



UNIT-III

Localization and calling

Madheswari.K
AP/CSE





Localization and calling

- One fundamental feature of the GSM system is the automatic, **worldwide localization of users.**
- The system always knows where a user currently is, and the **same phone number is valid worldwide.**
- To provide this service, GSM performs **periodic location updates even if a user does not use the mobile station** (provided that the MS is still logged into the GSM network and is not completely switched off).
- **HLR**-contains information about the **current location**
- **VLR**-currently responsible for the MS informs the **HLR about location changes**

Roaming

- Changing VLRs with **uninterrupted availability of all services** is also called roaming.
- Roaming can take place within the network of one provider, between two providers in one country (**national roaming** is, often not supported due to competition between operators), but also between different providers in different countries (**international roaming**).





Localization and calling

- To locate an MS and to address the MS, several numbers are needed:

1) Mobile station international ISDN number (MSISDN):

- ❑ only important number for a user of GSM is the phone number. Remember that the phone number is not associated with a certain device but with the SIM, which is personalized for a user.

- ❑ **Example**

- ❑ +49 179 1234567

country code (CC) +49 49 for Germany

- ❑ national destination code (NDC) (i.e., the address of the network provider, e.g., 179)
- ❑ subscriber number (SN).





Localization and calling

- To locate an MS and to address the MS, several numbers are needed:

2) International mobile subscriber identity (IMSI):

- GSM uses the IMSI for internal unique identification of a subscriber.
- IMSI consists of a **mobile country code (MCC)** (e.g., 240 for Sweden, 208 for France),
- the **mobile network code (MNC)** (i.e., the code of the network provider),
- and finally the **mobile subscriber identification number (MSIN)**.





Localization and calling

- To locate an MS and to address the MS, several numbers are needed:

3) Temporary mobile subscriber identity (TMSI):

- To hide the IMSI, which would give away the exact identity of the user signalling over the air interface, GSM uses the 4 byte TMSI for local subscriber identification.
- TMSI is selected by the current VLR and is only valid temporarily and within the location area of the VLR (for an ongoing communication TMSI and LAI are sufficient to identify a user; the IMSI is not needed).
- Additionally, a VLR may change the TMSI periodically.





Localization and calling

- **To locate an MS and to address the MS, several numbers are needed:**

4) Mobile station roaming number (MSRN):

- Another temporary address that hides the identity and location of a subscriber is MSRN.
- The VLR generates this address on request from the MSC, and the address is also stored in the HLR.
- MSRN contains the current visitor country code (VCC), the visitor national destination code (VNDC), the identification of the current MSC together with the subscriber number.
- The MSRN helps the HLR to find a subscriber for an incoming call.

All these numbers are needed to find a subscriber and to maintain the connection with a mobile station.





Mobile Terminated Call (MTC)

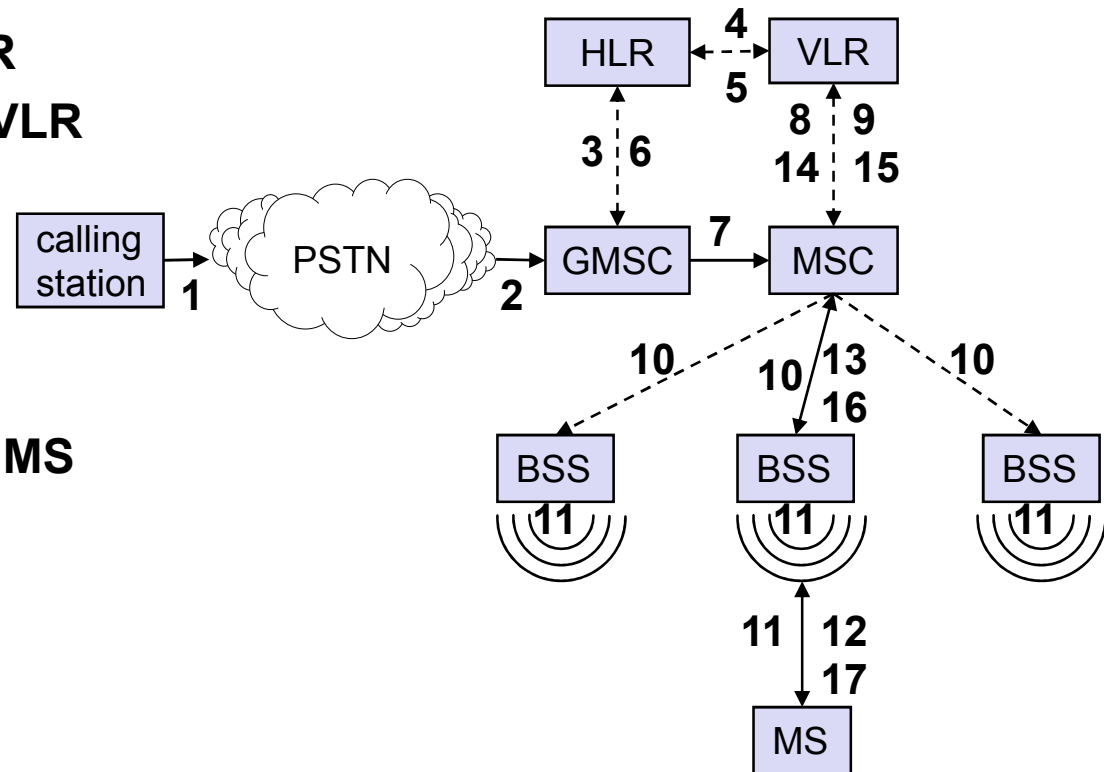
- The interesting case is the mobile terminated call (MTC), i.e., a situation in which a station calls a mobile station (the calling station could be outside the GSM network or another mobile station).





Mobile Terminated Call

- 1: calling a GSM subscriber
- 2: forwarding call to GMSC
- 3: signal call setup to HLR
- 4, 5: request MSRN from VLR
- 6: forward responsible MSC to GMSC
- 7: forward call to current MSC
- 8, 9: get current status of MS
- 10, 11: paging of MS
- 12, 13: MS answers
- 14, 15: security checks
- 16, 17: set up connection





Mobile Terminated Call (MTC)- Paging

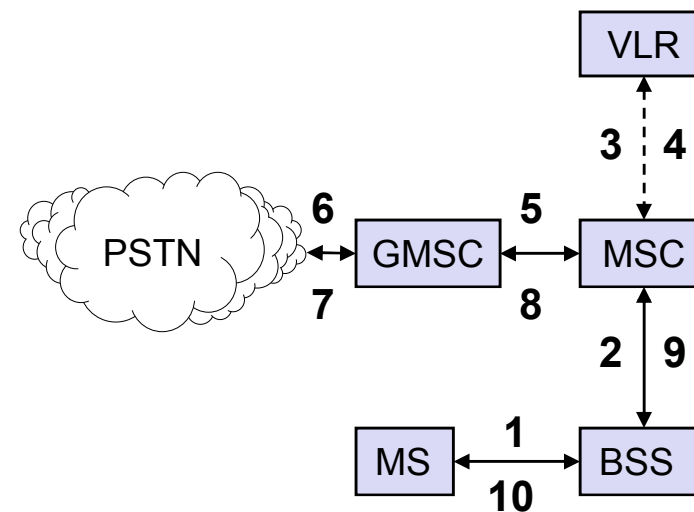
- A key use of the TMSI is in paging a mobile. "Paging" is the one-to-one communication between the mobile and the base station.
- The most important use of broadcast information is to set up channels for "paging".
- Every cellular system has a broadcast mechanism to distribute such information to a plurality of mobiles.





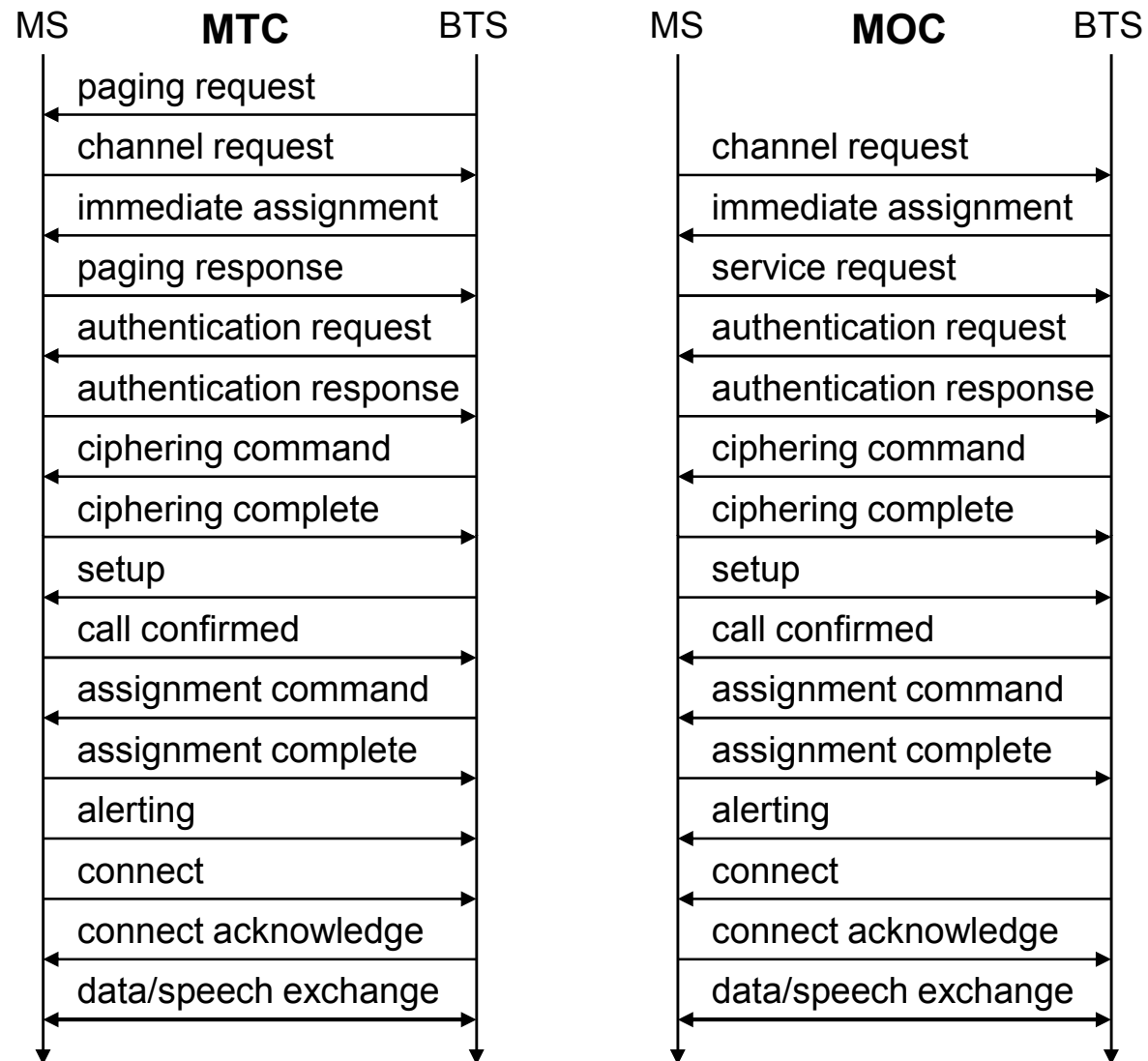
Mobile Originated Call

- 1, 2: connection request
- 3, 4: security check
- 5-8: check resources (free circuit)
- 9-10: set up call





MTC/MOC





Test Your Knowledge

- Do you know the current situation of mobile phone networks in Europe, Japan, China, and North America.
- What are the main differences, what are efforts to find a common system or at least interoperable systems?





Reference

➤
Jochen H. Schller, “Mobile Communications”, Second Edition, Pearson Education, New Delhi, 2007.
➤

