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INTEGRATED SERVICES DIGITAL NETWORK (ISDN)

GENERAL STRUCTURE

ATTRIBUTE TECHNIQUE FOR THE CHARACTERIZATION OF TELECOMMUNICATION SERVICES SUPPORTED BY AN ISDN AND NETWORK CAPABILITIES OF AN ISDN

ITU-T Recommendation I.140

(Previously "CCITT Recommendation")

FOREWORD

The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the International Telecommunication Union. The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, established the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

ITU-T Recommendation I.140 was revised by the ITU-T Study Group XVIII (1988-1993) and was approved by the WTSC (Helsinki, March 1-12, 1993).

NOTES

1 As a consequence of a reform process within the International Telecommunication Union (ITU), the CCITT ceased to exist as of 28 February 1993. In its place, the ITU Telecommunication Standardization Sector (ITU-T) was created as of 1 March 1993. Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.

In order not to delay publication of this Recommendation, no change has been made in the text to references containing the acronyms "CCITT, CCIR or IFRB" or their associated entities such as Plenary Assembly, Secretariat, etc. Future editions of this Recommendation will contain the proper terminology related to the new ITU structure.

2 In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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ATTRIBUTE TECHNIQUE FOR THE CHARACTERIZATION OF TELECOMMUNICATION SERVICES SUPPORTED BY AN ISDN AND NETWORK CAPABILITIES OF AN ISDN

(Melbourne, 1988; revised Helsinki, 1993)

1 Scope

The purpose of this Recommendation is to introduce the attribute technique and to describe attributes and list attribute values. Attributes are used in the characterization of services and network capabilities provided by an ISDN. The attribute technique can also be used to describe the salient features of other objects of study in telecommunications, e.g. charging.

This Recommendation (in the general I.100-Series) will act as a library of all attributes and attribute values used in other I-Series Recommendations. The inclusion of a particular attribute value in this Recommendation does not mean that this particular object is being recommended by CCITT, but that it is a potential attribute (or attribute value) which may be used in a particular Recommendation in the I-Series (e.g. to describe a CCITT-recommended service).

Annex A includes all attributes and their values so far identified and defined.

2 Attribute technique

2.1 Outline of the technique

This technique is used to describe objects in a structured, simple manner and to highlight the important aspects of the object. In order to be able to identify comparable objects, e.g. bearer services, the general concept of the object is broken down in a number of salient features. The salient features are termed attributes. Each attribute is independent of the others so that a change in the value of one will not affect the others. To describe a particular object the attributes are assigned values which identify that object.

Multimedia services are characterized by service dependent attributes (service attributes) describing the means of communication offered by interactive or distribution services and by service components describing the characteristics of the information to be transferred (e.g. audio, video, data).

It is not always necessary or useful to describe an object in great detail and so attributes have been graded into three levels:

- dominant attributes: these define a sub-set containing similar objects, this sub-set is termed a class or category;
- secondary attributes: these define a particular object; and
- qualifying attributes: these define variants of an object.

Characterization of attributes should be made in the I-Series of Recommendations when appropriate.

2.2 Basic rules

- Each attribute is assigned a name and definition.
- Some attributes may apply to only one object, others may be applicable to several objects. In this case the same attribute name is used.
- A given value should have the same name and definition in all Recommendations.
- Depending on the nature of the object described, a particular attribute may need to be used more than once.
- Each attribute should be described by three perspectives: generic, service and network.

– The service attributes and their values are valid for all communication relations of the service including all types of information supported by the service.

– The service component attributes and their values are associated to a specific type of information described by the service component. Several services may support the same service component.

2.3 Attribute lists

2.3.1 Generic attributes

Information transfer mode

Information transfer rate

Information transfer capability

Establishment

Symmetry

Configuration

Structure

Channel (rate)

Control protocol

Information transfer protocol

Performance

Interworking

Operations

Type of user information

High layer protocol

NOTE – This list will be completed according to further results on studies of connectionless, multimedia, broadband and mobile services.

2.3.2 Service attributes

2.3.2.1 Bearer services

2.3.2.1.1 Service attributes for 64 kbit/s-ISDN bearer services

1) Information transfer mode
2) Information transfer rate[1)]
3) Information transfer capability
4) Structure
5) Establishment of communication
6) Symmetry
7) Communication configuration
8) Access channel and rate
9) Access protocol
   - 9.1) Signalling access protocol layer 1
   - 9.2) Signalling access protocol layer 2
   - 9.3) Signalling access protocol layer 3
   - 9.4) Information access protocol layer 1[2)]

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1) Service information transfer rate considered at the access point.

9.5) Information access protocol layer 2[2)]

9.6) Information access protocol layer 3[2)]

10) Supplementary services provided

11) Quality of Service

12) Interworking capabilities

13) Operational and commercial aspects

2.3.2.1.2 Service attributes for broadband ISDN monomedia and multimedia bearer services

1) Information transfer mode

1.1) Connection mode

1.2) Traffic type of virtual channels or virtual path[3)]

1.3) Timing end-to-end of virtual channels or virtual path[3)]

1.4) VCI transparency (for virtual path services)

2) Information transfer rate: Peak bit rate, mean bit rate for virtual channels or virtual path[3)]

3) Information transfer capability of virtual channels or virtual path[3)]

4) Structure of virtual channels or virtual path[3)]

5) Establishment of communication

6) Symmetry of virtual channels or virtual path[3)]

7) Communication configuration

8) Access channels and rates

8.1) For user information

8.1.1) Number of channels

8.1.2) Type of channels

8.2) For signalling

9) Access protocols

9.1) Signalling access protocol – Physical layer

9.2) Signalling access protocol – ATM layer

9.3) Signalling access protocol – ATM adaptation layer (AAL)

9.4) Signalling access protocol – Layer 3 (above AAL)

9.5) Information access protocol – Physical layer

9.6) Information access protocol – ATM layer

9.7) Information access protocol – ATM adaptation layer (AAL) for virtual channels or virtual path[3)]

9.8) Information access protocol – Layers above AAL for virtual channels or virtual path[3)]

10) Supplementary services provided

11) Quality of Service of virtual channels or virtual path[3)] (sub-attributes are for further study)

12) Interworking capabilities

13) Operational and commercial aspects

2.3.2.2 Teleservices

2.3.2.2.1 Service attributes for 64 kbit/s-ISDN teleservices

1, 2, 3, 4, 5, 6, 7, 8, 9.1, 9.2, 9.3, 9.4, 9.5, 9.6: refer to 2.3.2.1.

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2) Information access protocol (layer 1 to 3) at the access point.

3) Virtual path for virtual path bearer services; for further study.

10) Type of user information

11) Layer 4 protocol

12) Layer 5 protocol

13) Layer 6 protocol

14) Layer 7 protocol

15) Supplementary services provided

16) Quality of Service

17) Interworking capabilities

18) Operational and commercial aspects

2.3.2.2.2 Service attributes for broadband ISDN monomedia and multimedia teleservices

1) Information transfer capability, service components
   - Mandatory service components (see Note)
   - Optional service components (see Note)
2) Information transfer mode
   - 2.1) Connection mode
   - 2.2) Traffic type (service specific) of virtual channels (see Note)
   - 2.3) Timing end-to-end (service specific) of virtual channels (see Note)
3) Information transfer rate (service specific):
   - Peak bit rate, mean bit rate of virtual channels (see Note)
4) Structure (service specific) of virtual channels (see Note)
5) Establishment of communication
6) Symmetry of service components (see Note)
7) Communication configuration
8) Access channels and rates
   - 8.1) For user information, service components
   - 8.2) For signalling
9) Access protocols
   - 9.1) Signalling access protocol – Physical layer
   - 9.2) Signalling access protocol – ATM layer
   - 9.3) Signalling access protocol – ATM adaptation layer (AAL)
   - 9.4) Signalling access protocol – Layer 3 (above AAL)
   - 9.5) Information access protocol – Physical layer
   - 9.6) Information access protocol – ATM layer
   - 9.7 Information access protocols – ATM adaptation layer (AAL) for virtual channels (see Note)
10) Supplementary services provided
11) Quality of Service (service specific) of virtual channels (sub-attributes are for further study) (see Note)
12) Interworking capabilities
13) Operational and commercial aspects

NOTE – This attribute may have multiple values when more than one virtual channel (VC) or service component (SC) is offered/supported by the service.

2.3.2.2.3 Service component attributes

1) Traffic type (service component specific)
2) Timing end-to-end (service component specific)

3) Information transfer rate (service component specific)
   3.1) Peak bit rate
   3.2) Mean bit rate
4) Structure (service component specific)
5) Layer 3 protocol functions
6) Layer 4 protocol functions
7) Layer 5 protocol functions
8) Layer 6 protocol functions
9) Layer 7 protocol functions
10) Quality of Service (service component specific) (sub-attributes are for further study)

2.3.2.3 Supplementary services

For further study.

2.3.2.4 Charging

For further study.

2.3.3 Network attributes

2.3.3.1 Connection types

2.3.3.1.1 Connection attributes for 64 kbit/s-ISDN connection types

1) Information transfer mode
2) Information transfer rate[4)]
3) Information transfer capability
4) Establishment of communication
5) Symmetry
6) Connection configuration
7) Structure
8) Channel (rate)
9) Connection control protocol
10) Information transfer coding/protocol[5)]
11) Network performance
12) Network interworking
13) Operations and management aspects

2.3.3.1.2 Connection attributes for broadband ISDN connection types (see Note 1)

1) Information transfer mode
   1.1) Connection mode
   1.2) Traffic type
   1.3) Timing end-to-end
   1.4) Virtual channel (VC) transparency (for connection oriented (CO) connections only)
2) Information transfer rate
   2.1) Physical layer, peak/mean bit rate

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4) Information transfer rate is considered between access points.

5) Information transfer protocol is considered between access points.

2.2) ATM layer, peak/mean throughput

2.3) ATM adaptation layer (AAL), peak/mean throughput

3) Information transfer capability

4) Establishment of connection

5) Symmetry

6) Connection configuration

6.1) Topology

6.2) Dynamics

7) Structure

7.1) Physical layer

7.2) ATM layer

7.3) ATM adaptation layer (AAL) (see Note 2)

7.4) Above AAL (for connectionless (CL) connections only)

8) Access channels

8.1) For user information

– Type of channel

8.2) For signalling

9) Connection access control protocols

9.1) Physical layer

9.2) ATM layer

9.3) ATM adaptation layer (AAL) (see Note 2)

9.4) Layer 3

10) Information transfer coding/protocols

10.1) Physical layer

10.2) ATM layer

10.3) ATM adaptation layer (AAL) (see Note 2)

10.4) Above AAL (for CL connections only)

11) Network performance

11.1) Cell error ratio

11.2) Severely errored cell block ratio

11.3) Cell loss ratio

11.4) Cell misinsertion rate

11.5) Mean cell transfer delay

11.6) Cell delay variation

12) Network interworking

13) Operations and management aspects

NOTES

1 In a multimedia or multi-connection call (of multimedia services) each connection will be described by the same set of connection attributes, but may be characterized by different attribute values.

2 So far applicable for B-ISDN connection types.

2.3.3.2 Connection elements

1) Information transfer mode

2) Information transfer rate

3) Information transfer capability

4) Establishment of communication
5) Symmetry
6) Connection configuration
7) Structure
8) Channel (rate)
9) Connection control protocol
10) Information transfer coding/protocol
11) Network performance
12) Network interworking
13) Operations and management aspects

2.3.3.3 Other network entities

The definition of attributes for basic connection components and network capabilities to support supplementary services needs further study.

2.4 Attribute definition

A list of definitions of attributes and attribute values is contained in Annex A to this Recommendation.

3 Application to the I-Series Recommendations

This technique has been applied in I.200-Series Recommendations for the specification of the telecommunication services supported by an ISDN and in Recommendation I.340 for the characterization of ISDN connection types and connection elements.

The application of the attribute technique for the characterization of multimedia services is for further study.

Annex A

List of definitions of attributes and attribute values

(This annex forms an integral part of this Recommendation)

A.1 Definitions of the attributes

A.1.1 Telecommunication service attribute definitions

information transfer mode: This attribute describes the operational mode for transferring (transporting and switching) user information through the ISDN.

Possible values:
– circuit
– packet
– ATM

information transfer rate: This attribute describes either the bit rate (circuit mode) or the throughput (packet mode). It refers to the transfer of digital information at the access points.

Possible values:
– appropriate bit or throughput rate

information transfer capability: This attribute describes the capability associated with the transfer of different types of information through the ISDN.

Possible values:
– unrestricted digital information
– speech
– 3.1 kHz audio
– 7 kHz audio (unrestricted digital information with tones and announcements)

– 15 kHz audio

– video

– other values

structure: This attribute refers to the capability of the ISDN to deliver information to the destination access point or reference point in a structure (e.g. time interval for circuit mode, service data unit for packet mode), that was presented in a corresponding signal structured at the origin (access point or reference point).

Possible values: – 8 kHz integrity

– service data unit integrity

– time slot sequence integrity

– restricted differential time delay

– unstructured

establishment of communication: This attribute describes the mode of establishment associated to the telecommunication service used to establish and release a given communication.

Possible values: – demand

– reserved

– permanent

symmetry: This attribute describes the relationship of information flow between two (or more) access points or reference points involved in a communication.

Possible values: – unidirectional

– bidirectional symmetric

– bidirectional asymmetric

communication configuration: This attribute describes the spatial arrangement for transferring information between two or more access points. It completes the structure associated with a telecommunication service as it associates the relationship between the access points involved and the flow of information between these access points.

Possible values: – point-to-point

– multipoint

– broadcast

access channel and rate: This attribute describes the channels and their bit rate used to transfer the user information and/or signalling information at a given access point.

Possible values: – name of the channel (letter) and the corresponding bit rate.

NOTE – This attribute can be used several times for communication characterization.

signalling access protocol layer 1-3, information access protocol layer 1-3: These attributes characterize the protocol on the signalling or user information transfer channel at a given access point or reference point.

Possible values: – appropriate protocol.

type of user information:

Possible values: – speech

– sound

– text

– facsimile

– text-facsimile

– videotex

– video

– text-interactive

layer 4-7 protocol: These attributes characterize the protocol on the user information transfer channel at a given access point or reference point.

Possible values: – appropriate protocol

supplementary services provided: This attribute refers to the supplementary services associated with a given telecommunication service.

quality of Service: This attribute is described by a group of specific sub-attributes, for example: service reliability, service availability.

The values are under study.

interworking capabilities: To be defined.

operational and commercial: To be defined.

A.1.2 Connection type attribute definitions

information transfer mode: This attribute describes the operational mode for transferring (transporting and switching) user information through the ISDN.

Possible values: – circuit

– packet

– ATM

information transfer rate: This attribute describes either the bit rate (circuit mode) or the throughput (packet mode). It refers to the transfer of digital information between access points or reference points.

Possible values: – appropriate bit or throughput rate

information transfer capability: This attribute describes the capability associated with the transfer of different types of information through the ISDN.

Possible values: – unrestricted digital information

– speech

– 3.1 kHz audio

– 7 kHz audio (unrestricted digital information with tones and announcements)

– 15 kHz audio

– video

– other values

establishment of connection: This attribute describes the mode of establishment used to establish and release a given connection in an ISDN.

Possible values: – demand

– semi-permanent

– permanent

symmetry: This attribute describes the relationship of information flow between two (or more) access points or reference points of a connection.

Possible values: – unidirectional

– bidirectional symmetric

– bidirectional asymmetric

connection configuration: This attribute describes the spatial arrangement for transferring information on a given connection. It consists of two sub-attributes, topology and dynamics.

structure: This attribute refers to the capability of the ISDN to deliver information to the destination access point or reference point in a structure (e.g. time interval for circuit mode, service data unit for packet mode), that was presented in a corresponding signal structured at the origin (access point or reference point).

Possible values:
- 8 kHz integrity
- service data unit integrity
- time slot sequence integrity
- restricted differential time delay
- unstructured

channel (rate): This attribute describes the channels and their bit rate used to transfer the user information and/or signalling information at a given access point.

Possible values:
- name of the channel (letter) and the corresponding bit rate

NOTE – This attribute can be used several times.

connection control protocol, information transfer coding/protocol: These attributes characterize the protocol/coding on the signalling or user information transfer channel at a given access point or reference point.

Possible values:
- appropriate protocol or coding

network performance: This attribute describes the network performance that relates to an ISDN connection.

This performance attribute consists of sub-attributes, for example:

Error performance: the values are given in the appropriate Recommendations.

Slip performance: the values are given in the appropriate Recommendations.

The definition of further sub-attributes is for further study.

network interworking: To be defined.

operation and management: To be defined.

A.1.3 Connection element attribute definitions

information transfer mode: This attribute describes the operational mode for transferring (transporting and switching) user information through the ISDN.

Possible values:
- circuit
- packet
- ATM

information transfer rate: This attribute describes either the bit rate (circuit mode) or the throughput (packet mode). It refers to the transfer of digital information between access points or reference points.

Possible values:
- appropriate bit or throughput rate

information transfer capability: This attribute identifies equipment which may restrict the types of information which may pass through the ISDN.

Possible values:
- speech processing equipment
- echo suppression equipment
- multi-satellite hops
- null

establishment of connection: This attribute describes the mode of establishment used to establish and release a given connection element in an ISDN.

Possible values:
- demand
- semi-permanent
- permanent

symmetry: This attribute describes the relationship of information flow between two (or more) access points or reference points of a connection element.

Possible values:
- unidirectional
- bidirectional symmetric
- bidirectional asymmetric

connection configuration: This attribute describes the spatial arrangement for transferring information across a given connection element. It consists of two sub-attributes, topology and uniformity.

structure: This attribute refers to the capability of the ISDN to deliver information to the destination access point or reference point in a structure (e.g. time interval for circuit mode, service data unit for packet mode), that was presented in a corresponding signal structured at the origin (access point or reference point).

Possible values:
- 8 kHz integrity
- service data unit integrity
- time slot sequence integrity
- 8 kHz integrity with restricted differential time delay
- unstructured

channel (rate): This attribute describes the channels and their bit rate used to transfer the user information and/or signalling information at a given access point.

Possible values:
- name of the channel (letter) and the corresponding bit rate

NOTE – This attribute can be used several times.

connection control protocol, information transfer coding/protocol: These attributes characterize the protocol/coding on the signalling or user information transfer channel at a given access point or reference point.

Possible values:
- appropriate protocol or coding

network performance: This attribute describes the network performance that relates to an ISDN connection element.

This performance attribute consists of sub-attributes, for example:

Error performance: the values are given in the appropriate Recommendations.

Slip performance: the values are given in the appropriate Recommendations.

The definition of further sub-attributes is for further study.

network interworking: To be defined.

operation and management: To be defined.

A.2 Definition of the attribute values

unrestricted digital information: Transfer of information sequence of bits at its specified bit rate without alteration.

This implies:
- bit sequence independence
- digit sequence integrity
- bit integrity

speech: Digital representation of speech coded according to a specified encoding rule (e.g. A-law, μ-law).

3.1 kHz audio: Digital representation of audio information such as voice-band data and speech with a bandwidth of 3.1 kHz, the encoding rule being specified (e.g. A-law, μ-law).

7 kHz audio (unrestricted digital information with tones and announcements): Digital representation of audio information with a bandwidth of 7 kHz, the encoding rule being specified.

15 kHz audio: Digital representation of audio information with a bandwidth of 15 kHz, the encoding rule being specified.

video: Digital representation of video image information, the encoding rule being specified

8 kHz integrity: This value applies when:

i) at each user-network interface, intervals of 125 μs are implicitly or explicitly demarcated; and

ii) all bits submitted within a single demarcated 125 μs interval are delivered within a corresponding single demarcated 125 μs interval.

service data unit integrity: This value applies when:

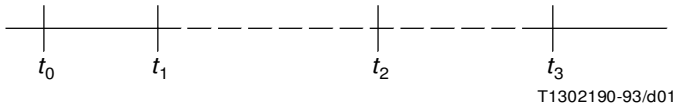
i) at each user-network interface, protocols provide a mechanism for identifying the boundaries of service data units (e.g. X.25 complete packet sequence); and

ii) all bits submitted within a single service data unit are delivered in a corresponding service data unit.

unstructured: This value is applicable when the telecommunication service or connection neither provides structural boundaries nor preserves structural integrity.

demand (communication): The communication can be started as soon as possible after the request is made (e.g. $t_1 - t_0$ is as short as possible).

Communication and connection release occurs in response to the request of any of the users (calling or called users), $t_3 - t_2$ is as short as possible (see Figure A.1).



t_0 Time instant at which the request for communication and connection is made.

t_1 Time instant at which the connection and communication is established.

t_2 Time instant at which request for communication and connection release is made

t_3 Time instant at which communication and connection is cleared.

NOTE – Recommendation I.112 provides also definitions for these three values (Nos. 205, 206, 207). However, the definitions proposed are more general (no reference to a time diagram) and are circuit-mode oriented.

FIGURE A.1/I.140

Establishment of communication and connection time diagram

reserved (communication): The communication can be started at time instant t_1 explicitly specified at the time instant of communication and connection request, t_0. Communication and connection release occurs at time instant t_3 explicitly specified also at t_0. Communication and connection duration is predetermined: the communication and connection is set up for a specified period of time. As an option, connection release occurs at time instant t_3 following a release request made at time instant t_2 during the communication and *a priori* undetermined ($t_3 - t_2$ is as short as possible). This option corresponds to an unspecified duration of the communication and connection, or to a possibility of unanticipated release (see Figure A.1).

permanent (communication): The communication can be started after the connection is set up at time instant t_1 in response to a subscription request for the service at time instant t_0. The duration may be unspecified. The communication and connection is released at time instant t_3 corresponding to the end of the subscription.

switched (connection): ISDN circuit switched connections/connection elements are set up at any time on demand via e.g. a bit channel in response to signalling information received from subscribers, other exchanges or other networks, i.e. on a per-call-basis. Message/packet switched connections/connection elements provided by an ISDN may be set up on demand via circuit-mode channels (e.g. B-channels) and special packet switching units or via the D-channel subject to any D-channel priority/flow control restrictions that may be applicable.

NOTE – A more general definition of this value is also given in Recommendation I.112 (No. 311).

semi-permanent (connection): Semi-permanent connections/connection elements pass through a switching network.

Semi-permanent connections/connection elements between agreed points may be provided for an indefinite period of time after subscription, for a fixed period or for agreed periods during a day, week or other interval.

permanent (connection): Permanent connections/connection elements are described by the following characteristics:

permanent connections/connection elements are available to the connected subscriber at any time during the period of subscription between fixed network destination points requested by the subscribers.

unidirectional: This value applies when the information flow of messages is provided only in one direction.

bidirectional symmetric: This value applies when the information flow characteristics provided by the service are the same between two (or more) access points or reference points in the forward and backward directions.

bidirectional asymmetric: This value applies when the information flow characteristics provided by the service are different in the two directions.

point-to-point communication: This value applies when there are only two access points.

multipoint communication: Communication between the following access points:

a) one source access-point to multiple destination access-points (point-to-multipoint);

b) multiple access-points to a single destination access-point (multipoint-to-point), e.g. polling station;

c) multiple source access-point to multiple destination access-points (multipoint-to-multipoint).

broadcast communication: Unidirectional communication from a single access-point to an unlimited number of unspecified destination access-points.

multicast communication: Unidirectional communication from a single access-point to a limited number of specified destination access-points.

point-to-point connection: This value applies when only two endpoints are provided by the connection.

multipoint connection: Connection between the following endpoints:

a) one source endpoint to multiple destination endpoints (point-to-multipoint);

b) multiple endpoints to a single destination endpoint (multipoint-to-point);

c) multiple source endpoints to multiple destination endpoints (multipoint-to-multipoint).

broadcast connection: To be defined.

simple connection: A connection consisting of only one connection element.

tandem connection: Two or more connection elements in series form a connection.

parallel connection: Two or more connection elements in parallel form a connection.

star: To be defined.

mesh: To be defined.

uniform: This value applies when all connection elements have the same attribute values.

non uniform: This value applies in all other cases.

concurrent: The configuration of a connection is described as concurrent when all of the connection elements involved are established simultaneously and released simultaneously.

sequential: A connection has a sequential configuration when its connection elements are established and released sequentially, i.e. only one of several connection elements or chains of connection elements exists at any given time.

add/remove: When connection elements can be established and released while other connection elements of the same connections still exist, the configuration of this connection is described as add/remove.

symmetry and/or topology change: When the symmetry attribute value of the connection element can be changed during a call.

time slot sequence integrity: This value applies when:

i) at each user-network interface, time slots are implicitly or explicitly demarcated for each access channel of an aggregate of access channels; and

ii) the information parts delivered from the time slots at the receiving end are in the same order as submitted at the transmitting end.

NOTE – Preserving the order of bits within an individual time slot from the transmitting to the receiving end is not part of this definition.

8 kHz integrity with restricted differential time delay (RDTD): This value applies when the following conditions are met:

– that at each point in a connection or connection element, time slots are explicitly or implicitly demarcated for each information channel or an aggregate of information channels; and

– that the information parts submitted to the time slots at the transmitting end are delivered to the receiving end with a differential time delay of not more than 50 ms (provisional).

A.3 Service attributes for broadband ISDN monomedia and multimedia bearer services

A.3.1 General descriptions of ATM related attributes

In the following, additional sub-attributes characterizing the service requirements on ATM-based networks are described:

– Broadband bearer services may be associated to bearer service subcategories characterized by the values of attributes Nos. 1.1 to 1.2 accordant with the classification of the AAL functions described in Recommendation I.362.

– Information transfer mode: this attribute describes the operational mode for transferring (i.e. transporting and switching) user information through the ISDN (e.g. ATM).

For a clearer characterization of the services' bearer capabilities four sub-attributes should be added to this attribute:

- *connection mode:* describing a connection oriented or connectionless transfer;
- *traffic type:* describing bit streams with constant (CBR) or variable bit rates (VBR) supported by the service in one or several VC or a VP (see 3.1);
- *timing end-to-end:* describing the timing relation between source and destination of signals to be transferred via one or several VC or a VP. End-to-end timing is necessary for real-time information, e.g. video signals;
- *VCI transparency:* this sub-attribute is relevant for virtual path (VP) bearer services. Its value describes the unrestricted use and multiplexing of virtual channels within the VP by the users;
- *attribute information transfer rate:* the bit rate of VBR services available to the user for the transfer of user's information via one or several VC or a VP are mainly described by two parameters which should be defined as sub-attributes:
  a) *peak bit rate:* the maximum bit rate offered to the user for a given time period (to be defined) for the transfer of a bursty signal;
  b) *mean bit rate:* the average bit rate available to the user for a given time period (to be defined).

The bit rate offered by a CBR service will be characterized by the sub-attribute peak bit rate.

The source traffic may be further characterized by additional attributes, e.g. "burstiness" and "peak duration". The definitions of those attributes are for further study.

Access protocols: the access protocol attribute should be amended by sub-attributes describing the ATM layer and ATM adaptation layer access protocols for signalling, OAM, and user information:

- Signalling access protocol – Physical layer
- Signalling access protocol – ATM layer
- Signalling access protocol – ATM adaptation layer (AAL)
- Information access protocol – Physical layer
- Information access protocol – ATM layer
- Information access protocol – ATM adaptation layer (AAL)

A.3.2 Multimedia related attributes

Multimedia services support the transfer (and in some cases also the retrieval, messaging, or distribution) of several types of information (service components). The service characteristics are described by the values of their attributes. These are the service dependent attributes (bearer service and teleservice attributes) describing the means of communication offered by the service, and the service component attributes describing the characteristics of the types of information to be transferred such as video, audio, data, etc. The service (dependent) attribute values are applicable for all the communication relations of the service including all types of information supported by the service. The service component attribute values are dedicated to a specific type of information independent from the service. The service component descriptions are also part of the descriptions of teleservices providing the transfer of such information types.

In the following, additional or modified service attributes and service component attributes are described characterizing the information transfer capabilities of multimedia (and partly also monomedia) services (via virtual channels or virtual path of the B-ISDN):

A.3.3 Service attributes

Multimedia bearer services and teleservices via an ATM-based network may offer several virtual channels (VC), one VC for each service component. Adapted to the special requirements of the service components to be supported, each of the VC may have particular characteristics described by particular attribute values. So, for the consideration of multimedia aspects most of the service attributes should be amended by sub-attributes describing the characteristics of the individual VC or service component where applicable.

Monomedia services and multimedia services offering only one VC or virtual path (VP) for the unrestricted use including multiplexing by the user can also be described using the same description method without VC specific sub-attributes.

A.3.4 Information transfer capabilities, service components (for teleservices)

This is a modified teleservice attribute describing by its sub-attributes the types of information, i.e. service components, which are mandatorily or optionally supported by this service. Two groups of sub-attributes are proposed:

- Mandatory service components
- Optional service components

The values of these sub-attributes contain the names of the service components, e.g. voice, audio, data, video. These service components are characterized by their attribute values.

A.3.5 Information transfer capabilities (for bearer services)

By this attribute the transfer capabilities (unrestricted or dedicated to specific information types as defined in I.140, I.210) of one or several VC or a VP are described.

A.3.6 Structure (service specific)

The attribute values characterize the information structure to be preserved when transporting the information via the network. An individual structure may be preserved for each VC or a global structure for all VCs or a VP covering the requirements of all service components supported by the service.

A.3.7 Symmetry

The values of this attribute (defined in I.140) characterize for each information type (service component) supported by this service the direction of the information flow depending on the type of communication. The information flow of each service component in one or several VC or a VP may be e.g. bidirectional when used in an interactive service or unidirectional in a distribution service.

A.3.8 Access channel and rate

Two sub-attributes should be added to describe the access channels and their bit rates for user information and signalling separately. A multimedia service may offer one individual virtual channel for each type of user information or one common virtual channel for all types of user information. For teleservices, also the association of the service components to the virtual channels should be described.

A.3.9 Quality of Service (service specific)

The value of this attribute characterizes either the overall QOS covering the individual QOS requirements of all service components of this service or individual QOS for each virtual channel depending on the service component to be transferred. The QOS sub-attributes to describe the overall QOS or the VC specific QOS are under study.