APPENDIX B: SUMMARY DESCRIPTION OF THE OSI REFERENCE MODEL

This Appendix presents a summarized description of the layered architectural model that has been standardized by the ISO and that is followed in developing standards and functional implementations. The layered architecture partitions the communications functions that occur between systems into multiple layers. Each layer adds to the services provided by lower layers. A layer defines the services that it must provide to the next higher layer using services from the layer beneath it but does not need to know the mechanism used to provide these services. Therefore, each layer's functions can be implemented independently of other layers. Each layer has a standard service specification that defines the services the layer provides. It also has a standard protocol specification that defines the format for information transfer between peer layers.

The seven-layer OSI model is illustrated in Figure B-1. Only recently have attempts been made to apply this layered concept to other networks. Narrative descriptions of the value-added services provided by protocols in each layer to the adjacent layer above are defined by Federal Standard 1037B (1991). They are as follows:

> **Physical Layer:** Layer 1, the lowest of seven hierarchical layers. The Physical Layer performs services requested by the Data Link Layer. The major functions and services performed by the Physical Layer are: (a) establishment and termination of a connection to a communications medium; (b) participation in the process whereby the communication resources are effectively shared among multiple users, e.g., contention resolution and flow control; and (c) conversion between the representation of digital data in user equipment and the corresponding signals transmitted over a communications channel.
>
> **Data Link Layer:** Layer 2. This layer responds to service requests from the Network Layer and issues service requests to the Physical Layer. The Data Link Layer provides the functional and procedural means to transfer data between network entities and to detect and possibly correct errors that may occur in the Physical Layer.
>
> **Network Layer:** Layer 3. This layer responds to service requests from the Transport Layer and issues service requests to the Data Link Layer. The Network Layer provides the functional and procedural means of transferring variable length data sequences from a source to a destination, via one or more networks while maintaining the quality of service requested by the Transport Layer. The Network Layer performs network routing, flow control, segmentation/desegmentation, and error control functions.

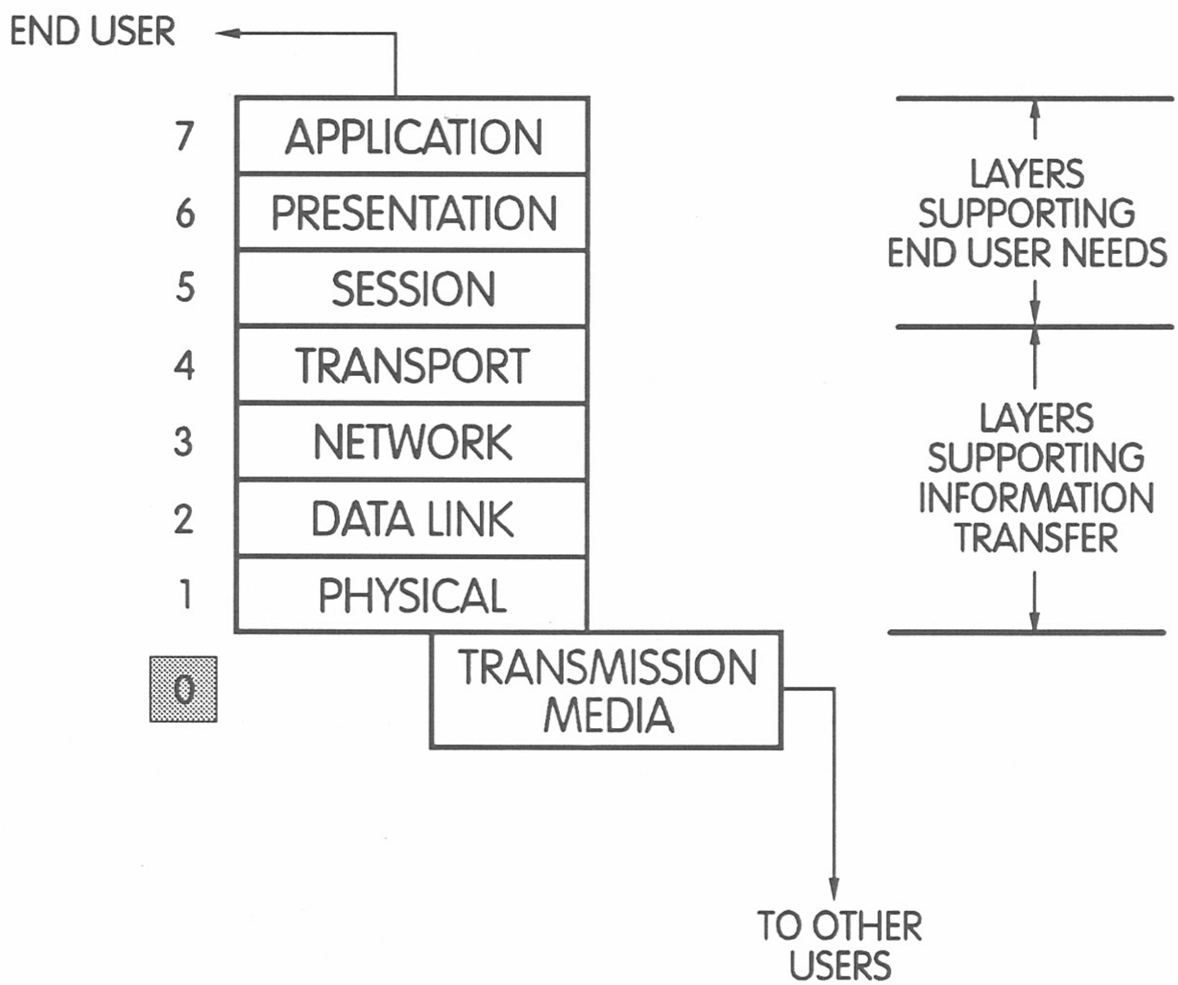

Figure B-1. Open system interconnection (OSI) protocol reference model.

Transport Layer: Layer 4. This layer responds to service requests from the Session Layer and issues service requests to the Network Layer. The purpose of the Transport Layer is to provide transparent transfer of data between end users, thus relieving the upper layers of any concern with providing reliable and cost-effective data transfer.

Session Layer: Layer 5. This layer responds to service requests from the Presentation Layer and issues service requests to the Transport Layer. The Session Layer provides the mechanism for managing the dialogue between end-user application processes. It provides for either duplex or half-duplex operation and establishes checkpointing, adjournment, termination, and restart procedures.

Presentation Layer: Layer 6. This layer responds to service requests from the Application Layer and issues service requests to the Session Layer. The Presentation Layer relieves the Application Layer of concern regarding syntactical differences in data representation within the end-user systems.

Application Layer: Layer 7. The highest layer. This layer interfaces directly to and performs common application services for the application processes; it also issues requests to the Presentation Layer. The common application services provide semantic conversion between associated application processes.

While the upper layers are embedded in the terminal software, the lower three layers are network-specific layers that support information transfer. Layer 1 assumes the existence of physical communication to other network elements as opposed to the virtual connectivity used by the higher layers. Some authors, e.g., Knightson et al. (1988), denote the transmission media itself including network topology as layer 0, since it is logically below layer 1 and is concerned with switch placement, concentrators, and lines, and what capacities to assign to the lines.

There is an abstract boundary between adjacent layers that is sometimes called an interface. This boundary separates functions into specific groupings. At each boundary, a service that the lower layer offers to its upper neighbor can be defined. Service providers are not required to physically implement access to these layer boundaries and may even merge layers. The important functional entities that must be transmitted are the protocols between peer-level layers. This protocol information is exchanged between network elements by appending it along with the final message in the sequence of transported bits (Appendix D). The implementation will conform to international standards when the protocol information that is transmitted between two layers of the local system and the corresponding layers of the communicating end systems is interpreted correctly by both systems.

The protocols within all layers define the networks’ functional (or protocol) architecture. The specification of these protocols is needed to implement a service to an end user. Implementation of these protocols in hardware and software can be accomplished in many ways. Neither the details of the implementation nor the boundary services are part of this architecture. One major advantage of this layered architecture concept is that lower layer implementations can be replaced as technologies advance, for instance, when a fiber link replaces a coaxial cable. The only requirement being that the new implementation provide the same set of services to its adjacent upper layer as before.

The OSI model is currently being extended to ISDN as illustrated in Figure B-2, (CCITT, 1989b). The separation between control information, user information, and management information is shown using multidimensional user, control, and management planes. The control plane may be divided further into local control (LC) and global control (GC) planes. Each plane may be a full protocol layered process or may only be partially implemented for some services. The management function coordinates the activities of all the planes. Management standards for layered architectures currently are under development, as described in this report.

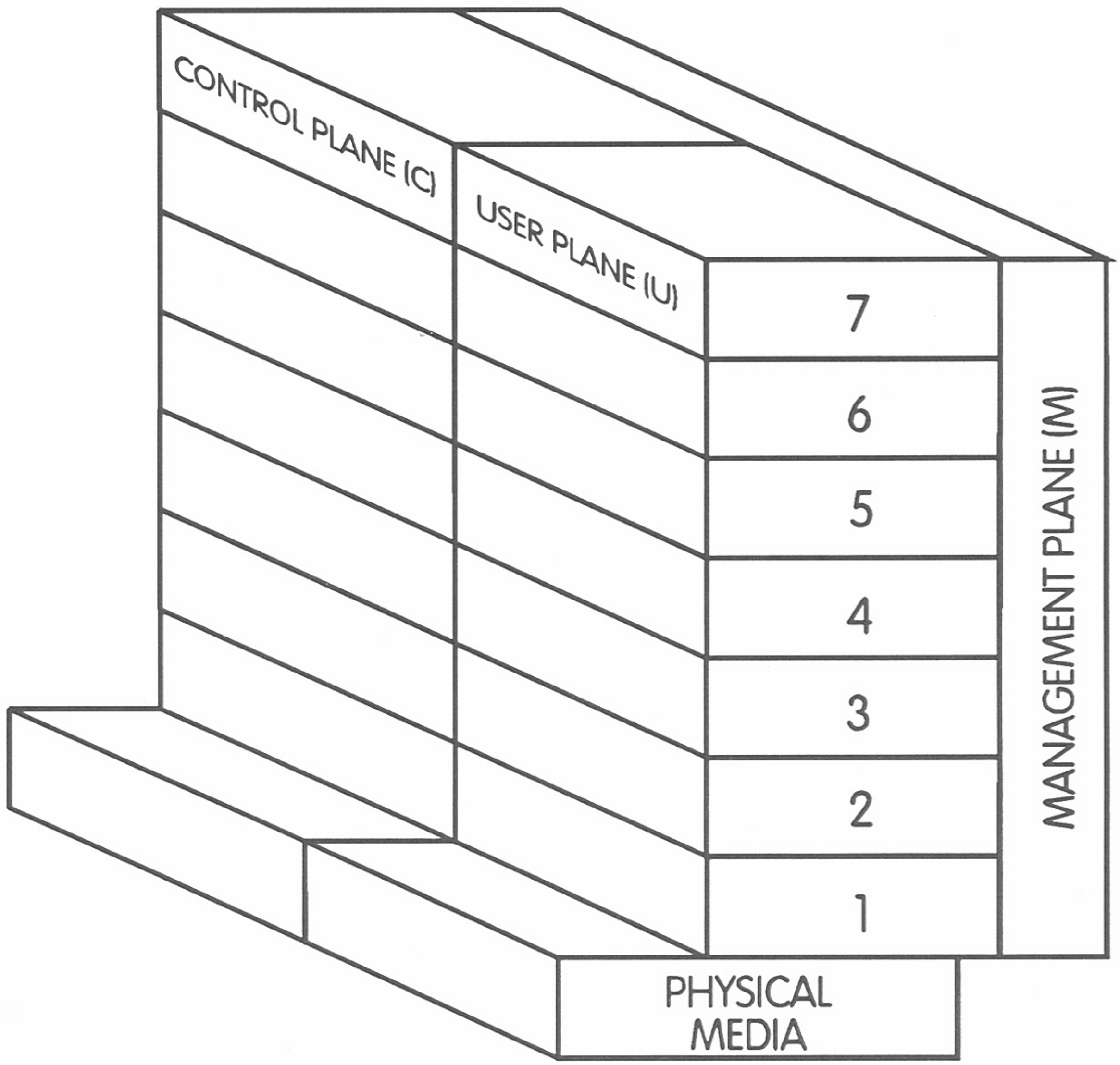

Figure B-2. Protocol reference model for ISDN.