

# Appendix E

## Differences with ITU-T draft Recommendation Q.2931

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The signaling protocol and procedures specified in this UNI Specification are based on ITU-T draft Recommendation Q.2931 [29]. The output of the June 1994 ITU-T Study Group 11 Meeting is used.

Differences exist between this UNI Specification and ITU-T draft Recommendation Q.2931. This Appendix summarizes the differences between this UNI Specification and ITU-T draft Recommendation Q.2931. This Appendix is not represented as complete; implementors cannot assume that the combination of this Appendix and ITU-T draft Recommendation Q.2931 will be the same as the main body of this UNI Specification. Not all minor editorial changes made are represented in this Appendix.

<b>ITU-T draft Recommendation Q.2931 [29] (Output of March 1994 ITU-TS SG 11 Meeting)</b>	<b>ATM Forum User-Network Interface Specification Version 3.1</b>
1. Scope	5.1 General Introductory section specific to this UNI Specification.
2. Overview of Call/Bearer Control	5.2 Overview of Call Control No differences.
2.1 BISDN Call or Connection States	5.2.1 ATM Call States No differences.
2.1.1 Call/Connection States at the User Side of the Interface	5.2.1.1 Call States at the User Side of the Interface No differences.
2.1.1.1 Null (U0)	5.2.1.1.1 Null (U0) No differences.
2.1.1.2 Call Initiated (U1)	5.2.1.1.2 Call Initiated (U1) No differences.
2.1.1.3 Outgoing Call Proceeding (U3)	5.2.1.1.3 Outgoing Call Proceeding (U3) No differences.

2.1.1.4 Call Delivered (U4)	5.2.1.1.4 Call Delivered (U4) Not supported.
2.1.1.5 Call Present (U6)	5.2.1.1.5 Call Present (U6) No differences.
2.1.1.6 Call Received (U7)	5.2.1.1.6 Call Received (U7) Not supported.
2.1.1.7 Connect Request (U8)	5.2.1.1.7 Connect Request (U8) No differences.
2.1.1.8 Incoming Call Proceeding (U9)	5.2.1.1.8 Incoming Call Proceeding (U9) No differences.
2.1.1.9 Active (U10)	5.2.1.1.9 Active (U10) No differences.
2.1.1.10 Release Request (U11)	5.2.1.1.10 Release Request (U11) No differences.
2.1.1.11 Release Indication (U12)	5.2.1.1.11 Release Indication (U12) No differences.
2.1.2 Call/Connection States at the Network Side of the Interface	5.2.1.2 Call States at the Network Side of the Interface No differences.
2.1.2.1 Null (N0)	5.2.1.2.1 Null (N0) No differences.
2.1.2.2 Call Initiated (N1)	5.2.1.2.2 Call Initiated (N1) No differences.
2.1.2.3 Outgoing Call Proceeding (N3)	5.2.1.2.3 Outgoing Call Proceeding (N3) No differences.
2.1.2.4 Call Delivered (N4)	5.2.1.2.4 Call Delivered (N4) Not supported.
2.1.2.5 Call Present (N6)	5.2.1.2.5 Call Present (N6) No differences.
2.1.2.6 Call Received (N7)	5.2.1.2.6 Call Received (N7) Not supported.
2.1.2.7 Connect Request (N8)	5.2.1.2.7 Connect Request (N8) No differences.

2.1.2.8 Incoming Call Proceeding (N9)	5.2.1.2.8 Incoming Call Proceeding (N9) No differences.
2.1.2.9 Active (N10)	5.2.1.2.9 Active (N10) No differences.
2.1.2.10 Release Request (N11)	5.2.1.2.10 Release Request (N11) No differences.
2.1.2.11 Release Indication (N12)	5.2.1.2.11 Release Indication (N12) No differences.
	5.2.1.2.12 Call Abort (N22) Retained for section numbering
2.2 Additional B-ISDN Call/Connection States Relating to Interworking Requirements	5.2.2 ATM Call States Relating to Interworking Requirements Not supported.
2.3 B-ISDN Call/Connection States for Global Call Reference	5.2.3 States Associated with the Global Call Reference No differences.
2.3.1 Call/Connection States at the User Side of the Interface	5.2.3.1 Call States at the User Side of the Interface No differences.
2.3.1.1 Null (Rest 0)	5.2.3.1.1 Null (Rest 0) No differences.
2.3.1.2 Restart Request (Rest 1)	5.2.3.1.2 Restart Request (Rest 1) No differences.
2.3.1.3 Restart (Rest 2)	5.2.3.1.3 Restart (Rest 2) No differences.
2.3.2 Call/Connection States at the Network Side of the Interface	5.2.3.2 Call States at the Network Side of the Interface No differences.
2.3.2.1 Null (Rest 0)	5.2.3.2.1 Null (Rest 0) No differences.
2.3.2.2 Restart Request (Rest 1)	5.2.3.2.2 Restart Request (Rest 1) No differences.
2.3.2.3 Restart (Rest 2)	5.2.3.2.3 Restart (Rest 2) No differences.

3 Message Functional Definitions and Contents	5.3 Message Functional Definitions and Contents User-network terminology modified. Information elements from codesets 4, 5, 6, and 7 not supported.
3.1 Messages for B-ISDN Call and Connection Control	5.3.1 Messages for ATM Point-to-Point Call and Connection Control ALERTING message not supported. NOTIFY message not supported.
3.1.1 ALERTING	5.3.1.1 ALERTING Not supported.
3.1.2 CALL PROCEEDING	5.3.1.2 CALL PROCEEDING Endpoint reference added for the point-to-multipoint procedures. Notification indicator not supported.
3.1.3 CONNECT	5.3.1.3 CONNECT AAL parameters maximum length modified from 21 to 11. End-to-end transit delay and Notification indicator not supported Endpoint reference added for the point-to-multipoint procedures.
3.1.4 CONNECT ACKNOWLEDGE	5.3.1.4 CONNECT ACKNOWLEDGE Notification indicator not supported.
3.1.5 RELEASE	5.3.1.5 RELEASE Notification indicator not supported.
3.1.6 RELEASE COMPLETE	5.3.1.6 RELEASE COMPLETE No differences.

3.1.7 SETUP	<p>5.3.1.7 SETUP</p> <p>ATM traffic descriptor minimum and maximum lengths modified from 20 to 30.</p> <p>Called party number is mandatory in the network-to-user direction.</p> <p>Called party number minimum length is increased and maximum length is specified.</p> <p>Calling party number maximum length is specified.</p> <p>Connection identifier is mandatory in the network-to-user direction.</p> <p>End-to-end transit delay, OAM traffic descriptor, and Notification indicator not supported.</p> <p>Broadband sending complete is optionally included in the user-to-network direction.</p> <p>Transit network selection maximum length specified at 8 octets.</p> <p>Endpoint reference added for the point-to-multipoint procedures.</p>
3.1.8 STATUS	<p>5.3.1.8 STATUS</p> <p>Endpoint reference added for the point-to-multipoint procedures.</p> <p>Endpoint state added for the point-to-multipoint procedures.</p>
3.1.9 STATUS ENQUIRY	<p>5.3.1.9 STATUS ENQUIRY</p> <p>Endpoint reference added for the point-to-multipoint procedures.</p>
3.1.10 NOTIFY	Not supported
3.2 Additional or Modified Messages for the Support of 64 kbit/s based ISDN Circuit Mode Services	<p>5.3.2 Messages for the Support of 64 kbit/s based ISDN Circuit Mode Services</p> <p>Not supported.</p>
	<p>5.3.3 Messages Related to Release 1 Supplementary Services</p> <p>Retained for section numbering.</p>
3.3 Messages used with the global call reference	<p>5.3.4 Messages used with the global call reference</p> <p>No differences.</p>
3.3.1 RESTART	<p>5.3.4.1 RESTART</p> <p>Restart of all virtual channels within a virtual path not supported.</p>

3.3.2 RESTART ACKNOWLEDGE	5.3.4.2 RESTART ACKNOWLEDGE Restart of all virtual channels within a virtual path not supported.
	5.3.5 Messages for Multipoint Call and Connection Control New messages added for the point-to-multipoint procedures. This material is not in ITU-T Q.93B.
4 General Message Format and Information Element Coding	5.4 General Message Format and Information Element Coding No differences.
4.1 Overview	5.4.1 Overview No differences.
4.2 Protocol Discriminator	5.4.2 Protocol Discriminator No differences.
4.3 Call Reference	5.4.3 Call Reference No Differences.
4.4 Message Type and Message Length	5.4.4 Message Type and Message Length No differences.
4.4.1 Message Type	5.4.4.1 Message Type The following message types are not supported: ALERTING PROGRESS SETUP ACKNOWLEDGE INFORMATION NOTIFY Escape to national specific message types is not supported. Explicit indication of message error handling procedures not supported.
4.4.2 Message Length	5.4.4.2 Message Length No differences.

4.5 Variable Length Information Elements	5.4.5 Variable Length Information Elements No differences.
4.5.1 Coding Rules	5.4.5.1 Coding Rules  Locking shift repetition rules not supported. Non-locking shift repetition rules not supported. Maximum length and maximum number of occurrences are specified for each supported information element. Coding standard for ISO/IEC standard and national standard not supported. Reservation of the value "1111 1111" of the information element identifier is not supported Explicit indication of information element error handling procedures not supported.
4.5.2 Extension of Codesets	5.4.5.2 Extension of Codesets Not supported.
4.5.3 Broadband Locking Shift Procedures	5.4.5.3 Broadband Locking Shift Procedures Not supported. Recognition of Broadband locking shift information element is supported.
4.5.4 Broadband Non-Locking Shift Procedures	5.4.5.4 Broadband Non-Locking Shift Procedures Not supported. Recognition of Broadband non-locking shift information element is supported.
4.5.5 ATM Adaptation Layer Parameters	5.4.5.5 ATM Adaptation Layer Parameters AAL type 2 not supported.

<p>4.5.6 ATM Traffic Descriptor</p>	<p>5.4.5.6 ATM Traffic Descriptor</p> <p>Traffic descriptor subfields added:</p> <ul style="list-style-type: none"> <li>Forward Sustainable Cell Rate (CLP=0)</li> <li>Backward Sustainable Cell Rate (CLP=0)</li> <li>Forward Sustainable Cell Rate (CLP=0+1)</li> <li>Backward Sustainable Cell Rate (CLP=0+1)</li> <li>Forward Maximum Burst Size (CLP=0)</li> <li>Backward Maximum Burst Size (CLP=0)</li> <li>Forward Maximum Burst Size (CLP=0+1)</li> <li>Backward Maximum Burst Size (CLP=0+1)</li> <li>Best Effort Indicator</li> <li>Traffic Management Options Identifier</li> </ul>
<p>4.5.7 Broadband Bearer Capability</p>	<p>5.4.5.7 Broadband Bearer Capability</p> <p>Point-to-multipoint user plane connection configuration added.</p>
<p>4.5.8 Broadband High Layer Information</p>	<p>5.4.5.8 Broadband High Layer Information</p> <p>The code value "000100" of the high layer information type is not supported</p>
<p>4.5.9 Broadband Low Layer Information</p>	<p>5.4.5.9 Broadband Low Layer Information</p> <p>User information layer 1 octet group not supported.</p> <p>Coding of ISO/IEC TR-9577 NLPIDs within the B-LLI defined.</p> <p>Coding for SNAP ID octet group added.</p>
<p>4.5.10 Call State</p>	<p>5.4.5.10 Call State</p> <p>Call states U2, N2, U4, N4, U7, N7, U15, N15, U17, N17, U25, and N25 not supported.</p>



4.5.11 Called Party Number	<p>5.4.5.11 Called Party Number</p> <p>Only two combinations of Type of Number and Addressing/Numbering Plan Identification are supported:</p> <p>Unknown/ATM Endsystem Address International number/ISDN number plan (E.164)</p>
4.5.12 Called Party Subaddress	<p>5.4.5.12 Called Party Subaddress</p> <p>No differences.</p>
4.5.13 Calling Party Number	<p>5.4.5.13 Calling Party Number</p> <p>Only two combinations of Type of Number and Addressing/Numbering Plan Identification are supported:</p> <p>Unknown/ATM Endsystem Address International number/ISDN number plan (E.164)</p>
4.5.14 Calling Party Subaddress	<p>5.4.5.14 Calling Party Subaddress</p> <p>No differences.</p>
4.5.15 Cause	<p>5.4.5.15 Cause</p> <p>Network-specific cause value 23 added.</p>
4.5.16 Connection Identifier	<p>5.4.5.16 Connection Identifier</p> <p>VP-associated signaling not supported.</p> <p>Preferred/exclusive indication "Exclusive VPCI/any VCI" not supported.</p> <p>The first octet of the VPCI field is coded to "00000000". The second octet of the VPCI field is numerically equal to the VPI value used.</p> <p>VCI values 16-31 are reserved for present or future use by this UNI Specification.</p>
4.5.17 End-to-End Transit Delay	<p>5.4.5.17 End-to-End Transit Delay</p> <p>Not supported.</p>

4.5.18 Quality of Service Parameter	5.4.5.18 Quality of Service Parameter Network specific coding standard is used. QOS classes 0-4 are supported.
4.5.19 Broadband Repeat Indicator	5.4.5.19 Broadband Repeat Indicator No differences.
4.5.20 Restart Indicator	5.4.5.20 Restart Indicator Class codepoint "indicated VPC" not supported.
4.5.21 Broadband Sending Complete	5.4.5.21 Broadband Sending Complete No differences.
4.5.22 Transit Network Selection	5.4.5.22 Transit Network Selection Only one combination of Type of Network Identification and Network Identification Plan is supported: National network identification/ Carrier identification code
4.5.23 Notification Indicator	Not Supported.
4.5.24 OAM Traffic Descriptor	Not Supported.
4.6 Information Elements for the Support of 64kbit/s Based ISDN Circuit Mode Services	5.4.6 Information Elements for Interworking with 64kbit/s Based ISDN Not supported.
	5.4.7 Information Elements for Supplementary Services Retained for section numbering
	5.4.8 ATM Forum Specified Information Elements New information elements added for the point-to-multipoint procedures. This material is not in ITU-T Q.2931.
5 B-ISDN Call/Connection Control Procedures	5.5 B-ISDN Call/Connection Control Procedures for ATM Point-to-Point Calls Signaling virtual channel uses VPI=0, VCI=5. Specification and Description Language (SDL) diagrams are not included.
5.1 Call/Connection Establishment at the Originating Interface	5.5.1 Call/Connection Establishment at the Originating Interface No differences.

5.1.1 Call/Connection Request	5.5.1.1 Call/Connection Request Sending complete is optionally included by the user.  Retransmission of SETUP is optional.
5.1.2 Connection Identifier (VPCI/VCI) Allocation/Selection	5.5.1.2 Connection Identifier (VPCI/VCI) Allocation/Selection  No differences.
5.1.2.1 Connection Identifier Allocation/ Selection - Origination	5.5.1.2.1 Connection Identifier Allocation/ Selection - Origination  VP-associated signaling is not supported.  The network side always allocates the VPCI/VCI for the connection.  The user does not include the Connection identifier in the SETUP message. Appropriate error handling procedures are defined.
5.1.2.1.1 Associated Signaling	
5.1.2.1.2 Non-Associated Signaling	
5.1.2.2 Use of VPCIs	5.5.1.2.2 Use of VPCIs  VPCI values are numerically equal to the VPI value. VP cross connects between the user and the network and non-facility-associated signaling are not supported.
5.1.2.3 VCI Range	5.5.1.2.3 VPCI and VCI Ranges  VCI values 16-31 are reserved for present or future use by this UNI Specification.  VPCI range added.
5.1.3 QoS and Traffic Parameters Selection Procedures	5.5.1.3 QoS and Traffic Parameters Selection Procedures  Error procedure for unsupported combination of traffic parameters added.
5.1.4 Invalid Call/Connection Control Information	5.5.1.4 Invalid Call/Connection Control Information  No differences.
5.1.5 Call/Connection Proceeding	5.5.1.5 Call/Connection Proceeding  Sending a CALL PROCEEDING message is optional. Consistent with Section 5.1.10 of ITU-T Recommendation Q.2931

5.1.6 Call/Connection Confirmation Indication	5.5.1.6 Call/Connection Confirmation Indication Not supported.
5.1.7 Call/Connection Acceptance	5.5.1.7 Call/Connection Acceptance No differences.
5.1.8 Call/Connection Rejection	5.5.1.8 Call/Connection Rejection No differences.
5.1.9 Transit Network Selection	5.5.1.9 Transit Network Selection No differences.
5.1.10 Extensions for Symmetric Call Operation	5.5.1.10 Extensions for Symmetric Call Operation Extensions to allow optional sending of the CALL PROCEEDING message is supported in Section 5.5.1.5. (See Annex H of Q2931)
5.2 Call/Connection Establishment at the Destination Interface - Point-to-Point Access Configuration Call Offering	5.5.2 Call/Connection Establishment at the Destination Interface - Point-to-Point Access Configuration Call Offering No differences.
5.2.1 Incoming Call/Connection Request	5.5.2.1 Incoming Call/Connection Request Overlap receiving not supported. Retransmission of SETUP is optional.
5.2.2 Address and Compatibility Check	5.5.2.2 Address and Compatibility Check Compatibility checking is implementation dependent.
5.2.3 Connection Identifier (VPCI/VCI) Allocation/Selection - Destination	5.5.2.3 Connection Identifier (VPCI/VCI) Allocation/Selection - Destination VP-associated signaling is not supported. The network side always allocates the VPCI/VCI for the connection.
5.2.4 QOS and Traffic Parameter Selection Procedures	5.5.2.4 QoS and Traffic Parameter Selection Procedures No differences.
5.2.5 Call/Connection Confirmation	5.5.2.5 Call/Connection Confirmation
5.2.5.1 Response to En-bloc SETUP or Completion of Overlap Receiving	5.5.2.5.1 Response to SETUP Overlap receiving not supported.

	<p>5.5.2.5.1.1 Procedures when the User is an ATM Endpoint</p> <p>This section is equivalent to Section 5.2.5.1 of ITU-T Recommendation Q.93B.</p> <p>ALERTING message not supported.</p> <p>New error procedure using network-specific cause 23, "user rejects all calls with calling line identification restriction (CLIR)", added.</p>
	5.5.2.5.1.2 Procedures when the User is not an ATM Endpoint
5.2.5.2 Receipt of CALL PROCEEDING and ALERTING	5.5.2.5.2 Receipt of CALL PROCEEDING ALERTING message not supported.
5.2.5.3 Called User Clearing During Incoming Call Establishment	5.5.2.5.3 Called User Clearing During Incoming Call Establishment Timer T301 not supported.
5.2.5.4 Call Failure	5.5.2.5.4 Call Failure Retransmission of SETUP is optional. ALERTING message not supported. Timer T301 not supported.
5.2.6 Call/Connection Acceptance	5.5.2.6 Call/Connection Acceptance ALERTING message not supported.
5.2.7 Active Indication	5.5.2.7 Active Indication Timer T301 not supported.
5.3 Call/Connection Establishment at the Destination - Point-to-Multipoint Access Arrangement Call Offering	5.5.3 Call/Connection Establishment at the Destination - Point-to-Multipoint Access Arrangement Call Offering Not supported.
5.4 Call/Connection Clearing	5.5.4 Call/Connection Clearing No differences.
5.4.1 Terminology	5.5.4.1 Terminology No differences.
5.4.2 Exception Conditions	5.5.4.2 Exception Conditions No differences.
5.4.3 Clearing Initiated by the User	5.5.4.3 Clearing Initiated by the User No Differences.

5.4.4 Clearing Initiated by the Network	5.5.4.4 Clearing Initiated by the Network No differences.
5.4.5 Clear Collision	5.5.4.5 Clear Collision No differences.
5.5 Restart Procedures	5.5.5 Restart Procedures Restart of all virtual channels within a virtual path not supported.
5.5.1 Sending RESTART	5.5.5.1 Sending RESTART Restart of all virtual channels within a virtual path not supported.
5.5.2 Receipt of RESTART	5.5.5.2 Receipt of RESTART Restart of all virtual channels within a virtual path not supported.
5.6 Handling of Error Conditions	5.5.6 Handling of Error Conditions No differences.
5.6.1 Protocol Discriminator Error	5.5.6.1 Protocol Discriminator Error No differences.
5.6.2 Message too Short	5.5.6.2 Message too Short No differences.
5.6.3 Call Reference Error	5.5.6.3 Call Reference Error No differences.
5.6.3.1 Invalid Call Reference Format	5.5.6.3.1 Invalid Call Reference Format No differences.
5.6.3.2 Call Reference Procedural Error	5.5.6.3.2 Call Reference Procedural Errors No differences.
5.6.4 Message Type or Message Sequence Errors	5.5.6.4 Message Type or Message Sequence Errors No differences.
5.6.5 Message Length Error	5.5.6.5 Message Length Error No differences.

5.6.6 General Information Element Errors	5.5.6.6 General Information Element Errors Locking and non-locking shift procedures not supported.
5.6.6.1 Information Element Sequence	5.5.6.6.1 Information Element Sequence No differences.
5.6.6.2 Duplicated Information Elements	5.5.6.6.2 Duplicated Information Elements No differences.
5.6.6.3 Coding Standard Error	5.5.6.6.3 Coding Standard Error No differences.
5.6.7 Mandatory Information Element Error	5.5.6.7 Mandatory Information Element Error No differences.
5.6.7.1 Mandatory Information Element Missing	5.5.6.7.1 Mandatory Information Element Missing No differences.
5.6.7.2 Mandatory Information Element Content Error	5.5.6.7.2 Mandatory Information Element Content Error Explicit indication of information element error handling procedure not supported.
5.6.8 Non-Mandatory Information Element Errors	5.5.6.8 Non-Mandatory Information Element Errors Explicit indication of information element error handling procedure not supported.
5.6.8.1 Unrecognized Information Element	5.5.6.8.1 Unrecognized Information Element No differences.
5.6.8.2 Non-Mandatory Information Element Content Error	5.5.6.8.2 Non-Mandatory Information Element Content Error No differences.
5.6.8.3 Unexpected Recognized Information Element	5.5.6.8.3 Unexpected Recognized Information Element No differences.
5.6.9 Signaling AAL Reset	5.5.6.9 Signaling AAL Reset Call states N4, N7, U4, and U7 not supported.
5.6.10 Signaling AAL Failure	5.5.6.10 Signaling AAL Failure No differences.
5.6.11 Status Enquiry Procedure	5.5.6.11 Status Enquiry Procedure No differences.

5.6.12 Receiving a STATUS Message	5.5.6.12 Receiving a STATUS Message No differences.
5.7 Error procedures with explicit action indication	5.5.7 Forward Compatibility Procedures Not supported.
5.8 Notification Procedure	Not supported.
6. Provision of 64 kbit/s based Circuit Mode ISDN Services in B-ISDN and Signaling Interworking between N-ISDN and B-ISDN	Not supported.
	5.6 Call/Connection Control for Multipoint Calls This material is not in ITU-T Q.2931.
7 List of Timers	5.7 List of Timers No differences.
7.1 Timers in the Network Side	5.7.1 Timers in the Network Side  Timers for the provision of 64 kbit/s based circuit mode ISDN services in B-ISDN and signaling interworking between N-ISDN and B-ISDN not supported.  Timer T301 not supported.  Retransmission of SETUP is optional.  Timer T398 added for the point-to-multipoint procedures. This material is not in ITU-T Q.2931.  Timer T399 added for the point-to-multipoint procedures. This material is not in ITU-T Q.2931.
7.2 Timers in the User Side	5.7.2 Timers in the User Side  Timers for the provision of 64 kbit/s based circuit mode ISDN services in B-ISDN and signaling interworking between N-ISDN and B-ISDN not supported.  Retransmission of SETUP is optional.  Timer T398 added for the point-to-multipoint procedures. This material is not in ITU-T Q.2931.  Timer T399 added for the point-to-multipoint procedures. This material is not in ITU-T Q.2931.



8 Primitives	Not included.
	5.8 Address Registration This material is not in ITU-T Q.2931.
	References Similar material is in Annex J of ITU-T Q.2931.
Annex A Specification and Description Language (SDL) Diagrams	Not included.
	Annex A Guidelines for Use of ATM Address Formats This material is not in ITU-T Q.2931.
Annex B Compatibility Checking	Annex B Compatibility Checking Not supported
Annex C Broadband Low Layer Information Negotiation	Annex C B-LLI Negotiation No differences.
C.1 General	C.1 General Text describing the expected implementation of B-LLI negotiation added.
C.2 Low Layer Compatibility Notification to the Called User	C.2 B-LLI Notification to the Called User No differences.
C.3 B-LLI Negotiation Between Users	C.3 B-LLI Negotiation Between Users No differences.
C.4 Alternate Requested Values	C.4 Alternate Requested Values Relationship of B-LLI negotiation procedures to point-to-multipoint procedures defined.
Annex D Transit Network Selection	Annex D Transit Network Selection Clarifying text based on ANSI T1.607 has been added.
D.1 Selection not Supported	D.1 Selection not Supported No differences.
D.2 Selection Supported	D.2 Selection Supported Specification of more than one transit network is not supported.

Annex E: Mapping Functions to Support 64 kbit/s Based Circuit Mode ISDN Services in B-ISDN and Signaling Interworking between N-ISDN and B-ISDN	Not supported.
	Annex E Cause Definitions This material is not in ITU-T Q.2931.
Annex F ATM Adaptation Layer Parameters Indication and Negotiation	Annex F ATM Adaptation Layer Parameters Indication and Negotiation No differences.
F.1 General	F.1 General No differences.
F.2 ATM Adaptation Layer Parameter Indication in the SETUP Message	F.2 ATM Adaptation Layer Parameter Indication in the SETUP Message User defined AAL indication in the SETUP message added.*
F.3 ATM Adaptation Layer Indication in the CONNECT Message	F.3 ATM Adaptation Layer Indication in the CONNECT Message Relationship of AAL parameters negotiation to point-to-multipoint procedures defined. User defined AAL indication in the CONNECT message added.*
F.4 MID range negotiation	F.4 MID Range Negotiation No differences.
F.5 Use of Forward and Backward Maximum CPCS-SDU Size by the AAL Entity	F.5 Use of Forward and Backward Maximum CPCS-SDU Size by the AAL Entity * No differences.
Annex G Signaling for Semi-Permanent Connection Control	Not supported.

Annex H Extensions for Symmetric Call Operation	Extensions to allow optional sending of the CALL PROCEEDING message is supported in section 5.5.1.5.
Annex I Terminology	Similar material is in the References section and Appendix F of the UNI Interface Specification.
	Appendix A Quality of Service Guidelines This material is not in ITU-T Q.2931.
	Appendix B Conformance Examples in a Traffic Contract This material is not in ITU-T Q.2931.
	Appendix C Multipoint State Machines This material is not in ITU-T Q.2931.
	Appendix D Example Signaling Codings This material is not in ITU-T Q.2931.
	Appendix E Differences with ITU-T draft Recommendation Q.2931 This material is not in ITU-T Q.2931.
	Appendix F Guidelines on the use of Bearer Class, Traffic Parameters and QoS This material is not in ITU-T Q.2931
	Appendix G OAM Cell Error Detection Code Field This material is not in ITU-T Q.2931
	Appendix H Glossary Similar material is in Appendix I of ITU-T Q.2931.
Appendix I Guidelines for the Use of Instruction Indicator	Not supported.

# Appendix F

## Guidelines on the use of Bearer Class, Traffic Parameters and QoS

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The following provides a brief description of what is meant by the various BCOB classes in the Bearer capability information element (see ITU-T Recommendation F.811 for additional information).

### F.1 Bearer Class

#### F.1.1 BCOB-A

When the user specifies BCOB-A, the user is requesting more than an ATM only service. The network may look at the AAL IE to provide interworking based upon its contents. One example of such interworking would be between an ATM user calling a non-ATM user who has switched DS1 capability. In this case, the network interworking function would need to know the AAL to be used to be able to perform this interworking function.

#### F.1.2 BCOB-C

As for BCOB-A, when the user specifies BCOB-C, the user is requesting more than an ATM only service. The network interworking function may look at the AAL and provide service based on it.

#### F.1.3 BCOB-X

When the user specifies BCOB-X, the user is requesting an ATM only service from the network. In this case, the network shall not process any higher layer protocols (e.g. AAL protocols).

The difference between BCOB-X and the other classes is what service is being requested from the network. For the VBR user that wants only a ATM cell relay service, the user should specify BCOB-X and Traffic Type VBR.

A user, that is placing a DS1 circuit emulation call but does not want to allow interworking, should specify BCOB-X and Traffic Type CBR. If the user wishes to allow interworking then the user should specify BCOB-A.

### F.2. Allowed Combination of Bearer Capabilities, Traffic Parameters, and QoS

The parameters specified in the Broadband Bearer Capability IE, the Traffic Descriptor IE and the Quality of Service Parameters IE of the SETUP message should be consistent. Table F-1 shows the allowable combinations of the Broadband Bearer Capability classes, the Traffic Descriptor parameters and the Quality of Service classes based on tables 5-7 and 5-8. If an illegal combination of parameters is specified, the call should be cleared with cause #63 "service or option not available, unspecified."

<i>Broadband Bearer Capability</i>												
Broadband Bearer	A,C	X	X	C	X	C	X	A,C	X	X	C	X
Traffic Type		CBR	&		&		&		CBR	&		&
Timing Required		Y	&&		&&		&&		Y	&&		&&
<i>Traffic Descriptor</i>												
PCR (CLP=0)	S	S	S									
PCR (CLP=0+1)	S	S	S	S	S	S	S	S	S	S	S	S
SCR (CLP=0)				S	S							
SCR (CLP=0+1)						S	S					
MBS (CLP=0)				S	S							
MBS (CLP=0+1)						S	S					
Best Effort											S	S
Tagging	Y/ N	Y/N	Y/ N	Y/ N	Y/ N	N	N	N	N	N	N	N
<i>QOS Classes</i>	*	*	*	*	*	*	*	*	*	*	0	0

**Table F-1. Allowable Combinations of Traffic Related Parameters in the SETUP message**

PCR = Peak Cell Rate, SCR = Sustainable Cell Rate, MBS = Maximum Burst Size

Y = Yes, N = No, S= Specified

Y/N = either “Yes” or “No” is allowed

\* = allowed QOS class values are a network option. Class 0 is always supported for alignment with ITU-T

& = parameter is coded to either “no indication” or “VBR” or octet 5a (Traffic Type / Timing Required) is absent; these three codings are treated as equivalent.

&& = parameter is coded to either “No indication” or “No” or octet 5a (Traffic Type / Timing Required) is absent; these three codings are treated as equivalent.

A blank entry in the table indicates that the parameter is not present.

# Appendix G

## OAM Cell Error Detection Code Field

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The Error Detection Code (EDC) field of all OAM cells carries a CRC-10 error detection code computed over the OAM cell Information Field excluding the EDC field. It shall be the remainder of the division (modulo 2) by the generator polynomial of the product of  $x^{10}$  and the content of the OAM cell Information Field (namely OAM Type, Function Type, function specific fields, and reserved field, excluding the EDC Field) (374 bits). Each bit of the concatenated fields mentioned above is considered as a coefficient (modulo 2) of a polynomial of degree 373 using the first bit as the coefficient of the highest order term. The CRC-10 generating polynomial is:

$$G(x) = 1 + x + x^4 + x^5 + x^9 + x^{10}$$

The result of the CRC calculation is placed with the least significant bit right justified in the CRC field.

One example test cell, with its corresponding calculated CRC-10 value, is shown below to provide some measure of assurance of a correctly implemented EDC generation function.

Example: CRC-10 for an RDI (formerly FERF) cell. The Cell Type is '0001', the Function Type is '0001', and the next 45 octets are all coded 6A hexadecimal. The reserved field consists of six '0' bits. The calculated CRC-10 is A F hexadecimal (i.e., '00 1010 1111'). The 48 octet information field is transmitted as:

```
1 1 6 A 6 A 6 A 6 A 6 A 6 A 6 A 6 A 6 A 6 A 6 A
6 A 6 A 6 A 6 A 6 A 6 A 6 A 6 A 6 A 6 A 6 A 6 A
6 A 6 A 6 A 6 A 6 A 6 A 6 A 6 A 6 A 6 A 6 A 6 A
6 A 6 A 6 A 6 A 6 A 6 A 6 A 6 A 6 A 6 A 0 0 A F
```

# Appendix H

## Glossary

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### **AAL Connection**

Association established by the AAL between two or more next higher layer entities.

### **Assigned cell**

Cell that provides a service to an upper layer entity or ATM Layer Management entity (ATMM-entity).

### **Asynchronous time division multiplexing**

A multiplexing technique in which a transmission capability is organized in a priori unassigned time slots. The time slots are assigned to cells upon request of each application's instantaneous real need.

### **Asynchronous transfer mode (ATM)**

A transfer mode in which the information is organized into cells. It is asynchronous in the sense that the recurrence of cells containing information from an individual user is not necessarily periodic.

### **ATM Peer to Peer Connection**

A virtual channel connection (VCC) or a virtual path connection (VPC).

### **ATM User-User Connection**

An association established by the ATM Layer to support communication between two or more ATM service users (i.e., between two or more next higher layer entities or between two or more ATMM-entities). The communication over an ATM Layer connection may be either bidirectional or unidirectional. The same Virtual Channel Identifier (VCI) is used for both directions of a connection at an interface.

### **ATM Layer link**

A section of an ATM Layer connection between two adjacent active ATM Layer entities (ATM-entities).

### **ATM link**

A virtual path link (VPL) or a virtual channel link (VCL).

### **ATM Traffic Descriptor**

A generic list of traffic parameters that can be used to capture the intrinsic traffic characteristics of a requested ATM connection.

**Broadband**

A service or system requiring transmission channels capable of supporting rates greater than the Integrated Services Digital Network (ISDN) primary rate.

**Broadband access**

An ISDN access capable of supporting one or more broadband services.

**Call**

A call is an association between two or more users or between a user and a network entity that is established by the use of network capabilities. This association may have zero or more connections.

**Cell**

ATM Layer protocol data unit (PDU).

**Cell delay variation (CDV)**

A quantification of cell clumping for a connection. The cell clumping CDV ( $y_k$ ), is defined as the difference between a cell's expected reference arrival time ( $c_k$ ) and its actual arrival time ( $a_k$ ). The expected reference arrival time ( $c_k$ ) of cell  $k$  of a specific connection is  $\max [ c_{\{k-1\}} + T, a_k ]$ .  $T$  is the reciprocal of the negotiated peak cell rate.

**Cell header**

ATM Layer protocol control information.

**Cell transfer delay**

The transit delay of an ATM cell successfully passed between two designated boundary.

**Connection**

An ATM connection consists of the concatenation of ATM Layer links in order to provide an end-to-end information transfer capability to access points.

**Connection admission control (CAC)**

The procedure used to decide if a request for an ATM connection can be accepted based on the attributes of both the requested connection and the existing connections.

**Connection endpoint (CE)**

A terminator at one end of a layer connection within a SAP.

**Connection endpoint identifier (CEI)**

Identifier of a CE that can be used to identify the connection at a SAP.



**Corresponding entities**

Peer entities with a lower layer connection among them.

**Demultiplexing**

A function performed by a layer entity that identifies and separates SDUs from a single connection to more than one connection.

**End system (ES)**

A system where an ATM connection is terminated or initiated. An originating end system initiates the ATM connection, and a terminating end system terminates the ATM connection. OAM cells may be generated and received.

**Header**

Protocol control information located at the beginning of a protocol data unit.

**Fairness**

As related to Generic Flow Control (GFC), fairness is defined as meeting all the agreed quality of service (QOS) requirements, by controlling the order of service for all active connections.

**Interface data**

The unit of information transferred to/from the upper layer in a single interaction across the SAP. Each Interface Data Unit (IDU) contains interface control information and may also contain the whole or part of the SDU.

**Intermediate system (IS)**

A system that provides forwarding functions or relaying functions or both for a specific ATM connection. OAM cells may be generated and received.

**Layer entity**

An active element within a layer.

**Layer function**

A part of the activity of the layer entities.

**Layer service**

A capability of a layer and the layers beneath it that is provided to the upper layer entities at the boundary between that layer and the next higher layer.

**Layer user data**

Data transferred between corresponding entities on behalf of the upper layer or layer management entities for which they are providing services.

**Metasignaling**

ATM Layer Management (LM) process that manages different types of signaling and possibly semipermanent virtual channels (VCs), including the assignment, removal and checking of VCs.

**Metasignaling VCs**

The standardized VCs that convey metasignaling information across a User-Network Interface (UNI).

**Multiplexing**

A function within a layer that interleaves the information from multiple connections into one connection.

**Multipoint access**

User access in which more than one terminal equipment (TE) is supported by a single network termination.

**Multipoint-to-Point Connection**

A Point-to-Multipoint Connection may have zero bandwidth from the Root Node to the Leaf Nodes, and non-zero return bandwidth from the Leaf Nodes to the Root Node. Such a connection is also known as a Multipoint-to-Point Connection.

**Multipoint-to-Multipoint Connection**

A Multipoint-to-Multipoint Connection is a collection of associated ATM VC or VP links, and their associated endpoint nodes, with the following properties:

1. All N nodes in the connection, called Endpoints, serve as a Root Node in a Point-to-Multipoint connection to all of the (N-1) remaining endpoints.
2. Each of the endpoints on the connection can send information directly to any other endpoint, but the receiving endpoint cannot distinguish which of the endpoints is sending information without additional (e.g., higher layer) information.

**Network Node Interface (NNI)**

The interface between two network nodes.

**Operation and Maintenance (OAM) cell**

A cell that contains ATM LM information. It does not form part of the upper layer information transfer.

**Peak Cell Rate**

At the PHY Layer SAP of a point-to-point VCC, the Peak Cell Rate  $R_p$  is the inverse of the minimum inter-arrival time  $T_0$  of the request to send an ATM\_SDU.

**Peer entities**

Entities within the same layer.

**Physical Layer (PHY) connection**

An association established by the PHY between two or more ATM-entities. A PHY connection consists of the concatenation of PHY links in order to provide an end-to-end transfer capability to PHY SAPs.

**Point-to-Multipoint Connection**

A Point-to-Multipoint Connection is a collection of associated ATM VC or VP links, with associated endpoint nodes, with the following properties:

1. One ATM link, called the Root Link, serves as the root in a simple tree topology. When the Root node sends information, all of the remaining nodes on the connection, called Leaf Nodes, receive copies of the information.
2. Each of the Leaf Nodes on the connection can send information directly to the Root Node. The Root Node cannot distinguish which Leaf is sending information without additional (higher layer) information. (See note below for Phase 1.)
3. The Leaf Nodes can not communicate directly to each other with this connection type.

Note - Phase 1 signalling does not support traffic sent from a Leaf to the Root.

**Point-to-point connection**

A connection with only two endpoints.

**Primitive**

An abstract, implementation independent, interaction between a layer service user and a layer service provider.

**Protocol**

A set of rules and formats (semantic and syntactic) that determines the communication behavior of layer entities in the performance of the layer functions.

**Protocol control information**

Information exchanged between corresponding entities, using a lower layer connection, to coordinate their joint operation.

**Protocol data unit (PDU)**

A unit of data specified in a layer protocol and consisting of protocol control information and layer user data.

**Relaying**

A function of a layer by means of which a layer entity receives data from a corresponding entity and transmits it to another corresponding entity.

**Segment**

A single ATM link or group of interconnected ATM links of an ATM connection.

**Semipermanent Connection**

A connection established via a service order or via network management.

**Service access point (SAP)**

The point at which an entity of a layer provides services to its LM entity or to an entity of the next higher layer.

**Service data unit (SDU)**

A unit of interface information whose identity is preserved from one end of a layer connection to the other.

**Shaping descriptor**

N ordered pairs of GCRA parameters (I,L) used to define the negotiated traffic shape of an APP connection.

**Source Traffic Descriptor**

A set of traffic parameters belonging to the ATM Traffic Descriptor used during the connection set-up to capture the intrinsic traffic characteristics of the connection requested by the source.

**Sublayer**

A logical sub-division of a layer.

**Switched connection**

A connection established via signaling.

**Symmetric Connection**

A connection with the same bandwidth value specified for both directions.

**Traffic parameter**

A parameter for specifying a particular traffic aspect of a connection.

**Trailer**

Protocol control information located at the end of a PDU.

**Transit delay**

The time difference between the instant at which the first bit of a PDU crosses one designated boundary, and the instant at which the last bit of the same PDU crosses a second designated boundary.

**Unassigned cells**

A cell identified by a standardized virtual path identifier (VPI) and virtual channel identifier (VCI) value, which has been generated and does not carry information from an application using the ATM Layer service.

**Virtual channel (VC)**

A communication channel that provides for the sequential unidirectional transport of ATM cells.

**Virtual channel connection (VCC)**

A concatenation of VCLs that extends between the points where the ATM service users access the ATM Layer. The points at which the ATM cell payload is passed to, or received from, the users of the ATM Layer (i.e., a higher layer or ATMM-entity) for processing signify the endpoints of a VCC. VCCs are unidirectional.

**Virtual channel link (VCL)**

A means of unidirectional transport of ATM cells between the point where a VCI value is assigned and the point where that value is translated or removed.

**Virtual channel switch**

A network element that connects VCLs. It terminates VPCs and translates VCI values. It is directed by Control Plane functions and relays the cells of a VC.

**Virtual path (VP)**

A unidirectional logical association or bundle of VCs.

**Virtual path connection (VPC)**

A concatenation of VPLs between virtual path Terminators (VPTs). VPCs are unidirectional.

**Virtual path link (VPL)**

A means of unidirectional transport of ATM cells between the point where a VPI value is assigned and the point where that value is translated or removed.

**Virtual path switch**

A network element that connects VPLs. It translates VPI (not VCI) values and is directed by Control Plane functions. It relays the cells of the VP.

**Virtual path terminator (VPT)**

A system that unbundles the VCs of a VP for independent processing of each VC.