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PRELIMINARY DRAFT FOR THE REVISION OF ISO/IEC 16512-2/PDAM 2

Source: UK National Body of SC 6.

Conventions used in this draft

References to UK comments and other source documents have been indicated in teal, e.g. *[GB 2]*. These are not expected to be included in the output document.

Changes to the original text have been indicated in red.

Table and figure numbers have been expressed in the following format: Figure 53 [50] where the number in black is the number in the source document and the number in blue is the expected number in the output document if all the UK comments are accepted. The table and figure numbers should be kept in this form with any modifications applied only to the figures in blue. The conversion to the final output numbers should only occur at the end of the editing process.

1) Clause 2. Normative references

Delete the following references [GB 2]:

– ITU-T Recommendation X.601 (2000), *Multi-peer communications framework.*
– ITU-T Recommendation X.605 (1998) | ISO/IEC 13252:1999, *Information technology – Enhanced communications transport service definition.*
– ITU-T Recommendation X.606 (2001) | ISO/IEC 14476-1:2002, *Information technology – Enhanced communications transport protocol: Specification of simplex multicast transport.*
– ITU-T Recommendation X.606.1 (2003) | ISO/IEC 14476-2:2003, *Information technology – Enhanced*

2) Sub-clause 2.2. Additional references

*Do **not** insert the following references [GB 3]*

– IETF RFC 1321 (1992), *The MD5 Message-Digest Algorithm*
– IETF RFC 2104 (1997), *HMAC: Keyed-Hashing for Message Authentication*

3) Clause 4. Abbreviations

Delete the following abbreviation [GB 4b]

‘AUTH Authentication’

4) Sub-clause 6.1.2

At the end of the first paragraph, delete the following [GB 4c]: ‘and authentication information’

5) Sub-clause 7.3. Messages

Replace 7.3 with the following text:

7.3 Messages

This sub-clause defines each message used in RMCP-2. RMCP-2 defines seven sets ~~*of request-and-reply* manner (sometimes called as *request-and-confirm* manner)~~ of request and answer messages and one heartbeat message. The message types and corresponding values for the messages are listed in Table 2.

7.3.1 SUBSREQ

The SUBSREQ message is used to subscribe to a RMCP-2 session. Issuing SUBSREQ message each MA can obtain bootstrapping information from the SM when it is acceptable. The message format is shown in Figure 40 [40].

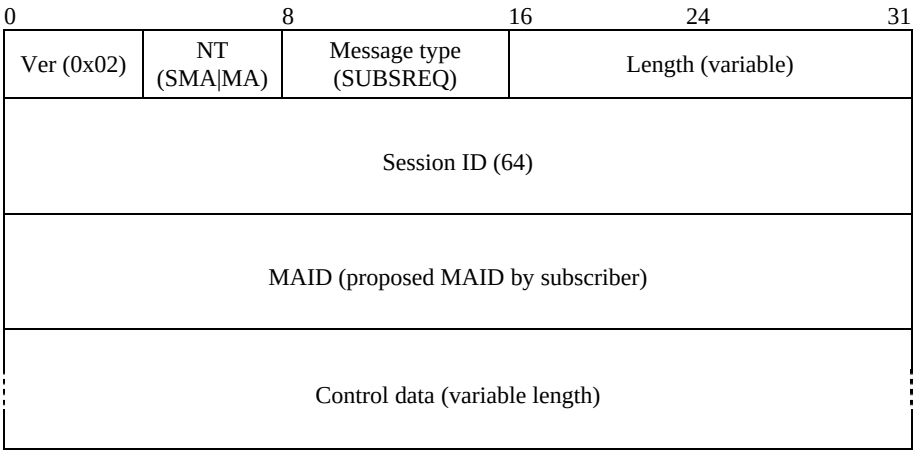


Figure 40 [40] – SUBSREQ message

The description of each field is as follows:

a) *Ver* – It represents the version of RMCP (0x02).

b) *NT* – It is the message issuer's node type (SMA|MA).

c) *Message type* – It represents the type of the message. The value is set to SUBSREQ for the message.

d) *Length* – It shows the total length of SUBSREQ message in bytes.

e) *Session ID* – It is a 64-bit value of RMCP Session ID.

f) *Proposed MAID* – It is the unique value for identifying the entity.

g) *Control data* – It contains a set of information required to subscribe to the RMCP-2 session. It may include the following information:

• SYSINFO

This control message tells the system power of MA, such as in/out bandwidth, controllable number of CMA.

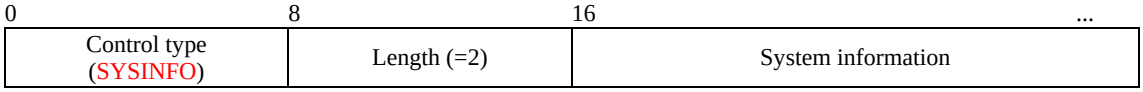


Figure 41 [41] – SYSINFO control

The ~~following~~ sub-controls ~~data~~ shown in Figures 42 [42] and 43 [43] are sub-controls data ~~which may~~ that follow the SYSINFO control data shown in Figure 41 [41].
Figure 42 shows a ~~sub-control data~~ SYSINFO control followed by an AVAILABLE_CMA sub-control. ~~SYSINFO control data~~. The description of each field is as follows:

a) *Sub-control type* – Available_CMA (one of SYS_INFO subtypes).

b) *Length* – It represents the length of control data value.

c) *Reserved* – It is reserved for further use.

d) *Value* – It contains the appropriate system information.

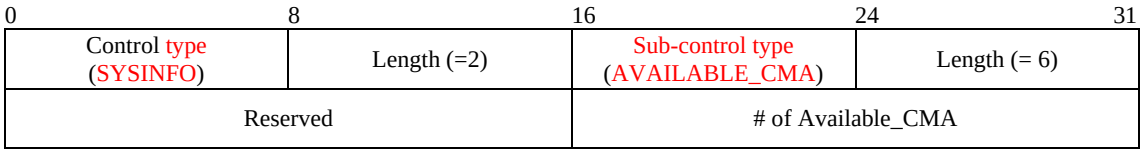


Figure 42 [42]– AVAILABLE_CMA sub-control

Figure 43 [43] shows a ~~sub-control data~~ SYSINFO control followed by a POSSIBLE_BW sub-control ~~SYSINFO control data.~~ The description of each field is as follows:

a) *Sub-control type* – Possible bandwidth (one of SYS_INFO subtypes).

b) *Length* – It represents the length of control data value.

c) *Value* – It represents the possible forwarding bandwidth which MA can afford.

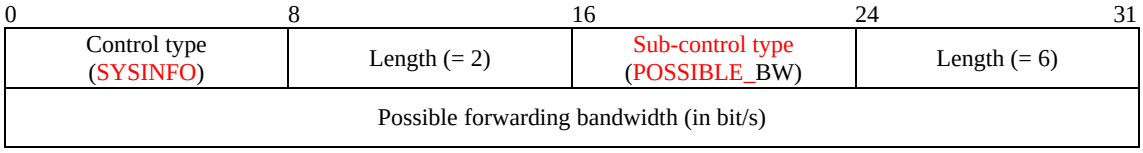


Figure 43 [43] – POSSIBLE_BW sub-control

Note that two bytes length control frame precedes each sub-control data.

- DATAPROFILE

DATAPROFILE control delivers controllable data profile of each MA. The purpose of this DATAPROFILE control is to make SM able to keep the classified neighbour list when the SM is aware of QoS.

Whenever MA does not include this control data within SUBSREQ message, the SM is not concerned about QoS management for the MA. The description of each field is as follows:

a) *Control type* – DATA_PROFILE.

b) *Length* – It represents the length of the data profile.

c) *Possible data profile* – It represents the data profile which MA wants to use.

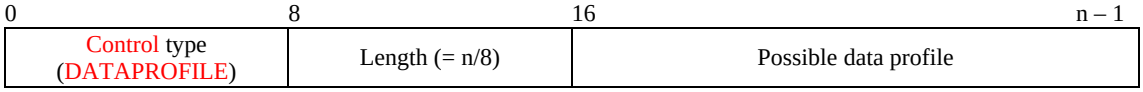


Figure 44 [44] – DATAPROFILE control

Because DATAPROFILE control consists of text-based variable message, the size may vary. To align 4-byte length, each data profile pads zero or more 1-byte zero padding as shown in Figure 45 [45]. The description of each field is as follows:

a) *Data profile* – The data profile describes the characteristics of data channel and it follows SDL-like encoding scheme.

b) *Zero or more zero padding* – To adjust the length of data profile, zero or more zero padding follows.

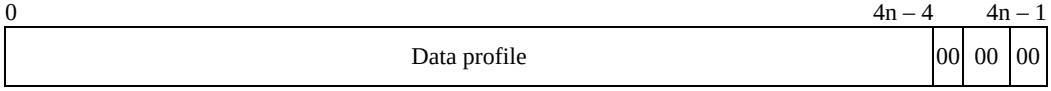


Figure 45 [45] – DATAPROFILE control and its padding

- ~~AUTH~~ [AUTH control deleted – see GB 4]

7.3.2 SUBSANS

The SUBSANS message is used by SM to give the results of subscription request and bootstrapping information for the session. The message format is shown in Figure 48 [46].

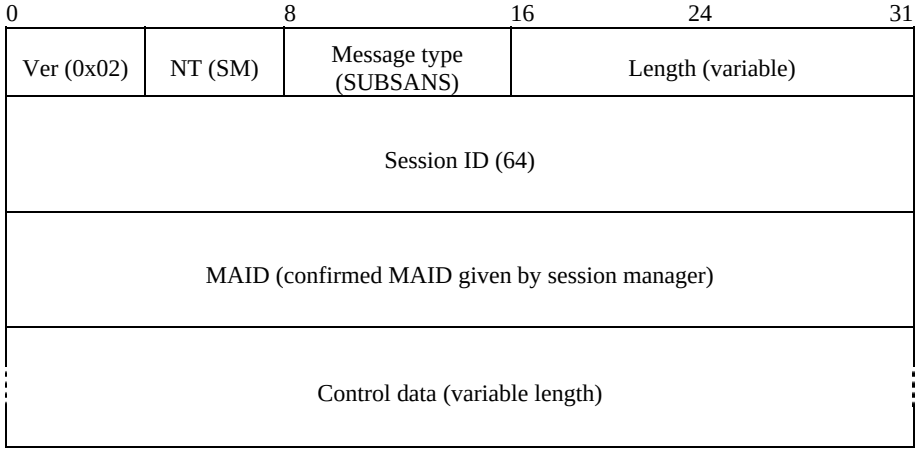


Figure 48 [46] – SUBSANS message

The description of each field is as follows:

a) *Ver* – It represents the version of RMCP (0x02).

b) *NT* – It is the message issuer's node type (SM).

c) *Message type* – It represents the type of the message. The value is set to SUBSANS for the message.

d) *Length* – It shows the total length of the SUBSANS message (in bytes).

e) *Session ID* – It is a 64-bit value of RMCP Session ID.

f) *Confirmed MAID* – It is the identification number of the MA. SM provides the confirmed ID as a result of the provided MAID suggested by MA in the SUBSREQ message.

g) *Control data* – It contains a set of information required to join a RMCP relayed multicast tree. It may include the following information:

- RESULT

This control ~~message~~ tells whether MA's subscription request is successful or not. If successful, it gives OK code within result code. If not, it gives appropriate error code such as resource exhaustion, destination unreachable. Figure 49 [47] shows the control message format of RESULT control. The following controls are used to deliver the necessary information to join RMCP-2 tree. When subscription is disallowed, the following control cannot be included. The description of each field is as follows:

a) *Control type* – RESULT.

b) *Length* – It represents the length of the result code.

c) *Result code* – It represents the result caused by the requestor and the detailed codes are listed in Table 3.

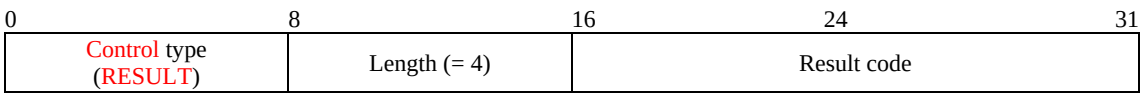


Figure 49 [47] – RESULT control

- DATAPROFILE

DATAPROFILE control is used by SM to confirm data profile back to the subscriber. DATAPROFILE control is meaningful when SM affords extra session data information to each subscriber. The format of DATAPROFILE control is shown in Figure 44 [44] and the content is in Figure 84 [86].

- NEIGHBORLIST

When a subscription is successful, SM gives ~~enough neighbour lists~~ sends a list of MAs back to the subscriber. The ~~meaning of~~ NEIGHBORLIST control ~~is that it can~~ may be used as bootstrapping information by each subscriber. Figure 50 [48] shows the format of NEIGHBORLISTcontrol. ~~note that it only delivers MAID~~. The description of each field is as follows:

a) *Control type* – denotes the NEIGHBORLIST control. Its value shall be set to 0x04 (see Table 2A [4]).

b) *Length* – shall be set to the length of the NEIGHBORLIST control

c) *Reserved* – is reserved for future use. Its value shall be set to 0x00.

d) # of NLs – shall be set to the number of subsequent MAIDs listed in the control.

e) MAID(s) – The list of MAIDs provided by the SM.

Figure 50 [48] – NEIGHBORLIST control

- [AUTH control deleted - see GB 4]

7.3.3 PPROBREQ

It is used to perform *Map discovery* procedure to discover actual network condition and to explore network neighbouring also. It is also used to check whether its counterpart is still alive. Figure 52 [49] illustrates the message format.

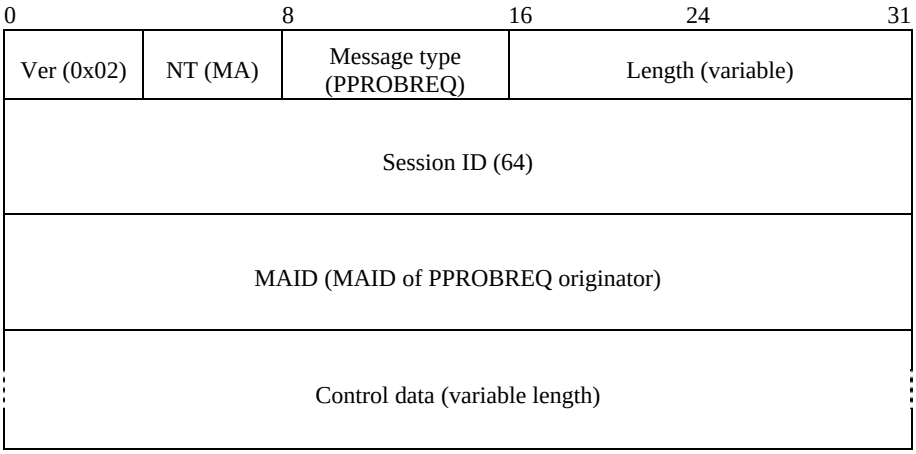


Figure 52 [49] – PPROBREQ message

The description of each field is as follows:

a) *Ver* – It represents the current version of RMCP (0x02).

b) *NT* – It is the message issuer's node type (MA).

c) *Message type* – It represents the type of the message. The value is set to PPROBREQ for the message.

d) *Length* – It shows the total length of the PPROBREQ message including control data (in bytes).

e) *Session ID* – It is a 64-bit value of the RMCP Session ID.

f) *MAID* – It is the MAID of the sender who sends the PPROBREQ message.

g) *Control data* – It may include the following information to inquire the map information:

- TIMESTAMP

Figure 53 [50] shows a TIMESTAMP control which is used to examine the distance between two MAs. The description of each field is as follows:

a) *Control type* – TIMESTAMP.

b) *Length* – It represents the total length of Timestamp option, the actual size is 16 (in bytes).

c) *Reserved* – It is reserved for further use.

d) *Time 1* – It is the time when the sender of PPROBREQ sends the packet to its counterpart.

e) *Time 2* – It is the time when the PPROBREQ appears to the counterpart.

f) *Time 3* – It is the time when the receiver of PPROBREQ sends the timestamp option as a reply.

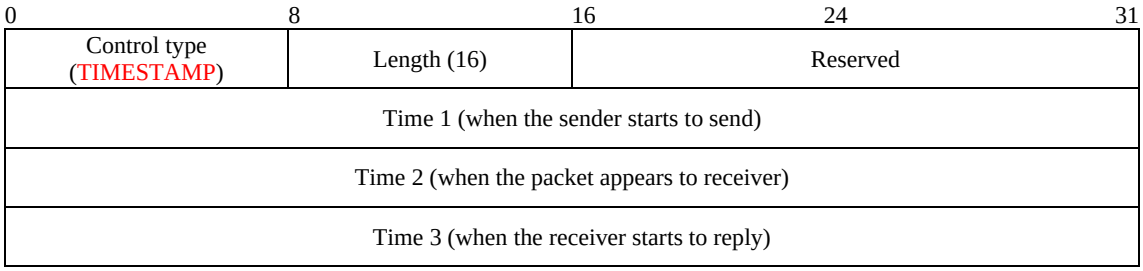


Figure 53 [50] – TIMESTAMP control

- NEIGHBORLIST

To explore RMCP-2 participants, each MA may exchange information about their neighbour by using NEIGHBORLIST control. The control format and usage are shown in Figures 50 [48] ~~and 51~~.

- ROOTPATH

To prevent loop and solve triangular problem, probing MA may include its *from_root path* by using the ROOTPATH control which is shown in Figure 54 [51]. The description of each field is as follows:

a) *Control type* – ROOTPATH.

b) *Length* – It represents the length of ROOTPATH option, the size is 2.

c) *Rootpath information* – This field includes rootpath information; the format and usage are as follows:

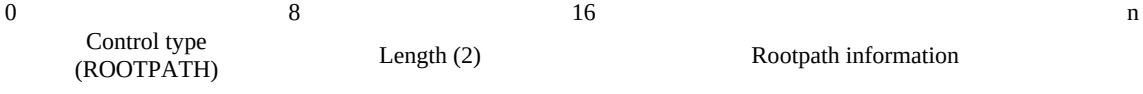


Figure 54 [51] – ROOTPATH control

Figure 55 [52] shows the general format of the ROOTPATH sub-controls. RP_XXX stands for one of the appropriate ROOTPATH types from the first six ROOTPATH types listed in Table 4 (see note). These ROOTPATH types represent different combinations of fields for MAIDs, bandwidth and delay. If the ROOTPATH type indicates that any of the MAIDs, bandwidth or delay fields are not needed, these fields shall not be present in the ROOTPATH control. The length of the rootpath element, in bytes, for each of the ROOTPATH types is indicated in Table 4.

NOTE – RP_PSEUDO is a special ROOTPATH type used to indicate a pseudo HB message used in network partitioning, detection and recovery (see 6.2.5.3.b and 7.3.16) and applies only the RP_COMMAND for the HB message.

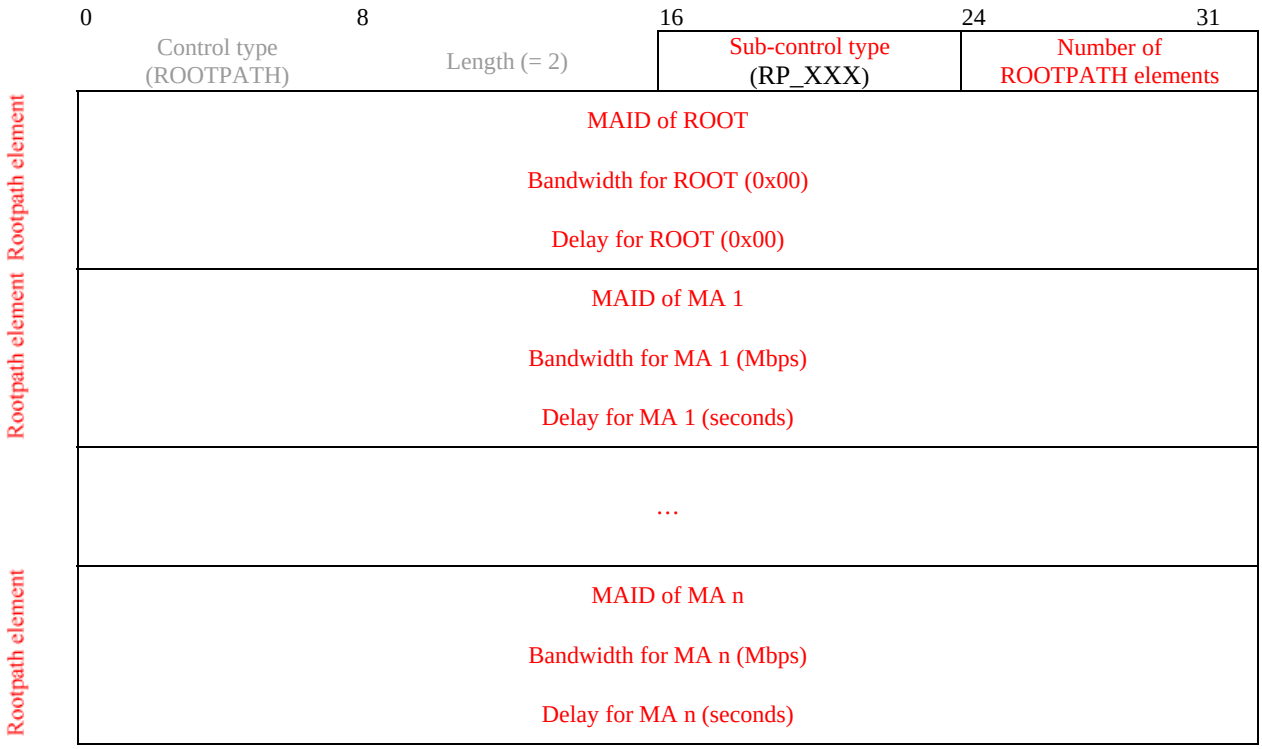


Figure 55 [52] – General format for ROOTPATH sub-controls. RP_XXX stands for one of the first six ROOTPATH types listed in Table 4.

The description of each field of the RP_XXX sub-controls is as follows:

- RP_XXX

  a) *Sub-control type* – denotes the RP_XXX sub-control. Its value shall be set to one of the first six code values in Table 4.
  b) *Number of ROOTPATH nodes* – shall be set to the number of ROOTPATH elements in the RP_XXX message.
  c) *MAID* – for each element in the ROOTPATH, listed in order from the ROOT, this field if present shall be set to that of the MAID corresponding to that element.
  d) *Bandwidth* – for each element in the ROOTPATH, listed in order from the ROOT, this field if present shall be set to the bandwidth, in Mbps, between the MA and its parent, as perceived by the MA. In the case of the ROOT element the value for the bandwidth shall be set to 0x00.
  e) *Delay* – for each element in the ROOTPATH, listed in order from the ROOT, this field if present shall be set to the delay in seconds from the ROOT as perceived by the MA. In the case of the ROOT element the value for the bandwidth shall be set to 0x00.

  NOTE – The values for the perceived bandwidth and delay for the ROOT node are set to 0x00 as the ROOTPATH is assumed to start at the ROOT.

- SYSTEMINFO

To prevent only-leaf node or slow node may be positioned high within the tree hierarchy; it includes system information such as in-and-out bandwidth, affordable number of CMA, etc.
Figure 41 [41] shows SYSTEMINFO control format.

- DATAPROFILE

DATAPROFILE control is used to verify whether the probed MA can afford the data delivery scheme which the probing MA wants to receive. Figure 44 [44] shows the DATAPROFILE control format and Figure 84 [86] shows its contents.

7.3.4 PPROBANS

It is an answer to the PPROBREQ message for performing the *map discovery* procedure and confirming if it is alive. It may contain actual network condition, and a series of its Neighbour information. Figure 56 [53] illustrates the format of the PPROBANS message.

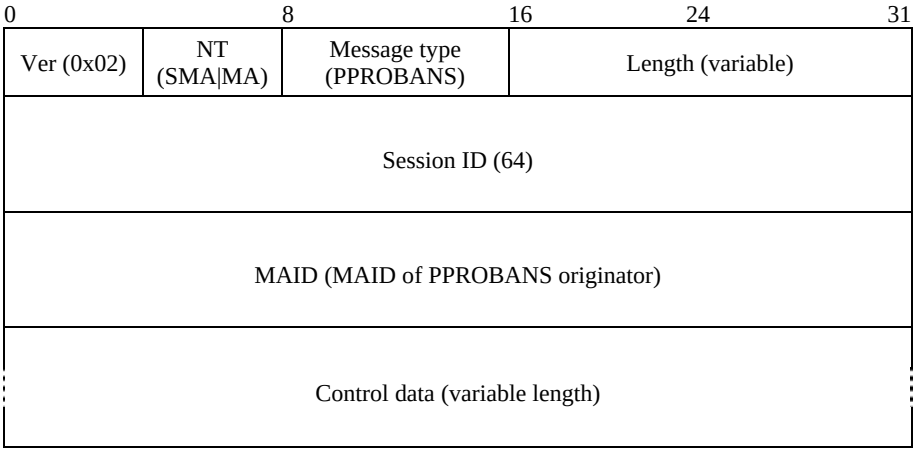


Figure 56 [53] – PPROBANS message

The description of each field is as follows:

a) *Ver* – It represents the current version of RMCP (0x02).

b) *NT* – It is the message issuer's node type (SMA or MA).

c) *Message type* – It represents the type of the message. The value is set to PPROBANS for the message.

d) *Length* – It shows the total length of PPROBANS message including control data (in bytes).

e) *Session ID* – It is a 64-bit value of the RMCP Session ID.

f) *MAID* – It is the MAID of the PPROBANS message sender.

g) *Control data* – It should include information appropriate to the PPROBREQ. Control data field of this message may include the following information:

- TIMESTAMP

This control is used to examine the distance between two MAs during the sequence of parent probing ~~pprobing~~. Figure 53 [50] shows the format of TIMESTAMP control data.

- NEIGHBORLIST

This NEIGHBORLIST control is designed to explore RMCP-2 participants. Each MA may gather information of its neighbour by using NEIGHBORLIST control as shown in Figures 50 [48] ~~and 51~~

- ROOTPATH

This ROOTPATH control is used by each MA to prevent loop and solve triangular problem. The probing MA may include its information of *from_root path* by using ROOTPATH control. Figures 54 [51] and 55 [52] show the control format of ROOTPATH and its sub-control format.

- SYSTEMINFO

To prevent only-leaf node or slow node may be located in the high position within the tree hierarchy. PPROBANS message may include system information such as in-and-out bandwidth, affordable number of CMA, etc., by using SYSTEMINFO control. Figure 41[41] shows the SYSTEMINFO control format.

- DATAPROFILE

DATAPROFILE control is used to verify whether the probed MA can afford data which the probing MA wants to use during data delivery. Figure 44 [44] shows the DATAPROFILE control format and Figure 84 [86] shows its contents.

7.3.5 HSOLICIT

HSOLICIT is used to process self-organizing in a local network. The purpose of this is to find the HMA inside a local network. Figure 57 [54] illustrates the message format of HSOLICIT.

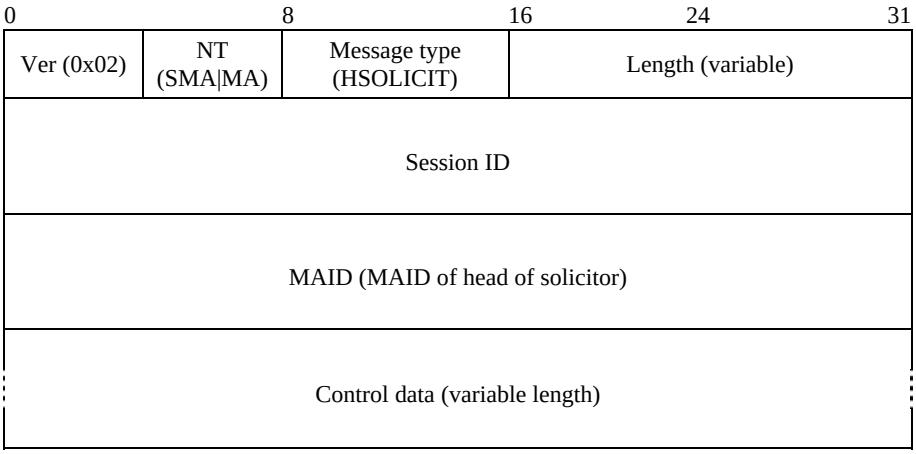


Figure 57 [54] – HSOLICIT message

The description of each field is as follows:

a) *Ver* – It represents the current version of RMCP (0x02).

b) *NT* – It is the message issuer's node type (SMA or MA).

c) *Message type* – It represents the type of the message. The value is set to HSOLICIT for the message.

d) *Length* – It shows the total length of HSOLICIT message including control data (in bytes).

e) *Session ID* – It is a 64-bit value of the RMCP Session ID.

f) *MAID* – It is the MAID of the node who sends this HSOLICIT to the local network.

g) *Control data* – It may include information of its neighbour list. Control data field of this message may include the following information:

- [AUTH control deleted – see GB 4]

7.3.6 HANNOUNCE

As a reply of HSOLICIT, it is used to announce the HMA's existence in a local network. Figure 58 [55] shows the format of this message.

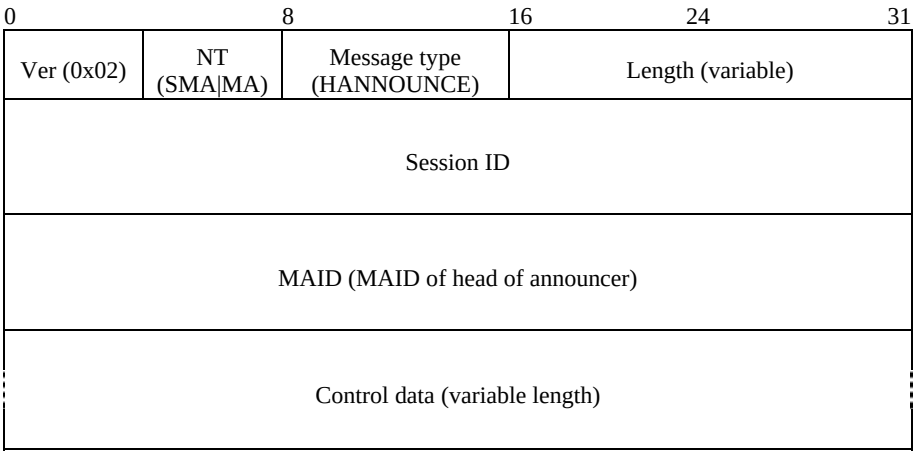


Figure 58 [55] – HANNOUNCE message

The description of each field is as follows:

a) *Ver* – It represents the current version of RMCP (0x02).

b) *NT* – It is the message issuer's node type (SMA or MA).

c) *Message type* – It represents the type of the message. The value is set to HANNOUNCE for the message.

d) *Length* – It shows the total length of HANNOUNCE message including control data (in bytes).

e) *Session ID* – It is a 64-bit value of the RMCP Session ID.

f) *MAID* – It is the MAID of the HMA in the local network.

g) *Control data* – It may include the following information:

- [AUTH control deleted – see GB 4]
- SYSINFO *[see GB 7]*

To inform the non-HMAs in the same multicast area with the system power of HMA, HMA may include system power of MA, such as in-and-out bandwidth, controllable number of CMA. Also HMA may include additional information such as Local IP and HMA lifetime to recover from HANNOUNCE collision.
Figure 59 [56] shows a sub-control message for Local-IP which follows SYSINFO control. The description of each sub-control field is as follows:

a) *Sub-control type* – It describes the sub-control data that contains local IP address.

b) *Length* – It defines the size of the sub-control data and the value will be six.

c) *Local IP* – It represents the IP address of local host.

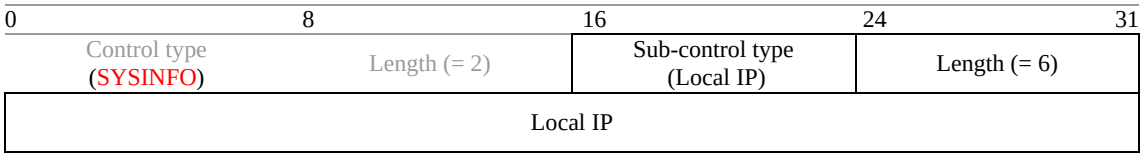


Figure 59 [56] – Local IP sub-control

The HMA_UPTIME ~~lifetime~~ control ~~data~~ is shown in Figure 60 [57]. The description of each sub-control field is as follows:

a) *Sub-control type* – It describes the type of sub-control data.

b) *Length* – It defines the size of the sub-control data and the value will be 6.

c) *Uptime* – It represents the time elapsed in seconds after the HMA first issues an HANNOUNCE message.

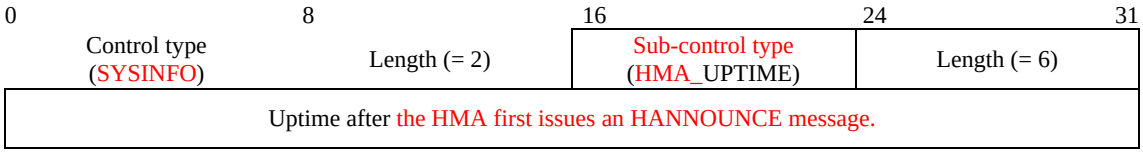


Figure 60 [57] – HMA_UPTIME sub-control

• NEIGHBORLIST

To share explored information by HMA with non-HMA in the same multicast-enabled area, HMA may include neighbour list as shown in Figure 50 [48] ~~and 51~~

7.3.7 HLEAVE

It is used to announce the HMA's leaving from RMCP-2 session to its local network. Figure 61 [58] illustrates the format of this message.

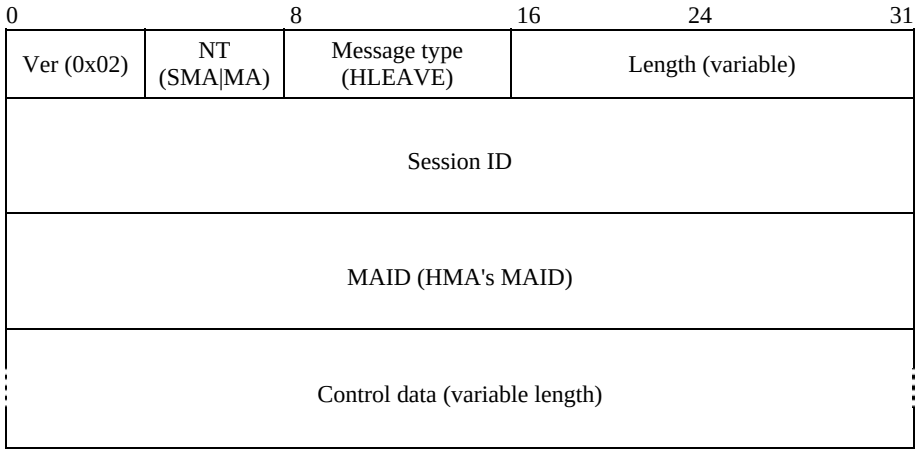


Figure 61 [58] – HLEAVE message

The description of each field is as follows:

a) *Ver* – It represents the current version of RMCP (0x02).

b) *NT* – It is the message issuer's node type (SMA or MA).

c) *Message type* – It represents the type of the message. The value is set to HLEAVE for the message.

d) *Length* – It shows the total length of the HLEAVE message including control data (in bytes).

e) *Session ID* – It is a 64-bit value of the RMCP Session ID.

f) *MAID* – It is the HMA's MAID in the local network.

g) *Control data* – It may include the following information:

• CANDIDATEHMA

When an HMA leaves a session, every non-HMA in the multicast-enabled area may compete to become an HMA. This may drive the multicast-enabled area be filled with HANNOUNCE message. To prevent HMA selection collision, HMA may use CANDIDATEHMA control which is shown in Figure 62 [59]. The description of each field is as follows:

a) *Control type* – denotes the CANDIDATEHMA control type. Its value shall be set to 0x0A

b) *Length* – shall be set to the length in bytes of the CANDIDATE HMA control.

c) *Reserved* – is reserved for future use. Its value shall be set to 0x00.

d) *Number of MAIDs* – shall be set to the number of subsequent MAIDs listed in the control.

e) *MAID(s)* – shall contain the list of MAIDs of candidate HMAs provided by the leaving HMA.

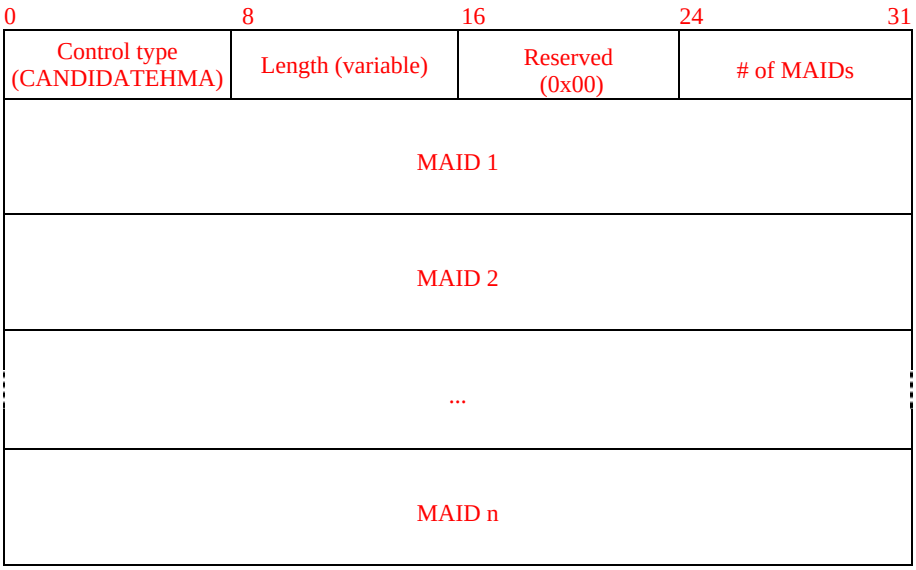


Figure 62 [59] –CANDIDATEHMA control

- NEIGHBORLIST

To share explored information by HMA with non-HMA in the same multicast-enabled area, HMA may include NEIGHBORLIST control as shown in Figure 50 [48] ~~and 51~~

- ROOTPATH

The leaving HMA may include its *from_root path* by using ROOTPATH control so that newly selected HMA can follow the same root path. The control data type is shown in Figures 54 [51] and 55 [52].

- [AUTH control deleted – see GB 4]

- REASON

The reason for HMA's leaving may vary according to the situation. For example, HMA may leave the session either of its own will or because the session has terminated. In the latter case, every non-HMA in the multicast-enabled area should leave the session promptly.
To give the reason why HMA leaves a session, HLEAVE message must include REASON control as shown in Figure 64 [60]. The description of each field is as follows:

a) *Control type* – This field represents the type of control.

b) *Length* – It represents the length of the control data and the size is 4.

c) *Reason code* – This 2-byte length field contains an integer value to indicate the specific reason for the leaving. The codes and their meaning are listed in Table 7.

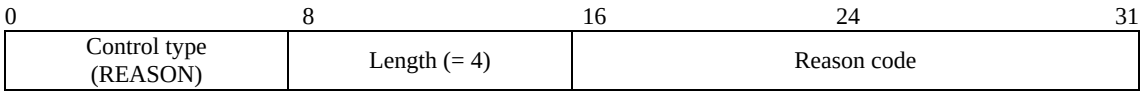


Figure 64 [60] – REASON control

7.3.8 RELREQ

This message is used by the CMA to request to the PMA of data forwarding. It usually includes a data profile which can be negotiated through the message exchanges of RELREQ and RELANS. Figure 65 [61] depicts the format of this message.

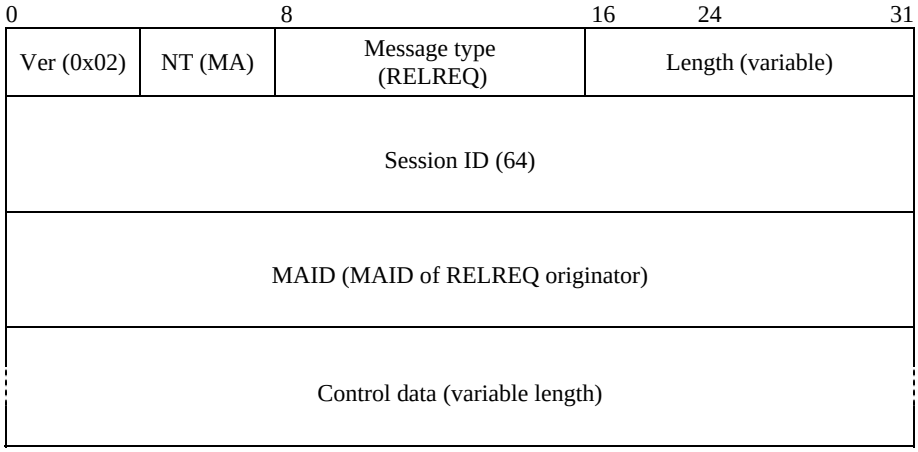


Figure 65 [61] – RELREQ message

The description of each field is as follows:

a) *Ver* – It represents the current version of RMCP (0x02).

b) *NT* – It is the message issuer's node type (MA).

c) *Message type* – It represents the type of the message. The value is set to RELREQ for the message.

d) *Length* – It shows the total length of the RELREQ message including control data (in bytes).

e) *Session ID* – It is a 64-bit value of the RMCP Session ID.

f) *MAID* – It is the MAID of the node who sends the RELREQ message.

g) *Control data* – It may include one or more requests related to the relay request. The controls used with this message are:

• RP_COMMAND

When CMA needs some information from PMA, it can ask PMA by using RP_COMMAND control within RELREQ message.
For example, whenever a MA connects to PMA during joining or parent switching procedure, the MA needs information *from_root path* of its new PMA for network diagnosis and loop detection. In this case, the MA uses then COMMAND control for ROOTPATH of newly attached PMA.
Figure 66 [62] shows the RP_COMMAND control format. The description of each field is as follows:

a) *Control type* – This field represents the type of control.

b) *Length* – It represents the length of the control data and the size is 4.

c) *Command code* – This 2-byte length field contains an integer value to indicate the specific reason for the leaving. The encoded value and their meaning are indicated in ~~8.3~~ Table 4.

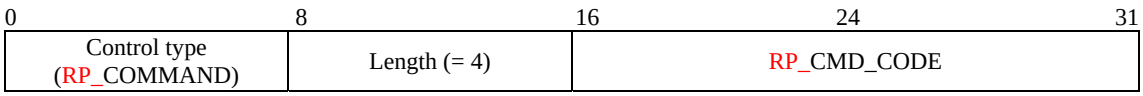


Figure 66 [62] – RP_COMMAND control

• DATAPROFILE

Whenever CMA connects to PMA, both MAs should agree on a data delivery scheme. To make it feasible, each CMA uses DATAPROFILE control to negotiate with its PMA. Figures 44 and 45 show DATAPROFILE control format and Figure 84 [86] shows its contents.

• TIMESTAMP

Each CMA should measure hop-by-hop delay between PMA and itself. For this purpose, CMA includes TIMESTAMP control as shown in Figure 53 [51] within RELREQ message.

7.3.9 RELANS

As a reply of RELREQ, RELANS is issued by the PMA to the CMA. The purpose of this message is to notify whether the relay request is allowed. It may also contain additional information which is necessary to negotiate the data channel between the PMA and itself. The message format of RELANS is shown in Figure 67 [63].

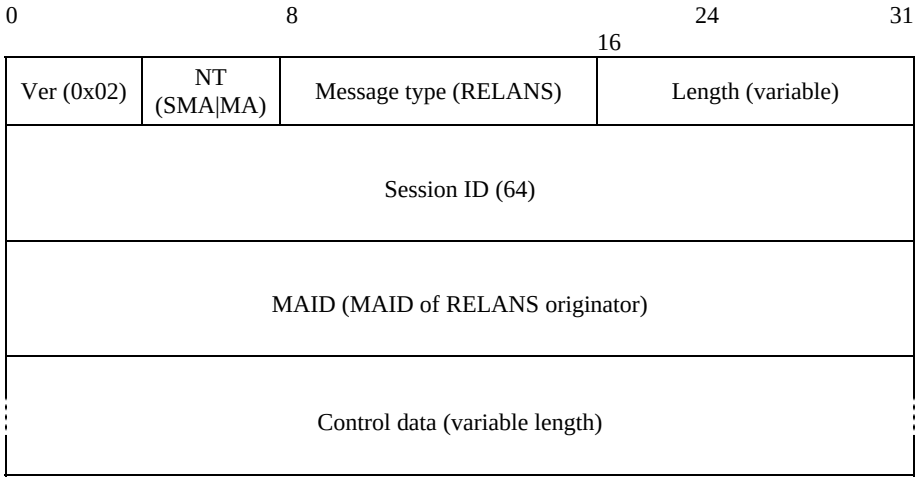


Figure 67 [63] – RELANS message

The description of each field is as follows:

a) *Ver* – It represents the current version of RMCP (0x02).

b) *NT* – It is the message issuer's node type, because this message can be issued by the SMA and the MA, the node type for the message can be the SMA or the MA.

c) *Message type* – It represents the type of the message. The value is set to RELANS for the message.

d) *Length* – It shows the total length of the RELANS message including control data (in bytes).

e) *Session ID* – It is a 64-bit value of the RMCP Session ID.

f) *MAID* – It is the MAID of the node who sends RELANS message.

g) *Control data* – It may include one or more of the following controls:

- RESULT

To tell whether CMA's RELREQ is successful, PMA uses RESULT control inside every RELANS message. If the relay request is successful, it gives OK as a result code of RESULT control. If not, it gives an appropriate error code, such as relay denial because of policy or resource exhaustion. Figure 49 [47] shows the RESULT control format.

- DATAPROFILE

Whenever CMA connects to PMA, it sends RELREQ message with DATAPROFILE control to negotiate data delivery scheme. Figures 44 [44] and 45 [45] show DATAPROFILE control format and Figure 84 [86] shows its contents.

- TIMESTAMP

Figure 53 [50] shows a TIMESTAMP control. TIMESTAMP control is used to examine the distance between two MAs.

- ROOTPATH

Whenever CMA asks *from_root path* with COMMAND control, PMA answer its CMA with its ROOTPATH information. Figures 54 [51] and 55 [52] show ROOTPATH control.

7.3.10 STREQ

STREQ is used for monitoring the status of MAs in the session. Figure 68 [64] shows the format of this message.

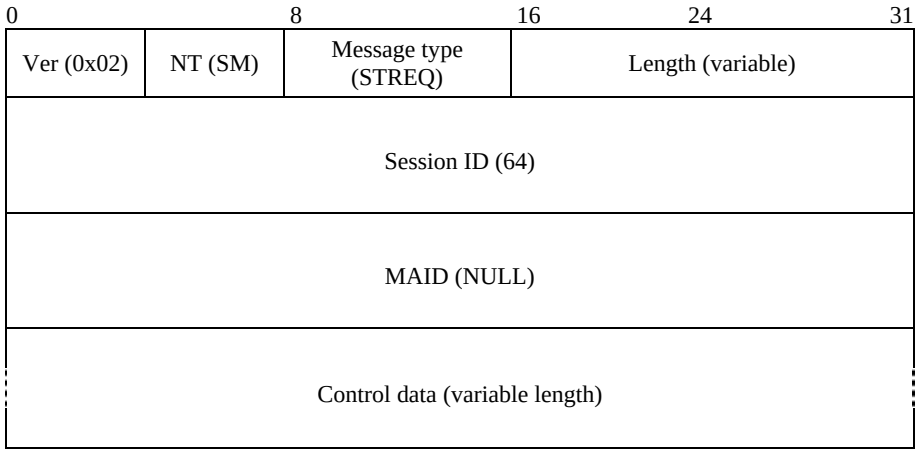


Figure 68 [64] – STREQ message

The description of each field is as follows:

a) *Ver* – It represents the current version of RMCP (0x02).

b) *NT* – It is the message issuer's node type. Because this message can be issued only by the SM, the node type for the message is only the SM.

c) *Message type* – It represents the type of the message. It is set to STREQ for the message.

d) *Length* – It shows the total length of STREQ message including control data (in bytes).

e) *Session ID* – It is a 64-bit value of the RMCP Session ID.

f) *MAID* – Because SM does not have a MAID, this field should be set to zero.

g) *Control data* – It may include one or more requests on the status report. The controls to be considered are:

- SI_COMMAND

STREQ message should include the SI_COMMAND control shown in Figure 68A [65] to express what status report it requires. To get MA's status, SM uses SI_COMMAND control within STREQ message. Table 6 summarizes considerable commands for status monitoring and its expected reports.
Figure 68A [65] shows the format of the SI_COMMAND control. The description of each field is as follows:

a) *Control type* – This field represents the type of control.

b) *Length* – It represents the length of the control data and the size is 4.

c) *Command code* – This 2-byte length field contains an integer value to indicate the combination of sub-control types required in the status report. ~~specific reason for the leaving. The encoded value and their meaning are indicated in 8.3~~. The SI_CMD_CODE value is obtained by adding together the command codes in Table 6A [8] for the individual sub-controls that are required.

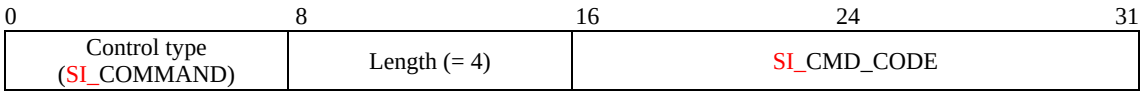


Figure 68A [65] – SI_COMMAND control

- TREEEXPLOR

Inspecting whole tree status can cause hazards because of report implosion. So it is very important to limit the scope of tree to be inspected. Figure 69 [66] shows TREEEXPLOR control which is used to limit the scope of tree. The fields of TREEEXPLOR control are as follows:

a) *Control type* – This field represents the control type which is TreeExplor.

b) *Length* – It represents the length of the TreeExplor option; the size should be 4.

c) *Reserved* – This field is reserved for further use.

d) *TREE_DEPTH* – It is an 8-bit integer value to specify the scope.

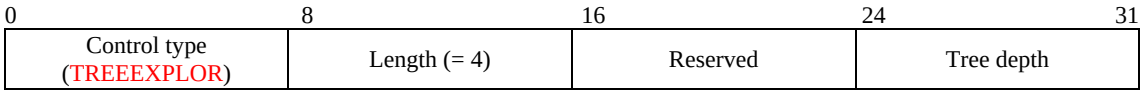


Figure 69 [66] – TREEEXPLOR control

7.3.11 STANS

This message is used for monitoring the status of MAs in the session. Figure 70 [67] shows the format of STANS message.

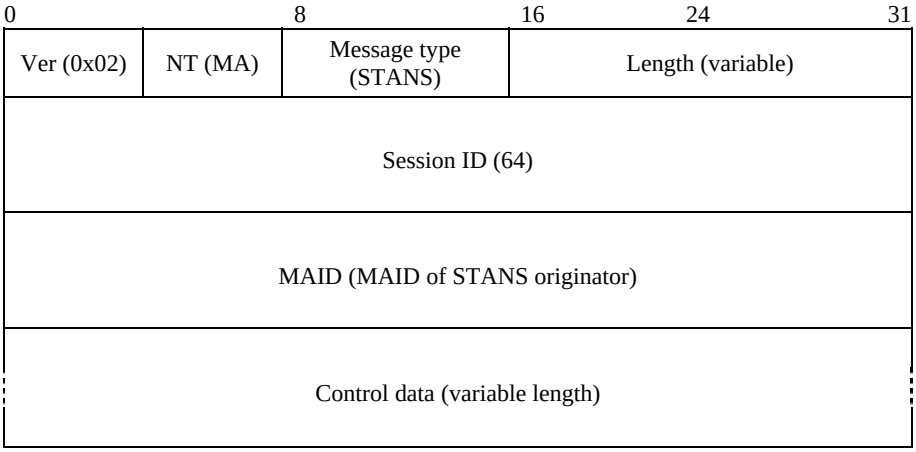


Figure 70 [67] – STANS message

The description of each field is as follows:

a) *Ver* – It represents the current version of RMCP (0x02)

b) *NT* – It is the message issuer's node type, because this message can be issued only by the MA, the node type for the message is set to the MA.

c) *Message type* – It represents the type of the message. It is set to STANS for the message.

d) *Length* – It shows the total length of STANS message including control data (in bytes).

e) *Session ID* – It is a 64-bit value of the RMCP Session ID.

f) *MAID* – It is the MAID of the STANS issuer.

g) *Control data* – It should include one or more answers for the status report request. Control data field of STANS message may include the following information:

- REPORT

According to SM's request, the MA should answer with an appropriate report. The message format of each report has {control type, control subtype} form.
According to SM's request, listed in Table 6, each MA sends the appropriate report back to SM. Figures 71 [68] to 76 octies [78] show the corresponding reports.

Figure 71 [68] shows the report format of the SI_ROOM_CMA sub-control. The description of each field is as follows:

a) *Sub-control type* – ~~It defines which kind of HMA list will be used. In this example, the list of MAID is used as a candidate HMA list~~. denotes the SI_ROOM_CMA sub-control. Its value shall be set to 0x14 (see Table 6)

b) *Length* – ~~It represents the number of list~~. denotes the length of the SI_ROOM_CMA sub-control. Its value shall be set to 0x06.

c) *Number of CMAs allocated* – shall be set to number of CMA places that have been allocated by the MA. ~~It tells the room for the CMAs~~.

d) *Number of CMAs reserved* – shall be set to the total number of CMA places that the MA is able to support. ~~It tells the room reserved by CMA~~.

NOTE – The available number of CMAs will be the difference between the number of CMAs reserved and the number of CMAs allocated.

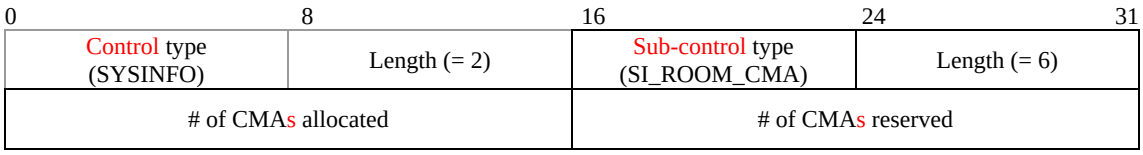


Figure 71 [68] – SI_ROOM_CMA sub-control *[see N13917]*

[SI_PROV_QOS proposed for deletion in GB 10]

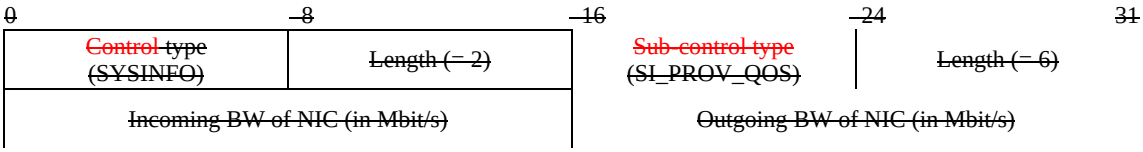
~~Figure 72 shows the report on the QoS value which can be provided by a system. The description of each field is as follows:~~

~~a) *Sub-control type* – It defines the type of sub-control to be used.~~

~~b) *Length* – It represents the size of the sub-control.~~

~~c) *Incoming BW of NIC* – It represents the maximum incoming bandwidth of network interface card (in Mbit/s).~~

~~d) *Outgoing BW of NIC* – It represents the maximum outgoing bandwidth of network interface card (in Mbit/s).~~



~~Figure 72 – SI_PROV_QOS sub-control~~

Figure 73 [69] shows the report on the ~~system uptime~~ SI_UPTIME sub-control after the MA joins the session. The description of each field is as follows *[GB 12]* Previously named SI_PERSIST_TIME*:*

a) *Sub-control type* – It defines the type of sub-control to be used.

b) *Length* – It represents the size of the sub-control.

c) *Uptime after MA joins session* – It indicates the time elapsed since the MA has joined the session in seconds.

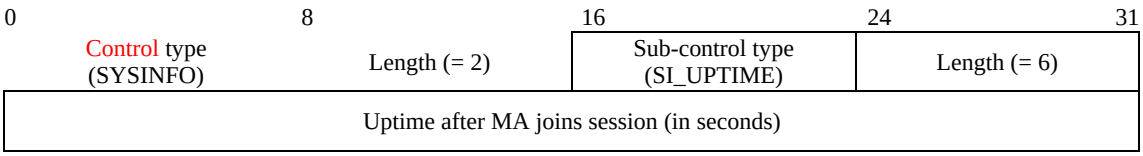


Figure 73 [69] – SI_UPTIME sub-control

[SI_PROV_QOS proposed for deletion in GB 10]

~~Figure 74 shows the report on the QoS perceived by each MA. The description of each field is as follows:~~

~~a) *Sub-control type* – It defines the type of sub-control to be used.~~

~~b) *Length* – It represents the size of the sub-control and the size should be 22.~~

~~c) *Number of PMA* – It is the number of PMA attached directly.~~

~~d) *Number of CMA* – It is the number of CMAs attached directly.~~

c) *Total incoming bytes* – It is the total bytes of incoming data.

f) *Number of incoming packet* – It is the total number of incoming packets.

g) *Total outgoing bytes* – It is the total bytes of outgoing data.

h) *Number of outgoing packet* – It is the total number of outgoing packets.

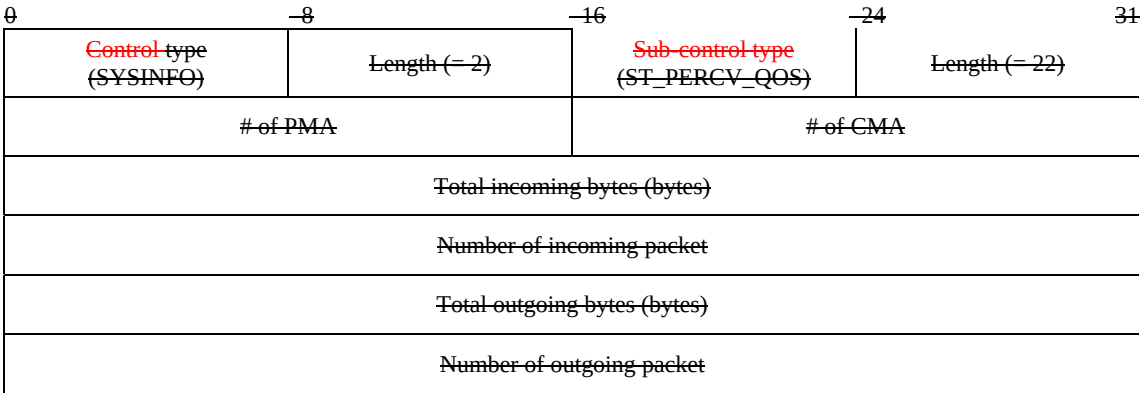


Figure 74 – ST_PERCV_QOS sub-control

Figure 75 [70] shows the report on the status of TREE. The description of each field is as follows:

a) *Sub-control type* – It defines the type of sub-control to be used.

b) *Number of MAIDs* – It is a list of MAIDs of candidate HMA and which is provided by the leaving HMA.

c) *MAID of PMA* – It is a MAID of PMA attached directly.

d) *MAID of CMA* – It is a MAID list of CMAs attached directly.

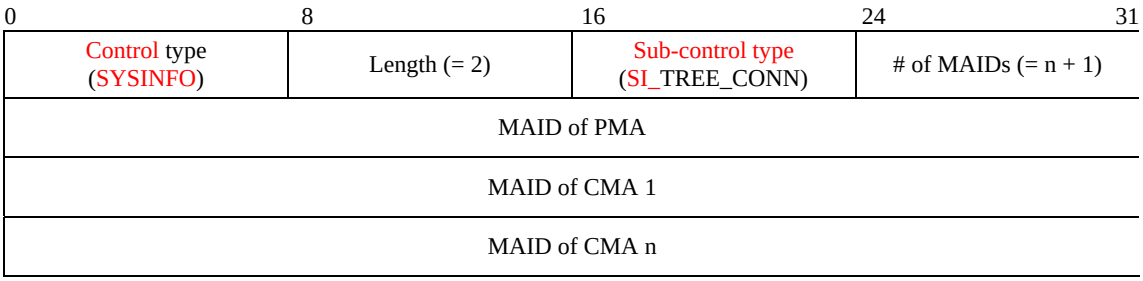


Figure 75 [70] – SI_TREE_CONN sub-control *[see GB 13 and N 13917]*

Figure 76 [71] shows the report on the members of the TREE. The description of each field is as follows:

a) *Sub-control type* – It defines the type of sub-control to be used.

b) *Number of MAIDs* – It is a list of MAIDs listed in the control.

c) *MAIDs* – It is a MAID list for a specific branch; for example, the top node of the specific branch will be presented in the field MAID 1, the bottom node will be presented in the field MAID n.

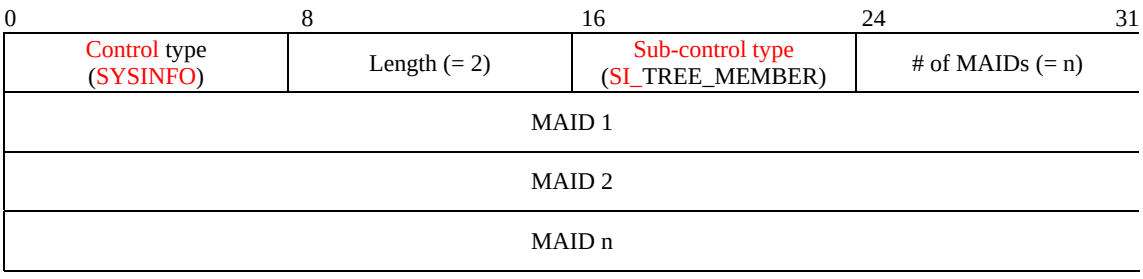


Figure 76 [71] – SI_TREE_MEMBER sub-control *[see GB 13 and N 13917]*

NOTE – Every report is preceded by a 2-byte long appropriate control.

Figure 76 bis [72] shows the format of the SI_DELAY sub-control. The description of each field of the SI_DELAY sub-control is as follows *[see GB 8 and N 13917]*:

- SI_DELAY

a) *Sub-control type* – denotes the SI_DELAY sub-control. Its value shall be set to 0x13 (see Table 6).
b) *Length* – denotes the length of the SI_DELAY sub-control. Its value shall be set to 0x06.
c) *Bandwidth* – shall be set to the delay in seconds from the ROOT, as perceived by the MA
d) *Delay* – is reserved for future use. Its value shall be set to 0x00.

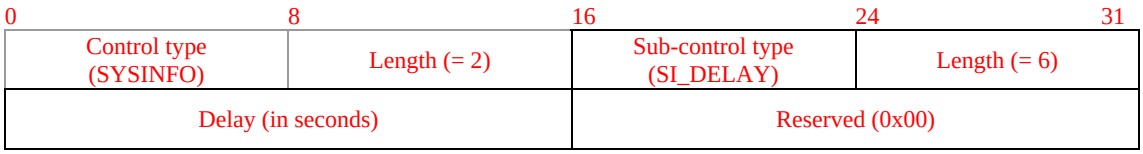


Figure 76 bis [72] – SI_DELAY sub-control

Figure 76 ter [73] shows the format of the SI_SND_BW sub-control. The description of each field of the SI_SND_BW sub-control is as follows *[see GB 9 and N 13917]*:

- SI_SND_BW

a) *Sub-control type* – denotes the SI_SND_BW sub-control. Its value shall be set to 0x35 (see Table 6).
b) *Length* – denotes the length of the SI_SND_BW sub-control. Its value shall be set to 0x06
c) *Bandwidth* – shall be set to the total bandwidth in Mbps consumed by the MA to serve its CMAs
d) *Reserved* – is reserved for future use. Its value shall be set to 0x00.

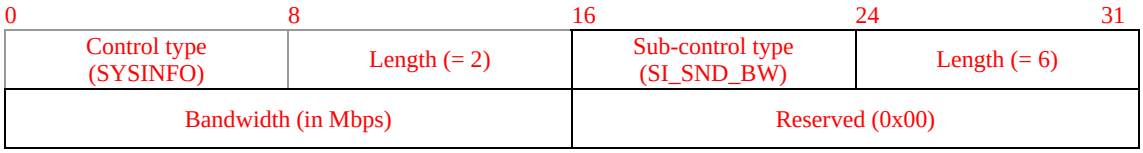


Figure 76 ter [73] – SI_SND_BW sub-control

Figure 76 quater [74] shows the format of the SI_SND_BW sub-control. The description of each field of the SI_SND_BW sub-control is as follows *[see GB 11 and N 13917]*:

- SI_SND_PACKET

a) *Sub-control type* – denotes the SI_SND_PACKET sub-control. Its value shall be set to 0x36 (see Table 6).
b) *Length* – denotes the length of the SI_SND_PACKET sub-control. Its value shall be set to 0x06.
c) *Number of packets* – shall be set to the total number of packets sent by the MA from startup.
d) *Reserved* – is reserved for future use. Its value shall be set to 0x00.

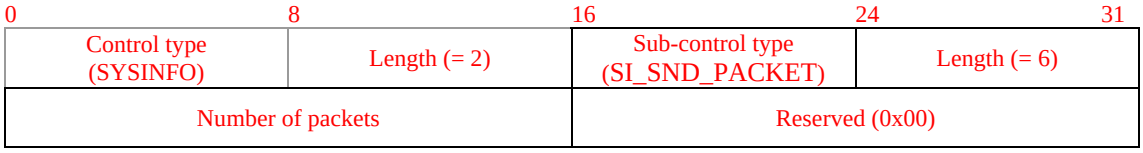


Figure 76 quarter [74] – SI_SND_PACKET sub-control

Figure 76 quinquies [75] shows the format of the SI_SND_BW sub-control. The description of each field of the SI_SND_BYTES sub-control is as follows *[see GB 11 and N 13917]*:

- SI_SND_BYTES

a) *Sub-control type* – denotes the SI_SND_BYTES sub-control. Its value shall be set to 0x37 (see Table 6).
b) *Length* – denotes the length of the SI_SND_BYTES sub-control. Its value shall be set to 0x06.
c) *Number of packets* – shall be set to the total number of bytes sent by the MA from startup.
d) *Reserved* – is reserved for future use. Its value shall be set to 0x00.

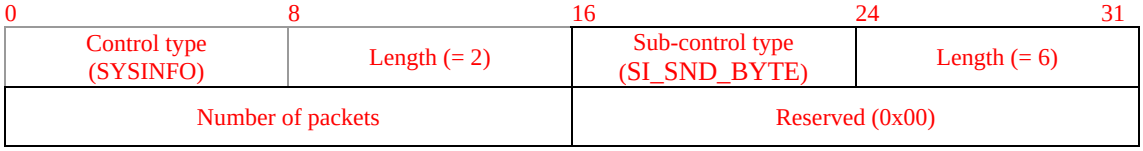


Figure 76 quinquies [75] – SI_SND_BYTES sub-control

Figure 76 sexies [76] shows the format of the SI_RCV_BW sub-control. The description of each field of the SI_SND_BW sub-control is as follows *[see GB 11 and N 13917]*:

- SI_RCV_BW

a) *Sub-control type* – denotes the SI_RCV_BW sub-control. Its value shall be set to 0x46 (see Table 6).
b) *Length* – denotes the length of the SI_RCV_BW sub-control. Its value shall be set to 0x06
c) *Number of packets* – shall be set to the bandwidth in Mbps perceived by the MA between its PMA.
d) *Reserved* – is reserved for future use. Its value shall be set to 0x00.

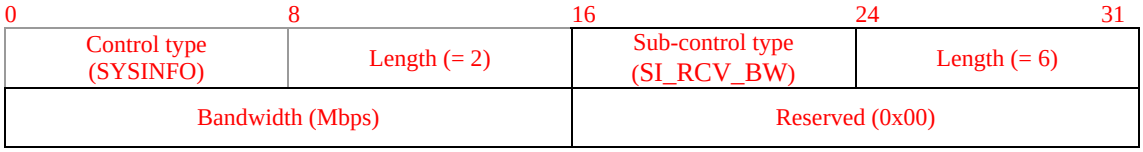


Figure 76 sexies [76] – SI_RCV_BW sub-control

Figure 76 septies [77] shows the format of the SI_RCV_PACKET sub-control. The description of each field of the SI_RCV_PACKET sub-control is as follows *[see GB 11 and N 13917]*:

- SI_RCV_PACKET

a) *Sub-control type* – denotes the SI_RCV_PACKET sub-control. Its value shall be set to 0x47 (see Table 6).
b) *Length* – denotes the length of the SI_RCV_PACKET sub-control. Its value shall be set to 0x06.
c) *Number of packets* – shall be set to the number of packets received by the MA from startup.
d) *Reserved* – is reserved for future use. Its value shall be set to 0x00.

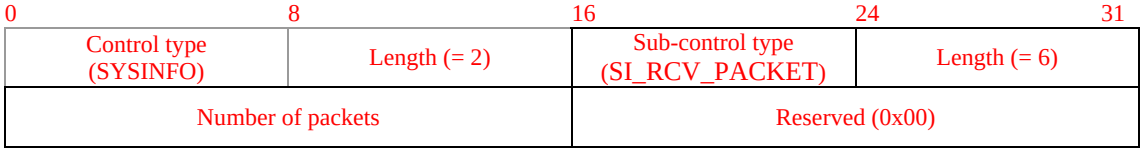


Figure 76 septies [77] – SI_RCV_PACKET sub-control

Figure 76 octies [78] shows the format of the SI_RCV_BYTES sub-control. The description of each field of the SI_RCV_BYTES sub-control is as follows *[see GB 11 and N 13917]*:

- SI_RCV_ BYTES

a) *Sub-control type* – denotes the SI_RCV_ BYTES sub-control. Its value shall be set to 0x45 (see Table 6).
b) *Length* – denotes the length of the SI_RCV_ BYTES sub-control. Its value shall be set to 0x06.

c) *Number of packets* – shall be set to the number of bytes received by the MA from startup.
d) *Reserved* – is reserved for future use. Its value shall be set to 0x00.

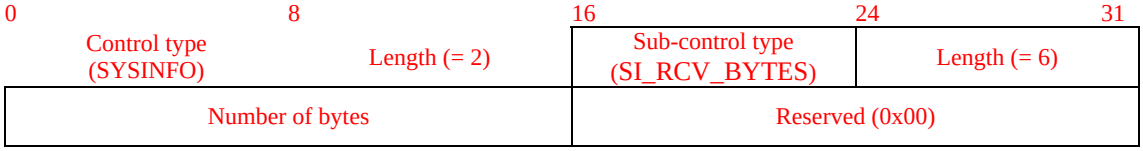


Figure 76 octies [78] – SI_RCV_BYTES sub-control

7.3.12 STCOLREQ

STCOLREQ is used for monitoring a RMCP-2 session similarly to STREQ. But the difference is that firstly the scope of STREQ is restricted to only one MA but that of STCOLREQ can be expanded to a part or all the session. Secondly, STREQ can be issued by SM only but STCOLREQ is issued by PMA.
When a MA receives STCOLREQ from the PMA, it starts the *status collection procedure* and forwards this message to its CMAs of limited area which is confined by the TREEEXPLOR sub-control. Figure 77 [79] shows the format of the STCOLREQ message.

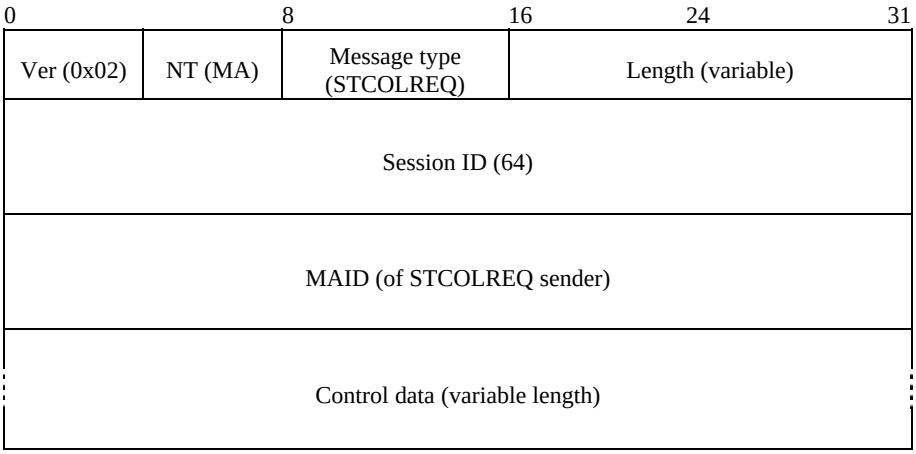


Figure 77 [79] – STCOLREQ message

The description of each field is as follows:

a) *Ver* – It represents the current version of RMCP (0x02).
b) *NT* – It is the message issuer's node type. Because this message can be issued by the PMA, the node type for the message is set to the MA.
c) *Message type* – It represents the type of the message. It is set to STCOLREQ for the message.
d) *Length* – It shows the total length of STCOLREQ message including control data (in bytes).
e) *Session ID* – It is a 64-bit value of the RMCP Session ID.
f) *MAID* – It is the MAID of the STCOLREQ issuer; it appears normally to the CMA as the MAID of the PMA.
g) *Control data* – It may include one or more requests on the status report. Control data field of this message may include the following information:

- SI_COMMAND

When PMA asks its CMAs of its status, it includes the SI_COMMAND control in its STCOLREQ message. ~~Table 6 summarizes considerable commands for status monitoring.~~ The SI_COMMAND control is specified in 7.3.10 and its format is shown in Figure 68A [65].

- TREEEXPLOR

Inspecting whole tree status can cause hazards because of report implosion. So it is very important to limit the scope of tree to be inspected.
Figure 69 [66] shows TREEEXPLOR control which is used to limit the scope of tree.

7.3.13 STCOLANS

Figure 78 [80] illustrates the format of the STCOLANS message which is used to respond to the STCOLREQ message. It informs the collected status of its downstream to its upstream. STCOLANS follows the tree hierarchy back to reach the final destination which sends STCOLREQ.

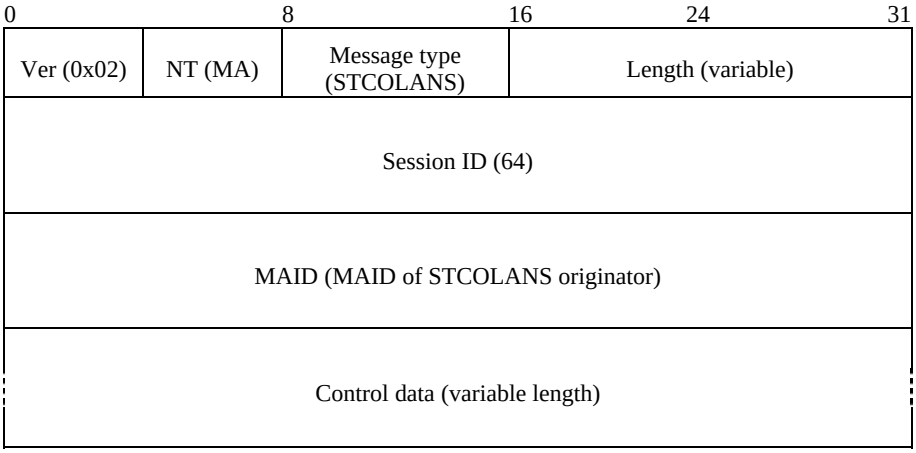


Figure 78 [80] – STCOLANS message

The description of each field is as follows:

a) *Ver* – It represents the current version of RMCP (0x02).

b) *NT* – It is the message issuer's node type. Because this message can be issued by the CMA, the node type for the message is set to the MA.

c) *Message type* – It represents the type of the message. It is set to STCOLANS for the message.

d) *Length* – It shows the total length of STCOLANS message including control data (in bytes).

e) *Session ID* – It is a 64-bit value of the RMCP Session ID.

f) *MAID* – It is the MAID of the STCOLANS issuer. Normally it appears to the PMA as the MAID of the CMA.

g) *Control data* – It may include one or more requests on the status report. Control data field of this message may include the following information:

- REPORT

According to PMA's request, CMA should answer with an appropriate report. The message format of each report has {control type, control subtype} form.
According to the request listed in Table 6, each CMA sends appropriate reports to its PMA. Figures 71 [68] to 76 octies [78] show the corresponding reports.

7.3.14 LEAVREQ

This message is used for three different purposes. The first is for leaving. When an MA leaves from the RMCP-2 session or when an MA leaves from its PMA for parent switching, it sends LEAVEQ to the corresponding MAs by the leaving procedure.
A SM and PMA may use this message but their targets are different. The target of the SM is any MA in the session, but that of PMA is only its own CMA.
The last purpose is for terminating a session. When the SMA leaves the session, this message should be forwarded to the end-most MA in the tree hierarchy. Figure 79 [81] illustrates the format of LEAVREQ message.

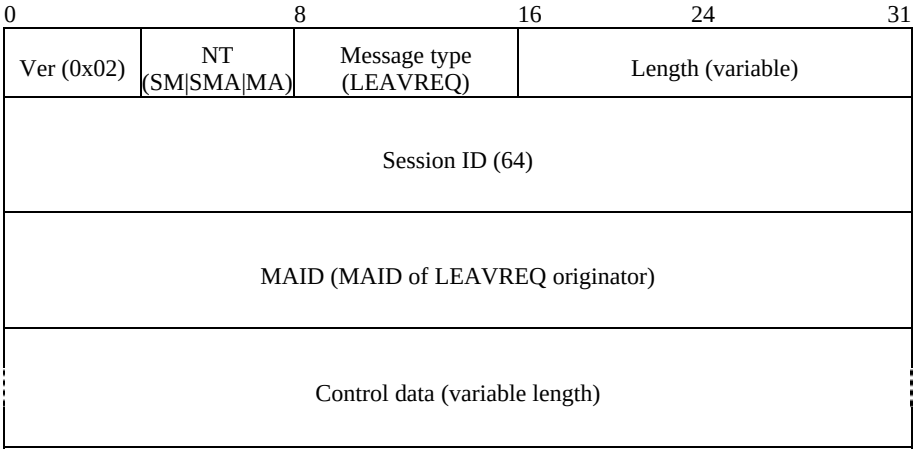


Figure 79 [81] – LEAVREQ message

The description of each field is as follows:

a) *Ver* – It represents the current version of RMCP (0x02).

b) *NT* – It is the message issuer's node type. Because this message can be issued by all the RMCP-2 entities, the node type for the message may be set to either SM, SMA or MA.

c) *Message type* – It represents the type of the message. It is set to LEAVREQ.

d) *Length* – It shows the total length of the LEAVREQ message including control data (in bytes).

e) *Session ID* – It is a 64-bit value of the RMCP Session ID.

f) *MAID* – It is the MAID of the LEAVREQ originator. When this message is generated by SM, this field must be set to zero.

g) *Control data* – Control data field of this message may include the following information:

- REASON

To give the reason why MA tries to leave a session, LEAVREQ message must include REASON control. Figure 64 [60] shows REASON control format.

7.3.15 LEAVANS

As a confirmation of the LEAVREQ message, the MA, which receives LEAVREQ, sends a LEAVANS back. Figure 80 [82] illustrates the format of LEAVANS message.

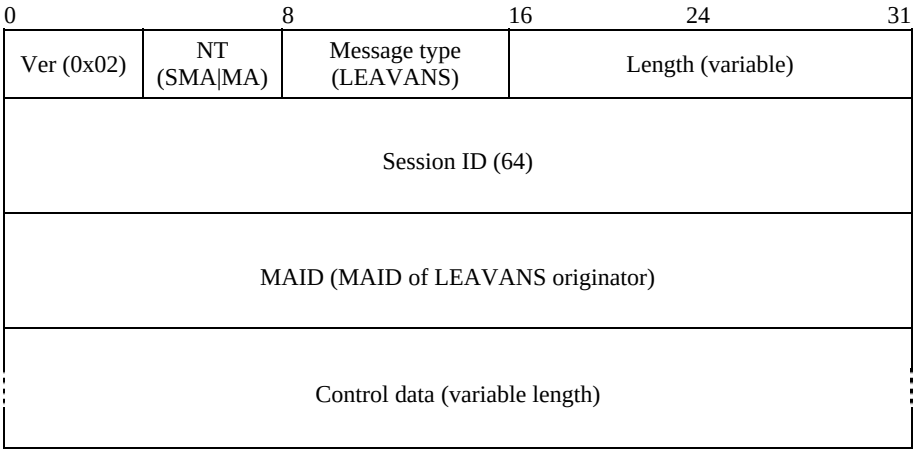


Figure 80 [82] – LEAVANS message

The description of each field is as follows:

a) *Ver* – It represents the current version of RMCP (0x02).

b) *NT* – It is the message issuer's node type. The node type for the message may be set to either SMA or MA.

c) *Message type* – It represents the type of the message. It is set to LEAVANS.

d) *Length* – It shows the total length of LEAVANS message including control data (in bytes).

e) *Session ID* – It is a 64-bit value of the RMCP Session ID.

f) *MAID* – It is the MAID of the LEAVANS originator.

g) *Control data* – Control data field of this message may include the following information:

- RESULT

LEAVANS message is used to indicate whether leaving MA's LEAVREQ message has successfully arrived. So the result code in RESULT control should always have the meaning of OK.

7.3.16 HB

The HB message is issued periodically by the SMA to give clock information through the RMCP-2 session. With the HB, each MA can diagnose network condition. Figure 81 [83] illustrates the format of HB message.

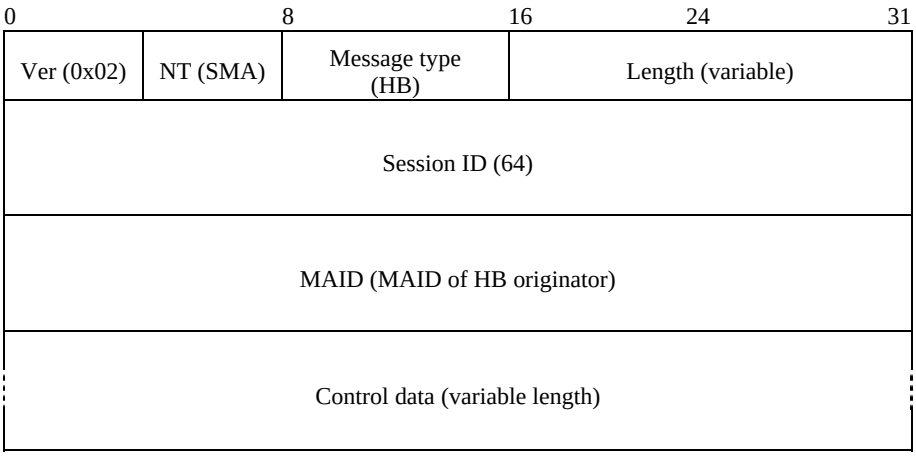


Figure 81 [83] – HB message

The description of each field is as follows:

a) *Ver* – It represents the current version of RMCP (0x02).

b) *NT* – It is the message issuer's node type. The node type for the message may be set to SMA.

c) *Message type* – It represents the type of the message. It is set to HB.

d) *Length* – It shows the total length of the HB message including control data (in bytes).

e) *Session ID* – It is a 64-bit value of the RMCP Session ID.

f) *MAID* – It is the MAID of the HB originator. Although HB is forwarded by the PMA to the CMA, this field is not changed by the intermediate node.

g) *Control data* – It should include the ROOTPATH option which is shown in Figure 54 [51]. Control data field of this message may include the following information:

- ROOTPATH

ROOTPATH control is updated by each MA. Beginning from the root, each MA who relays HB appends its MAID as well as subsidiary information such as hop-by-hop delay, hop-by-hop bandwidth, according to its preceding session configuration. Figures 54 [51] and 55 [52] show ROOTPATH control and its sub-control data.

- [AUTH control deleted – see GB 4]

- RP_COMMAND

When a PMA tries to recover from network partition, its descendants may start network fault recovery procedure due to HB expectation timeout. In other words, a single point of partitioning may cause a fault recovery chain effect.
So it is necessary to generate a pseudo-HB message to delay its descendants' fault recovery procedure and means of notifying its pseudo-HB message to its descendants.
RP_PSEUDO command in Table 4 is used to indicate that the ROOTPATH in HB message with this RP_COMMAND is a pseudo ROOTPATH. The format of the RP_COMMAND is shown in Figure 66 [62].

7.3.17 TERMREQ

TERMREQ is used to terminate an existing RMCP-2 session. It is issued by the SM and then it is forwarded by the SMA to the end-most MAs along the tree hierarchy. Figure 82 [84] shows the format of TERMREQ message.

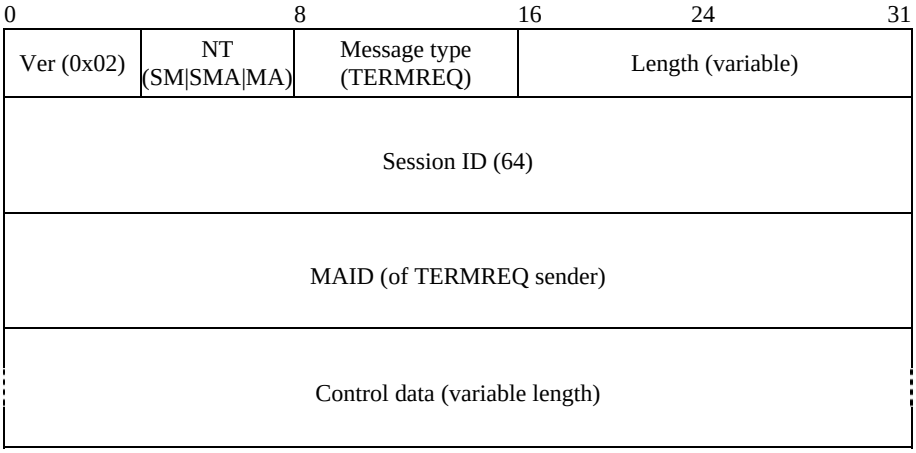


Figure 82 [84] – TERMREQ message

The description of each field is as follows:

a) *Ver* – It represents the current version of RMCP (0x02).

b) *NT* – It is the message issuer's node type. Because this message can be issued by the SM and must be forwarded to the end-most MA along the RMCP-2 tree, the node type for the message may be set to ~~either~~ SM, SMA or MA.

c) *Message type* – It represents the type of the message. It is set to TERMREQ.

d) *Length* – It shows the total length of the TERMREQ message including control data (in bytes).

e) *Session ID* – It is a 64-bit value of the RMCP Session ID.

f) *MAID* – It is the MAID of the TERMREQ message sender. When this message is sent by the SM, this field ~~must~~ shall be set to zero. Normally the MAID of TERMREQ message appears to a MA as its PMA.

g) *Control data* – It may include the following reason code to explain session termination.

- REASON

To give the reason why a session is to be terminated, TERMREQ message should include REASON control as shown in Figure 64 [60]. The reason for session termination will be either SMA's ~~inexistence~~ non-existence or the termination by session owner.

7.3.18 TERMANS

Figure 83 [85] illustrates the format of the TERMANS message.

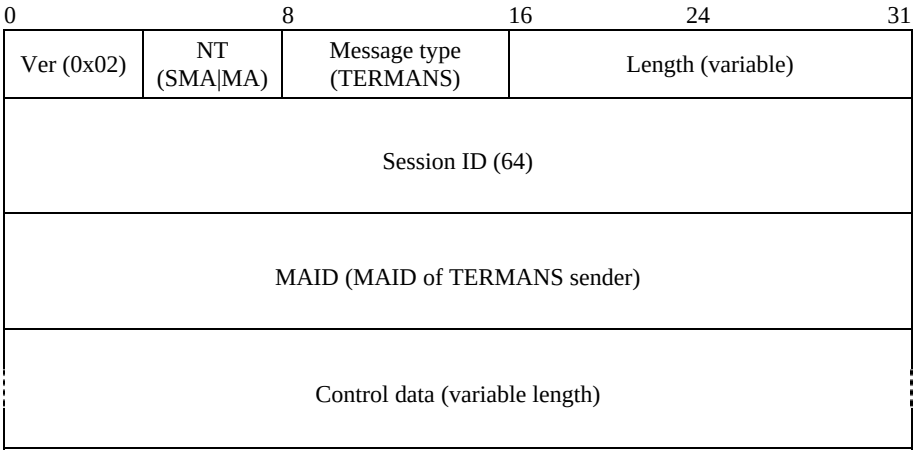


Figure 83 [85] – TERMANS message

The description of each field is as follows:

a) *Ver* – It represents the current version of RMCP (0x02).

b) *NT* – It is the message issuer's node type because this message can be issued along the reverse direction of the RMCP-2 tree as a reply to the TERMREQ. The node type for the message may be set to either SMA or MA.

c) *Message type* – It represents the type of the message. It is set to TERMANS.

d) *Length* – It shows the total length of the TERMANS message including control data (in bytes).

e) *Session ID* – It is a 64-bit value of the RMCP Session ID.

f) *MAID* – It is the MAID of the TERMANS message sender. Normally the MAID of TERMANS message appears to the receiver as one of its CMAs.

g) *Control data* – Control data field of this message may include the following information:

- RESULT

TERMANS message is used to indicate whether TERMREQ message has successfully arrived. So the result code in Figure 49 [47] should always be OK.

6) Sub-clause 8.1. Data forwarding profile

Change Figure 84 to Figure 86

7) Sub-clause 8.3. Messages

Delete the current sub-clause 8.3 and replace with the following text:

8.3 ~~Encoding rules to represent~~ Code values used in RMCP-2

8.3.0 [8.3.1] Codes values for basic RMCP-2 node types *[N 13917]*

Table 1A [2] lists the node types (NT) for the basic RMCP-2 protocol and their corresponding 4-bit code values.

NOTE – The code value for the MA node type applies only to the basic RMCP-2 protocol defined in clauses 5 – 7 of this Recommendation | International Standard. The secure RMCP-2 protocol in Amendment 1 does not use the code value for MAs: it has its own code values for DMA and RMA node types.

Table 1A [2] – Node type code values for basic RMCP-2

Node type	Code value (4 bits)
SM	0x1
SMA	0x2
MA	0x4

8.3.1 Code values for RMCP-2 message types

Table 2 [3] lists the RMCP-2 message types and their corresponding code values.

Table 2 [3] – Code values for RMCP-2 message types.

Message type	~~Value (8 bits)~~	Code value (Hexadecimal)
SUBSREQ	~~00000010~~	0x02
SUBSANS	~~00000011~~	0x03
PPROBREQ	~~00000100~~	0x04
PPROBANS	~~00000101~~	0x05
HSOLICIT	~~00000110~~	0x06
HANNOUNCE	~~00000111~~	0x07
HLEAVE	~~00001000~~	0x08
RELREQ	~~00001001~~	0x09
RELANS	~~00001100~~	0x0C
STREQ	~~00010011~~	0x12
STANS	~~00010100~~	0x13
STCOLREQ	~~00010100~~	0x14
STCOLANS	~~00010101~~	0x15
LEAVREQ	~~00010110~~	0x16
LEAVANS	~~00010111~~	0x17
HB	~~00011000~~	0x18
TERMREQ	~~00011001~~	0x19

TERMANS	~~00011010~~	0x20

8.3.1A [8.3.2] Code values for RMCP-2 control types

Table 2A [4] lists the RMCP-2 control types and their corresponding code values *[D.Cor.1]*

Table 2A [4] –Code values for RMCP-2 control types

Control type	Value (Hexadecimal)
~~AUTH~~	~~0x01~~
~~COMMAND~~	~~0x02~~
RP_COMMAND	0x01
SI_COMMAND	0x02
DATAPROFILE	0x03
NEIGHBORLIST	0x04
REASON	0x05
RESULT	0x06
ROOTPATH	0x07
SYSINFO	0x08
TIMESTAMP	0x09
CANDIDATEHMA	0x0A
TREEEXPLOR	0x0B

8.3.2 [8.3.3] RMCP-2 return value

Table 3 [5] lists the encoded values and meaning of the result codes, which are normally used as the return codes for an RMCP-2 request such as SUBSREQ and RELREQ.

Table 3 [5] – Result codes *[N 13917]*

Result Code	Meaning
0x10	OK
0x20	System Problem
0x30	Administrative Problem

8.3.3 [8.3.4] Values related to the ROOTPATH control

Table 4 [6] lists the code values for the sub-control types of the ROOTPATH and RP_COMMAND controls. The same code is used for both the ROOTPATH and the RP_COMMAND sub-controls. The length in bytes of each rootpath element is indicated for each ROOTPATH type. *[N 13917]*

Table 4 [6] – Sub-control and command codes for ROOTPATH and RP_COMMAND controls.

Sub-control type	Code	Meaning	Length of rootpath element in bytes
The following six code values apply both to ROOTPATH and RP_COMMAND controls.			
RP_ID	0x11	The ROOTPATH control contains only the MAID for each node	16
RP_ BW	0x12	The ROOTPATH control contains only the bandwidth in Mbps as perceived by the MA for each node.	4
RP_ DL	0x14	The ROOTPATH control contains only the delay in seconds from the ROOT node as perceived by the MA for each node	4

RP_ID_BW	0x13	The ROOTPATH control contains the MAID and bandwidth in Mbps as perceived by the MA for each node.	20
RP_ID_DL	0x15	The ROOTPATH control contains the MAID and the delay in seconds from the ROOT node as perceived by the MA for each node.	20
RP_ID_BW_DL	0x17	The ROOTPATH control contains the MAID, bandwidth in Mbps and the delay in seconds as perceived by the MA for each node.	24
The following code value applies only to the RP_COMMAND control in HB messages.			
RP_PSEUDO	0x10	Indicates that the ROOTPATH control in the HB message is a pseudo-ROOTPATH for fault recovery	N/A

NOTE – The code values for RP_ID_BW, RP_ID_DL and RP_ID_BW_DL sub-controls are calculated by 0x10 plus the arithmetic sums of last four bits of the individual codes of the RP_ID, RP_BW and RP_DL components.

[Table 5 has been incorporated into Table 4]

8.3.4 [8.3.5] Values related to SYSINFO control data

A single control data may include zero or more sub-control data. This clause defines codes for RMCP-2 sub-control data. SYSINFO control data is used for exchange information related to MA. Table 6 [7] lists the sub-control types, its code, and meaning. ~~The four most significant bits of the encoded code specify the category of the information. The lowest four bits specifies detailed items such as bandwidth, packets, and bytes.~~ *[N13917]*

Table 6 [7]– Sub-control types for SYSINFO

Type	Code (8 bit)	Meaning
~~SI_PROV_QOS~~	~~0x10~~	~~Maximum incoming / outgoing bandwidth of MA's network interface card.~~
LOCAL_IP	0x11	IP address of MA.
HMA_UPTIME	0x15	Time of MA's uptime.
SI_UPTIME	0x12	Time of MA's uptime.
SI_DELAY	0x13	Status of delay as perceived by MA from ROOT.
SI_ROOM_CMA	0x14	The room for CMAs.
~~ST_PERCV_QOS~~	~~0x20~~	~~The QoS perceived by each MA~~
AVAILABLE_CMA	0x24	The number of ~~available~~ CMA places that are available for allocation by the MA.
POSSIBLE_BW	0x25	The possible forwarding bandwidth that the MA can afford.
SI_SND _BW	0x35	Total bandwidth consumed by PMA to serve its CMAs.
SI_SND_PACKET	0x36	Total number of packets sent by MA from startup.
SI_SND _BYTES	0x37	Total number of bytes sent by MA from startup.
SI_RCV_BW	0x45	Bandwidth perceived by MA between its PMA.
SI_RCV_PACKET	0x46	Number of packets received by MA from startup.
SI_RCV_BYTES	0x47	Number of bytes received by MA from startup.
SI_TREE_CONN	0x68	PMA and CMA(s) of MA.
SI_TREE_MEMBER	0x69	List of tree members.

Table 6A [8] lists the command codes corresponding to the sub-controls for the SYSINFO control. Combinations of different sub-controls may be indicated by adding together the corresponding individual command codes.

NOTES

1. Table 6A [8] only contains the sub-control types that require a command control for their initiation. There is, therefore no one-to-one correspondence with the sub-controls in Table 6 [7].

2. The 16-bit format column in Table 6A [8] demonstrates how the command code values may be added together to give unique combinations. The bit positions can be considered as representing individual sub-control types and the 1 or 0 values can be interpreted as presence or absence of these sub-control types..

Table 6A [8] – SI_COMMAND codes for SYSINFO

Sub-control Type	Sub-control Code	Command Code	16-bit format
SI_UPTIME	0x12	0x00 01	0000 0000 0000 0001
SI_DELAY	0x13	0x00 02	0000 0000 0000 0010
SI_ROOM_CMA	0x14	0x00 04	0000 0000 0000 0100
SI_SND _BW	0x35	0x00 08	0000 0000 0000 1000
SI_SND_PACKET	0x36	0x00 10	0000 0000 0001 0000
SI_SND _BYTES	0x37	0x00 20	0000 0000 0010 0000
SI_RCV_BW	0x45	0x00 40	0000 0000 0100 0000
SI_RCV_PACKET	0x46	0x00 80	0000 0000 1000 0000
SI_RCV_BYTES	0x47	0x01 00	0000 0001 0000 0000
SI_TREE_CONN	0x68	0x02 00	0000 0010 0000 0000
SI_TREE_MEMBER	0x69	0x04 00	0000 0100 0000 0000

NOTE – The sub-control code column has been added for cross reference to Table 6 [7].

8.3.5 [8.3.6] Values related to the leave

Table 7 [9] lists the reason codes for leaving. The four most significant bits of the code specify the main cause of leaving, and the four least significant bits specify further details for leaving, such as exhaustion of system resources or termination by the user's request.

Table 7 [9] – Leave reason code

Category	Code	Meaning
Leave	0x10	~~MA's Own leave~~ Leave initiated by MA
	0x11	~~SMA leave~~ Leave of SMA
Kick out	0x20	~~SM kick out~~ Expulsion by SM
	0x21	~~PMA kick out~~ Expulsion by PMA
Parent switching	0x40	~~MA's parent switching~~ Parent switching by MA

8.3.6 [8.3.7] Values related to the session termination

Table 8 [10] lists the reason codes for the session termination. The four most significant bits of the code specify the main reason for the session termination, and the four least significant bits specify the detailed reason for session termination.

Table 8 [10] – Termination reason code

Category	Code	Meaning

Normal session termination	0xE0	Session is terminated normally
Abnormal session termination	0xF0	Session is terminated abnormally without reason
	0xF1	Session is terminated abnormally by user request

[8.3.7 and Table 9 have not been included as comment GB 4 proposes withdrawal of the AUTH control]

[8.3.8 and Table 10 (in PDAM 2) have been deleted. There is no need for NL_MAID sub-control in NEIGHBORLIST and CANDIDATEHMA. See GB 20]

FIGURE AND TABLE NUMBERS

(not to included in the output document)

Figures

current	*proposed*
40	[40]
41	[41]
42	[42]
43	[43]
44	[44]
45	[45]
46	deleted
47	del
48	[46]
49	[47]
50	[48]
51	deleted
52	[49]
53	[50]
54	[51]
55	[52]
56	[53]
57	[54]
58	[55]
59	[56]
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61	[58]
62	[59]
63	deleted
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66	[62]
67	[63]
68	[64]
68A	[65]
69	[66]
70	[67]
71	[68]

current	*proposed*
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74	deleted
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76	[71]
76 bis	[72]
76 ter	[73]
76 qua	[74]
76 qui	[75]
76 sex	[76]
76 sep	[77]
76 oct	[78]
77	[79]
78	[80]
79	[81]
80	[82]
81	[83]
82	[84]
83	[85]
84	[86]

Tables

1A	[2]
2	[3]
2A	[4]
3	[5]
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6	[7]
6A	[8]
7	[9]
8	[10]
9	deleted
10	deleted