CCITT SGXV
Working Party XV/1
Experts Group for ATM Video Coding

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TITLE: B-ISDN Multimedia Service Interworking

PURPOSE: Proposal

## Abstract

This document addresses issues associated with interworking multimedia services based on, or interconnected through, an ATM-based B-ISDN. Specific items addressed include network interworking (B-ISDN- 64 kbit/s ISDN), the interworking 64 kbit/s services via an ATM-based B-ISDN and terminal interworking (e.g. H.320-H.32X). The importance of cell-based multiplexing for longer term terminal interworking scenarios is strongly identified, together with the possible interim, short term role of user and hybrid multiplexing schemes.

## 1. Introduction

Multimedia service, network and terminal interworking between B-ISDN and 64 kbit/s ISDN* is an issue of major importance cost and availability of services for users. This document considers the implications of multimedia service and terminal interworking. Service and terminal interworking functions are implemented by Network Adaptor (NA) and/or Terminal Adaptor (TA) devices. Figures 1 to 4 show the possible interworking communication scenarios from the early evolution phase toward B-ISDN until fully developed B-ISDN. The important role of different multimedia multiplex methods in terminal interworking functions are considered.

## 2. Multimedia Multiplex Methods

There are three multimedia multiplex methods which may be used to implement the terminal interworking functions of multimedia services. They are user multiplex, cell-based multiplex, and hybrid multiplex.

### 2.1 User Multiplex

For user multiplexing, the media are multiplexed into H.221 frame structure. This method facilitates the interworking between H.320 terminals and H.32x terminals. This is a short term solution since it does not capitalise on the flexibility of B-ISDN characteristics such as dynamic bandwidth allocation, multicasting, separate routing of the different media and the ability to add/drop media and/or parties (see AVC-76). It is suitable for the early support of B-ISDN multimedia services only when the number of H.320 terminals is much greater than that of H.32x terminals.

### 2.2 Cell-based Multiplex

Cell-based multiplexing requires media to be supported within different virtual channels (VC). This has been identified, within the ATM Experts Group on Video Coding, as a suitable objective for a long term solution. It requires the H.32x terminal to produce a cell-based multimedia multiplex stream to facilitate intercommunication between H.32x terminals. However, the TA or NA must have the capability to convert these bit stream into the H.221 frame structure for interworking with H.320 terminals.

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* The term "64 kbit/s ISDN" refers to the current, circuit-switched ISDN based on 64 kbit/s or multiples thereof. It does not mean that the total rate available is limited to 64 kbit/s.

### 2.3 Hybrid Multiplex

Hybrid multiplexing methods combine features of both the user multiplex and cell-based multiplex techniques. The burden of the conversion between H.221 and cell-based multiplex bit stream is put into the H.32x terminals. This solution will not be cost effective when the number of H.32x terminals is much larger than that of H.320 terminals.

## 3. Interworking communication scenarios

### 3.1 Network concatenation of 64 kbit/s based ISDN via B-ISDN

During the early evolution phase towards B-ISDN, the concatenation of 64 kbit/s based ISDNs via B-ISDN is possible and is illustrated in Figure 1. For this interworking configuration, the end-to-end multimedia services and interfaces are the same as those currently provided by 64 kbit/s based ISDN. User multiplexing is used, and the H.221 bit stream produced by the terminal equipment (TE), i.e., H.320 terminals is transmitted via B-ISDN in circuit emulation mode.

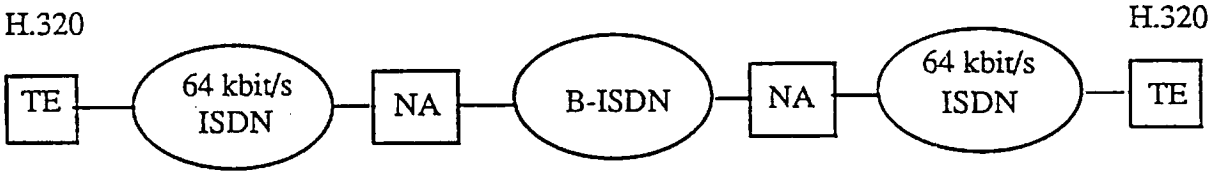


Figure 1. Concatenation of 64 Kbit/s ISDN via B-ISDN

The NA will provide interworking functions between ATM based B-ISDN and 64 kbit/s based ISDN. These functions include mapping of protocols of 64 kbit/s ISDN bearer service to Broadband Connection Oriented Bearer Service class A (F.811). Note that the NA does not need to recognise that the media (audio, video, data) stream are multiplexed in H.221 frame structure. It is only required to convert the H.221 bit stream into ATM cells and deliver it via a virtual channel in CBR AAL type 1.

### 3.2 B-ISDN to 64 kbit/s ISDN Interconnection

The B-ISDN can be interconnected to 64 kbit/s ISDN as shown in Figure 2, and provide 64 kbit/s based ISDN and B-ISDN services.

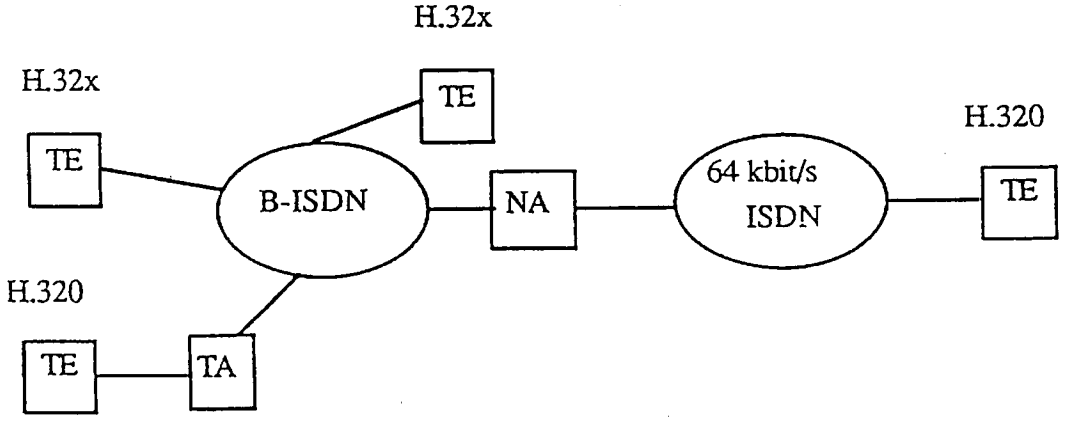


Figure 2. B-ISDN to 64 kbit/s ISDN interconection.

This shows a possible B-ISDN multipoint multimedia conference configuration. The two H.32x multimedia terminals can communicate using the cell-based multimedia multiplex. However, the situation becomes more complex when H.320 terminals are connected to B-ISDN via a TA, or via 64 kbit/s ISDN. In this case the NA or the TA must have some terminal interworking functions depending on which multimedia multiplex methods are used as

discussed in section 2. During the evolution of 64 kbit/s based ISDN toward a fully developed B-ISDN the user multiplex, hybrid multiplex and cell-based multiplex methods will all play a role. The terminal interworking implications of each of these methods is described below.

• User Multiplex

The NA will have interworking functions similar to those in Section 3.1. The TA needs to convert the H.221 to a similar H.22x bitstream. This means introducing the rigid frame structure of 64 kbit/s ISDN into the B-ISDN. The multimedia multipoint controller unit (MCU) can have functionalities similar to the 64 kbit/s ISDN MCU (H.231).

• Hybrid Multiplex

The NA needs to convert the H.221 bit stream from the 64 kbit/s based ISDN into multiple VCs for each medium in the B-ISDN. The H.32x terminal must switch to H.221 emulation mode to communicate with an H.320 terminal. The TA functions are simple, but this is at the expense of the complexity of H.32x. The multimedia MCU must have the capability to handle both VCs and H.221 multiplexing stream.

• Cell-based Multiplex

The NA has similar functions as in the hybrid multiplex case. The H.32x terminal now produces the multimedia information in multiple VCs. The TA becomes complicated in converting cell-based multimedia multiplexing VCs from into the H.221 bit stream for interworking with an H.320 terminal. However, this sets the scene for long term simplicity when H.32x terminals dominate. The multimedia MCU only needs to handle cell-based multiplex VCs.

Cell-based multiplexing is the most attractive option for the longer term, however both user and hybrid multiplexing may be required to provide interim or short term solutions.

### 3.3 Network Concatenation of B-ISDN via 64 kbit/s ISDN

In this case, the service capabilities provided between B-ISDN access points are restricted to 64 kbit/s ISDN capabilities (Figure 3). The terminal interworking situation is similar to that in Section 3.2.

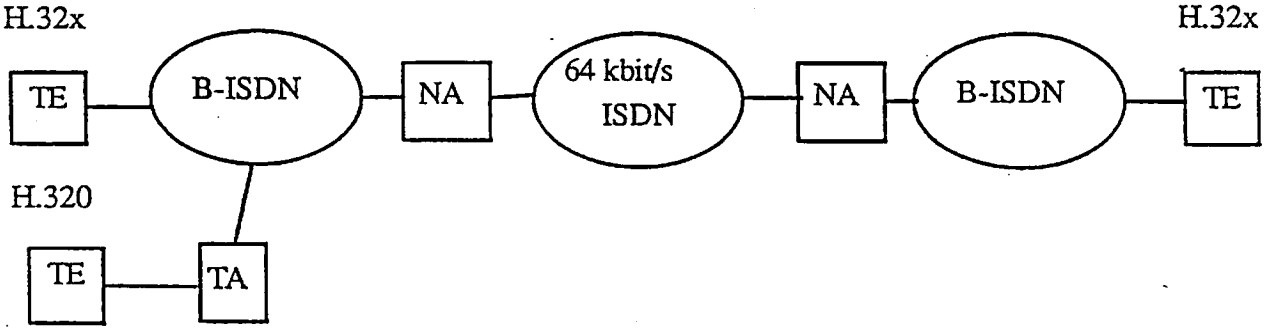


Figure 3. Network concatenation of B-ISDN via 64 kbit/s ISDN

### 3.4 B-ISDN

When the B-ISDN is not connected to ISDN, there may be an interim need for terminal interworking. In this situation, end to end access has broadband capabilities and can provide the services currently provided by 64 kbit/s ISDN. The terminal interworking situation is similar to that in Section 3.2.

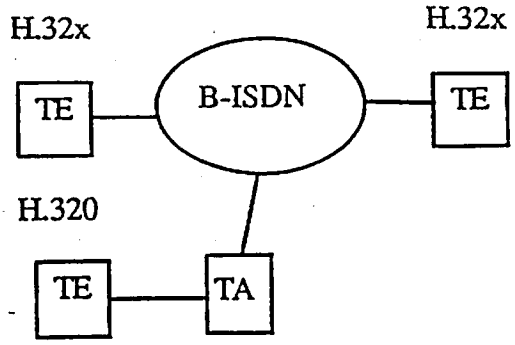


Figure 4. Broadband multipoint multimedia interworking

## 4. Conclusion

Network Adaptor and Terminal Adaptor functions are required for the interworking of multimedia services and terminals between 64 kbit/s ISDN and B-ISDN. Depending on the multimedia multiplex methods used, the terminal interworking functions are put into the terminal (H.32x), TA or NA.

The user multiplex method permits a simple and low cost interworking solution requiring only a simple NA and TA. However, this solution does not capitalise on the network characteristics of the B-ISDN and it limits the functionalities of the B-ISDN multimedia terminals, e.g. H.32x, and the multimedia MCU.

The hybrid multiplex based solution introduces more complexity into the NA and the H.32x terminals while maintaining the simplicity of the TA.

The cell-based VC multiplex solution requires similar complexity in the NA as in hybrid multiplexing. The TA is more complicated in handling multimedia conversion functions, but the H.32x terminal becomes simple.

In a scenario consisting of fully developed B-ISDN, the NA and TA will be phased out gradually, and the number of B-ISDN multimedia terminals will exceed that of 64 kbit/s ISDN multimedia terminals. The cell-based multiplex interworking method offers a low cost solution in this case. In considering the various scenarios, it should also be noted that the NA is a shared resource (so the cost per user terminal of its complexity is small), whereas the cost of complexity introduced into the TA or terminal must be accepted directly by the user.

Long term consideration of the likely cost and complexity of interworking multimedia terminals strongly favours the use of cell-based multiplexing.

## 5. References

(1) CCITT SG XVIII, Draft Rec. I.5xx, "General arrangements for interworking between B-ISDN and 64 kbit/s based ISDN", June 1991.

(2) CCITT SG XV WP/1 Experts group for ATM video coding: "Virtual Path Support of Multimedia Service Multiplexes", AVC-76, August 1991.