Telecommunication Standardization Sector
Study Group 15
Experts Group for ATM Video Coding
(Rapporteur's Group on Part of Q.2/15)

Document AVC-512
July 1993

SOURCE: Stephen Hall (Australian UVC Consortium)

TITLE: Design of H.32z terminals for LANs

PURPOSE: Proposal

Abstract

The demand for access to multimedia services from LAN-attached desktop computers is increasing, and a standards-based solution will ensure maximum connectivity is achieved, through interworking with existing and future TSS SG15 terminals. Two options for the design of H.32z terminals are proposed, and it is concluded that the scheme in which the various data streams are multiplexed into separate LAN packets offers the greatest benefits.

1. Introduction

There is a growing demand from users for access to audiovisual/multimedia services, using desktop computers which are attached to packet switched local area networks (LANs). While proprietary solutions suitable for local or closed-user-group communications are emerging, wide connectivity can only be achieved through a standards-based approach. In particular, interworking with terminals covered by current and future TSS SG15 recommendations (eg. H.320 and H.32x) is required. With this in mind, and considering the many similarities between packet switched LANs and ATM networks, we believe that the Experts Group is in the best position to develop the appropriate recommendations (H.32z, H.22z, etc.).

Existing and future packet switched LANs are likely to incorporate a range of networking technologies, including Ethernet, Token Ring, FDDI and ATM. The common denominator in such LANs is the ability to transport variable-length packets asynchronously between network nodes (involving segmentation and reassembly in the case of ATM). By configuring the network appropriately, and using bandwidth allocation mechanisms in network routers and switches, the delay constraints imposed by real-time multimedia traffic can be satisfied.

An example network configuration is shown in Fig. 1, where two H.32z terminals are connected to a high-speed LAN backbone via dedicated Ethernet and Token Ring segments. The LAN hub allocates bandwidth for the real-time traffic and switches packets between the different LAN segments. A gateway between the LAN and the public network allows communication with remote H.320 and H.32x terminals, by converting between the H.22z protocol used on the LAN and the H.221 or H.22x protocols used in the public network. Note that the gateway is part of the customer premises network, but it has standard ISDN and B-ISDN network interfaces.

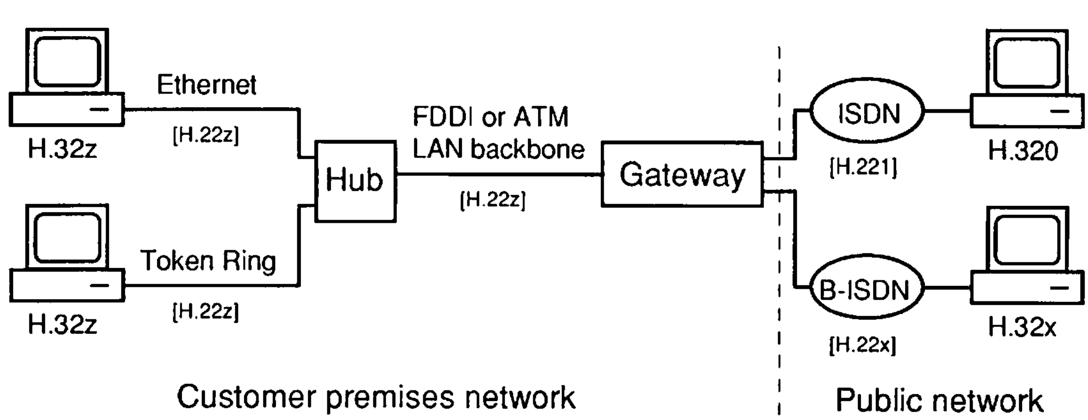

Fig.1 Example network configuration.

2. H.32z Terminal Design

We consider below two ways of creating an H.32z terminal, by converting an H.320 terminal for operation on a packet switched LAN. Essentially, these involve making a "cut" through the existing design in one of two places (marked A and B in Fig. 2), and implementing a new H.22z protocol for transporting the multimedia information across the LAN. This approach makes substantial use of modules covered by existing recommendations, and should therefore enable the realisation of H.32z terminals in the near future.

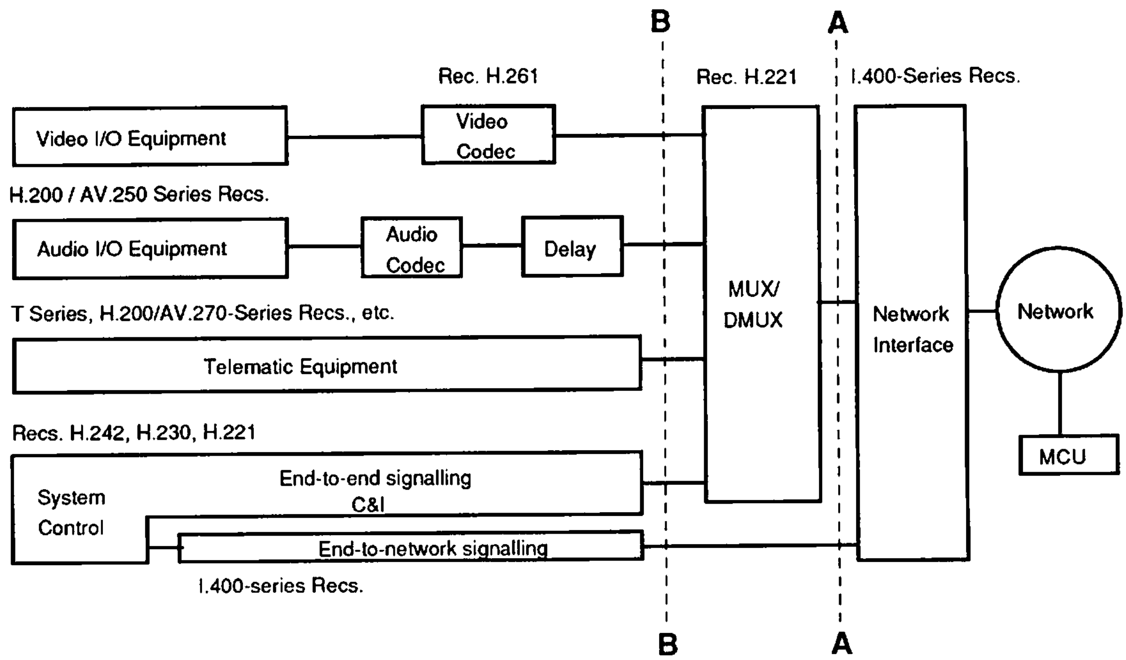

Fig. 2. H.320 terminal structure [from TSS Rec. H.320, Figure 1/H.320, 1990]

Scheme A:

In this approach, the H.221 framing function is retained in the H.32z terminal, and one or more H.221 frames are placed into packets for transmission across the LAN. The benefits of this approach are:

- There is minimal disruption to the existing H.320 terminal design.
- The temporal relationship between the various data streams established by the H.221 frame is implicitly maintained across the LAN.

Scheme B:

In this approach, the multiplexing, framing and network interface functions which are specific to ISDN (or B-ISDN) are omitted from the H.32z terminal, and placed in the gateway. Each data stream (video, audio, signalling, etc.), is then transmitted separately across the LAN, ie. using a different LAN packet for each type of data. Scheme B offers the following benefits:

- Different data streams can be provided with the appropriate quality of service on the LAN. For example, automatic retransmission can be provided for corrupted or lost end-to-network signalling information, whereas the extra delay incurred makes this inappropriate for audio and video.
- There is scope for implementing advanced service features by making use of the unique characteristics of the LAN environment. For example, multicast packet addresses can be used to send video and audio information simultaneously to a number of terminals on the LAN. Similarly, an audio stream can be separately routed to a terminal which does not have a video capability.

- Any increase due to packetisation in the end-to-end audio/video delay can be minimised, by varying the LAN packet length according to the occupancy of the video coder output buffer. In this case the buffer will be emptied in bursts, so that it will be necessary to perform the video rate control function using a "virtual" buffer (ie. an up/down counter), rather than the physical buffer.

- The H.32z terminal is more amenable to incorporation in desktop computers, since the H.221 bit-oriented multiplex is replaced by a byte-oriented approach. This facilitates access by application software to signalling and user data in the multimedia streams.

- Extension to higher bit rates is facilitated. For example, it may be desirable in the future to create an H.32z terminal which can handle a bidirectional video stream at CIF resolution for conversational services, and a unidirectional stream at a higher spatial resolution, for retrieval services. The flexible nature of packet-oriented multiplexing allows such enhancements to be added without redesigning the multiplex.

3. Conclusion

Two ways of designing an H.32z terminal for use on packet switched LANs have been described. On balance, the benefits offered by scheme B, in which the individual data streams are multiplexed into separate LAN packets, are considered to outweigh those offered by scheme A, which is based on the encapsulation of H.221 frames. An H.22z protocol designed according to scheme B is proposed in AVC-513. Further work is required to establish whether other portions of the H.320 terminal (eg. H.242, H.230) need to be modified for the LAN environment. In addition, the potential for harmonisation of H.32z with H.32x and associated recommendations should be considered.