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SERVICES

Audiovisual services

**Service description and requirements for
audiovisual on-demand services**

ITU-T Recommendation F.741

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ITU-T Recommendation F.741

Service description and requirements for audiovisual on-demand services

Summary

Audiovisual on-demand services are one class of the generic multimedia services identified in ITU-T Rec. F.700. Following the methodology proposed in ITU-T Rec. F.701, this Recommendation describes the functional model, application scenarios, a variety of requirements, and interworking and interoperation of the audiovisual on-demand services.

Source

ITU-T Recommendation F.741 was approved on 13 September 2005 by ITU-T Study Group 16 (2005-2008) under the ITU-T Recommendation A.8 procedure.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. 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 Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 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

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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As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

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ITU-T Recommendation F.741

Service description and requirements for audiovisual on-demand services

1 Scope

This Recommendation describes the audiovisual on-demand services and defines the functional model and application scenarios. Based on these descriptions, it gives the requirements for services, managements, etc.

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; 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. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

2.1 Normative references

None.

2.2 Informative references

- ITU-T Recommendation F.700 (2000), *Framework Recommendation for multimedia services*.
- ITU-T Recommendation F.701 (2000), *Guideline Recommendation for identifying multimedia service requirements*.
- ITU-T Recommendation F.740 (1993), *Audiovisual interactive services*.
- ITU-T H-series Recommendations – Supplement 1 (1999), *Application profile – Sign language and lip-reading real-time conversation using low bit-rate video communication*.

3 Definitions

This Recommendation defines the following terms:

3.1 authentication and authorization: Authentication and authorization refers to validating the identities of users who want to use the services and authorizing the legal users to prevent unauthorized access to the services.

3.2 audiovisual multicasting: When users request the same content at the same time, the audiovisual on-demand services platform lists them in the same multicasting group. The platform sends the requested content media streams to that multicasting group, the users within the same group then may receive the same requested contents.

3.3 audiovisual on-demand services: A kind of network-delivered service that offers the functionality of the home VCR (as play only) without having a need to get a copy of the chosen material.

3.4 audiovisual on-demand services platform: The application environment which supplies audiovisual on-demand services to users.

3.5 audiovisual on-demand presented: One value-added service supplied by the audiovisual on-demand services platform. The person who consumes the content is not the person who requests it. The person who requests the content (as a gift to the viewer) pays for it instead of the person who consumes it.

3.6 download services: Users store the chosen contents in their terminals by downloading them from service platforms in order to play them at any time they like.

3.7 electronic program guide (EPG): Electronic program guide is the assistance tool which helps users to look up the contents they want. It is a kind of metadata of contents which usually consists of program name, program provider, language used by program, etc. Service provider can determine the information the EPG delivers.

3.8 near VoD: Near VoD is a special multicast application that improves the availability of video information, without requiring a dedicated point-to-point connection to each viewer.

3.9 information resources retrieval: It is the retrieval for contents by finding related contents based on the keywords such as, content titles, authors, schedules or actors names.

3.10 uniform service portal: A portal which provides all the users with audiovisual on-demand services information such as authentication and contents retrieval information.

3.11 VCR functions: The functionalities of video cassette recorder, such as select/cancel, start, stop, pause (with or without freeze frame), fast forward, reverse, scan forward or reverse (both with image), and setting and resetting memory marks.

4 Abbreviations

This Recommendation uses the following abbreviations:

CP	Content Provider
DRM	Digital Right Management
EPG	Electronic Program Guide
IPTV	Internet Protocol Television
PDA	Personal Digital Assistant
QoS	Quality of Service
SP	Service Provider
STB	Set Top Box
VCR	Video Cassette Recorder
VoD	Video on Demand

5 Conventions

In this Recommendation the following conventions are used:

- "shall" indicates a mandatory requirement.
- "should" indicates a suggested but optional course of action.
- "may" indicates an optional course of action rather than a recommendation that something take place.

6 Prose description

Audiovisual on-demand services involve asymmetric interactive multimedia communications between users and machines (audiovisual resources) which may provide users with audiovisual information from all around the world, at any time, through telecommunication networks. Users can find the information needed with the assistance of a navigation subsystem. The audiovisual on-demand services platform sends contents information with some grade of guaranteed QoS after the users have chosen the service mode. Users can then use VCR-like functionalities to view the received information.

The contents provided by the audiovisual on-demand services platform may be textual, aural, graphical or imagery, or video information. Media resources may be stored at any locations on the networks. Audiovisual on-demand services platform integrates media resources, performs DRM and provides navigation service and content delivery through telecommunication networks.

Users may use audiovisual on-demand services at fixed or mobile locations, such as at homes, offices, or on moving trains. Users should be able to access broadband network environment with streaming media communication capabilities to get audiovisual on-demand service applications using PC, STB plus TV set, mobile phone, PDA or other equipment.

7 Functional model of audiovisual on-demand services

7.1 Functional model

Audiovisual on-demand services may provide information contents stored at different locations of networks to users by managing and integrating information resources. Audiovisual on-demand services may provide content navigation and retrieval service, provide local caching for remote information resources, and have authentication and accounting functions and security mechanisms. Audiovisual on-demand services may provide IPTV, VoD, Near VoD and download services to users. The functional model of audiovisual on-demand services system is shown in Figure 1.

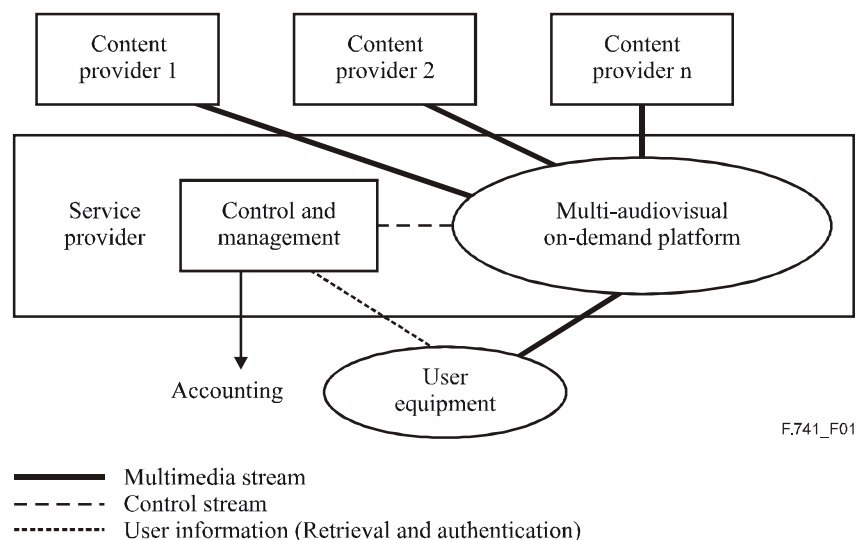


Figure 1/F.741 – Functional model of audiovisual on-demand services system

An audiovisual on-demand services system is made of content providers, service providers (control and management system and multi-audiovisual on-demand service providers) and end users.

The control and management system provides the following operational support functions for audiovisual on-demand services:

- Operational support: it refers to user management, authentication and authorization, accounting and charging management functions;
- Service support: it refers to navigation, ordering contents, resources management, DRM and multicast control functions;
- Network support: it refers to functions such as device management, optimization policy, system maintenance and network security.

Multi-audiovisual on-demand services provide three modes of services: point-to-point unicasting services, point-to-multipoint multicasting services and download services. Using any one of these three modes of services, users can retrieve the desired contents and get related services. Because the techniques used for these three services modes are different, they may have different features:

- Point-to-point unicasting services: It takes client/server point-to-point configuration, such as VoD services. Each user has a unicasting media streaming. This mode of services supports VCR-like functionalities such as play, pause, replay, fast forward and fast reverse.
- Point-to-multipoint multicasting services: It takes point-to-multipoint configuration. The services platform multicasts media streams to a multicasting group based on users' requests. Users who are in the multicasting group receive the same media streams. This mode of services does not support VCR-like functionalities, but users can exit from the multicasting group during the use of the services.
- Download services: A kind of service which provides contents to users by downloading and storing. It may use distributed storage methods and multipoint download techniques to avoid a server bottleneck resulting from multiple pieces of content downloading at the same time.
- Service providers may provide all kinds of value-added services, such as audiovisual on-demand as a gift, gaming or pre-ordered contents.

7.2 Participants

Participants of audiovisual on-demand services have the following three main roles as shown in Figure 1:

- Content Providers (CP): CP refers to the owner of information resources. They may be issuers of music, movies, live programs or common information resources (such as museums and public libraries). Generally speaking, content providers provide contents lists and information contents through networks or other paths to service providers, for users' retrieval and request at any time.
- Service Providers (SP): SP provides information navigation and retrieval windows and requested contents information to users, and takes charge of security authentication and accounting of the whole system, network resources management and maintains management functions.
- End users: End users are audiovisual on-demand services requesters and content information consumers, who pay for the services they get.

8 Description of audiovisual on-demand service application scenarios

8.1 Point-to-point unicasting applications

Users can request contents through an electronic program guide or contents retrieval, according to their needs, anytime and anywhere. They can use VCR-like functionalities, such as fast-forward, fast-reverse and pause, to control the receipt of the contents. The information resources are general

stored contents. The users' locations may be fixed or mobile. The following shows a typical case of a point-to-point unicasting application.

User A is a tour guide who needs to learn something about the historical, natural and cultural knowledge of certain countries around the world. Most of the time, he obtains such knowledge with the assistance of audiovisual on-demand services and by watching the related information from audiovisual resources. He is able to view such topics as news of current affairs, scenes of natural beauty, nature and films or movies about the culture. The following week, he will be taking a group of people to visit Europe. The application scenario is as follows:

Step 1: User A turns on his PC, makes a connection to an SP through a telecommunication network at his office. User A wants to request one short program introducing the landscape of his destination. He begins by selecting the name of the program, the language he prefers and indicating whether or not he would like to have the text synchronized with the video.

Step 2: After he sends the request command to the SP, the SP prompts him to authenticate. As soon as he passes the authentication he can receive the film with high QoS.

Step 3: While watching the film, he receives a telephone call. So he presses the pause button and stops the transmission whilst he answers the phone. After a few minutes, he resumes watching. But he has forgotten the last part of the content before the phone call. He decides to reverse the content to review the portion he forgot, and resumes watching from where he paused.

Step 4: After he finishes watching the requested content, User A requests an old film. Because he does not exit from the SP, he may request the new film without again having to authenticate himself. The SP assigns a media server nearest to him to provide media streaming to him.

Step 5: User A needs to go outside before he finishes watching the whole film. He sends a request to the SP and asks to roam to his multimedia mobile phone in order to continue to watch the rest of the film. As soon as the film ends, User A exits from the SP.

Step 6: User A returns to his office, he accesses the original SP again. He finds another interesting program on another SP through the navigation system. He requests that program. The second SP prompts him to authenticate. After he passes the authentication, he gets the authorization to request the program with the accounting function performed between the two SPs.

Step 7: While he is waiting for the requested film, he receives some advertisements from the SP before the film. Then he receives the content and watches it. User A exits from the system after he finishes watching the film.

8.2 Point-to-multipoint multicasting applications

IPTV and Near VoD take a point-to-multipoint multicasting configuration. For IPTV applications, contents are multicast or broadcast in fixed-time and fixed-channel (multicasting IP address). While users use IPTV applications, they can view that content by joining that channel at broadcasting time. For Near VoD applications, service providers decide to open channels according to users' requests. The information resources of multicasting contents may be real-time contents or stored contents with authorization. The following describes a multicasting application scenario:

Step 1: User A often watches the programs broadcast on one particular IPTV channel in the evening. One evening he decides to watch some programs from audiovisual on-demand services providers. He makes a connection to an SP. After he passes authentication, he chooses the "Today's News" channel and begins to watch this program on his terminal. Because User A is learning English, and because "Today's News" is in Chinese, he chooses to have the text in English with the video shown on the screen.

Step 2: User A sits on his sofa watching the news just the same way as he watches the news in front of a TV set.

Step 3: User A has a habit of watching the programs introductions, and hopping between the channels. He finds there will be a live football match on another channel within a few minutes. He switches to that channel. Because the football match will only begin in a few minutes, he switches back to the news channel again.

Step 4: User A wants to watch two programs at the same time, so he sends a request to the SP to watch the second channel with the football match and divides the screen into two parts. He may watch two programs on one screen at the same time. However, if he wants to watch one of them clearly, he clicks the window of that program and turns it into the whole screen. If he is interested in more programs at the same time, he can request the information from several channels provided by the audiovisual on-demand services, and watch several programs at the same time.

Step 5: The next day, one of user A's colleagues tells him that there is a videoconference on intellectual property rights. User A is interested in it, so he requests to listen to the live videoconference through an SP which connects to a videoconference services platform.

Step 6: The videoconference ends, User A exits and disconnects from the service provider.

8.3 Audiovisual download and value-added services

To protect the digital copyright of information resources, they should be encrypted. Audiovisual on-demand value-added services include audiovisual pre-ordering, audiovisual on-demand as a gift service, etc. The initiators and consumers of services may be the same persons or different persons. The scenario is as follows:

Step 1: User A is on vacation. He turns on his PC and finds an e-mail notice from an audiovisual on-demand services provider saying that "Your friend "XX" has ordered a film "XXXX" for you, the password is XXXXXXXX. Hope you enjoy it. If you want to get it now, please click on its name." User A wants to continue to read other e-mails, so he does not click immediately.

Step 2: After User A exits from his e-mail system, he clicks on the film's name shown on a moving bar and enters the password to watch the film after he finishes reading the notice with the film.

Step 3: The film his friend ordered for him is one of a series of films. He is very interested in it, so he searches for the next one of the series while he is watching the first one. He chooses the next film on the list of films and selects to receive it in download mode. The SP prompts him to authenticate. After user A passes the authentication, he gets the security key to the film. User A downloads that film while he is watching the first film.

Step 4: User A orders a new film from EPG and hopes to watch it in the evening. He opens a pre-order window and enters the content name, play time, etc.

Step 5: He wishes to send this new film to his friend as a present. So he chooses audiovisual on-demand presentation services to order the new film for his friend. He directly enters the film name together with his friend's e-mail address and pays for the gift content, since he has already passed the authentication. User A exits from the SP.

9 Requirements for audiovisual on-demand services

9.1 Requirements for services

To realize the applications scenarios described in clause 8, their services requirements include the following:

- 1) To provide flexible requesting modes, including requesting on-demand, multicasting and download.
- 2) To provide EPG and program introductions, allowing customized services of program contents ordering and retrieval.

- 3) To provide the roaming of the media streaming between different terminals of one user.
- 4) To have control capabilities to achieve VCR-like functionalities.
- 5) SP may provide value-added services e.g., content as a gift.
- 6) To provide insertion of advertisements.
- 7) To provide the interoperation and internetworking with other services.

9.2 Requirements for management

To ensure QoS and protect the copyrights of digital contents, the following requirements for management should be met:

- 1) Audiovisual on-demand service providers can order contents from contents providers online or offline.
- 2) There should be a reasonable mechanism to optimize contents caching and load balancing.
- 3) There should be methods to manage terminals.
- 4) There should be some methods for managing network security.

9.3 Requirements for navigation

An audiovisual on-demand services platform should provide a uniform services portal and an EPG and provide searching functions based on key words entered. An EPG should include the program name and audio and text synchronized with the video in different languages.

9.4 Requirements for security authentication

An SP should provide authentication services to users. Only users who receive authorization can use audiovisual on-demand services in order to ensure effective accounting and to prevent illegal users from accessing the audiovisual on-demand services. An SP also should be able to prevent the audiovisual on-demand services from illegal malicious attack.

The audiovisual on-demand services may support the mobility of users terminals. A user can get authorization as long as he/she enters his/her personal registration number at any location on any terminal.

9.5 Requirements for accounting

Accounting for users includes two parts. One part is for content providers who provide contents to users, and the other part is for service providers who provide services to users.

An SP should have reasonable distribution policies that enable charging users to ensure the content providers' profit, and use scientific accounting policies to ensure that users are fairly charged for the services and content they use.

Accounting and charge settlement is essential for the interoperation between an SP and other service and content providers. To support the efficient operation of sharing audiovisual on-demand services, SPs should provide reasonable accounting services between different service providers and should be able to offer different accounting and pricing policies to users.

9.6 Requirements for QoS

The QoS of audiovisual on-demand services is mainly determined by the quality of media devices, system storage policies, edge pre-caching and optimization, media compression techniques, etc. Cooperation between the network environments and services environments affects the QoS too. The control and management capability for multicasting services is also an important factor to QoS. The requirements for services are:

- Clear and fluent picture effect.

- The same viewing method as that of TV.
- Ease of operation and ease and speediness of the channel switchover.

The main parameters of QoS are quality of audiovisual media, response time, speed of program switchover, response capability of interactive operation, controlling multicasting period, etc.

9.7 Requirements for DRM

To ensure the content providers profit, an SP should employ necessary DRM mechanisms for the resources of content providers and save the authorization information of agreements between participants, distribute security keys and send the necessary information for using resources each time.

The resources of content providers may be filtered according to the service provider's policy.

10 Related applications

Audiovisual on-demand services can provide the following related applications:

- Entertainment applications: live broadcasting, movies and TV film series on-demand, Karaoke on-demand and interactive games.
- Monitoring-type applications: Special on-demand contents, regarding e.g., homes, schools and day-care environments.
- Advertisement-type applications: related to general audiovisual advertisement services applications.
- Audiovisual-type applications: museums on net and exhibition of auction goods on net;
- Text-type applications: digital libraries, digital painting and calligraphy, etc.
- Educational-type applications: distance learning, telemedicine, etc.
- Electronic commerce: goods exhibitions at electronic shops.

11 Interworking and interoperation

11.1 Interworking and interoperation between different audiovisual on-demand service providers

Many service providers can provide audiovisual on-demand services on the same open telecommunication network with their own access, navigation, authentication and accounting systems. All the service providers can be accessed by all the users equally. Interworking and interoperation between different audiovisual on-demand service providers can use the following methods:

- Users of one audiovisual on-demand service provider can get the services from another audiovisual on-demand service provider. An accounting service should be provided based on the agreements between the two SPs.
- One SP may provide navigation services to users, while another provides the contents.

11.2 Interworking between audiovisual on-demand and audiovisual conferencing systems

For both audiovisual on-demand services and videoconference services handling audiovisual information, most of the time users do not store the information during the videoconference session and cannot watch it after the conference. If the audiovisual on-demand services platform stores the information of the videoconference during the videoconference session, users can request either to join the videoconference during the conference or retrieve it after the videoconference. Because each of these services has its own special characteristics, the necessary conversion functions are as follows:

- Transforming from one encoding format to another.
- Transforming from one transmission protocol to another.
- If audiovisual conference records are to be used as resources for VoD or Near VoD services, the audiovisual on-demand service platform should provide the necessary equipment to store the audiovisual conference information and transform the information formats to suit VoD and Near VoD services requirements.

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