# Chapter 5: The Data Link Layer

# Our goals:

- understand principles behind data link layer services:
  - error detection, correction
  - sharing a broadcast channel: multiple access
  - link layer addressing
  - reliable data transfer, flow control: done!
- instantiation and implementation of various link layer technologies

# Overview:

- link layer services
- multiple access protocols and LANs
- error detection, correction
- link layer addressing, ARP
- specific link layer technologies:
  - Ethernet
  - hubs, bridges, switches
  - IEEE 802.11 LANs and
     wireless
     5: DataLink Layer
  - O PPP

# **Chapter Data Link Layer**

**Todd Lammle** 

#### **Chapter Data Link Layer:**

Networking Explained Michael Gallo, William M. Hancock PhD CISSP CISM, 2001-12-17 Networking Explained 2e offers a comprehensive overview of computer networking with new chapters and sections to cover the latest developments in the field including voice and data wireless networking multimedia networking and network convergence Gallo and Hancock provide a sophisticated introduction to their subject in a clear readable format These two top networking experts answer hundreds of questions about hardware software standards and future directions in network technology Wireless networks Convergence of voice and data Multimedia networking Network+ Training Guide Drew Bird, Mike Harwood, 2002 Annotation The authoritative solution to passing the Network exam Has CompTIAs Authorized Quality Curriculum CAQC stamp of approval Features exam tips study strategies review exercises case studies practice exams ExamGear testing software and more This exam certifies that candi20020822s know the layers of the OSI model can describe the features and functions of network components and have the skills needed to install configure and troubleshoot basic networking hardware peripherals and protocols The Network exam developed by CompTIA is only two years old but already is held by 50 000 individuals Readers preparing for this exam will find our Training Guide series to be an indispensiblenbsp self study tool This book is their one stop shop because of its teaching methodology the accompanying ExamGear testing software and Web site support at www quepublishing com certification Drew Bird MCNI MCNE MCT MCSE MCP I has been working in the IT industry for over 12 years instructing for the past five Drew has completed technical training and consultancy assignments for a wide variety of organizations including the Bank of England The London Stock Exchange Iomega and the United Nations Mike Harwood MCT MCSE A has 6 years experience in IT As well as training and authoring technical courseware he currently acts as a system manager for a multi-site network and performs consultancy projects for a computer networking company As a team they have written Network Exam Cram Coriolis and Network Exam Prep Coriolis Hack the Stack Stephen Watkins, George Mays, Ronald M. Bandes, Brandon Franklin, Michael Gregg, Chris Ries, 2006-11-06 This book looks at network security in a new and refreshing way It guides readers step by step through the stack the seven layers of a network Each chapter focuses on one layer of the stack along with the attacks vulnerabilities and exploits that can be found at that layer The book even includes a chapter on the mythical eighth layer The people layer This book is designed to offer readers a deeper understanding of many common vulnerabilities and the ways in which attacker's exploit manipulate misuse and abuse protocols and applications The authors guide the readers through this process by using tools such as Ethereal sniffer and Snort IDS The sniffer is used to help readers understand how the protocols should work and what the various attacks are doing to break them IDS is used to demonstrate the format of specific signatures and provide the reader with the skills needed to recognize and detect attacks when they occur What makes this book unique is that it presents the material in a layer by layer approach which offers the readers a way to learn about exploits in a manner similar to which they most likely

originally learned networking This methodology makes this book a useful tool to not only security professionals but also for networking professionals application programmers and others All of the primary protocols such as IP ICMP TCP are discussed but each from a security perspective The authors convey the mindset of the attacker by examining how seemingly small flaws are often the catalyst of potential threats The book considers the general kinds of things that may be monitored that would have alerted users of an attack Remember being a child and wanting to take something apart like a phone to see how it worked This book is for you then as it details how specific hacker tools and techniques accomplish the things they do This book will not only give you knowledge of security tools but will provide you the ability to design more robust security solutions Anyone can tell you what a tool does but this book shows you how the tool works CompTIA Network+ N10-004 Exam Prep Mike Harwood, 2009-06-29 Your Complete Certification Solution Covers the critical information you need to know to score higher on your Network exam Implement proven best practices for managing networks efficiently and reliably Thoroughly understand network hardware components devices cabling and connectors Systematically review TCP IP related network protocols and the OSI model Manage network operating systems and clients Identify network vulnerabilities and configure network security to address them Use security tools such as cryptography and antivirus software Provide reliable secure Internet access WAN access and VLAN support Implement disaster recovery plans that protect business continuity Troubleshoot network and Internet connectivity problems Efficiently document the network and provide high quality user support informit com examcram ISBN 13 978 0 7897 3795 3 ISBN 10 0 7897 3795 7 **Storage Networking** Protocol Fundamentals James Long, 2006 A comparative analysis of Ethernet TCP IP and Fibre Channel in the context of SCSI Introduces network administrators to the requirements of storage protocols Explains the operation of network protocols to storage administrators Compares and contrasts the functionality of Ethernet TCP IP and Fibre Channel Documents the details of the major protocol suites explains how they operate and identifies common misunderstandings References the original standards and specifications so you can get a complete understanding of each protocol Helps you understand the implications of network design choices Discusses advanced network functionality such as QoS security management and protocol analysis Corporations increasingly depend on computer and communication technologies to remain competitive in the global economy Customer relationship management enterprise resource planning and e mail are a few of the many applications that generate new data every day Effectively storing managing and accessing that data is a primary business challenge in the information age Storage networking is a crucial component of the solution to meet that challenge Written for both storage administrators who need to learn more about networking and network administrators who need to learn more about storage Storage Networking Protocol Fundamentals is a concise introduction to storage networking protocols The book picks up where Storage Networking Fundamentals left off by focusing on the networking protocols that underlie modern open systems block oriented storage networks. The first part of the book introduces you to the field of storage networking and

iSCSI Small Computer Systems Interface over IP and Fibre Channel It also examines in detail each of the major protocol suites layer by layer within the OSI reference model The third part discusses advanced functionalities of these technologies such as quality of service QoS load balancing functions security management and protocol analysis You can read this book cover to cover or use it as a reference directly accessing the particular topics of interest to you Storage networking is a critical concept for today s businesses and this book provides a unique and helpful way to better understand it Storage networking is also continuously evolving and as such this book may be seen as an introduction to the information technology infrastructures of the future from the foreword by Claudio DeSanti vice chairman of the ANSI INCITS T11 Technical INTRODUCTION TO DATA, COMPUTER COMMUNICATION AND NETWORKING Dr.V.V.S.S.S.Chakravarthy, Dr. Udaya Kumar, Dr. B.V.D.S. Sekhar, Dr. Bomma Rama Krishna, 2023-06-12 In the rapidly evolving world of technology data communication plays a pivotal role in enabling the exchange of information across various systems and networks This book provides a comprehensive overview of the fundamental concepts components and techniques involved in data communication Chapter 1 introduces the readers to the basics of data communication including an exploration of its applications and the components of a data communication system The chapter also covers essential topics such as data representation and the advantages of the binary number system Chapter 2 delves into the realm of data transmission discussing different modes of data transmission and various transmission media It also explores multiplexing techniques and provides insights into guided and unguided transmission media In Chapter 3 the focus shifts to signal encoding techniques The chapter explores the differences between analog and digital signals and discusses digital to analog conversion It also examines popular encoding methods such as AM FM Manchester coding and differential Manchester coding Chapter 4 expands on digital communication by exploring different digital modulation methods including frequency shift keying FSK phase shift keying PSK and quadrature amplitude modulation QAM The chapter also explores the uses of computer networks local area networks LANs and wide area networks WANs In Chapter 5 the concept of network topology takes center stage The chapter explains various line configurations and explores different network topologies such as bus star ring mesh and tree It also introduces the layered architecture including the OSI model and the TCP IP model Chapter 6 provides an introduction to the data link layer covering its functions and design issues The chapter discusses error detection and correction techniques and explores elementary data link protocols It also delves into multiple access protocols wireless local area networks WLANs and switching techniques Chapter 7 focuses on Data Link Control Protocols and High Level Data Link Control HDLC It explores the functions and design issues of the Data Link Layer including error detection and correction techniques The chapter also discusses elementary data link protocols such as Sliding Window Protocols and HDLC and their advantages and disadvantages Additionally it delves into the Medium Access Sublayer and multiple access

the Open Systems Interconnection OSI reference model The second part compares networked storage technologies including

protocols highlighting the advantages and disadvantages of these protocols Lastly the chapter covers wireless local area networks WLANs and introduces different switching techniques This book serves as a valuable resource for students professionals and enthusiasts seeking to gain a solid understanding of data communication By combining theoretical explanations with practical examples it aims to empower readers with the knowledge and skills necessary to navigate the complex world of data communication effectively Mastering The OSI model Cybellium, 2023-09-06 Cybellium Ltd is dedicated to empowering individuals and organizations with the knowledge and skills they need to navigate the ever evolving computer science landscape securely and learn only the latest information available on any subject in the category of computer science including Information Technology IT Cyber Security Information Security Big Data Artificial Intelligence AI Engineering Robotics Standards and compliance Our mission is to be at the forefront of computer science education offering a wide and comprehensive range of resources including books courses classes and training programs tailored to meet the diverse needs of any subject in computer science Visit https www cybellium com for more books **CCNP CIT Exam** Certification Guide Amir S. Ranjbar, 2004 Learn the troubleshooting and support topics for the NEW Cisco CCNP 642 831 CIT exam with the only official preparation book Practice with over 200 test questions including simulation based questions on the enclosed CD ROM Prepare for the CCNP CIT exam with proven learning tools from the number 1 selling Exam Certification Guide Series from Cisco Press CCNA Routing and Switching Study Guide Todd Lammle, 2013-10-07 Prepare for the new CCNA exams with this Todd Lammle study guide Cisco author speaker and trainer Todd Lammle is considered the authority on all things networking and his books have sold almost a million copies worldwide This all purpose CCNA study guide methodically covers all the objectives of the ICND1 100 101 and ICND2 200 101 exams as well as providing additional insight for those taking CCNA Composite 200 120 exam It thoroughly examines operation of IP data networks LAN switching technologies IP addressing IPv4 IPv6 IP routing technologies IP services network device security troubleshooting and WAN technologies Valuable study tools such as a companion test engine that includes hundreds of sample questions a pre assessment test and multiple practice exams Plus you ll also get access to hundreds of electronic flashcards author files and a network simulator CCNA candidates may choose to take either the ICND1 100 101 and ICND2 200 101 exams or the CCNA Composite exam 200 120 this study guide covers the full objectives of all three Written by bestselling Sybex study guide author Todd Lammle an acknowledged authority on all things Cisco Covers essential Cisco networking topics such as operating an IP data network IP addressing switching and routing technologies troubleshooting network device security and much more Includes a comprehensive set of study tools including practice exams electronic flashcards comprehensive glossary of key terms videos and a network simulator that can be used with the book s hands on labs Bonus Content Access to over 40 MicroNugget videos from CBT Nuggets CCNA Routing and Switching Study Guide prepares you for CCNA certification success CCNA Routing and Switching Deluxe Study Guide Todd Lammle, William Tedder, 2013-12-23 Get

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