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: Terminal Specifications for High Quality Videoconferencing
Purpose: Discussion

## 1.Introduction

This paper describes H.32X specifications for high quality videoconferencing application.
In this paper terminals are defined with a hierarchical structure; a terminal with class value_N also supports all lower class values. The lowest terminal is class 1 and then a class 1 terminal is equivalent to H.32Y.
Figure 1 illustrates an audiovisual network configuration for H.32X terminals.

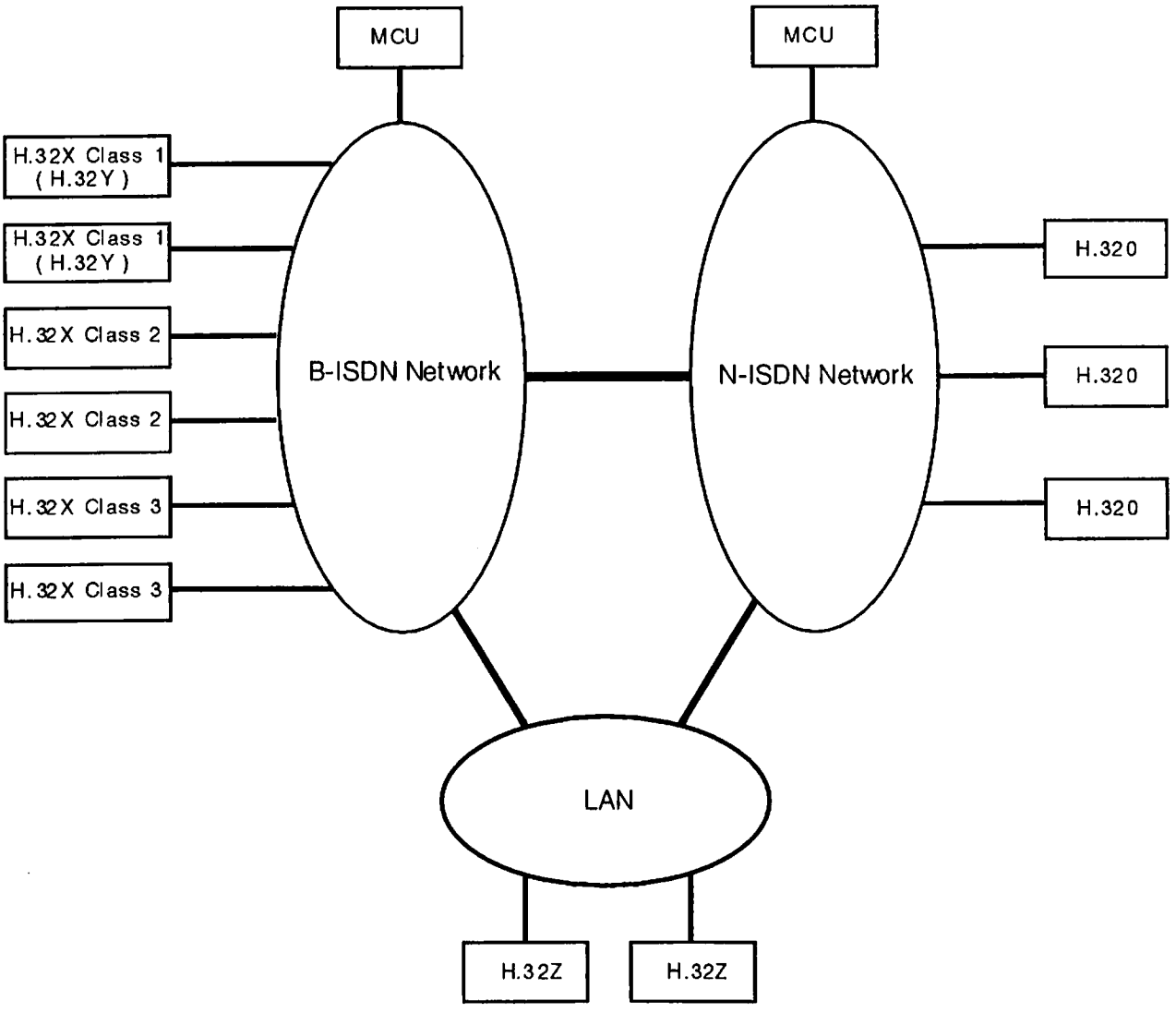


Fig.1 An Audiovisual network cofiguration

Each specification has an indication "M" or "O" depending on whether it is mandatory or optional.

1.1 Application

(1)Real time communication

- IPC :Interpersonal Communications ( videoconferencing , videophone ,etc. )
- ENG :Electronic News Gathering
- RVS :Remote Video Surveillance

(2)Non real time communication

- EC :Electronic Cinema
- HTT :Home Television Theater
- MMM :Multimedia Mailing

1.2 Input Equipment

(1)Camera (M)

a)4:3 Display aspect ratio

- NTSC Camera
- PAL／SECAM Camera

b)16:9 Display aspect ratio

- NTSC/PAL Camera (Letter Box) ;Video coding algorithm using MP@ML
- HDTV Camera ;Video coding algorithm using MP@HL or H14L

(2)Audio Equipment (M)

- Microphone ( Stereo;videoconferencing)
- Music source ( Compact Disc etc.)
- Cinema sound ( Surround )
- Echo canceler ( videoconferencing , videophone )

(3)VTR (O)

- with precise time base corrector
- without time base corrector

In this case Decoder doesn't synchronize with Encoder.

(4)FAX (O)

(5)Telematic Equipment (O)

- Pointing Device

(6)Telewriting Equipment (O)

1.3 Output Equipment

(1)Monitor (M)

a)4:3

NTSC monitor

PAL/SECAM monitor

b)16:9

- NTSC/PAL monitor ( Letter Box )
- HDTV monitor

(2)Audio Equipment (M)

Loud Speaker

(3)VTR (O)

(4)FAX (O)

(5)Telematic Equipment (O)

(6)Telewriting Equipment (O)

1.4 The number and kinds of media for multiplexing

a)Video
more than 1 program (a pair of Audio and Video)[Note)]
· H.261
· H.262

b)Audio
more than 1 program (a pair of Audio and Video)[Note)]
· Telephone quality ; G.711
· AM Broadcasting quality ; G.722
· CD quality ; MPEG2 Audio (Stereo)

c)Data
It is necessary to have Data channel multiplexing method like H.DLL.
· LSD (FAX, Telewriting etc.)
~64kbps :1 channel or more
-remote camera control
-VTR control for answering videophone
· HSD (JPEG etc.)
64kbps~ :1 channel or more
· MLP (MCU etc.)
Low bit rate channel , High bit rate channel : 1 channel or more ( each bit rate channel )

d)JPEG (photographic)
using HSD channel

Note)If multiprogram is supported, it will be applicable for multipoint videoconferencing.

1.5 Control channel

(1)end-to-end control
The following sequences are necessary;capability exchange , mode switching , C&I and encryption etc.
However it is also necessary to have a mode which skips capability exchange for application like RVS etc.

(2)Encryption control
The H.32X terminal should have an optional capability of data encryption and then encryption control channel should be provided.

## 2. Video Coding Method

The following table lists terminal types of H.32X. The terminal type is categorized according to the video coding modes.

Table 1 Terminal type about Video Coding Modes

| | | Class 1 | Class 2 | Class 3 | Comment |
|---|---|---|---|---|---|
| Picture Format | CIF/QCIF | M | M | M | |
| | ITU-R BT.601(Local Format) | — | M | M | Encoder;525/60 or 625/50<br>Decoder;525/60 and 625/50<br>Note 1),Note 2) |
| | HDTV | — | — | M | |
| Coding | H.261 | M | M | M | |
| | H.262 MP@ML | — | M | M | Low delay / Normal Mode |
| | H.262 MP@HL or H14L | — | — | M | Low delay / Normal Mode |
| Bit Rate | Fixed Rate (64k～1920kbps) | M | M | M | |
| | Fixed/Variable Rate (～15Mbps) | — | M | M | |
| | Fixed/Variable Rate (～80Mbps) | — | — | M | |
| Display Aspect | 4:3 | | | | Not Specified Note 2) |
| | 16:9 | | | | |
| Pel Aspect | CIF/QCIF,625/50 | | | | Not Specified Note 2) |
| | 525/60 | | | | |
| | HDTV | | | | |
| | 1:1 ( for Work Station ) | | | | |

Note ) M;Mandatory , —;Not applicable

Note: 1) MP@ML decoder must be able to decode both formats.
2) Display method of each format is left to the receiving terminal implementation.

Clock Recovery :
Class 1 terminal ; H.261 Method
( using independent clock source )
Class 2/3 terminal ; Time Stamp Method ( using STC of MPEG2 Systems )

## 3.Audio Coding Method

The following table lists terminal types of H.32X. The terminal type is categorized according to the audio coding modes.

Table 2 Terminal type about Audio Coding Modes

| | Class 1 | Class 2 | Class 3 | Comment |
|---|---|---|---|---|
| G.711 | M | M | M | 56,64 kbps |
| G.722 | O | O | O | 48,56,64 kbps |
| G.728 | O | O | O | 16 kbps |
| MPEG2 Audio Layer 2 | O | M | M | 32 ~ 384 kbps Note 1) |

Note ) M;Mandatory , O;Optional

Note1) Because of reasonable cost/performance.

Clock Recovery :

Class 1 terminal ; Network synchronization

Class 2/3 terminal ; Time Stamp Method ( using STC of MPEG2 Systems )

## 4.Network Adaptation[1]

The following table lists terminal types of H.32X. The terminal type is categorized according to the ATM network adaptation.

Table 3 Terminal type about ATM network adaptation

| AAL | Multimedia Multiplexing | Protocol | Class 1 | Class 2 | Class 3 | Comment |
|---|---|---|---|---|---|---|
| Type 1 | H.221 | H.242 | M | M | M | fixed rate (64~1920kbps) |
| | PES + H.22X | H.24X | | O | O | fixed rate ( ~ 80 Mbps) |
| Type2 | PES + H.22X | H.24X | | M | M | variable rate |
| Type 5 | PES + H.22X | H.24X | | O | O | variable rate |

Note ) M;Mandatory , O;Optional

Fixed rate transmission is a subset of variable rate transmission. Note that pay load size of cell in AAL Type 1 is different from the one in AAL Type 5.

If AAL Type 2 has the same SAR-PDU as Type 1, fixed rate operation will be a subset of variable rate operation.

Note)This AAL Type 2 is one type of proposed AAL.

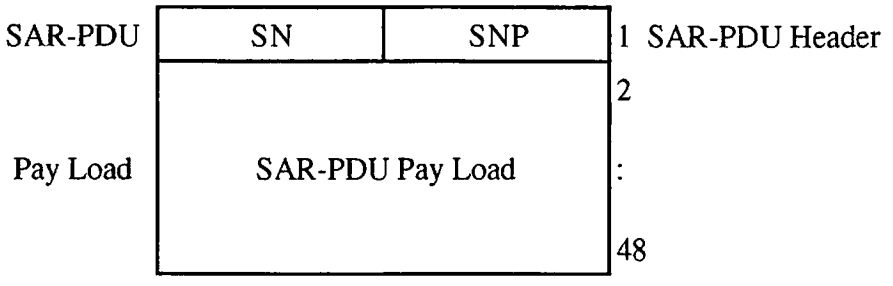


Fig 2 SAR-PDU Format ( AAL Type 1 )

## 5.Multipoint

To establish intercommunication between various audiovisual terminals, it is necessary to carry out a inband procedure according to H.242 , H.243 and H.24X by MCU.
In a multipoint connection, it must be assumed that different terminals can be connected to the same MCU, in which case there will be two methods to deal with this situation;
(1) the conferencing will be performed by the lowest level mode.
(2) the conferencing will be performed by the MCU transcoding.

MCU will select video bitstream from received bitstreams and distribute it to connected terminals.
There are two ways of video distribution by MCU.
(1) video switching; one video bitstream is distributed from MCU.
(2) continuous presence; synthesized single or multiple video bitstreams are distributed from MCU.

## 6.Media Synchronization

(1)Audio and Video Synchronization

It is necessary to be -20 ms to 40 ms for the difference between Video and Audio.

Class 1 terminal ; H.320 Method ( Fixed delay in Audio )

Class 2/3 terminal ; Time Stamp Method ( using STC of MPEG2 System )

(2)Synchronization with Pointing device

In this case, the undetectable range is nearly ten times wider than that of AV synchronization.

## 7. Error Detection and Correction[1]

7.1 Error Detection and Correction

We selected ATM AAL Type 1, Type 2 and Type 5 considering packing efficiency.

Table 4 Error Detection and Correction

| AAL | Bit error detection | Bit error correction | Cell loss detection | Cell loss correction | Comment |
|---|---|---|---|---|---|
| Type 1 | optional FEC | optional FEC | SN | optional FEC | |
| Type 2 | optional FEC | optional FEC | SN | optional FEC | the same method as Type 1 |
| Type 5 | by means of CRC | | | | |

Note) If AAL Type 2 has the same SAR-PDU as Type 1, it will perform bit error correction, cell loss detection and cell loss correction by means of the same mothod as Type 1.

7.2 Error Concealment

(1)Video

Encoder:INTRA MV, INTRA Slice, Short Slice (O)

It is advisable to use these methods at the encoder.

Appropriate slice size depends on the network characteristics.

Refer to Clause D.12.2.1 of draft Rec.H.262 ¦ CD 13818-2.

Decoder:Concealment (O)

(2)Audio

Encoder:Nothing

Decoder:Not Specified

## 8. Conclusion

In case of videoconferencing, it is necessary to have a hierarchical structure for H.32X terminal. In this paper, we have discussed the terminal specifications for high quality videoconferencing and AAL Type 2 that has the same SAR-PDU length as Type 1.

## References

[1]AVC-609 Multimedia multiplex and AAL for high quality videoconferencing(Japan), Section 4 and 6 Mar.1994,Paris