



2G, 3G Network Planning and Optimization...

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1.10 Immediate Assignment Procedure

The purpose of immediate assignment is to establish a radio connection (RR connection) between MS and system at Um interface.

1.10.1 Network Access License and Random Access Request

The request of MS for channel assignment is controlled by its own access level and the access grant level broadcast in cell. Each MS has one access level of the ten levels from 0 to 9. In addition, it may also have one or several levels of the five special access levels from I1 to I5. Access level is stored in SIM card. BCCH system information broadcasts access levels and special access levels that the network grants and the information that whether all MSs allow emergency call or allow special access levels only. If the mobile originated call is not emergency call, the MS can access to network only when it belongs to the granted access level or granted special access level. If the mobile originated call is emergency call, the MS can access to network only when all the MSs in the cell allow emergency call or it belongs to the granted special access level.

When an MS wants to establish connection with the network, it sends a channel request to network through RACH channel. Channel request information contains 8-bit useful signaling information, among which 3 bits-6 bits are used as the minimal indicator of access cause. The system processes different channel requests based on this rough indication. It differentiates the granted calls from the denied calls and assigns proper channels for the granted calls. This kind of process is especially useful when the network is overload and the flow control is required. Since the channel capacity is limited, this indicator cannot transfer all the information from MS, such as the detailed cause of channel request, user identity and the features of mobile equipment. These kinds of information are sent in the following SABM messages. The 8-bit information also contains the random discriminator sent by the MS and the immediate assignment command (it contains information about the assigned channel). Immediate assignment command carries the discriminator sent by the previous MS. MS compares this discriminator with its own discriminator and judges whether it is the message for itself from network. Since there are at most 5 bits in the 8 bits information carrying discriminator, only 32 MSs can be differentiated at the same time. Further discrimination of the MSs requires the response information at Um interface. Channel request information belongs to internal information of BSS.

In GSM, RACH is a kind of ALOH. In order to reduce the collision on RACH during MS access to network and improve the efficiency of RACH channel and MS access. GSM specifies the required access algorithm for MS. This kind of algorithm defines three parameters: Tx_interger T, the maximum retransmission times RET, and parameter S related to T and channel combination.

T represents the number of timeslots between two transmissions when continuous channel requests are sent. S is an intermediate variable depends on T and the configuration of CCCH. See the description of this parameter in Chapter 7. RET is the MS maximum retransmission times allowed in order to avoid access collision. Each time after MS sends access request, T3120 is to receive (or reject) immediate assignment message. MS will retransmit access request for the messages that are not received or rejected when T3120 times out under the premise that RET is not exceeded and restart the T3120. When the retransmission times reaches RET and T3120 times out, T3126 will be started to receive (or reject) immediate assignment message. When T3126 times out, cell re-selection will be initiated.

1.10.2 Initial Immediate Assignment

After decoding the channel request information, BTS sends a channel required message to BSC. This message contains important additional information and the estimation of TA by BTS. After receiving this message, BSC selects a proper channel for this request and activates the land resources by sending a channel active message to BTS. BTS returns a channel active acknowledge message to BSC. If BSC receives this message, BTS will send an immediate assignment command or immediate assignment extended message on CCCH. In order to improve channel efficiency, GSM introduces the message layout of immediate assignment extended that contains the assignment information of two MSs. The immediate assignment message contains the assignment information of one MS. According to GSM specifications, MS must identify the immediate assignment (extended) information for the last three channel requests.

If there is no channel to activate, BSC will send an immediate assignment reject or immediate assignment extended reject message to MS. After receiving the reject message, MS stops T3120 based on one of the last three channel requests and starts T3122. During the specified time of T3122, MS has no access to network and turns into idle mode. Before T3122 times out, MS cannot initiate connection attempt except emergency call within the same cell.

After receiving immediate assignment message, MS compares the received assignment command with the information stored in its channel request and judges whether this message is for itself. If this message matches one of its last three channel requests, MS will stop T3120 or T3126 and switch to the assigned channel. Then it starts to establish the signaling link by using Set Asynchronous Balanced Mode (SABM) command.

1.10.3 Initial Message

After receiving immediate assignment message and decoding it, MS adjusts its configuration of transmission and reception to the assigned channel and transmits signaling according to the TA value specified by BSS and the initial maximum transmission power broadcast in BCCH system information (see the description of msTxPwrMaxCCH). MS sends an SABM frame on assigned SDCCCH/TCH to establish the asynchronous balanced mode (SAPI=0) that is used to establish signaling message link layer connection under acknowledgement mode. According to GSM protocol, SABM carries an initial message that contains layer 3 service request information.

When two MSs send the same channel requests (which is possible in high traffic volume area), the two MSs may respond to the same dedicated channel. In order to save this problem, after receiving SABM frame, BTS makes no modification but sends a UA frame (no frame number acknowledgement)

Live

ЭТО ДЕНЬ	724 195
ОТ ДНЕЙ	136 47
ВЧ МЕСЯ	45 8
СЕГОДНЯ	45 8
НА ПИНИИ	37 3

Hit

0 0 6 1 2 0

Постоянные читатели

containing the same information as that of initial message. If the information of UA frame is different from that of SABM frame, MS will abandon this channel and start reaccess process. Only the right MS can stay on this channel.

SABM frame carries four kinds of initial messages: CM service request (such as call setup, short message, and supplementary service), location updating request (generic location updating, periodic location updating, and IMSI attach), IMSI detach, and paging response. All these messages contain the identity of MS, detailed access cause, and MS classmark (indicating some key features such as transmission power level, encryption algorithm, short message capacity, and frequency capacity). After receiving the initial message, BTS sends an establish indication message to BSC. BSC receives this message and sends complete layer 3 information to MSC to request SCCP connection to MSC. Layer 3 information carries the causes for CM service request, which includes mobile originated call, emergency call, location updating, and short message service. This information also carries cipher key sequence number, MS identification number, and some physical information of the MS such as transmit power level, ciphering algorithm, pseudo-synchronization, and short message. After receiving this information, MSC sends connection confirmed message to BSC (if the connection cannot be established, MSC will send SCCP refused message) to indicate that the signaling link between MS and MSC has been established. By this time, MSC can control the transmission properties of RR management; BSS monitors the transmission quality and prepares for handover. Then the MM connection begins.

Authentication or encryption is triggered when required in the following processing.

In the immediate assignment process, T3101 starts when BSC sends channel active message to BTS and ends when the establish indication is received. If T3101 times out before signaling channel is established, the activated channel will be released.

1.10.4 Immediate Assignment Failure

If a failure occurs to the underlying MS on the new channel before the establishment of signaling link, the network releases the assigned channel of MS. The following processing depends on the failure type and previous actions. If the failure is caused by the mismatch of message field in decision contention and no re-assignment is initiated, the immediate assignment is restarted.

If the failure is caused by other reasons or if the re-assignment triggered by the mismatch of message field in decision contention is carried out and the assignment still fails, MS turns into idle mode and triggers cell re-selection.

If the available information is not sufficient to define a channel after the MS receives immediate assignment message, RR connection fails.

If the assigned frequencies of MS belong to two or more than two frequency bands, RR connection fails.

If the assigned frequency of MS is not consistent with the requested frequency but supported by MS, MS accesses the channel with the frequency used in channel request. If MS does not support the assigned frequency, RR connection fails.

If T3101 times out before the signaling channel is established, network releases the assigned channel.

Network cannot tell whether MS resends the access attempt or not.

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