

(Recommendation Q.931, §§ 5 to 9)

Page

5. Circuit switched call procedures 6

6. Packet communication procedures 41

7. User-to-user signalling procedures 61

8. Applications of circuit-switched supplementary services to terminals using stimulus procedures 75

9. List of system parameters 75

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Similarly, if the network determines that a requested service is not authorized or is not available, the network shall initiate call clearing in accordance with § 5.3 with one of the following causes:

- a) #57 "bearer capability not authorized",
- b) #58 "bearer capability not presently available",
- c) #63 "service or option not available, unspecified", or
- d) #65 "bearer service not implemented".

Note - If a supplementary service is not authorized and is not available, the procedure to be used is defined in the supplementary service control procedures.

5.1.5.2 Call proceeding, overlap sending

If overlap sending is used following the occurrence of one of these conditions:

- a) the receipt by the network of a sending complete indication which the network understands; or,
- b) analysis by the network that all call information necessary to effect call establishment has been received;

and if the network can determine that access to the requested services and supplementary service is authorized and

available, the network shall: send a CALL PROCEEDING message to the user; stop timer T302; and enter the Outgoing Call Proceeding state. Similarly if the network determines that a requested service or supplementary service is not authorized or is not available, the network shall initiate call clearing in accordance with § 5.3 with one of the following causes:

- a) #57 "bearer capability not authorized",
- b) #58 "bearer capability not presently available",
- c) #63 "service or option not available, unspecified", or
- d) #65 "bearer service not implemented".

Note 1 - The CALL PROCEEDING message is sent to indicate that the requested call establishment has been initiated, and no more call establishment information will be accepted.

Note 2 - If a supplementary service is not authorized or is not available, the procedure to be used is defined in the supplementary service control procedures.

When the user receives the CALL PROCEEDING message, the user shall enter the Outgoing Call Proceeding state. If, for symmetry purposes, the calling user employs timer T304, the user shall stop timer T304 when the CALL PROCEEDING message is received. If, for symmetry purposes, the calling user employs timer T304 then, on expiry of T304, the user shall initiate call clearing in accordance with § 5.3 with cause 102 "recovery on time expiry".

An alerting or connect indication received from the called party will stop timer T302 and cause an ALERTING or CONNECT message respectively to be sent to the calling user. No CALL PROCEEDING message shall be sent by the network. If, for symmetry purposes, the calling user employs timer T304, the user shall stop timer T304 on receiving the ALERTING or CONNECT message.

At the expiration of timer T302, the network shall:

- a) initiate call clearing in accordance with § 5.3 with cause #28 "invalid number format" (incomplete number) sent to the calling user and with cause #102 "recovery on timer expiry" is sent towards the called user, if the network determines that the call information is definitely incomplete; otherwise,
- b) send a CALL PROCEEDING message and enter the Outgoing Call Proceeding state.

5.2.5.3 Called user clearing during incoming call establishment

If the SETUP message has been delivered on a point-to-point data link and a RELEASE COMPLETE or DISCONNECT message is received before a CONNECT message has been received, the network shall: stop timer T303, T304, T310 or T301 (if running); continue to clear the user as described in § 5.3.3, and clear the call to the calling user with the cause received in the RELEASE COMPLETE or DISCONNECT message.

If timer T312 has expired and the network receives a DISCONNECT message from the called user after having received a SETUP ACKNOWLEDGE, CALL PROCEEDING or ALERTING message (but before receiving a CONNECT message), the network shall continue to clear the user as described in § 5.3.3. The network shall stop timer T304 (if

running) for this user.

SETUP ACKNOWLEDGE or PROCEEDING messages have been received, the cause sent to the calling user shall be a cause received from the called user, giving preference to (in order of priority): #17 "user busy"; #21 "call rejected"; any other appropriate cause sent by a called user.

SETUP ACKNOWLEDGE or CALL PROCEEDING messages have been received, the cause sent to the calling user shall be a cause received from the called user, giving preference to (in order of priority): #17 "user busy"; #21 "call rejected"; any other appropriate cause sent by a called user.

xxxxx

On receipt of a RESUME message, the network enters the Resume Request state. After a positive validation of the call identity that relates to the suspended call containing a valid identity that relates to a currently suspended call, the network shall: send a RESUME ACKNOWLEDGE message to the user; release the call identity; stop timer T307 and enter the Active state. The RESUME ACKNOWLEDGE message shall specify the B-channel reserved to the call by the

network by means of the Channel identification element, coded "B-channel is indicated, no alternative is acceptable".

5.8.5 General information element errors

The general information element error procedures may also apply to information elements in codesets other than 0. In that case, the diagnostics in the cause information element may indicate information elements other than those in codeset 0 by applying the locking or non-locking shift procedures as described in § 4.5.

5.8.5.1 Information element out of sequence

A variable length information element which has a code value lower than the code value of the variable length information element preceding it shall be considered as an out of sequence information element.

If the network or user receives a message containing an out of sequence information element, it may ignore this information element and continue to process the message. If this information is mandatory, and the network or user chooses to ignore this out of sequence information element, then the error handling procedure for missing mandatory information elements as described in § 5.8.6.1 shall be followed. If the ignored information element is non-mandatory, the receiver continues to process the message.

Note - Some implementations may choose to process all the information elements received in a message regardless of the order in which they are placed.

5.8.5.2 Duplicated information elements

If an information element is repeated in a message in which repetition of the information element is not permitted, only the contents of information element appearing first shall be handled and all subsequent repetitions of the information element shall be ignored. When repetition of information elements is permitted, only the contents of permitted information elements shall be handled. If the limit on repetition of information elements is exceeded, the contents of information elements appearing first up to the limit of repetitions shall be handled and all subsequent repetitions of the information element shall be ignored.

5.8.6 Mandatory information element errors

5.8.6.1 Mandatory information element missing

When a message other than SETUP, DISCONNECT, RELEASE or RELEASE COMPLETE is received which has one or more mandatory information elements missing, no action should be taken on the message and no state change should occur. A STATUS message is then returned with cause #96 "mandatory information element is missing".

When a SETUP or RELEASE message is received which has one or more mandatory information elements missing, a RELEASE COMPLETE message with cause #96 "mandatory information element is missing" shall be returned.

When a DISCONNECT message is received with the cause information element missing, the actions taken shall be the same as if a DISCONNECT message with cause #31 "normal, unspecified" was received (see § 5.3), with the exception that the RELEASE message sent on the local interface contains cause #96 "mandatory information element is missing".

When a RELEASE COMPLETE message is received with a cause information element missing, it will be assumed that a RELEASE COMPLETE message was received with cause #31 "normal, unspecified".

The sending or receipt of the STATUS message in such a situation will not directly affect the call state of either the sender or receiver. The side having received the STATUS message shall inspect the Cause information element. If the STATUS message contains cause #97 "message type non-existent or not implemented", timer T322 shall continue to time for an explicit response to the STATUS ENQUIRY message. If a STATUS message is received that contains cause #30 "response to status enquiry", timer T322 shall be stopped and the appropriate action taken, based on the information in that STATUS message, relative to the current state of the receiver. If timer T322 expires and a STATUS message with cause #97 "message type non-existent or not implemented" was received, the appropriate action shall be taken, based on the information in that STATUS message, relative to the current call state of the receiver.

When in the Null state, the receiver of a STATUS message indicating other than to discard the message and shall remain in the Null state.

the Null state shall take no action

In semi-permanent connection type 1), the procedures of Section 6.3 are followed for call establishment and release.

In semi-permanent connection type 2), only the procedures of Section 6.3.2 are followed for call establishment and release.

When semi-permanent connection type 2), is used for PVCs none of the following procedures apply.

Semi-permanent connections are established via a provisioning process without Q.931 procedures.

Note - Some networks may not support every type of access. In the case of B-channel access, the network will clear a request for unsupported services by sending a RELEASE COMPLETE message with cause #65, "bearer service not implemented". In the case of a request for D-channel access (an SABME with SAPI=61), on a network port which does not support the service, no response is required of the network.

6.1.1 Circuit-switched access to PSPDN services (Case A)

The B-channel connection between the user and the AU shall be controlled using the D-channel signalling procedures for call establishment described in Section 5.1. The specific B-channel to be used as a switched connection is selected using the channel selection procedures described in Section 5.1.2 and summarized in Table 6-1/Q.931.

6.1.2 Access to the ISDN virtual circuit service (Case B)

6.1.2.1 B-channel

Demand access B-channel connections are controlled using the D-channel signalling procedures for call establishment described in Section 5.1 using the messages defined in Section 3.2 with the following exceptions:

- The procedures for overlap sending specified in Section 5.1.3 do not apply.
- The procedures for call proceeding and overlap sending specified in Section 5.1.5.2 do not apply.
- The procedures for notification of interworking at the origination interface specified in Section 5.1.6 do not apply.
- The procedures for call confirmation indication specified in Section 5.1.7 do not apply.
- The procedures for call connected specified in Section 5.1.8 apply as follows:
 - Upon accepting the access connection, the network shall send a CONNECT message across the user-network interface to the calling user and enter the Active state.
 - This message indicates to the calling user that an access connection to the packet handler has been established.
 - On receipt of the CONNECT message, the calling user may optionally send a CONNECT ACKNOWLEDGE message, and shall enter the Active state.
- The procedures for call rejection specified in Section 5.1.9 apply as follows:
 - When unable to accept the access connection, the network shall initiate call clearing at the originating user-network interface as described in Section 5.3.
- The procedures for transit network selection specified in Section 5.1.10 do not apply.

The specific B-channel to be used as a demand connection is selected using the channel negotiation procedures described in Section 5.1.2 and summarized in Table 6-1/Q.931.

The bearer capability information element included in SETUP message shall be coded with:

- Information transfer capability set to either:
 - a) "unrestricted digital information"; or
 - b) "restricted digital information";
- transfer mode set to "circuit mode";
- information rate set to "64 kbit/s".

Note - Bearer capability information element octets 4a and 4b shall not be included.

When the Channel indication information element indicates Channel indication = No channel, Exclusive, and D-channel indication = Yes, then the Bearer capability information element should be encoded as follows:

- Information transfer capability set to either: Unrestricted digital information or restricted digital information;
- Transfer mode set to: packet mode;
- Information rate set to: packet mode (00000);
- Layer 2 protocol set to: Recommendation 0.921;
- Layer 3 protocol set to: Recommendation X.25, packet layer.

In all other cases, the Bearer capability information element should be encoded as follows:

- Information transfer capability set to either: Unrestricted digital information or restricted digital information;
- Transfer mode set to: packet mode;
- Information rate set to: packet mode (00000);
- Layer 2 protocol set to: Recommendation X.25[5], link layer;
- Layer 3 protocol set to: Recommendation X.25, packet layer.

There exists an understanding that if the terminal responds with D- channel indication set (see Table 6-3/Q.931), the Layer 2 protocol to be used is Recommendation Q.921 (LAPD)[3].

The clearing of the switched connection shall be effected by using the D-channel signalling procedures for call clearing as specified in Section 5.3. For access to PSPDN services, no exceptions apply. For the ISDN virtual circuit service, the messages of Section 3.2 are used, and the following exceptions apply:

- The terms defined in Section 5.3.1 "Terminology" apply by replacing "circuit-switched ISDN connection" with "demand packet mode access connection".

- The exception condition (f) specified in Section 5.3.2 does not apply.
- The procedures for clearing with tones and announcements provided in Section 5.3.4.1 do not apply.

The B-channel may be cleared at any time by the user though, in general, it will be cleared following the clearing of the last virtual call over that B-channel. In the ISDN virtual circuit service, if the user clears the B-channel access connection using a Q.931 clearing message while X.25[5] virtual calls still exist on the B-channel, the network shall clear the X.25 virtual call(s) with cause #17, "remote procedure error", and diagnostic #64, "call set-up, call clearing, or registration problem".

In case B, if a Q.931 RESTART message is received by the PH during the X.25 data transfer phase, the X.25 virtual calls shall be treated as follows:

At the expiration of timer T320, the network may disconnect the X.25 link layer and the access connection. B-channel clearing is as described in Section 5.3 with the exceptions above, with cause #102, "recovery on timer expiry".

When failure occurs, or the X.25 virtual call is cleared prematurely, the rules of Section 5.8 shall apply. In addition, the following rules for determining the appropriate cause to be used shall apply in order of decreasing priority.

4. If the Q.931 SETUP message is sent across the user-network interface, but no response is received to the second expiry of timer T303, rule #3 applies.

5. If the Q.931 SETUP message is sent across the user-network interface, and a response is received from a user which results in the clearing of the call at the user-network interface, the X.25 virtual call shall be cleared using a clear indication packet containing the appropriate cause from Table 6-5/Q.931 relative to the cause received/sent in the Q.931 clearing message.

6. If an X.25 clear request packet is received from the originating user prior to the delivery of the X.25 incoming call packet to the called user (premature clearing), the PH shall send a clear confirmation packet to the calling user and the access connection shall be treated as follows:

- If the Q.931 SETUP message was associated with the Unconditional notification class of service (see Section 3.2.3 of Recommendation X.31)[14], the access connection, when and if established, shall be cleared. The Q.931 clearing message shall contain the appropriate cause as described in Table 6-6/Q.931.

- If the Q.931 SETUP message was associated with the Conditional notification class of service (see Section 3.2.3 of Recommendation X.31) and there exists at least one terminal which responds positively to the Q.931 SETUP message, then two options are allowed:

- a) the access connection is cleared as described for the Unconditional class of service; or

- b) the access connection is established and timer T320 is started. Upon expiry of timer T320, the access connection is cleared with cause #102, "recovery on timer expiry" and diagnostic indicating timer T320.

6.4.4 Cause mappings

6.4.4.1 Access to/from PSPDN services (Case A)

The AU may choose to follow the procedures in Section 6.4.4.2 when mapping between causes delivered by the ISDN or the PSPDN.

6.4.4.2 Access to/from the ISDN virtual circuit service (Case B)

There are several cases where it is necessary to map causes between Q.931 and X.25[5]. Networks shall use Table 6-5/Q.931 and Table 6-6/Q.931 to map the causes between Q.931 and X.25 messages. The figures in Appendix II describe some example situations.

