LANs to WANs - Network Management in the 1990s

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For sure, communication networks have changed our lives. The book is meant to highlight their importance, be that of **LAN**s or **WAN**s, as well as to introduce and summarize wide technical aspects. practical problems, and comprehensive outlooks on management concerns. Generously shared experiences, which stand for many years of collaboration, are met with on every page of the book.

The first part of the book focuses on **LAN**s. As distributed processing and computing become more popular among users, **LAN**s widespread is a first topic of discussion.

An introduction to **LAN**'s architecture, elements, to the most popular **LAN** types, and standards is the core of **Chapter 1**.

After making a short introduction to **LAN** operating systems, **Chapter 2** follows with details on LAN operating systems based on DOS, UNIX and OS/2. putting forth the client-server architecture. Modules belonging to the operating system reside on the server, as well as on other network resources which may represent the "client". **LAN**s features and performances during system selection are correlated with evaluation criteria.

Chapter 3 discusses on the importance of standards and standardization. It seems to be the crux of the matter if a successful **LAN** business is planned. The IEEE 802 **LAN** standards have been developed to support low- cost equipments' interfacing.

An introduction to this topic is offered by the 7th-layered OSI model with its set of protocols at each layer.by the functionality of commonly used **LAN** protocols and their relationship with the OSI reference model.

CO-LANs or the telephone company central office-based **LAN** as alternatives to private **LAN**s are described in **Chapter 4**. Even though CO-LANs operate at low speed if compared with the 1 Mb/s of the private **LAN**s, they might serve users whose data-switching needs are well-defined. Telephone companies supported CO-LANs through data-over-voice (DOV) technology by packed switch techniques or by means of the migration to ISDN- integrated services digital network.

The second part of the book is dedicated to by now popular and widespread **WAN**s.Such topics as modems and multiplexers, private branch exchange (PBX)-history, components and applicability, channel service units, packet-switched networks and hybrid networks are dealt with along 8 chapters of this part.

Chapter 5 looks at high-speed diagnostic modems still used to pass data over local access lines at transmission speeds of 19.2 Kb/s over leased lines. Such modems use frequency division multiplexing (FDM) to derive the diagnostic channel. In order to

have a modem operated at its stated level of performance, the diagnostic and production data should be combined onto a single, wider band.

Encoding-decoding schemes and the level of circuit integration are also analysed.

Chapter 6 is a thorough analysis of the private branch exchange (PBX). This chapter surveys PBX's history and components, different architectures and types of PBX, either analog or digital, centralized or distributed, and sees to the PBX implementation in the integrated services digital network (ISDN). The chapter concludes with the remark that **LANs** do a better and faster job with respect to data, offering features for their high-speed transport , such as error detection.

Chapter 7 covers the subject of multiplexers, the backbone of private and public networking, and the multiplexer implementation of ISDN. As to the latter, the multiplexer support of ISDN greatly improves disaster recovery and it is faster and more economical to implement; today's T1 multiplexers offer unprecedented flexibility to design and maintain fault-tolerant networks.

Newer digital services and high-capacity T1 service require channel service units (CSUs) and data service units (DSUs) capable of interfacing data terminal equipment with the network. CSU-DSUs should be considered as essential network building blocks, as they have evolved from passively interface devices on the network to "intelligent" devices with network management feature, diagnostic capabilities, and higher level of functionality. **Chapter 8** details all these subjects.

Digital cross-connect systems (DCSs), the subject matter of **Chapter 9**, will have an enhanced role in the networks of the future. As the T1 links emerged, the DCSs were called to simplify their administration and control, to enforce the ability to access and test individual circuits, switch channels from one link to another, and reconfigure circuits to achieve optimal efficiency and cost- savings.

Since 1981, very small aperture terminals (VSATs) have proved to be a well-established, reliable transmission technology for today's private networks. **Chapter 10** deals with the VSAT systems which integrate transmissions and switching functions to provide preassigned and on-demand links for point-to-point and broadcast networks. This chapter reviews VSAT varieties and their applications, VSAT network configurations, transmission technologies, categories of protocols used within VSAT network, security standards for VSAT applications, and future directions of VSAT.

Chapter 11 describes the packet transmission technologies. Despite the fact that their fading has been predicted a few years ago, the packet switched networks are still widespread. The range of packet network equipments covers from statistical multiplexers and X.25 equipment, to newer technologies as fast packet and frame relay. **Chapter 11** focuses on the popular X.25 packet networks which the '90s saw grow. Also discussed there are CCITT recommendation X.25, the family of associated "X - specs" (developed to support asynchronous network traffic) and the further development of packet switching.

Chapter 12 looks into the hybrid networking. Instead of a single network architecture, users may now select from among several architectural building blocks - the variety of building blocks and network case studies are discussed and featured through the pages of the chapter. The hybrid approach offers more flexibility in case of future expansions of the network and the implementation of new communication technologies , as it is a combination of circuit switching and packet switching.

Individual **LANs** continue to proliferate as islands located in different premises, and so does the need for interconnecting them, usually by **WAN**. Internetworking- which is Part III- describes along its several chapters, such devices as bridges, routers and gateways used to interconnect **LANs**. **Chapters 13, 14,** and **15** dwell on each type of device, exploring protocols, applications, and performance issues.

Network support infrastructure- which is Part IV- commences at **Chapter 16** with network design. The on-going process of network design implies changes brought about by new technologies in an environment of sharp competition.

The design process milestones, phases like exploration, modelling, and integration, and the available design tools are all analysed in this chapter. Systems integrator and integration define the task of connecting disparate products and systems to form a unified network. Mainly, this process calls for reconciling physical connections and overcoming problems raised by non-compatible protocols. These subject- matters are the stuff of **Chapter 17**. The equipment selection, installation, and maintenance ask for large expertise that typically is not the

privilege of one single organization and therefore many companies will rely on system integrators.

Networks tend to grow in size and complexity to meet the ever changing needs of an organization. With the complexity, here comes the need for control. A network consists of many diverse elements, each of them with its own management needs and using a unique control protocol and specific management routines. The goal is to provide full network connectability, correct functionality, and high flexibility to the network's users. **Chapter 18** reflects the impact of these aspects on network management.

The demand for remote diagnostic capabilities is the effect of the increasing complexity of new technologies. It is more and more difficult for users to isolate, diagnose, and recover problems. Whether problems are revealed through alarms, diagnosis, or users experience trouble with their equipment, the need for timely and qualified maintenance and support services is anyhow a critical one. **Chapter 19**, which is dedicated to maintenance and support roles, reveals the roles of hardware vendors, maintenance firms and users in providing such services.

With more and more companies admitting the strategic value of their networks, the capability of restoring failed lines quickly and efficiently becomes essential. **Chapter 20** - network restoral options- advances various restoral methods used on networks, and the restoral options of hardware vendors.

Chapter 21 - regulatory involvement- explains how specific regulatory actions can affect the cost and characteristics of networks and also advises on how to determine regulatory actions, so that to make them known to the state and federal regulatory agencies.

The future of networking,which is Part V, discusses the latest innovation in T1 technology : fractional T1 (FT1).

FT1 makes use of enough incremental bandwidth to support existing applications with no need to lease the entire T1 facility. **Chapter 22** enters into the ramifications of FT1 by providing cost-benefit analyses and a discussion of hardware requirements.

Chapter 23 deals with the Integrated Services Digital Network (ISDN) , a turning point in the evolution of telecommunication networks worldwide. The long-term objective of ISDN is to implement a common standard for the provision of carrier services, so that operating costs should be minimized and the performance and reliability of the network should be maximized. If previous chapters have explored fractional T1 in the networking environment, and a migration platform to ISDN, **Chapter 24** refers to fractional ISDN (F-ISDN), which are technological developments enabling the combination of FT1 for dedicated circuits with primary rate ISDN for switched circuits over the same T1 facility.

Chapter 25 discusses an open network architecture (ONA) which allows independent operators to offer new services over the public telephone network. **Chapter 26** approaches the concept of intelligent networks. Briefly, an intelligent network is a distributed information processing network defined by the computer logic and databases within it. This intelligence will be derived from sophisticated software embedded at strategic locations within the public network. By getting access to this intelligence, users will be able to engineer their own services and to customize features without telephone company involvement.

Chapter 27 relates about an emerging technology, SONET (synchronous optical network) which will eventually render fibre optics to their full potential, and replace the asynchronous networks of today; the same fibre cable capacity would be increased by using an end-to-end SONET equipment.

Essentially,a metropolitan area network (**MAN**) is a huge **LAN** that encompasses an entire city providing data transport at fibre optic speed. Typically, a **MAN** will link other lower- speed **LANs** across a region. **Chapter 28**- Metropolitan Area Networks- defines technologies that go into the development of **MANs**; most of the development activity focuses around telephone companies, and **MANs** provide an infrastructure where telephone companies can better position themselves for the provision of multiple services.

Part VI,which is the concluding part of the book, places networking among competitive breakthroughs, as businesses worldwide begin to appreciate the strategic role of communication networks.

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