MSC-BSC Interface

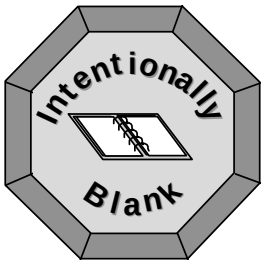
Chapter 10

This chapter is designed to provide the student with an overview of the MSC-BSC interfaces (A and Ater interface).

OBJECTIVES:

Upon completion of this chapter the student will:

- be able to describe when the BSSAP protocol (MSC-BSC) is used on the A interface.
- be able to describe when the BTAP protocol (BSC-TRC) is used on the Ater interface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10 MSC-BSC Interface

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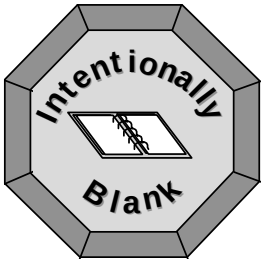
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GENERAL

INTRODUCTION

The interface separating the BSS from the MSC is called the A interface. In Ericsson GSM system, if the separate Transcoder Controller (TRC) or remote BSC without transcoding capabilities are used, the interface between TRC and BSC is called Ater interface.

The underlying transport mechanism defined to carry signaling information between the BSC, the TRC and the MSC is the MTP and the SCCP of C7 system.

MTP provides reliable transfer of signaling messages over one or more 2 or 1.5 Mbps digital transmission links. Each 2 or 1.5 Mbps interface provides 31 or 24 times 64 kbps channels which can be used for traffic or signaling as the operator requires.

SCCP is used for setting up logical connections which makes it possible to identify communication with a particular mobile.

MTP and SCCP are described in previous chapters.

One of the SCCP user functions is called Base Station System Application Part (BSSAP). It is described in the next section. It is responsible for standard GSM signaling between MSC and BSC.

Signaling between TRC and BSC is done using Ericsson proprietary protocol called BTAP, BSC/TRC Application Part. It is described in the last section of this chapter.

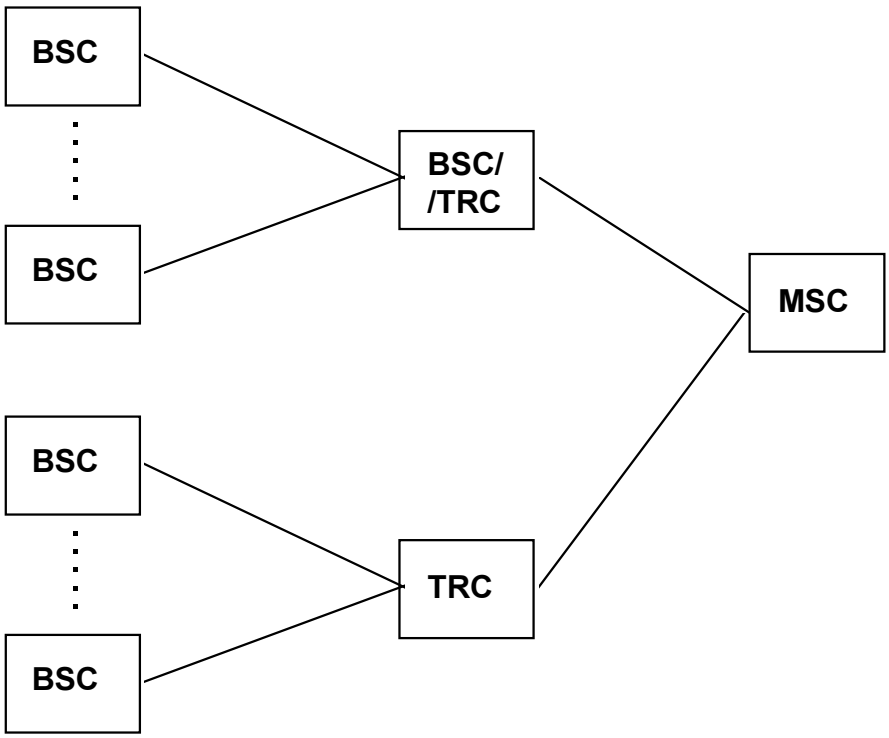
NETWORK STRUCTURE

Two new types of physical network elements are introduced – the BSC (without transcoders) and the Transcoder Controller (TRC). With the existing combined BSC/TRC, the BSC and the TRC provide the operator with a flexible way of implementing different BSS topologies. Refer to Figure 10-1.

The TRC node has the ability to support up to sixteen BSCs over the Ater interface. The transcoders in the various TRA pools in a TRC can be shared between all BSCs associated with the TRC. One of the connected BSCs may reside on the same physical platform as the TRC, that is, in a combined BSC/TRC network element.

One TRC or BSC/TRC can be connected to up to four MSCs. This makes it possible to build large TRCs supporting several MSCs. One BSC is still controlled by one specific MSC.

The TRC can contain several transcoder pools, one pool per type of transcoder resource (for example Full Rate, Enhanced Full Rate and Half Rate pools). The transcoders are allocated on a per call basis which means that transmission (between TRC and TRXs) and transcoder resources are used more efficiently.



TRC = Transcoder Controller
A interface = MSC/BSC interface
Ater interface = BSC/TRC interface

Figure 10-1 The MSC-BSC interface structure

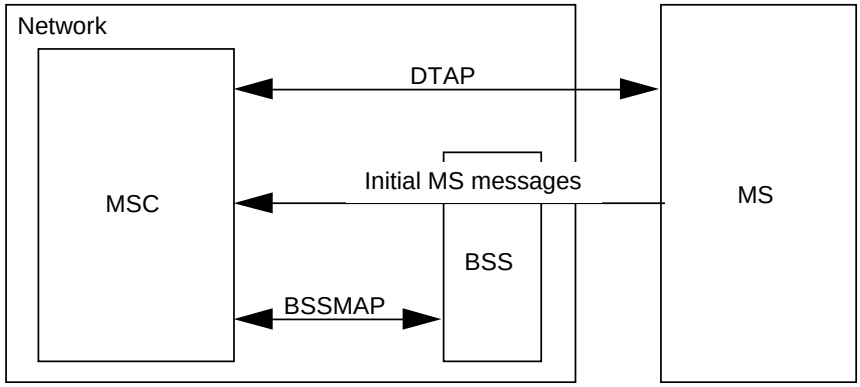
BASE STATION SYSTEM APPLICATION PART

The BSSAP protocol has been specially developed for the A-interface. It not only supports messages between the MSC and BSS, but also messages between the MSC and MS. BSSAP uses one signaling connection for each active MS, having one or more active transactions for the transfer of layer 3 messages.

BSSAP is split into two subparts (see Figure 10-2):

- **Direct Transfer Application Part (DTAP) -** which is used to send Connection Management (CM) and Mobility Management (MM) messages between the MSC and MS. These messages are sent transparently through the BSS in connection oriented mode. The CM and MM protocols are described in chapter 6 “Um interface”.
- **Base Station System Management Application Part (BSSMAP) -** which is used to send messages between the MSC and BSC that are related to:
  - the MS (handover control, resource management)
  - a cell within the BSS
  - the whole BSS

  BSSMAP uses both the connection oriented (CO) and the connectionless signaling (CL) services of SCCP. Messages to support dedicated procedures for example handover procedures, assignment procedures or initial MS messages; are sent using CO mode. Messages used to support global procedures (messages that concern a complete cell or the complete BSS) are sent using CL mode. Examples of messages sent in CL mode are:
  - block (a trunk)
  - reset (restart)
  - paging



DTAP = Direct Transfer Application Part
BSSMAP = BSS Management Part

Figure 10-2 Logical differences between BSSMAP, DTAP and Initial MS messages.

There is a distribution function in BSSAP which discriminates between messages belonging to the two subparts. See Figure 10-3.

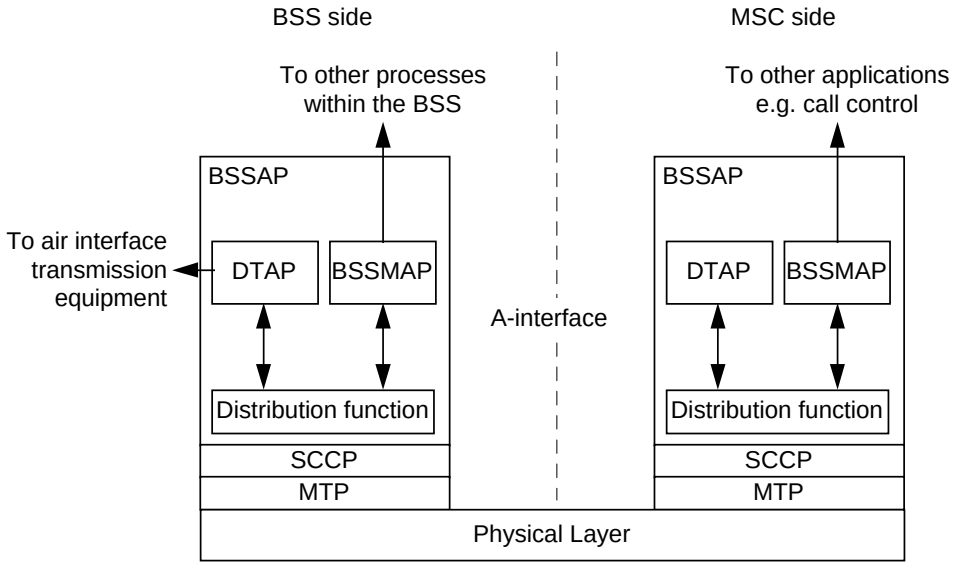


Figure 10-3 BSSAP, divided into BSSMAP, DTAP, and the distribution function.

The Distribution Data Unit (DDU) in the message is analyzed in order to decide whether it is DTAP or BSSMAP. See Figure 10-4.

MESSAGE FORMAT

Because MTP is used, the upper layer information is carried by MSUs. See chapter 8 “MTP”. The SIO field indicates SCCP. In the SCCP part, there is a SSN pointing at BSSAP (SSN=254). The SCCP user data field starts with a BSSAP header consisting of a Distribution Data Unit (DDU) and a length indicator. The layer 3 message follows. See Figure 10-4.

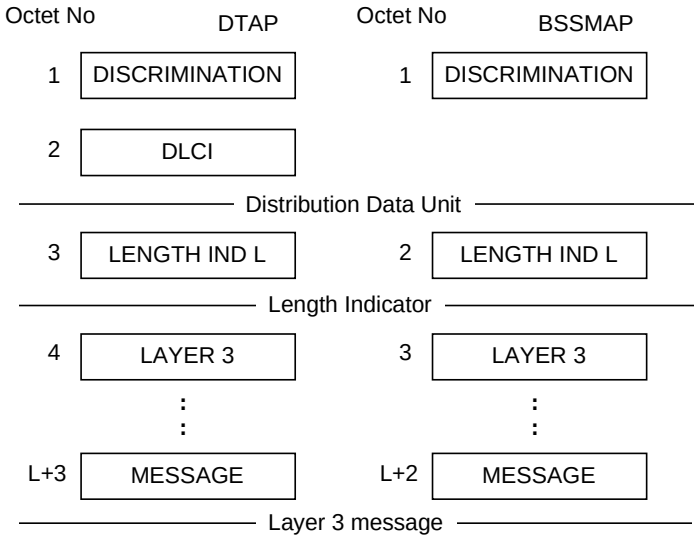


Figure 10-4 Structure of DTAP and BSSMAP messages.

The first octet of the DDU contains the discrimination parameter. The parameter equals 1, meaning transparent, for a DTAP message and equals 0, meaning non transparent, for a BSSMAP message. For DTAP messages, the DDU also contains a Data Link Connection Identification (DLCI) parameter. The DLCI parameter is used to indicate the data link connection used over the radio interface with help of the SAPI value. For explanation of SAPI, see chapter 6 “Um interface”.

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

Figure 10-5 shows the messages used by BSSMAP.

Connectionless:
Block
Blocking acknowledge
Paging
Reset
Reset acknowledge
Reset circuit
Reset circuit acknowledge
Unblock
Unblocking acknowledge

Connection oriented:
Assignment request
Assignment complete
Assignment failure
Cipher mode command
Cipher mode complete
Classmark update
Clear command
Clear complete
Clear request
Complete layer 3 information
Handover command
Handover complete
Handover detect
Handover failure
Handover performed
Handover request
Handover request acknowledge
Handover required
Handover required reject
SAPI “n” clear command
SAPI “n” clear complete
Trace inovocation

Figure 10-5 Messages for BSSMAP.

Messages for CM and MM, sent as DTAP over the A-interface are described in chapter 6 “Um interface”.

INITIAL MS MESSAGES

There are some messages that are sent transparently between the MSC and the MS, but to which the BSC adds some information. These messages are called initial MS messages. See Figure 10-2:

- Location Updating Request
- Paging Response
- IMSI detach
- CM Service Request

When an initial MS message is received in the BSC, the BSC analyses parts of the message, adds CGI and sends it all to the

MSC in a BSSMAP message called “Complete Layer 3 Information”. CGI can for example be used for charging (home cells) and for routing emergency calls to the nearest rescue center.

Figure 10-6 shows when BSSMAP and DTAP protocols can be used.

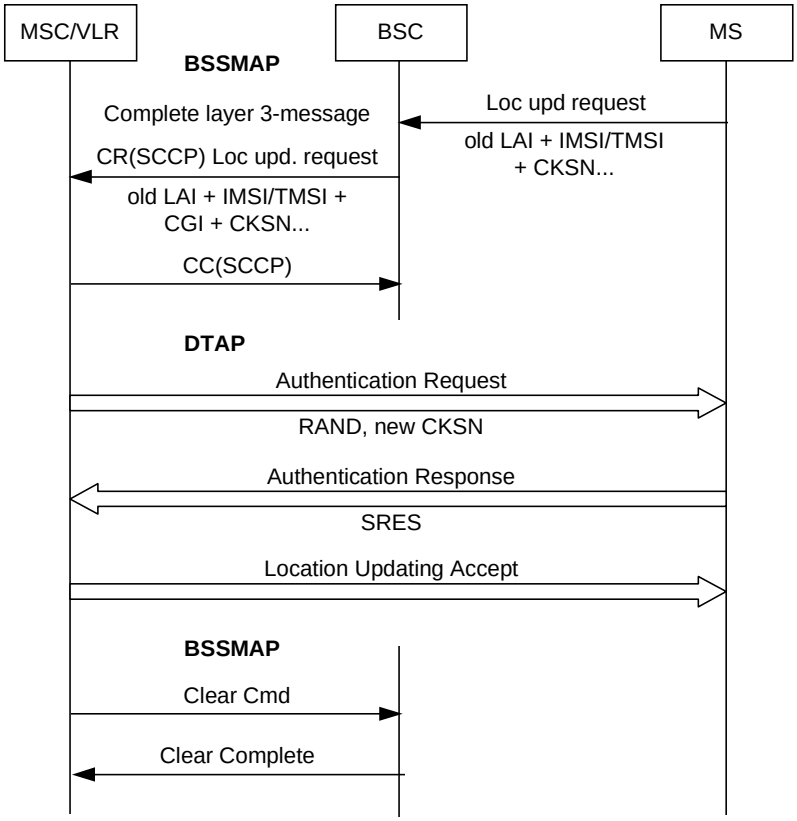


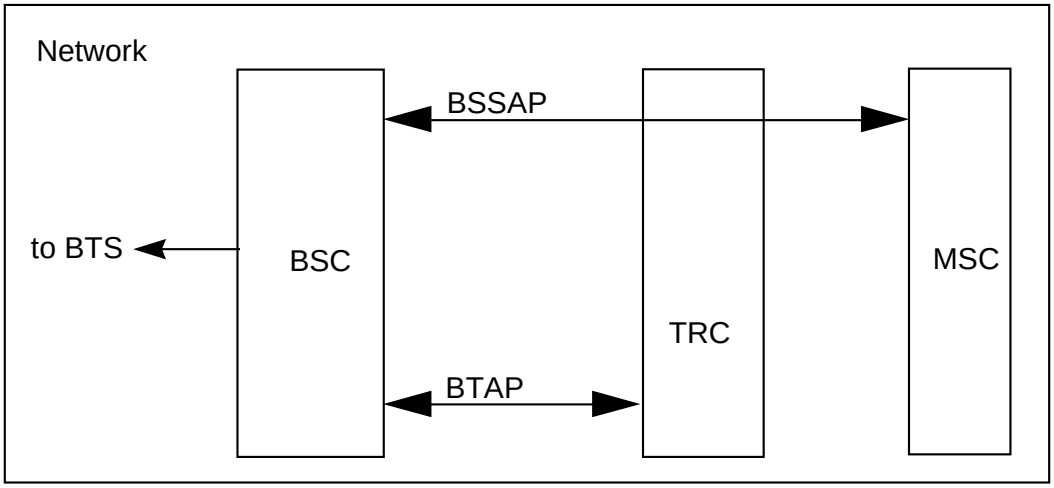
Figure 10-6 An example of Location updating - BSSAP.

BSC/TRC APPLICATION PART

BTAP is an Ericsson proprietary protocol used for signaling between the BSC and TRC in system revision R7 when separated TRCs and/or remote BSCs are used. The A interface signaling remains unchanged in the new system structure. In the case of a combined BSC/TRC, internal signaling between the TRC and BSC part is used.

The BSC/TRC Application Part (BTAP) sends messages associated with mobile traffic in CO mode of the SCCP protocol. All other messages are sent in CL mode.

Although the physical connection originates from the MSC via the TRC (or BSC/TRC) to the serving BSC, the serving BSC controls the TRC. BSSAP signaling travels transparently through the TRC node. See Figure 10-7.



BTAP = BSC/TRC Application Part
BSSAP = BSS Application Part

Figure 10-7 Signaling on Ater interface.

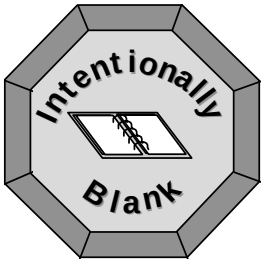
OPERATION AT CALL SETUP

A new SCCP signaling connection is initiated when the BSC wishes to seize transmission resources in the TRC for a specific mobile call or test connection. Only the BSC initiates establishment of a SCCP signaling connection. The BSC sends a SEIZE TRANSMISSION message or a SEIZE TEST CONNECTION message to the TRC. These messages are

included in the SCCP connection request message user data field.

The normal release procedure for an Ater signaling connection is always initiated by the BSC by sending a RELEASE TRANSMISSION message. When the BSC has received a RELEASE TRANSMISSION ACKNOWLEDGE message from the TRC, the BSC initiates the SCCP signaling connection release.

At call setup and after signaling connection setup, an assignment request is sent via the MSC to the BSC. The request is sent directly to the BSC and can pass transparently through the TRC or BSC/TRC. The BSC receives the assignment request and requests a transcoder device from the TRC or BSC/TRC also indicating the A-interface CIC to be used for this specific call. The TRC or BSC/TRC allocates a transcoder device and the time slot on the Ater interface, which is connected to the A-interface CIC specified by the MSC. The TRC or BSC/TRC replies to the BSC, which establishes the connection to the mobile station.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