



INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

I.375.2

(06/98)

SERIES I: INTEGRATED SERVICES DIGITAL NETWORK

Overall network aspects and functions – General network
requirements and functions

**Network capabilities to support multimedia
services: Example of multimedia retrieval
service class – Video-on-demand service
using an ATM-based network**

ITU-T Recommendation I.375.2

(Previously CCITT Recommendation)

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ITU-T RECOMMENDATION I.375.2

NETWORK CAPABILITIES TO SUPPORT MULTIMEDIA SERVICES: EXAMPLE OF MULTIMEDIA RETRIEVAL SERVICE CLASS – VIDEO-ON-DEMAND SERVICE USING AN ATM-BASED NETWORK

Summary

This Recommendation specifies network requirements for one type of multimedia retrieval services, namely the Video-on-demand service. The Network capabilities to support the service are described by means of reference configurations and corresponding network architectures. Functional blocks in the architecture are identified and the physical and logical relationships among these blocks are described. Although assumptions must necessarily be made regarding the functionality of Customer Premises Equipment (CPE), specific requirements for CPE are outside the scope of this Recommendation.

This Recommendation focuses on IN-based solutions. Non-IN-based solutions are also included, but in much less detail.

General aspects of network capabilities to support multimedia services covering all service classes are provided in a separate Recommendation, I.375.1.

Source

ITU-T Recommendation-I.375.2 was prepared by ITU-T Study Group 13 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on the 1st of June 1998.

Keywords

Functional groups, Multimedia services, Network capabilities, Reference configuration, Video-on-demand.

FOREWORD

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The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

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Recommendation I.375.2

NETWORK CAPABILITIES TO SUPPORT MULTIMEDIA SERVICES: EXAMPLE OF MULTIMEDIA RETRIEVAL SERVICE CLASS – VIDEO-ON-DEMAND SERVICE USING AN ATM-BASED NETWORK

(Geneva, 1998)

1 Scope

This Recommendation specifies network requirements for the support of multimedia retrieval services. Network capabilities to support multimedia services and applications are described by means of reference configurations and corresponding network architectures. Functional blocks in the architecture, whether generic to the multimedia retrieval service class or specific to a service within the class, are identified and the physical and logical relationships among these blocks are described. Although assumptions must necessarily be made regarding the functionality of Customer Premises Equipment (CPE), specific requirements for CPE are outside the scope of this Recommendation.

This Recommendation focuses on IN-based solutions for multimedia retrieval services, e.g. Video-on-demand (VOD). Non-IN-based solutions for VOD are included in clauses 4 to 6, although not detailed.

General aspects of network capabilities to support multimedia services are covered in a separate Recommendation, I.375.1.

2 Multimedia retrieval services – Reference configuration

Multimedia retrieval services are characterized by point-to-point communication and unidirectional information exchange. The reference configuration for the multimedia retrieval services class is shown in Figure 1. It presents the functions of multimedia retrieval services to be supported by network capabilities.

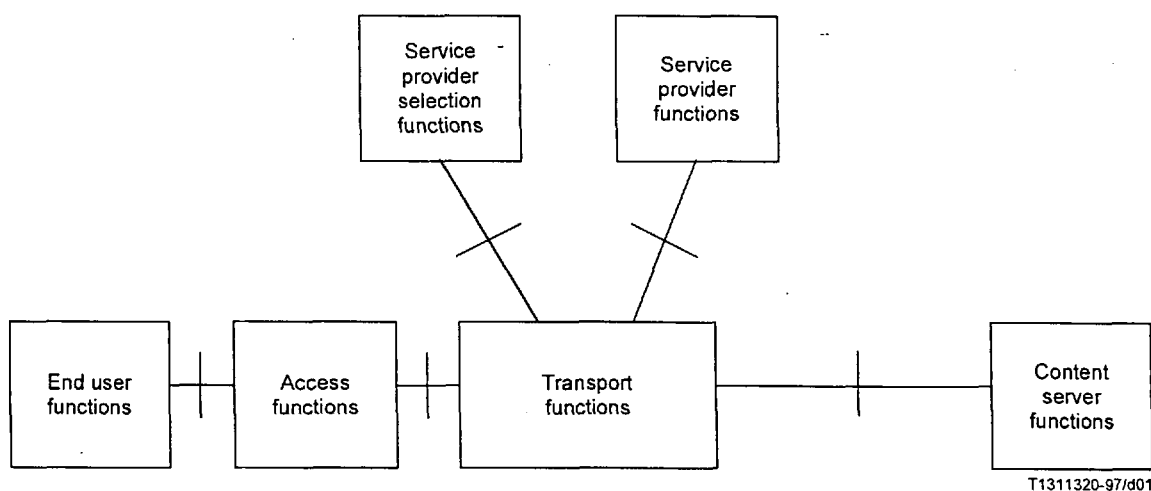


Figure 1/I.375.2 – Reference configuration for multimedia retrieval services class

The functional groups contain the following functions to be supported:

NOTE 1 – The following list may not necessarily be exhaustive.

- *End user functions*
 - Application control functions:
These functions are needed to control the application by the exchange of messages between the end user and the content provider via the service provider. They differ from retrieval service to retrieval service and will therefore not be described on this level.
 - Network control functions:
These functions are needed to control the network by the exchange of messages between the end user and the service provider. They also differ from retrieval service to retrieval service and will therefore not be described on this level.
 - Information handling functions, e.g.:
 - Access control functions:
These functions are related to security aspects, e.g. needed to ensure authentication and authorization.
 - Information conversion.
 - Information encoding and decoding.
 - Information encryption and decryption.
 - Data stream termination functions, e.g.:
 - ATM termination (if applicable).
 - MPEG-2 transport stream termination (if applicable).
 - Error correction handling.
- *Access functions*
 - End user interface termination function.
 - Transport interface termination function.
 - Access bearer handling.
 - Bearer channel concentration.
 - Signalling and packet information multiplexing/demultiplexing.
 - Circuit emulation for the ATM transport.
 - Multiplexing/demultiplexing.
 - Cross-connect function including grooming and configuration.
- *Transport functions*
 - Point-to-point transport of bearer information (user information).
 - Point-to-point transport of protocol information for signalling.
 - Point-to-point transport of protocol information for operation and maintenance.
 - Network control functions.
- *Service provider selection functions*
 - Termination of network control functions.
 - Selection of service provider.
 - Navigation functions related to the service provider.
- *Service provider functions*
 - Content selection functions.
 - Broker functions.
 - Billing functions.
 - Navigation functions related to the content server, including Directory services.

- *Content server functions*

- Application preparation and storage.
- Termination of application control functions.

NOTE 2 – The Servers from which content is loaded onto the Content Server Functions as well as the network through which this process is carried out is outside the scope of this Recommendation.

These functional groups are separated by reference points. The definition and description of the reference points is for further study.

3 The video-on-demand service

VOD is an interactive multimedia retrieval service providing residential and business users individual access from their home or workplace to a remote library of recorded video programs for entertainment, distance learning, remote education and training, information, etc. The features of VOD can be compared with renting a film from the local video store, watching the video using a Video Cassette Recorder (VCR), and controlling the presentation of the video by functions similar to those of a VCR.

4 The reference configuration and its functional elements

Two examples of reference configurations, one with and one without Intelligent Network (IN), and the functions of their major elements for VOD are given. Those reference configurations (Figures 2 and 3) are derived from the general reference configuration in Figure 1. These network functions could, with possibly necessary amendments, also support other residential and business multimedia services/applications such as Advanced Pay Per View (APPV), Games, Home Shopping, Joint Editing, Multimedia Mail, Targeted Advertisement, Interactive Distant Learning, etc.

This Recommendation addresses a two-level selection mechanism in order to retrieve information content. However, this does not imply that the two-level selection should be used always.

Different scenarios for VOD provision are possible depending on Level 1 and Level 2 selection functionality and on the degree of IN integration in a B-ISDN environment as follows:

- without the support of IN;
- IN provides only authentication and address information of Gateways and Servers;
- IN provides access to and use of Intelligent Peripheral (IP) with Specialized Resource Function (SRF) at Level 1 selection;
- IN provides Specialized Resource Function (SRF) at Level 2 selection.

It is also assumed that Intelligent Network (IN) functions (Figure 3) that encompass Broadband ISDN requirements are used as a target solution; i.e. in Figure 3, the IN functional elements SCP, IP, SCF, SRF, etc. cover besides N-ISDN also B-ISDN requirements. Besides other functionalities, the IN may provide Level 1 selection functionality for the Service Provider Selection for multimedia services/applications. As an evolutionary step and in particular in smaller networks, VOD may also be implemented without the support of IN (Figure 2).

These reference configurations also contain Network Management System functions (TMN).

The reference configurations given indicate Reference Points (RPs) between the functional elements. These are used to identify the physical interfaces and logical interrelations between the network elements of the VOD delivery system.

The reference configuration presented in Figure 3 is intended as a solution in which ATM transport functions are used throughout the network. The evolutionary path to implement this reference configuration may be done in stages by using sub-configurations of this reference configuration (see, for example, subclause 4.2 on Access Network).



The reference configurations for VOD are represented by four major functional areas named as follows:

- Customer Premises Equipment Functions (CPE).
- Access Network Functions (ACCESS).
- ATM Core Network Functions (ATM CORE).
- VOD Server System Functions.

The functional elements of these four areas and their functionality are described in detail in the following subclauses. A further description of the IN Functional Entities realized in the functional elements of the VOD delivery system is provided in Annex A.

The selection mechanism provided by the VOD Service to the user to select the information to be retrieved is a two-level selection mechanism: Level 1 offers the selection of the service provider (e.g. Level 1 gateway), and Level 2 offers the selection of the VOD content, i.e. of the video program, within a service provider's domain. This two-level selection mechanism is reflected in the VOD reference configuration by two individual functional elements of the VOD delivery system, one for the Level 1 selection: the Service Provider Selection [may be provided by the network operator in the ATM core network functional area or by a separate service providers' broker (or possibly also a service provider)] and another for the Level 2 selection: the Content Selection (provided by the service provider in the VOD server system). This two-level selection mechanism is also reflected in the description of the functional interactions in clause 7.

4.1 Customer premises equipment functions

The functional area Customers Premises Equipment Functions (CPE) includes in the described scenario the functions of devices at the customer's (user's) home used to provide VOD. The functions of the CPE for VOD include the functions of **Set Top Box (STB)** and functions of the **Terminal Equipment (TE)**. The TE, in the case of VOD in the residential environment, may be a TV set. The TE may also include existing equipment such as Work Stations, Personal Computer (PC), Telephone, etc., for VOD and/or other services.

The **STB** functions present to the user various forms of menus and selection objects, and other typical graphical user interfaces. They contain the necessary hardware and software functions to provide VOD services in the home. The STB acts as an interface and an adaptation unit between the NT and the TE.

The STB functions provide the platform on which the service's user application runs, and the infrastructure for user applications to offer sophisticated user interfaces.

If the STB does not contain the procedures needed for control of selection processes and applications, the relevant software may be downloaded by an "STB Server" [in Figure 2 as part of the Service Related Control and in Figure 3 as part of the Intelligent Peripheral (IP)] and/or the Content Selection as part of the VOD Server System.

Depending on the functional scenario, the STB may support a basic and partly optional set of features, as shown in Appendix I. The list of functions is not exhaustive and is provided as a basis for further study of network capabilities to support VOD.

4.2 Access network functions

The Access Network Functions (ANF) support the physical interconnection and information transport of video streams (e.g. 1.544-8 Mbit/s), and of signalling and interactive data and control bit streams between the CPE and the ATM Core Network (ATM node). Dependent on the different access media and topologies used, different access functions have to be provided.

In the long term, network operators will preferably implement all-fibre access networks. But in the short term, the introduction of VOD will be primarily based on existing and upgraded access infrastructures using different transmission media.

The long-term and target solution will use ATM from the ATM core network till the CPE. But as evolutionary steps and as interim solutions, ATM may also be terminated in the AU of the access network.