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Title: **Usage of Q.931 messages in H.225.0**

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Purpose: **Proposal / Discussion**

Introduction

This document proposes a subset of Q.931 messages and information elements to be used in H.225.0 for connection setup and connection progress signaling. It also specifies which fields of the respective information elements to use, assigns values to certain fields, and restricts the values of other fields when a message containing this field is originated by an H.323 entity.

General

Each H.225.0 end point shall be able to receive and identify an incoming Q.931 message as such. It shall be capable of processing the mandated Q.931 messages; it may be capable of processing the optional Q.931 messages. In any case, each H.225.0 end point shall be able to skip messages unknown to it without disturbing operation.

Each H.225.0 end point shall be able to interpret and generate the messages and information elements mandated in the following for the respective Q.931 messages. It may interpret and generate the optional messages and information elements as defined below as well. It also may interpret other messages and information elements of Q.931, but shall not generate these in LAN-internal calls. The end points shall be able to skip unknown information elements contained in a Q.931 message without disturbing operation.

Intermediate systems (gateways and gatekeepers) shall be able to forward all Q.931 messages and all information elements even if they do not understand the contents of the respective messages.

{ Note: We have not yet discussed whether or not a LAN-D channel for Q.931 shall be re-used for setup of further connections between the same two entities! }

Q.931 Messages and message contents

H.225.0 mandates the use of the following messages with the subsequently listed information elements (with *protocol discriminator, call reference, message type*, and *user-user* always being present).

- ALERTING
  - bearer capability (optional)
  - channel identification (optional) ***{Is this really needed? If so, it should go into more messages.}***
  - progress indicator (optional)
  - display (optional)
  - signal (optional)

- CALL PROCEEDING
  - bearer capability (H.323 mandatory)
  - progress indicator (optional)
  - display (optional)
- CONNECT
  - bearer capability (H.323 mandatory)
  - progress indicator (optional)
  - display (optional)
  - date/time (optional)
  - signal (optional)
- CONNECT-ACK
  - display (optional)
  - signal (optional)
- DISCONNECT (optional)
  - cause (Q.931 mandatory) ***{Values to be provided by H.323 or by Q.850?}***
  - progress indicator (optional)
  - display (optional)
  - signal (optional)
- INFORMATION (optional)
  - sending complete (optional)
  - display (optional)
  - keypad facility (optional)
  - signal (optional)
  - called party number (optional)
- NOTIFY (optional)
  - bearer capability (optional) ***{Do we need this here?}***
  - notification indicator (Q.931 mandatory)
  - display (optional)
- PROGRESS (optional)
  - bearer capability (optional) ***{Do we need this here?}***
  - cause (optional)
  - progress indicator (Q.931 mandatory)
  - display (optional)
- RELEASE (optional)
  - cause (optional)
  - display (optional)
  - signal (optional)
- RELEASE COMPLETE (optional)

- cause (optional)
- display (optional)
- signal (optional)

- SETUP
  - sending complete (optional)
  - bearer capability (Q.931 mandatory)
  - progress indicator (optional)
  - display (optional)
  - keypad facility (optional)
  - signal (optional)
  - calling party number (optional)
  - called party number (optional)
  - low layer compatibility (optional) ***{ Currently, I tend to leave these two out of the spec, as***
  - high layer compatibility (optional) ***the contents is already covered by the bearer capability.}***
  - user-user (H.323 mandatory) — *for interworking, added by gateway as appropriate*
- SETUP ACK (optional)
  - progress indicator (optional)
  - display (optional)
  - signal (optional)
  - user-user (H.323 mandatory) — *for interworking, added by gateway as appropriate*

Information elements to be used in the Q.931 messages

Protocol Discriminator

As defined in subclause 4.2/Q.931

Shall be set to 08H — this identifies the Q.931/I.451 user-network messages Figure 4-2/Q.931.

{ Note: There has been some discussion about multiplexing Q.931 and other H.225.0 (but not H.245) messages over this channel; if so, we need specify a second protocol discriminator for distinction here. }

Call reference

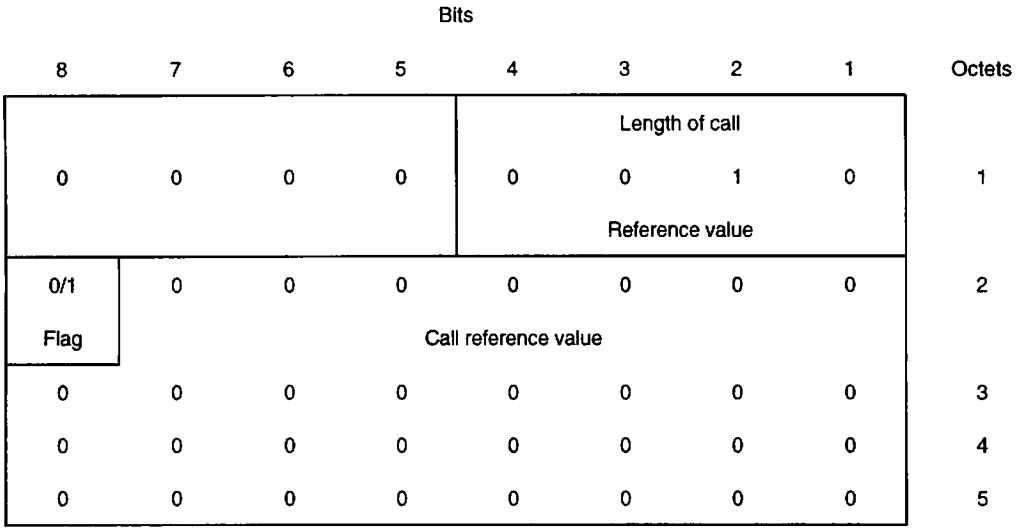
As defined in subclause 4.3/Q.931

A call reference value length of four octets shall be supported by any H.323 end point.

The call reference value is chosen at the side originating the call and has to be locally unique. For subsequent communication, the calling and the called side shall use this call reference value in all the message belonging to this particular call.

The value is encoded following to Figure 4-4/Q.931 for a one-octet call reference, according to Figure 4-5/Q.931 for a two-octet call reference and according to Figure 1/H.225.0 for a four octet call-reference. The most significant octet of the reference value is always encoded in octet number 2.

{ Note: do we want to mandate a two-octet call reference for simplification ? Do we need a four-octet call-reference at all ? 32k calls seem to be sufficient. }



c) Four octet call reference value

Figure 1/H.225.0: Extension to the encoding of the call reference value

{We need a conference reference as well. This has not yet been considered explicitly.}

Message Type

The message type is encoded according to Figure 4-6/Q.931 using the values specified in Table 4-2/Q.931 or the extension mechanism as specified in section X.y of this recommendation. H.225.0 restricts the set of messages allowed to those specified in section X.y of this recommendation.

{Do we need H.225.0 specific extensions at all?}

Bearer Capability

This information element is encoded according to Figure 4-11/Q.931 and Table 4-6/Q.931. The following applies to the use of the various fields of this information element (the octet number references refer to Figure 4-11/Q.931):

Information transfer capability (octet #3)

- The extension bit (bit 8) shall be set to '1'.
- The coding standard (bits 6, 7) shall be set to '00' indicating 'ITU-T'.
- Information transfer capability (bits 0 - 5):
  - For calls originating from an ISDN end point the information indicated to the gateway shall be forwarded. ***{ Note: this is to allow some advance information about the nature of the connection to be forwarded to the H.323 end point, e.g. voice only vs. data vs. video; this would have an impact on the bandwidth required as well as on the ability/willingness to accept the call or not }***
  - Calls that originate from an H.323 end point shall use this field to indicate their wish to place an audiovisual call. Therefore, the field shall be set to 'unrestricted digital information', i. e. '01000'. Other values are ffs.

extension bit for octet #4 (bit 8)

- Shall be set to '0'

Transfer Mode — octet #4, bits 6,7

- Shall specify 'circuit mode', value '00'

Information transfer rate

- This value shall be set to 'Multirate (64kbit/s base rate)', i. e. a value of '11000'. The *rate multiplier* is used to indicate the bandwidth needed.

Rate multiplier — octet #4.1

- The extension bit (bit 8) shall be set to '1'.
- The bits 1 - 7 shall indicate the bandwidth needed for the call as defined in the following (Note, that in contrast to Q.931, a value of '1' is allowed here)
- For a call originating from an ISDN end point the gateway shall simply pass on the information that it receives from the ISDN.
- For a call incoming from an H.324 end point the gateway shall set the rate multiplier to 01H.
- For a call incoming from B-ISDN some translation from Q.2931 to Q.931 needs to be performed. ***{Note: this should already be specified elsewhere. }***
- For a call originated from an H.323 end point, this shall be used to indicate the bandwidth to be used for this call. If the called system is another H.323 end point, this value shall reflect the bandwidth to be used on the LAN. If a gateway is involved, then this value shall reflect the number of external connections to be set up.
  { Note: we need some further disctinctions here. }

Layer 1 protocol — octet #5

- The extension bit (bit 8) shall be set to '1'.
- Bits 6 and 7 shall indicate the layer one identifier, i. e. '01'
- Bits 1 through 5 shall indicate the layer one protocol.
- The allowed values are G.711 (A-law '00011' and μ-Law '00010') to indicate a voice-only call and H.221/H.242 ('00101') to indicate an H.323 videophone call.
  {Shall we go for a new code point for H.225.0 information? This seems too 'expensive' to me.}

Octets #5a, #5b, #5c, #5d shall not be present.

Layer 2 protocol identifier — octet #6

- Shall not be present.

Layer 3 protocol identifier — octet #7

- Shall not be present.

Call identity

The call identity is used to uniquely refer to a call throughout its lifetime. It is constructed by concatenating the transport addresses to be used for the H.245 connections of this call ***{If we do not want to keep the Q.931 channel open, we must not use the Q.931 address.}***. The first half of the call identity is the calling entity's transport address to be used for the H.245 connection, the second half is the called entities transport address to be used for the H.245 connection. During connection setup not all information is known to the calling entity; for those messages, it shall fill the called entities transport address with 00H octets.

{Do we need such LAN-wide unique reference for ongoing calls? It is currently not used.}

This information element is encoded according to Figure 4-12/Q.931 and Table 4-6/Q.931.

Length

- The length of the call identity *n* is determined by the protocol stack used on the LAN:

  $n = 2 * (\text{length (LAN address)} + \text{length (TSAP identifier)})$.

- For IPv4, *n* equals 12.

Call Identity (octets 3 - k)

- Encoded as depicted in figure 2/H.225.0:

Octet #3		3+n/2-1 3+n/2		3+n-1
Calling entity transport address			Called entity transport address	
LAN address	TSAP identifier		LAN address	TSAP identifier

Figure 2/H.225.0: allocation of octets for the call identity information element

Call state

- Shall not be used.

Called party number

This information element is encoded following Figure 4-14/Q.931 and Table 4-9/Q.931.

{How do we identify e-mail and other H.323-specific addresses?}

Octet #3 Extension (bit 8)

- Set to '1'.

Type of number (octet #3, bit 5-7)

- Encoded following the values and rules of Table 4-9/Q.931.

Numbering plan identification (octet #3, bit 1-4)

- Encoded following the values and rules of Table 4-9/Q.931.

Number "digits"

- Any number of IA5 characters, according to the formats specified in the appropriate numbering/dialling plan.

Called party subaddress

Shall not be used.

Calling party number

This information element is encoded following Figure 4-16/Q.931 and Table 4-11/Q.931.

{(How) Do we identify e-mail and other H.323-specific addresses?}

Octet #3 Extension (bit 8)

- Set to '1'.

Type of number (octet #3, bit 5-7)

- Encoded following the values and rules of Table 4-9/Q.931.

Numbering plan identification (octet #3, bit 1-4)

- Encoded following the values and rules of Table 4-9/Q.931.

Octet #3a

- Shall not be present.

Number "digits"

- Any number of IA5 characters, according to the formats specified in the appropriate numbering/dialling plan.

Calling party subaddress

Shall not be used.

Cause

TBD. ***{ Q.850 defines the use of this value on 26 pages; a closer look at this is required.}***

Channel identification

Shall not be used.

Congestion level

Shall not be used.

Date/time

Encoded following Figure 4-21/Q.931.

Display

Encoded following Figure 4-22/Q.931.

High layer compatibility ***{ Get rid of this? }***

This field is encoded following Figure 4-23/Q.931 and Table 4-15/Q.931.

The following restrictions apply:

Coding standard (octet #3, bit 6,7)

- ITU-T standardized coding ('00').

Interpretation (octet #3, bit 3-5)

- Shall be set to '100'.

Presentation method of protocol profile (octet #3, bit 1,2)

- Shall be set to '01'.

Extension (octet #4, bit 8)

- Shall be set to '1'.

High layer characteristics identification (octet #4, bit 1-7)

- Encoded following Table 4-15/Q.931, with the following values being permitted:
  - Telephony ('0000001')
  - Audiovisual ('1100000')

Octet #4a

- Shall not be present.

Keypad facility

Encoded following Figure 4-24/Q.931.

Low layer compatibility ***{Do we need this ?}***

Encoded following Figure 4-25/Q.931 and Table 4-16/Q.931.

The following restrictions apply:

Extension (octet 3, bit 8)

- Shall be set to '1'.

Coding standard (octet #3, bit 6,7)

- Shall indicate 'ITU-T' ('00')

Information transfer capability (octet #3, bit 1-5)

- Shall indicate 'unrestricted digital information' ('10001')

Extension bit (octet #4, bit 8)

- Shall be set to '0'.

Transfer mode (octet #4, bit 6,7)

- Shall indicate 'circuit mode' ('00').

Information transfer rate (octet #4, bit 1-5)

- Shall indicate 'multirate' with 64kbit/s base rate (i.e. '11000').

Rate multiplier (octet #4.1)

- Shall indicate the bandwidth to be used for a call in multiples of 64 kbit/s.

User information layer one protocol (octet #5)

- Bit 8 (extension) shall be set to '1'.
- Bits 6,7 shall indicate 'user information layer one protocol', i.e. '01'.
- Bits 1-5 may indicate one of the following: G.711 (A-law '00011' and μ-Law '00010') to indicate a voice-only call and H.221/H.242 ('00101') to indicate an H.323 videophone call.

User information layer two protocol— octet #6

- Shall not be present.

User information layer three protocol— octet #7

- Shall not be present.

More Data

Shall not be used.

Network-specific facilities

Shall not be used.

Notification indicator

Encoded following Figure 4-28/Q.931 and Table 4-19/Q.931.

Progress indicator (optional)

Encoded following Figure 4-29/Q.931 and Table 4-20/Q.931.

This information element is only required for interfacing an H.323 terminal to an ISDN- and ATM-based terminal where detailed call proceeding information is available. In this case, the gateway shall forward this information to the H.323 terminal. The H.323 end system need not interpret this information element.

If this information element is generated by an H.323 terminal, the following restrictions apply:

Coding standard (octet #3, bit 6,7)

- Shall indicate 'ITU-T' ('00').

Location

- Following Table 4-20/Q.931.
- The values 'user' ('0000'), 'private network serving the local user' ('0001'), and 'private network serving the remote user' ('0101') are permitted.

Progress description

- Following Table 4-20/Q.931.
- ***{Do we need new values here? Is this only relevant to the implementation of the gateway?}***

Repeat indicator

Shall not be used.

Restart indicator

Shall not be used.

Segmented message

Shall not be used (there is no critical upper limit on the message size in H.323).

Sending complete

Encoded following Figure 4-33/Q.931.

No restrictions apply.

Signal

Encoded following Figure 4-34/Q.931 and Table 4-24/Q.931.

No restrictions apply.

Transit network selection

Shall not be used.

User-user

Encoded following Figure 4-36/Q.931 and Table 4-26/Q.931.

The user-user information element is used by all H.323 entities to convey H.323-related information. Actual user-user information to be exchanged only between the involved terminals is nested in the H323-UserInformation PDU (to which no restrictions apply).

The following restrictions apply:

Protocol discriminator

- Shall indicate X.208/X.209 coded user information ('00000101')
  {This should now reference X.680, X.690, and X.691.}

User information

- Shall contain an ASN.1 structure (TDB) that — besides the H.323 relevant information — includes the actual user data e. g. as follows:

```
H323-UserInformation ::= SEQUENCE
{
        h323-pdu        H323-CallSetupInformation,
        user-data       SEQUENCE
                        {
                                protocol-discriminator  INTEGER (0..255),
                                user-information        OCTET STRING
                        }
}
```