

SOURCE: Australia

TITLE: Framework for Standardisation of Video Services on the B-ISDN

PURPOSE: Proposal

Abstract

The Experts Group for ATM Video Coding has been established to define coding algorithms for the B-ISDN. It is important, therefore, to consider the characteristics of the B-ISDN and establish long term objectives and an overall architecture for all video services. This document identifies the objectives that should be set to permit advantage to be taken of the network characteristics, and stresses the need to align with developments on the B-ISDN. It also suggests specific targets to progress the work towards defining the overall architecture.

1. Introduction

In defining a video coding system for the B-ISDN, it must be kept in mind that this network will provide widespread broadband capability not just for the first time, but for the foreseeable future. The network is intended to be upgradeable to ever-larger bandwidths as required, and has sufficient flexibility to accommodate the signalling and transport needs of all existing, planned and unforeseen services. The potential market for video services for the B-ISDN is vast, and will occur over an open-ended period of time.

The importance of the video communications system definition therefore cannot be overestimated. It is crucial to consider the long-term, and ask the questions "What video services do we want?", "What are their technical characteristics?" and "What degree of integration and interworking is required?" before considering the evolutionary path to achieve these.

This input document considers these issues by focussing on the fundamental characteristics that make the B-ISDN unique for video services provision. A "top-down" approach is necessary, in which the target is defined before considering migration or evolution to it. A "bottom up" approach, in which, for example, an existing coding algorithm is modified to make it more suitable for ATM transport, could prejudice the achievement of long term objectives. Having considered the features that should be included in the coding system, a strategy for study of appropriate systems to satisfy the long term goals is offered for consideration. It is encouraging to see this approach adopted by CMTT (see documents CMTT-2/TEMP/6 and CMTT/2-18 in AVC-28). The Experts Group should adopt a similar approach, coordinating with CMTT.

2. Objectives for Video Services Provision on the B-ISDN.

There are three principal characteristics of the B-ISDN, all of which should be considered in defining the objectives for a video communications system if maximum benefits are to be gained:

(i). The B-ISDN will use cell-based ATM transport.

The consequences of this have been well discussed and much research has been carried out, though more is required. It means that Variable Bit Rate (VBR) coding can be considered, that error protection must take account of cell loss and that two levels of cell loss priority are available. However, the fundamental objective for the work of the Experts Group that follows from this can be stated fairly briefly as:

The video coding system must optimise performance, in terms of picture quality and end to end delay, on the B-ISDN.

(ii). The B-ISDN UNI will have a very large capacity.

The consequences of this are that many, indeed possibly all, video services could be delivered on the one network, over the one interface, using the one signalling and control system. This offers an unprecedented opportunity to integrate video services using a family of coding systems, common coding systems or a hierarchical coding scheme that will allow maximum interworking between service classes and provide the greatest potential for upward and downward compatibility:

The video coding system must provide for maximum integration of all video services on the B-ISDN.

(iii). The B-ISDN offers great flexibility in its transport.

The ability to multicast cells to several recipients, to renegotiate rate parameters during a connection, and to support multimedia services using multiple virtual channels are examples of increased flexibility offered by the B-ISDN (see AVC-39). Such capabilities mean that there are new opportunities for video service provision. For example, continuous presence multipoint conferencing could be implemented through the distribution of multiple signals to each participant using multicasting (see AVC-37), thereby effectively distributing some of the functionality of the multipoint bridge. Dynamic adaptation of bandwidth during a connection, and the ability to selectively route components of the call could lead to efficient network operation and transmission savings for the user.

The video coding system must permit advantage to be taken of the flexibility of transport offered by the B-ISDN.

These three objectives, highlighted in bold above, should be central to the development of video coding algorithms and video systems both within the ATM Video Coding Experts Group and for other groups working on video services for the B-ISDN (such as CMTT). Without consideration of all three, the resulting capability will always be less than that which could be achieved.

3. Workplan to Achieve Objectives

The Experts Group has set itself broad objectives (coding rates from 64 kbit/s to 10s of Mbit/s; common coding techniques across a broad range of services, qualities and bit rates; source signal in standard, EDTV or HDTV formats). The key objectives defined in Section 2 above should also be incorporated in the definition of a video coding system for the B-ISDN. It is now appropriate to define more specific goals, taking account of the objectives proposed by SGXVIII in the IVS Baseline Document (AVC-25) and the expected timing of the B-ISDN as described in AVC-24.

At the first meeting of the Experts Group, it was agreed that suitable targets would be:

- decisions on the basic architecture in time for the 1992 Recommendations;
- full codec definition for the 1994 Recommendations.

However, our objectives must be aligned with B-ISDN standardisation and developments. It makes little sense to standardise distribution and broadcast video services in 1994, since signalling studies on these features will not be complete in that year; (see the Timetable of Network and Service Results, Annex 1, AVC-24). Furthermore, codec definition must be based on agreed, co-ordinated long term objectives.

Early work should be directed at the definition of the overall architecture for video coding systems on the B-ISDN, in conjunction with the other interested groups (notably CMTT, CCIR 11 and MPEG), taking account of the objectives stated earlier. The IVS Baseline Document (AVC-25) would seem an appropriate way of ensuring maximum co-ordination on this crucial early issue. Having established this basic architecture, the more detailed goals and objectives for the Experts Group work can be established. The 1994 SGXV Recommendation(s) could define a short term solution to video service provision on the B-ISDN, as well as the definition of the architecture for the solution based on long term objectives. Complete codec specification,

consistent with the opportunities offered by the B-ISDN and co-ordinated with the coding groups with responsibilities in other applications, may be ambitious in this time frame.

A timetable for the definition of the coding method for communicative services is needed, expanding on that defined at the first meeting, with more specific objectives defined. The following targets for this and the next Experts Group meeting are offered as a starting point for discussions. It is important to note that some of the early decisions impact significantly on the long term objectives both for this group and for others.

It should be brought to the attention of WPXV/1 that work on interworking of audio signals and multimedia multiplexing needs to be carried out, in co-operation with other interested groups, and this will form an important part of a total audio-visual or multimedia system.

May 91: Propose the basic architecture of the video coding system for the B-ISDN:

- Picture parameters for each service category;
- Definition of services to be covered in an integrated system;
- Basic approach to provide service integration;
- VBR or CBR coding method;
- Method of multiplexing multiple media;
- Degree of compatibility with defined coding standards.

This should then be proposed to CCITT SGs I, VIII, XI and XVIII, CMTT, CCIR SG11 and ISO/IEC and co-ordinated via the IVS Baseline Document.

Nov. 91: Agreement on the basic architecture as described above.

Definition of goals for '94 Recommendation. e.g. codec architecture including:

- Range of bit rates for "videophone" and "videoconference" services;
- End-to-end delay limits;
- Interworking requirements;
- Peak(?) rate control requirements;
- Method, or options, for multipoint working.

1992 outline Recommendation drafted.

4. Conclusion

Australia strongly urges consideration of long term goals in the definition of video services on the B-ISDN, with care taken to ensure that all the benefits offered by the network can be exploited. A broad architecture should be defined for all video services on the B-ISDN, and this should be carried out in consultation with other relevant standards groups, particularly CMTT and CCITT SGXVIII. The work programme should be aligned to other B-ISDN standards development and implementation.

Working from the broad architecture, specific goals should be identified and incorporated in any proposed video coding algorithms. Specific objectives must be identified to permit assessment of alternative coding architectures. These objectives must be aligned to the capabilities and implementation strategies for the B-ISDN. Since video services will constitute a large, if not dominant, fraction of the traffic on the B-ISDN, it is also important to ensure that network developments accommodate the features required to achieve desired functionality for the video services. Close collaboration, particularly with SGXVIII, will be necessary to achieve this.

A more detailed workplan is necessary, building on the broad objectives discussed in the first Experts Group meeting. A preliminary work programme has been suggested as the basis for further discussion.