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SERIES F: NON-TELEPHONE TELECOMMUNICATION
SERVICES

Audiovisual services

**Service description and requirements for
distance learning services**

ITU-T Recommendation F.742

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Service description and requirements for distance learning services

Summary

Following the methodology defined in ITU-T Rec. F.701, this Recommendation provides the service description and requirements for distance learning services. This Recommendation is intended to support the multimedia framework for distance learning services.

Source

ITU-T Recommendation F.742 was approved on 13 September 2005 by ITU-T Study Group 16 (2005-2008) under the ITU-T Recommendation A.8 procedure.

FOREWORD

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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.

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ITU-T Recommendation F.742

Service description and requirements for distance learning services

1 Scope

This Recommendation provides the service description and the requirements for distance learning services. This Recommendation is intended to support the multimedia framework for distance learning services.

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.702 (1996), *Multimedia conference services*.
- ITU-T Recommendation F.740 (1993), *Audiovisual interactive services*.
- ITU-T Recommendation F.750 (2005), *Metadata framework*.
- ITU-T H-series Recommendations – Supplement 1 (1999), *Application profile – Sign language and lip-reading real-time conversation using low bit-rate video communication*.
- IEEE 1484.1 (2003), *Learning Technology Systems Architecture (LTSA) – Architecture and Reference Model*.

3 Definitions

This Recommendation defines the following terms:

Terms defined in ITU-T Recs F.700, F.701 and H.323 are used in this Recommendation and listed in this clause for the reader's convenience.

3.1 ad hoc multipoint conference: An ad hoc multipoint conference is a point-to-point conference that is expanded into a multipoint conference at some time during the call. This can be done if one or more of the terminals in the initial point-to-point conference contain a Multipoint Controller (MC), if the call is made using a Gatekeeper that includes MC functionality, or if the initial call is made through an MCU as a multipoint call between only two terminals.

3.2 audiovisual multicasting: When users request the same content at the same time, the audiovisual on-demand services platform list them in the same multicasting group. The system

sends the requested content media streaming to that multicasting group address, then the users within the same group may receive the same requested content.

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

3.4 broadcast conference: A broadcast conference is one in which there is one transmitter of media streams and many receivers. There is no bidirectional transmission of control or media streams. Such conferences may be implemented using network transport multicast facilities, if available.

3.5 broadcast panel conference: A broadcast panel conference is a combination of a multipoint conference and a broadcast conference. In this conference, several terminals are engaged in a multipoint conference, while many other terminals are only receiving the media streams. There is bidirectional transmission between the terminals in the multipoint portion of the conference and no bidirectional transmission between them and the listening terminals.

3.6 centralized multipoint conference: A centralized multipoint conference is one in which all participating terminals communicate in a point-to-point fashion with an MCU. The terminals transmit their control, audio, video, and/or data streams to the MCU. The MC within the MCU centrally manages the conference. The Multipoint Processor (MP) within the MCU processes the audio, video, and/or data streams and returns the processed streams to each terminal.

3.7 decentralized multipoint conference: A decentralized multipoint conference is one in which the participating terminals multicast their audio and video to all other participating terminals without using an MCU. The terminals are responsible for:

- a) Summing the received audio streams; and
- b) Selecting one or more of the received video streams for display.

No audio or video MP is required in this case. The terminals communicate on their H.245 Control Channels with an MC that manages the conference. The data stream is still centrally processed by the Multipoint Communication System (MCS)-MCU that may be within an MP.

3.8 distance learning: Learning experiences and environments distributed over space and time (asynchronous learning). In this Recommendation, it refers to distance learning using telecommunication services over telecommunication networks.

3.9 distance learning services platform (DLSP): A collection of multimedia service systems with an integrated management system, an integrated authentication, authorization and accounting system to support part or all kinds of distance learning services.

3.10 hybrid multipoint conference – centralized audio: A hybrid multipoint – centralized audio conference is one in which terminals multicast their video to other participating terminals and unicast their audio to the MP for mixing. The MP returns a mixed audio stream to each terminal.

3.11 hybrid multipoint conference – centralized video: A hybrid multipoint – centralized videoconference is one in which terminals multicast their audio to other participating terminals and unicast their video to the MP for switching or mixing. The MP returns a video stream to each terminal.

3.12 individual instruction: A form of distance learning in which a teacher (or another learner) explains or answers the questions asked by a learner located at a different place through telecommunication networks.

3.13 mixed multipoint conference: A mixed multipoint conference (see Figure 1) has some terminals (D, E and F) participating in a centralized mode while other terminals (A, B and C) are participating in a decentralized mode. A terminal is not aware of the mixed nature of the

conference, only of the type of conference it is participating in. The MCU provides the bridge between the two types of conferences.

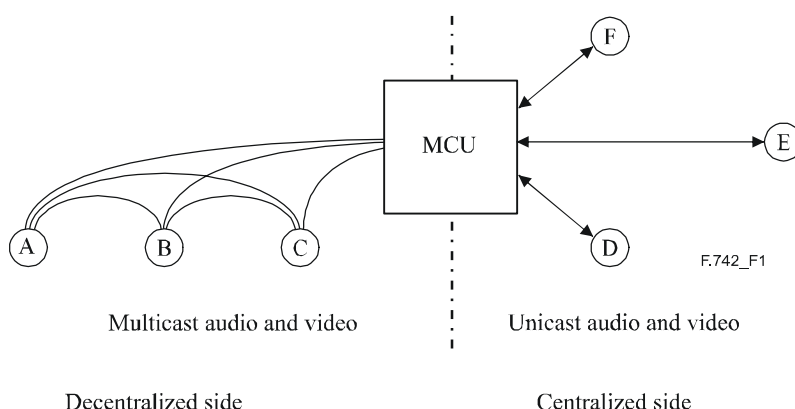


Figure 1/F.742 – Mixed multipoint conference

3.14 multimedia services: Multimedia services are telecommunication services that handle two or more types of media in a synchronized way from the user's point of view. A multimedia service may involve multiple parties, multiple connections, and the addition or deletion of resources and users within a single communication session.

3.15 multi-role learning/team learning: Learners (of the collective learner entity) operating as a team in which learners have different roles.

3.16 self-pacing learning: A form of distance learning in which learners find a solution to a question given by a teacher, or others, by searching information related to the question from learning resources, analysing the information and giving solutions to the question with or without the help of others.

3.17 teaching-centred: A form of distance learning in which the main role is a teacher. Learners located at separate places learn by listening to or watching the courses given by the teacher with or without interaction between the learners and the teacher during the course.

3.18 videoconference service: An audiovisual conference service providing bidirectional real-time transfer of voice, motion video and real-time text between groups of users in two or more separate locations. Although the audio and motion video information are the essential part of the service, other types of information, such as high resolution still pictures or graphics may also be exchanged.

3.19 videophone service: An audiovisual conversational service providing bidirectional symmetric real-time transfer of voice, motion video and real-time text between two locations. The minimum requirement is that, under normal conditions, the picture information transmitted is sufficient for the adequate representation of fluid movement of a person displayed in head and shoulder view.

4 Abbreviations

This Recommendation uses the following abbreviations:

AVoD	Audiovisual on-Demand
BBS	Bulletin Board System
DL	Distance Learning
DLSP	Distance Learning Services Platform

DRM	Digital Right Management
MCU	Multipoint Control Unit
PC	Personal Computer
PDA	Personal Digital Assistance
PSTN	Public Switched Telephone Network
STU	Set Top Unit
TV	Television

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

Distance learning involves interactive and non-interactive multimedia communications between learners and learning resources located at two or more separate locations. The aims of learners who use distance learning services may be to get some degree certificates based on the degree standards, to get training given by employers, or to learn special knowledge independently. The distance learning services may be teaching-centred learning services that are similar to traditional face-to-face classroom learning, individual instruction, self-pacing learning, multi-role learning/team learning, etc.

In the course of distance learning, information may be required from remote databases containing the learning resources, or from live lectures. The material may be textual, aural, graphical, or video in nature and may be stored in a multimedia format. The information can be delivered in point-to-point configuration, point-to-multipoint or multipoint-to-multipoint configuration.

Participants in the distance learning may be located in classrooms equipped with related facilities, offices, homes or other places, such as on trains, where they are able to access to a distance learning services platform. Learners may learn in real-time with or without interaction with others, following a curriculum schedule or in non-real-time by themselves on demand. The equipment that learners use may be a PC, PDA, mobile phone, or even a TV set with STU. Learners can change their equipment without interruption while they are learning, with the assistance of a DLSP.

7 The functional model of distance learning services

The structure of distance learning services system is shown in Figure 2. It is composed of learning resources, DLSP and learners. Learners get learning materials from learning resources through a distance learning services platform.

The learning resources include live courses given by teachers (visual classroom), the digital video records of live courses stored in servers, courseware produced by special software developers based on the courses material given by teachers, digital knowledge (visual library, visual laboratory), digital news, etc. The networks which deliver the learning resources between learners and DLSP, between learning resources and DLSP may be IP-based networks, satellite communication networks, mobile communication networks, PSTN, etc.

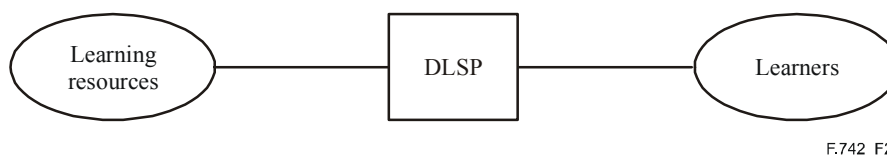


Figure 2/F.742 – Structure of distance learning services system

This Recommendation focuses on the application scenario descriptions of distance learning services and requirements for distance learning services. The descriptions of network layer and access layer are outside the scope of this Recommendation. The applications related to teaching activities, courseware making, teaching management, etc. are not discussed in this Recommendation.

8 Applications

8.1 Consumer/residential applications

Consumer/residential applications include the following.

8.1.1 Real-time interactive distance learning applications

- 1) Formal degree learning applications: Consumers may obtain a formal degree by attending virtual face-to-face classroom lessons as defined by applicable organizations responsible for these qualifications.
- 2) Students/consumers temporarily attending a formal virtual face-to-face classroom-based education when they cannot go to their classrooms because of illness or other reasons. Students who attend virtual face-to-face classroom-based education can observe and participate in the same lectures with their classmates at the same time but from a distant location.
- 3) Attending public lectures given by famous people: Consumers/students can attend scheduled, public lectures given by famous people when they cannot go to the speakers' location because of limited seating, or because of long distance travel limitations.
- 4) Real-time individual instruction: A consumer/student may pose questions to a teacher or other individual and that person answers from the distant location in virtual face-to-face mode, using either visual, auditory or real-time text methods.
- 5) Real-time multi-role learning/team learning: A group of consumers located in different places learn by themselves through audio and visual discussion, or by real-time text.
- 6) Real-time quiz or exams: Consumers electronically attend quizzes or exams given by universities or public institutions at home or in special places. They receive quiz items or exam items and answer them electronically during virtual face-to-face sessions, or at the end of term.

8.1.2 Real-time non-interactive distance learning applications

- 1) Formal degree learning applications: Consumers/students can obtain formal degrees by remotely attending virtual face-to-face classroom lessons by watching only as authorized by recognized formal institutions.
- 2) Temporarily attending formal face-to-face classroom-based education to avoid missing lectures because of illness or other reasons: Consumers who cannot physically attend normal face-to-face classroom-based education can observe the same lectures with their classmates at the same time by watching only.

- 3) Attending public lectures given by famous people: Consumers can virtually attend public lectures given by famous people at a distance by watching when they cannot go to the speakers' location due to limited seating, or because of long distance travel limitations.

8.1.3 Non-real-time distance learning applications

- 1) Making up missed lectures: Consumers/students can watch recorded lectures stored in a learning resources database. While watching, they can control the recorded lectures using VCR-like commands such as fast forward, reverse, pause and stop.
- 2) Self-pacing: Consumers can remotely search for learning material that they are interested in from video, still image, text, and audio that is stored in learning resource databases on demand. Consumers/students learn by watching the recorded material selected. They can control delivery (fast forward, reverse, pause and stop) of the content. They can also store the selected material in local storage for reviewing later, if permitted.
- 3) Individual instruction: Consumers/students ask questions by sending their questions electronically to the teacher or the other individual who answer later.
- 4) Multi-role learning/team learning: Consumers/students can post different topics on bulletin boards to allow others to give opinions or information on the topics and promote discussion electronically.
- 5) Enrolling in courses: Consumers/Students can enrol in courses electronically.
- 6) Downloading and uploading homework: Consumers/Students can be given homework from the long-distance learning resources after the class, and hand in the homework electronically.
- 7) Downloading learning materials: Consumers/Students download reference learning materials in video, still image, text, or audio form and can store it in their local storage for reference as desired.

8.2 Business/institutional applications

- 1) Team cooperation: A group of employees within one company located in different places can discuss the same topic or finish (for example co-design) the same project as if they were located in one place. During this cooperation they can see, hear, text, and co-design in real-time.
- 2) Employee training: When a company recruits new employees, they may need to learn, e.g., the procedures of the company, the services the company provides, its scope, and possibly to acquire technical knowledge as well. Employees accomplish this by attending lectures in virtual face-to-face classrooms; by watching prepared material; and by reading the learning materials stored in a digital library.
- 3) Universities provide formal degree education: Universities can provide formal degree education to students by providing virtual classrooms with a Q&A environment, digital libraries, and virtual campuses. Universities can provide on-line, curriculum management, administration management, facilities for teachers to design courses and create lectures for future use.
- 4) Social organizations provide services to the public: Social organizations provide relevant knowledge to the public through virtual classrooms and/or stored materials in learning resources.
- 5) Customer care applications: Questions from customers on how to use products and services can be handled by providing virtual classroom teaching with tutorials, providing Q&A materials about their goods in video, audio, text, still image form, etc., and storing them on servers for easy access.

9 Application scenarios

Distance learning applications include real-time and non-real-time applications. They can also be divided into four models: Teaching-centred, individual instruction, team learning, and self-pacing learning applications.

9.1 Real-time distance learning applications

Real-time distance learning applications include real-time interactive learning applications and real-time non-interactive learning applications.

9.1.1 Real-time interactive distance learning applications

Real-time interactive distance learning applications include real-time interactive teacher-centred learning, real-time interactive one-to-one individual instruction, and real-time interactive team learning.

Case 1: Real-time interactive teaching-centred distance learning applications

Real-time interactive teaching-centred distance learning applications are similar to the non-electronic, traditional face-to-face classroom education except that the teacher and learners are located at different places. The teacher may give lectures in a classroom, an office, during a journey, or even from home. The steps are as follows:

Step 1: The learners and the teacher receive the curriculum schedule in advance with the assistance of DLSP. Before the lecture begins, the teacher and the learners register to attend the lecture or course on the videoconference service system. The videoconference system sets up a multipoint videoconference environment between the teacher and learners located in two or more places. If some learners who do not have interactive terminals want to attend the course by only watching the lecture, they can request to attend the lecture by joining the videoconference as receivers only. For them, the environment becomes a broadcast panel conference. Some learners may be students from abroad, or from different provinces with different dialects, or are not able to hear or understand the audio version of the language used by the teacher. They can request translation into text and/or appropriate audio in the language they want and have the translated text and/or audio synchronized with the speaker's video shown on their screens.

Step 2: The teacher begins the lecture and the learners receive the data in either one or other combinations of video, audio or text in their respective locations.

Step 3: If one learner within a multipoint videoconference wishes to ask a question, he may do so by sending a request command to the teacher.

Step 4: If the teacher agrees that the learner may ask questions, then the teacher controls the system to let all the other learners see or listen to that particular learner asking the questions.

Step 5: After the teacher answers that learner's questions the teacher can control the system to return to the teacher-centred lecture.

Step 6: If the teacher wants to show the learners certain information (in text, image, audio or video), the teacher may draw it on a blackboard, hold up an image or obtain stored information from audiovisual on-demand service systems, or Web-based service systems. At the same time, the learners may get the information from the teacher or obtain it directly from the same learning resources. Learners can see both the teacher and the downloaded information on one screen, or the information can be divided into separate boxes on the same screen, or two different screens could be utilized.

Step 7: At anytime the teacher may assign homework to the learners and permit them to hand in their homework electronically. Students can do their homework online after the lecture, or at anytime, at the instruction of the teacher.

Step 8: The teacher can stop the lecture and has the control to close the videoconference and disconnect the learners.

Case 2: Individual instruction

This case is similar to case 1, except that interactions are between an individual learner and a teacher. If the learner has a question to ask to the teacher, the learner proceeds as follows:

Step 1: The learner connects to a DLSP and makes a connection with the teacher using a videoconference services system.

Step 2: The learner asks the questions and the teacher answers. If the learner and the teacher use different languages, the DLSP takes charge of translation between them and providing text synchronized with the speaker's video on the screen.

Step 3: During this process, either one or the other may obtain assistance information from learning resources using an audiovisual on-demand service system or Web-based service system. The information they obtain may be in different languages, with or without text synchronized with the video.

Step 4: If both of them are not able to find a solution to the problem, they can invite others to join in their discussion by setting up an ad hoc videoconference connection amongst themselves, in which case, it will become a team learning case.

Step 5: After they finish the communication, they close the connection(s).

Case 3: Team learning

This case is similar to case 2, except that the interactions are between a team of participants. In this case, a participant may have multiple roles. In other words, sometimes a participant's role may be that of a teacher and other times, that of a learner. The communication environment should be an interactive conference service system (centralized multipoint conference, decentralized multipoint conference, mixed multipoint conference) plus an audiovisual on-demand service system and or a Web-based service system. If the learners and the teacher use different languages, the DLSP takes charge of translation between them and providing text synchronized with the speaker's video on the screens.

9.1.2 Real-time non-interactive distance learning applications

Real-time non-interactive distance learning applications is a kind of teaching-centred distance learning. In this situation, the learners are located at different places but the learners are not able to interact with the teacher during the course. The steps are as follows:

Step 1: According to the curriculum schedule, the learners make connections with the teacher and receive the course from the teacher using a broadcast conference service system, or they have joined a broadcasting group to receive courses from the teacher using an audiovisual multicasting service system. If the learners and the teacher use different languages, a DLSP takes charge of translation between them and providing text synchronized with the speaker's video on the screens.

Step 2: The teacher teaches as if in traditional classroom except that there is no interaction between the learners and the teacher. During the course, the teacher may show the learners some information by drawing or obtaining it from learning resources stored in an audiovisual on-demand service system or Web-based service system. The information the teacher obtains may be in a different language with or without text synchronized with the video.

Step 3: The teacher closes the class, and the learners are disconnected from the broadcasting videoconference service system and/or exit the broadcasting group of the audiovisual multicasting service system.

9.2 Non-real-time distance learning applications

Non-real-time distance learning applications include asynchronous teaching-centred distance learning, individual instruction and team learning, self-pacing learning applications.

Case 1: Teaching-centred

When a learner cannot attend a class according to the curriculum schedule for various reasons, the learner may, at a later date, obtain that course at any time if it is stored in a learning resource using an audiovisual on-demand service system. In this case, the learner cannot interact with the teacher in real time. However, the learner can send questions to the Web-based service system and get answers at a later time. The learner can send control commands, such as fast forward, reverse, pause and stop. The steps are as follows:

Step 1: A learner who wants to learn a special course searches the learning resource with the assistance of the navigation system (by use of metadata) of an audiovisual on-demand service system or audiovisual multicasting services system. He can choose the language to be used with or without text synchronized with the video and he can choose to have sign language.

Step 2: After the learner finds the lecture, the navigation system sends the address of the learning resource in which the lecture is stored.

Step 3: The learner receives the multimedia lecture information and learns by watching received information.

Step 4: When the learner learns by watching received information, the learner can send commands such as pause, forward, reverse and stop, on demand. The learner can also send questions to the systems.

Step 5: The lecture ends, the learner exits the system.

Case 2: Individual instruction and team learning

When the learners and teachers are not able to or do not want to do real-time individual instruction, they can use a Bulletin Board System (BBS) or e-mail systems for individual instruction and team learning.

Case 3: Self-pacing

When a person is seeking a solution to a particular problem or he wishes to acquire some special knowledge, he can do so by using an audiovisual on-demand service system, audiovisual multicasting service system or Web-based system. The steps are as follows:

Step 1: The learner searches the special learning resources containing information related to his question.

Step 2: The learner downloads certain multimedia information or learns while downloading from learning resources using an audiovisual on-demand service system, audiovisual multicasting service system or Web-based system.

Step 3: After the learner finishes learning, he/she exits the system.

10 Requirements

10.1 General requirements

This clause describes the general requirements for a Distance Learning Services Platform (DLSP).

A DLSP:

- 1) Should combine the functions of a videoconference service system, an audiovisual on-demand service system, and a Web-based service system.

- 2) Should provide uniform authentication and authorization services to end-users, and allow users to employ all kinds of learning materials once the user has passed authentication.
- 3) Should provide real- and non-real-time distance learning services with or without interaction to users, including real- and non-real teacher-centred, individual instruction, self-pacing learning, multi-role learning/team learning services with acceptable QoS.
- 4) Should provide point-to-point, point-to-multipoint and multipoint-to-multipoint services.

10.2 Requirements of users

There are two types of user.

Type One user – Distance Learning Service Provider

The teacher delivers the lessons and contributes to the database. There are users of a DLSP who may be able to update the database with new materials that both teachers and learners can access, but who may not necessarily be able to amend or remove, database material such as administration records, curriculum schedules, student records and permanent learning resources. This type of user can be defined as the Distance Learning Service Provider.

Type Two user – Consumer

Teachers and learners both can use the DLSP in the same way during real-time teacher-centred distance learning applications. They can both be Consumers/learners of DLSP. In this case, the teacher and learners have similar requirements from the DLSP. This type of user can be defined as the Consumer (including learners and teachers).

For Distance Learning Service Providers, a DLSP:

- 1) Should provide various mechanisms to provide all forms of long-distance learning services on demand.
- 2) Should enable the provision of distance-learning services to special groups of consumers, such as a closed user group of registered students of a university.

For Consumers, a DLSP:

- 1) Should allow teachers/learners to access it by using different terminals such as PDA, PC, TV plus STU, and mobile phone.
- 2) Should allow the learners to use distance learning services following curriculum schedules, or on demand.
- 3) Should allow the learners to reuse learning materials: e.g., by storing learning materials locally and by being able to replay them, or share them with others for discussion at a designated time.
- 4) Should allow the learners to use two or more terminals to view a live lecture and other learning materials or to view a live lecture, other students and other learning materials on the same screen with synchronization.
- 5) Should allow the teachers/learners to search curriculum schedules, learning materials and personal information, e.g., consumers' enrollment and course grade information.
- 6) Might allow the teachers/learners to change their terminals while they receive services without obvious interruption of the services, for example, they can change their terminals from PCs to mobile phones.
- 7) Should allow the teachers/learners to control non-real-time learning materials on demand, by means of fast forward, reverse, pause and stop.
- 8) Should allow listening-only learners to participate in interactive distance learning courses.
- 9) Should allow learners to pose questions.

- 10) Should allow learners to choose if they want to use different languages, sign language and text synchronized with video with lip reading requirements as stipulated in Supplement 1 of the H-series Recommendation.

10.3 Naming-related requirements

A DLSP should assign unique identification names to users.

10.4 Navigation-related requirements

A DLSP should provide mechanisms to help users find learning materials or provide course schedules. The information should include the course name, the languages which can be provided in audio and text synchronized with video.

10.5 Synchronization/display-related requirements

A DLSP should provide synchronization/display mechanisms to synchronize several live videos or a live video with sign language, text synchronized with the live video, and pre-stored learning materials.

10.6 Security authentication-related requirements

To protect the security of learning resources and users' information, a DLSP should provide security authentication to users, including consumers and distance learning service providers, using their unique identification names.

10.7 DRM-related requirements

Most learning resources have copyrights. There should be some DRM methods to protect the copyrights of learning resources. The DLSP should also provide means to ensure the security of user information and resources. This includes allowing consumers to store learning material, to use it for a limited duration locally, and to redistribute learning material to several terminals for limited use.

10.8 Accounting-related requirements

According to the different types of applications, there should be different accounting policies, such as accounting for a closed user group, accounting based on usage duration, or accounting based on the courses.

10.9 QoS-related requirements

A DLSP should provide mechanisms to ensure quality of service. For example:

- 1) Video and audio information should be clear and without humanly perceptible asynchronism between audio and video and text.
- 2) Learning material in text shown on terminals should be readable.
- 3) Video information shown on the terminals of the teacher, and the learning materials in video, audio, text, still image, and handwriting on the blackboard should be synchronized.
- 4) The requests for learning material should have a reasonable response time.

11 Implementation notes

Distance learning applications are closely related to videoconference applications, audiovisual on-demand applications, IPTV applications and Web-based applications, but differ in that the aim of the applications is teaching and learning. The information used is related to the learning resources and the learning records, and the participants are teachers and learners.

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