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

Transport of Large Screen Digital Imagery

Transport of Large Screen Digital Imagery (LSDI) applications that employ MPEG-2 encoded HDTV signals

ITU-T Recommendation J.600

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Summary

This Recommendation specifies approaches to the transport of audio, video and data signals, for those Large Screen Digital Imagery (LSDI) applications that employ HDTV signals encoded in conformity with MPEG-2 specifications. It is based on the use of specifications detailed in existing ITU-T Recommendations in the J-series.

Large Screen Digital Imagery is a family of digital imagery systems applicable to programs such as dramas, plays, sporting events, concerts, cultural events, etc., from capture to large screen presentation in high resolution quality in appropriately equipped theatres, halls, and other venues.

Source

ITU-T Recommendation J.600 was approved on 29 June 2004 by ITU-T Study Group 9 (2001-2004) 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.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure e.g. interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

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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.

CONTENTS

Introduction

The Large Screen Digital Imagery (LSDI)[1] service is a major development of a new and important technology that will have a profound effect on all media producers, distributors, and exhibitors, and will result in a proliferation of high-quality, large-screen group presentation facilities.

The LSDI service is made possible by the recent development of large screen, theatre-sized, bright, high-definition digital projectors. That breakthrough, coupled with existing support systems for high-definition television distribution, storage and play-out, allows the implementation of a LSDI service based on the use of high-resolution television systems. The service hinges on the availability of the LSDI venue – a digital theatre, an auditorium, or a place for collective viewing.

Programs delivered to LSDI presentation venues will be in digital form at various quality levels from future very high resolution through HDTV, possibly down to digital SDTV quality. They may include real-time and non-real-time programs such as stage productions, concerts, sporting events, documentaries, cultural and industrial programming.

Those programs may need to be delivered to LSDI presentation venues by satellite, cable, optical fibre, terrestrial broadcasting or via recorded media, in the streaming or in the guaranteed-delivery mode. They will generally be stored on and played-out from servers or other play-out devices placed in the presentation venue.

This Recommendation gathers the specifications present in the J-series of ITU-T Recommendations, applicable to the transport of MPEG-2 encoded HDTV signals to LSDI presentation venues, over the various media that fall in the scope of ITU-T Study Group 9.

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[1] Large Screen Digital Imagery is a family of digital imagery systems applicable to programs such as dramas, plays, sporting events, concerts, cultural events, etc., from capture to large screen presentation in high resolution quality in appropriately equipped theatres, halls, and other venues.

ITU-T Recommendation J.600

Transport of Large Screen Digital Imagery (LSDI) applications that employ MPEG-2 encoded HDTV signals

1 Scope

This Recommendation specifies approaches to the transport of audio, video and data signals, for those LSDI applications that employ HDTV signals, encoded in conformity with MPEG-2 specifications. It is based on the use of specifications given in existing ITU-T Recommendations in the J-series.

2 Normative 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.

– ITU-T Recommendation J.82 (1996), *Transport of MPEG-2 constant bit rate television signals in B-ISDN*.

– ITU-T Recommendation J.83 (1997), *Digital multi-programme systems for television, sound and data services for cable distribution*.

– ITU-T Recommendation J.94 (1998), *Service information for digital broadcasting in cable television systems*.

– ITU-T Recommendation J.111 (1998), *Network independent protocols for interactive systems*.

– ITU-T Recommendation J.112 (1998), *Transmission systems for interactive cable television services*.

– Annex A/J.112 (2001), *Digital Video Broadcasting: DVB interaction channel for Cable TV (CATV) distribution systems*.

– Annex B/J.112 (2004), *Data-over-cable service interface specifications: Radio-frequency interface specification*.

– Annex C/J.112 (2002), *Data-over-cable service interface specification: Radio-frequency interface specification using QAM technique*.

– ITU-T Recommendation J.120 (2000), *Distribution of sound and television programs over the IP network*.

– ITU-T Recommendation J.121 (2002), *Quality control protocol for webcasting*.

ITU-T Recommendation J.124 (2004), *Multiplexing format for multimedia webcasting over TCP/IP networks*.

– ITU-T Recommendation J.131 (1998), *Transport of MPEG-2 signals in PDH networks*.

– ITU-T Recommendation J.132 (1998), *Transport of MPEG-2 signals in SDH networks*.

– ITU-T Recommendation J.181 (2004), *Digital program insertion cueing message for cable television systems*.

– ITU-T Recommendation J.184 (2001), *Digital broadband delivery system: Out-of-band transport*.

– ITU-T Recommendation J.185 (2002), *Transmission equipment for transferring multi-channel television signals over optical access networks by FM conversion*.

– ITU-T Recommendation J.186 (2002), *Transmission equipment for multi-channel television signals over optical access networks by sub-carrier multiplexing (SCM)*.

– ITU-T Recommendation J.187 (2002), *Transport mechanism for component-coded digital high-definition television signals using MPEG-2 video coding including all service elements for contribution and primary distribution*.

– ITU-T Recommendation J.189 (2002), *Seamless splicing for MPEG-2 bit streams*.

3 Terms and definitions

This Recommendation defines the following terms:

3.1 LSDI presentation venue: The venue (a theatre, an auditorium or another venue for group viewing) where LSDI programs are presented to a collective audience.

3.2 LSDI service: A service whereby programs are distributed in the form of digital signals, in real-time or non-real-time, for collective viewing in theatres or other group venues equipped with appropriate electronic projectors, to provide excellent presentation in terms of picture and sound quality, size of the presentation screen, and presentation environment.

3.3 LSDI application: An instancing of the LSDI service, designed to meet a specific set of user requirements.

4 Transport of LSDI applications

The specifications contained in the J-series ITU-T Recommendations listed below apply as appropriate to the transport of LSDI applications that employ MPEG-2 encoded HDTV signals.

4.1 Transport of LSDI applications over digital cable television systems

The following ITU-T Recommendations apply to the transport of LSDI applications over digital cable television systems.

- ITU-T Rec. J.83: *Digital multi-programme systems for television, sound and data services for cable distribution.* This Recommendation specifies the framing structure, channel coding and modulation for digital multi-programme television, sound and data signals distributed by cable networks. The system input is specified to be the MPEG-2 transport layer. Being highly flexible, the MPEG-2 transport layer can be configured to deliver any desired mix of television, sound and data signals, including LSDI programs with the attendant ancillary signals.
- ITU-T Rec. J.94 + Amendments 1 and 2: *Service information for digital broadcasting in cable television systems*. This Recommendation and its amendments define the Service Information that conveys the relevant description of the services contained in a multiplex of audio, video, and data that is distributed by cable television networks. The service information is specified to be contained within the MPEG-2 transport layer as Program Specific Information (PSI). The mechanism provides some ancillary data capacity in the forward channel, which can for instance be used to accommodate program related services such as conditional access and copy protection.
- ITU-T Rec. J.112 + Annexes A, B and C: *Transmission systems for interactive cable television services*. This Recommendation extends the scope of ITU-T Rec. J.83 to make provision for bidirectional data flow over hybrid fibre-coaxial cables for interactive

services. (It can be expected that the LSDI environment will need interactivity mainly for two-way messaging dealing with transport issues.)

- ITU-T Rec. J.181: *Digital program insertion cueing message for cable television systems*. This Recommendation supports the splicing of MPEG-2 transport streams for the purpose of Digital Program Insertion, which includes advertisement insertion and insertion of other content types. An in-stream messaging mechanism is defined to signal splicing and insertion opportunities. A technique for carrying notification of upcoming Splice Points in the transport stream is specified.
- ITU-T Rec. J.184: *Digital broadband delivery system: Out-of-band transport*. This Recommendation describes the Physical Layer and Data Link Layer (including the MAC Layer) used in cable networks which employ an Out-Of-Band channel architecture. There are two methods used for Out-Of-Band (OOB) transport in cable systems, respectively denoted as Mode A and Mode B. This Recommendation details the specifications of both methods.

4.2 Transport of MPEG-2 constant bit rate LSDI signals in B-ISDN

The following ITU-T Recommendation applies to the transport of MPEG-2 constant bit rate LSDI signals in B-ISDN.

- ITU-T Rec. J.82: *Transport of MPEG-2 constant bit rate television signals in B-ISDN*. This Recommendation covers the transport of television signals in Broadband-ISDN, when they are encoded and transmitted in compliance with MPEG-2 systems with a constant bit rate. Broadband ISDN is based on the Asynchronous Transfer Mode (ATM). Other ITU-T Recommendations which apply are those of the I-series concerning ATM.

4.3 Transport of LSDI applications over PDH networks

The following ITU-T Recommendation applies to the delivery of LSDI applications over PDH networks.

- ITU-T Rec. J.131: *Transport of MPEG-2 signals in PDH networks.* This Recommendation specifies the structure of MPEG-2 transport streams within PDH networks working at hierarchical bit rates of 1544 kbit/s, 2048 kbit/s, 6312 kbit/s, 34 368 kbit/s, 44 736 kbit/s and 139 264 kbit/s specified in ITU-T Rec. G.702. The equipment considered is the Network Adapter, which performs the adaptation between MPEG-2 transport streams and the interfaces of PDH networks.

4.4 Transport of LSDI applications over SDH networks

The following ITU-T Recommendation applies to the delivery of LSDI applications over SDH networks.

- ITU-T Rec. J.132: *Transport of MPEG-2 signals in SDH networks.* This Recommendation specifies the structure of MPEG-2 transport streams within SDH networks working at the hierarchical bit rate of 155 520 kbit/s or at a bit rate of 51 840 kbit/s specified in ITU-T Rec. G.707/Y.1322. The equipment considered is the "network adapter" performing the adaptation between MPEG-2 transport streams and the interfaces of SDH networks. The bit rates and the frame structures for STM-N signals, the SDH multiplexing structures and the different overheads of an STM-N frame are specified in ITU-T Rec. G.707/Y.1322.

4.5 Transport of LSDI applications over optical fibre

The following ITU-T Recommendations apply to the delivery of LSDI applications over optical fibre systems.

- ITU-T Rec. J.185: *Transmission equipment for transferring multi-channel television signals over optical access networks by FM conversion.* This Recommendation describes a method to transmit multi-channel television signals over an optical access network that utilizes FM conversion. In this system, multi-channel frequency division multiplexing (FDM) television signals are simultaneously converted into one single wideband FM signal. This FM signal is then transmitted through the optical access network by using the intensity modulation technique.
- ITU-T Rec. J.186: *Transmission equipment for multi-channel television signals over optical access networks by sub-carrier multiplexing (SCM).* This Recommendation describes a method to transmit multi-channel television signals over optical access networks through the use of sub-carrier multiplexing (SCM). In this technique, the main carrier is the optical frequency signal carrier. The sub-carriers transfer the electrically multiplexed FDM video signals in the optical sidebands. The SCM method is used in trunk lines of Hybrid Fibre-Coax systems.

4.6 Transport of LSDI applications using Internet Protocols

The following ITU-T Recommendations apply to the delivery of LSDI applications using Internet Protocols.

- ITU-T Rec. J.120: *Distribution of sound and television programs over the IP network.* This Recommendation defines the transport protocol and system configuration for distributing sound and television programs over the Internet ("Webcasting"). It specifies the operations necessary to adapt audio and video bitstreams to the Internet Protocol and the functional characteristics associated with this system. It also includes an electronic attachment containing sample source code and some tools for conformance tests.
- ITU-T Rec. J.121: *Quality control protocol for webcasting.* This Recommendation defines protocols between a server and a client to be used in order to distribute sound and television programs, i.e., perform "Webcasting", over a general IP network, which is a non-QoS guaranteed network where data error or packet losses may occur. The use of the specified protocols results in an improvement of quality.
- ITU-T Rec. J.124: *Multiplexing format for multimedia webcasting over TCP/IP networks.* This Recommendation provides a multiplexing format appropriate for audio and video transmission by download-based protocol over TCP/IP without any session control protocols between server and client. It introduces a fragment structure which divides the file header into fragmented headers, and each header is placed dispersedly in a file. The fragment structure can reduce initial delay of the streaming of long duration content that is caused by a huge file header. In addition, formatted text information can be stored in the file.
- For further reference, a large number of Recommendations exist, which are identified as IPCablecom Recommendations and are numbered in the J-series of ITU-T Recommendations with numbers in the decades 160 and 170. These Recommendations specify an architecture and an extensive set of integrated protocol interfaces that operate as a system to enable the efficient delivery of time-critical interactive services, using Internet Protocols, over digital cable television networks equipped with appropriate cable modems. Several Recommendations in the IPCablecom group may usefully be applied to the delivery of LSDI programs over digital cable television networks.

4.7 Network-independent protocols for transport of LSDI programs

The following ITU-T Recommendations provide specifications that may be used for network-independent protocols for the delivery of LSDI applications. Since the specified protocols are independent of the physical and transport layer, they generally apply to all the delivery mechanisms listed above.

- ITU-T Rec. J.111: *Network independent protocols for interactive systems*. This Recommendation describes protocols independent of the underlying physical and transport protocols, for the support of interaction services based on digital TV broadcast systems.
- ITU-T Rec. J.187: *Transport mechanism for component-coded digital high-definition television signals using MPEG-2 video coding including all service elements for contribution and primary distribution.* This Recommendation specifies the general transport mechanism for conveying all the service elements required for contribution and primary distribution applications of TV programs using the MPEG-2 4:2:2 profile or Main profile at High level compression.
- ITU-T Rec. J.189: *Seamless splicing for MPEG-2 bit streams.* This Recommendation specifies a seamless splicing technique for the MPEG-2 bit stream based on ITU-T Recs H.222.0 | ISO/IEC 13818-1 and J.181. The MPEG-2 syntax of a spliceable bit stream is fully in accordance with ITU-T Rec. H.222.0 | ISO/IEC 13818-1, while the transport mechanism of scheduling information is modified by applying some constraints on the streams being spliced.

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