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SOURCE: KPN, PTT Research (NL)
TITLE: Multiplex at ATM layer with H.222
PURPOSE: Information, Discussion

1. Consideration of multiple channel transmission with H.222

The reference model for H.222 as shown in figure 1 contains several AAL modules. Indeed, several types of AAL may operate in parallel in a H.32x broadband terminal, although at the moment it is not decided whether every terminal shall have all AAL types implemented.

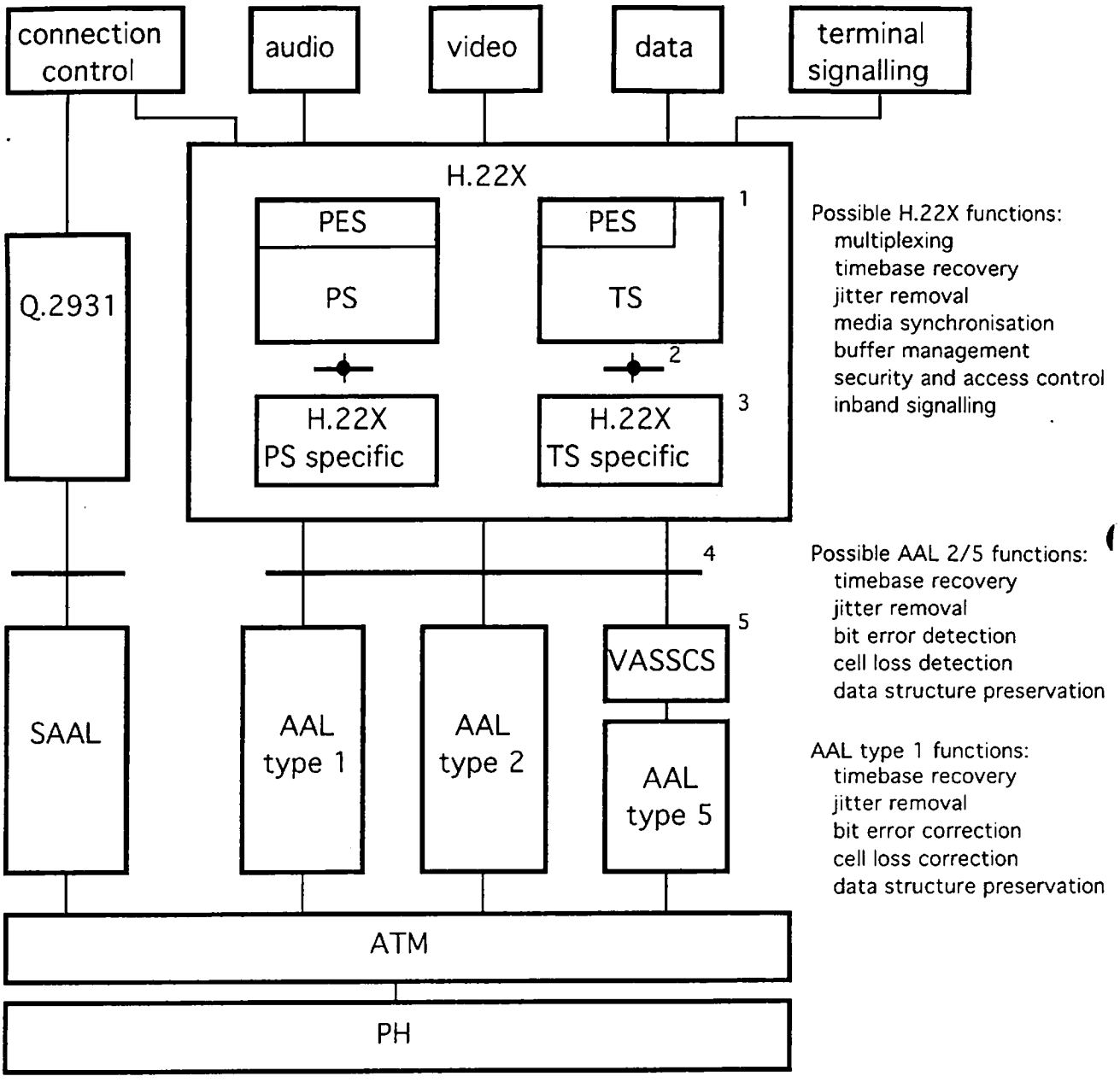
Multiplexing of the elementary streams can be in the H.222.0 TS or PS, but also in the ATM layer. There may be more than one ATM virtual channel (VC) for every type of AAL, e.g. multiple AAL2 VC's. For several purposes it is attractive to discern in the ATM layer between elementary streams in a program or between programs of a TS at ATM layer:

1. Different Qualities of Service in ATM may be defined for different signal components (elementary streams), being conveyed in different VC's.
   Example: layered coding.
2. Routing of programs and elementary streams of programs by ATM switches without need of H.222 equipment as network element.
3. Multipoint control unit operating at ATM layer instead of H.222 layer.

Considering the logical model of H.22x in figure 1, the allocation of different TS_packets (TS) or PES_packets (PS) to the different VC's and AAL-types is performed by the H.222.1 part.

At receiver side, the peer H.222.1 specific part shall recompose a logically valid TS or PS, from the cells arriving over different VC's. The specific requirements for H.222.1 in this scenario are:

1. Combining the data from the different VC's into a logical valid TS or PS for the target H.222.0 decoder.
2. Compensation of the transmission delay differences between the VC's.
3. Reduction of cell delay variations between the VC's, to a jitter that is acceptable for the target H.222.0 decoder.



Notes: 1. The Transport Stream may carry user data in Transport Stream packets, without using the PES packet syntax.

2. The Program Stream and the Transport Stream are logically valid at these respective points in the H.32X terminal (in the absence of channel impairments).

3. The H.22X Program Stream and Transport Stream specific parts represent procedures, parameters, or protocol beyond that specified by MPEG-2 Systems.

4. The H.22X/AAL service boundary.

5. VASSCS - Video and Audio Service Specific Convergence Sublayer. This is currently undefined.

Figure 1. Proposed H.32X network adaptation protocol reference model.

The complexity of the implementation of these H.222.1 specific functions is highly dependent on the implementation of the H.222.0 decoder. Reconstruction of a single H.222.0 (ISO/IEC 13818-1) compliant bitstream for a (physical) common H.222.0 interface is more complex than an implementation where the H.222.0 is dedicated to this multiple VC operation.
Note that cell sequence integrity is guaranteed in the VC's. For TS, the continuity counter counts separately for every PID, so no continuity count problems will occur.

2. Experimental configuration

In PTT Research an experimental system with multiple VC transmission has been implemented on basis of MPEG1 PS, with fixed length PES packets. Tests with the system over ATM will start in september. Three separate VC's are used, which convey the following information:

Channel 1: Pack_headers + PES_packets with video_1 (CBR).
Channel 2: PES_packets with video_2 (CBR or VBR), e.g. enhancement signal to 1.
Channel 3: PES_packets with audio_1 (CBR)

Extensions to H.222.0 PS and TS are possible with the same structure. Transmission of the SCR's is in packheaders, which are combined with the PES_packets of the CBR video signal, or alternatively with CBR audio signal.

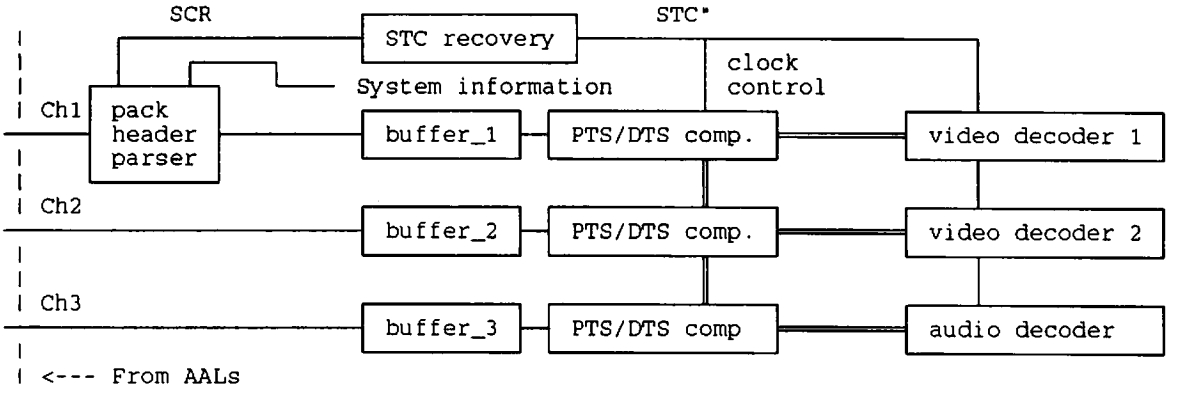


Figure 2. Overview of three channel decoder

The anticipated delay differences are in the range of 10 ms at ES rates up to 10 Mbit/s (including peak cell delay variations).
Note that the speed at which data from the AAL is written in the buffers is determined by the AALs that are used. This speed is decoupled from the speed of the network interface (e.g. 155 Mbit/s). It will be approximately the ES data rate when AAL1 is used, or a data-rate well above the peak-rate of VBR when AAL2 or AAL5 is used.

3. Conclusion

There are several advantages in conveying different programs and different elementary streams of a program in different virtual channels in the ATM layer. The presented configuration allows for easy support of multichannel transmission. In this configuration it mainly is a matter of additional buffering in the system decoder.

The common interface point at note 2 in figure 1 is not supported in this case. We suggest to define a conformance point at the H.222 / AAL service boundary (note 4 in figure 1) for this configuration.