- **Temporary mobile subscriber identity (TMSI)**: As all transmission is sent through the air interface, there is a constant threat to the security of information sent. A temporary identity is usually sent in place of IMSEI.

11.4.4 Interfaces, Planes, and Layers of GSM

In a cellular network, possible interfaces are air interface U_m between MS and BTS; interface A_{bis} between BSC and BTS; interface A between BSC and MSC; and MAP (mobile application part), which defines operation between the MSC and the telephone network (Table 11.4).

Table 11.4: ▶
Interfaces of GSM

Interface Designation		Between
U_m		MS–BTS
A_{bis}		BTS–BSC
A		BSC–MSC
MAPn	B	MSC–VLR
	C	MSC–HLR
	D	HLR–VLR
	E	MSC–MSC
	F	MSC–EIR
	G	VLR–VLR

Functionally, the GSM system can be divided into five planes, as shown in Figure 11.16. The physical plane provides the means to carry user information (speech or data) on all segments along the communication path and to carry signaling messages between entities [11.3]. Radio resource management (RR) establishes and releases stable connections between MSs and a MSC and maintains them despite user movements. The RR functions are mainly performed by the MS and the BSC. Mobility management (MM) functions are handled by the MS (or SIM), the HLR/AUC, and the MSC/VLR. These also include management of security functions. Communication management (CM) is used to set up calls between users and maintain and release resources. In addition to call management, it includes supplementary services management and short message management. Operation, administration, and maintenance (OAM) enables the operator to monitor and control the system at any time.

For a MS to operate in a MSC, it must be registered by accessing the BSS, which allocates the channels, after authenticating the MS by accessing the VLR through

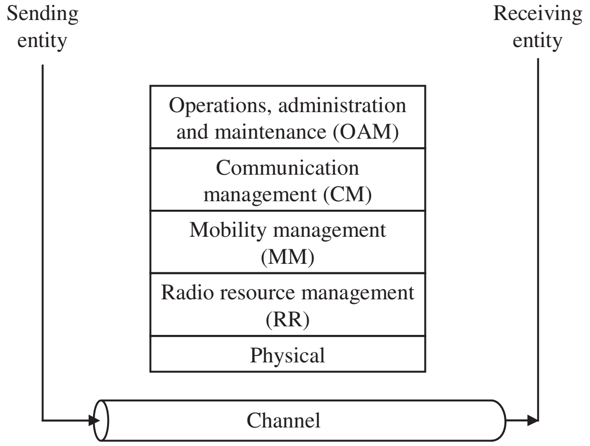
Sending entity
Receiving entity
Operations, administration and maintenance (OAM)
Communication management (CM)
Mobility management (MM)
Radio resource management (RR)
Physical
Channel

Figure 11.16 Functional planes in GSM.

the MS's HLR. The MSC then assigns a TMSI to the MS and updates the VLR and HLR.

To make a call from a telephone in the PSTN, the packets travel through the gateway MSC to the terminating MSC (the place where the MS is located) after getting the information from the home HLR of the MS. Then the MS is contacted through the BSS, where the MS is roaming. If it is the same MSC, there is no problem. But if it is not, then the VLR of the current MSC contacts the HLR of the MS's home MSC, which notifies the prior MSC about relocation of the MS. Hence these three registers are updated with the new information.

Authentication in GSM is done with the help of a fixed network that is used to compare the IMSI of the MS reliably (Figure 11.17). When the MS asks for any request, the fixed network sends it a random number, and it also uses an authentication algorithm to encrypt with the IMSI and the key stored in its memory. In the MS, the received random number is encrypted using IMSI, and the same key is transmitted to the fixed network, which compares it with the original value sent by the fixed network. If they match, then the MS is authentic.

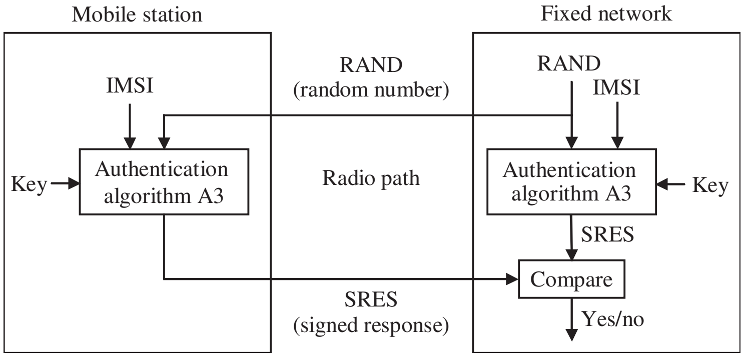

Figure 11.17 Authentication process in GSM.