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Experts Group for Video Coding and Systems
in ATM and Other Network Environments

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TITLE: Report of Rapporteur's Meeting, Lannion, France, November 13-17, 1995

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1 General

On November 13-17, SWP 4/13-1 met and discussed performance issues related to B-ISDN. France Telecom CNET graciously hosted the meeting at their facilities in Lannion, France. Fifteen people participated from seven countries representing twelve different companies and administrations. The list of attendees is attached.

The main objectives of the meeting were:

A. to progress the work on the I.356 performance objectives and per-connection QoS (living list (LL) 2.40 and 3.30)
B. to complete propose revisions to Annex C/I.356
C. to make additional editorial changes to draft revised Recommendation I.356 as agreed by the group
D. to determine the goals for the April, 1996 SG 13 meeting relative to I.356.

2 Input

The group considered seventeen total contributions.

Refinement to the definition of SECB (LL 3.90)
TD2 Proposed modification of SECB definition (NTT, Tsukasa Okamoto)

TD12 Refinement to the current SECB definition in draft revised I.356 (AT&T, Ken Glossbrenner)

TD17 Definition of cell block size for VBR connections (BT, Dave Mustill)

The establishment of end-to-end objectives and QoS classes for international ATM connections (LL 2.40, 3.30, 3.B4)

TD1 ATM cell transfer performance objectives and their allocation in ITU-T draft Recommendation I.356 (Intelsat, Patrick Yeung)

TD3 Proposed QoS classes in ATM bearer services (NTT, Tsukasa Okamoto)

TD8 QoS classes in Recommendation I.356 (France Telecom, Annie Gravey)

TD13 ATM performance objectives and Quality of Service class definition (AT&T & Bellcore, Garry Couch & Ken Glossbrenner)

TD7 Cell rate dependency of CLR objective (KDD, Toru Hasegawa)

TD5 Proposed CLR allocation method and the objective value to each portion for Class 1 (NTT, Tsukasa Okamoto)

TD6 Proposed end-to-end CDV objective and its allocation for Class 1 (NTT, Tsukasa Okamoto)

Hypothetical reference connections and the allocation of ATM performance objectives to national and international portions (LL 3.30)

TD4 Proposed HRX for the purpose of end-to-end performance objectives and their allocation (NTT, Tsukasa Okamoto)

TD9 Performance objective apportionment rules (France Telecom, Annie Gravey)

TD14 Principles for the allocation of ATM cell transfer performance objectives (Bellcore, Garry Couch)

TD15 The real-time allocation of per-connection performance objectives (AT&T, Ken Glossbrenner)

Editorial updates and improvements to revised Recommendation I.356)

TD11 Proposed text for Annex C in I.356 (France Telecom, Christophe Rabadan)

TD10 Proposed modifications to section 5 of I.356 (France Telecom, Annie Gravey)

TD16 On the status of the proposed Annex D in draft Recommendation I.356 (U.S.A.)

3 Meeting results

The principal results of the meeting are listed below. Each of these results should be reviewed carefully by all participating companies and administrations before they are approved by the Working Party.

1. Reduction in the threshold value used in determining whether a received cell block is a SECB outcome.
2. Selection of candidate objectives for international CER, CMR, and SECBR.
3. Candidate definitions for four "Quality of Service" (QoS) classes suitable for the ATM transfer capabilities defined in the current I.371. The four QoS classes differ with respect to their objectives for CTD, CDV, CLR_{0+1}, and CLR_0.
4. Development of hypothetical reference connections (HRXs) that are considered complex and lengthy, but are also considered realistic international VP and VC connections in the 2001 time frame.
5. Preliminary agreement that the candidate performance levels and QoS classes can be supported even over the chosen HRXs.
6. Preliminary allocations of each of the end-to-end objectives to the national and international portions.

7. Reaffirmation that hypothetical reference connections are not normative and will not become an integral part of the revised Recommendation I.356.
8. Agreement on new text for Annex C/I.356 based on D.824 (July, 1995)
9. Agreement on new text for Section 5/I.356 based on the current cell conformance rules of I.371.
10. Agreement to convert Annex D/I.356 into an Appendix.

The details of the results are found in the following sections. The ideas developed at this meeting will be included in a proposal for new baseline text for I.356. The Rapporteur will present this proposed baseline text in a contribution (COM 13-________) to the April meeting of Study Group 13. This proposed baseline text was not reviewed in Lannion, so changes from the current baseline text will be highlighted for thorough review in April.

4 SECB Definition

In order to improve the ability to distinguish correctable cell losses from uncorrectable bursts of cell loss and in order to help distinguish cell loss due to congestion from cell losses due to burst errors, the threshold for declaring a severely errored block (SECB) outcome was changed. In the current draft I.356, M is N/16. It was agreed to change M from N/16 to N/32. Also Table 1/I.356 will be corrected so that the '≥' symbols the column for M will be replaced by '>' symbols.

5 Performance Objectives and Quality of Service Classes

The group proposed candidate values for end-to-end performance of CER, CMR, and SECBR. Those values and relevant notes are presented in Table 1 of this report. These proposed objectives should be carefully reviewed before they are approved by the Working Party.

The group agreed that the CER, CMR, and SECBR values cannot easily be adjusted on connection-by-connection basis. Therefore the commitment to these parameters does not differ among the QoS classes. The exception is that no commitment will be made to SECBR in the U class, where there is also no commitment with respect to CLR.

The group proposed four candidate quality of service classes for use with the various I.371 ATM cell transfer capabilities (ATC). The QoS classes are presented in Table 1 along with relevant notes and a listing of the ATCs to which each class might be applied. For clarity, Table 1 also lists the ATM Forum service classes to which each QoS class might be applied.

TABLE 1 - (LANNION PROPOSAL FOR)

Provisional Network Performance Objectives and QoS Class Definitions for I.356

ATM Transfer Capability: I.371	ATM Transfer Capability: ATM Forum		CTD	2-pt. CDV	CLR_{0+1}	CLR_0	CER	CMR	SECBR
		Nature of the Network Performance Objective:	upper bound on the mean CTD (note 1)	upper bound on the difference between upper and lower 10^{-8} quantiles of CTD (note 2)	upper bound on the cell loss probability (notes 3,4)	upper bound on the cell loss probability (notes 3,4)	upper bound on the cell error probability (notes 3,4)	upper bound on the mean CMR (notes 5,6)	upper bound on the SECB probability (note 3)
		Default Objectives:	no default	no default	no default	no default	$4*10^{-6}$ ($4*10^{-7}$ FFS) (note 7)	1/day (note 8)	10^{-4} (note 9)
		Applicable QoS Classes:							
DBR, SBR1, ABT/DT, ABT/IT	CBR, VBR1	Class 1 (stringent class)	400 msec (note 10)	3 msec (note 11)	$3*10^{-7}$ (10^{-8} FFS) (note 12)	none (note 13)	default	default	default
DBR, SBR1, ABT/DT ABT/IT	CBR, VBR1	Class 2 (tolerant class)	U (note 10)	U	10^{-5} or 10^{-6} (ED NOTE)	none (note 13)	default	default	default
SBR2 SBR3, ABR	VBR2, VBR3, ABR	Class 3 (bi-level class)	U (note 10)	U	U	10^{-5} or 10^{-6} (ED NOTE)	default	default	default (note 14)
Any ATC	UBR	U class	U (note 10)	U	U	U	default	default	U (note 15)

GENERAL NOTE TO ACCOMPANY THE TABLE: All values are provisional and they need not be met by networks until they are revised (up or down) based on real operational experience.

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GENERAL NOTES TO TABLE 1:

The objectives apply to public B-ISDNs, MPT-to-MPT. The objectives are believed to be achievable on the 27,500 km hypothetical reference connections presented in this document. The network providers' commitment to the user is to attempt to build end-to-end connections achieving each of the applicable objectives. The vast majority of public network connections should meet those objectives. When the MPT reference points are separated by large geographic distances, the probability of not meeting all of the applicable objectives is increased. For some parameters, performance on shorter and/or less complex connections may be significantly better.

Individual network providers may choose to offer performance commitments better than their allocated objectives.

"U" means "unbounded". When the performance relative to a particular parameter is specified as being "U" the ITU establishes no objective for this parameter and the default I.356 objective can be ignored. When the objective for a parameter is set to "U", performance with respect to that parameter may, at times, be arbitrarily poor.

There may be applications (e.g. some low bit rate VBR video or voice applications) that desire low CDV, but do not need the CLR performance offered by Class 1. This requires further study.

NOTE 1 This is a bound on the mean of the (underlying) CTD distribution during the life of a connection.

NOTE 2 This is the difference between the 10^{-8} and the ($1-10^{-8}$) quantiles of the (underlying) CTD distribution during the life of the connection. 10^{-8} was chosen because it allows for the proper engineering of delay buildout buffers when the overall CLR objective is 10^{-8}. The use of other quantiles for 2-point CDV specification is for further study.

NOTE 3 This assumes that the ratio will converge to a single value as the number of cells observed increases.

NOTE 4 Cell outcomes during SECBs are not included in the computation of CER, CLR_0, or CLR_{0+1}.

NOTE 5 This assumes that the observed rate will converge to a single value (the underlying mean rate) as the time duration of the observation increases.

NOTE 6 Misinserted cell outcomes during SECBs are not included in the computation of CMR.

NOTE 7 It is possible that in the near future, networks will be able to commit to a CER of $4*10^{-7}$. This subject is for further study.

NOTE 8 Some network phenomena have been observed that tend to increase the CMR as the cell rate of the virtual connection increases. More complete analyses of these phenomena may ultimately suggest a larger CMR objective for high bit rate connections.

NOTE 9 The SECBR is sensitive to short interruptions in the cell stream (i.e., 2 to 9 seconds in duration) which will result in many SECBs and may make the SECBR objective difficult to meet.

NOTE 10 During connection establishment the user can request a specific CTD. Networks will collaboratively estimate the end-to-end CTD and signal that estimate to the called user. The degree to which that signaled estimate represents a performance commitment for CTD is for further study.

NOTE 11 Applies when the switching speeds are as specified in Section 6.2. 2-pt. CDV will generally increase as transport rates decrease. High bit rate DBR connections may need and may receive less CDV. This is for further study.

NOTE 12 It is possible that in the near future, networks will be able to commit to a CLR for Class 1 of 10^{-8}. This subject is for further study.

NOTE 13 There is no separate commitment to the CLR_0 in Class 1 and Class 2. In most cases it may be assumed that the CLR_0 received will be better than or equal to the commitment for CLR_{0+1}. To assure this, the user may send CLP=0 cells exclusively.

NOTE 14 In Class 3 (the bi-level class), lost cells with CLP=1 do not contribute to SECBs or to the SECBR.

NOTE 15 There is no default commitment to the SECBR for the U class because there are no commitments to any CLRs.

EDITOR'S NOTE: The CLRs for Class 2 and 3 will be determined at the April, 1996 meeting.

6 Hypothetical Reference Connections and Validation of the Objectives

The following complex, but realistic hypothetical reference connections (HRXs) were developed to test whether the candidate end-to-end objectives and QoS classes could be supported between two remotely separated end points in the year 2001.

1. VCC with intensive protection switching capability at the virtual path level
2. VCC
3. VPC with intensive protection switching capability at the virtual path level
4. VPC

It is assumed that each international connection (VCC or VPC) has two national portions (NP) and one international portion (IP). The HRXs developed assume combinations of up to three international transit portions (ITP) where the VC is accessed.

The length of the HRX is assumed to be 27,500 km, as in G.826.

It was the general opinion of the group that the end-to-end objectives and QoS classes proposed in Table 1 could be achieved on those HRXs that did not support intensive VP protection switching capabilities. The feasibility of the objectives on the HRXs with intensive VP protection switching capability was not verified. Due to the lack of direct information there were no final conclusions in this area. The participants were encouraged to validate the candidate objectives using the following HRXs and contribute on this subject in April.

6.1 Number ATM nodes in HRXs

An ATM node accesses the ATM layer, in the sense that VP and/or VC switching is performed in this node. By definition, an IIP for a VP connection does not contain any ATM nodes. An IIP for a VC connection may contain several ATM nodes that access only the VP layer. Let IIP(i) denote a VC international interoperator portion that spans i countries accessing only the VP layer.

Table 2 indicates the number of ATM nodes that are crossed in the four HRXs.

	NP	IIP(0)	IIP(1)	IIP(2)	IIP(3)	ITP
VCC intensive	4(5+1)=24	0	3	6	9	3+2x5=13
VCC	8	0	3	6	9	3
VPC intensive	4x5=20	0	not applicable	not applicable	not applicable	2x5=10
VPC	4	0	not applicable	not applicable	not applicable	3

Table 2 - Number of ATM nodes (VP or VC nodes) in each portion of 4 HRXs

Table 3 presents the total number of ATM nodes crossed by each HRX that has been identified. For a VCC with intensive protection switching, (VCC_{int} i) corresponds to a connection in which "i" countries access the VC layer in the international portion. For the VCC HRX without intensive VP protection switching and for both VPC HRXs, the number of ITPs does not affect the total number of ATM nodes assumed within the connection.

HRX	VCC_{int} - 3	VCC_{int} - 2	VCC_{int} - 1	VCC_{int} - 0	VCC	VPC_{int}	VPC
number of nodes	87	77	67	57	25	70	17

Table 3 - Total number of nodes in HRXs

6.2 Switching speeds in the HRXs

Two types of nodes are considered for within the present HRXs:

- nodes with output links at a rate equal to 34 or 45 Mbit/s
- nodes with output links at least equal to STM1 (155Mbit/s)

(In the near future, it is likely that many ATM connections will have access links at a rate lower than the above rates. Two cases are considered:

1. *the ingress access link rate is below 34/45 Mbit/s but output rates are at least at 34/45 Mbit/s: in this case, no supplementary CDV degradation is to be expected*
2. *the egress link rate is below 34/45 Mbit/s: in this case, a supplementary CDV performance degradation may be expected possibly beyond the end-to-end objective presented in Table 1. For the HRXs considered, the egress link rate is assumed to be at or above 34/45 Mbit/s.)*

Table 4 lists the maximum number of ATM nodes assumed to operate at 34/45 Mbit/s for each standardized connection portion of the 4 HRXs. The remaining links are assumed to operate at 150 Mbit/s or more.

	NP	IIP(0)	IIP(1)	IIP(2)	IIP(3)	ITP
VCC intensive	3	0	1	2	3	1
VCC	3	0	1	2	3	1
VPC intensive	2	0	0	0	0	1
VPC	2	0	0	0	0	1

Table 4 - Maximum number of ATM nodes at 34/45 Mbit/s in each portion

6.3 Loading within the HRXs

The load assumed for each switching element was .95 for both VCC and VPC intensive HRXs and .85 for both VCC and VPC HRXs. However, it is unlikely that the network will operate continuously at such a high load, especially on the access links.

6.4 Other aspects of the HRXs

- Each of the HRXs are built with a ratio of route-to-air distance based on G.826.
- One satellite hop is assumed.
- The error performance of all transmission facilities is consistent with Recommendation G.826.
- CTD due to terrestrial transmission and physical layer processing is 6.25 microseconds per km.

- CTD due to satellite propagation and satellite processing is 260 milliseconds (Rec. G.114.) Contribution TD1 suggested a value of 320 milliseconds is more appropriate for satellites that have additional processing to achieve superior error performance for ATM.
- An ATM node creates a worst-case average of 300 microseconds of queuing delay for Class 1.

7 Allocation of the performance objectives

The group proposed that public network providers should commit to supporting the end-to-end objectives presented in Table 1. Our analyses of HRXs tentatively demonstrated that those objectives are achievable on long, complex connections. In order to cooperatively achieve those objectives, the group agreed that allocation rules were needed for each standardized portion of the end-to-end connection. The following sections list the preliminary allocation rules proposed for each parameter. Network providers should attempt to build their connection portions in a way that the vast majority of connection portions achieve their allocated objectives for each performance parameter. Thus the performance of a shorter and less complex end-to-end connection than the HRXs will be better than that represented by Table 1.

The allocation rules for several of the objectives are based on the Recommendation G.826 rules for allocating physical layer performance. **Participants are encouraged to study these rules and make contributions for specific improvements in April.**

The rules for computing allocations are not requirements for implementation. Network providers may choose to comply with their performance allocation using some other architecture. For example, the CTD budget that the computation allows for indirect routing could be used for additional switches instead of indirect routes. This subject is a national matter.

7.1 Route length calculation

Several of the parameters assume an allocation due to route length. The route length calculation is taken from G.826. If D_{km} is the air-route distance between the two reference points that bound the portion, then the route length calculation is:

- if $D_{km} < 1000km$, $R_{km} = 1.5 * D_{km}$
- if $1000 \le D_{km} \le 1200km$, $R_{km} = 1500km$
- if $D_{km} > 1200$, $R_{km} = 1.25 * D_{km}$

The above rule does not apply to satellite hops, but only to terrestrial routes.

7.2 Allocation of the Class 1 CTD objective

This section proposes a method of calculating the maximum CTD that should be given on any connection portion in support of a QoS Class 1 connection.

When a connection portion does not contain a satellite hop, an allocation rule is considered for the maximum delay (CTD) allocated to the portion, where the CTD is expressed in microseconds:

CTD (in microseconds) = $(R_{km} * 6.25) + (N_{sw} * 300)$

In the above formula:

- R_{km} represents the route length assumption taken from Section 7.1,
- and $(N_{sw} * 300)$ is an allowance for ATM nodes in the connection portion.

N_{sw} is taken from Table 2.

The 300 μsec value is considered as an approximate worst case value for ATM nodes providing Class 1 service. A corresponding value for other classes is FFS.

It is not expected that a standardized connection portion includes more than one satellite hop for Class 1 service. When a connection portion does contain a satellite hop, this portion is allocated a fixed delay, equal to 260 + δ ms, independent on the actual length of the portion and on its complexity. This figure corresponds to the propagation delay of the signal plus an allowance for digital processing and tail circuits in the portion. The value of δ is currently unspecified, but it may be about 60 msec. This is for further study.

It is expected that in most cases, the total CTD that results when each connection portion complies with its allocation is below 400ms. However, it may happen that in some cases, the value of 400ms is exceeded. For long connections, network providers may need to make additional bilateral agreements to improve the probability of achieving the 400 msec objective for Class 1 service.

Relationship with signaling facility offered by Recommendation Q.2931:

Recommendation Q.2931 enables the user to signal a maximum acceptable CTD. If the user takes advantage of this facility, each signaling node will increment the estimated value of end-to-end CTD which is eventually delivered to the called user. The users may or may not accept the call, taking account of the requested CTD and the network estimated CTD.

Because standards for populating the signaling fields with CTD estimates are not available, the relationship between the signaled CTD values and the network providers' commitment to CTD remains to be studied. The group agreed that for the time being, the only commitment recommended is to the default 400 msec for Class 1 service.

7.3 Allocation of the Class 1 CDV objective

This section proposes the maximum CDV that should be given by a national portion or an international portion in support of a QoS class 1 connection.

- Both national portions of the international connection are allowed 1.5 msec of CDV.
- The international portion of the international connection is allowed 1.5 msec of CDV. (Further allocation to the IIPs and ITPs of the connection is for further study.)

The allocated CDVs sum to more than the end-to-end CDV because CDV behaves similarly to the variances of roughly independent random variables. When independent random variables are summed, the resulting variance is roughly the square root of the sum of the squares.

Some organizations had reservations about the end-to-end value of 3 msec and also considered 2 msec a more appropriate allocation for the national portion. The 3 msec objective is presented here based on the fact that (1) some applications (e.g. video) want lower CDV and (2) 1.5 msec seems feasible for national portions without intensive VP protection capability. Further analysis of this problem is recommended.

7.4 Allocation of the SECBR and CER objective

This section proposes a method of calculating the maximum SECBR and CER that should be given on any connection portion starting with the end-to-end objectives found in Table 1. This method is a direct application of the allocation rules of G.826.

- Round the calculated route length, R_{km}, for the portion (NP, IIP, ITP) up to the nearest 500 km.

- For a national portion take a block allowance of 17.5% plus 1% per 500km, if no satellite hop. If there is a satellite hop, a single 42% block allowance replaces the previous computation.
- For an IIP(0) or an ITP take a block allowance of 1% plus 1% per 500km, if no satellite hop. If there is a satellite hop, a single 35% block allowance replaces the previous computation.
- For an IIP(1) take a block allowance of 3% plus 1% per 500km, if no satellite hop. If there is a satellite hop, a single 35% block allowance replaces the previous computation.
- For an IIP(2) take a block allowance of 5% plus 1% per 500km, if no satellite hop. If there is a satellite hop, a single 35% block allowance replaces the previous computation.
- For an IIP(3) take a block allowance of 7% plus 1% per 500km, if no satellite hop. If there is a satellite hop, a single 35% block allowance replaces the previous computation.

7.5 Allocation of the Class 1 CLR objective

This section proposes a method for calculating the maximum CLR that should be given on any connection portion in support of a QoS Class 1 connection. The rule is intended to apply only to class 1, for which it is thought that both physical layer impairments and network complexity play a significant role in the end-to-end objectives.

In order to ensure that the complexity of each portion is considered, some of the allocation given to calculated route length for SECBR and CER is taken and allocated as block to each portion.

- Round the calculated route length, R_{km}, for the portion (NP, IIP, ITP) up to the nearest 1000 km.
- For a national portion take a block allowance of 17.5% plus 1% per 1000km, if no satellite hop. If there is a satellite hop, a single 42% block allowance replaces the previous computation.
- For an IIP(0) or an ITP take a block allowance of 5% plus 1% per 1000km, if no satellite hop. If there is a satellite hop, a single 35% block allowance replaces the previous computation.
- For an IIP(1) take a block allowance of 15% plus 1% per 1000km, if no satellite hop. If there is a satellite hop, a single 35% block allowance replaces the previous computation.
- For an IIP(2) take a block allowance of 25% plus 1% per 1000km, if no satellite hop. If there is a satellite hop, a single 35% block allowance replaces the previous computation.
- For an IIP(3) take a block allowance of 35% plus 1% per 1000km, if no satellite hop. If there is a satellite hop, a single 35% block allowance replaces the previous computation.

7.6 Allocation of the Class 2 and 3 CLR objectives

This section proposes a method for calculating the maximum CLR that should be given on any connection portion in support of a QoS Class 2 or Class 3 connection. In these classes network complexity (switching stages) play the significant role in the end-to-end objectives. One consequence is that this allocation rule does not make use of the calculated route length.

- For a national portion take 27.5% of the end-to-end objective.
- The allocations to IIP and ITP are to be decided in April, 1996.

7.7 Allocation of the CMR objective

This section proposes the maximum CMR that should be given by a national portion or an international portion in support of the end-to-end objective of 1/day.

- Both national portions of the international connection are allowed a CMR of 1 per 72 hours.
- The international portion of the international connection is allowed a CMR of 1 per 72 hours. (Further allocation to the IIPs an IPTs of the connection is for further study.)

Most networks should be easily able to achieve these allocated objectives. They are presented here as information to potential users that cell misinsertions are rare and as a reminder that an imperceptible CMR is an objective for network design.

8 Annex C/I.356 Revisions

The next baseline text for draft revised I.356 will include the changes proposed for Annex C in TD11. These changes modify the current Annex C by specifying:

- the definition of variables and counters needed for estimating network performance
- CER estimation for the aggregate (CLP=0+1) user cell flow
- CLR estimation over both the aggregate and the high priority (CLP=0) user cell flow
- CMR estimation over the aggregate user cell flow
- SECB outcome estimates when a CLR is specified for the aggregate user cell flow and SECB estimation when there is no CLR specified for the aggregate flow
- performance estimation when there are FM OAM cell losses.

9 Section 5/I.356 Revisions

The next baseline text for draft revised I.356 will include the editorial changes proposed for Section 5 in TD10. These changes are based on the current I.371 conformance definitions for both the DBR and the SBR ATM transfer capabilities.

10 Annex D/I.356 Status

Because the performance of the UPC/NPC mechanism is strictly a national matter, Annex D of draft revised recommendation I.356 will become an informative appendix. Text will be added at the beginning of the new appendix indicating that this is informative material included solely to help network providers meet their CLR objectives for their portion.

11 Summary and Status

The Rapporteur will incorporate each of the proposals selected at this Rapporteur's meeting in an new candidate baseline text for I.356. The proposals and the candidate baseline will be reviewed by the full Working Party and Study Group. Based on the results of April, if there are no substantial changes, I.356 may be frozen at the end of the April meeting for approval at the 1996 WTSC.

The following issues should be reviewed carefully by all participants in preparation for the April meeting:

A. The user requirements for end-to-end CDV.
B. The appropriate objectives for CLR in Classes 2 and 3.
C. The number of ATM nodes in each national and international transit portion and whether each of them will create as much as 300 μsec.
D. The need for intensive protection switching at the VP level.

E. The value of CTD through a geostationary satellite and its associated processing.
F. The potential meaning of the CTD information exchanged in SG 11 messages and to what degree performance agreements can be developed and offered based on that information.
G. Applicability of allocation rules to connections other than HRXs.

Electronic correspondence will continue to advance these issues as rapidly as possible.

The Rapporteur will generate a liaison to the ITU-R to determine an appropriate figure for the propagation and processing delays associated with satellites used for ATM.

The Rapporteur will generate a liaison to Study Group 11 informing them we are studying the problem of allocating end-to-end CTD and the problem of making a performance commitment based on CTD estimates communicated in signaling messages.

In April, the SWG will also consider updates to I.350 and I.351.

12 Appreciation

The group expressed its appreciation to France Telecom and particularly to Mrs. Annie Gravey and Mrs. Danielle Garel for the excellent facilities provided during the meeting.