

Annex L

(to Recommendation Q.931)

Low layer information coding principles

L.1 Purpose

This annex describes principles that shall be used when the calling user specifies information during call setup regarding low layer capabilities required in the network and by the destination terminal.

Note - In this context and throughout this annex the term "called user" is the end point entity which is explicitly addressed. This may be an addressed interworking unit (IWU) (see I.500-Series Recommendations [51] and X.31 [14] case A).

L.2 Principles

L.2.1 Definitions of types of information

There are three different types of information that the calling ISDN user may specify during call setup to identify low layer capabilities needed in the network and by the destination terminal:

- a) type I information is information about the calling terminal which is only used at the destination end to allow a decision regarding terminal compatibility. An example would be modem type. This information is encoded in octets 5 to 7 of the Low layer capability information element;
- b) type II information is the selection of bearer service from the choices of bearer services offered by the network to which the calling user is connected. This type of information is present even if no interworking occurs. An example is unrestricted digital information (UDI). This information is coded in:
 - i) octets 3 and 4 (including octets 4a and 4b if necessary) of the Bearer capability information element when the transfer mode required by the calling user is circuit mode,
 - ii) octets 3, 4, 6 and 7 (including 4a and 4b if necessary) of the Bearer capability information element when the transfer mode required by the calling user is packet mode;
- c) type III information is information about the terminal or intended call which is used to decide destination terminal compatibility and possibly to facilitate interworking with other ISDNs or other dedicated networks. An example is A-law encoding. This information is encoded in octet 5 of the Bearer capability information element.

L.2.2 Examination by network

Type I information is user-to-user (i.e. not examined by network) while both types II and III should be available for examination by the destination user and the network. The Low layer capability information element is an

information element which is not examined by the network while the Bearer capability information element is an information element which is examined by the user and the network.

L.2.3 Location of type I information

Type I information (i.e. terminal information only significant to the called user) shall, when used, be included in the Low layer compatibility information element.

L.2.4 Location of types II and III information

Type II (i.e. bearer selection) information shall be included in the Bearer capability information element. Type III information, when used, is included in the Bearer capability information element. The network may use and modify the information (e.g. to provide interworking). The rationale for the user including some terminal related information in the type III information (interworking related) is shown by the following example.

Normally with UDI, the rate adaption technique chosen is related to the terminal. The specification of a particular rate adaption scheme with a UDI bearer service could allow a compatibility decision by the destination terminal in a purely ISDN situation. However, it could also conceivably be used to allow interworking with a PSTN, assuming that the appropriate functions (i.e. data extraction, modem pool) are available at the interworking unit.

If the rate adaption information is carried in the Low layer compatibility information element, and not in the Bearer capability information element, then interworking by the network providing the bearer capability would not be possible. However, if the rate adaption information is carried in the Bearer capability information element, interworking would be possible.

Hence, there is some terminal related information which may be considered interworking related. The consequence for the calling user of not including such terminal related information in the Bearer capability information element is that the call may not be completed if an interworking situation is encountered.

L.2.5 Relationship between Bearer capability and Low layer compatibility information elements

There shall be no contradiction of information between the Low layer compatibility and the Bearer capability at the originating side. However, as some Bearer capability code points may be modified during the transport of the call, this principle implies that there should be minimal duplication of information between Bearer capability information element and Low layer compatibility information element.

Note - If as a result of duplication, a contradiction occurs between the Bearer capability information element and the Low layer compatibility information element at the terminating side, the receiving entity shall ignore the conflicting information in the Low layer compatibility information element.

The following example, dealing with the specification of the encoding scheme used by the terminal for the speech or 3.1 kHz audio bearer services, shows the consequences of duplication.

It is expected that some ISDNs will support only A-law and some only μ -law, with conversion provided by the μ -law network. (See Recommendation G.711.) If the encoding scheme is specified in both the Bearer capability information element and the Low layer compatibility information element, interworking between two ISDNs might require a change of the user information layer 1 protocol in the Bearer capability information element (e.g. from A-law to μ -law), while the encoding scheme specified in the Low layer compatibility information element would presumably be forwarded to the destination unchanged. Since, to determine compatibility, the destination terminal examines both

the Bearer capability information element and the Low layer compatibility information element, it would receive conflicting information regarding the encoding scheme used.

L.3 Information classification

The following are the examples of classifying low layer information currently identified. This information is provided to facilitate understanding of the characteristics of types II and III information.

L.3.1 Examples for speech and 3.1 kHz audio bearer services

a) Type II information (common to all applications using these bearer services):

- information transfer capability = speech or 3.1 kHz audio;
- information transfer mode = circuit;
- information transfer rate = 64 kbit/s;
- user information layer 1 protocol = A/ μ law.

b) Type III information for interworking with CSPDN (3.1 kHz audio applications are assumed) - Figure L-1/Q.931:

- user information layer 1 protocol = rate adaption + user rate (Note);

Note - Only those profiles conforming to CCITT standardized rate adaption are allowed when only the above information is provided.

c) Type III information for interworking with PSTN:

i) voice applications: Figure L-2/Q.931:

- user information layer 1 protocol = A/ μ law;

ii) voice band data applications: Figure L-3/Q.931:

- user information layer 1 protocol = A/ μ law.

L.3.2 Examples for 64 kbit/s UDI circuit mode bearer service

a) Type II information (common):

- information transfer capability = unrestricted digital information;
- information transfer mode = circuit;
- information transfer rate = 64 kbit/s.

b) Type III information for interworking with PSPDN (packet applications): Figure L-4/Q.931:

- no type III information is required.

c) Type III information for interworking with PSTN:

i) voice applications: Figure L-5/Q.931 - no type III information is required;

ii) rate-adapted data applications: Figure L-6/Q.931 - no type III information is required.

d) Type III information for interworking with PSTN with end-to-end digital connectivity (data applications)
Figure L-7/Q.931:

- user information layer 1 protocol = rate adaption + user rate (Note).

Note - The profile described in I.463 [52] is allowed.

L.3.3 Examples for ISDN virtual-circuit bearer service

a) Type II information (common):

- information transfer capability = unrestricted digital information;
- information transfer mode = packet;
- information transfer rate = -----;
- user information layer 1 protocol = rate adaption + user rate (Note 1);
- user information layer 2 protocol = LAPB (Note 2);
- user information layer 3 protocol = X.25 [5] packet layer protocol (Note 2).

Note 1 - This parameter is included only when user packet information flow is rate adapted. Only those profiles conforming to X.31 are allowed when only the above information is provided for layer 1 protocol.

Note 2 - Only those profiles conforming to X.31 are used.
See Figures L-8, L-9 and L-10/Q.931.

b) Type III information for interworking with PSPDN, CSPDN, PSTN:

- no type III information is necessary.

Note 1 - Is user rate sufficient to specify the type of modem at IWF?

FIGURE L-1/Q.931

BC = 3.1 kHz audio, voice band data ■ CSPDN

FIGURE L-2/Q.931

BC = 3.1 kHz audio, voice ■ PSTN

FIGURE L-3/Q.931

BC = 3.1 kHz audio, voice band data ■ PSTN

FIGURE L-4/Q.931

BC = 64 kbit/s UDI, packet application ■ PSPDN

FIGURE L-5/Q.931

BC = 64 kbit/s UDI, voice ■ PSTN

FIGURE L-6/Q.931

BC = 64 kbit/s UDI, rate adapted data ■ PSTN

FIGURE L-7/Q.931

BC = 64 kbit/s UDI ■ existing digital network

FIGURE L-8/Q.931

BC = ISDN virtual circuit (VC) ■ PSPDN

FIGURE L-9/Q.931

BC = ISDN virtual circuit (VC) ■ CSPDN

FIGURE L-10/Q.931

BC = ISDN virtual circuit (VC) ■ PSTN

L.4 Scenarios outside the scope of ISDN standardization

L.4.1 Examples for speech and 3.1 kHz audio bearer services

a) Type II information (common):

- information transfer capability = speech or 3.1 kHz audio;
- information transfer mode = circuit;
- information transfer rate = 64 kbit/s;
- user information layer 1 protocol = A/μ law.

b) Type III information for interworking with PSTN - voice band data applications - modem type conversion occurs: Figure L-11/Q.931:

- user information layer 1 protocol = rate adaption + user rate + other attributes (if required).

L.4.2 Examples for 64 kbit/s UDI circuit mode bearer services

a) Type II information (common):

- information transfer capability = unrestricted digital information;
- information transfer mode = circuit;
- information transfer rate = 64 kbit/s.

b) Type III information for interworking with PSTN - voice band data applications - Figure L-12/Q.931:

- no type III information is required.

Note - This scenario seems to be a part of PSTN services.

FIGURE L-11/Q.931

BC = 3.1 kHz audio, voice band data ■ PSTN

Note - This scenario seems to be a combination of interworking with PSTN and a part of PSTN services.

FIGURE L-12/Q.931

BC = 64 kbit/s UDI, voice-band data ■ PSTN

Annex M

(to Recommendation Q.931)

Low layer compatibility negotiation

This annex describes an additional low layer compatibility checking procedure

If, for any reason, the network is unable to convey this information element, it shall act as described in section 5.8.7.1 (unrecognized information element). Users are advised not to include in the Low layer compatibility information element sent from the called user to the calling user, attributes which would have the same value as the ones contained in the Low layer compatibility information element received from the calling party.

M.4 Low layer compatibility negotiation options

The Low layer compatibility information element contains a negotiation indicator which may have one of the following values:

- a) low layer compatibility negotiation not allowed (default): then the called user shall not invoke negotiation;
- b) out-band low layer compatibility negotiation allowed: the called user may then invoke low layer compatibility negotiation, as needed, according to section 3 above;
- c) in-band negotiation allowed: the called user may then invoke low layer compatibility negotiation using the supported in-band negotiation, according to service or application requirements;
- d) either in-band or out-band negotiation allowed: the called user may invoke one or the other low layer compatibility negotiation procedures according to its requirements. If the call is end-to- end ISDN, and the out-band low layer compatibility negotiation is supported by both parties, then this method of negotiation is preferred.

Annex N

(to Recommendation Q.931)

Procedures for establishment of bearer connection prior to call acceptance

N.1 General

Annex O

(to Recommendation Q.931)

Optional procedures for bearer service change

The procedure for bearer service change may not be provided on all networks. On those networks that support it, a user may use this procedure after making a suitable subscription-time arrangement.

Note 1 - The definition of necessary mechanisms (if any) within Signalling System No. 7 to support this procedure, including any undesirable charging implications, is for further study.

When a bearer service requested in an originator's SETUP message cannot be provided by the network, the network would reject the call or, under some circumstances, the network may change the bearer service and provide bearer service change notification. These procedures are currently applicable only to a change from 64 kbit/s unrestricted to 64 kbit/s restricted, and from 64 kbit/s restricted to 64 kbit/s restricted with rate adaptation.

Note 2 - During an interim period some networks may only support restricted 64 kbit/s digital information transfer capability, i.e. information transfer capability solely restricted by the requirement that the all-zero octet is not allowed. For interworking the values given in Appendix 1 of Recommendation I.340 should apply. The interworking functions have to be provided in the network restricted capability. The ISDN with 64 kbit/s transfer capabilities will not be offered by this interworking, other than by conveying the appropriate signalling message to or from the ISDN terminal.

Note 3 - The possibility of changing from 3.1 kHz audio to speech is for further study.

Up to three Bearer capability information elements may be present in the SETUP message from the originating user, corresponding to the allowed bearer service modifications given above. The Bearer capability information element shall be immediately preceded by the Repeat indicator information element with the meaning field specifying "Prioritized list for selecting one possibility". Hence, the order of Bearer capability information elements would indicate order of bearer service preference.

If the SETUP message contains Bearer capability information elements not agreeing with any of the permissible ordered combinations listed above, the network will reject the call attempt.

After sending a CALL PROCEEDING message, when the originating network or terminating premises equipment determines that the preferred bearer service cannot be provided, it sends a NOTIFY message toward the call originator. The NOTIFY message contains a Notification indicator information element with a coding which indicates to the originating party the change in bearer service and also contains a Bearer capability information element specifying the attributes of the new bearer service.

Receipt of the NOTIFY message is not acknowledged. The call originator may allow the call to continue or may

initiate call clearing in accordance with