RECOMMENDATION ITU-R BT.807*

Reference model for data broadcasting

(1992)

The ITU Radiocommunication Assembly,

considering

a) that data broadcasting services are growing rapidly in number and diversity of application;

b) that the media used to convey data broadcasting services now covers the whole gamut of broadcast emission bearers from LF radio through to SHF satellite systems;

c) that the reducing cost of computing equipment makes the development of complex receiving terminals economically viable;

d) that there will be an increasing need to interconnect broadcast transmission and reception equipment to computer networks and other data broadcasting equipments;

e) that a method needs to be found to ease standardization and facilitate smooth evolution of data broadcasting systems in the future;

f) that it is desirable to encourage the development of compatible interface specifications to rationalize the design of equipment,

recommends

1 that the layered approach of the ISO Open Systems Interconnection (OSI) basic reference model as described in ISO 7498 (1984) should be used in the development of any new data broadcasting system;

2 that the OSI basic reference model should be interpreted in the broadcasting context, according to Annex 1.

ANNEX 1

Interpretation of the ISO OSI basic reference model in the broadcasting context

1 Introduction

The study and development of systems and services of data broadcasting are active in various areas such as the television and sound channels in terrestrial and satellite broadcasting.

---

* Radiocommunication Study Group 6 made editorial amendments to this Recommendation in 2002 in accordance with Resolution ITU-R 44.

In order to ease standardization of data broadcasting systems and to facilitate smooth evolution of data broadcasting services in the future, the development of a common reference model for data broadcasting is necessary.

In particular, the use of such a reference model would facilitate the description and introduction of integrated services digital broadcasting (ISDB) which could include Teletext, still pictures, audio signals, high fidelity audio, facsimile, data and other types of information.

2 Definition

Data broadcasting: the broadcasting of coded information intended to be received by the general public by means of appropriate data processing equipment.

3 A layered model for data broadcasting

A hierarchical organization of communication functions for data broadcasting is presented in Table 1 where the functional items, listed at each hierarchical level, do not refer to specific implementation solutions, but to the overall logical features that are considered sufficient to characterize the service and performance of any typical system.

According to this functional model, services may be delivered by arranging the information into logical groupings, delivering them to lower layers for transmission and, after reception, recovering the information in the proper form for use by the recipient.

In what follows, the names of the layers are those adopted by the ISO in ISO 7498 (1984) “Basic reference model for open systems interconnection”.*

TABLE 1

Layer structure of data broadcasting

OSI basic reference model	Data broadcasting	
Layer	Principal function	Classification
7 Application	Use of information at application level	Service information protocol
6 Presentation	Conversion and presentation of information	
5 Session	Selection of and access to information	
4 Transport	Identification of group of data	Data broadcasting system
3 Network	Identification of logical channel	
2 Data link	Linkage with logical transmission unit	
1 Physical	Physical transmission	

* The term “network” is used in this Annex in the telecommunications sense of a set of interconnected links sharing the same protocol. This is distinguished from the use of “network” in the conventional broadcasting sense of set of transmitters broadcasting the same programme material.

Broadcasting networks are basically unidirectional. Even where new interactive services are introduced, the reverse path normally uses a different type of network. This situation is included within the OSI 7-layer model by the concept of "connectionless" operation. In typical telecommunications, the connectionless class of transmission normally refers to a virtual uni-directional protocol, where physical bidirectional data paths exist, but are only used in one direction (an example is the X.25 "datagram"). However, the concept equally covers a physically uni-directional situation. In both cases a prior agreement is required as to the purpose and significance of the data transmission. In the data broadcasting case this agreement must be set up via other means of communication, although it will frequently be implicit, such as in the purpose of equipment sold to a user.

Layer 1: Physical

Within a given broadcast transmission system this layer relates to the electrical transmission of the data signal and includes such items as carrier or sub-carrier frequency modulation method, bit rate and pulse shaping. It may also specify the physical details of connectors.

Layer 2: Data link

This layer, which is concerned with an individual link, includes logical functions related to the data transmission such as digital frame synchronization techniques and associated error control procedures, data formatting, and link-access procedures.

Layer 3: Network

This layer includes logical functions related to multiplexing, demultiplexing and error control of data packets belonging to different communication flows. Examples of such functions are data channel addressing and data packet sequencing. It is relevant to the passage of data through a given network. This normally involves data passing through several links of the network.

A network in a broadcasting application often consists of a single star. Every link in such a network starts at the transmitter and ends in a receiver. Thus the process involved when data passes through the network is the same as data passing over a single link. Where the receiver is a cable-head, the cable operator may choose to distribute data in a form different from that broadcast (such as to extract sub-title data from Teletext and superimpose the sub-titles onto the vision). This means that the tasks performed by Layers 2 and 3 apply to a single transmission path in some cases and in others to a more complex topology. This does not mean that the two layers cannot be unambiguously distinguished, but it is significant that attempts to apply the OSI model to data broadcasting have sometimes led to difficulties. In practice, the single-star topology of a broadcasting network may make the distinction relatively unimportant.

Layer 4: Transport

This layer provides the function of arranging the data in a way suitable for secure transfer from one point to another, by such means as segmenting data into groups of information (e.g. scrambling where applicable), delivering them to the lower layers for transmission to the distant point and there reconstituting the groups of information and arranging them in a proper sequence. It is the lowest layer which by definition has end-to-end significance, that is, the transport unit appears intact from entering to leaving the network.

Layer 4 may have to take account of some features of the networks it uses. It should not, however, be specific to any particular type of network.

In data broadcasting, the network will be uni-directional. Thus the Layer 4 protocol must either operate in the connectionless mode, or use a different type of network for a "reverse path". Also, data broadcasting applications are often implemented by terminals which cover all layers up to 7, the application layer, in one suite of equipment. In this situation the interfaces to the transport layer can appear unimportant.

However, in the definition of data broadcasting protocols the distinction between Layers 3 and 4 is important. Typically, data will be recovered from the broadcasting network as the contents of frames or packets. Layer 3 ends where such framing ceases to have significance. Only the contents of the frames, or packets, are passed to Layer 4.

Although this distinction may be theoretical in a complete terminal which implements all layers up to application, it becomes vital if data distributed via a broadcasting network are intended for onward transmission through a different type of network.

Layer 5: Session

This layer includes data handling functions which are intended to assist the user to gain access to services. Examples of such functions are access control and service identification (SI).

As broadcasting protocols become more complex, multiple services can be carried over the same network, and services can include additional or optional components. This makes it desirable to provide service identification information within the broadcast and raises issues connected with the OSI 7-layer model which may often be theoretical, but in some situations could be important. For instance, Layers 4 and 5 should not be specific to any particular type of network, and thus should not in principle perhaps appear in a broadcasting specification. In practice, traditional broadcasting terminals often implement all layers up to application.

Layer 6: Presentation

This layer comprises the functions needed for the presentation of information relevant to each application which could include text, pictures, sound and other types of processable data.

Layer 7: Application

This layer refers to practical use of the potential facilities provided by the lower layers for a given type of service. Examples are captioning, telesoftware, cyclic Teletext, stock market data, telemusic, etc.