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Palm Springs, USA, 14th - 16th March 2001

Tdoc NP-010163
revision of NP-010102

CR-Form-v3

CHANGE REQUEST

⌘ **24.008** **CR** ⌘ rev **-** ⌘ Current version: **3.6.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☒ Radio Access Network ☐ Core Network ☐

Title:	⌘	Modification to MS's MM states to enable LCS signalling on RR layer
Source:	⌘	Nokia
Work item code:	⌘	LCS ***Date:*** ⌘ 07.03.2001
Category:	⌘	**A** ***Release:*** ⌘ R99

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	LCS communication occurs in RR layer. For MT-LR/NI-LR case the MM layer is not active (from MS point of view) after authentication which causes that RR connection will be closed even if RR is needed for LCS signalling. The connection is closed by MS via T3240 timer within 10 seconds after last MM interaction. The LCS signalling may take longer than 10 seconds. This correction enables to stop T3240 timer and transit to a new MM state when RR layer sends indication to MM layer using RR-No-Abort-Ind (no abort) RR-SAP service primitive. The return to the normal MM operation occurs when RR-No-Abort-Ind (abort allowed) RR-SAP service primitive is received from RR layer. A new timer T32xx is added to quard the new MM state. This change together with CR to 04.07 (addition of RR-No-Abort-Ind primitive at RR-SAP in MS side) will correct the problem.
Summary of change:	⌘	The definition of a new MM state RR CONNECTION RELEASE NOT ALLOWED is added and the state transitions to/from the new state are defined. A new timer T32xx is defined.
Consequences if not approved:	⌘	RR connection is released by MS even if the RR is needed for LCS signalling

Clauses affected:	⌘	4.1.2.1.1, 4.2, 4.2.6 (added), 4.2.7 (added), 4.5.1.1, 11.2, 11.2.x (added)
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	This CR is coupled with CR to 04.07 (tdoc NP-010099 & NP-010100).

********** First Modified Section **********

4.1.2.1 MM sublayer states in the mobile station

In this section, the possible states for the MM sublayer in the mobile station is described. In figure 4.1/GSM 04.08 an overview of the MM sublayer protocol is given.

4.1.2.1.1 Main states

0 NULL

The mobile station is inactive (e.g. power down). Important parameters are stored. Only manual action by the user may transfer the MM sublayer to another state.

3 LOCATION UPDATING INITIATED

A location updating procedure has been started and the MM awaits a response from the network. The timer T3210 is running.

5 WAIT FOR OUTGOING MM CONNECTION

The MM connection establishment has been started, and the MM awaits a response from the network. The timer T3230 is running.

6 MM CONNECTION ACTIVE

The MM sublayer has a RR connection to its peer entity on the network side. One or more MM connections are active.

7 IMSI DETACH INITIATED

The IMSI detach procedure has been started. The timer T3220 is running.

8 PROCESS CM SERVICE PROMPT

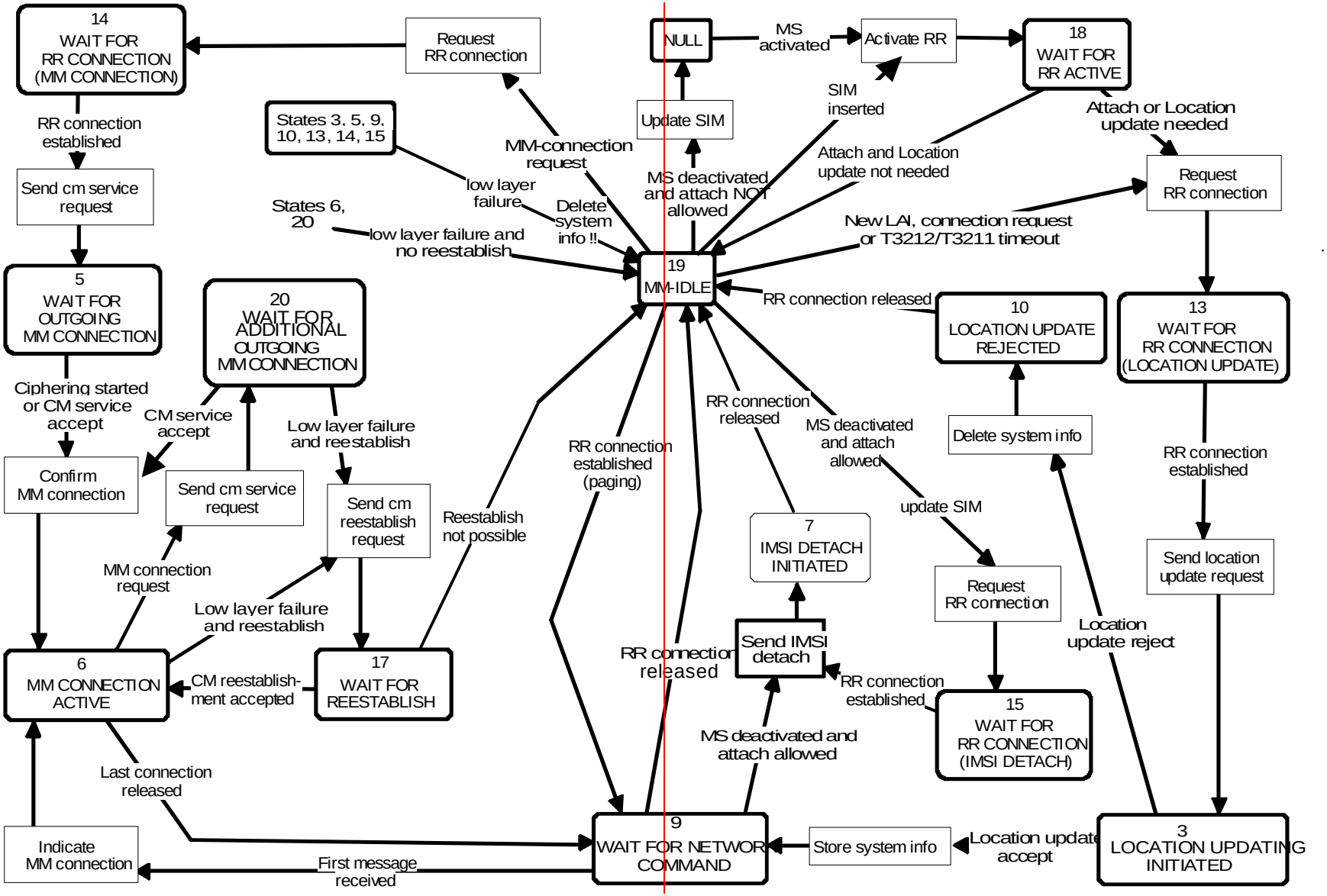
The MM sublayer has a RR connection to its peer entity on the network side. The Mobile Station has received a CM SERVICE PROMPT message but has not yet responded $(CCBS)$.

9 WAIT FOR NETWORK COMMAND

The MM sublayer has a RR connection to its peer entity in the network, but no MM connection is established. The mobile station is passive, awaiting further commands from the network. The timer T3240 may be running.

10 LOCATION UPDATE REJECTED

A location updating procedure has been rejected and RR connection release is awaited. The timer T3240 is running.


14
WAIT FOR
RR CONNECTION
(MM CONNECTION)
Request
RR connection
NULL
MS
activated
Activate RR
18
WAIT FOR
RR ACTIVE
RR connection
established
Send cm service
request
States 3, 5, 9,
10, 13, 14, 15
MM-connection
request
Update SIM
SIM
inserted
Attach or Location
update needed
Attach and Location
update not needed
Request
RR connection
low layer
failure
Delete
system
info !!
MS deactivated
and attach NOT
allowed
States 6,
20
low layer failure and
no reestablish
New LAI, connection request
or T3212/T3211 timeout
5
WAIT FOR
OUTGOING
MM CONNECTION
19
MM-IDLE
RR connection released
10
LOCATION UPDATE
REJECTED
13
WAIT FOR
RR CONNECTION
(LOCATION UPDATE)
20
WAIT FOR
ADDITIONAL
OUTGOING
MM CONNECTION
Ciphering started
or CM service
accept
CM service
accept
Low layer failure
and reestablish
RR connection
released
MS deactivated
and attach
allowed
Delete system info
RR connection
established
Confirm
MM connection
Send cm service
request
Send cm
reestablish
request
RR connection
established
(paging)
Reestablish
not possible
update SIM
7
IMSI DETACH
INITIATED
Send location
update request
MM connection
request
Low layer failure
and reestablish
Request
RR connection
Location
update reject
Send IMSI
detach
RR connection
released
6
MM CONNECTION
ACTIVE
CM reestablish-
ment accepted
17
WAIT FOR
REESTABLISH
RR connection
established
15
WAIT FOR
RR CONNECTION
(IMSI DETACH)
MS deactivated and
attach allowed
Last connection
released
9
WAIT FOR NETWOR
COMMAND
Store system info
Location updat
accept
3
LOCATION UPDATIN
INITIATED
Indicate
MM connection
First message
received

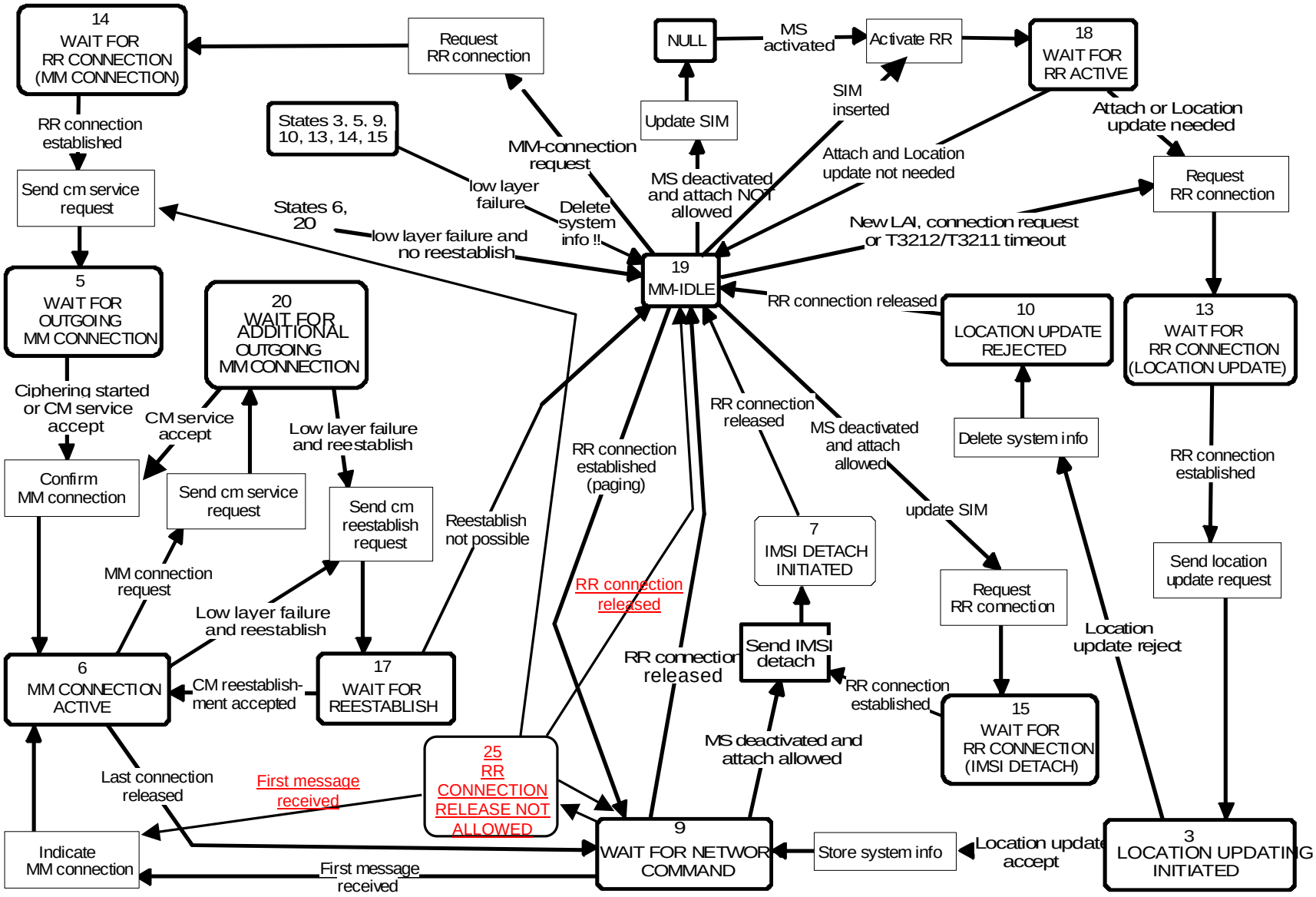
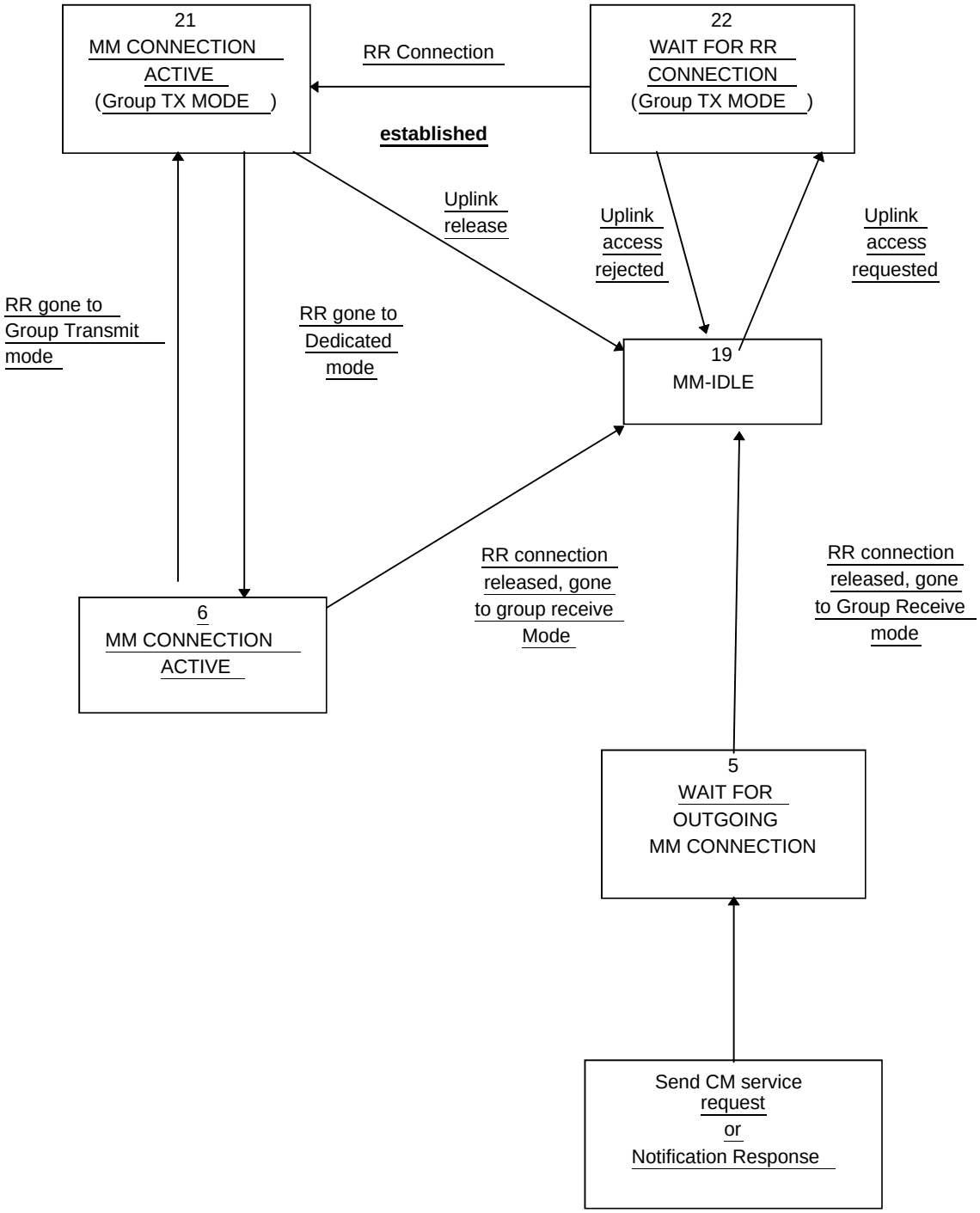


Figure 4.1a / GSM 04.08: Overview mobility management protocol / MS Side



Additions to Figure 4.1.a/GSM 04.08

13. WAIT FOR RR CONNECTION (LOCATION UPDATING)

    The MM sublayer has requested RR connection establishment for starting the location updating procedure.

14. WAIT FOR RR CONNECTION (MM CONNECTION)

    The MM sublayer has requested RR connection establishment for dedicated mode for starting the MM connection establishment.

15. WAIT FOR RR CONNECTION (IMSI DETACH)

    The MM sublayer has requested RR connection establishment for starting the IMSI detach procedure.

17. WAIT FOR REESTABLISH

    A lower layer failure has occurred and re-establishment may be performed from the disturbed CM layer entities.

18. WAIT FOR RR ACTIVE

The MM sublayer has requested activation of the RR sublayer.

19. MM IDLE

    There is no MM procedure running and no RR connection exists except that a local MM context may exist when the RR sublayer is in Group Receive mode. This is a compound state, and the actual behaviour of the mobile station to Connection Management requests is determined by the actual substate as described hereafter.

20. WAIT FOR ADDITIONAL OUTGOING MM CONNECTION.

    The MM connection establishment for an additional MM connection has been started, and the MM awaits response from the network.

21. MM CONNECTION ACTIVE (GROUP TRANSMIT MODE)

    (Only applicable for mobile stations supporting VGCS talking:) The MM sublayer has a RR connection on the VGCS channel to its peer entity on the network side. Only one MM connection is active.

22. WAIT FOR RR CONNECTION (GROUP TRANSMIT MODE)

    (Only applicable for mobile stations supporting VGCS talking:) The MM sublayer has requested to perform an uplink access on the VGCS channel.

23. LOCATION UPDATING PENDING

    (Only applicable for GPRS MS operation modes A and B; not shown in figure 4.1a) A location updating has been started using the combined GPRS routing area updating procedure.

24. IMSI DETACH PENDING

    (Only applicable for GPRS MS operation modes A and B; not shown in figure 4.1a) An IMSI detach for non-GPRS services has been started using the combined GPRS detach procedure at not switching off.

25. RR CONNECTION RELEASE NOT ALLOWED

    (Only applicable for MSs supporting LCS) There is no MM procedure running but RR connection exists. The timer T32xx is running.

********** Next Modified Section **********

4.2 Behaviour of the MS in MM Idle state, WAIT FOR NETWORK COMMAND state, RR CONNECTION RELEASE NOT ALLOWED state, GMM-DEREGISTERED state and GMM-REGISTERED state

In this section, the detailed behaviour of the MS in the main states MM IDLE, WAIT FOR NETWORK COMMAND, RR CONNECTION RELEASE NOT ALLOWED,GMM-DEREGISTERED and GMM-REGISTERED is described. Sections 4.2.1 to 4.2.3 refer to the state MM IDLE, whereas section 4.2.4 and section 4.2.5 refer to the states GMM-DEREGISTERED and GMM-REGISTERED, respectively. Section 4.2.6 and section 4.2.7 refer to states WAIT FOR NETWORK COMMAND and RR CONNECTION RELEASE NOT ALLOWED, respectively.

The MM IDLE state is entered when none of the MM procedures are running and no RR connection exists. It is left when one of the MM procedures are triggered or a RR connection is established.

The specific behaviour in the MM IDLE state depends on the service state of the mobile station as described in section 4.1.2.1.2. The service state depends in particular on the update status which is defined in section 4.1.2.2.

How an appropriate service state is chosen after power on is described in section 4.2.1, and the specific behaviour of the mobile station in MM IDLE state is described in section 4.2.2. The service state chosen when the MM IDLE state is returned to from any state except NULL state is described in 4.2.3.

It should be noted that transitions between the various MM idle states are caused by (e.g.):

- results of procedures on RR connected mode (see section 4.2.3);
- insertion or removal of the SIM;
- cell selection/reselection (see also GSM 03.22);
- PLMN search;
- loss of coverage.

How various MM procedures affects the service state and the update status is described in the detailed descriptions of the procedures in sections 4.3 to 4.5.

********** First Added Section **********

4.2.6 Behaviour of the MS supporting LCS in MM WAIT FOR NETWORK COMMAND state

The following, additional, requirements are only applicable for MS supporting LCS.

When in state WAIT FOR NETWORK COMMAND, RR CONNECTION RELEASE NOT ALLOWED state is entered, if RR-No-Abort-Ind (no abort) has been received (in this or any of the other MM states).

In above state transition, timer T3240 is stopped and reset but not restarted. Timer T32xx shall be started.

4.2.7 Behaviour of the MS supporting LCS in MM RR CONNECTION RELEASE NOT ALLOWED state

The following requirements are only applicable for MS supporting LCS.

When in state RR CONNECTION RELEASE NOT ALLOWED;

if a request for MM connection establishment is received:

- timer T32xx is stopped and reset but not restarted and;
- CM SERVICE REQUEST is sent and;
- state WAIT FOR OUTGOING MM CONNECTION is entered

if RR-No-Abort-Ind (abort allowed) is received:

- timer T32xx is stopped and reset but not restarted and;
- timer T3240 is started and;
- state WAIT FOR NETWORK COMMAND is entered

if timer T32xx expires:

- timer T32xx is reset but not restarted and;
- RR connection is released and;
- MM IDLE state is entered

if a CM message is received from the network:

- timer T32xx is stopped and reset but not restarted and;
- MM CONNECTION ACTIVE state is entered (via Indicate MM connection sub-state).

if a radio channel release is initiated by the network:

- timer T32xx is reset but not restarted and;
- RR connection is released and;
- MM IDLE state is entered.

********** Next Modified Section **********

4.5.1 MM connection establishment

4.5.1.1 MM connection establishment initiated by the mobile station

Upon request of a CM entity to establish an MM connection the MM sublayer first decides whether to accept, delay, or reject this request:

- An MM connection establishment may only be initiated by the mobile station when the following conditions are fulfilled:
  - Its update status is UPDATED.
  - The MM sublayer is in one of the states MM IDLE, RR CONNECTION RELEASE NOT ALLOWED or MM connection active but not in MM connection active (Group call).

  An exception from this general rule exists for emergency calls (see section 4.5.1.5). A further exception is defined in the following clause.
- If an MM specific procedure is running at the time the request from the CM sublayer is received, and the LOCATION UPDATING REQUEST message has been sent, the request will either be rejected or delayed, depending on implementation, until the MM specific procedure is finished and, provided that the network has not sent a "follow-on proceed" indication, the RR connection is released. If the LOCATION UPDATING REQUEST message has not been sent, the mobile station may include a "follow-on request" indicator in the message. The mobile station shall then delay the request until the MM specific procedure is completed, when it may be given the opportunity by the network to use the RR connection: see section 4.4.4.6.

In order to establish an MM connection, the mobile station proceeds as follows:

a) If no RR connection exists, the MM sublayer requests the RR sublayer to establish an RR connection and enters MM sublayer state WAIT FOR RR CONNECTION (MM CONNECTION). This request contains an establishment cause and a CM SERVICE REQUEST message. When the establishment of an RR connection is indicated by the RR sublayer (this indication implies that the CM SERVICE REQUEST message has been successfully transferred via the radio interface, see section 2.2), the MM sublayer of the mobile station starts timer T3230, gives an indication to the CM entity that requested the MM connection establishment, and enters MM sublayer state WAIT FOR OUTGOING MM CONNECTION.

b) If an RR connection is available, the MM sublayer of the mobile station sends a CM SERVICE REQUEST message to the network, starts timer T3230, gives an indication to the CM entity that requested the MM connection establishment, and enters:
   - MM sublayer state WAIT FOR OUTGOING MM CONNECTION, if no MM connection is active;
   - MM sublayer state WAIT FOR ADDITIONAL OUTGOING MM CONNECTION, if at least one MM connection is active;
   - If an RR connection exists but the mobile station is in the state WAIT FOR NETWORK COMMAND then any requests from the CM layer that are received will either be rejected or delayed until this state is left.

c) Only applicable for mobile stations supporting VGCS talking:

If a mobile station which is in the MM sublayer state MM IDLE, service state RECEIVING GROUP CALL (NORMAL SERVICE), receives a request from the GCC sublayer to perform an uplink access, the MM sublayer requests the RR sublayer to perform an uplink access procedure and enters MM sublayer state WAIT FOR RR CONNECTION (GROUP TRANSMIT MODE).

When a successful uplink access is indicated by the RR sublayer, the MM sublayer of the mobile station gives an indication to the GCC sublayer and enters MM sublayer state MM CONNECTION ACTIVE (GROUP TRANSMIT MODE).

When an uplink access reject is indicated by the RR sublayer, the MM sublayer of the mobile station gives an indication to the GCC sublayer and enters the MM sublayer state MM IDLE, service state RECEIVING GROUP CALL (NORMAL SERVICE).

In the network, if an uplink access procedure is performed, the RR sublayer in the network provides an indication to the MM sublayer together with the mobile subscriber identity received in the TALKER INDICATION message. The network shall then enter the MM sublayer state MM CONNECTION ACTIVE (GROUP TRANSMIT MODE).

The CM SERVICE REQUEST message contains the

- mobile identity according to section 10.5.1.4;
- mobile station classmark 2;
- ciphering key sequence number; and
- CM service type identifying the requested type of transaction (e.g. mobile originating call establishment, emergency call establishment, short message service, supplementary service activation, location services)

A MS supporting eMLPP may optionally include a priority level in the CM SERVICE REQUEST message.

A collision may occur when a CM layer message is received by the mobile station in MM sublayer state WAIT FOR OUTGOING MM CONNECTION or in WAIT FOR ADDITIONAL OUTGOING MM CONNECTION. In this case the MM sublayer in the MS shall establish a new MM connection for the incoming CM message as specified in 4.5.1.3.

Upon receiving a CM SERVICE REQUEST message, the network shall analyse its content. The type of semantic analysis may depend on other on going MM connection(s). Depending on the type of request and the current status of the RR connection, the network may start any of the MM common procedures and RR procedures.

In GSM, the network may initiate the classmark interrogation procedure, for example, to obtain further information on the mobile station's encryption capabilities.

The identification procedure (see section 4.3.3) may be invoked for instance if a TMSI provided by the mobile station is not recognized.

The network may invoke the authentication procedure (see section 4.3.2) depending on the CM service type.
In GSM, the network decides also if the ciphering mode setting procedure shall be invoked (see section 3.4.7 in GSM 04.18).
In UMTS, the network decides also if the security mode control procedure shall be invoked (see section 8.1.10 in 3GPP TS 25.331).

NOTE: If the CM_SERVICE_REQUEST message contains a priority level the network may use this to perform queuing and pre-emption as defined in 3GPP TS 23.067.

In GSM, an indication from the RR sublayer that the ciphering mode setting procedure is completed, or reception of a CM SERVICE ACCEPT message, shall be treated as a service acceptance indication by the mobile station.

In UMTS, an indication from the RR sublayer that the security mode control procedure is completed, or reception of a CM SERVICE ACCEPT message, shall be treated as a service acceptance indication by the mobile station. The procedures in section 4.1.1.1.1 shall always have precedence over this section.

In UMTS, during a MM connection establishment for all services, except for emergency call (see chapter 4.1.1.1.1), the security mode control procedure with activation of integrity protection shall be invoked by the network unless integrity protection is already started (see chapter 4.1.1.1.1).

The MM connection establishment is completed, timer T3230 shall be stopped, the CM entity that requested the MM connection shall be informed, and MM sublayer state MM CONNECTION ACTIVE is entered. The MM connection is considered to be active.

If the service request cannot be accepted, the network returns a CM SERVICE REJECT message to the mobile station.
The reject cause information element (see 10.5.3.6 and Annex G) indicates the reason for rejection. The following cause values may apply:

#4 : IMSI unknown in VLR

#6 : Illegal ME

#17 : Network failure

#22 : Congestion

#32 : Service option not supported

#33 : Requested service option not subscribed

#34 : Service option temporarily out of order

If no other MM connection is active, the network may start the RR connection release (see section 3.5) when the CM SERVICE REJECT message is sent.

If a CM SERVICE REJECT message is received by the mobile station, timer T3230 shall be stopped, the requesting CM sublayer entity informed. Then the mobile station shall proceed as follows:

- If the cause value is not #4 or #6 the MM sublayer returns to the previous state (the state where the request was received). Other MM connections shall not be affected by the CM SERVICE REJECT message.
- If cause value #4 is received, the mobile station aborts any MM connection, deletes any TMSI, LAI and ciphering key sequence number in the SIM, changes the update status to NOT UPDATED (and stores it in the SIM according to section 4.1.2.2), and enters the MM sublayer state WAIT FOR NETWORK COMMAND. If subsequently the RR connection is released or aborted, this will force the mobile station to initiate a normal location updating). Whether the CM request shall be memorized during the location updating procedure, is a choice of implementation.
- If cause value #6 is received, the mobile station aborts any MM connection, deletes any TMSI, LAI and ciphering key sequence number in the SIM, changes the update status to ROAMING NOT ALLOWED (and stores it in the SIM according to section 4.1.2.2), and enters the MM sublayer state WAIT FOR NETWORK COMMAND. The mobile station shall consider the SIM as invalid until switch-off or the SIM is removed.

********** Next Modified Section **********

11.2 Timers of mobility management

Table 11.1/3GPP TS 24.008: Mobility management timers - MS-side

TIMER NUM.	MM STAT	TIME OUT VAL.	CAUSE FOR START	NORMAL STOP	AT THE EXPIRY
T3210	3	20s	- LOC_UPD_REQ sent	- LOC_UPD_ACC - LOC_UPD_REJ - AUTH_REJ - Lower layer failure	Start T3211
T3211	1 2	15s	- LOC_UPD_REJ with cause#17 netw. failure - lower layer failure or RR conn. released after RR conn. abort during loc. updating	- Time out - cell change - request for MM connection establishment - change of LA	Restart the Location update proc.
T3212	1, 2	Note 1	- termination of MM service or MM signalling	- initiation of MM service or MM signalling	initiate periodic updating
T3213	1 2 11	4s	- location updating failure	- expiry - change of BCCH parameter	new random attempt
T3214	3 5 7	20s	AUTHENT FAILURE Cause = MAC failure sent	AUTHENT REQ - received	Consider the network as 'false' (see 4.3.2.6.1)
T3216	3 5 7	15s	AUTHENT FAILURE Cause = Synch failure sent	AUTHENT REQ received	Consider the network as 'false' (see 4.3.2.6.1)
T3220	7	5s	- IMSI DETACH	- release from RM-sublayer	enter Null or Idle, ATTEMPTING TO UPDATE
T3230	5	15s	- CM SERV REQ CM REEST REQ	- Cipher mode setting - CM SERV REJ - CM SERV ACC	provide release ind.
T3240	9 10	10s	see section 11.2.1	see section 11.2.1	abort the RR connection
T32xx	25	300s	see section 11.2.x	See section 11.2.x	abort the RR connection

NOTE 1: The timeout value is broadcasted in a SYSTEM INFORMATION message

Table 11.2/3GPP TS 24.008: Mobility management timers - network-side

TIMER NUM.	MM ST AT	TIME OUT VAL.	CAUSE FOR START	NORMAL STOP	AT THE EXPIRY	AT THE SECOND EXPIRY
T3250	6	12s	TMSI-REAL-CMD or LOC UPD ACC with new TMSI sent	TMSI-REALL-COM received	Optionally Release RR connection	
T3255		Note	LOC UPD ACC sent with"Follow on Proceed"	CM SERVICE REQUEST	Release RR Connection or use for mobile station terminating call	
T3260	5	12s	AUTHENT-REQUEST sent	AUTHENT-RESPONSE received AUTHENT-FAILURE received	Optionally Release RR connection	
T3270	4	12s	IDENTITY REQUEST sent	IDENTITY RESPONSE received	Optionally Release RR connection	

NOTE 2: The value of this timer is not specified by this recommendation.

********** Next Added Section **********

11.2.x Timer T32xx

Timer T32xx is started in the mobile station when entering from WAIT FOR NETWORK COMMAND state to RR CONNECTION RELEASE NOT ALLOWED state.

If timer T32xx did not expire in state RR CONNECTION RELEASE NOT ALLOWED, the timer T32xx is stopped and reset (but not started) before leaving RR CONNECTION RELEASE NOT ALLOWED state.

If timer T32xx expires:

- timer T32xx is reset but not restarted and;
- RR connection is released and;
- transition from RR CONNECTION RELEASE NOT ALLOWED state to MM IDLE state is performed.