Advances in Telecommunications Networks

by William S.Lee and Derrick C.Brown

Rodica Ciocea received the Engineer degree in Electronics and Telecommunications from the Polytechnical Institute of Bucharest in 1979. Since then she has worked at the Research Institute for Informatics as system engineer and programmer. She has been on the team designing and implementing software products dedicated to a pass-through access service for asynchronous terminals in a heterogeneous network environment, EDP on a data switching equipment based on a multimicroprocessor architecture. She has also worked on a VIDEOTEX network value added service (VIDEOTEX terminal emulator on IBM PC like, access point for VIDEOTEX pages acquisition, multiaccess to VIDEOTEX databases). In 1993 she joined the team maintaining the national EuropaNET node.

The purpose of the book is stated as *"to provide insight into the many advances in long-distance telecommunications"*, to mark changes in the used technologies *"from analog to digital, from microwave radio to fiber-optic cable"*.

Largely experienced in the domain (having contributed to the developments in network elements and transmission systems), the authors opt for a practical approach at the expense of a mathematical approach. They present the principles underlying the operation of equipment and systems and especially the field orientation rather than *"the fine details of topics that are likely to change"*.

Illustrations, (schemes and diagrams) come to support their endeavour.

After the introduction, **Chapter 2** reviews the network architecture advances, concentrating on the following elements:

- passing from analog to digital (passing through the intermediate phase of mixed analog and digital networks);

- asynchronous digital networks (configuration with VF (Voice Frequency) interfaces, configuration with digital access interfaces, introduction of DCS (Digital Cross-connect Systems), intermediate access sites);

- SONET (Synchronous Optical NETworks) systems (general presentation, site configuration, SONET intermediate access sites).

Chapter 3 is about digital multiplexing and transmission. Once specific technical notions clarified and the implementation problems solved (digital signals, PCM (Pulse Code Modulation) , digital multiplexing, digital hierarchies, synchronization, regeneration), transmission systems (through metallic pair cable, coaxial cable, microwave radio, fiber-optic cable), cross-connect frames, digital cross-connect systems, traffic assignment and grooming, are presented.

Chapters 4, 5 and **6** describe the digital signals (for DS0, DS1 DS3 types respectively) (frame structure, line-coding techniques).

Chapter 7 deals with the methods of synchronization of signals and networks, dwelling upon: analog and digital synchronization, the slip-rate objective attainment, network clocks hierarchy and stability, primary-reference frequency sources, distribution of timing signals.

Chapters 8, 9 and **10** present the digital cross-connect systems (DCS 1/0, DCS 3/1 and DCS 3/3) (general description, administrative sub-system, switch matrix sub-system, traditional functions, applications etc.).

Chapter 11 points out significant aspects of network operation such as: forms of network surveillance, security measures, languages, syntax and messages used in the communication between the network operator and a network element, the application of different types of DCS in network control, stress testing of DS1 facilities, specific operation requirements by SONET systems, operations support systems

(centralized control systems) and their architecture.

Chapter 12 discusses the use of DCS 3/3 system in the survivability of traffic in the event of a failure in the network (through methods such as route versatility, survivability plans for quickly restoring traffic after a path failure (using DCS 3/3 and RDPS - reverse direction protection switch, etc.).

Chapter 13 introduces synchronous networks associated with the SONET technology. The disadvantages of asynchronous systems and the advantages of synchronous ones, basic SONET technology (section, line and path overheads, multiplexing techniques, optical line rates), STS structure, synchronous payload envelope, virtual tributaries, SONET broadband traffic, operations, administration, maintenance and provisioning, synchronization, network protection, are explained.

The use of rings made up of SONET systems to achieve self-healing networks, is presented in **Chapter 14**. Topological and operational aspects such as SONET-ring configuration, SONET type systems presentation from the point of view of ring-protection methods used (unidirectional path-switched rings, unidirectional line-switched ones), are detailed.

The **last Chapter** is devoted to the evolution of networks towards handle future broadband services.

It starts with a short review of nowadays telecommunications systems types, then focussing on such topics as deployment of SONET systems, potential broadband services, broadband ISDN, ATM. Asynchronous Transfer Mode is treated in its general features (definition, connecting aspects, its role in the foreseen networks evolution).

Even though the book could have been a little more "reader friendly", it certainly makes, by the covered subjects and their concrete approach, an essential reading.

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