The ATM Forum
Technical Committee

UBR with MDCR Addendum to UNI Signalling 4.0, PNNI 1.0 and AINI

AF-CS-0147.000

July, 2000

Preface

During preparation of this addendum, the Control Signalling working group was chaired by Gert Oster. The minutes at related working group meetings were recorded by Thomas Cornély. The editors of this addendum were Sirak Bahlbi, Mickey Spiegel and Gert Öster. The editors would like to thank the following contributors for their help with this addendum as well as all participants of the Control Signalling working group for the many days and evenings spent discussing this addendum:

Sirak Bahlbi
Thomas Cornély
Robert B. Dianda
Timothy Dwight
Jia Feiling
Laurent Frelechoux
Daniel Hernandez-Ortega
Sohel Khan
Shawn McAllister
Roger Morley
Bruce Northcote
Gert **ö**ster
E. Mickey Spiegel

This specification uses three levels for indicating the degree of compliance necessary for specific functions, procedures, or coding. They are indicated by the use of key words as follows:

Requirement: "Shall" indicates a required function, procedure, or coding necessary for compliance. The word "shall" used in text indicates a conditional requirement when the operation described is dependent on whether or not an objective or option is chosen.
Objective: "Should" indicates an objective which is not required for compliance, but which is considered desirable.
Option: "May" indicates an optional operation without implying a desirability of one operation over another. That is, it identifies an operation that is allowed while still maintaining compliance.

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1 Introduction

1.1 Scope
[Normative]

This addendum describes the additional routing information, signalling information elements, and additional routing and signalling procedures required to support UBR with MDCR, as defined in [TM-MDCR]. It should be noted that, [TM-MDCR] defines UBR with MDCR, as an optional extension to the UBR service category. This addendum is based on UNI Signalling 4.0, PNNI 1.0 and AINI specification.

This addendum specifies signalling for the support of UBR with MDCR across public and private UNI interfaces, PNNI interfaces and AINI interfaces.

UBR with MDCR is an optional feature of UNI Signalling 4.0, PNNI 1.0 and AINI.

This addendum does not address the UBR with MDCR procedures at a PNNI between different administrative domains within the same PNNI routing domain.

A device supporting the UBR with MDCR feature shall implement these procedures for point-to-point calls/connections, and shall implement these procedures for point-to-multipoint calls/connections if point-to-multipoint calls/connections are supported. A device shall support the UBR with MDCR procedures for all supported connection types (SVCCs, soft PVCCs, SVPCs, or soft PVPCs).

A switch supporting the UBR with MDCR feature at the UNI, PNNI or AINI shall be capable of forwarding the MDCR information element. A switch supporting the UBR with MDCR feature at the UNI or AINI may also be capable of generating a network-generated MDCR information element.

A switch can support the PNNI routing extensions of this addendum independently of the PNNI signalling extensions for UBR with MDCR.

1.2 Overview
[Informative]

The UBR with MDCR procedures are summarized as follows:

- For a UBR call/connection the SETUP message may optionally indicate a Minimum Desired Cell Rate (MDCR). The indicated MDCR is advisory on the part of the user, and does not define a service commitment on the part of the network. However for nodes supporting this feature, network specific service commitments for UBR connections with MDCR > 0 are not precluded.
- UBR connections which indicate MDCR may be supported at PNNI and AINI interfaces which do not support this feature. Such interfaces will be requested to pass along the MDCR information unchanged, and will provide traffic management treatment as they would any other UBR connection.
- It is allowable that a call/connection may be cleared due to the values indicated in the MDCR parameter. Such an action would be indicative of network policy, and is hence beyond the scope of this specification.
- PNNI DTL originator nodes and entry border nodes may utilize the values indicated in the MDCR information element as well as values advertised by PNNI routing when selecting the path over which to route the associated connection.
- If the network receives a SETUP message, for a UBR call/connection, that does not indicate a MDCR over an inter-network interface, the receiving network can optionally include a MDCR information element with the Network generated indicator, before forwarding the call/connection across the network. This would allow the network to implement certain policies that utilize the MDCR

information without requiring users to include the MDCR information element in the SETUP message.

1.3 MDCR Scenarios
[Informative]

MDCR information can be generated as follows:

1. End-to-end MDCR: the MDCR information is generated by the user originating the UBR call/connection, forwarded unchanged by intermediate networks, and finally delivered to the destination user.

2. Network generated MDCR: the MDCR information is included by the network receiving the UBR call/connection over a user-network or an inter-network interface. For example, the MDCR information may be included:
   - at the network side of a UNI or
   - at the succeeding side of an AINI.

Note that network generated MDCR could be discarded on network egress or ingress.
Several scenarios are shown in Figures 1.1 through 1.6 below.
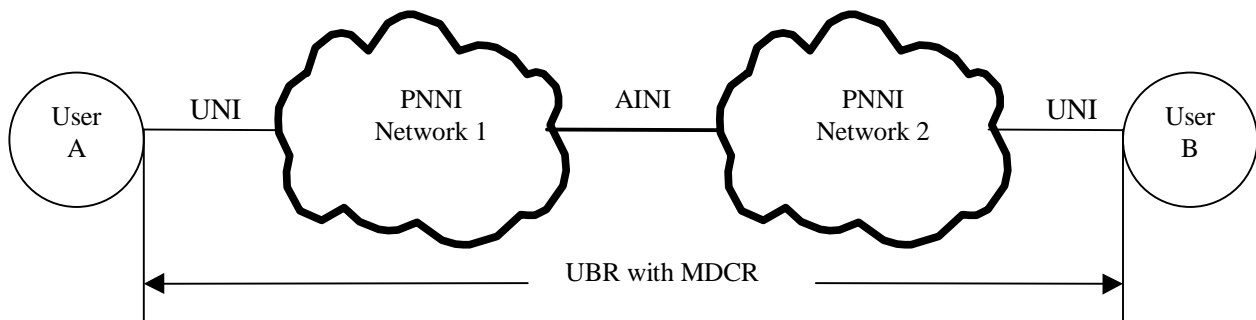
Figure 1. 1 End-to-end UBR signaling with user generated MDCR
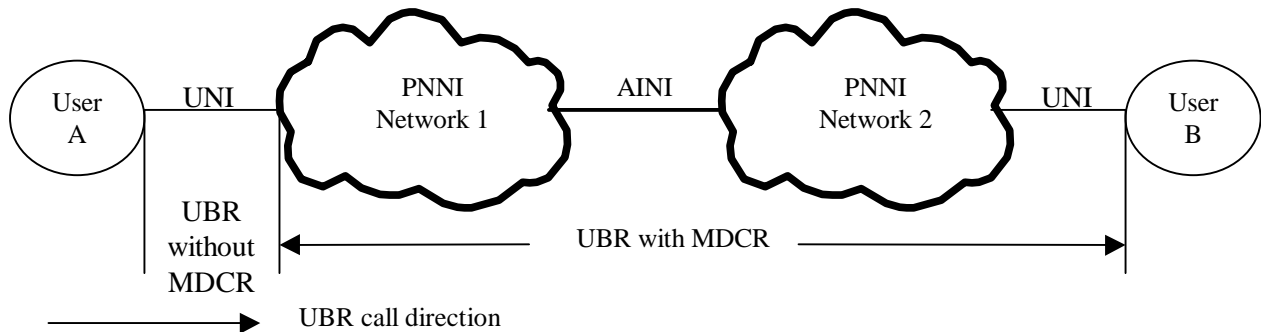
Figure 1. 2 UBR signaling with network generated MDCR at UNI
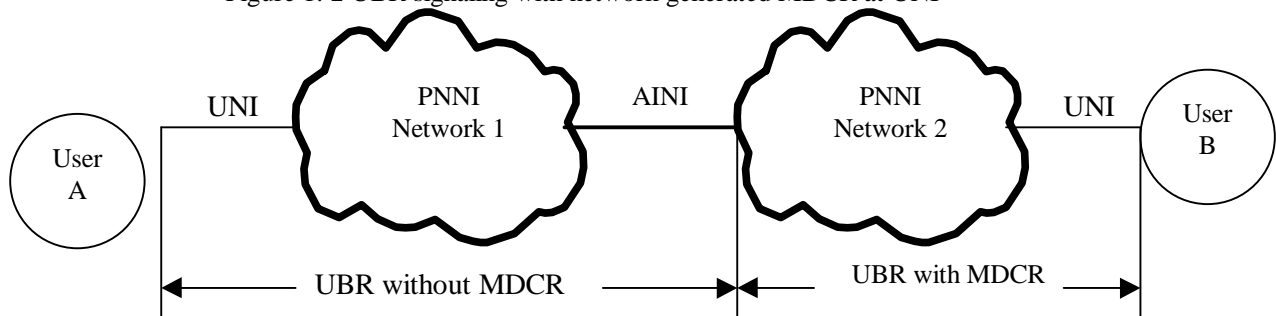
Figure 1. 3 UBR signaling with network generated MDCR at AINI
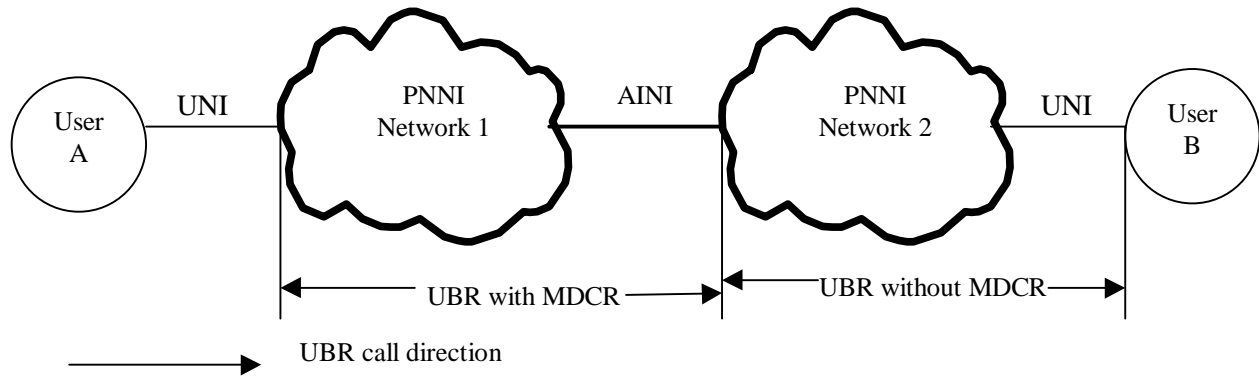
Figure 1. 4 UBR signaling with network generated MDCR within network 1 and discarded at succeeding side of AINI
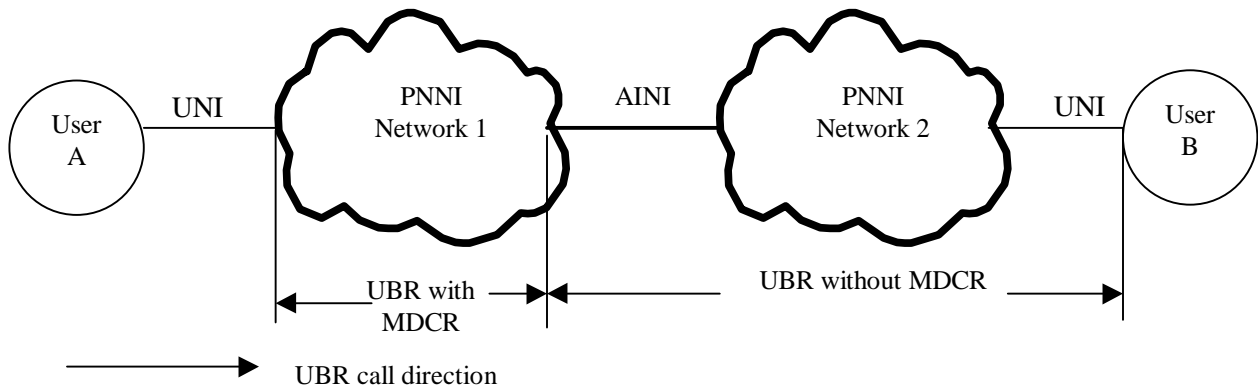
Figure 1. 5 UBR signaling with network generated MDCR within network 1 and discarded at preceding side of AINI
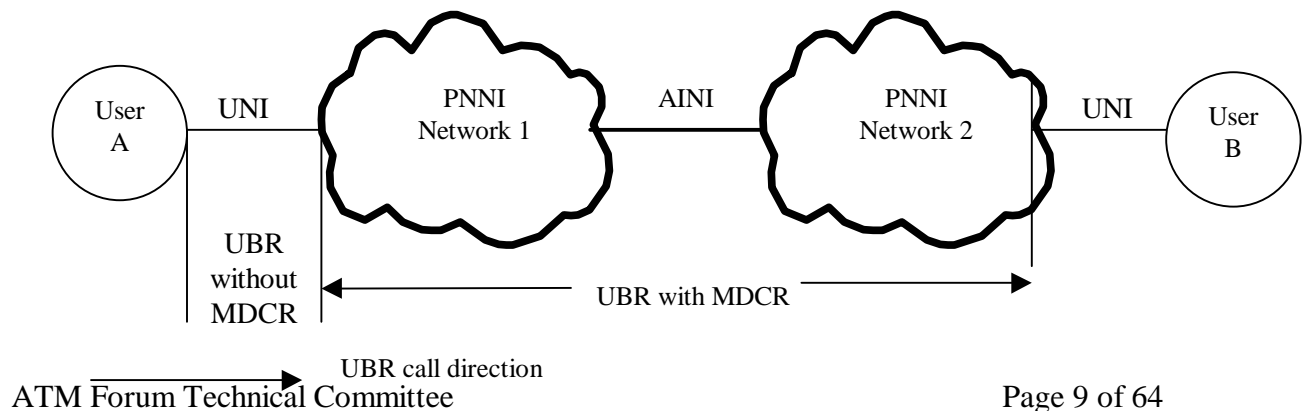
Figure 1. 6 UBR signaling with network generated MDCR at source UNI and discard at the destination UNI

2   References and Acronyms

2.1   References

[SIG 4.0]   ATM Forum Technical Committee, "ATM User-Network Interface (UNI) Signalling Specification, Version 4.0", af-sig-0061.000, July 1996.

[PNNI 1.0]   ATM Forum Technical Committee, "Private Network-Network Interface Specification Version 1.0", af-pnni-0055.000, March 1996.

[AINI]   ATM Forum Technical Committee, "ATM Inter Network Interface (AINI) Specification", af-cs-0125.000, July 1999.

[TM-MDCR]   ATM Forum Technical Committee, "Addendum to Traffic Management V4.1 For an Optional Minimum Desired Cell Rate Indication for UBR", af-tm-0150.000, June 2000.

2.2   Acronyms

AINI	ATM Inter-Network Interface
ATM	Asynchronous Transfer Mode
AvCR	Available Cell Rate
B-ISUP	Broad Band-Integrated Service User Part
CDV	Cell Delay Variation
CLP	Cell Loss Priority
CLR	Cell Loss Ratio
DTL	Designated Transit List
ITU-T	International Telecommunication Union - Telecommunication standardization sector
IUT	Implementation Under Test
MDCR	Minimum Desired Cell Rate
MIB	Management Information Base
PICS	Protocol Implementation Conformance Statement
PNNI	Private Network-Network Interface
PVCC	Permanent Virtual Channel Connection
PVPC	Permanent Virtual Path Connection
QoS	Quality of Service
RAIG	Resource Available Information Group
SPVC	Soft Permanent Virtual Connection
SUT	System Under Test
SVC	Switched Virtual Connection
TM-MDCR	Traffic Management MDCR
UBR	Unspecified Bit Rate
BeCR	Best effort Cell Rate
UNI	User-Network Interface
VBR	Variable Bit Rate
VCI	Virtual Channel Identifier

VPC	Virtual Path Connection
VPCI	Virtual Path Connection Identifier
VPI	Virtual Path Identifier

3   Coding Requirements

[Normative]

This section illustrates the coding of the MDCR information element to support the UBR with MDCR capability.

3.1   MDCR Information Element coding

Bits								Octets
8	7	6	5	4	3	2	1	Octets
Minimum Desired Cell Rate (MDCR)								1
1	1	1	1	0	0	0	0	1
Information element identifier								
1 Ext	Coding Standard	Information Element Instruction Field						2
1 Ext	Coding Standard	Flag	Reserved	Information Element Action Indicator				2
Length of Minimum Desired Cell Rate contents								3-4
Origin								5
Forward Minimum Desired Cell Rate Identifier (CLP=0+1)								6* (Note 1)
0	0	0	0	0	0	0	1	
Forward Minimum Desired Cell Rate value								6.1*
Forward Minimum Desired Cell Rate value (Continued)								6.2*
Forward Minimum Desired Cell Rate value (Continued)								6.3*
Backward Minimum Desired Cell Rate Identifier (CLP=0+1)								7* (Note 1)
0	0	0	0	0	0	1	0	
Backward Minimum Desired Cell Rate value								7.1
Backward Minimum Desired Cell Rate value (Continued)								7.2
Backward Minimum Desired Cell Rate value (Continued)								7.3

Note 1 - Although the forward and backward minimum desired cell rate parameters are optional within the context of the information element, their inclusion is mandatory within the context of this specification

Figure 3. 1 Minimum Desired Cell Rate Information Element

It is expected that the coding and use of this information element will be extended to generalise it use for other capabilities.

Coding standard (octet 2)

Bits	Meaning
8 7 6 5 4 3 2 1	
1 1	ATM Forum specific

Origin (octet 5)

Indicates the origin of this information element.

Bits	Meaning
8 7 6 5 4 3 2 1	
0 0 0 0 0 0 0 0	Originating user
0 0 0 0 0 0 0 1	Network generated

Forward/Backward Minimum Desired Cell Rate (octets 6.1 – 6.3 and 7.1 – 7.3)

The forward and backward minimum desired cell rate (MDCR) parameters indicate the minimum desired cell rate. It is coded as a 24-bit binary integer, with Bit 8 of the first octet being the most significant bit and Bit 1 of the third octet being the least significant bit. Allowable combinations of Traffic Parameters are described in SIG 4.0/Annex 9, as amended by this addendum.

A MDCR information element with content error and the pass along request bit in the IE instruction field set to "pass along request" shall be treated as an unrecognized information element.

If a forward minimum desired cell rate parameter is included within MDCR information element, a backward minimum desired cell rate parameter, or vice versa, shall also be included. If only a forward or backward minimum desired cell rate parameter is included in the MDCR information element, the MDCR information element shall be treated as a non mandatory information element with content error as specified in Q.2931/5.6.8.

4   UNI support of UBR with MDCR
[Normative]

4.1   Additions to UNI Signalling messages

4.1.1   Basic Point-to-Point Call

Add the following to section 2.0/SIG 4.0 Basic Point to Point Call:

3.1.7/Q.2931 SETUP:
Add the following to Table 3-8/Q.2931:

Information Element name	Reference	Direction	Type	Length
Minimum Desired Cell Rate	Section 3.1	both	O	13

4.5.1/Q.2931 Coding Rules

Add the following to Table 2-1/SIG 4.0:

Bits		Information Element	Max Length	Max no. of Occurrences
8 7 6 5	4 3 2 1			
1 1 1 1	0 0 0 0	Minimum Desired Cell Rate	13	1

4.1.2   Point to Multi-point calls

Add the following to section 5/SIG 4.0 Point-to-Multipoint Calls:

8.1.2.1/Q.2971 ADD PARTY:
Add the following to Table 8-10/Q.2971:

Information Element name	Reference	Direction	Type	Length
Minimum Desired Cell Rate	Section 3.1	both	O	13

4.2   UBR with MDCR Signalling Procedures for UNI 4.0

This section defines the additional signalling procedures, in order to support UBR with MDCR.

The procedures for the basic call/connection control in section 2/SIG 4.0 and section 5/SIG 4.0 shall apply. Only additional procedures to handle UBR calls/connections that specify MDCRs and procedures

to handle the insertion of a network generated MDCR parameter for UBR calls/connections are described in this section.

4.2.1   Call/Connection Establishment at the Originating Interface

The procedures of section 2/SIG 4.0 item 5.1.3/Q.2931 and section 5/SIG 4.0 shall apply with the following additions:

4.2.1.1   Procedures at the User Side

4.2.1.1.1   Procedures at the S_B and Coincident S_B and T_B Reference Points

If the calling user wishes to associate a Forward or Backward MDCR value with a UBR call/connection, it shall include a MDCR information element formatted as defined in section 3 in the SETUP or ADD PARTY message sent to the network. The information element shall contain the appropriate MDCR values for both the forward and backward direction. The origin field shall be set to "originating user".

For a point-to-multipoint call/connection, the MDCR values for both directions shall be present and the backward MDCR value shall be set to zero.

In an ADD PARTY message, the forward and backward MDCR values shall be set to those signalled in the original SETUP message. If no MDCR information element was included in the original SETUP message, no MDCR information element shall be included in the ADD PARTY message.

4.2.1.1.2   Procedures at the T_B Reference Point

The procedures of section 4.2.2.1 shall apply changing "network" to "user".

4.2.1.2   Procedures at the Network Side

If the MDCR information element is received in a SETUP message that does not specify the ATM Service Category UBR, the call/connection shall be cleared with cause # 73, " Unsupported combination of traffic parameters".

If a MDCR information element is received in an ADD PARTY message that does not correspond to a UBR connection, the party shall be cleared with cause # 73, " Unsupported combination of traffic parameters".

If the network receives a SETUP message containing a MDCR information element with the origin field set to "originating user", then if the call/connection is progressed, the network shall include the received MDCR information element unchanged in the forwarded setup indication.

If the network side receives a SETUP or ADD PARTY message containing a MDCR information element with the origin field set to "network generated" , then the network side shall take one of the following actions:
- Discard the MDCR information element and process the message as if the MDCR information element was not present,

- Replace the MDCR information element with a new MDCR information element (with the origin field set to "network generated"), or
- Retain the received MDCR information element.

If the network receives a SETUP message without a MDCR information element, then if the call/connection is progressed, the network may optionally include a MDCR information element with the origin field set to "network generated" in the forwarded setup indication. The content of the MDCR information element should be based on system configuration.

If, for a point-to-multipoint call/connection, the network generated a MDCR information element in the initial setup indication, then the network shall include the same MDCR information element in all subsequent add party indications.

If applicable, network-specific local actions are taken to process the call/connection according to the requested MDCR values.

Validation to ensure consistency between forwarded setup and add party indications for the same call/connection is optional. When validation is performed, upon reception of an ADD PARTY message, the following procedures shall apply:
- If the forwarded setup indication did not contain a MDCR information element, then no MDCR information element shall be included in the forwarded add party indication.
- If the forwarded setup indication contained a MDCR information element, the same MDCR information element shall be included in the forwarded add party indication.

When no validation is performed, then if the MDCR information element in the ADD PARTY message contains a MDCR information element with the origin field set to "originating user" and the party is progressed, the network shall include the received MDCR information element unchanged in the forwarded add party indication.

4.2.2   Call/Connection Establishment at the Destination Interface

The procedures of section 2/SIG 4.0 item 5.2.4/Q.2931 and section 5/SIG 4.0 shall apply with the following additions:

4.2.2.1 Procedures at the Network Side

If applicable, network-specific local actions are taken to process the call/connection according to the requested MDCR values.

If the network receives a setup or add party request containing a MDCR information element with the origin field set to "originating user" , then if the call/connection or party is progressed, the network shall include the received MDCR information element unchanged in the forwarded message.

If the network receives a setup or add party request containing a MDCR information element with the origin field set to "network generated", the network may discard the MDCR information element.

4.2.2.2 Procedures at the User Side

4.2.2.2.1   Procedures at the S$_B$ and Coincident S$_B$ and T$_B$ Reference Point

If a MDCR information element is received in a SETUP message that does not specify the ATM Service Category UBR, the call/connection shall be cleared with cause # 73, " Unsupported combination of traffic parameters".

4.2.2.2.2   Procedures at the T$_B$ Reference Point

The procedures of section 4.2.1.2 shall apply changing "network" to "user".

4.3   Additions to Section 3 of Annex 9/UNI SIG4.0

Modify the last two columns at the end of Table A9-2 in annex 9.3 /SIG 4.0 as follows:

ATM service Category	UBR					
Conformance	UBR.1			UBR.2		
Bearer Capability						
Broadband Bearer Class	C	X	VP	C	X	VP
ATM Transfer Capability (note 1)	Absent	Absent, 0, 2, 8 or 10	Absent, 10	Absent	Absent, 0, 2, 8 or 10	Absent, 10
Traffic Descriptor for a given direction						
PCR (CLP=0)						
PCR (CLP=0+1)		S			S	
SCR, MBS (CLP=0)						
SCR, MBS (CLP=0+1)						
ABR MCR						
Best Effort		S (note 9)			S (note 9)	
Tagging		N			Y	
Frame Discard		Y/N			Y/N	
MDCR		OO			OO	
QoS Classes		0			0	
Transit delay (note 2)						
peak-to-peak CDV						
CLR (CLP=0) (Note 11)						
CLR (CLP=0+1) (Note 11)						

Add the following item to the list of abbreviations for Table A9-2:

    OO = May or may not be present

4.4   Compatibility with nodes not supporting the UBR with MDCR Feature

Upon receiving a SETUP or ADD PARTY message specifying the UBR service category and containing the MDCR information element, nodes not supporting this feature will treat the MDCR information element as an unrecognized information element.

Nodes supporting the UBR with MDCR capability shall set the action indicator to "Discard information element, proceed and report status" or "Discard information element and proceed", and the IE instruction flag field (bit 5 of octet 2) to "follow explicit instruction". With either of these settings, at nodes that do not support the UBR with MDCR capability, UBR calls/connections that include the MDCR information element will be treated the same as UBR calls/connections that do not include the MDCR information element.

5   PNNI Support of UBR with MDCR

[Normative]

5.1   Additions to PNNI Signalling messages

This section specifies the necessary enhancements for the support of UBR calls/connections specifying MDCRs.

In section 6.4.5.1/PNNIv1.0, add the following to Table 6-5:

Bits								Information Element	Max Length	Max. no. of Occurrences
8	7	6	5	4	3	2	1			
1	1	1	1	0	0	0	0	Minimum Desired Cell Rate	13	1

5.1.1   SETUP

The following information element is added to Figure 6-8 in 6.3.1.6/PNNI 1.0:

Information Element	Reference	Type	Length
Minimum Desired Cell Rate	Section 3.1	O	13

5.1.2   ADD PARTY

The following information element is added to Figure 6-19 in 6.4.3.1/PNNI 1.0:

Information Element	Reference	Type	Length
Minimum Desired Cell Rate	Section 3.1	O	13

5.2   UBR with MDCR Signalling Procedures for PNNI

The procedures for the basic call/connection control in sections 6.5/PNNI 1.0 and 6.6/PNNI 1.0 shall apply. Only additional procedures to handle UBR calls/connections that specify MDCRs are described in this section.

If the preceding side receives a setup or add party request containing a MDCR information element, then if the call/connection or party is progressed, the preceding side shall include the received MDCR information element unchanged in the forwarded message.

The following procedures apply at the succeeding side:

If a MDCR information element is received in a SETUP message which does not specify the ATM Service Category UBR, the call/connection shall be cleared with cause # 73, " Unsupported combination of traffic parameters".

If a MDCR information element is received in an ADD PARTY message that does not correspond to a UBR connection, the party shall be cleared with cause # 73, " Unsupported combination of traffic parameters".

If applicable, network-specific local actions are taken to process the call/connection according to the requested MDCR values.

If the succeeding side receives a valid SETUP message containing a MDCR information element, then if the call/connection is progressed, the succeeding side shall include the received MDCR information element unchanged in the forwarded setup indication.

Validation to ensure consistency between forwarded setup and add party indications for the same call/connection is optional. When validation is performed, upon reception of an ADD PARTY message, the following procedures shall apply:

- If the forwarded setup indication did not contain a MDCR information element, then no MDCR information element shall be included in the forwarded add party indication.
- If the forwarded setup indication contained a MDCR information element, the same MDCR information element shall be included in the forwarded add party indication.

When no validation is performed, then if the MDCR information element is present in the ADD PARTY message and the party is progressed, the network shall include the received MDCR information element unchanged in the forwarded add party indication.

5.3   Changes to section 5/PNNI 1.0 PNNI Routing Specification

This section specifies the changes to Section 5 of PNNI 1.0 required for the support of UBR with MDCR routing extensions.

5.8.1.1.3.8/PNNI 1.0 Available Cell Rate (AvCR)

Modify the entire section as follows:

AvCR is a measure of effective available capacity for CBR, Real Time VBR and Non-Real Time VBR service categories. For ABR service category, AvCR is a measure of capacity available for minimum cell rate (MCR) reservation.

If UBR with MDCR routing extensions are supported, then the AvCR indicator for UBR bit shall be set to 1 in the RAIG that applies to the UBR service category. This bit has no meaning if the RAIG does not apply to the UBR service category. If the RAIG does indicate that it is applicable to the UBR service category and the AvCR indicator for UBR is set to 1, then the AvCR in this RAIG shall provide a measure of the capacity not reserved for service commitments (see figure 5.1). Except when the procedures in Appendix I are implemented, MDCR is not considered to be "reserved" (in the sense that new calls are not rejected due to load of existing UBR calls), so the AvCR shall not be decremented when accepting new UBR calls with non-zero MDCR. If the RAIG indicates that it is applicable to the UBR service category and the AvCR indicator for UBR is not set to 1, then AvCR is not applicable to the UBR service category.[1]

AvCR is a required topology attribute for CBR, real time VBR, non-real time VBR and ABR service categories. AvCR is expressed in units of cells per second.

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[1] There are cases in the PNNI 1.0 specification where the AvCR has no defined meaning.
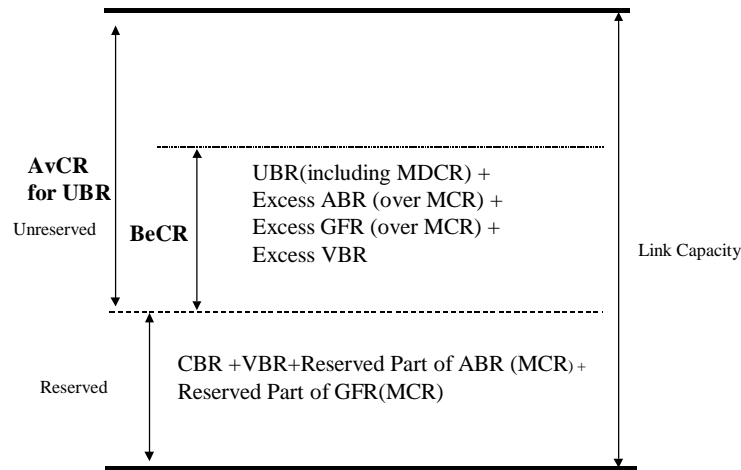
Figure 5. 1 Illustration of BeCR and AvCR for UBR

(Note that in some cases the BeCR can be larger than the AvCR)

Add a new section 5.8.1.1.3.11/PNNI 1.0 as follows:
5.8.1.1.3.11/PNNI 1.0 BeCR

BeCR is a measure of the difference between the load offered by all connections and the reserved capacity of those connections present on this node or link (see figure 5.1). The BeCR shall not account for any "reserved" traffic already accounted for by decrementing AvCR in the UBR RAIG. Except when the procedures in Appendix I are implemented, MDCR is not decremented from AvCR (as described in clause 5.8.1.1.3.8/PNNI 1.0 of this section), so all UBR traffic shall be accounted for in the BeCR.

The BeCR attribute shall only be generated in a RAIG that applies to the UBR service category, when the AvCR indicator for UBR is set to 1. If the BeCR attribute is received in a RAIG that does not apply to the UBR service category, it shall be ignored.

BeCR is an optional topology attribute for the UBR service category. BeCR is expressed in units of cells per second.

Add a new section 5.8.5.2.5.9/PNNI 1.0 as follows:
5.8.5.2.5.9/PNNI 1.0 BeCR

Changes in the optional topology attribute BeCR are measured in terms of the difference from the last value advertised. A threshold (BeCR_T) parameter, expressed as a percentage of maxCR, provides flexible control over the definition of significant change for BeCR.

Given a previous value for BeCR the algorithm establishes an upper bound and a lower bound for BeCR values which define a range of insignificance. Any new value for BeCR computed that is within the bounds is not a significant change from the previous value. Any new value for BeCR that is outside the bounds is a significant change.

The bounds of the range of insignificance are computed using the following algorithm:

```
compute_BeCR_bounds ( PREV_BeCR, maxCR, BeCR_T )
{
    /*
                •   PREV_BeCR = previous/currently advertised value for BeCR
                    for service category in cells/sec

                •   maxCR = Maximum Cell Rate for service category in
                    cells/sec

                •   BeCR_T = threshold as a percentage
                    ( 1 <= BeCR_T <= 100 )

    */

        delta = maxCR * ( BeCR_T/100);

    upper_BeCR_bound = PREV_BeCR + delta;

    if ( delta > PREV_BeCR )
        { lower_BeCR_bound = 0; }        /* set lower bound to zero */
    else
        { lower_BeCR_bound = PREV_BeCR - delta; }

} /* end compute_BeCR_bounds() */
```

When BeCR changes, the following algorithm is used to determine if the change is significant:

```
/* NEW_BeCR = new value for BeCR */
if (NEW_BeCR < lower_BeCR_bound ||
     NEW_BeCR > upper_BeCR_bound)
    { /* change in BeCR is significant */ }
else
    { /* change BeCR is NOT significant */ }
```

5.13.5/PNNI 1.0 Generic CAC Algorithm for Best-Effort Service
Modify the first paragraph of the section as follows:
For UBR connections, a link/node is may be included if and only if the UBR service category is supported
and Maximum Cell Rate is not equal to zero.

5.14.3/PNNI 1.0 Information Group Summary
Modify Table 5-18 as follows:

Table 5-18: Information Group Summary

Type	IG Name	Contains IGs one level down
32	Aggregation token	
33	Nodal hierarchy list	
34	Uplink information attribute	Outgoing resource availability (128)
35	LGN horizontal link extension	
64	PTSE	Nodal state parameters (96), Nodal information group (97), Internal reachable ATM addresses (224), Exterior reachable ATM addressees (256), Horizontal links (288), Uplinks (289), System Capabilities (640)
96	Nodal state parameters	Outgoing resource availability (128)

97	Nodal information group	Next higher level binding information (192)
128	Outgoing resource availability	Optional GCAC parameters (160), BeCR parameter (161)
129	Incoming resource availability	Optional GCAC parameters (160), BeCR parameter (161)
160	Optional GCAC parameters	
161	Optional BeCR parameter	
192	Next higher level binding information	
224	Internal reachable ATM addresses	Outgoing resource availability (128), Incoming resource availability (129)
256	Exterior reachable ATM addresses	Outgoing resource availability (128), Incoming resource availability (129), Transit network ID (304)
288	Horizontal links	Outgoing resource availability (128)
289	Uplinks	Uplink information attribute (34), Outgoing resource availability (128)
304	Transit network ID	
384	Nodal PTSE ack	
512	Nodal PTSE summaries	
513	Requested PTSE header	
640	System capabilities	

Table 5-18: Information Group Summary continued

Type	IG Name	Contained in IGs one level up	Contained in packets
32	Aggregation token		Hello (1)
33	Nodal hierarchy list		Hello (1)
34	Uplink information attribute	Uplinks (289)	Hello (1)
35	LGN horizontal link extension		Hello (1) for LGN horizontal Hello
64	PTSE		PTSP (2)
96	Nodal state parameters	PTSE — restricted IG	PTSP (2)
97	Nodal information group	PTSE — restricted IG	PTSP (2)
128	Outgoing resource availability	Uplink information attribute (34), Nodal state parameters (96), Internal Reachable ATM Address (224), Exterior reachable ATM addresses (256), Horizontal links (288), uplinks (289)	Hello (1), PTSP (2)
129	Incoming resource availability	Internal Reachable ATM Address (224), Exterior reachable ATM addresses (256)	PTSP (2)
160	Optional GCAC parameters	Outgoing resource availability (128), Incoming resource availability (129)	Hello (1), PTSP (2)
161	Optional BeCR parameter	Outgoing resource availability (128), Incoming resource availability (129)	Hello (1), PTSP (2)
192	Next higher level binding information	Nodal information group (97)	PTSP (2)
224	Internal reachable ATM addresses	PTSE — restricted IG	PTSP (2)
256	Exterior reachable ATM addresses	PTSE — restricted IG	PTSP (2)
288	Horizontal links	PTSE — restricted IG	PTSP (2)
289	Uplinks	PTSE — restricted IG	PTSP (2)
304	Transit network ID	Exterior reachable ATM addresses (256)	PTSP (2)
384	Nodal PTSE ack		PTSE Ack (3)
512	Nodal PTSE summaries		DBSummary (4)
513	Requested PTSE header		PTSE Request (5)
640	System capabilities	PTSE	all packets

Modify Table 5-19 as follows:

Table 5-19: Information Groups in PNNI Packets

Type	Packet Name	Contains Igs
1	Hello	Aggregation token (32), Nodal hierarchy list (33), Uplink information attribute (34), LGN horizontal link extension (35), Outgoing resource availability (128), Optional GCAC parameters (160), Optional BeCR parameter (161), System capabilities (640)
2	PTSP	PTSE (64), Nodal state parameters (96), Nodal information group (97), Outgoing resource availability (128), Incoming resource availability (129), Next higher level binding (192), Optional GCAC parameters (160), Optional BeCR parameter (161), Internal reachable ATM addresses (224), Exterior reachable ATM addresses (256), Horizontal links (288), Uplinks (289), Transit network ID (304), System capabilities (640)
3	PTSE ACK	Nodal PTSE Ack (384), System capabilities (640)

| 4 | DBSummary | Nodal PTSE summaries (512), System capabilities (640) |
| 5 | PTSE Request | Requested PTSE header (513), System capabilities (640) |

5.14.5/PNNI 1.0 The Resource Availability Information Group

Add a new third paragraph as follows:

The information group tags of the Optional BeCR parameter information group shall be set to optional, summarizable and non-transitive.

Modify Table 5-22/PNNI 1.0 as follows:

Table 5-22: The Resource Availability Information Group

Offset	Size (Octets)	Name	Function/Description
0	2	Type	Type = 128 for outgoing resource availability information Type = 129 for incoming resource availability information
2	2	Length	
4	2	RAIG Flags	For Bit definitions see Table 5-23 RAIG Flags.
6	2	*Reserved*	
8	4	Administrative Weight	default value = DefaultAdminWeight, additive
12	4	Maximum Cell Rate	Units : cells/second
16	4	Available Cell Rate	Units : cells/second
20	4	Cell Transfer Delay	Units : microseconds
24	4	Cell Delay Variation	Units : microseconds
28	2	Cell Loss Ratio (CLP=0)	Encoded as the negative logarithm of the value, i.e., the value n in a message indicates a CLR of 10^{-n}
30	2	Cell Loss Ratio (CLP=0+1)	Encoded as the negative logarithm of the value, i.e., the value n in a message indicates a CLR of 10^{-n}
Optional GCAC related information:			
32	2	Type	Type = 160 (optional GCAC parameters)
34	2	Length	
36	4	Cell Rate Margin	Units : cells/seconds
40	4	Variance Factor	units of 2^{-8}. Note : the value of 0xFFFFFFFF for Variance Factor is used to indicate infinity
Optional BeCR parameter:			
44	2	Type	Type = 161 (BeCR parameter)
46	2	Length	
48	4	BeCR	Units : cells/seconds

Modify Table 5-23/PNNI 1.0 as follows

Table 5-23: RAIG Flags

Bit ID:	Bit 16 (MSB)	Bit 15	Bit 14	Bit 13	Bit 12	Bits 11..3~~2~~	Bit 2	Bit 1 (LSB)
Meaning:	CBR	Rt-VBR	nrt-VBR	ABR	UBR (1)	*Reserved*	AvCR indicator for UBR (Note 1)	GCAC CLP Attribute

Note 1 - The AvCR indicator for UBR bit only applies when the UBR bit is set to 1. If the UBR bit is set to 1 and the AvCR indicator for UBR is set to 1, then the AvCR in this RAIG provides a measure of the unreserved capacity. If the UBR bit is set to 1 and the AvCR indicator for UBR is set to 0, then AvCR is not applicable to the UBR service category. See Clause 5.8.1.1.3.8/PNNI 1.0 in this section (i.e. Section 5.3) for further details.

Annex E/PNNI 1.0 Architectural Variables

Add a new architectural variable as follows:

BeCR_T: default value 20, allowed range 1 through 100.

> The percentage of maxCR such that changes in BeCR of less than that amount from the last advertised value are not considered significant.

5.4   Compatibility with nodes not supporting the UBR with MDCR feature

Upon receiving a SETUP/ ADD PARTY message specifying the UBR service category and containing the MDCR information element, nodes not supporting this feature will treat the MDCR information element as an unrecognized information element.

Nodes supporting the UBR with MDCR capability shall set the action indicator (bits 1-3 of octet 2) to " Discard information element, proceed and report status" or "Discard information element and proceed", the IE instruction flag field (bit 5 of octet 2) to "follow explicit instruction" and the pass along request field (bit 4 of octet 2) to "pass along request". With these settings, at nodes that do not support the UBR with MDCR capability, UBR calls/connections that include the MDCR information element will be treated the same as UBR calls that do not include the MDCR information element.

6   AINI Support of UBR with MDCR
[Normative]

6.1   AINI Signalling

6.1.1   Additions to AINI Signalling Messages

The message coding defined in section 3 shall apply.

6.1.2   UBR with MDCR Signalling Procedures for AINI

The following procedures apply in addition to those specified in Section5.2:

If the preceding side receives a setup or add party request containing a MDCR information element, with the origin field set to "network generated" , then the preceding side may discard the MDCR information element.

If the succeeding side receives a SETUP or ADD PARTY message containing a MDCR information element with the origin field set to "network generated" , then the succeeding side shall take one of the following actions:
- Discard the MDCR information element and process the message as if the MDCR information element was not present,
- Replace the MDCR information element with a new MDCR information element (with the the origin field set to "network generated"), or
- Retain the received MDCR information element.

At the succeeding side of an AINI, if the received SETUP message for a UBR call/connection does not contain a MDCR information element, the receiving network can optionally include a MDCR information element with the origin field set to "network generated" before forwarding the call/connection across the network. The content of the MDCR information element should be based on system configuration.

If, for a point-to-multipoint call/connection, the succeeding side of an AINI generated a MDCR information element in the initial setup indication, then the succeeding side shall also include the same MDCR information element in all subsequent add party indications.

6.1.3   Compatibility with nodes not supporting the UBR with MDCR feature

Upon receiving a SETUP/ADD PARTY message specifying the UBR service category and containing the MDCR information element, nodes not supporting this feature will treat the MDCR information element as unrecognized information element.

Nodes supporting the UBR with MDCR capability shall set the action indicator (bits 1-3 of octet 2) to " Discard information element, proceed and report status" or "Discard information element and proceed", the IE instruction flag field (bit 5 of octet 2) to "follow explicit instruction" and that the pass along request field (bit 4 of octet 2) to "pass along request". With these settings, at nodes that do not support the UBR

with MDCR capability, UBR call/connection that include the MDCR information element will be treated the same as UBR calls/connections that do not include the MDCR information element.

6.2   Interworking between AINI and B-ISUP

Add the following to 4.1.1.2.1.1/AINI

AINI to	B-ISUP
SETUP	IAM
MDCR	Not carried (Note 1)

Notes:

1. Actions to be performed are specified in the action indicator of this information element except that no status need be returned.

Add the following to 4.1.4.2.1.1/AINI:

AINI ⟶ B-ISUP	
SETUP	IAM
MDCR	Not carried (Note 1)

Notes:

1. Actions to be performed are specified in the action indicator of this information element except that no status need be returned.

Add the following to 4.1.4.2.1.2/AINI:

AINI ⟶ B-ISUP	
ADD PARTY	IAM
MDCR	Not carried (Note 1)

Notes:

1. Actions to be performed are specified in the action indicator of this information element except that no status need be returned.

6.3   Interworking Between AINI and PNNI

The procedures of section 4.2/AINI apply (i.e. information elements and messages are mapped to their equivalent counterparts).

Annex A   Protocol Implementation Conformance Statement (PICS) for the UNI V4.0 Component of the UBR with MDCR addendum to UNI Signalling 4.0, PNNI 1.0 and AINI.

A.1   Introduction

To evaluate conformance of a particular implementation, it is necessary to have a statement of which capabilities and options have been implemented. Such a statement is called a Protocol Implementation Conformance Statement (PICS).

A.1.1 Scope

This document provides the PICS proforma for the UNI 4.0 component of the UBR with MDCR Addendum to UNI Signalling 4.0, PNNI 1.0 and AINI defined in [1] in compliance with the relevant requirements, and in accordance with the relevant guidelines, given in ISO/IEC 9646-7. In most cases, statements contained in notes in the specification, which were intended as information, are not included in the PICS.

A.1.2   Normative References

[1]   UBR with MDCR Addendum to UNI Signalling 4.0, PNNI 1.0 and AINI.
[2]   ISO/IEC 9646-1: 1994, Information technology – Open systems interconnection – Conformance testing methodology and framework – Part 1: General Concepts (See also ITU Recommendation X.290 (1995)).
[3]   ISO/IEC 9646-7:1995, Information technology – Open systems interconnection – Conformance testing methodology and interconnection – Part 7: Implementation Conformance Statements (See also ITU telecommunication X.296 (1995)).
[4]   ISO/IEC 9646-3:1998, Information technology – Open systems interconnection – Conformance testing methodology and interconnection – Part 3: The Tree and Tabular Combined Notation (TTCN) (See also ITU telecommunication X.292 (1998)).

A.1.3   Definitions

Terms defined in [1]

Terms defined in ISO/IEC 9646-1 and in ISO/IEC 9646-7

In particular, the following terms defined in ISO/IEC 9646-1 apply:

Protocol Implementation Conformance Statement (PICS): A statement made by the supplier of an implementation or system, stating which capabilities have been implemented for a given protocol.

PICS proforma: A document, in the form of a questionnaire, designed by the protocol specifier or conformance test suite specifier, which when completed for an implementation or system becomes the PICS.

A.1.4   Acronyms

ASN.1   Abstract Syntax Notation One

ATS   Abstract Test Suite
IUT   Implementation Under Test
PICS   Protocol Implementation Conformance Statement
SUT   System Under Test

A.1.5 Conformance

The PICS does not modfy any of the requirements detailed in the UBR with MDCR Addendum to UNI Signalling 4.0, PNNI 1.0 and AINI. In case of apparent conflict between the statements in the base specification and in the annotations of "m" (mandatory) and "o" (optional) in the PICS, the text of the base specification takes precedence.

The supplier of a protocol implementation, which is claimed to conform to the UNI V4.0 component of the ATM Forum UNI Signalling 4.0, PNNI 1.0 and AINI Addendum for the support of UBR with MDCR, is required to complete a copy of the PICS proforma provided in this document and is required to provide the information necessary to identify both the supplier and the implementation.

A.2   Identification of the Implementation

Identification of the Implementation Under Test (IUT) and system in which it resides (the System Under Test (SUT)) should be filled in so as to provide as much detail as possible regarding version numbers and configuration options.

The product supplier information and client information should both be filled in if they are different.

A person who can answer queries regarding information supplied in the PICS should be named as the contact person.

A.2.1   Date of Statement

_____

A.2.2.   Implementation Under Test (IUT) Identification

IUT Name: _____

_____

_____

IUT Version: _____

A.2.3.   System Under Test (SUT) Identification

SUT Name: _____

_____

Hardware Configuration: _____

_____

_____

Operating System: _____

A.2.4   Product Supplier

Name: _____

Address: _____

_____

_____

Telephone Number: _____

Facsimile Number: _____

Email Address:_____

Additional Information: _____

_____

_____

A.2.5   Client

Name: _____

Address: _____

_____

_____

Telephone Number: _____

Facsimile Number: _____

Email Address:_____

Additional Information: _____

_____

_____

A.2.6   PICS Contact Person
(A person to contact if there are any queries concerning the content of the PICS)

Name: _____

Telephone Number: _____

Facsimile Number: _____

Email Address:_____

Additional Information: _____

_____

_____

Identification of the Protocol Specification

This PICS proforma applies to the following standard:

[1]   UBR with MDCR Addendum to UNI Signalling 4.0, PNNI 1.0 and AINI.

A.3   PICS Proforma

A.3.1   Global statement of conformance

The implementation described in this PICS meets all of the mandatory requirements of the reference protocol.

[ ] YES
[ ] NO

Note: Answering "No" indicates non-conformance to the specified protocol.   Non-supported mandatory capabilities are to be identified in the following tables, with an explanation by the implementor explaining why the implementation is non-conforming.

A.3.2   Instructions for Completing the PICS Proforma

The PICS Proforma is a fixed-format questionnaire. Answers to the questionnaire should be provided in the rightmost columns, either by simply indicating a restricted choice (such as Yes or No), or by entering a value or a set of range of values.

The following notations, defined in ISO/IEC 9647-7, are used for the support column:

Yes   supported by the implementation
No   not supported by the implementation

The following notations, defined in ISO/IEC 9647-7, are used for the status column:

m   mandatory – the capability is required to be supported.
o   optional – the capability may be supported or not.
o.i   qualified optional – for mutually exclusive or selectable options from a set. "i" is an integer which identifies a unique group of related optional items and the logic of their selection is defined immediately following the table.

A supplier may also provide additional information, categorised as exceptional or supplementary information. These additional information should be provided as items labelled X.<i> for exceptional information, or S.<i> for supplemental information, respectively, for cross reference purposes, where <i> is any unambiguous identification for the item. The exception and supplementary information are not mandatory and the PICS is complete without such information. The presence of optional supplementary or exception information should not affect test execution, and will in no way affect interoperability

verification. The column labelled 'Reference' gives a pointer to sections of the protocol specification for which the PICS Proforma is being written.

A.4   PICS for the support of UBR with MDCR at UNI interface

A.4.1   Major Capability at UNI interface (MCU)

Item Number	Item Description	Status	Condition for Status	Reference	Support
MCU1	Does the IUT support UBR with MDCR connections at the user side?	o.1		1	Yes__ No__
MCU1.1	Does the IUT support UBR with MDCR for point-to-multipoint connections at the user side?	m	MCU1 AND Note1	1	Yes__ No__
MCU1.2	Does the IUT support UBR with MDCR at the user side of the S_B or coincident S_B and T_B reference points?	o.2	MCU1	4	Yes__ No__
MCU1.3	Does the IUT support UBR with MDCR at the user side of the T_B reference point?	o.2	MCU1	4	Yes__ No__
MCU2	Does the IUT support UBR with MDCR connections at the network side?	o.1		1	Yes__ No__
MCU3	Is the IUT capable of generating an MDCR Information Element with the origin field set to "network generated"?	o		1	Yes__ No__
MCU4	Does the IUT support validation to ensure consistency between forwarded setup and add party indications for the same call/connection?	o	MCU1.1 OR MCU2	1	Yes__ No__
COMMENTS o.1: At least one of MCU1 or MCU2 must be supported o.2: At least one of MCU1.2 or MCU1.3 must be supported Note1: If point-to-multipoint is supported at the UNI					

A.4.2   Supported Information Elements at UNI (SIEU)

Item Number	Item Description	Status	Condition for status	Reference	Support
SIEU 1	For a UBR with MDCR call/connection, does the IUT include a forward and backward MDCR cell rate value in the MDCR information element in the SETUP message as coded in section 3.1?	m		3.1	Yes__ No__
SIEU 2	For a UBR with MDCR call/connection, does the IUT include a forward and backward MDCR cell rate value in the MDCR information element in the ADD	m	MCU1.1 OR MCU2	3.1	Yes__ No__

	PARTY message as coded in section 3.1?				
SIEU 3	Does the IUT set the action indicator of the MDCR information element to "Discard information element, proceed and report status" or "Discard information element and proceed", and the IE instruction flag field (bit 5 of octet 2) to "follow explicit instruction"?	m		4.4	Yes__ No__
Comments:					

A.4.3 Signalling Procedures at the Originating Interface

A.4.3.1 Signalling Procedures at the S_B and Coincident S_B and T_B User Side of the Reference Point

Item Number	Item Description	Status	Condition for status	Reference	Support
SPOI 1	If a UBR with MDCR connection is requested, does the IUT send a SETUP message to the network side that includes the MDCR information element containing a forward and backward MDCR value?	m	MCU1.2	4.2.1.1.1	Yes__ No__
SPOI 2	For UBR with MDCR point-to-multipoint call/connection, does the IUT include forward and backward MDCR values in the MDCR information element?	m	MCU1.1 AND MCU1.2	4.2.1.1.1	Yes__ No__
SPOI 3	Does the IUT set the forward and backward MDCR value in the MDCR information element in the ADD PARTY message to be the same as those signalled in the original SETUP message?	m	MCU1.1 AND MCU1.2	4.2.1.1.1	Yes__ No__
Comments:					

A.4.3.2 Signalling Procedures at the T_B User side of the Reference Point

Item Number	Item Description	Status	Condition for Status	Reference	Support
SPOI 4	If the IUT receives a setup request with a MDCR information element with the origin field set to "originating user" ,	m	MCU1.3	4.2.1.1.2	Yes__ No__

Item Number	Item Description	Status	Condition for Status	Reference	Support
	does the IUT progress the call/connection with the received MDCR information element in the forwarded message?				
SPOI 5	If the IUT receives an add party request with a MDCR information element with the origin field set to "originating user" , does the IUT progress the call/connection with the received MDCR information element in the forwarded message?	m	MCU1.1 AND MCU1.3	4.2.1.1.2	Yes__ No__
SPOI 6	If the user receives a setup or add party request containing a MDCR information element with the origin field set to "network generated" , is the IUT capable of discarding the MDCR information element?	o	MCU1.3	4.2.1.1.2	Yes__ No__
Comments:					

A.4.3.3 Signalling Procedures at the Network Side

Item Number	Item Description	Status	Condition for Status	Reference	Support
SPOI 7	If the IUT receives a SETUP message with a MDCR information element with the origin field set to "originating user" , does the IUT progress the call/connection with the received MDCR information element in the forwarded setup indication?	m	MCU2	4.2.1.2	Yes__ No__
SPOI 8	If the network side of the IUT receives a SETUP message containing a MDCR information element with the origin field set to "network generated", is the IUT capable of discarding the MDCR information element and processing the message as if the MDCR information element was not present?	o	MCU2	4.2.1.2	Yes__ No__
SPOI 9	If the network side of the IUT receives a SETUP message containing a MDCR information element, with the origin field set to "network generated", is the IUT capable of replacing the MDCR information element with a new MDCR information element (with the origin field set to "network generated")?	m	MCU2 AND MCU3	4.2.1.2	Yes__ No__
SPOI 10	If the network side of the IUT receives a ADD PARTY message containing a MDCR information element with the	m	SPOI 8	4.2.1.2	Yes__ No__

	origin field set to "network generated", is the IUT capable of discarding the MDCR information element and processing the message as if the MDCR information element was not present?				
SPOI 11	If the network side of the IUT receives a ADD PARTY message containing a MDCR information element with the origin field set to "network generated", is the IUT capable of replacing the MDCR information element with a new MDCR information element (with the origin field set to "network generated")?	m	SPOI 9	4.2.1.2	Yes__ No__
SPOI 12	If a MDCR information element is received in a SETUP message that does not specify the UBR ATM service category, does the IUT Release the call/connection with cause #73, "unsupported combination of traffic parameters"?	m	MCU2	4.2.1.2	Yes__ No__
SPOI 13	If a MDCR information element is received in an ADD PARTY message that does not correspond to a UBR connection, does the IUT release the party with cause #73, 'unsupported combination of traffic parameters'?	m	MCU2	4.2.1.2	Yes__ No__
SPOI 14	When validating to ensure consistency between forwarded setup and add party indications for the same call/connection, if the forwarded setup indication did not contain a MDCR information element, does the IUT not include a MDCR information element in the forwarded add party indication?	m	MCU 4 AND MCU2	4.2.1.2	Yes__ No__
SPOI 15	When validating to ensure consistency between forwarded setup and add party indications for the same call/connection, if the forwarded setup indication contained a MDCR information element, does the IUT include the same MDCR information element in the forwarded add party indication?	m	MCU 4 AND MCU2	4.2.1.2	Yes__ No__

SPOI 16	When no validation to ensure consistency between forwarded setup and add party indications is performed for the same call/connection, does the IUT include the MDCR information element received in the ADD PARTY message in the forwarded add party indication, if the origin field in the MDCR information element in the ADD PARTY message is set to "originating user"?	m	MCU2 AND (NOT MCU4)	4.2.1.2	Yes__ No__
SPOI 17	If the IUT receives a SETUP message without a MDCR information element, then if the call/connection is progressed, is the IUT capable of including an MDCR information element with the origin field set to "network generated" in the forwarded setup indication?	m	MCU3 AND MCU2	4.2.1.2	Yes__ No__
SPOI 18	If, for a point-to-multipoint call/connection, the IUT when acting as the network generated a MDCR information element in the initial setup indication, does the IUT include the same MDCR information element in all subsequent add party indications?	m	MCU3 AND MCU2	4.2.1.2	Yes__ No__
Comments:					

A.4.4 Signalling Procedures at the Destination Interface

A.4.4.1 Signalling Procedures at the Network Side

Item Number	Item Description	Status	Condition for Status	Reference	Support
SPDI 1	If the IUT receives a setup request with a MDCR information element with the origin field set to "originating user" , does the IUT progress the call/connection with the received MDCR information element in the forwarded message?	m	MCU2	4.2.2.1	Yes__ No__
SPDI 2	If the IUT receives an add party request with a MDCR information element with the origin field set to "originating user" , does the IUT progress the call/connection with the received MDCR information element in the forwarded message?	m	MCU2	4.2.2.1	Yes__ No__
SPDI 3	If the network receives a setup or add	o	MCU2	4.2.2.1	Yes__ No__

	party request containing a MDCR information element with the origin field set to "network generated" , is the IUT capable of discarding the MDCR information element?				
Comments:					

A.4.4.2 Signalling Procedures at the S_B and Coincident S_B and T_B User Side of the Reference Point

SPDI 4	If a MDCR information element is received in a SETUP message which does not specify the UBR ATM service category, does the IUT release the call/connection with cause #73, 'unsupported combination of traffic parameters'?	m	MCU1.2	4.2.2.2.1	Yes__ No__
Comments:					

A.4.4.3 Signalling Procedures at the T_B User Side of the Reference Point

Item Number	Item Description	Status	Condition for Status	Reference	Support
SPDI 5	If the IUT receives a SETUP message with a MDCR information element with the origin field set to "originating user", does the IUT progress the call/connection with the received MDCR information element in the forwarded setup indication?	m	MCU1.3	4.2.2.2.2	Yes__ No__
SPDI 6	If the user side of the IUT receives a SETUP message containing a MDCR information element with the origin field set to "network generated" , is the IUT capable of discarding the MDCR information element and processing the message as if the MDCR information element was not present?	o	MCU1.3	4.2.2.2.2	Yes__ No__
SPDI 7	If the network side of the IUT receives a SETUP message containing a MDCR information element, with the origin field set to "network generated", is the IUT capable of replacing the MDCR information element with a new MDCR information element (with the origin	m	MCU1.3 AND MCU3	4.2.2.2.2	Yes__ No__

	field set to "network generated")?				
SPDI 8	If the network side of the IUT receives a ADD PARTY message containing a MDCR information element with the origin field set to "network generated", is the IUT capable of discarding the MDCR information element and processing the message as if the MDCR information element was not present?	m	MCU1.1 AND SPDI 6	4.2.2.2.2	Yes__ No__
SPDI 9	If the network side of the IUT receives a ADD PARTY message containing a MDCR information element with the origin field set to "network generated", is the IUT capable of replacing the MDCR information element with a new MDCR information element (with the origin field set to "network generated")?	m	MCU1.1 AND SPDI 7	4.2.2.2.2	Yes__ No__
SPDI 10	If a MDCR information element is received in a SETUP message that does not specify the UBR ATM service category, does the IUT Release the call/connection with cause #73, "unsupported combination of traffic parameters"?	m	MCU1.3	4.2.2.2.2	Yes__ No__
SPDI 11	If a MDCR information element is received in an ADD PARTY message that does not correspond to a UBR connection, does the IUT release the party with cause #73, 'unsupported combination of traffic parameters'?	m	MCU1.1 AND MCU1.3	4.2.2.2.2	Yes__ No__
SPDI 12	When validating to ensure consistency between forwarded setup and add party indications for the same call/connection, if the forwarded setup indication did not contain a MDCR information element, does the IUT not include a MDCR information element in the forwarded add party indication?	m	MCU1.1 AND MCU1.3 AND MCU 4	4.2.2.2.2	Yes__ No__
SPDI 13	When validating to ensure consistency between forwarded setup and add party indications for the same call/connection, if the forwarded setup indication contained a MDCR information element, does the IUT include the same MDCR information element in the forwarded add party indication?	m	MCU1.1 AND MCU1.3 AND MCU 4	4.2.2.2.2	Yes__ No__
SPDI 14	When no validation to ensure consistency between forwarded setup and add party indications is performed for the same call/connection, does the IUT include the MDCR information element received in the ADD PARTY message in the forwarded add party	m	MCU1.1 AND MCU1.3 AND (NOT MCU4)	4.2.2.2.2	Yes__ No__

	indication, if the origin field in the MDCR information element in the ADD PARTY message is set to "originating user" ?				
SPDI 15	If the IUT receives a SETUP message without a MDCR information element, then if the call/connection is progressed, is the IUT capable of including an MDCR information element with the origin field set to "network generated" in the forwarded setup indication?	m	MCU1.3 AND MCU3	4.2.2.2.2	Yes__ No__
SPDI 16	If, for a point-to-multipoint call/connection, the IUT at the user side generated a MDCR information element in the initial SETUP message, does the IUT include the same MDCR information element in all subsequent add party indications?	m	MCU1.1 AND MCU1.3 AND MCU3	4.2.2.2.2	Yes__ No__
Comments:					

Annex B   Protocol Implementation Conformance Statement (PICS) for the PNNI1.0 Components of the UBR with MDCR addendum to UNI Signalling 4.0, PNNI 1.0 and AINI.

B.1   Introduction

To evaluate conformance of a particular implementation, it is necessary to have a statement of which capabilities and options have been implemented. Such a statement is called a Protocol Implementation Conformance Statement (PICS).

B.1.1   Scope

This document provides the PICS proforma for the PNNI 1.0 components of the UBR with MDCR Addendum to UNI Signalling 4.0, PNNI 1.0 and AINI defined in [1] in compliance with the relevant requirements, and in accordance with the relevant guidelines, given in ISO/IEC 9646-7. In most cases, statements contained in notes in the specification, which were intended as information, are not included in the PICS.

B.1.2   Normative References

[1]   UBR with MDCR Addendum to UNI Signalling 4.0, PNNI 1.0 and AINI.
[2]   ISO/IEC 9646-1: 1994, Information technology – Open systems interconnection – Conformance testing methodology and framework – Part 1: General Concepts (See also ITU Recommendation X.290 (1995)).
[3]   ISO/IEC 9646-7: 1995, Information technology – Open systems interconnection – Conformance testing methodology and framework – Part 7: Implementation Conformance Statements (See also ITU Recommendation X.296 (1995)).
[4]   ISO/IEC 9646-3:1998, Information technology – Open systems interconnection – Conformance testing methodology and interconnection – Part 3: The Tree and Tabular Combined Notation (TTCN) (See also ITU telecommunication X.292 (1998)).

B.1.3   Definitions

Terms defined in [1]

Terms defined in ISO/IEC 9646-1 and in ISO/IEC 9646-7

In particular, the following terms defined in ISO/IEC 9646-1 apply:

Protocol Implementation Conformance Statement (PICS): A statement made by the supplier of an implementation or system, stating which capabilities have been implemented for a given protocol.

PICS proforma: A document, in the form of a questionnaire, designed by the protocol specifier or conformance test suite specifier, which when completed for an implementation or system becomes the PICS.

B.1.4 Acronyms

ASN.1   Abstract Syntax Notation One
ATS   Abstract Test Suite
IUT   Implementation Under Test
PICS   Protocol Implementation Conformance Statement
SUT   System Under Test

B.1.5 Conformance

The PICS does not modify any of the requirements detailed in the UBR with MDCR Addendum to UNI Signalling 4.0, PNNI 1.0 and AINI. In case of apparent conflict between the statements in the base specification and in the annotations of "m" (mandatory) and "o" (optional) in the PICS, the text of the base specification takes precedence.

The supplier of a protocol implementation, which is claimed to conform to the PNNI 1.0 components of the ATM Forum UNI Signalling 4.0 , PNNI 1.0 and AINI Addendum for the support of UBR with MDCR, is required to complete a copy of the PICS proforma provided in this document and is required to provide the information necessary to identify both the supplier and the implementation.

B.2   Identification of the Implementation

Identification of the Implementation Under Test (IUT) and system in which it resides (the System Under Test (SUT)) should be filled in so as to provide as much detail as possible regarding version numbers and configuration options.

The product supplier information and client information should both be filled in if they are different.

A person who can answer queries regarding information supplied in the PICS should be named as the contact person.

B.2.1   Date of Statement

_____

B.2.2   Implementation Under Test (IUT) Identification

IUT Name: _____

_____

_____

IUT Version: _____

B.2.3   System Under Test (SUT) Identification

SUT Name: _____

_____

Hardware Configuration: _____

_____

_____

Operating System: _____

B.2.4   Product Supplier

Name: _____

Address: _____

_____

_____

Telephone Number: _____

Facsimile Number: _____

Email Address:_____

Additional Information: _____

_____

_____

B.2.5   Client

Name: _____

Address: _____

_____

_____

Telephone Number: _____

Facsimile Number: _____

Email Address:_____

Additional Information: _____

_____

_____

B.2.6   PICS Contact Person
(A person to contact if there are any queries concerning the content of the PICS)

Name: _____

Telephone Number: _____

Facsimile Number: _____

Email Address:_____

Additional Information: _____

_____

_____

Identification of the Protocol Specification

This PICS proforma applies to the following standard:

[1]   UBR with MDCR Addendum to UNI Signalling 4.0, PNNI 1.0 and AINI.

B.3   PICS Proforma

B.3.1   Global statement of conformance

The implementation described in this PICS meets all of the mandatory requirements of the reference protocol.

[ ] YES
[ ] NO

Note: Answering "No" indicates non-conformance to the specified protocol. Non-supported mandatory capabilities are to be identified in the following tables, with an explanation by the implementor explaining why the implementation is non-conforming.

B.3.2   Instructions for Completing the PICS Proforma

The PICS Proforma is a fixed-format questionnaire. Answers to the questionnaire should be provided in the rightmost columns, either by simply indicating a restricted choice (such as Yes or No), or by entering a value or a set of range of values.

The following notations, defined in ISO/IEC 9647-7, are used for the support column:

Yes   supported by the implementation
No   not supported by the implementation

The following notations, defined in ISO/IEC 9647-7, are used for the status column:

m   mandatory – the capability is required to be supported.
o   optional – the capability may be supported or not.
o.i   qualified optional – for mutually exclusive or selectable options from a set. "i" is an integer which identifies a unique group of related optional items and the logic of their selection is defined immediately following the table.

A supplier may also provide additional information, categorized as exceptional or supplementary information. These additional information should be provided as items labelled X.<i> for exceptional information, or S.<i> for supplemental information, respectively, for cross reference purposes, where <i> is any unambiguous identification for the item. The exception and supplementary information are not mandatory and the PICS is complete without such information. The presence of optional supplementary or exception information should not affect test execution, and will in no way affect interoperability verification. The column labelled 'Reference' gives a pointer to sections of the protocol specification for which the PICS Proforma is being written.

B.4   PICS for the support of UBR with MDCR at the PNNI interface

B.4.1   Major Capability at PNNI interface (MCP)

Item Number	Item Description	Status	Condition for status	Reference	Support
MCP1	Does the IUT support PNNI signalling of UBR with MDCR connections at the PNNI interface?	o.1			Yes__ No__
MCP1.1	Does the IUT support validation to ensure consistency between forwarded setup and add party indications for the same call/connection?	o	MCP1		Yes__ No__
MCP2	Does the IUT support PNNI routing procedures for UBR with MDCR?	o.1			Yes__ No__
MCP2.1	Does the IUT support generation of AvCR in the RAIG for the UBR service category?	m	MCP2		Yes__ No__
MCP2.2	Does the IUT support generation of BeCR?	o	MCP2.1		Yes__ No__
Comments: o.1: At least one of MCP1 or MCP2 must be supported					

B.4.2 Supported Information Elements at PNNI (SIEP)

Item	Item Description	Status	Condition for status	Reference	Support
SIEP1	For a UBR with MDCR call/connection, does the IUT include a forward and backward MDCR cell rate value in the MDCR information element in the SETUP message as coded in section	m	MCP1	3.1	Yes__ No__

	3.1?				
SIEP 2	For a UBR with MDCR call/connection, does the IUT include a forward and backward MDCR cell rate value in the MDCR information element in the ADD PARTY message as coded in section 3.1?	m	MCP1	3.1	Yes__ No__
Comments					

B.4.3 Signalling Procedures for UBR with MDCR at PNNI interface(SPUMP)

Item	Item Description	Status	Condition for status	Reference	Support
SPUMP 1	If the preceding side of the IUT receives a setup request containing a MDCR information element, then if the call/connection is progressed, does the IUT include the received MDCR information element unchanged in the forwarded message?	m	MCP1	5.2	Yes__ No__
SPUMP 2	If the preceding side of the IUT receives an add party request containing a MDCR information element, then if the party is progressed, does the IUT include the received MDCR information element unchanged in the forwarded message?	m	MCP1	5.2	Yes__ No__
SPUMP 3	If the MDCR information element is received in a SETUP message that does not specify the UBR ATM service category, does the IUT release the call/connection with cause #73, "unsupported combination of traffic parameters"?	m	MCP1	5.2	Yes__ No__
SPUMP 4	If the MDCR information element is received in an ADD PARTY message that does not correspond to a UBR connection, does the IUT release the party with cause #73, "unsupported combination of traffic parameters"?	m	MCP1	5.2	Yes__ No__
SPUMP 5	If the succeeding side of the IUT receives a valid SETUP message containing a MDCR information element, does the IUT include the received MDCR information element in the forwarded setup indication?	m	MCP1	5.2	Yes__ No__
SPUM 6	When validating to ensure consistency between forwarded setup and add party indications for the same call/connection, if the forwarded setup	m	MCP 1.1	5.2	Yes__ No__

Item	Item Description				
	indication did not contain a MDCR information element, does the IUT not include a MDCR information element in the forwarded add party indication?				
SPUMP 7	When validating to ensure consistency between forwarded setup and add party indications for the same call/connection, if the forwarded setup indication contained a MDCR information element, does the IUT include the same MDCR information element in the forwarded add party indication?	m	MCP 1.1	5.2	Yes__ No__
SPUM 8	When no validation to ensure consistency between forwarded setup and add party indications is performed for the same call/connection, if the MDCR information element is present in the ADD PARTY message and the party is progressed, does the IUT include the received MDCR information element unchanged in the forwarded add party indication?	m	NOT MCP1.1	5.2	Yes__ No__
SPUMP 9	If the IUT receives a MDCR information element with content error and the pass along request bit in the IE instruction field set to "pass along request", does the IUT treat the MDCR information element as an unrecognized information element?	m	MCP1	3.1	Yes__ No__
SPUMP 10	Does the IUT set the action indicator (bits 1-3 of octet 2) of the MDCR information element to "Discard information element, proceed and report status" or "Discard information element and proceed", the IE instruction flag field (bit 5 of octet 2) to "follow explicit instruction" and the pass along request field (bit 4 of octet 2) to "pass along request"?	m	MCP1	5.4	Yes__ No__
Comments					

B.4.4 PNNI Routing Procedures (PRP)

Item	Item Description	Status	Condition for status	Reference	Support
PRP1	Does the IUT set the AvCR indicator for UBR bit and generate an AvCR in the RAIG that applies to the UBR service category?	m	MCP2.1	5.3	Yes__ No__
PRP2	Does the IUT include the BeCR	m	MCP2.2	5.3	Yes__ No__

Item	Item Description	Status	Condition for status	Reference	Support
	topology attribute in the RAIG for the UBR service category formatted according to Table 5-22?				
Comments					

Annex C   Protocol Implementation Conformance Statement (PICS) for the AINI Components of the UBR with MDCR addendum to UNI Signalling 4.0, PNNI 1.0 and AINI.

C.1   Introduction

To evaluate conformance of a particular implementation, it is necessary to have a statement of which capabilities and options have been implemented. Such a statement is called a Protocol Implementation Conformance Statement (PICS).

C.1.1   Scope

This document provides the PICS proforma for the AINI components of the UBR with MDCR Addendum to UNI Signalling 4.0, PNNI 1.0 and AINI defined in [1] in compliance with the relevant requirements, and in accordance with the relevant guidelines, given in ISO/IEC 9646-7. In most cases, statements contained in notes in the specification, which were intended as information, are not included in the PICS.

C.1.2   Normative References

[1]   UBR with MDCR Addendum to UNI Signalling 4.0, PNNI 1.0 and AINI.
[2]   ISO/IEC 9646-1: 1994, Information technology – Open systems interconnection – Conformance testing methodology and framework – Part 1: General Concepts (See also ITU Recommendation X.290 (1995)).
[3]   ISO/IEC 9646-7: 1995, Information technology – Open systems interconnection – Conformance testing methodology and framework – Part 7: Implementation Conformance Statements (See also ITU Recommendation X.296 (1995)).
[4]   ISO/IEC 9646-3:1998, Information technology – Open systems interconnection – Conformance testing methodology and interconnection – Part 3: The Tree and Tabular Combined Notation (TTCN) (See also ITU telecommunication X.292 (1998)).

C.1.3   Definitions

Terms defined in [1]

Terms defined in ISO/IEC 9646-1 and in ISO/IEC 9646-7

In particular, the following terms defined in ISO/IEC 9646-1 apply:

Protocol Implementation Conformance Statement (PICS): A statement made by the supplier of an implementation or system, stating which capabilities have been implemented for a given protocol.

PICS proforma: A document, in the form of a questionnaire, designed by the protocol specifier or conformance test suite specifier, which when completed for an implementation or system becomes the PICS.

C.1.4   Acronyms

ASN.1   Abstract Syntax Notation One
ATS   Abstract Test Suite
IUT   Implementation Under Test
PICS   Protocol Implementation Conformance Statement
SUT   System Under Test

C.1.5 Conformance

The PICS does not modify any of the requirements detailed in the UBR with MDCR Addendum to UNI Signalling 4.0, PNNI 1.0 and AINI. In case of apparent conflict between the statements in the base specification and in the annotations of "m" (mandatory) and "o" (optional) in the PICS, the text of the base specification takes precedence.

The supplier of a protocol implementation, which is claimed to conform to the AINI components of the ATM Forum UNI Signalling 4.0, PNNI 1.0 and AINI Addendum for the support of UBR with MDCR, is required to complete a copy of the PICS proforma provided in this document and is required to provide the information necessary to identify both the supplier and the implementation.

C.2   Identification of the Implementation

Identification of the Implementation Under Test (IUT) and system in which it resides (the System Under Test (SUT)) should be filled in so as to provide as much detail as possible regarding version numbers and configuration options.

The product supplier information and client information should both be filled in if they are different.

A person who can answer queries regarding information supplied in the PICS should be named as the contact person.

C.2.1   Date of Statement

_____

C.2.2   Implementation Under Test (IUT) Identification

IUT Name: _____

_____

_____

IUT Version: _____

C.2.3   System Under Test (SUT) Identification

SUT Name: _____

_____

Hardware Configuration: _____

_____

_____

Operating System: _____

C.2.4   Product Supplier

Name: _____

Address: _____

_____

_____

Telephone Number: _____

Facsimile Number: _____

Email Address:_____

Additional Information: _____

_____

_____

C.2.5   Client

Name: _____

Address: _____

_____

_____

Telephone Number: _____

Facsimile Number: _____

Email Address:_____

Additional Information: _____

_____

_____

C.2.6   PICS Contact Person

(A person to contact if there are any queries concerning the content of the PICS)

Name: _____

Telephone Number: _____

Facsimile Number: _____

Email Address: _____

Additional Information: _____

_____

_____

Identification of the Protocol Specification

This PICS proforma applies to the following standard:

[1]   UBR with MDCR Addendum to UNI Signalling 4.0, PNNI 1.0 and AINI.

C.3   PICS Proforma

C.3.1   Global statement of conformance

The implementation described in this PICS meets all of the mandatory requirements of the reference protocol.

[ ] YES
[ ] NO

Note: Answering "No" indicates non-conformance to the specified protocol. Non-supported mandatory capabilities are to be identified in the following tables, with an explanation by the implementor explaining why the implementation is non-conforming.

C.3.2   Instructions for Completing the PICS Proforma

The PICS Proforma is a fixed-format questionnaire. Answers to the questionnaire should be provided in the rightmost columns, either by simply indicating a restricted choice (such as Yes or No), or by entering a value or a set of range of values.

The following notations, defined in ISO/IEC 9647-7, are used for the support column:

Yes   supported by the implementation
No   not supported by the implementation

The following notations, defined in ISO/IEC 9647-7, are used for the status column:

m   mandatory – the capability is required to be supported.
o   optional – the capability may be supported or not.
o.i   qualified optional – for mutually exclusive or selectable options from a set. "i" is an integer which
         identifies a unique group of related optional items and the logic of their selection is defined
         immediately following the table.

A supplier may also provide additional information, categorized as exceptional or supplementary
information. These additional information should be provided as items labelled X.<i> for exceptional
information, or S.<i> for supplemental information, respectively, for cross reference purposes, where <i>
is any unambiguous identification for the item. The exception and supplementary information are not
mandatory and the PICS is complete without such information. The presence of optional supplementary
or exception information should not affect test execution, and will in no way affect interoperability
verification. The column labelled 'Reference' gives a pointer to sections of the protocol specification for
which the PICS Proforma is being written.

C.4   PICS for the support of UBR with MDCR at the AINI interface

C.4.1   Major Capability at AINI interface (MCA)

Item Number	Item Description	Status	Condition for status	Reference	Support
MCA1	Does the IUT support UBR with MDCR for point-to-multipoint connections at the AINI interface?	m	Note1	1	Yes__ No__
MCA2	Is the IUT capable of generating a MDCR Information Element with the origin field set to "network generated"?	o		1	Yes__ No__
MCA3	Does the IUT support validation to ensure consistency between forwarded setup and add party indications for the same call/connection?	o	MCP1		Yes__ No__
Comments: Note1: If point to multipoint is supported at the AINI					

C.4.2 Supported Information Elements at AINI (SIEA)

Item	Item Description	Status	Condition for status	Reference	Support
SIEA1	For a UBR with MDCR call/connection, does the IUT include a forward and backward MDCR cell rate value in the MDCR information element in the SETUP message as coded in section 3.1?	m		3.1	Yes__ No__
SIEA 2	For a UBR with MDCR call/connection, does the IUT include a forward and backward MDCR cell rate value in the MDCR information element in the ADD PARTY message as coded in section 3.1?	m	MCP1	3.1	Yes__ No__

Comments

C.4.3 Signalling Procedures for UBR with MDCR at AINI interface (SPUMA)

Item	Item Description	Status	Condition for status	Reference	Support
SPUMA 1	If the preceding side of the IUT receives a setup request containing a MDCR information element with the origin field set to "originating user", then if the call/connection is progressed, does the IUT include the received MDCR information element unchanged in the forwarded message?	m		5.2, 6.1.2	Yes__ No__
SPUMA 2	If the preceding side of the IUT receives an add party request containing a MDCR information element with the origin field set to "originating user", then if the party is progressed, does the IUT include the received MDCR information element unchanged in the forwarded message?	m	MCP1	5.2, 6.1.2	Yes__ No__
SPUMA 3	If the MDCR information element is received in a SETUP message that does not specify the UBR ATM service category, does the IUT release the call/connection with cause #73, "unsupported combination of traffic parameters"?	m		5.2, 6.1.2	Yes__ No__
SPUMA 4	If the MDCR information element is received in an ADD PARTY message that does not correspond to a UBR connection, does the IUT release the party with cause #73, "unsupported combination of traffic parameters"?	m	MCP1	5.2, 6.1.2	Yes__ No__
SPUMA 5	If the succeeding side of the IUT receives a valid SETUP message containing a MDCR information element with the origin field set to "originating user", does the IUT include the received MDCR information element in the forwarded setup indication?	m		5.2, 6.1.2	Yes__ No__
SPUMA 6	When validating to ensure consistency between forwarded setup and add party indications for the same call/connection, if the forwarded setup indication did not	m	MCP 3	5.2, 6.1.2	Yes__ No__

	contain a MDCR information element, does the IUT not include a MDCR information element in the forwarded add party indication?				
SPUMA 7	When validating to ensure consistency between forwarded setup and add party indications for the same call/connection, if the forwarded setup indication contained a MDCR information element, does the IUT include the same MDCR information element in the forwarded add party indication?	m	MCP 3	5.2, 6.1.2	Yes__ No__
SPUMA 8	When no validation to ensure consistency between forwarded setup and add party indications is performed for the same call/connection, if the received ADD PARTY message includes a MDCR information element with the origin field set to "originating user" and the party is progressed, does the IUT include the received MDCR information element unchanged in the forwarded add party indication?	m	MCP 1 AND (NOT MCP3)	5.2, 6.1.2	Yes__ No__
SPUMA 9	If the preceding side receives a setup or add party request containing a MDCR information element with the origin field set to "network generated", is the IUT capable of discarding the MDCR information element?	o		6.1.2	Yes__ No__
SPUMA 10	If the succeeding side of the IUT receives a SETUP message containing a MDCR information element with the origin field set to "network generated", is the IUT capable of discarding the MDCR information element and processing the message as if the MDCR information element was not present?	o		6.1.2	Yes__ No__
SPUMA 11	If the succeeding side of the IUT receives a SETUP message containing a MDCR information element, with the origin field set to "network generated", is the IUT capable of replacing the MDCR information element with a new MDCR information element (with the origin field set to "network generated")?	m	MCP2	6.1.2	Yes__ No__
SPUMA 12	If the succeeding side of the IUT receives a ADD PARTY message	m	SPUM 10 AND	6.1.2	Yes__ No__

	containing a MDCR information element with the origin field set to "network generated", is the IUT capable of discarding the MDCR information element and processing the message as if the MDCR information element was not present?		MCP1		
SPUMA 13	If the succeeding side of the IUT receives a ADD PARTY message containing a MDCR information element with the origin field set to "network generated", is the IUT capable of replacing the MDCR information element with new a MDCR information element (with the origin field set to "network generated")?	m	SPUM 11 and MCP1	6.1.2	Yes__ No__
SPUMA 14	If the received SETUP message at the succeeding side of the IUT for a UBR call/connection does not contain a MDCR information element, is the IUT capable of including a MDCR information element with the origin field set to "network generated" before forwarding the call/connection?	m	MCP2	6.1.2	Yes__ No__
SPUMA 15	If, for a point-to-multipoint call/connection, the succeeding side of the IUT generated a MDCR information element in the initial setup indication, does the IUT include the same MDCR information element in all subsequent add party indications?	m	MCP1 AND MCP2	6.1.2	Yes__ No__
SPUMA 16	If the IUT receives a MDCR information element with content error and the pass along request bit in the IE instruction field set to "pass along request", does the IUT treat the MDCR information element as an unrecognized information element?	m		3.1	Yes__ No__
SPUMA 17	Does the IUT set the action indicator (bits 1-3 of octet 2) of the MDCR information element to "Discard information element, proceed and report status" or "Discard information element and proceed", the IE instruction flag field (bit 5 of octet 2) to "follow explicit instruction" and the pass along request field (bit 4 of octet 2) to "pass along request"?	m		6.1.3	Yes__ No__
Comments					

Annex D   UBR with MDCR SNMP MIB

[Normative]

1. Add REVISION Clause

```
pnniMIB MODULE-IDENTITY
        LAST-UPDATED    "0006160000Z"
        ORGANIZATION    "The ATM Forum"
        CONTACT-INFO
            "The ATM Forum
             2570 West El Camino Real, Suite 304
             Mountain View, CA 94040-1313 USA
             Phone: +1 650-949-6700
             Fax:   +1 650-949-6705
             info@atmforum.com"
        DESCRIPTION
            "The MIB module for managing ATM Forum PNNI routing."
        REVISION        "0005080000Z"
        DESCRIPTION
            "Updated version of the PNNI MIB adding support for the UBR
             with MDCR capability (af-cs-0147.000)."
        REVISION        "9810240000Z"
        DESCRIPTION
            "Updated version of the PNNI MIB released with the PNNI
             Addendum on PNNI/B-QSIG Interworking and Generic
             Functional Protocol for the Support of Supplementary
             Services (af-cs-0102.000)."
        REVISION        "9705010000Z"
        DESCRIPTION
            "Updated version of the PNNI MIB released with the PNNI
             V1.0 Errata and PICS (af-pnni-0081.000)."
        REVISION        "9602270000Z"
        DESCRIPTION
            "Initial version of the MIB for monitoring and controlling
             PNNI routing."
        ::= { atmfPnni 1 }
```

2.1 Add objects to PnniNodeTimerEntry

```
PnniNodeTimerEntry ::=
        SEQUENCE {
                pnniNodePtseHolddown            Integer32,
                pnniNodeHelloHolddown           Integer32,
                pnniNodeHelloInterval           Integer32,
                pnniNodeHelloInactivityFactor   Integer32,
                pnniNodeHlinkInact              Integer32,
                pnniNodePtseRefreshInterval     Integer32,
                pnniNodePtseLifetimeFactor      INTEGER,
                pnniNodeRxmtInterval            Integer32,
                pnniNodePeerDelayedAckInterval  Integer32,
                pnniNodeAvcrPm                  INTEGER,
                pnniNodeAvcrMt                  INTEGER,
                pnniNodeCdvPm                   INTEGER,
                pnniNodeCtdPm                   INTEGER,
                pnniNodeBeCRT                   INTEGER,
                pnniNodeGenerateUbrAvCR         TruthValue,
```

```
                    pnniNodeGenerateBeCR            TruthValue,
                    pnniNodeBeCRTuningFactor        INTEGER
                    }
```

2.2 Define new objects in pnniNodeTimerEntry

```
pnniNodeBeCRT OBJECT-TYPE
        SYNTAX          INTEGER (1..1000)
        UNITS           "percent"
        MAX-ACCESS      read-create
        STATUS          current
        DESCRIPTION
            "The threshold used in the algorithms that determine
             significant change for BeCR parameters, expressed
             as a percentage of maxCR. This object is not applicable
             when pnniNodeGenerateBeCR is 'false'."
        REFERENCE
            "UBR with MDCR Addendum to UNI Signalling 4.0, PNNI 1.0 and
AINI"
        DEFVAL  { 20 }
        ::= { pnniNodeTimerEntry 14 }

pnniNodeGenerateUbrAvCR OBJECT-TYPE
        SYNTAX          TruthValue
        MAX-ACCESS      read-create
        STATUS          current
        DESCRIPTION
            "Indicates whether the AvCR Indicator for UBR is
             set to '1' in RAIGs originated by this node."
        REFERENCE
            "UBR with MDCR Addendum to UNI Signalling 4.0, PNNI 1.0 and
AINI"
        ::= { pnniNodeTimerEntry 15 }

pnniNodeGenerateBeCR OBJECT-TYPE
        SYNTAX          TruthValue
        MAX-ACCESS      read-create
        STATUS          current
        DESCRIPTION
            "Indicates whether a BeCR information group is
             generated in RAIGs originated by this node. This object
             is not applicable when pnniNodeGenerateUbrAvCR is
             'false'."
        REFERENCE
            "UBR with MDCR Addendum to UNI Signalling 4.0, PNNI 1.0 and
AINI"
        ::= { pnniNodeTimerEntry 16 }

pnniNodeBeCRTuningFactor OBJECT-TYPE
        SYNTAX          INTEGER (1..10000)
        UNITS           "percent"
        MAX-ACCESS      read-create
        STATUS          current
        DESCRIPTION
            "The BeCR values derived by this node are multiplied by
             the value of this object before they are advertised in
             PNNI.  This allows for normalization of BeCR values in
             multi-vendor environments where the capabilities of the
```

```
                    switches are well known (e.g. through lab tests and
                    interoperability tests).

                    This object is not applicable when pnniNodeGenerateBeCR
                    is 'false' or pnniNodeLowest is 'false'."
              REFERENCE
                    "UBR with MDCR Addendum to UNI Signalling 4.0, PNNI 1.0 and
AINI"
              DEFVAL  { 100 }
              ::= { pnniNodeTimerEntry 17 }
```

3.1 Add objects to PnniMetricsEntry

```
PnniMetricsEntry ::=
        SEQUENCE {
                pnniMetricsTag            PnniMetricsTag,
                pnniMetricsDirection      INTEGER,
                pnniMetricsIndex          Integer32,
                pnniMetricsClasses        INTEGER,
                pnniMetricsGcacClp        ClpType,
                pnniMetricsAdminWeight    Unsigned32,
                pnniMetrics1              Unsigned32,
                pnniMetrics2              Unsigned32,
                pnniMetrics3              Unsigned32,
                pnniMetrics4              Unsigned32,
                pnniMetrics5              Unsigned32,
                pnniMetrics6              Unsigned32,
                pnniMetrics7              Unsigned32,
                pnniMetrics8              Unsigned32,
                pnniMetricsRowStatus      RowStatus,
                pnniMetricsAvcrIndicatorForUbr    TruthValue,
                pnniMetrics9              Unsigned32
                }
```

3.2 Define new objects in pnniMetricsEntry

```
pnniMetricsAvcrIndicatorForUbr OBJECT-TYPE
        SYNTAX       TruthValue
        MAX-ACCESS   read-create
        STATUS       current
        DESCRIPTION
            "When bit 1 (UBR) of pnniMetricsClasses is set to one,
             this object reflects the value of the AvCR indicator for
             UBR.  In this case, when the value of this object is
             'true', then pnniMetrics2 provides a measure of the
             capacity not reserved for service commitments.
             When the value of this object is 'false', then
             pnniMetrics2 is not applicable to the UBR service
             category.

             This object does not apply when bit 1 (UBR) of
             pnniMetricsClasses is set to zero."
        REFERENCE
            "UBR with MDCR Addendum to UNI Signalling 4.0, PNNI 1.0 and
AINI
             Section 5.3 Clause 5.8.1.1.3.8/PNNI 1.0"
        ::= { pnniMetricsEntry 16 }
```

```
pnniMetrics9 OBJECT-TYPE
        SYNTAX          Unsigned32
        MAX-ACCESS      read-create
        STATUS          current
        DESCRIPTION
            "An alternate routing parameter from the advertising node
             to the remote end of the PNNI entity or to the reachable
             address or transit network, for the specified service
             categories.

             For information learned from PNNI nodes, this is the
             BeCR in cells per second.  This value is applicable only
             when bit 1 of pnniMetricsClasses is set to 1.

             If this parameter is not used, its value should be set to
             0xFFFFFFFF."
        REFERENCE
            "UBR with MDCR Addendum to UNI Signalling 4.0, PNNI 1.0 and
AINI"
        ::= { pnniMetricsEntry 17 }
```

4 Define new conformance group containing the new objects

```
pnniUbrWithMdcrOptionalGroup OBJECT-GROUP
        OBJECTS {
                pnniNodeBeCRT,
                pnniNodeGenerateUbrAvCR,
                pnniNodeGenerateBeCR,
                pnniNodeBeCRTuningFactor,
                pnniMetricsAvcrIndicatorForUbr,
                pnniMetrics9
                }
        STATUS current
        DESCRIPTION
                "A collection of optional PNNI objects used for
                 management of the UBR with MDCR capability."
        ::= { pnniMIBGroups 33 }
```

Appendix I: Example of Network Specific Policy Using the MDCR Parameter
[INFORMATIVE]

I.1 Introduction

This Appendix describes signaling and routing procedures which provide an example of how to support the network-specific MDCR interpretation described in Appendix **I.1** of [TM-MDCR]. That interpretation of MDCR is merely presented as an example it is not specified either as a requirement or as an option. The behaviors and expectations described below apply only in the context of that example.

Refer to Appendix I.1 of [TM-MDCR] for more information.

I.1.1 Use of MDCR to Offer a Minimum Bandwidth Commitment for UBR Connections

This Appendix does not mandate any changes to the normative text of this document, but merely provides an example of how to use options of the normative text and behaviors allowed by the normative text to enable support of network-specific service guarantees.

A network that supports this network specific feature provides:

- A bandwidth commitment based on the value indicated by the user in the Minimum Desired Cell Rate parameters.

- Use of available bandwidth above the MDCR with a network specific policy.

An example of what could be done by a PNNI implementation in order to provide an MDCR commitment to connections is as follows:

In order to increase the efficiency of connection establishment, it is preferable that connections requesting a given MDCR be routed through nodes and links which both support this feature and have sufficient capacity to provide the cell rate commitment the network wishes to make. In order to do so:

1.   Nodes should advertise the effective available capacity for MDCR commitments using the AvCR in the UBR RAIG, and setting the AvCR indicator for UBR bit as described in Section 5.3. In this case, the MDCR should be accounted for by decrementing the AvCR when accepting new UBR calls/connections with non-zero MDCRs, rather than by increasing the BeCR. In general, MDCR should be accounted for either by decrementing the AvCR in the UBR RAIG, or by accounting for it in the BeCR, but not both (see figure App 1).
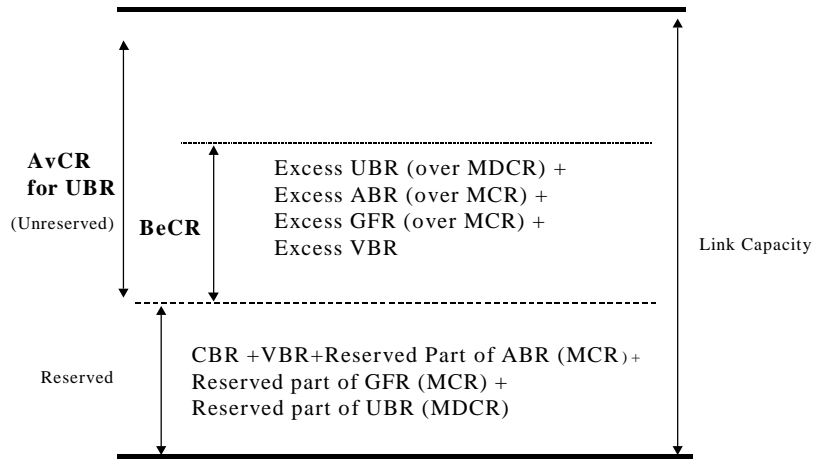
Figure App 1: Illustration of BeCR and AvCR for UBR when MDCR commitment is implemented

2. When a user generated MDCR information element is included in the SETUP or ADD PARTY
    message of a UBR call/connection, the routing function considers a link only if the AvCR indicator
    for UBR is set to 1 in its UBR RAIG and the advertised AvCR for UBR is greater than or equal to the
    Minimum Desired Cell Rate. (See Note)

3. When a UBR call/connection with a user generated MDCR information element is received by a
    node, and if the node cannot provide a commitment to the MDCR, then the call/connection should be
    cranked back. This allows either an entry border node or the DTL originator to attempt alternate
    routing to allow the connection to succeed. (See Note)

Note: If the MDCR is generated by the network and the MDCR cannot be met, the call/connection should
be treated the same as a UBR call/connection that does not include a MDCR information element.

ATM Forum Technical Committee