ITU-T Telecommunication Standardization Sector
Study Group 15
Experts Group for Video Coding and Systems
in ATM and Other Network Environments

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Title: Report of the Systems Adhoc and WG11 meetings held in Atlanta
Purpose: Report

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1. Introduction

The MPEG Systems adhoc group meeting and WG11 meeting were held in Atlanta as follows;

June 8-9 Adhoc group to edit the Systems CD,
June 10-12 WG11.

The ITU-T SG15 Experts Group for Video Coding and Systems in ATM and Other Network Environments sent the two representatives for these meetings.

2. Organizational matters

1) DIS for the Systems part

DIS was edited and approved at the WG11 meeting. Its polished version has been sent to the SC29 Secretariat in Tokyo. This will be forwarded to the DIS ballot with other two parts (Video and Audio). In ITU-T, this version will be input as Draft H.222.0 for approval at the February 1995 meeting of SG15.

2) Specifications at the MPEG decoder input

Additional work has been initiated to stipulate an interface between the MPEG decoder and the network/DSM adaptor as detailed in Section 4 below.

3) Common text

The SG15 decision to apply the common text approach to ITU-T Rec. H.222.0 | ISO/IEC 13818-1 was reported and welcomed by the WG11. Cooperation for collecting patent statements was requested.

4) Relationship between MPEG Systems and ATM

A position paper was produced by Messrs. Alexander MacInnis and Sakae Okubo as in the separate document AVC-642. This is intended for obtaining understanding of the general public.

3. Technical matters

3.1 Issues resolved but not yet documented

There was a number of issues that have been already resolved at the Paris meeting but not yet documented. They have been now inserted in the DIS.

1) Support of variable rates: it points out that variable bit rate is in general not possible in Multi Program TS, but only in Single Program TS.

2) Payload definition of null packets: text provided.

3) Stuffing in Transport Packets not possible after PES payload: text provided.

4) PES overhead in buffer Bn: text improved.

3.2 Open issues

A reasonable number of open issues has been addressed and resolved.

1) Random Access Indicator: the Paris text did not allow RAI in non PCR_PIDs. Fixed.

2) Continuity Counter: the CC can be discontinuous when the Discontinuity Indicator in the Adaptation Field is set to 1, with some restrictions.

3) MPEG1-MPEG2 stuffing bytes: the Paris text did not give any clue as to differentiate MPEG1 System streams and MPEG2 Program Streams when transferred through Transport Packets. Therefore it was not possible to reconstruct the original stream. This has been fixed through the use an MPEG1_MPEG2_identifier field in the PES_extension.

4) Registration Descriptor: has been completely reviewed and simplified. Similarly the Copyright Descriptor.

5) Removal of coded B-picture data in trick modes: it has been pointed out that in certain cases (slow motion) 16 Mbytes buffer decoders cannot work unless B-pictures involved in the presentation are left in the buffer Bn as far as they are displayed (approximately). The proposed modification has been accepted.

6) Navigation services: additions have not been accepted.

7) Inconsistency in PTS/DTS definition: fixed.

8) Hierarchy Descriptor: in order to allow multiple hierarchies in a single program an additional field has been added.

9) Adaptation Field Control: it has been pointed out that when set to '11' there shall be at least one byte of payload in the Transport Packet.

10) Trick mode semantics: improved.

11) Maximum Bitrate Descriptor: it has been added to indicate the maximum bitrate inclusive of transport overhead of programs or elementary streams.

12) Informative Annex for Private Data: added (Annex H).

13) Program Timing Descriptor / event sections: only the event definition has been accepted.

14) Transport Buffer dependency on transport rate: a proposal has been made to change the T-STD model in order to avoid dependency from actual bit rate of Transport Stream. Not accepted, because it would have added new constraints on encoders and remux.

15) Startcode Emulation: it has been added a sentence to clarify that startcode emulation at PES header borders is possible (in Annex G). No change in the syntax has been done.

16) Splicing Point tables: all the required tables added.

17) PTSs/DTSs in normal (non low delay) case: text improved.

18) Removal of TP overhead in T_STD: text improved.

19) Sustained bitrate (to video decoders): variable bit rate video is allowed provided that the mean rate measured in a picture time does not exceed the maximum rate per profile and level (plus adjustments for remux tolerance).

20) Remux strategy: the Multiplex buffer utilization Descriptor has been improved.

21) Audio/Video Descriptors: defined.

22) Packet Rate in CSPS: a proposal to modify the formula has not been accepted.

23) Rate TBn to Bn for audio in T_STD: the leaky rate for audio is now 2 Mbit/s.

24) Timing issues PSI: discussed, but nothing has been specified.

25) PSD syntax and semantics: improved, to allow fast reverse.

26) STC accuracy at 50 ppm: accuracy is now specified as 20 ppm.

27) PCR inaccuracy due to restamping: a TS may experience several remux stages. Each remux stage inserts a certain error in the PCR value. This error, as well as the 20 ppm accuracy of clocks, has been taken into account to compute the 500 ns tolerance that each T_STD decoder shall accept. This number does not take into account other sources of PCR errors (such as network jitter). Thus this tolerance still refers to the bitstream contents only, without any consideration about real time delivery.

SCR tolerance has not been specified due to the fact that no remultiplexing is involved in Program Streams.

28) Buffer consequences of "non perfect streams": withdrawn.

29) Jitter in byte delivery: an informative annex has been added (Annex K, see details below).

30) Compliance: the mathematical model is normative, a real time delivery model is addressed in an informative annex (Annex J, see details below).

31) Annex C: improved.

32) Annex D: it described private descriptors: now incorporated in Annex C.

33) PES priority: a wrong statement has been removed.

34) Timing terminology: improved (OPCR, definition of PCR inaccuracy as at point 27).

35) Copyright bit semantic: text improved.

36) Program channel and individual program: see Annex C.

4. Items of the SG15 concern

Some of the issues addressed during the meeting impact on the SG15 work.

4.1 Jitter tolerance

The main one relates to the jitter tolerance (issues 29 - 30). As an outcome of the meeting, bit-stream compliance will be tested through the mathematical model. This implies that encoders and remux are allowed to fully exploit the T_STD buffer resources (both TBn and Bn).

In real time systems, however, this could break decoders even in a zero jitter environment, due to PCR inaccuracy. Small amount of jitter (e.g.: due to removal of FEC or whatever

data-link layer information even in perfectly synchronous networks) could even easier break real decoders. Not to say about jitter-inducing networks like ATM.

Some amount of headroom in buffers TBn and Bn should be therefore made available to compensate PCR inaccuracy and jitter. An informative annex (Annex K) has been added to the DIS to give some explanation and guidance on this subject. It basically suggests two possible approaches to solve the problem in real systems: or by accommodating the entire jitter in the MPEG decoder, or by accommodating part of it in the decoder and the rest in a channel specific adaptor. For example, in cases where the amount of network jitter is very small, the first approach could be used, while in networks like ATM the second one seems more attractive.

A special Ad Hoc Group has been set up to study a real-time interface for MPEG-2 decoders. The expected outcome of this group should be a specification of the interface between MPEG-2 decoders and the rest of the world in terms of timing delivery, that is jitter.

The intent is currently to define one and only one interface, with a jitter tolerance such that reasonable applications can be accommodated without any need for external network specific dejittering. This jitter specification is unlikely to cover the ATM case, thus dejittering at the AAL or H.22X specific layer is required.

This real-time interface specification could be integrated as a normative part of MPEG2 Systems (IS in November 94). Due to time constraints and procedural problems this could not be the case, and its publication as IS could therefore be shifted at least until November 95.

4.2 VBR

Another issue somehow related to the SG15 activities refers to VBR (really: piecewise CBR) programs in a Transport Stream. The MPEG mathematical model makes use of the time bytes enters the T_STD. Those times are computed based on the transport rate, which in turn is computed dividing the time interval between the next and previous PCR values carried in the same program as the analyzed byte, divided by the total number of bytes carried in the transport stream between those two PCR fields.

See the second and third paragraphs of Section 0.1 / Systems DIS for the rationale disallowing VBR for the multi-program Transport Stream.

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