubiquitous computational resources, there are now ample opportunities to develop innovative computational technologies in order to solve a wide range of issues concerning uncertainty, imprecision, and vagueness in various real-life problems. The challenge of blending modern computational techniques with traditional computing methods has inspired researchers and academics alike to focus on developing innovative computational techniques. In the near future, computational techniques may provide vital solutions by effectively using evolving technologies such as computer vision, natural language processing, deep learning, machine learning, scientific computing, and computational vision. A vast number of intelligent computational algorithms are emerging, along with increasing computational power, which has significantly expanded the potential for developing intelligent applications. These proceedings of the International Conference on Inventive Computation Technologies [ICICT 2019] cover innovative computing applications in the areas of data mining, big data processing, information management, and security. 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,

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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.

What is the flow table state? Does your organization currently use or plan to use SD-WAN? Do you know what your Customers want/need? Does the product offer bi-directional replication capability across WAN clusters for distributed / partitioned cache? What are the potential sources of vulnerabilities in your DR/sensor networks? This valuable Software-Defined Networking SDN production self-assessment will make you the entrusted Software-Defined Networking SDN production domain veteran by revealing just what you need to know to be fluent and ready for any Software-Defined Networking SDN production challenge. How do I reduce the effort in the Software-Defined Networking SDN production work to be done to get problems solved? How can I ensure that plans of action include every Software-Defined Networking SDN production task and that every Software-Defined Networking SDN production

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outcome is in place? How will I save time investigating strategic and tactical options and ensuring Software-Defined Networking SDN production costs are low? How can I deliver tailored Software-Defined Networking SDN production advice instantly with structured going-forward plans? There's no better guide through these mind-expanding questions than acclaimed best-selling author Gerard Blokdyk. Blokdyk ensures all Software-Defined Networking SDN production essentials are covered, from every angle: the Software-Defined Networking SDN production self-assessment shows succinctly and clearly that what needs to be clarified to organize the required activities and processes so that Software-Defined Networking SDN production outcomes are achieved. Contains extensive criteria grounded in past and current successful projects and activities by experienced Software-Defined Networking SDN production practitioners. Their mastery, combined with the easy elegance of the self-assessment, provides its superior value to you in knowing how to ensure the outcome of any efforts in Software-Defined Networking SDN production are maximized with professional results. Your purchase includes access details to the Software-Defined Networking SDN production self-assessment dashboard download which gives you your dynamically prioritized projects-ready tool and shows you exactly what to do next. Your exclusive instant

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access details can be found in your book. You will receive the following contents with New and Updated specific criteria: - The latest quick edition of the book in PDF - The latest complete edition of the book in PDF, which criteria correspond to the criteria in... - The Self-Assessment Excel Dashboard - Example pre-filled Self-Assessment Excel Dashboard to get familiar with results generation - In-depth and specific Software-Defined Networking SDN production Checklists - Project management checklists and templates to assist with implementation INCLUDES LIFETIME SELF ASSESSMENT UPDATES Every self assessment comes with Lifetime Updates and Lifetime Free Updated Books. Lifetime Updates is an industry-first feature which allows you to receive verified self assessment updates, ensuring you always have the most accurate information at your fingertips. Annotation OpenFlow is an open interface for remotely controlling tables in network switches, routers, and access points. It is considered a turning point in Software Defined Networking (SDN), data center networking and virtualization as, more secure and efficient data centers are being built using OpenFlow. It defines a protocol that lets a controller use a common set of instructions to add, modify, or delete entries in a switch's forwarding table. Starting with an introduction to SDN and OpenFlow, you will learn about the role of each building block, moving

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onto demonstrations of how SDN/OpenFlow can be used to provide new services and features, which will change the way that networking works and the innovative business impacts. By the end of this practical guide, you will have an insight into the Software Defined Networking and OpenFlow fundamentals. Packed with detail, this book will walk you through the essentials; you will learn about the OpenFlow protocol, switches, and controllers. Following on from this, you will be taken through a number of practical, hands-on examples on how to use a network emulation platform called OpenFlow laboratory. You will learn how to develop your innovative network application using the OpenFlow controllers API quickly, and test your network application without commissioning any OpenFlow hardware equipment. You will also be introduced to the concept of Software Defined Networking and the details of OpenFlows protocol, along with the building blocks of an OpenFlow networking deployment. This book will teach you how to setup your OpenFlow/SDN laboratory using state-of-the-art technology and open source offerings.

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,

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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.

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

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switches. Describes a range of SDN use cases: enterprises, datacenters, access networks. Includes hands-on programming exercises, downloadable from GitHub.

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,

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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 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 approachThis book is an

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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. 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.

The mobile market has experienced unprecedented growth over the last few decades. Consumer trends have shifted towards mobile internet services supported by 3G and 4G networks worldwide. Inherent to existing networks are problems such as lack of spectrum, high energy consumption, and inter-cell interference. These limitations have led to the emergence of 5G technology. It is clear that any 5G system will integrate optical communications, which is already a mainstay of wide area networks. Using

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an optical core to route 5G data raises significant questions of how wireless and optical can coexist in synergy to provide smooth, end-to-end communication pathways. *Optical and Wireless Convergence for 5G Networks* explores new emerging technologies, concepts, and approaches for seamlessly integrating optical-wireless for 5G and beyond. Considering both fronthaul and backhaul perspectives, this timely book provides insights on managing an ecosystem of mixed and multiple access network communications focused on optical-wireless convergence. Topics include Fiber–Wireless (FiWi), Hybrid Fiber-Wireless (HFW), Visible Light Communication (VLC), 5G optical sensing technologies, approaches to real-time IoT applications, Tactile Internet, Fog Computing (FC), Network Functions Virtualization (NFV), Software-Defined Networking (SDN), and many others. This book aims to provide an inclusive survey of 5G optical-wireless requirements, architecture developments, and technological solutions.

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

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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 (smartcard) 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

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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 handbook introduces the basic principles and fundamentals of cyber security towards establishing an understanding of how to protect computers from hackers and adversaries. The highly informative subject matter of this handbook, includes various concepts, models, and terminologies along with examples and illustrations to demonstrate substantial technical details of the field. It motivates the readers to exercise better protection and defense mechanisms to deal with attackers and mitigate the

situation. This handbook also outlines some of the exciting areas of future research where the existing approaches can be implemented. Exponential increase in the use of computers as a means of storing and retrieving security-intensive information, requires placement of adequate security measures to safeguard the entire computing and communication scenario. With the advent of Internet and its underlying technologies, information security aspects are becoming a prime concern towards protecting the networks and the cyber ecosystem from variety of threats, which is illustrated in this handbook. This handbook primarily targets professionals in security, privacy and trust to use and improve the reliability of businesses in a distributed manner, as well as computer scientists and software developers, who are seeking to carry out research and develop software in information and cyber security. Researchers and advanced-level students in computer science will also benefit from this reference.

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

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(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

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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

The adoption of cloud and IoT technologies in both the industrial and academic communities has enabled the discovery of numerous applications and ignited countless new research opportunities. With numerous professional markets benefiting from these advancements, it is easy to forget the non-technical issues that accompany technologies like these. Despite the advantages that these systems bring, significant ethical questions and regulatory issues have become prominent areas of discussion. *Social, Legal, and Ethical Implications of IoT, Cloud, and Edge Computing Technologies* is a pivotal reference source that provides vital research on the non-technical repercussions of IoT technology adoption. While highlighting topics such as smart cities, environmental monitoring, and data privacy, this publication explores the regulatory and ethical risks that stem from computing technologies. This book is ideally designed for researchers, engineers, practitioners, students, academicians, developers, policymakers, scientists, and educators seeking current research on the sociological impact of cloud and IoT technologies.

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5G is the upcoming generation of the wireless network that will be the advanced version of 4G LTE+ providing all the features of a 4G LTE network and connectivity for IoT devices with faster speed and lower latency. The 5G network is going to be a service-oriented network, connecting billions of IoT devices and mobile phones through the wireless network, and hence, it needs a special emphasis on security. Security is the necessary enabler for the continuity of the wireless network business, and in 5G, network security for IoT devices is the most important aspect. As IoT is gaining momentum, people can remotely operate or instruct their network devices. Therefore, there is a need for robust security mechanisms to prevent unauthorized access to the devices. Evolution of Software-Defined Networking Foundations for IoT and 5G Mobile Networks is a collection of innovative research on the security challenges and prevention mechanisms in high-speed mobile networks. The book explores the threats to 5G and IoT and how to implement effective security architecture for them. While highlighting topics including artificial intelligence, mobile technology, and ubiquitous computing, this book is ideally designed for cybersecurity experts, network providers, computer scientists, communication technologies experts, academicians, students, and researchers.

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

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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

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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

This book provides a quick reference and insights into modeling and optimization of software-defined networks (SDNs). It covers various algorithms and approaches that have been developed for optimizations related to the control plane, the considerable research related to data plane optimization, and topics that have significant potential for research and advances to the state-of-the-art in SDN. Over the past ten years, network programmability has transitioned from research concepts to more mainstream technology through the advent of technologies amenable to programmability such as service chaining, virtual network functions, and programmability of the data plane. However, the rapid development in SDN technologies has been the key driver behind its evolution. The logically centralized abstraction of network states enabled by SDN facilitates programmability and use of sophisticated optimization

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and control algorithms for enhancing network performance, policy management, and security. Furthermore, the centralized aggregation of network telemetry facilitates use of data-driven machine learning-based methods. To fully unleash the power of this new SDN paradigm, though, various architectural design, deployment, and operations questions need to be addressed. Associated with these are various modeling, resource allocation, and optimization opportunities. The book covers these opportunities and associated challenges, which represent a "call to arms" for the SDN community to develop new modeling and optimization methods that will complement or improve on the current norms.

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

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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.

This book constitutes the refereed proceedings of the 28th IFIP WG 11.3 International Working Conference on Data and Applications Security and Privacy, DBSec 2014, held in Vienna, Austria, in July 2014. The 22 revised full papers and 4 short papers presented were carefully reviewed and selected from 63 submissions. The papers are organized in topical sections on access control, privacy, networked and mobile environments, data access, cloud databases, and private retrieval. The book is devoted to the selected resource allocation problems in Software- Defined Networks. Moreover, it covers results concerning Software Defined Wide Area Networks (SD-WANs) which is one of the current networking hot topics. The variety of different cases is considered including virtualization and information-centric paradigm. For each case, the mathematical model together with the problem formulation is given and some solution algorithms are proposed. The algorithms are discussed and evaluated, mostly with simulations. "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,

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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 controllersIncludes a new chapter on NETCONF and SDNPresents expanded coverage of SDN in optical networksProvides support materials for use in computer networking courses
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