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SERIES I: INTEGRATED SERVICES DIGITAL
NETWORK

B-ISDN equipment aspects – ATM equipment

Voice on ATM circuit multiplication equipment

Recommendation ITU-T I.733

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Recommendation ITU-T I.733

Voice on ATM circuit multiplication equipment

Summary

The purpose of a voice on ATM circuit multiplication equipment (VACME) is to provide a bandwidth efficient means of connecting TDM-based international switching centres (ISCs) and an ATM network. In addition to providing traditional CME functions, the equipment will have additional capabilities such as ATM multiplexing to optimize bandwidth utilization.

VACME is a general switched telephone network (GSTN) trunking equipment using pulse code modulation (PCM) and low rate encoding technique together with digital speech interpolation (DSI) and facsimile demodulation/remodulation. Recommendation ITU-T I.733 addresses key issues, such as interfaces, signal processing functions, ATM adaptation layer mappings, and OAM functions, to be used in VACME in order to ensure the interworking of this equipment.

Source

Recommendation ITU-T I.733 was approved on 16 March 2009 by ITU-T Study Group 16 (2009-2012) under Recommendation ITU-T A.8 procedures. This version also includes Corrigendum 1 approved on 14 December 2009.

FOREWORD

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Voice on ATM circuit multiplication equipment

1 Scope

The purpose of a voice on ATM circuit multiplication equipment (VACME) is to provide a bandwidth efficient means of connecting TDM-based international switching centres (ISCs) and an ATM network. In addition to providing traditional circuit multiplication equipment (CME) functions, the equipment will have additional capabilities such as ATM multiplexing to optimize bandwidth utilization.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- [ITU-T G.703] Recommendation ITU-T G.703 (2001), *Physical/electrical characteristics of hierarchical digital interfaces*.
- [ITU-T G.704] Recommendation ITU-T G.704 (1998), *Synchronous frame structures used at 1544, 6312, 2048, 8448 and 44 736 kbit/s hierarchical levels*.
- [ITU-T G.711] Recommendation ITU-T G.711 (1988), *Pulse code modulation (PCM) of voice frequencies*.
- [ITU-T G.723.1] Recommendation ITU-T G.723.1 (2006), *Dual rate speech coder for multimedia communications transmitting at 5.3 and 6.3 kbit/s*.
- [ITU-T G.726] Recommendation ITU-T G.726 (1990), *40, 32, 24, 16 kbit/s Adaptive Differential Pulse Code Modulation (ADPCM)*.
- [ITU-T G.728] Recommendation ITU-T G.728 (1992), *Coding of speech at 16 kbit/s using low-delay code excited linear prediction*.
- [ITU-T G.729] Recommendation ITU-T G.729 (2007), *Coding of speech at 8 kbit/s using conjugate-structure algebraic-code-excited linear prediction*.
- [ITU-T G.732] Recommendation ITU-T G.732 (1988), *Characteristics of primary PCM multiplex equipment operating at 2048 kbit/s*.
- [ITU-T G.733] Recommendation ITU-T G.733 (1988), *Characteristics of primary PCM multiplex equipment operating at 1544 kbit/s*.
- [ITU-T G.736] Recommendation ITU-T G.736 (1993), *Characteristics of a synchronous digital multiplex equipment operating at 2048 kbit/s*.
- [ITU-T G.763] Recommendation ITU-T G.763 (1998), *Digital circuit multiplication equipment using G.726 ADPCM and digital speech interpolation*.
- [ITU-T G.767] Recommendation ITU-T G.767 (1998), *Digital circuit multiplication equipment using 16 kbit/s LD-CELP, digital speech interpolation and facsimile demodulation/remodulation*.

- [ITU-T G.775] Recommendation ITU-T G.775 (1998), *Loss of Signal (LOS), Alarm Indication Signal (AIS) and Remote Defect Indication (RDI) defect detection and clearance criteria for PDH signals.*
- [ITU-T G.803] Recommendation ITU-T G.803 (2000), *Architecture of transport networks based on the synchronous digital hierarchy (SDH).*
- [ITU-T G.804] Recommendation ITU-T G.804 (2004), *ATM cell mapping into plesiochronous digital hierarchy (PDH).*
- [ITU-T I.363.1] Recommendation ITU-T I.363.1 (1996), *B-ISDN ATM Adaptation layer specification: Type 1 AAL.*
- [ITU-T I.363.2] Recommendation ITU-T I.363.2 (1997), *B-ISDN ATM Adaptation layer specification: Type 2 AAL.*
- [ITU-T I.366.2] Recommendation ITU-T I.366.2 (2000), *AAL type 2 service specific convergence sublayer for narrow-band services.*
- [ITU-T Q.50] Recommendation ITU-T Q.50 (2001), *Signalling between Circuit Multiplication Equipment (CME) and International Switching Centres (ISC).*

3 Definitions

This Recommendation defines the following terms:

3.1 circuit multiplication equipment (CME): A generic type of the equipment, including all these types of equipment such as DCME, PCME, IP-CME, VACME and channel transcoder, having a number of 64 kbit/s PCM encoded input trunks, compressing speech signals on channel basis in various ways and sending them out through various types of bearers including STM type, packetized type, ATM type and IP type.

3.2 circuit multiplication system (CMS): A telecommunications network comprised of two or more interoperating CME terminals where each CME terminal contains a transmit unit and a receive unit.

3.3 comfort noise: Artificially generated noise signal at the receive side to compensate for the silent part of conversation that was removed by the send side and that gives a comfortable feeling to the receiver when silence elimination is introduced. It is desirable for a comfort noise to have the characteristics similar to those of the original background noise signal that was suppressed (e.g., in terms of its level and spectrum).

3.4 digital circuit multiplication equipment (DCME): A general class of equipment which permits concentration of a number of 64 kbit/s PCM encoded trunk circuits on a reduced number of transmission circuits.

3.5 digital speech interpolation (DSI): A process which, when used in the transmit unit of a VACME, causes digital voice signals of a trunk channel to be mapped into ATM cells transferred through an ATM network only when activity is actually present on the trunk channel. This, by exploiting the probability of the speech activity factor of trunk channels being less than 1.0, enables the traffic from a number of trunk channels to be concentrated and carried by a lesser number of ATM cells compared with the number of cells necessary for continuous connections.

NOTE – A similar concept is defined in [ITU-T G.763], [ITU-T G.767], and [b-ITU-T G.768], however, in specific terms as applicable to these Recommendations.

3.6 facsimile demodulation/remodulation: A processing introduced in a VACME where facsimile traffic is discriminated from voiceband data; subsequently demodulated to recover the baseband digital signal; mapped into ATM cells; demultiplexed in the VACME receive unit; and

remodulated using the same modulation scheme as used on the original signal received by the VACME transmit unit.

NOTE – A similar concept is defined in [ITU-T G.763], [ITU-T G.767], and [b-ITU-T G.768], however, in specific terms as applicable to these Recommendations.

3.7 low rate encoding (LRE): A voiceband signal encoding method which results in a bit rate less than 64 kbit/s. Conversion between voiceband signals encoded in PCM at 64 kbit/s and those encoded at the lower rates will be carried out by the means specified in the referred ITU-T Recommendations.

NOTE – In [ITU-T G.763], [ITU-T G.767], and [b-ITU-T G.768], LRE is defined in slightly different terms, as specifically needed in these Recommendations.

3.8 silence elimination: A process that suppresses the transmission of the inactive part of the silent part of conversation to attain efficient transmission of a voice conversation. When silence elimination is introduced, it is necessary to insert comfort noise at the receive side, to compensate for the suppressed silence periods present during listening and pause time intervals. This process is also sometimes called **silence suppression**.

NOTE – A similar concept is used in [ITU-T G.763], [ITU-T G.767], and [b-ITU-T G.768], however, in specific terms as applicable to these Recommendations.

3.9 trunk channel (TC): A unidirectional, digital transmission path (generally short distance) used for carrying traffic and which connects a VACME to other equipment, e.g., an ISC. Two such trunk channels (transmit and receive) are needed by 4-wire telephone circuits and constitute a trunk circuit.

NOTE 1 – Signals carried by a trunk channel are transmitted at a bit rate of 64 kbit/s.

NOTE 2 – A number of trunk channels in each direction of transmission are required between a VACME CME and, for instance, an ISC. These trunk channels may be carried by a number of 2048 or 1544 kbit/s systems for example.

3.10 voice on ATM circuit multiplication equipment (VACME): A class of equipment which allows for the concentration of a number of 64 kbit/s PCM encoded input trunk circuits onto a reduced amount of bandwidth in the ATM domain. ATM cross-connection and multiplexing functions allow for a more efficient use of bandwidth.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations:

AAL	ATM Adaptation Layer
ADPCM	Adaptive Differential Pulse Code Modulation
AIS	Alarm Indication Signal
AMI	Alternate Mark Inversion
ATM	Asynchronous Transfer Mode
BAIS	Backward Alarm Indication Signal
BER	Bit Error Rate
B3ZS	Bipolar with three-Zero Substitution
B8ZS	Bipolar with eight-Zero Substitution
BMAIS	Backward Multiframe Alarm Indication Signal
CID	Channel Identifier
CME	Circuit Multiplication Equipment