CONTENTS

About the Author and Contributors

PART ONE MODERN NETWORKING

CHAPTER 1 ELEMENTS OF MODERN NETWORKING

- 1.1 The Networking Ecosystem
- 1.2 Example Network Architectures
- 1.3 Ethernet
- 1.4 Wi-Fi
- 1.5 4G/5G Cellular
- 1.6 Cloud Computing
- 1.7 Internet of Things
- 1.8 Network Convergence
- 1.9 Unified Communications
- 1.10 Key Terms

CHAPTER 2 REQUIREMENTS AND TECHNOLOGY

- 2.1 Types of Network and Internet Traffic
- 2.2 Demand: Big Data, Cloud Computing, and Mobile Traffic
- 2.3 Requirements: QoS and QoE
- 2.4 Routing
- 2.5 Congestion Control
- 2.6 SDN and NFV
- 2.7 Modern Networking Elements
- 2.8 Key Terms

PART TWO SOFTWARE DEFINED NETWORKS

CHAPTER 3 SDN: Background and Motivation

- 3.1 Evolving Network Requirements
- 3.2 The SDN Approach
- 3.3 SDN- and NFV-Related Standards
- 3.4 Key Terms

CHAPTER 4 SDN Data Plane and OpenFlow

- 4.1 SDN Data Plane
- 4.2 OpenFlow Logical Network Device
- 4.3 OpenFlow Protocol
- 4.4 Key Terms

CHAPTER 5 SDN Control Plane

- 5.1 SDN Control Plane Architecture
- 5.2 ITU-T Model
- 5.3 OpenDaylight
- **5.4 REST**
- 5.5 Cooperation and Coordination Among Controllers
- 5.6 Key Terms

CHAPTER 6 SDN Application Plane

- 6.1 SDN Application Plane Architecture
- 6.2 Network Services Abstraction Layer
- 6.3 Traffic Engineering
- 6.4 Measurement and Monitoring
- 6.5 Security
- 6.6 Data Center Networking
- 6.7 Mobility and Wireless
- 6.8 Information-Centric Networking
- 6.9 Key Terms

PART THREE VIRTUALIATION

CHAPTER 7 Network Functions Virtualization: Concepts and Architecture

- 7.1 Background and Motivation for NFV
- 7.2 Virtual Machines
- 7.3 NFV Concepts
- 7.4 NFV Benefits and Requirements
- 7.5 NFV Reference Architecture
- 7.6 Key Terms

CHAPTER 8 NFV Functionality

- 8.1 NFV Infrastructure
- 8.2 Virtualized Network Functions
- 8.3 NFV Management and Orchestration
- 8.4 NFV Use Cases
- 8.5 SDN and NFV
- 8.6 Key Terms

CHAPTER 9 Network Virtualization

- 9.1 Virtual LANs
- 9.2 OpenFlow VLAN Support
- 9.3 Virtual Private Networks
- 9.4 Network Virtualization
- 9.5 OpenDaylight's Virtual Tenant Network
- 9.6 Software Defined Infrastructure
- 9.7 Key Terms

PART FOUR DEFINING AND SUPPORTING USER NEEDS

CHAPTER 10 Quality of Service

- 10.1 Background
- 10.2 QoS Architectural Framework
- 10.3 Integrated Services Architecture (ISA)
- 10.4 Differentiated Services
- 10.5 Service Level Agreements
- 10.6 IP Performance Metrics
- 10.7 OpenFlow OoS Support
- 10.8 Key Terms

CHAPTER 11 Quality of Experience

- 11.1 Why QoE?
- 11.2 Service Failures Due to Inadequate QoE Considerations
- 11.3 QoE-Related Standardization Projects
- 11.4 Definition of OoE
- 11.5 QoE Strategies in Practice
- 11.6 Factors Influencing QoE
- 11.7 Measurements of QoE
- 11.8 Application of QoE
- 11.8 Key Terms

CHAPTER 12 Network Design Implications of QoS and QoE

- 12.1 Classification of QoE/QoS
- 12.2 IP-oriented Parameter-based QoS/QoE Mapping Models
- 12.3 Actionable QoE over IP-based Networks
- 12.4 QoE vs. QoS Service Monitoring
- 12.5 QoE-based Network and Service Management
- 12.6 Key Terms
- 12.7 References

PART FIVE MODERN NETWORK ARCHITECTURE: CLOUDS AND IoT

CHAPTER 13 Cloud Computing

- 13.1 Basic Concepts
- 13.2 Cloud Services
- 13.3 Cloud Deployment Models
- 13.4 Cloud Architecture
- 13.5 SDN and NFV
- 13.6 Key Terms

CHAPTER 14 The Internet of Things: Components

- 14.1 The IoT Era Begins
- 14.2 The Scope of the Internet of Things
- 14.3 Components of IoT-Enabled Things
- 14.4 Key Terms

CHAPTER 15 The Internet of Things: Architecture and Implementation

- 15.1 IoT Architecture
- 15.2 IoT Implementation
- 15.3 Key Terms

PART SIX RELATED TOPICS

CHAPTER 16 SECURITY

- 16.1 Security Requirements
- 16.2 SDN Security
- 16.3 NFV Security
- 16.4 Cloud Security
- 16.5 IoT Security
- 16.6 Key Terms

CHAPTER 17 THE IMPACT OF THE NEW NETWORKING ON IT CAREERS

- 17.1 The Changing Role of Network Professionals
- 17.2 DevOps
- 17.3 Training and Certification
- 17.4 Online Resources