SOURCE: Australia

TITLE: B-ISDN Network Standardisation - Its Impact on the Development of ATM Video Coding

PURPOSE: Information / Proposal

Abstract

Recent activity in defining the scope and intent of B-ISDN network standards is a major influence on the direction of work within the Expert's Group for ATM Video Coding. A staged development of ATM video coding, aligned with that of the standardisation of key B-ISDN capabilities, offers major advantages in ensuring full advantage is made of an ATM network.

1.Introduction

The standardisation of Broadband ISDN network aspects is progressing rapidly in CCITT Study Group XVIII. During the last 12 months, many decisions of a fundamental nature have been made. As a result, it is now possible to see far more clearly the relationship between the developing network capabilities and the services they are intended to support.

2.The Staged Introduction of Service Support Capabilities

While no overall rollout plan exists for the Broadband ISDN, guidance on the staged introduction of service support capabilities may be found in the development of the B-ISDN signalling capabilities. A copy of the revised timetable of network and service results from SGXVIII to other groups requiring signalling capabilities is appended to this document. The timetable clearly indicates the following:

● a three staged work programme, with target dates of 1992, 1994 and 1996 respectively.

● an initial focus on simple networking for the support of data services and fixed rate services, including video, through the use of circuit emulation.

● a longer term focus on facilities suited to the support of variable bit rate video services.

It is clear that many issues of relevance to the development of appropriate coding strategies and the flexible support of video and multimedia services will not be fully resolved before 1994/96. An appropriate response might take the form of a similarly staged progression of work in the ATM Expert's Group. Such an approach would allow immediate exploitation of emerging facilities, but more significantly - it would be possible to provide relevant and timely guidance to SGXVIII on service coding requirements.

3.The Impact of Resource Allocation Strategies

The June meeting of SGXVIII was significant in outlining objectives for traffic control and resource management in an ATM-based B-ISDN. The major outcome of this meeting was the agreement that while traffic parameters will be standardised, this will be a continuing process. The only traffic parameter agreed to date is peak rate, and it seems unlikely that traffic parameters relating to the support of variable bit rate streams, such as video, will be available before 1994.

Standards relating to cell loss objectives can only be determined after the joint consideration of service requirements and network capabilities. SGXV should therefore input to this process by providing an indication of likely range of required cell loss performance values necessary to ensure flexible and efficient coding.

4. Charging Principles

The manner in which users will be charged for service support within the B-ISDN is an open issue. In general, tariffing arrangements are not subject to standardisation but the principles of charging, and their related network capabilities, may be defined. There appears general agreement that SGXVIII should deal with the network capabilities for B-ISDN charging and

provide information to SGIII on this topic. Factors which may influence the charge for a service might include :

- *Use of Resources*
- *Traffic Characteristics*
- *Fixed Costs per Call*
- *Connection Costs*

Charging principles, such as these, are sufficiently broad and flexible to reflect the diverse demands made on the B-ISDN by a wide and changing service range which extends from telemetry through to high definition imaging and video applications.

5. B-ISDN Performance

5.1 Cross Media Delay

The issue of cross media delay between the different information types comprising a multimedia call has been discussed in several earlier contributions. The ATM Expert's Group has endorsed the principle of cell based multimedia multiplexing and sought guidance from SGXVIII concerning mechanisms for ensuring a bounded differential delay for media carried within different virtual channels. In this respect, the network is asked to guarantee that synchronisation defined by a multimedia application is preserved. The options available for achieving a bounded differential delay between multiple associated communication channels is of major importance. For example, the network may elect to convey supplementary synchronisation information to the destinations which are then responsible for recovering the cross-media synchronisation or to ensure that associated channels cover the same physical connection path.

5.2 Call Reconfiguration - Multimedia, Multipoint, Multiparty

Services based on multimedia, and multipoint /multiparty communications may require frequent in-call reconfiguration. A simple form of reconfiguration is available in the H.221 format where it is possible to reassign the proportion of the total bandwidth available to the different service forms carried. Within an ATM based network, capability will exist to support more complex forms of communication however it is not clear what level of service reconfiguration performance can be provided.

The speed with which calls can be reconfigured will be determined by the responsiveness of control techniques e.g.signalling and resource allocation, rather than the speed of either switching or transmission. Call reconfiguration performance requirements will vary between, and within, applications and proposed signalling and resource allocation schemes must provide a level of performance matched to customer expectations.

The ATM Expert's Group is well placed to advise on expectations and requirements for the reconfiguration performance of complex calls. It is proposed that this issue be recognised as falling within the broad terms of reference of the ATM Expert's Group.

6. Conclusion

Recent developments in standardising B-ISDN network aspects represent a major influence on possible rate and direction of progress in the ATM Expert's Group. It is apparent that many major issues e.g. traffic parameter specification, cell loss objectives and network performance may not be sufficiently stable to act as a basis for near term coding development. This factor and the staged development of standards within SGXVIII provides an opportunity for a similarly staged approach to developing appropriate video coding standards, including the accommodation of fixed and variable rate coding within a single standard.

Standards relating to cell loss objectives can only be determined after the joint consideration of service requirements and network capabilities. SGXV should therefore input to this process by providing an indication of the likely range of required cell loss performance values necessary to ensure flexible and efficient coding.

(Release 1)	by 2 (Release 2)	by 3 (Release 3)
1. B-ISDN Bearer services[3]	← as for 90 with additions:	← as for 90 and 92 with additions:
BCOB-A (CBR, CO, with end-to-end timing) peak traffic parameter, emulation (speech, 3.1 kHz audio & 64 kbit/s unrestricted) and higher rates	BCOB-B (VBR, CO, with end-to-end timing)	Multi-media
BCLB (VBR, CLS, no end-to-end timing) peak traffic parameter	BCOB-C (VBR, CO, no end-to-end timing)	Distributive services
BCOB-X (unrestricted, proprietary AAL) peak traffic parameter	Bandwidth allocated on basis of traffic characteristics (CBR and VBR) for all classes	Negotiation of QoS class by user from QoS classes
Information transfer capability: unrestricted	Relationship of CLP to QoS & Indication of QoS by user	
2. Network Architecture (refer I.311 §2)	← as for 90 with additions:	← as for 90 and 92 with additions:
For both UNI and NNI	Connectionless servers (switched access)	
VPC cross connect only	VP Resource management systems	
VCC Switching (ATM switching)	Service Control Point (IN) access	
non-intelligent multiplexing		
Connectionless servers interconnected with semi-permanent VCC/VPC.		
Access to connectionless services with semi-permanent VCC/VPC (at UNI)[6]		
3. Network Capabilities	← as for 90 with additions:	← as for 90 and 92 with additions:
VC switching (point-point)	Simple Multi-point VC & VP connections	Broadcast connections
VP cross connect (point-point)	VP configuration with standard OAM	VP configuration with in-band OAM and switching
VP establishment with OAM system[7,8]	CLP use	
VCC, within a User-user VPC, establishment on demand	Negotiation of VPC and VCC bandwidth during establishment	
Indication of VPC and VCC peak bit-rate during establishment[9]	Re-negotiation of VPC/VCC bandwidth during active phase	
	Indication of QoS	
3.1 Traffic characteristics:	← as for 90 with additions:	← as for 90 and 92 with additions:
Peak allocated VCC and VPC[9]	Bandwidth allocated to VCC and VPC on basis of traffic characteristics, including additional parameters e.g. average, burstiness, peak duration[4]	
	N-ISDN interworking	
Circuit emulation, including 64 kbit/s		
3.2 Connection Configurations (User bearer services)	← as for 90 with additions:	← as for 90 and 92 with additions:
unidirectional, point to point	simple point to multipoint ATM bearers limited topologies, including add/drop features[5]	
bi-directional, point to point symmetrical asymmetrical		
single connection, simultaneous establishment	multi-connection, delayed establishment	
3.3 Connection Configurations (Signalling)	← as for 90 with additions:	← as for 90 and 92 with additions:
uni-directional, point to multipoint, broadcast		
bi-directional, point to point symmetrical		
3.4 Interworking[11]	← as for 90 with additions:	← as for 90 and 92 with additions:
to narrowband ISDN using BCOB-A	for further study in Release 2 & 3	for further study in Release 2 & 3
to other connectionless networks using BCLB[6]		
4. Other attributes	← as for 90 with additions:	← as for 90 and 92 with additions:
Common channel signalling transfer mode	Supplementary Services	
Meta-signalling channel	Broadband aspects of charging and relationship to resource allocation	
Initial guidance on charging		
Limited supplementary services as per Q.767[10]		

BCOB: Broadband Connection Oriented Bearer Service, BCLB: Broadband Connectionless Bearer Service

1. Proposed for 1992 Signalling Recommendations
2. As an objective for 1992 Signalling Recommendations, to be included in 1992 Recommendations where possible.
3. This includes the support of narrowband ISDN services as defined in Q.767.
4. SGX1 should note that further information on additional parameters may be available before '92 for inclusion in '92 signalling Recommendations if possible.
5. SGX1 is requested to urgently study this connection configuration's feasibility.
6. *No signalling impact is expected, as the ATM bearer connections will be semi-permanent*
7. *The OAM system may be non-standard.*
8. *Customer to VP service provider signalling relation to be considered in Release 2.*
9. *A peak rate traffic parameter will be specified as a data request rate at the ATM layer SAP. Whether an additional peak rate traffic parameter has to be specified as a bit rate at the AAL SAP is for further study.*
10. *Subject to minimal impact on connection configurations. Further study is required on the applicability of these supplementary services to B-ISDN services defined by SGI.*
11. *Further study is required on the bearer services for interworking.*