Module Interfaces (GSM Location Update Procedure)

**Subscribers**

- **BCCH** Location Area = Maryland, Signal Strength = Good
- **BCCH** Location Area = Maryland, Signal Strength = Great

**GSM Network**

- **BCCH** Location Area = Maryland, Signal Strength = Good
- **BCCH** Location Area = Vienna, Signal Strength = Great

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### GSM Mobile reaches cell boundary (both cells in same Location Area)

- **BCCH** Location Area = Maryland, Signal Strength = Good

  - The BCCH on the primary cell is monitored for signal strength.

- **BCCH** Location Area = Maryland, Signal Strength = Great

  - The BCCH of the neighboring cells is monitored to determine if any of the neighbors have a better signal strength. In this case, the cell has reached the boundary between Rockville and Bethesda cells and it finds that the signal quality of the Bethesda cell is better.

### GSM Mobile reaches Location Area boundary (old and new cells are in different Location Areas)

- **BCCH** Location Area = Maryland, Signal Strength = Good

  - The BCCH on the beacon frequencies is monitored.

- **BCCH** Location Area = Vienna, Signal Strength = Great

  - Now the Vienna cell is being received with better signal strength, so cell will be picked as primary.

### RR Connection Setup

- **RR CHANNEL REQUEST**

  - The mobile establishes a RR connection to send the location update to the network.

- **RR IMMEDIATE ASSIGNMENT**

  - A radio channel has been assigned to the GSM mobile.

### GSM Location Update Procedure

- **RR SABM + MM LOCATION UPDATING REQUEST**

  - Maryland TMSI, Maryland LAI

  - The mobile tunes to the assigned radio channel and sends the SABM to initiate the radio connection. The location update is also piggybacked on the message.

- **MM AUTHENTICATION REQUEST**

  - RAND

  - The MSC VLR decides to authenticate the subscriber. The RAND value received from the HLR is sent to the mobile.

- **MM AUTHENTICATION RESPONSE**

  - SRES

  - The mobile passes the computed SRES value in the response.

### Enable Ciphering

- **RR CIPHERING MODE COMMAND**

  - mode = CLEAR

  - The BSC sends the CIPHERING MODE COMMAND to the mobile.

- **RR CIPHERING MODE COMPLETE**

  - mode = CIPHERED

  - Ciphering has already been enabled, so this message is transmitted with ciphering.

- **MM LOCATION UPDATING ACCEPT**

  - Virginia TMSI

  - The new MSC replies back to the mobile via the Virginia BSC. The message also assigns a new Temporary Mobile Subscriber Id (TMSI) to the terminal. Since the TMSI assignment is being sent after ciphering is enabled, the relationship between TMSI and the subscriber cannot be obtained by unauthorized users.

- **MM TMSI REALLOCATION COMPLETE**

  - The GSM mobile replies back indicating that the new TMSI allocation has been completed.

### RR Connection Release

- **RR CHANNEL RELEASE**

  - The BSC initiates RR release with the mobile.

- **RR DISC**

  - The mobile sends a disconnect message to release the LAPm connection.

- **RR UA**

  - The BSC replies with an Unnumbered Acknowledge message.