Signaling Connection Control Part (SCCP)

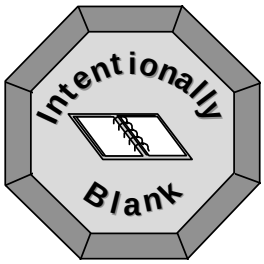
Chapter 9

This chapter is designed to provide the student with an overview of the protocol Signaling Connection Control Part (SCCP).

OBJECTIVES:

Upon completion of this chapter the student will be able to describe:

- the Signaling Connection Control Part message format.
- how SCCP routing is performed.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9 Signaling Connection Control Part (SCCP)

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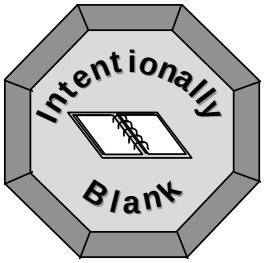
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SIGNALING CONNECTION CONTROL PART (SCCP)

A software packet called Signaling Connection Control Part (SCCP) has been introduced to meet future demands. SCCP provides additional functions for MTP to cater to both connection oriented signaling to transfer circuit-related signaling information, and connectionless signaling to transfer non-circuit related signaling messages via a SS7 network.

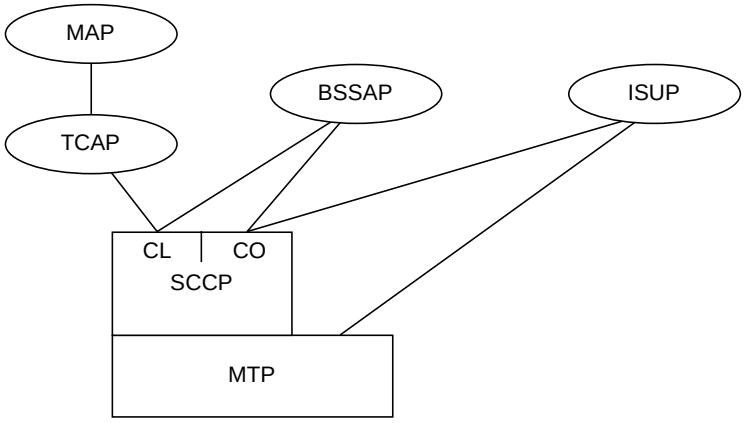


Figure 9-1 SCCP Signal Connection Control Part.

The SCCP and the MTP together form the network service part which keeps No. 7 in line with layer 1-3 of the OSI model.

SCCP consists of the following main subfunctions, all implemented in the central software:

- **SCCP connection oriented (CO) control -** which handles establishment, data transfer and supervision of logical signaling connections.
- **SCCP connectionless (CL) control -** which handles the connectionless transfer of data units.
- **SCCP management -** which handles the status information of the SCCP network. This information, regarding the availability of other SPs and users of the network, is used to update the message routing tables.
- **SCCP routing -** which handles the routing of SCCP messages within the SS7 network. This may include the translation of a global title to get a specific network address.

The SCCP routing function also provides message distribution based on the SCCP SubSystem Number (SSN). The SSN identifies either an SCCP user or the SCCP management subfunction. A message whose called party address is a local user is passed to the SCCP CO or CL control while a message for a remote user is forwarded to the MTP for transfer to a distant SCCP user. The addressing duty of SCCP and MTP are illustrated in Figure 9-2.

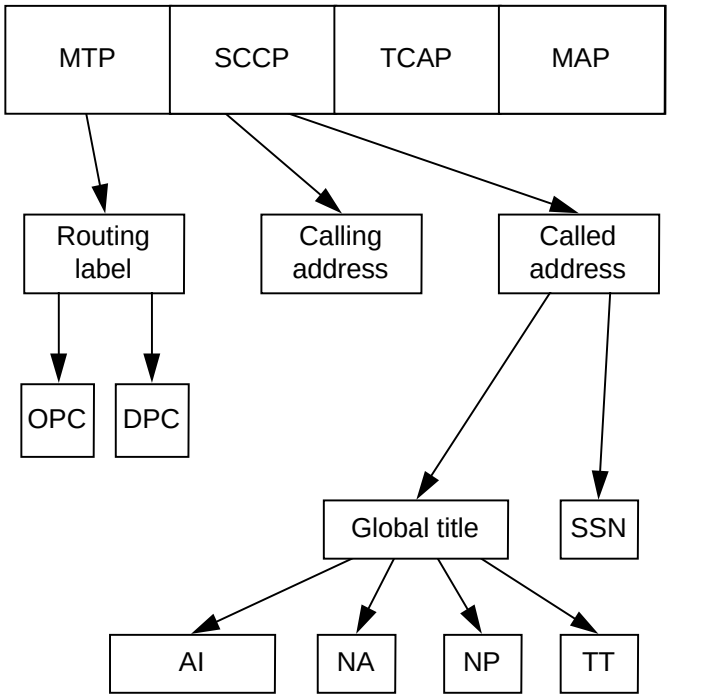


Figure 9-2 SCCP addressing.

The SCCP messages are carried on the signaling data link by means of signal units. The service indicator in the SIO is coded 0011 for the SCCP. The SIF of each MSU containing an SCCP message consists of an integer number of octets. A message consists of the routing label, message type code, mandatory fixed part, mandatory variable part, and the optional part of fixed or variable length. The message format is shown in Figure 9-3.

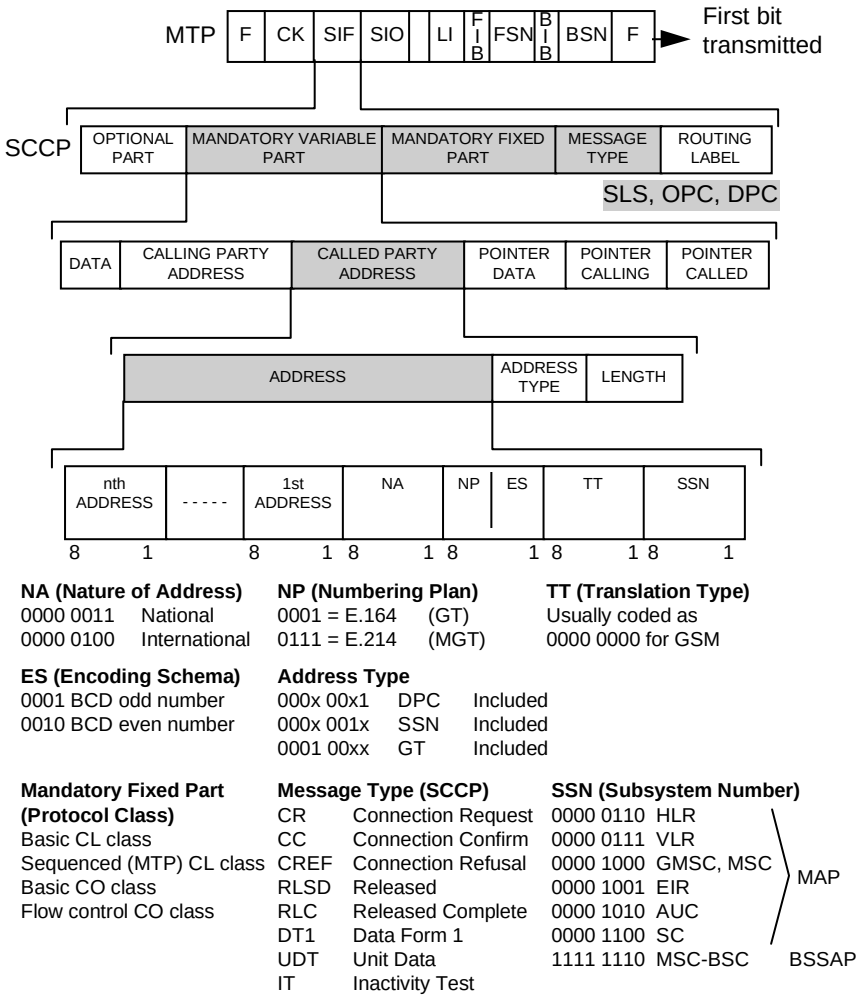


Figure 9-3 SCCP message format: UDT.

CONNECTION - ORIENTED SIGNALING

SCCP allows the SCCP user to set up a logical signaling connection to another SCCP user. See Figure 9-4. This means that all exchanged messages follow the same path. The calling SCCP user sends a Connection Request (CR) message. Within a CR, there is a local reference number to the calling exchange (A), the protocol class and the address to the called exchange (B). The CR may also include the SCCP address for exchange A and user data. When exchange B receives the CR, it answers by sending a Connection Confirm (CC) message including the local reference number set up by SCCP-A, a local reference number selected by SCCP-B and the selected protocol class. User data may also be included. In case SCCP-B for any reason cannot set up the connection it returns a Connection REFused (CREF) message to SCCP-A.

The logical connection is established when the CC message is received by exchange A. In the subsequent exchange of information, SCCP-A uses the reference given by SCCP-B in the CC message, while SCCP-B uses the reference given by SCCP-A in the CR message. The user data is sent in Data Form 1 (DT1) or 2 (DT2) message depending on the protocol class. DT1 is used for signaling data only while DT2 also can be used for acknowledgment. The connection is cleared by sending a clearing message and an acknowledgment of that message.

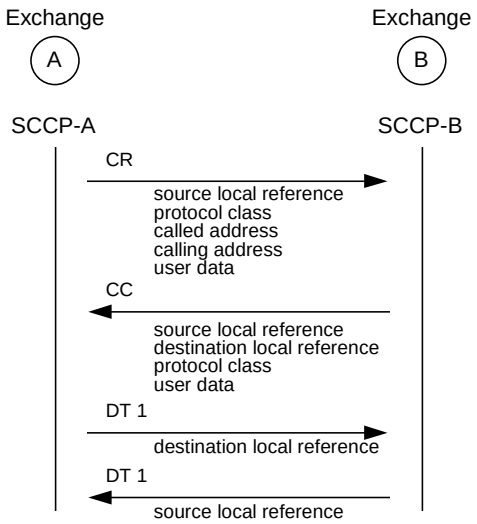


Figure 9-4 Establishment of a logical connection between SCCP in exchange A and B.

A signaling connection, that is, a communication path between two SCCP users, may consist of one or more sections. Figure 9-5 shows the setup of a logical connection between exchange A and exchange F. One reason for dividing a connection in several sections (logical connections in a tandem arrangement) is that it may pass through several national networks.

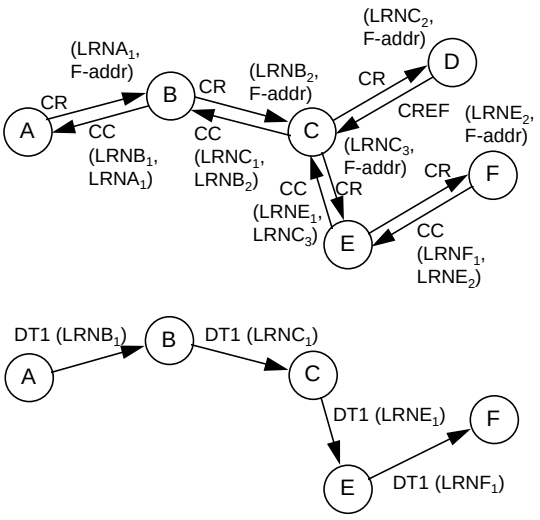


Figure 9-5 CO tandem arrangement: establishment of a logical connection and subsequent message transfer.

Figure 9-6 shows logical connection establishment using CR and CC and the use of DT1 for subsequent message transfer during the location updating procedure. See also Figure 9-3 for message types.

Figure 9-6 shows the SCCP messages used during location updating.

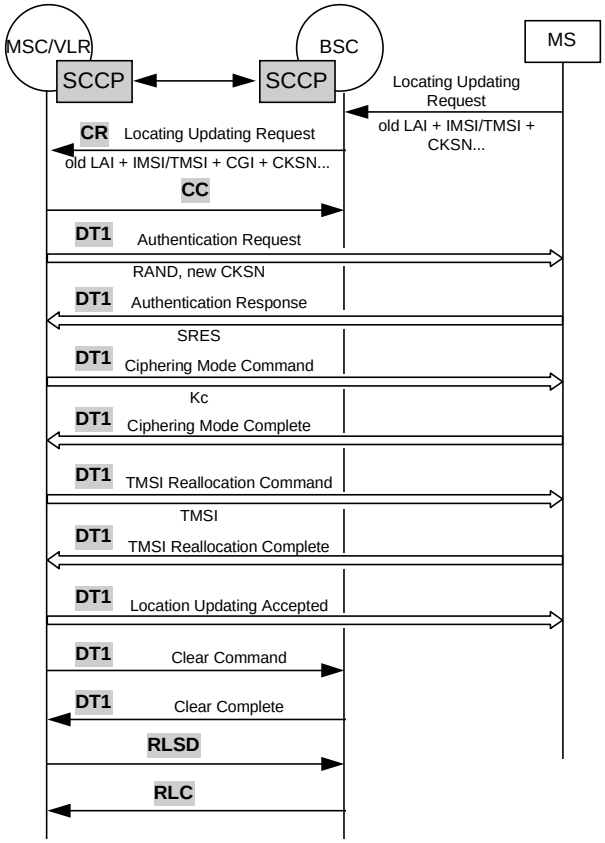


Figure 9-6 SCCP Messages at location updating.

CONNECTIONLESS SIGNALING

The SCCP allows the SCCP user to send signaling messages without establishing a logical connection. User data is sent in a Unit Data (UDT) message. Each message includes the called and calling address which identifies the destination and origination of the message. See Figure 9-7. This means that the messages may arrive at the destination point following different signaling paths. See Figure 9-8. If the SCCP user wishes to be informed that a message has been discarded instead of being delivered, a return option parameter must be set to “return message on error”. When the destination node finds out that a packet in a message has disappeared it requests re-transmission from the originating node.

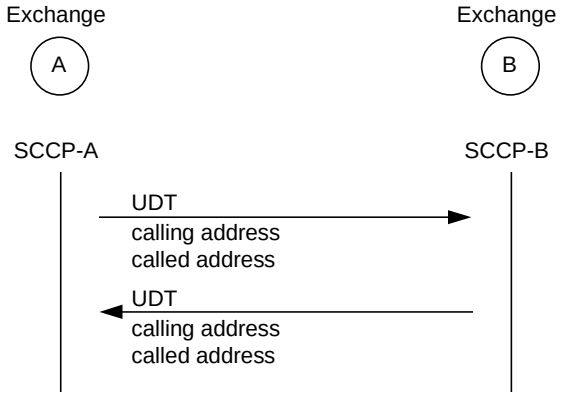


Figure 9-7 SCCP using connectionless signaling.

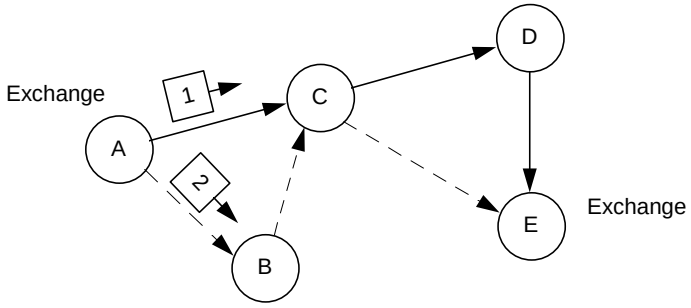


Figure 9-8 CL messages and unit data messages may take different paths through the network.

SCCP ADDRESSING AND ROUTING

The called and calling party addresses contain the information necessary for the SCCP to determine an originating and a destination node. In the case of CO procedures, the addresses are the originating and destination points of the signaling connection, while in the case of CL procedures the addresses are the originating and destination points of the message.

When transferring CO or CL messages, two basic addresses are distinguished by SCCP routing:

1. **Global Title (GT)** A GT is an address which does not explicitly contain information that would allow routing in the signaling network. This means that the SCCP translation function is required.
2. **DPC + SSN** A DPC and an SubSystem Number (SSN) allows direct routing by the SCCP and MTP. That is, the translation function of the SCCP is not required.

The called party address may contain:

- **SSN only -** which indicates that the receiving SCCP is the termination point of the message. The SSN is used to determine the local subsystem.
- **GT only -** which indicates that translation is required. The translation results in a new DPC for routing the message and possibly a new SSN or GT, or both in the called party address.
- **SSN and GT -** An address indicator is used to determine whether the SSN or the GT should be used for routing.

An example of how SCCP GT translation works in an intermediate exchange and in a terminating exchange is shown in Figure 9-9.

The GT translation results in a Global Title Routing Case (GTRC) or in an indication that the message terminates. A parameter could be set if no GT translation is needed. SCCP then includes the subsystem number (SSN).

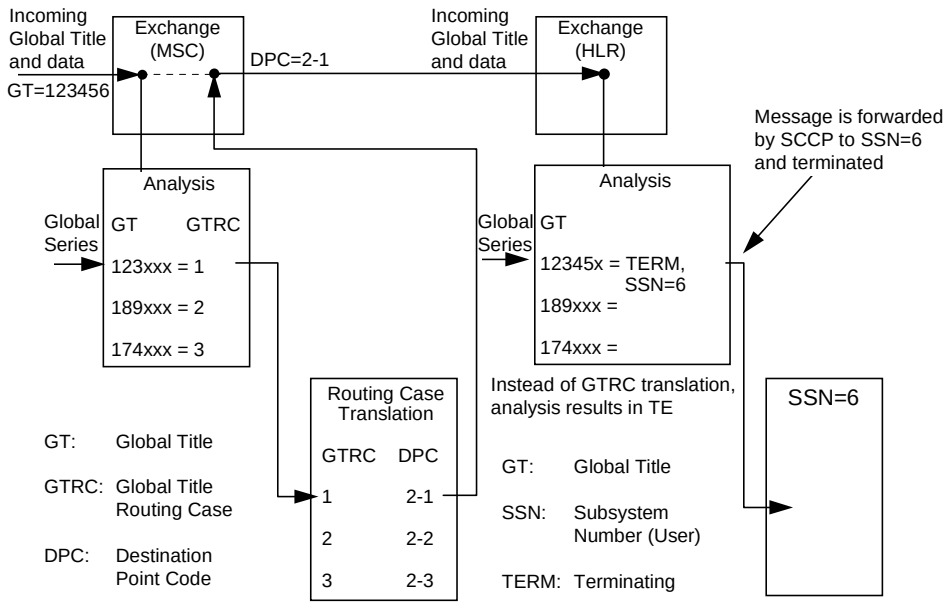
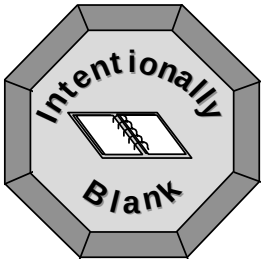


Figure 9-9 SCCP global title translation will either result in a GT routing case or in an indication that the message terminates in this node.

SCCP in the MSC analyses the GT and determines that all GTs that start with 123 should be sent to GTRC=1. To find out the DPC for GTRC=1, SCCP looks in a routing case translation table. The information about the DPC is then sent to the MTP

which sends the message to the appropriate SP. At the destination DPC=2-1, the GT analysis shows that the message terminates in this node. The subsystem is HLR and SCCP routes the message to HLR.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