

GLOBAL SYSTEM FOR MOBILE (GSM) COMMUNICATIONS

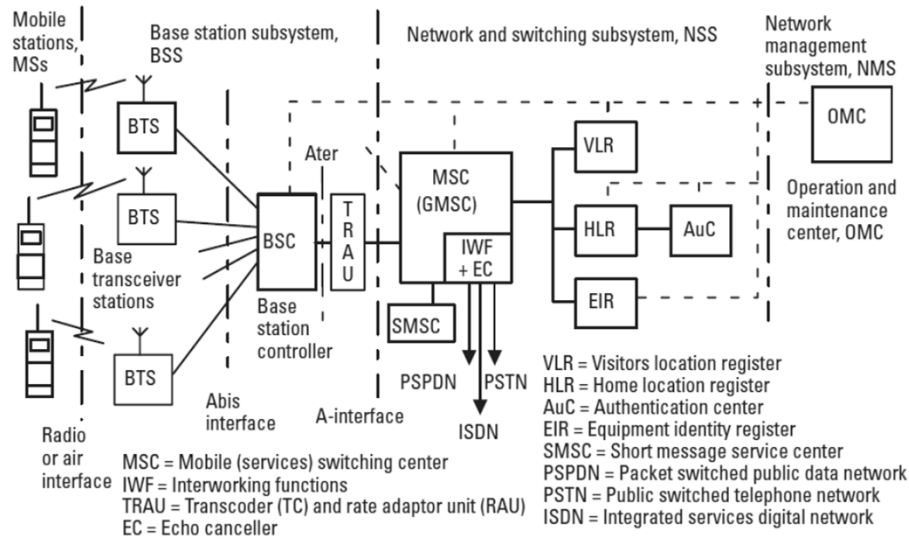


GSM

- The European digital cellular system GSM was developed by CEPT during the 1980s
- Two other cellular networks are based on GSM technology:
 - the European DCS-1800, which operates in the 1.8-GHz band,
 - the American GSM-1900, which operates in the 1.9-GHz band.
- In GSM, subscription and mobile equipment are separated:
 - Subscriber data are stored and handled by a subscriber identity module (SIM), which is a smart card belonging to a subscriber.
 - The radio equipment is called mobile equipment (ME)
- The mobile station consists of two parts: ME and SIM

MS=SIM+ME

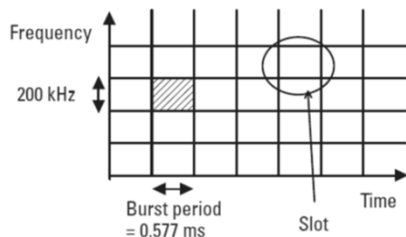
Structure of the GSM Network



Physical Channels

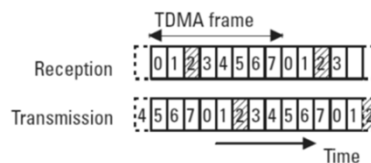
- The multiple-access scheme used in GSM utilizes two access methods: FDMA and TDMA.

A transmission burst occupies a window in time and frequency called a slot. There are eight time slots on each carrier frequency. Eight simultaneous calls may use the same frequency.



Bidirectional radio transmission has fixed duplex distance: 45 MHz (900 MHz band) and 95 MHz (1,800 MHz band).

Emission of a mobile station takes place 3 burst periods later than reception.



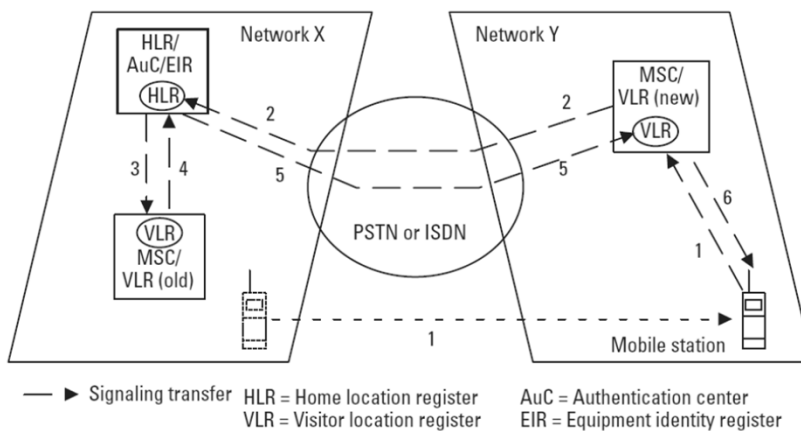
A mobile station receives, shifts the frequency by 45 or 95 MHz, and emits a moment later.

Logical Channels

- The physical channels at the GSM radio interface are divided into logical channels.
- Logical channels are mapped onto one physical channel defined as one slot (usually TS0) in each TDMA frame and transmitted as regular radio bursts.
- When the call is connected, two channels on the radio path are dedicated to it:
 - the traffic channel (TCH)
 - the slow associated control channel (SACCH)
- The following information from the network to the MSs:
 - Synchronization information of frequency and time slots;
 - Information about common channels that is used by neighboring cells;
 - Location area and network identification;
 - Paging messages for incoming calls and channel assignment for a new call.

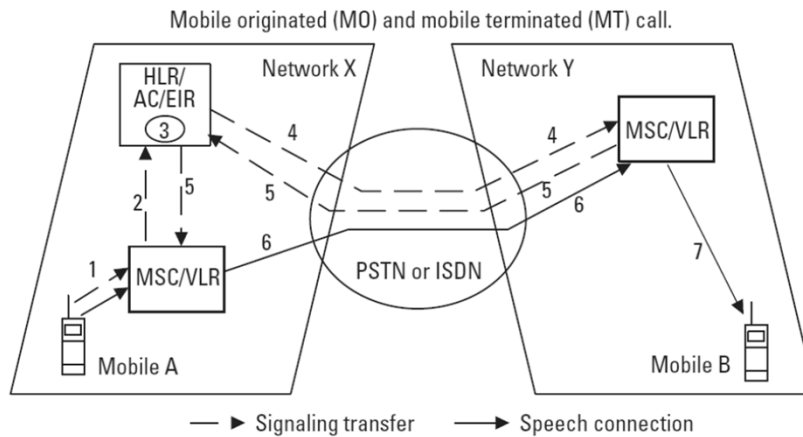
Operation of the GSM Network

Location update in GSM network



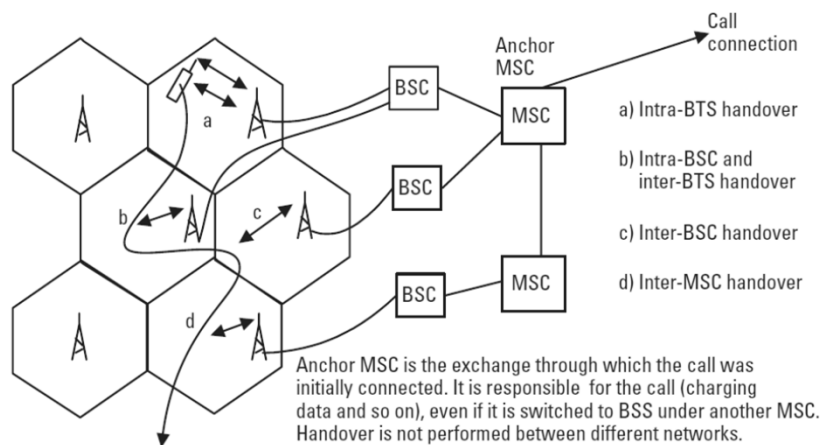
Operation of the GSM Network

Mobile call in a cellular network



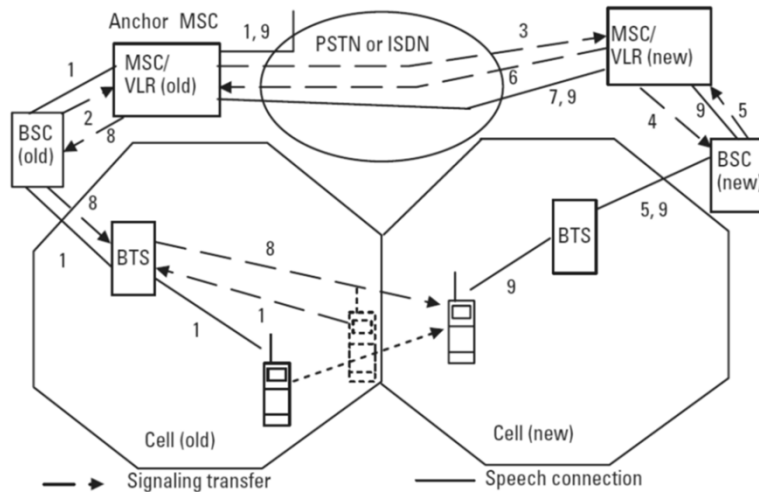
Operation of the GSM Network

Handover or handoff



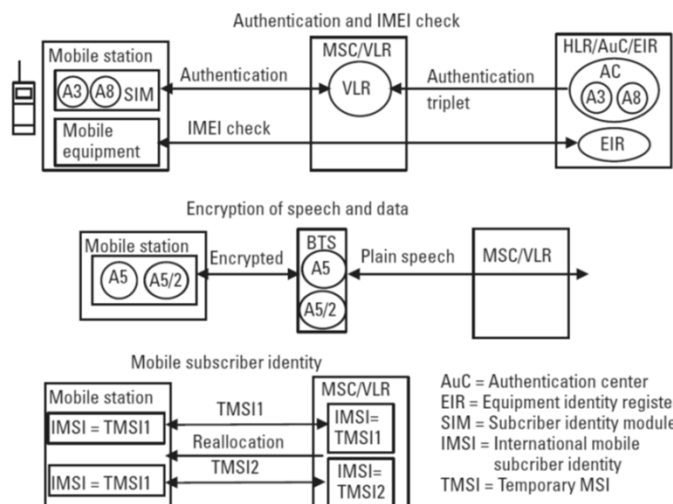
Operation of the GSM Network

Handover or handoff between two MSCs



Operation of the GSM Network

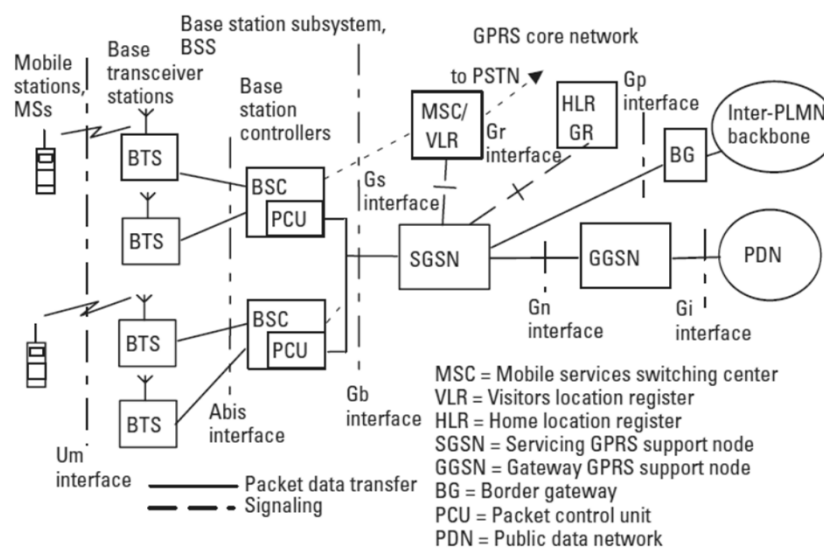
The security functions of GSM



GSM Enhanced Data Services

- To meet increased demand for better data services, standards have been developed for a new channel coding (14.4 Kbps), high-speed circuit-switched data (HSCSD), GPRS, and enhanced data rate in GSM evolution (EDGE).
- HSCSD is sometimes called multi slot service and it increases data throughput by combining one to four time slots on one carrier frequency into a single data channel.
- EDGE implements a new modulation scheme in the GSM air interface.
- EDGE defines several coding schemes and by selecting a suitable modulation and coding scheme the system can adapt its operation to channel conditions.

GPRS Network Structure



Operation of GPRS

- GPRS provides genuine packet-switched radio access and packet service users share the radio channels allocated for GPRS.
- When a GPRS user wants to access a packet-switched service, he or she performs GPRS attach.
- IP address is allocated for the MS and the user sees the Web page of his or her ISP's browser.
- Physical radio channel transmits data blocks that occupy one time slot in four subsequent TDMA frames.