DOWNLOAD PDF ENGINEERING APPROACH TO COMPUTER NETWORKING

Chapter 1 : Pearson Education - Engineering Approach to Computer Networking, An

Suitable for students, working network engineers, and (to some degree) salespeople responsible for promoting network services, An Engineering Approach to Computer Networking: ATM Networks, the Internet, and the Telephone Network explains how voice and data networks operate.

Atoms, Bits, and Networks. Networking Concepts and Techniques. Concepts, History, and Challenges. Protocols and Protocol Layering. Resource Constraints and Their Metrics. Performance Analysis and Tuning. Addressing in the Telephone Network. Addressing in the Internet. Addressing in ATM Networks. Finding Datalink Layer Addresses. Routing in the Telephone Network. Routing Within a Broadcast Lan. Routing With Policy Constraints. Routing for Mobile Hosts. Causes of Bit Errors. Bit-Error Detection and Correction. Causes of Packet Errors. Packet-Error Detection and Correction. An Economic Framework for Traffic Management. You will find clear overviews of these technologies and extensive, up-to-date coverage of all essential networking topics: For each topic, the book identifies fundamental constraints and analyzes the pros and cons of several alternative solutions. Through detailed descriptions of common protocols used in telephone, Internet, and ATM networks - as well as a tour of system design and protocol implementation techniques-this book shows you how these concepts are put to use in real networks. Practical in focus, An Engineering Approach to Computer Networking features many real-world examples and is supported with on-line material including: Microsoft PowerPoint slides covering the material in the book. A multithreaded, packet-level network simulator that allows users to simulate arbitrary protocols. Simulation exercises covering multiple access, error control, flow control, routing, and scheduling. A bibliography with links to Web sites referred to in the text. Solutions to all exercises. With this deeper understanding of network structure and hands-on experience implementing protocols, you will have an excellent command of the field and be better equipped to design powerful and efficient networks and leading-edge networking software. Keshav, Associate Professor of Computer Science at Cornell University, has employed the engineering approach with great success in networking courses he has taught at the Indian Institute of Technology, Delhi, and Columbia University. Keshav received his Ph. He can be reached at skeshav cs.

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Chapter 2 : An Engineering Approach to Computer Networking : Srinivasan Keshav :

An engineering approach to computer networking: ATM networks, the Internet, and the telephone network Addison-Wesley Longman Publishing Co., Inc. Boston, MA, USA Â© ISBN

Answers to Review Questions and Selected Exercises. Computer networks are complex systems that almost magically link tens of millions of computers and more than a billion telephones around the world. A single mouse-click in a Web browser can download text, images, and animations from a computer hundreds or thousands of miles away. With a satellite or cellular telephone, even the most intrepid explorer in the remotest corner of the Earth can call home. How do we build these marvelous webs of interconnection? The goal of this book is to introduce readers to what lies at the basis of computer networks, and why they work the way they do. This book is based on a course that I taught at the Indian Institute of Technology, Delhi, India, in the spring of My aim was to teach students why networks were built the way they were. I wanted them to question every design decision, and to understand how these decisions would change if we changed the assumptions. I call this an engineering approach to computer networking. Perhaps it is easiest to appreciate this approach by comparing it with some other approaches. Suppose you wanted to route packets in a computer network. A protocol approach would describe the routing protocols in common use and their packet formats and algorithms, and perhaps compare several routing protocols. An analytical approach would model the network as a graph, assume a traffic distribution from every source to every destination, then compute optimal routing. In my opinion, both these approaches, though important, miss the point. A purely protocol approach tells the reader how routing works, but not why it was designed that way. The success of an analytical approach depends critically on the assumptions it makes. Unfortunately, because of the complexities of the real world, to make the problem tractable, the analyst must make many simplifying assumptions. In my experience, this simplification leads to "toy" models that do not explain what is really important, and what details we can ignore. In contrast, the engineering approach is to begin by identifying the fundamental constraints on the problem, make reasonable "real-world" assumptions, and then examine several alternative solutions, trading off their pros and cons. An engineer recognizes that no solution is perfect, but that every solution represents a particular trade-off between cost and benefit. This book focuses on identifying the fundamental problems and the trade-offs in solving them. The second aspect of an engineering approach is to learn by doing. This book is meant to be used with implementation exercises on the Internet and on the REAL network simulator. These exercises, which are available on-line at http: Unlike other textbooks in the area, this book simultaneously studies the principles underlying the Internet, the telephone network, and asynchronous transfer mode ATM networks. The Internet is the most successful embodiment of a data network, and its study needs no further justification. Unfortunately, few outside the telephone industry know much about how the telephone network operates, perhaps because of the layers of acronyms and arcana that surround its operations. This book is a small attempt to rectify the situation. Finally, many see ATM networks as the future of computer networking. Although this may not be true, ATM networks are interesting because they draw on experience with the telephone network and the Internet to build an integrated services network that provides end-to-end quality of service. This ambitious goal has led to a unique set of design decisions that have influenced both networking research and commercial networking products. Thus, ATM networks are well worth studying. Target audience I assume that readers will have some familiarity with data structures and algorithms, operating systems, elementary algebra, and computer architecture. Deeper material assumes knowledge of calculus and probability. However, most concepts do not require mathematical sophistication beyond a first undergraduate course. In particular, the book almost completely avoids use of queuing theory. Although an appreciation of queuing theory is important in engineering computer networks, I feel queuing theory is best studied as a separate course: The bulk of this book is written at a level suitable for first-year graduate students in computer science or electrical engineering. It is also suitable for advanced undergraduate

seniors. Students who intend to work in the area of computer networking or related areas should probably read through the entire text and attempt all the exercises. A number of features make it easy to use for a first undergraduate course. First, every chapter is self-contained, so that instructors can skip entire chapters if necessary. Second, each topic is developed from first principles, with little assumption about the background of the reader, other than some familiarity with mathematics and operating systems. A more sophisticated development that follows from these first principles is marked with vertical sidebars and can be ignored in a first course. Third, most topics are presented at an intuitive level, with little mathematical or algorithmic formalism. Finally, complete solutions are provided to instructors for all numerical exercises. The book is also targeted at professionals in the field, and at researchers in other areas who want an introduction to the current research frontiers in computer networking. A comprehensive index helps in locating a topic quickly. Moreover, the glossary is keyed to the section or subsection that describes the topic, so that one can rapidly look up the context for a technical term. For those interested in pursuing a topic further, an extensive annotated bibliography references key papers in the field. Organization The book has three sections. The first section is an overview of three important networking technologies: Each introductory chapter describes key elements in the technology, some history, and my perception of the important challenges for the technology. The second section describes the pieces that come together to form a network. Most chapters in this section begin with an overview of a problem and a taxonomy of possible solutions. We then study a number of representative solutions, concentrating on the set of trade-offs they represent. We can apply most of these solutions to any protocol layer, so we study them independently of protocol layering. The second section starts with an introductory chapter on protocol layering Chapter 5 and an overview of the art and science of system design Chapter 6. These chapters provide a "toolkit" of common system design techniques that we will use in subsequent chapters. Chapter 7 introduces the issue of multiple access, which arises in contexts as diverse as satellite networks, cellular telephony, and local area networks. Chapter 8 describes switching, which is fundamental to the operation of all nontrivial networks. In order to provide end-to-end quality of service, switches and other multiplexing points must implement a scheduling algorithm. We study scheduling algorithms in Chapter 9. The next two chapters cover naming, addressing, and routing. At this point, the reader knows enough about how to put together a wide-area network. But, for the network to work efficiently, we need to add two more functionalities: We study these in Chapters 12 and As we build larger and larger networks, the problem of network control becomes significant. We study this in Chapter The third section applies the tools and techniques discussed in the preceding chapters to understanding and implementing some common protocols. Chapter 15 presents a detailed description of protocol headers in the telephone network, Internet, and ATM networks, tying together the material in the previous chapters. Finally, Chapter 16 is a survey of protocol implementation techniques. Style conventions Textbooks, almost by definition, tend to be boring. A dry assemblage of facts does little to bring out the controversies, the intellectual fights, and the wide-eyed what-if questions that make networking such an interesting and challenging field. I have attempted to capture some of these in what I call engineering boxes. These boxes go off on a tangent from the text, question standard assumptions, and present viewpoints on the fringe of the mainstream. They offer a subjective commentary on the objective and dry material in the text. I firmly believe in the use of numerical examples to explain concepts. Solved numerical examples throughout the book reinforce the use of back-of-the-envelope calculations in system design, and simultaneously introduce the student to "real-world" constants that engineers use in their calculations. I hope these examples will motivate readers to do their own rough calculations as they embark on a system design. Advanced material is in smaller font and set off with vertical sidebars as shown in this paragraph. Such material can be ignored in a first reading, or in an undergradute course, with no loss of continuity. Usage guidelines In a graduate class, I recommend that the instructor assign Chapters as a single reading assignment at the end of the first class. The material here should serve primarily as a review. Subsequent chapters, starting with Chapter 6, can be covered in two or three one-hour lectures per chapter, except Chapter 11, which will require four lectures. In my courses, I used the

first hour to cover principles, and the second and, if necessary, third to cover specific solutions. I also recommend choosing some exercises for homework and assigning one implementation exercise every two weeks. In an undergraduate class, the instructor could spend the first several lectures on the first six chapters. The remaining chapters could be covered at the discretion of the instructor, perhaps skipping advanced material. In a first course, Chapters 13, 14, and 16 and advanced topics in Chapters 7, 8, 9, 11, and 12 can be left out entirely. A reader unfamiliar with the field should probably first read Chapters Subseqent chapters may be read as the occasion arises. Much of the material can also be accessed by way of the keyed glossary. Acknowledgments I have drawn upon many people in the course of writing this book. During my visit to the Indian Institute of Technology, Delhi, where work on this book began, I had the good fortune to interact with Professors B. Maheshwari, and Huzur Saran. Detailed class notes by Rajeev Leekha and V. Padmanabhan gave me the confidence to start writing this book and formed the core of the first draft.

Chapter 3 : Slides for An Engineering Approach to Computer Networking

An Engineering Approach to Computer Networking: ATM Networks, the Internet and the Telephone Network (Addison-Wesley Professional Computing (Paperback)) This book is in very good condition and will be shipped within 24 hours of ordering.