

| Location Update (GSM Location Update Procedure) |            |                        |               |                        |               |                        |                        |                  |                                 |
|-------------------------------------------------|------------|------------------------|---------------|------------------------|---------------|------------------------|------------------------|------------------|---------------------------------|
| Subscribers                                     |            | GSM Network            |               |                        |               |                        |                        |                  | EventStudio System Designer 4.0 |
| GSM Mobiles                                     |            | Maryland Location Area |               | Maryland GSM Equipment | GSM Databases | Virginia Location Area | Virginia GSM Equipment |                  |                                 |
| Other GSM Mobile                                | GSM Mobile | Rockville Cell         | Bethesda Cell | Maryland MSC VLR       | HLR           | Vienna Cell            | Virginia BSC           | Virginia MSC VLR | 01-Oct-08 20:39 (Page 1)        |

This sequence diagram was generated with EventStudio System Designer 4.0 (<http://www.EventHelix.com/EventStudio>). The EventStudio source files for this document can be downloaded from <http://www.eventhelix.com/call-flow/gsm-location-update.zip>.

Have you ever wondered how your cellular provider is able to route calls to you virtually anywhere? How does the cellular provider know where you are?

The short answer to these questions is that your cell phone keeps the cellular operator informed about your location. In this sequence diagram we will examine how a mobile phones keep selecting the best cell to service your call and also keeps the cellular provider informed about your location.

We will be tracing the journey of a mobile phone from Rockville, Maryland to Vienna, Virginia. The path taken by the mobile phone is described in the following article:

[http://www.EventHelix.com/RealtimeMantra/Telecom/GSM\\_network\\_example.htm](http://www.EventHelix.com/RealtimeMantra/Telecom/GSM_network_example.htm)

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Before we go any further, let us discuss a few important terms.

**Location Area (LA)**

A GSM network is divided into cells. A group of cells is considered a location area. A mobile phone in motion keeps the network informed about changes in the location area. If the mobile moves from a cell in one location area to a cell in another location area, the mobile phone should perform a location area update to inform the network about the exact location of the mobile phone.

**Home Location Register (HLR)**

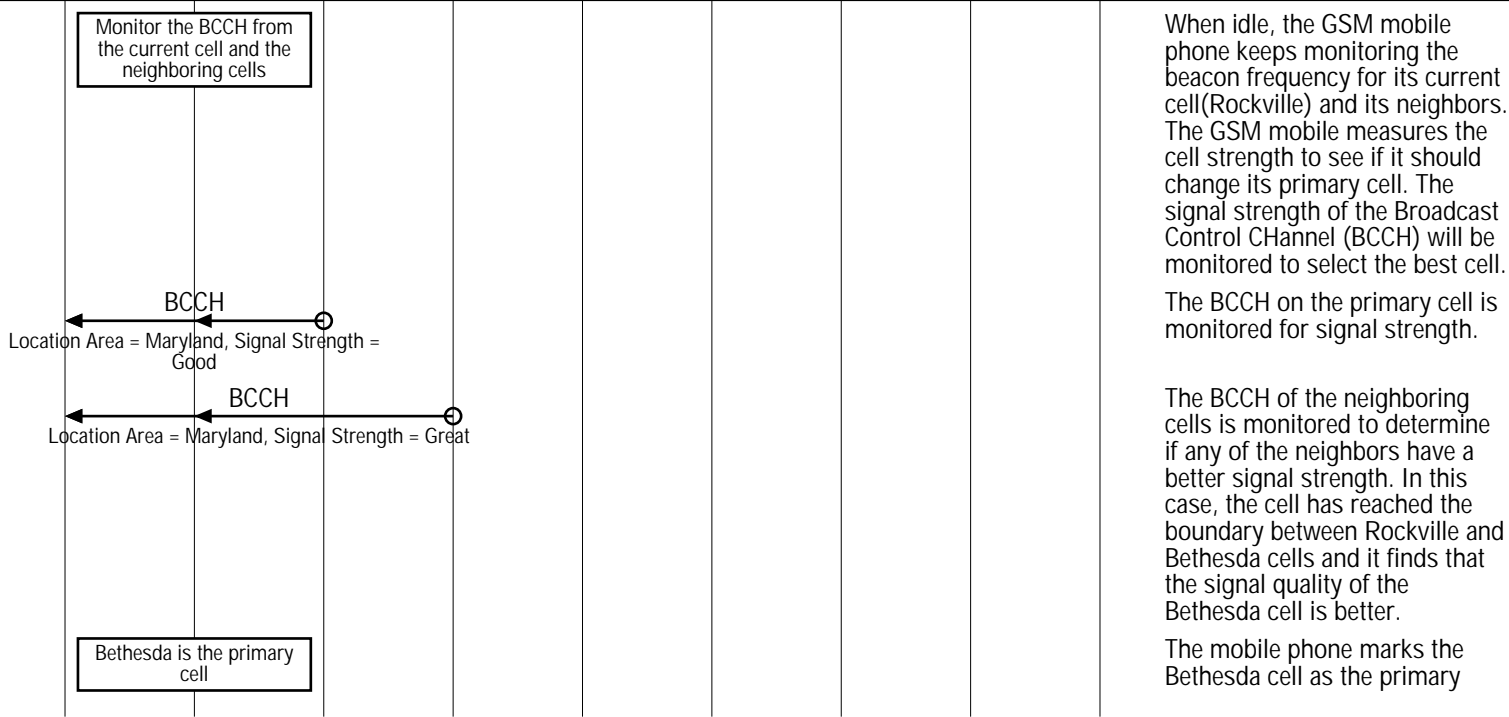
The HLR maintains a database for the mobile subscribers. At any point of time, the HLR knows the address of the MSC VLR that control the current location area of the mobile. The HLR is informed about a location area update only if the location area change has resulted in a change of the MSC VLR.

**Mobile Switching Center - Visitor Location Register (MSC VLR)**

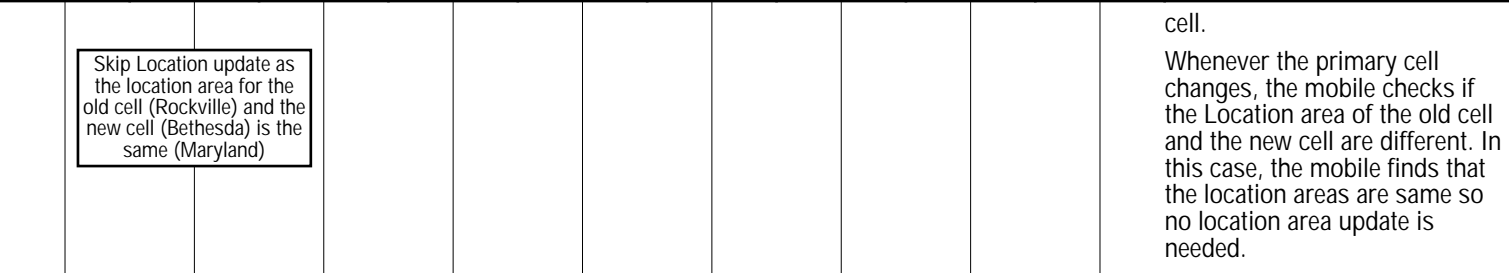
The MSC VLR is responsible to switching voice calls and it also keeps track of the exact location area where the mobile user is present. Note that a typical MSC VLR will service several location areas.

|                               |  |  |  |  |  |  |                                                      |
|-------------------------------|--|--|--|--|--|--|------------------------------------------------------|
| Rockville is the primary cell |  |  |  |  |  |  | The mobile phone is currently in the Rockville cell. |
|-------------------------------|--|--|--|--|--|--|------------------------------------------------------|

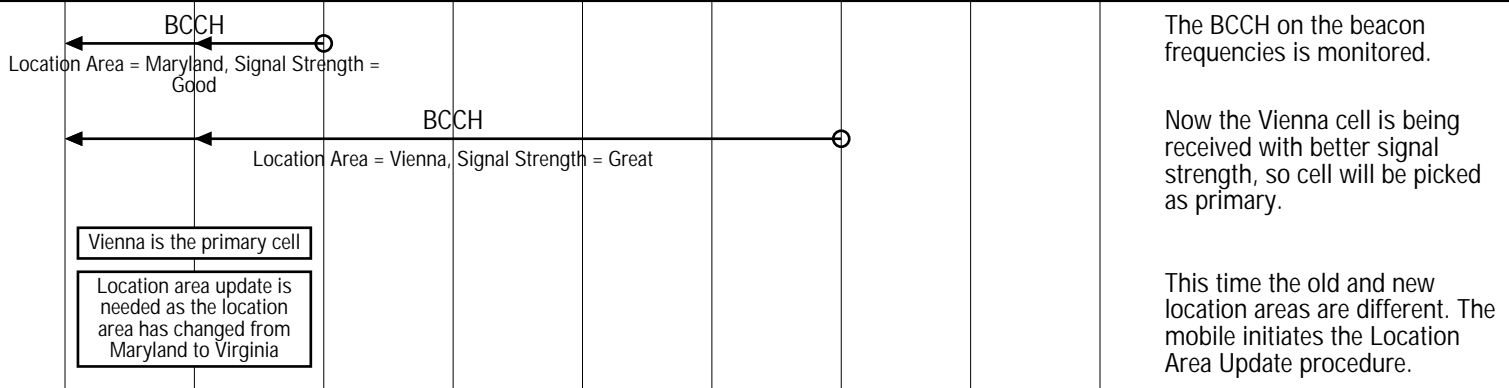
GSM Mobile reaches cell boundary (both cells in same Location Area)



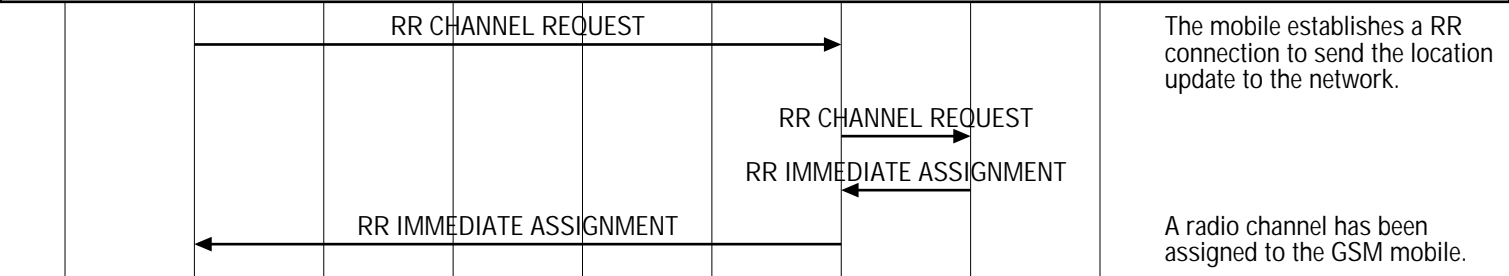
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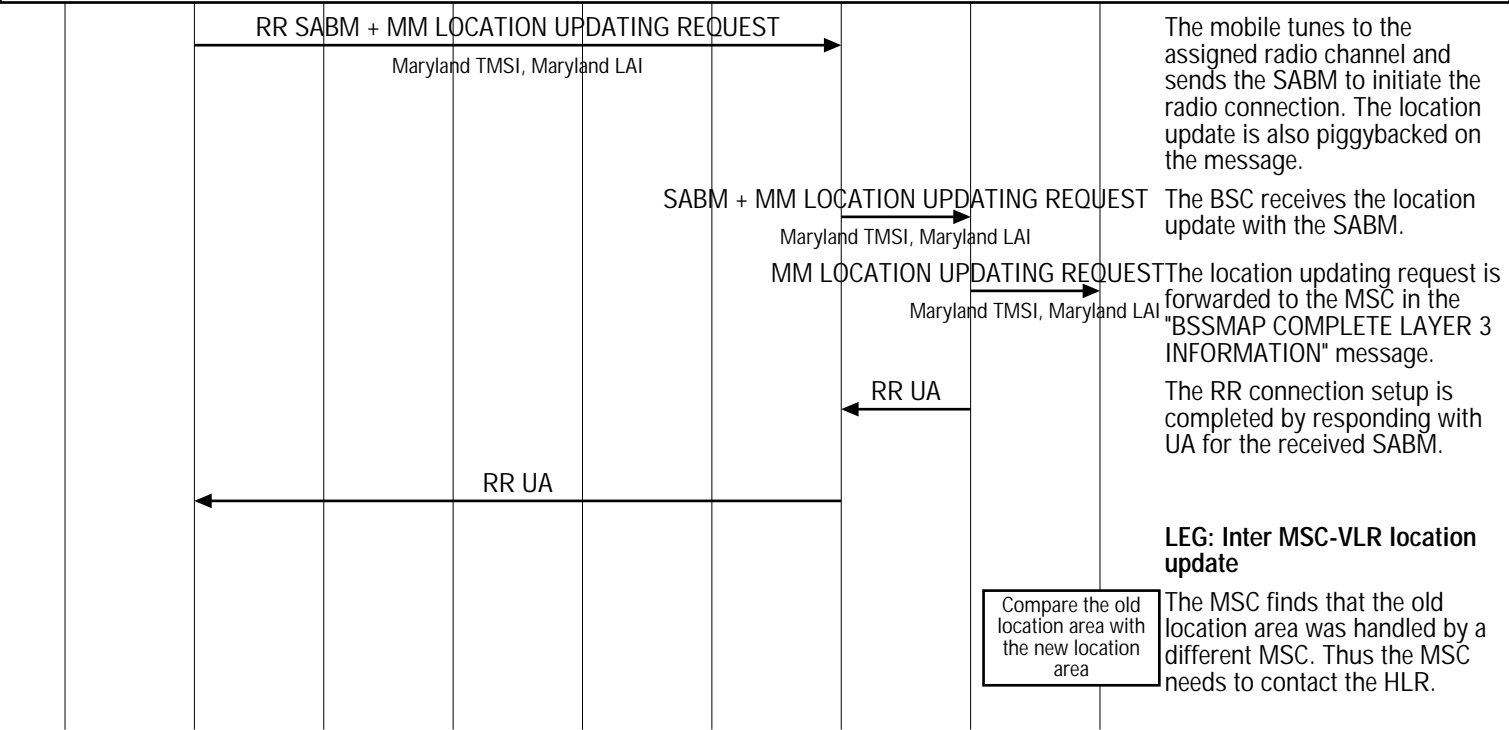
GSM Mobile reaches Location Area boundary (old and new cells are in different Location Areas)

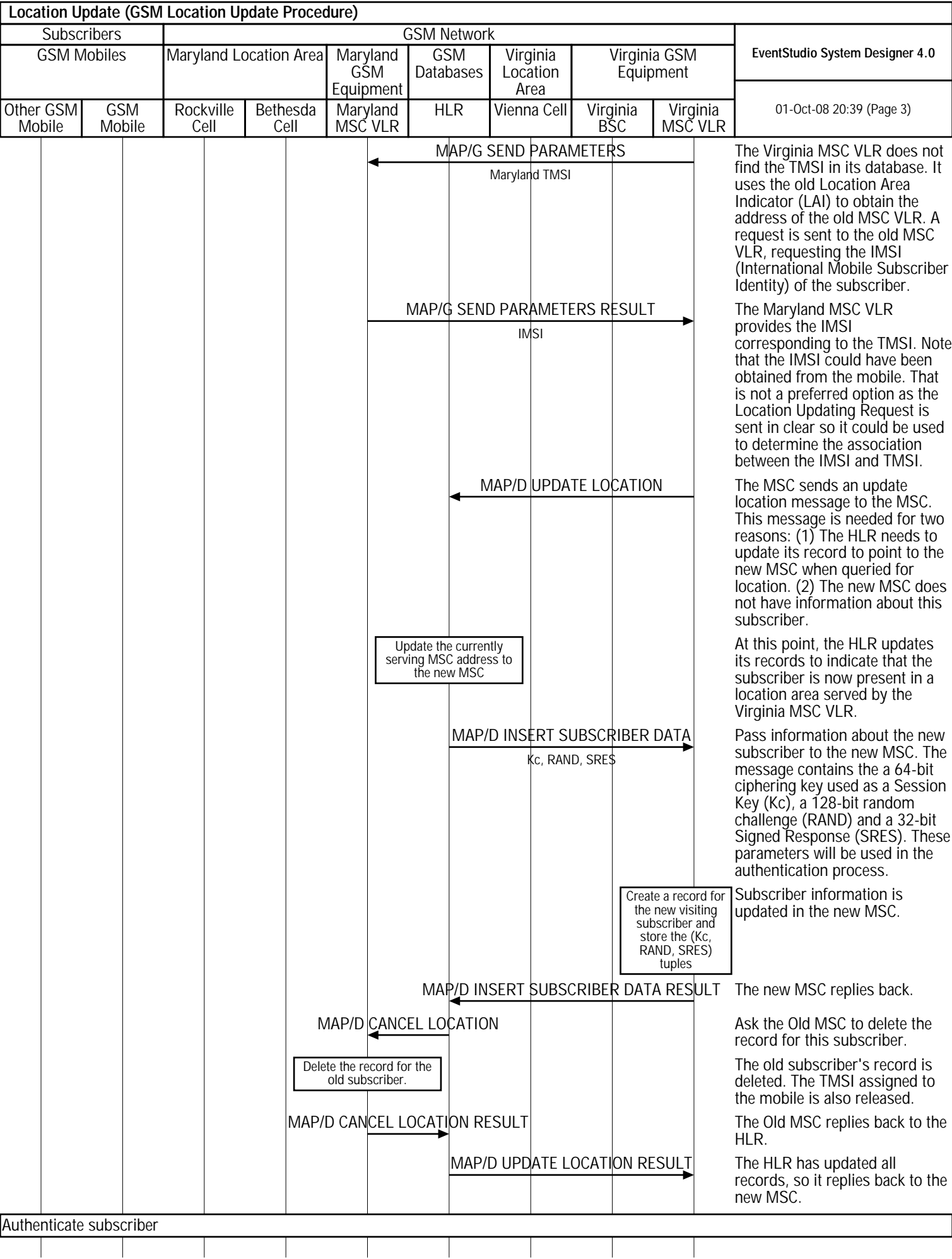


RR Connection Setup



GSM Location Update Procedure





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