

6. USE OF THE SCCP

The MTP and the SCCP are used to support signalling messages between the MSC and the BSS. One user function of the SCCP, called Radio Subsystem Application Part (BSSAP) is defined. The BSSAP uses one signalling connection per active Mobile Station having one or more active transactions, for the transfer of layer 3 messages related to this transaction. The BSSAP user function is further subdivided into two separate functions :

- The Direct Transfer Application sub-Part (DTAP) is used to transfer call control and mobility management messages to and from the MS; the layer-3 information in these messages is not interpreted by the BSS. The description of the layer 3 protocol for the MS-MSC call control and mobile management information exchange is contained in Recommendation GSM 04.08.
- The BSS Management Application sub-Part (BSSMAP) supports other procedures between the MSC and the BSS related to the MS (resource management, handover control), or to a cell within the BSS, or to the whole BSS. The description of the layer 3 protocol for the BSSMAP information exchange is contained in Recommendation GSM 08.08.

Both connectionless and connection-oriented procedures are used to support the BSSMAP. Rec. GSM 08.08 explains whether connection or connectionless services should be used for each layer 3 procedure. Section 6.4 deals with the use of connectionless services of the SCCP.

A distribution function located in BSSAP, which is reflected in the protocol specification by the layer 3 header defined in section 6.3, performs the discrimination between the data related to those two subparts, as illustrated in Recommendation GSM 08.08 figure 1.

This section describes the use of SCCP connections for MS transactions. Section 6.1 describes the connection establishment procedures. Section 6.2 describes the connection release procedures. Section 6.3 describes the distribution between BSSMAP and DTAP messages and the data transfer over a SCCP connection.

6.1 Connection Establishment

A new connection is established when individual information related to a MS transaction has to be exchanged between BSS and MSC, and no such transaction exists between the MSC and the BSS involved.

Two connection establishment cases have to be distinguished:

- i) A new transaction (e.g. Location updating, incoming or outgoing call) is initiated on the radio path : following an Access Request made by the MS on the Random Access Channel, a DCCH or a TCH has been successfully allocated and a layer-2 connection has been established on the SDCCH (resp. FACCH) channel of the allocated resource. The connection establishment is then initiated by the BSS.
- ii) The MSC decides to perform an external handover to a new cell, and a new DCCH or TCH has to be reserved in the new BSS. The connection establishment is then initiated by the MSC.

The above cases are the only two cases currently identified for connection establishment. Others may emerge in the future.

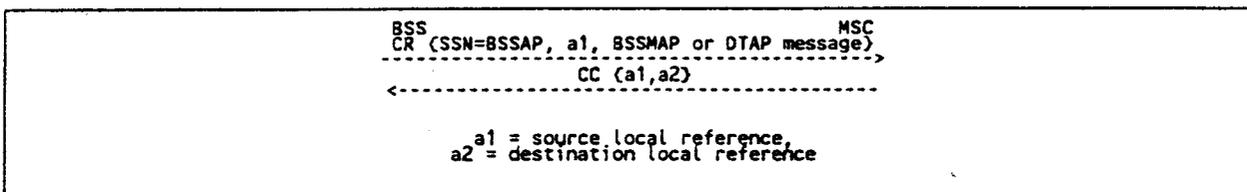


Figure 1/08.06
SET-UP OF SCCP CONNECTIONS ON THE FIRST BSS/MS INTERFACE

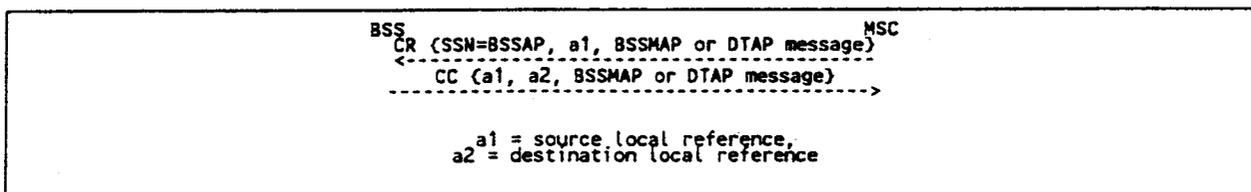


Figure 2/08.06
SET-UP OF SCCP CONNECTIONS ON A NEW BSS/MS (HANDOVER) INTERFACE

6.1.1 Establishment procedure in case I)

In case 1), the connection establishment is performed at the reception by the BSS of the first layer-3 message from the MS (piggybacked on the SABM frame). This message (LOCATION UPDATING REQUEST, CM-SERVICE REQUEST, CM REESTABLISHMENT REQUEST or PAGING RESPONSE) which contains the identity of the MS (TMSI or IMSI) is transferred to the MSC together with the Location Area Code (LAC) and the cell number, in a BSSMAP message (COMPLETE L3 INFORMATION) included in the user data field of the SCCP Connection Request message (see figure 1). The exact coding of the BSSMAP message is specified in Recommendation 08.08.

At the reception of the Connection Request message, the MSC may check, based on the received identity, whether another association already exists for the same MS. If it is the case, the connection establishment is refused. If that is not the case, a Connection Confirm message is sent back to the BSS. This message may optionally contain a BSSMAP or DTAP message in the user data field.

The procedures in case of connection establishment failure are specified in Recommendation GSM 08.08.

6.1.2 Establishment procedure in case II)

In this case, the connection establishment is undertaken by the MSC as soon as the MSC decides to perform an external handover to a new cell.

A Connection Request message is sent to the BSS. The user data field of this message may contain the BSSMAP Handover Request message (see fig.2). However, it is preferable to transfer the layer 3 messages in the user data field of the Connection Request in order to complete the establishment of the relation between the radio channel requested and the

SCCP connection as soon as possible. The exact structure of the user data field is explained in 6.3.

When receiving the Connection Request message, the BSS performs the necessary checking and reserves, in the successful case, a radio channel for the requested handover. A Connection Confirm message is also returned to the MSC and may contain the BSSMAP Handover Request Acknowledge message in the user data field.

The procedures in case of connection establishment failure are specified in Recommendation GSM 08.08.

6.2 Connection Release

This procedure is always initiated at the MSC side.

A connection is released when the MSC realizes that a given signalling connection is no longer required. That may occur, in normal cases :

- at the end of a transaction (call, location updating...);
- after completion of a successful external handover;
- the connection with the old BSS is released.

The MSC sends a SCCP released message. The user data field of this message is optional and may contain a transparent layer-3 message to the MS or be empty. The structure of the user data field, if any, is explained in section 6.3.

When receiving this message, the BSS releases all the radio resources allocated to the relevant MS, if there are still any left, and sends a SCCP Release Complete back to the MSC.

Abnormal cases : a connection failure may be detected by the connection supervision service provided by SCCP. The procedures in that case are specified in Recommendation GSM 08.08.

6.3 Transfer of DTAP and BSSMAP Data

The DTAP and BSSMAP Layer 3 messages between the MSC and the BSS are contained in the user data field of the exchanged SCCP frames. This field is optional for the Connection Request (CR) (except for BSS originated connections, see below; Connection Confirm (CC) and Released (RLSD) frames; the use of this field in such frames in the various establishment and release cases, which allows to gain indelay and efficiency, is described in sections 6.2 and 6.3. The user data field is a mandatory parameter of the Data frames (DT), which always contain either a DTAP or a BSSMAP message.

6.3.1 Distribution Function

The distribution of messages between the BSSMAP and DTAP functions and the distribution/multiplexing of DTAP messages to/from the various radio link layer 2 access points are performed in an intermediate layer of protocol between SCCP and Layer 3 later referred as the distribution sublayer.

The protocol for this sublayer simply consists of the management of a one or two octet Distribution Data Unit. Each SCCP User Data field necessarily contains such a distribution Data Unit as anheader, followed by the actual Layer 3 BSSMAP or DTAP message.

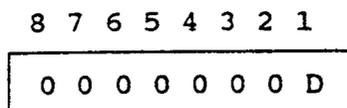
6.3.2 Transfer of DTAP Messages

The DTAP function is in charge of transferring layer 3 messages from the MS (resp from the MSC) to the MSC (resp to the MS) without any analysis of the message contents. The interworking between the layer 2 protocol on the radio side and signalling system 7 at the landside is based on the use of individual SCCP connections for each MS and on the distribution function.

The structure of the user data field is given in figure 3. The user data field contains a distribution data unit, a length indicator, and the actual layer 3 message.

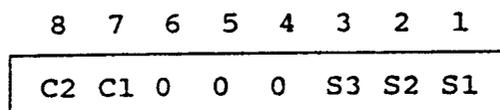
The Distribution Data Unit consists of two parameters: the Discrimination parameter and the Data Link Connection Identification (DLCI) parameter.

The Discrimination parameter, which is set to the "Transparent" value, is coded on one octet, as follows :



The discrimination bit D is set to the "Transparent" value 1.

The DLCI parameter is used for MSC to BSS messages to indicate the type of data link connection to be used over the radio interface. In the direction BSS to MSC the DLCI parameter is used to indicate the type of originating data link connection over the radio interface. The DLCI parameter is coded in one octet, as follows :



C2 C1 represents the radio channel identification
C2=0; C1=0 represents the fACCH or the sDCCH;
C2=0; C1=1 represents the sACCH; other values are reserved.

S3 S2 S1 represents the SAPI value used on the radio link, which coding is specified in Recommendation GSM 04.06.

Bits 4, 5 and 6 are spare.

The length indicator is coded in one octet, and is the binary representation of the number of octets of the subsequent layer 3 message parameter.

The coding of the DTAP layer 3 messages is specified in Recommendation GSM 04.08.

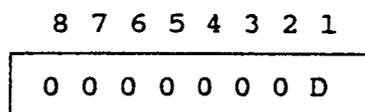
6.3.3 Transfer of BSSMAP Messages

The transfer of BSSMAP messages over a SCCP connection allows the BSSMAP functions in both the MSC and the BSS to identify to which particular Mobile Station association the exchanged message (e.g. assign, handover request, etc..) applies.

The structure of the user data field is given in figure 3. The user data field contains a distribution data unit, a length indicator, and the actual layer 3 message.

The Distribution Data Unit only consists of the Discrimination parameter, which is set to the "Not Transparent" value.

This parameter is coded on one octet, as follows :



The discrimination bit D is set to the "Not Transparent" value 0.

The length indicator is coded in one octet, and is the binary representation of the number of octets of the subsequent layer 3 message parameter.

The coding of the BSSMAP layer 3 messages is specified in Recommendation GSM 08.08.

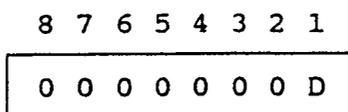
6.4 Connectionless Services

Some BSSMAP procedures described in Recommendation GSM 08.08 use the connectionless services of the SCCP.

The structure of the user data field of the unitdata message (UDT) is given in figure 3. The user data field contains a distribution data unit, a length indicator, and the actual layer 3 message.

The Distribution Data Unit only consists of the Discrimination parameter, which is set to the "Not Transparent" value.

This parameter is coded on one octet, as follows :



The discrimination bit D is set to the "Not Transparent" value 0.

The length indicator is coded in one octet, and is the binary representation of the number of octets of the subsequent layer 3 message parameter.

The coding of the BSSMAP layer 3 messages is specified in Recommendation GSM 08.08.

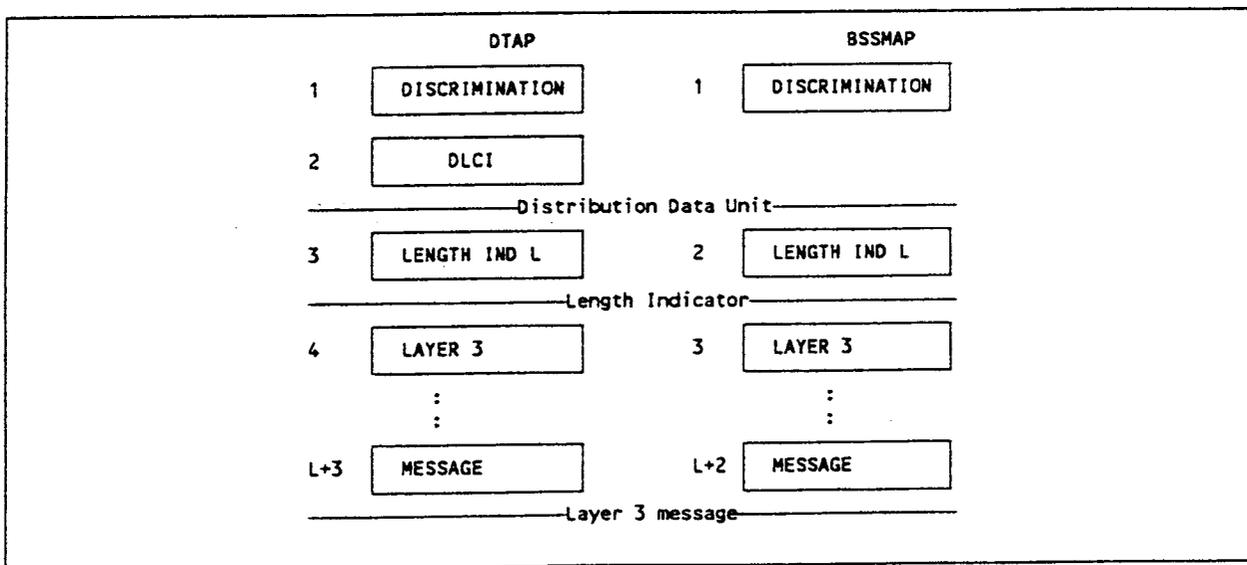


Figure 3/08.06
 Structure of the User Data Field