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SERIES J: TRANSMISSION OF TELEVISION, SOUND
PROGRAMME AND OTHER MULTIMEDIA SIGNALS

Interactive services

**Basic principles for a worldwide common
family of systems for the provision of
interactive television services**

ITU-T Recommendation J.110

(Previously CCITT Recommendation)

ITU-T J-SERIES RECOMMENDATIONS

TRANSMISSION OF TELEVISION, SOUND PROGRAMME AND OTHER MULTIMEDIA SIGNALS

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FOREWORD

The ITU-T (Telecommunication Standardization Sector) is a permanent organ of the International Telecommunication Union (ITU). The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1 (Geneva, October 1996).

ITU-T Recommendation J.110 was prepared by ITU-T Study Group 9 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on the 22nd of April 1997.

NOTE

In this Recommendation, the expression “Administration” is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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SUMMARY

This Recommendation, which has been produced in conjunction with the broadcasting study groups of the Radiocommunication Sector of the ITU, gives general guidance for the harmonious development of interactive television services. It covers the subject areas of interaction channels, interactive services and transport mechanisms.

INTRODUCTION

The development of new digital technology has led to the convergence of broadcasting, telecommunications and computers. There has been rapid progress towards enhanced digital television broadcasting using HFC, SMATV, MMDS, LMDS, ISDN, ADSL, terrestrial over-air transmission, satellite delivery systems, etc. Reliance upon digital technology provides opportunities for the introduction of interactive services. Interactivity may be required at a number of levels, each having a variety of Quality of Service requirements for the interaction channel.

The interaction channel, often referred to as the return channel, generally includes both upstream and downstream paths, but in some instances may use only an upstream path to the source of the service. Interactivity can be local only without a return path, or simple interactivity using a unidirectional interaction channel or in its fullest form using a bidirectional interaction channel to and from the source of the service.

There is, thus, a need for the harmonization of systems for the provision of interactive services.

BASIC PRINCIPLES FOR A WORLDWIDE COMMON FAMILY OF SYSTEMS FOR THE PROVISION OF INTERACTIVE TELEVISION SERVICES

(Geneva, 1997)

1 Scope

This Recommendation gives general guidance for a worldwide common family of systems for the provision of interactive television services to the public. It is a preliminary step towards facilitating the interoperability of interactive services. It is intended to assist in the preparation of future Recommendations for specific services which should take into account the output from other ITU groups dealing with multimedia services. This Recommendation is based on the following principles:

- a) There should be maximum commonality in the techniques used for interactive television services delivered by HFC, SMATV, MMDS, LMDS, ISDN, ADSL, terrestrial over-air transmission, satellites, etc.
- b) The interaction channel should be designed as a “container” able to transport data services (including video, audio and the associated data signals) in a transparent and flexible way.

Guidance for harmonizing the development of interactive television services can be found in the service architecture shown below. It is beyond the scope of this Recommendation to specify the technical details of the transport and access networks used for media delivery and application interaction. A preliminary list of technical parameters under study which may affect such specifications is provided in informative Appendix I.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

- [1] ITU-T Recommendation J.1 (1997), *Terminology for new services in television and sound-programme transmission*.
- [2] ITU-T Recommendation J.83 (1997), *Digital multi-programme systems for television, sound and data services for cable distribution*.
- [3] ITU-T Recommendation J.84 (1997), *Distribution of digital multi-programme signals for television, sound and data services through SMATV networks*.
- [4] ITU-T M.3000-Series of Recommendations, *Telecommunication management network*.
- [5] ITU-T Recommendation I.414 (1993), *Overview of Recommendations on layer 1 for ISDN and B-ISDN customer accesses*.

3 Terms and definitions

The terms and definitions in Recommendation J.1 apply and are augmented by the definitions below for the purposes of this Recommendation.

3.1 broadcast channel: A unidirectional, broadband, point-to-multipoint channel, which may include video, audio and data. The broadcast channel is established from the services provider to the users. It may include the forward interaction path.

3.2 interaction channel: A bidirectional channel between the user and the service provider for interaction purposes. In certain implementations the interaction channel could also carry a user selected broadcast service. In general, the interaction channel is formed by:

- **return interaction path (return channel):** A communication channel from the user to the service provider. It is multiple point-to-point.
- **forward interaction path:** An individual communications channel from the service provider to the user. It may be embedded into the broadcast channel. This channel may not be present in all implementations.

4 Abbreviations

This Recommendation uses the following abbreviations:

ADSL	Asymmetric Digital Subscriber Line
GSM	Global Systems for Mobile communication
HFC	Hybrid Fibre Coax
ISDN	Integrated Services Digital Network
LMDS	Local Multipoint Distribution System
MMDS	Multichannel Multipoint Distribution System
SMATV	Satellite Master Antenna Television
TMN	Telecommunications Management Network

5 Interactivity and the role of interaction paths

The basic requirement of an interaction channel is that the user be able to respond in some way to the interactive service. This response may take the form of “voting” for a particular participant in a competitor show, “purchasing” goods that are demonstrated or advertised in a shopping channel programme, etc. This would be achievable within a one-way (reverse direction) narrow-band path.

A higher level of interactivity might require that a user, who has made a response to an interactive service, be sent an acknowledgement. This might be the case where the consumer has made a credit card purchase from a shopping channel via the basic interaction channel. That consumer would expect to receive an acknowledgement that his or her credit card transaction had been accepted. This level of interactivity would require a two-way interaction channel, one in the reverse direction, the other the forward direction.

A further level of interactivity would occur where, in response to information in the interactive service, the consumer requests further information on particular topics from the source of the service, or from a central database via the source of the interactive service. This could require that the forward channel be broadband. In this particular example, the reverse path would only need to be a narrow-band one, but it is possible that applications will arise whereby the consumer will need to make a broadband response/contribution to the interactive service and also receive a broadband “answer” from the service source.

6 Reference model for the interaction channel

A reference model for the system architecture of a narrow-band interaction channel in a broadcasting scenario is shown. In this reference model, two channels are established between the user and the service provider, as in Figure 1. The detailed reference model is presented in Figure 2.

7 Specification of the broadcast channel

In Figure 2, the top section represents the unidirectional broadcast channel. This is fully specified by other relevant Recommendations of the ITU (e.g. Recommendation J.83 for HFC and Recommendation J.84 for SMATV).

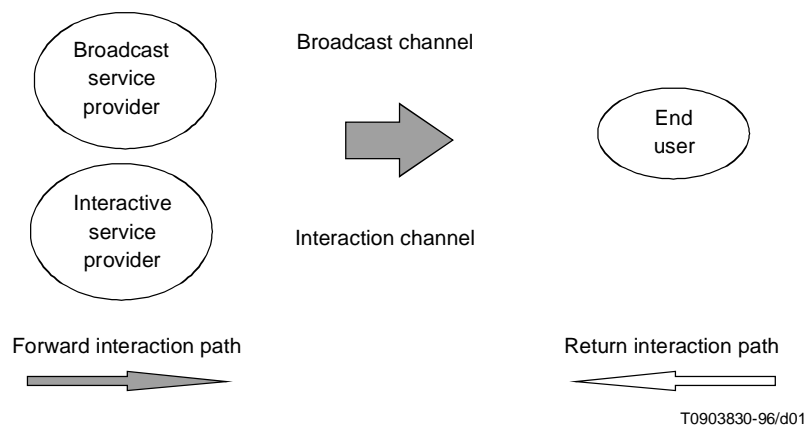


Figure 1/J.110 – Illustration of channel terminology in interactive television systems

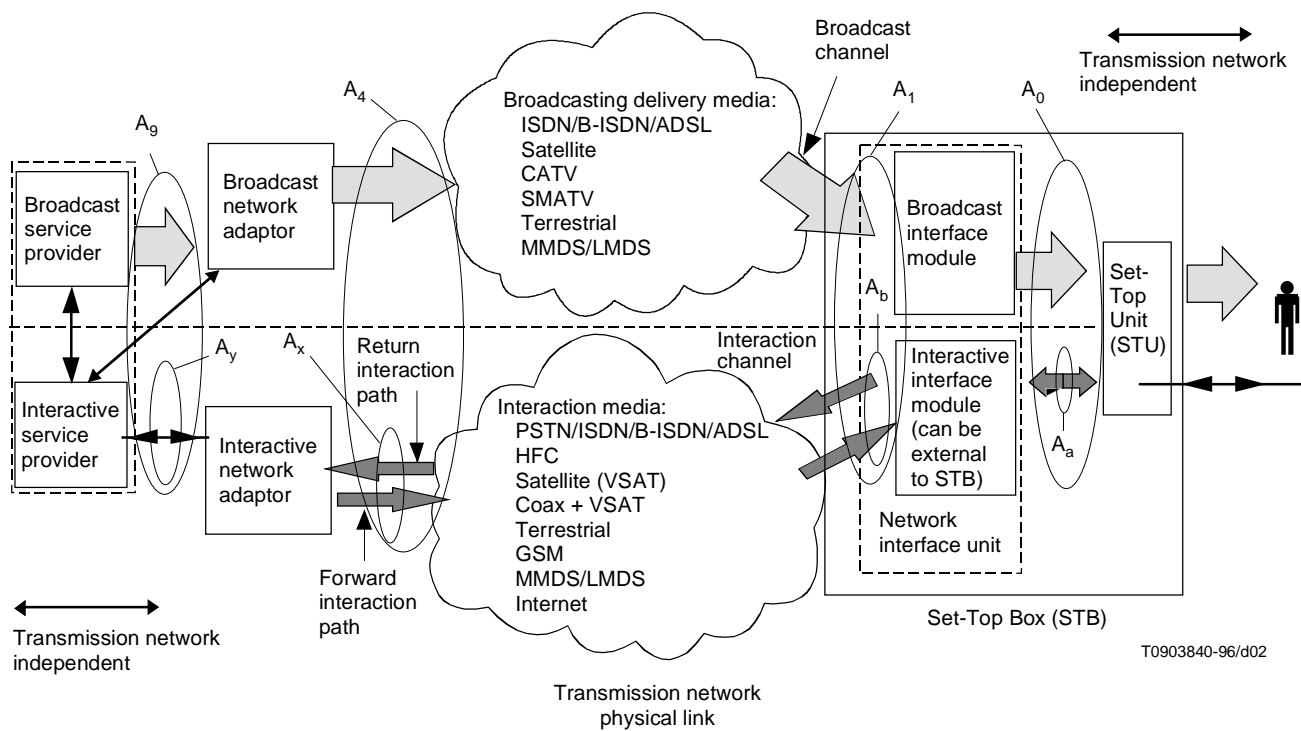


Figure 2/J.110 – Functional reference model for interactive television services

8 Specification of the interaction channel

The lower part of Figure 2 represents the bidirectional interaction channel.

Several interfaces exist within the interactive system. These are related to specific areas where it is proposed that standards should be developed. These are:

- A_a: Set-top unit to interactive interface module. This can be either internal or external to a set-top unit. This interface is network independent.
- A₀: Set-top unit to network interface unit. This can be either internal or external to a set-top unit. This interface is network independent.
- A_b: Interactive interface module to interaction media. This interface is network dependent.
- A₁: Network interface unit to broadcast and interaction media. This interface is network dependent.
- A_x: Interaction media to interactive network adaptor. This interface is network dependent.
- A₄: Interaction media and broadcast media to interactive network and broadcast network adaptors. This interface is network dependent.
- A_y: Interactive network adaptor to interactive service provider's system. This can either be connected directly to a server or via a "core network". This interface is network independent.
- A₉: Interactive and broadcast network adaptors to interactive service and broadcast service provider's systems. This can either be connected directly to a server or via a "core network". This interface is network independent.

The detailed specification of the interfaces at the reference points shown in Figure 2 is likely to be the subject of future ITU-T Recommendations. It is expected that the interactive service control used will take advantage of modern design techniques, such as the use of layered protocols.

Where more than one interaction network is required (e.g. SMATV to VSAT), several interaction media to interaction media interfaces may be used in series. Where the broadcast channel and the interaction channel are carried over the same medium, A₄ and A_x could be combined as a common interface and also A₁ and A_b could be common.

8.1 Interaction channel transport mechanisms

The interaction channel is an integral part of the interactive television system. This is the portion that will allow the home viewer to respond and interact with the information contained in the service. In principle, a number of possibilities exist for the interaction channel:

- in over-the-air applications, it may be possible to use the existing receiving antenna and cable. It may also be possible that a special transmitter/receiver unit could be incorporated into the television set. It is also possible that a simple transmitter and antenna, similar to those used for cellular mobile systems, may be a more cost effective solution;
- use of existing cable systems, by utilizing the return channel capability of the cable systems or of SMATV systems;
- the use of satellite-based systems such as VSAT, to link the nodes which concentrate the signals from a number of different users to a service provider;
- a simplified version of mobile telephone equipment, using the same cellular stations as the mobile service, or possibly using separate receiving stations located at the television transmitter. In the case of using the same cellular mobile stations, a more simplified version of the data transmission protocol may be used;
- use of the existing public telephone (telecommunications) networks, including ISDN/B-ISDN/ADSL (see Recommendation I.414);

- a similar solution may be possible by using mobile service via low-Earth orbit satellites (LEOs);
- use of the Internet.

8.2 Interaction channel characteristics

8.2.1 Data rate

The preliminary studies for the return interaction path user bit rates have been grouped into three categories:

- a) Low data rate (L), implies a data rate of approximately 150 bit/s, or even less, for simple return commands, including simple error correction.
- b) Medium data rate (M), implies a data rate of approximately 6 to 7 kbits/s for more complex applications and instructions, including the requirement for more sophisticated protection for security and error protection coding.
- c) High data rate (H), implies a data rate of typically 64 kbits/s, or more, and possibly up to several Mbit/s for more demanding applications.

8.2.2 Bandwidth

In many cases, bandwidth will depend not only on data rate, but also on the specific choice of transport mechanism and frequency band. In any over-the-air applications, the system parameters will most likely follow the bandwidth parameters of the systems already in mass production. For example, where it is proposed to use the existing cellular mobile network, some of the main parameters of that mobile system may well be appropriate to the interaction channel.

8.2.3 Modulation

The modulation and coding will depend mainly on the system used for the interaction channel, and should be selected, if possible, from existing methods so as to utilize mass-produced components, particularly where more expensive solutions are proposed for the interaction channel.

8.2.4 Structure of the interactive service

To ensure openness of access for users and services and of maximum commonality among interactive services and customer premises equipment, the protocols and interfaces used in the interaction path should be common, open and standardized. Similarly, the protocols should be arranged in layers, independent of each other to the extent possible, to enable future development.

9 Management functions

For further study. It is expected that any Recommendations will be consistent with TMN principles, as documented in the M.3000-Series of Recommendations.

Appendix I

Technical parameters under study

A number of technical parameters are still under study which may affect the detailed specification of the access and transport network interfaces. These include:

- a) channel delay;
- b) duty cycle;
- c) reception (fixed and mobile);
- d) channel control (network management and conditional access);
- e) analogue system transmission (vertical blanking interval and subcarrier);

- f) hybrid cable system (fibre and coax, and/or RF);
- g) antenna (type, placement, existing, directional);
- h) data flow control;
- i) quality of service;
- j) flexibility;
- k) potential interference impact to or from other services;
- l) interoperability in transport mechanisms, e.g. hybrid systems;
- m) framing;
- n) Media Access Control (MAC) protocols.

NOTE 1 – Relevant activities are underway in the ITU-T, ISO and other bodies, and these studies should be taken into account to avoid duplication.

NOTE 2 – The use of TMN principles as outlined in the M.3000-Series of Recommendations should be taken into account in defining the network-dependent interfaces.

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