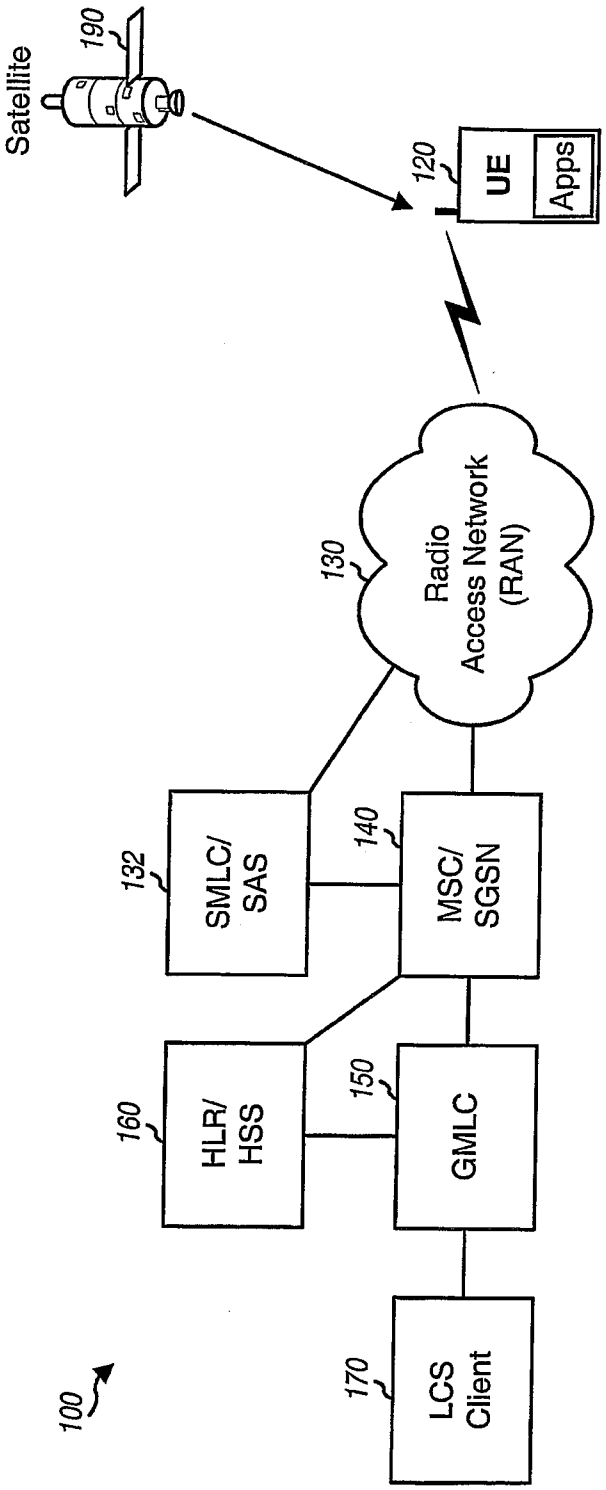

Satellite
190
120
UE
Apps
130
Radio Access Network (RAN)
132
SMLC/ SAS
140
MSC/ SGSN
160
HLR/ HSS
150
GMLC
170
LCS Client
100

FIG. 1A

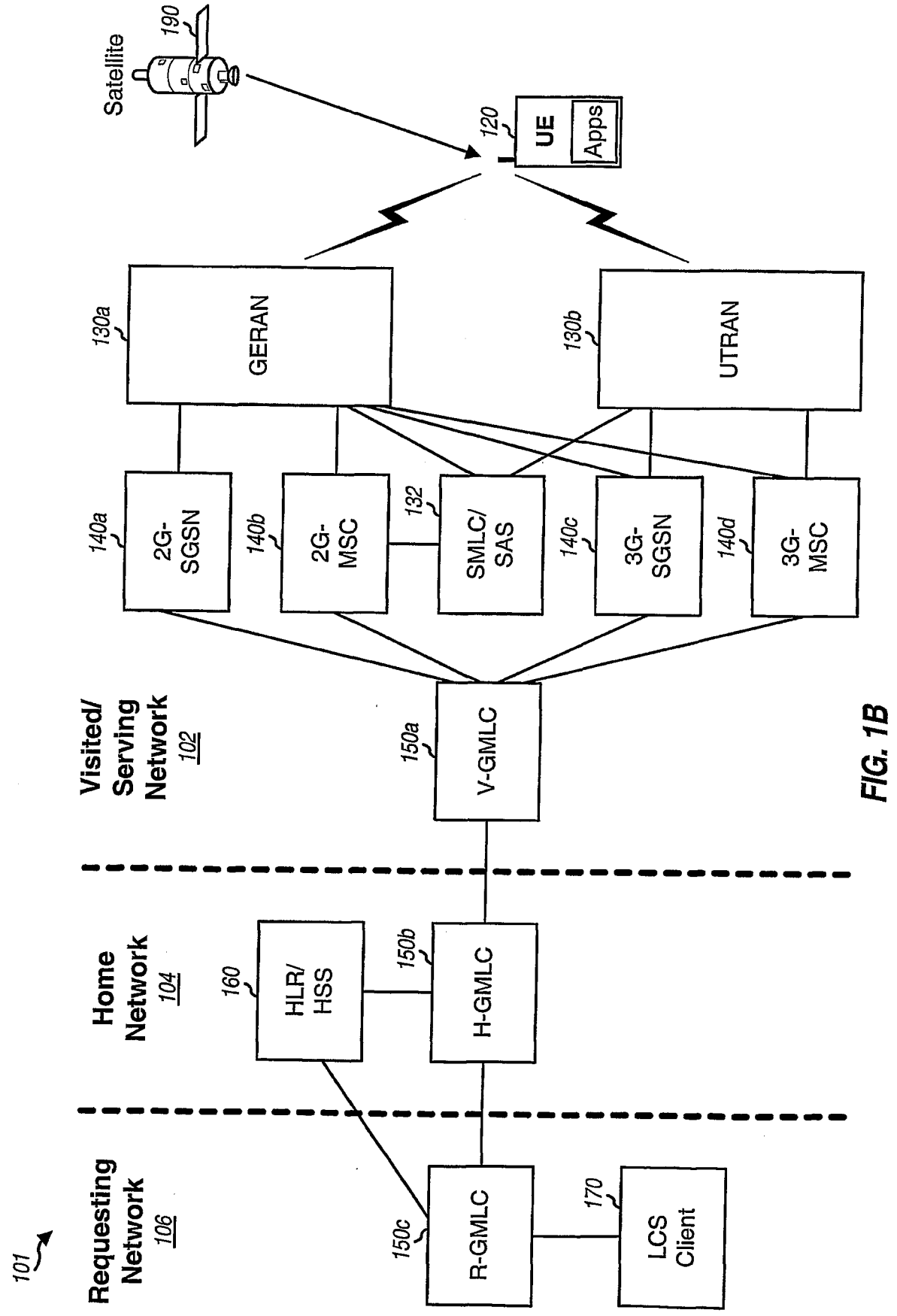

101
Requesting Network 106
Home Network 104
Visited/ Serving Network 102
Satellite
190
120
UE
Apps
130a
GERAN
130b
UTRAN
140a
2G-SGSN
140b
2G-MSC
132
SMLC/ SAS
140c
3G-SGSN
140d
3G-MSC
150a
V-GMLC
150b
H-GMLC
160
HLR/ HSS
150c
R-GMLC
170
LCS Client

FIG. 1B

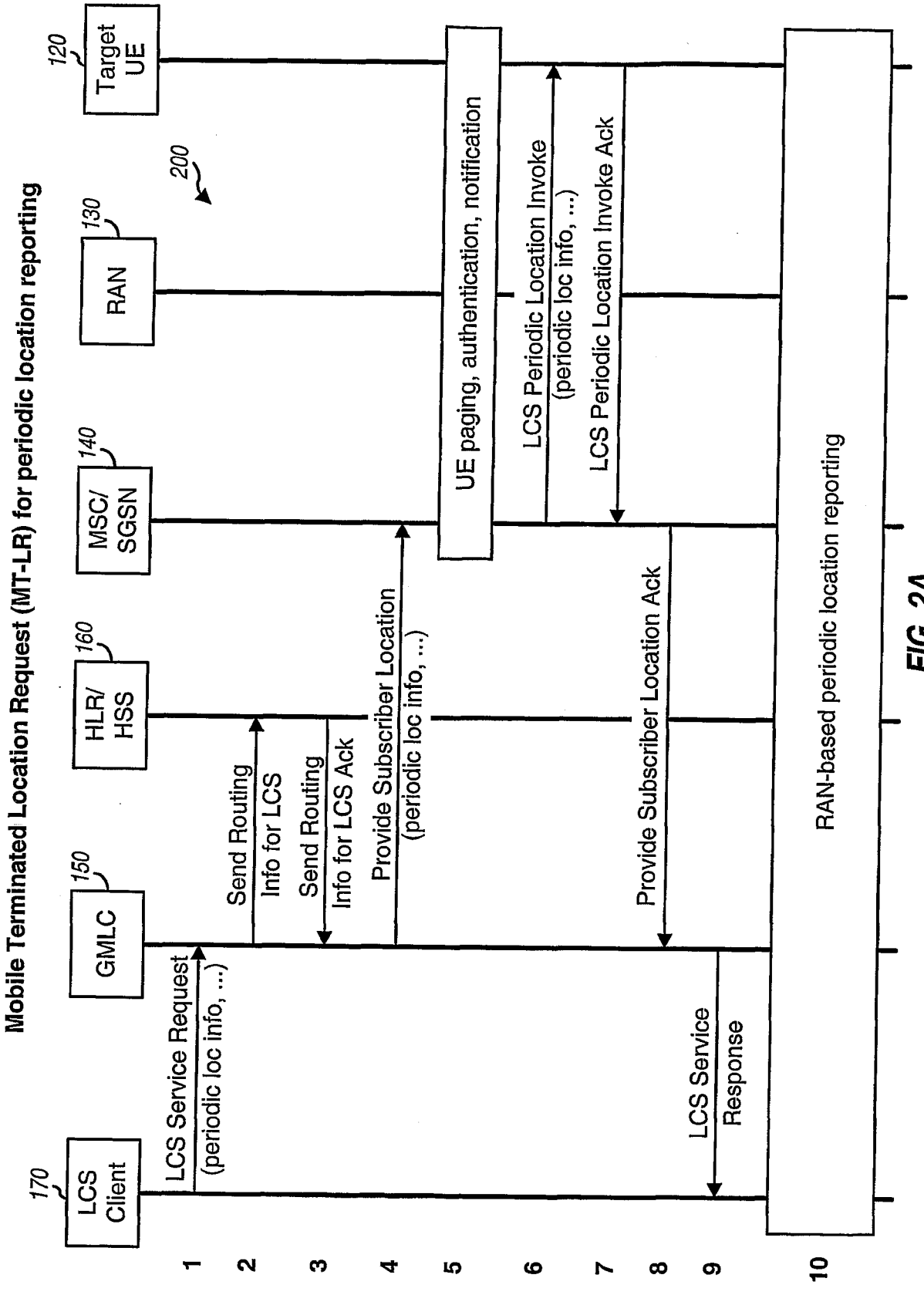

Mobile Terminated Location Request (MT-LR) for periodic location reporting
LCS Client
170
GMLC
150
HLR/ HSS
160
MSC/ SGSN
140
RAN
130
200
Target UE
120
LCS Service Request
(periodic loc info, ...)
Send Routing Info for LCS
Send Routing Info for LCS Ack
Provide Subscriber Location
(periodic loc info, ...)
UE paging, authentication, notification
LCS Periodic Location Invoke
(periodic loc info, ...)
LCS Periodic Location Invoke Ack
Provide Subscriber Location Ack
LCS Service Response
RAN-based periodic location reporting
1
2
3
4
5
6
7
8
9
10

FIG. 2A

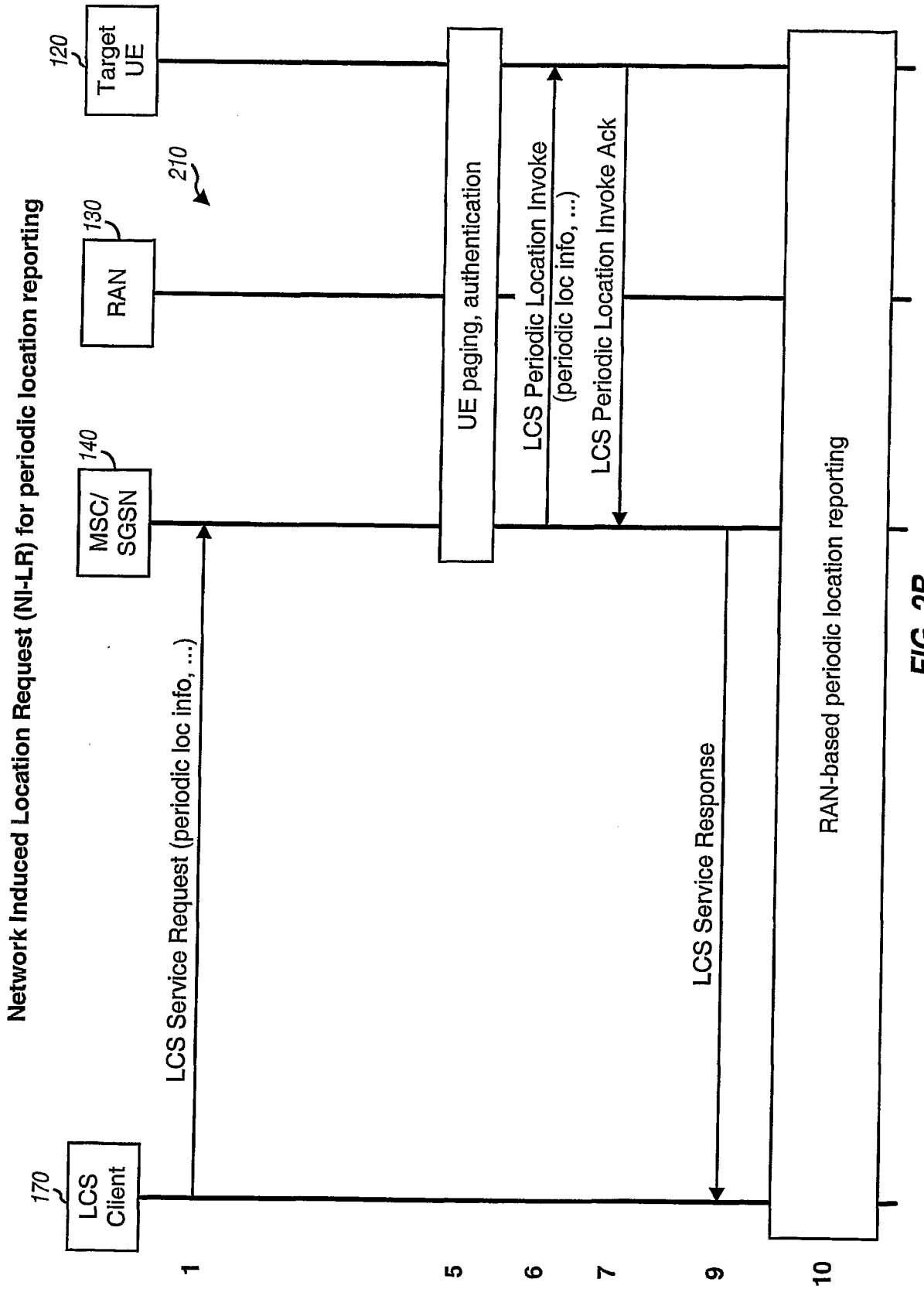

Network Induced Location Request (NI-LR) for periodic location reporting
LCS Client
170
Target UE
120
RAN
130
MSC/ SGSN
140
210
LCS Service Request (periodic loc info, ...)
UE paging, authentication
LCS Periodic Location Invoke (periodic loc info, ...)
LCS Periodic Location Invoke Ack
LCS Service Response
RAN-based periodic location reporting
1
5
6
7
9
10

FIG. 2B

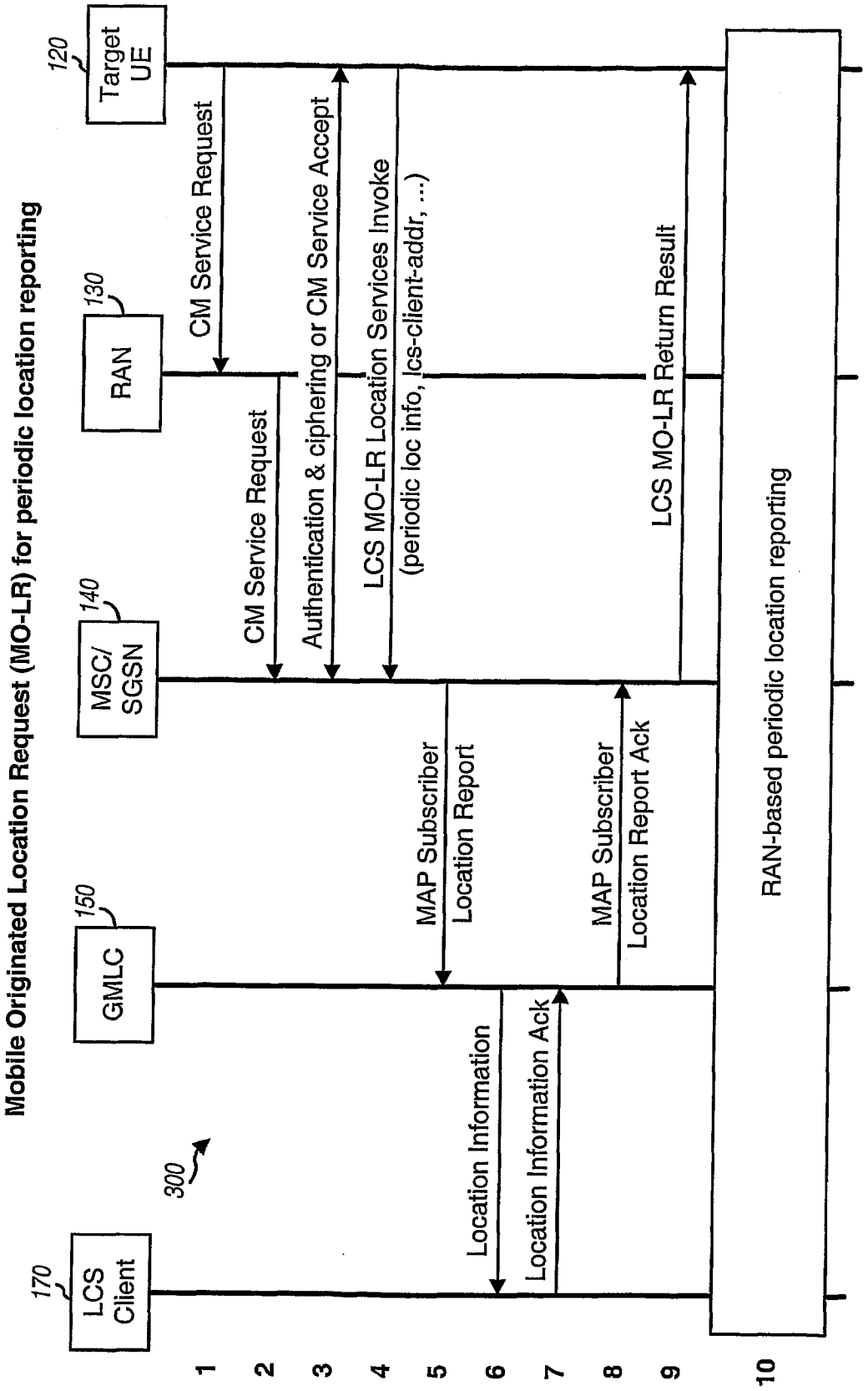

Mobile Originated Location Request (MO-LR) for periodic location reporting
300
120
Target UE
130
RAN
140
MSC/ SGSN
150
GMLC
170
LCS Client
CM Service Request
CM Service Request
Authentication & ciphering or CM Service Accept
LCS MO-LR Location Services Invoke
(periodic loc info, lcs-client-addr, ...)
LCS MO-LR Return Result
MAP Subscriber Location Report
MAP Subscriber Location Report Ack
Location Information
Location Information Ack
RAN-based periodic location reporting
1
2
3
4
5
6
7
8
9
10

FIG. 3

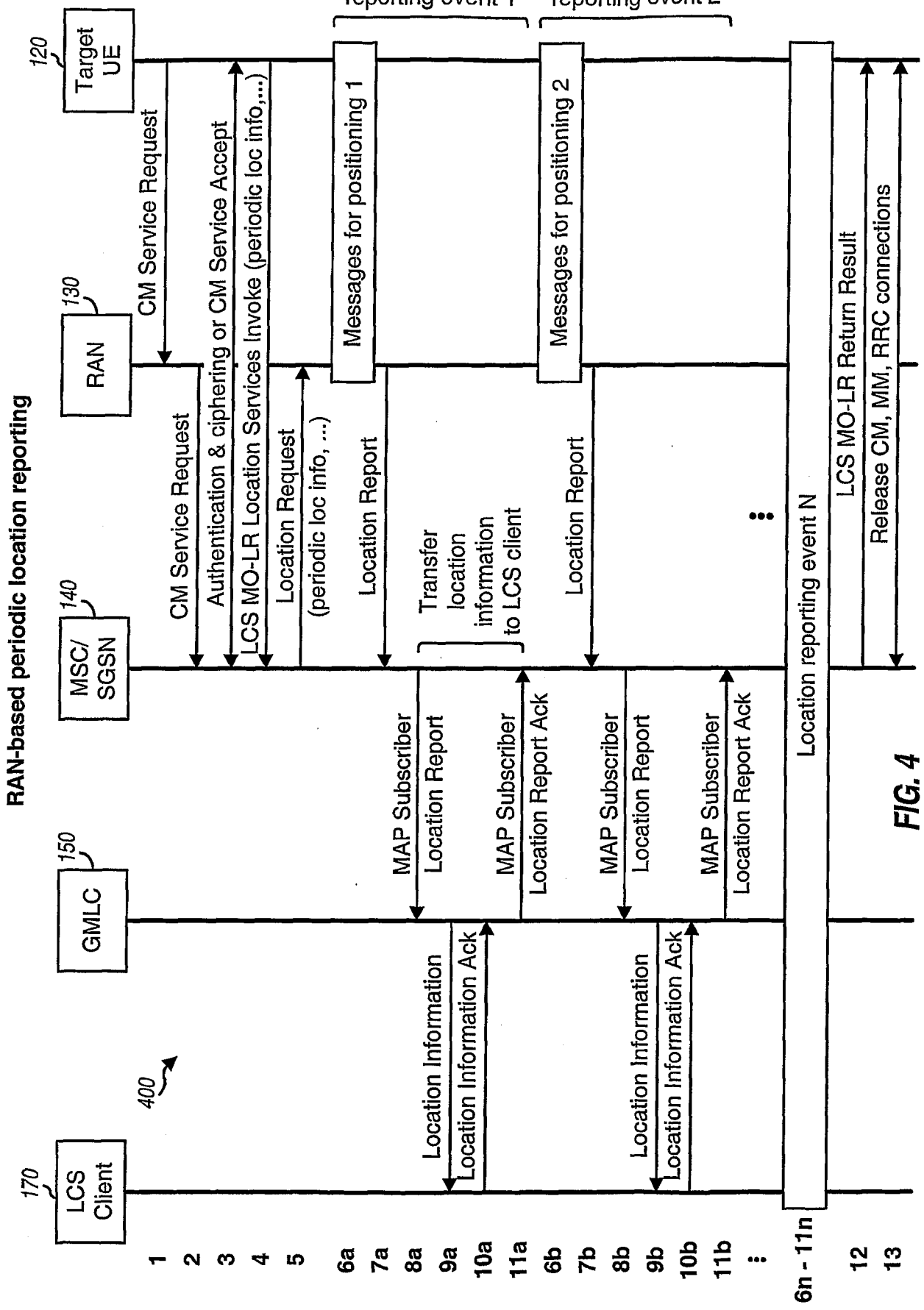

RAN-based periodic location reporting
Location reporting event 1
Location reporting event 2
120 Target UE
130 RAN
140 MSC/ SGSN
150 GMLC
170 LCS Client
400
CM Service Request
Authentication & ciphering or CM Service Accept
LCS MO-LR Location Services Invoke (periodic loc info,...)
Location Request (periodic loc info, ...)
Messages for positioning 1
Location Report
Transfer location information to LCS client
Messages for positioning 2
Location Report
Location reporting event N
LCS MO-LR Return Result
Release CM, MM, RRC connections
MAP Subscriber Location Report
MAP Subscriber Location Report Ack
MAP Subscriber Location Report
MAP Subscriber Location Report Ack
Location Information
Location Information Ack
Location Information
Location Information Ack
1 2 3 4 5 6a 7a 8a 9a 10a 11a 6b 7b 8b 9b 10b 11b ... 6n - 11n 12 13

FIG. 4

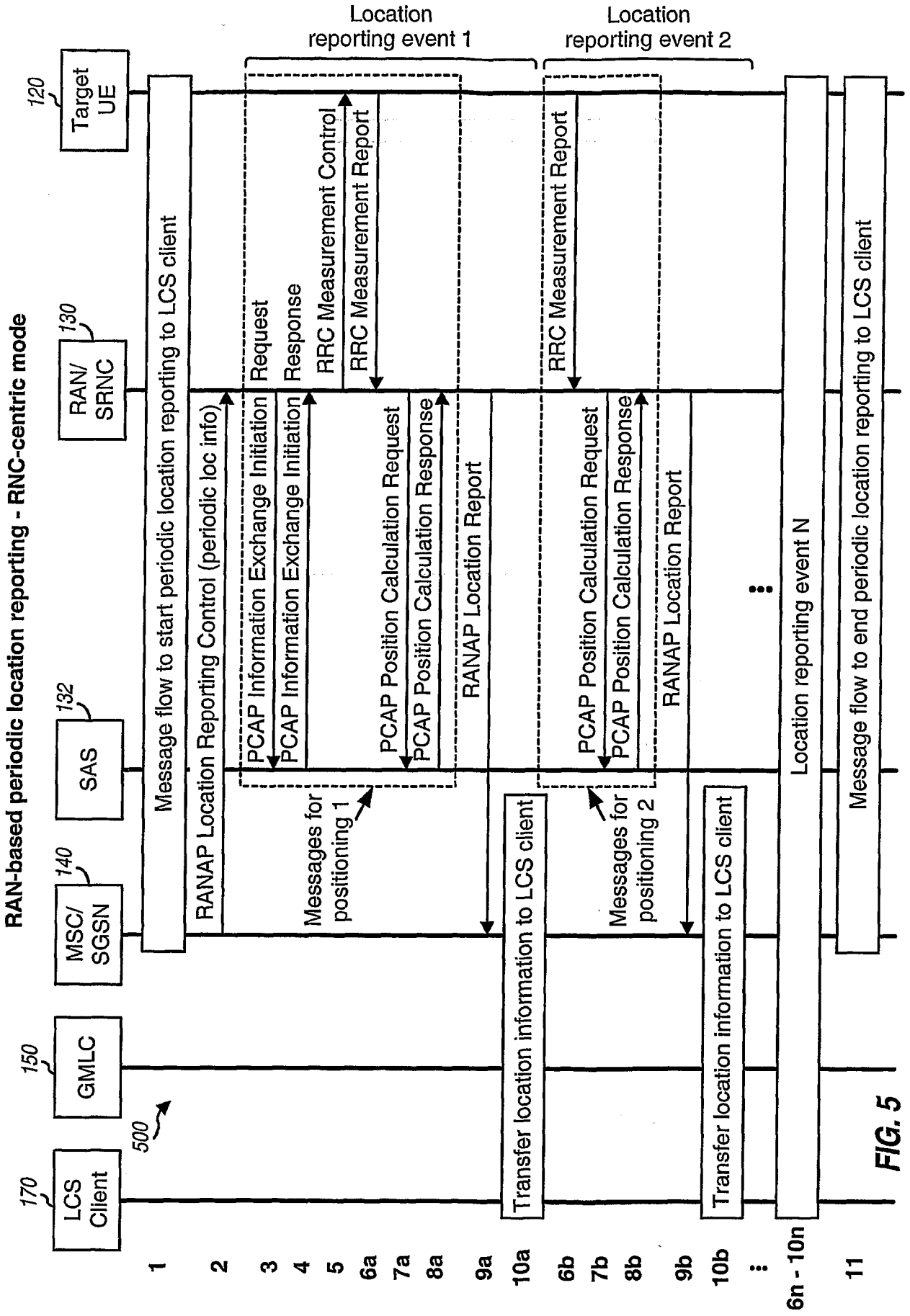

RAN-based periodic location reporting - RNC-centric mode
LCS Client
170
GMLC
150
MSC/ SGSN
140
SAS
132
RAN/ SRNC
130
Target UE
120
500
Location reporting event 1
Location reporting event 2
Message flow to start periodic location reporting to LCS client
RANAP Location Reporting Control (periodic loc info)
PCAP Information Exchange Initiation
Request
PCAP Information Exchange Initiation
Response
RRC Measurement Control
RRC Measurement Report
Messages for positioning 1
PCAP Position Calculation Request
PCAP Position Calculation Response
RANAP Location Report
Transfer location information to LCS client
RRC Measurement Report
Messages for positioning 2
PCAP Position Calculation Request
PCAP Position Calculation Response
RANAP Location Report
Transfer location information to LCS client
Location reporting event N
Message flow to end periodic location reporting to LCS client
1
2
3
4
5
6a
7a
8a
9a
10a
6b
7b
8b
9b
10b
6n - 10n
11

FIG. 5

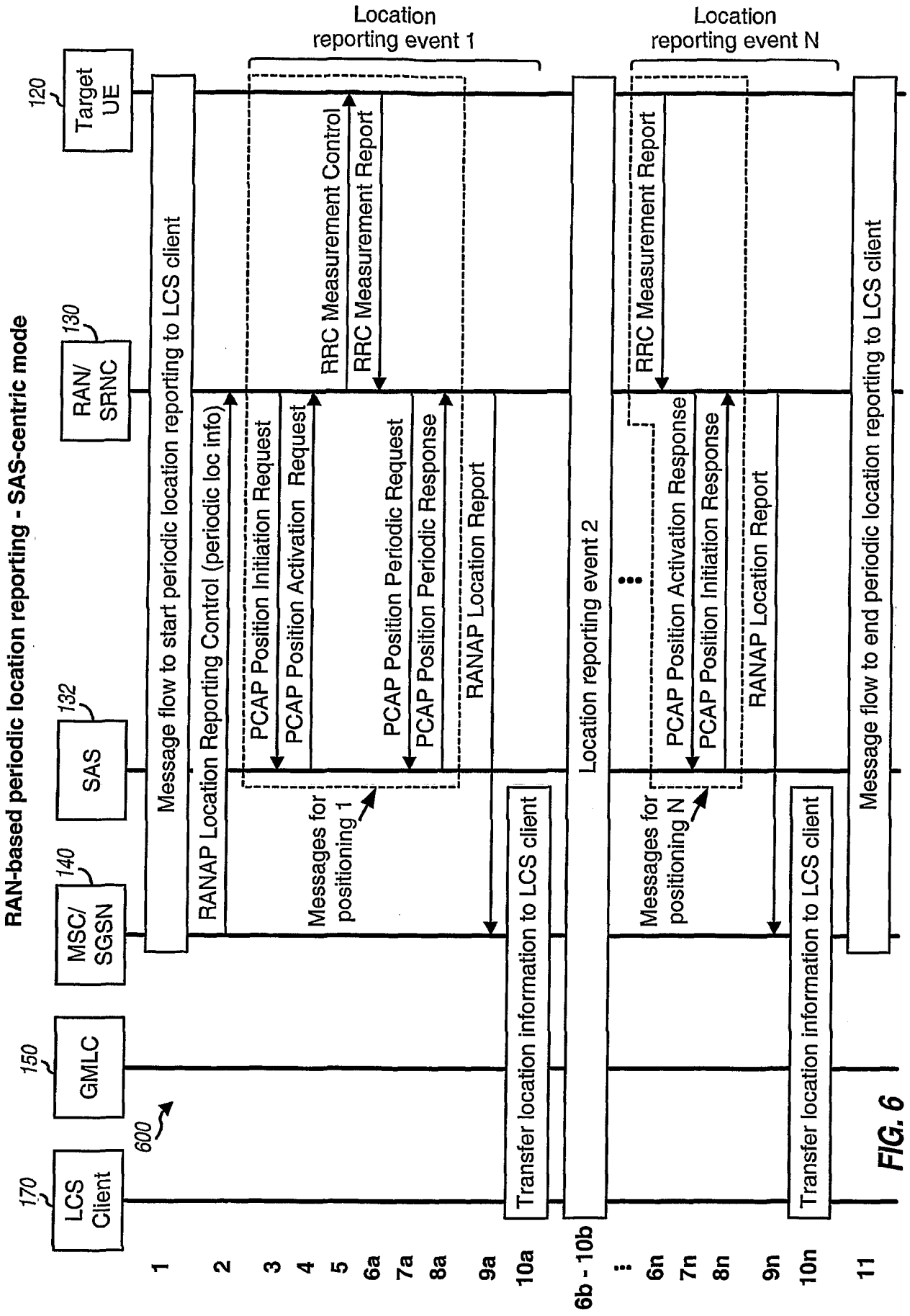

RAN-based periodic location reporting - SAS-centric mode
LCS Client
GMLC
MSC/ SGSN
SAS
RAN/ SRNC
Target UE
600
150
140
132
130
120
170
Location reporting event 1
Location reporting event N
Message flow to start periodic location reporting to LCS client
RANAP Location Reporting Control (periodic loc info)
PCAP Position Initiation Request
PCAP Position Activation Request
RRC Measurement Control
RRC Measurement Report
PCAP Position Periodic Request
PCAP Position Periodic Response
RANAP Location Report
Messages for positioning 1
Transfer location information to LCS client
Location reporting event 2
RRC Measurement Report
PCAP Position Activation Response
PCAP Position Initiation Response
RANAP Location Report
Messages for positioning N
Transfer location information to LCS client
Message flow to end periodic location reporting to LCS client
1
2
3
4
5
6a
7a
8a
9a
10a
6b - 10b
6n
7n
8n
9n
10n
11

FIG. 6

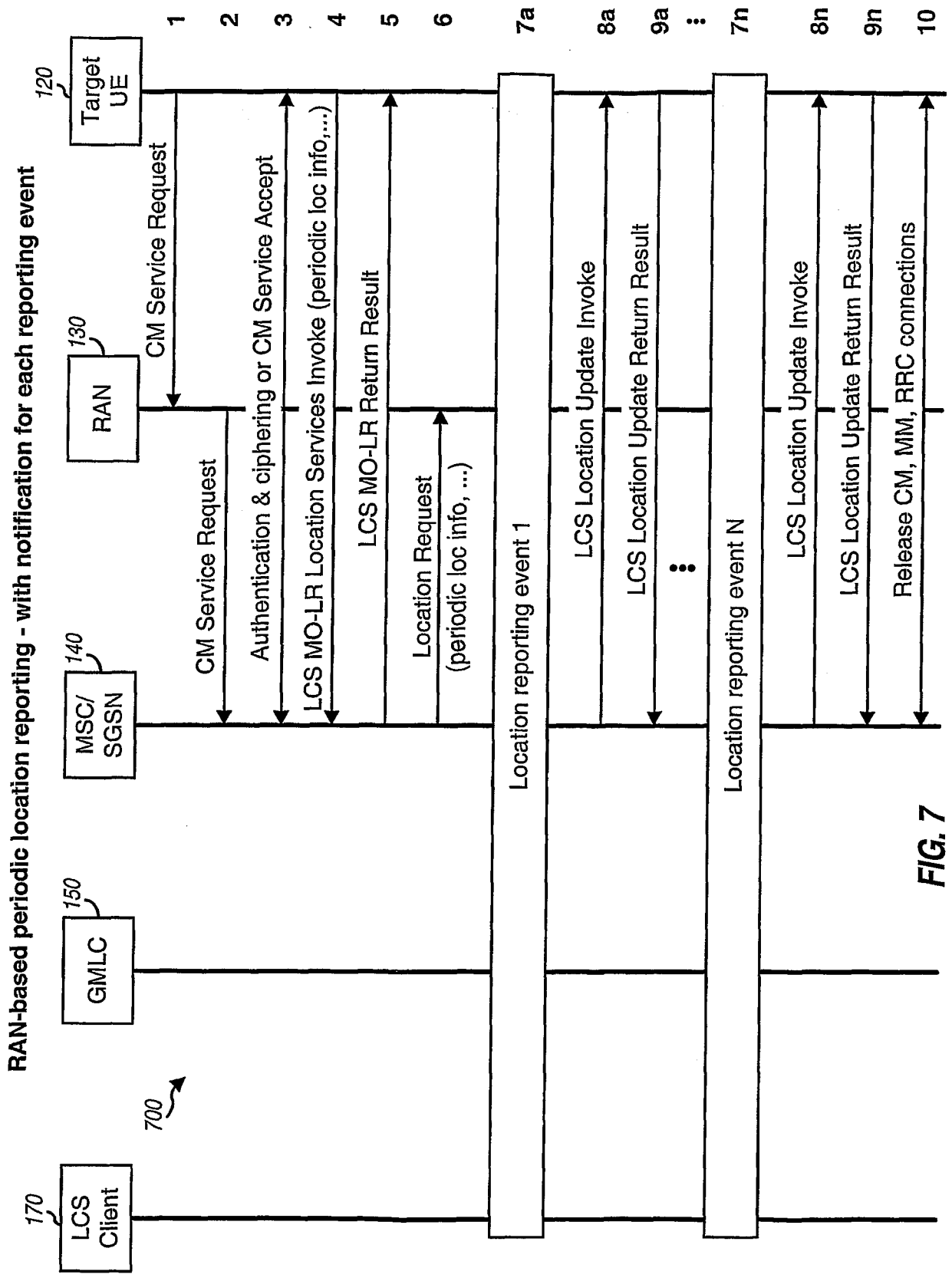

RAN-based periodic location reporting - with notification for each reporting event
700
170
LCS Client
150
GMLC
140
MSC/ SGSN
130
RAN
120
Target UE
1
2
3
4
5
6
7a
8a
9a
7n
8n
9n
10
CM Service Request
Authentication & ciphering or CM Service Accept
LCS MO-LR Location Services Invoke (periodic loc info,...)
LCS MO-LR Return Result
Location Request (periodic loc info, ...)
Location reporting event 1
LCS Location Update Invoke
LCS Location Update Return Result
Location reporting event N
LCS Location Update Invoke
LCS Location Update Return Result
Release CM, MM, RRC connections

FIG. 7

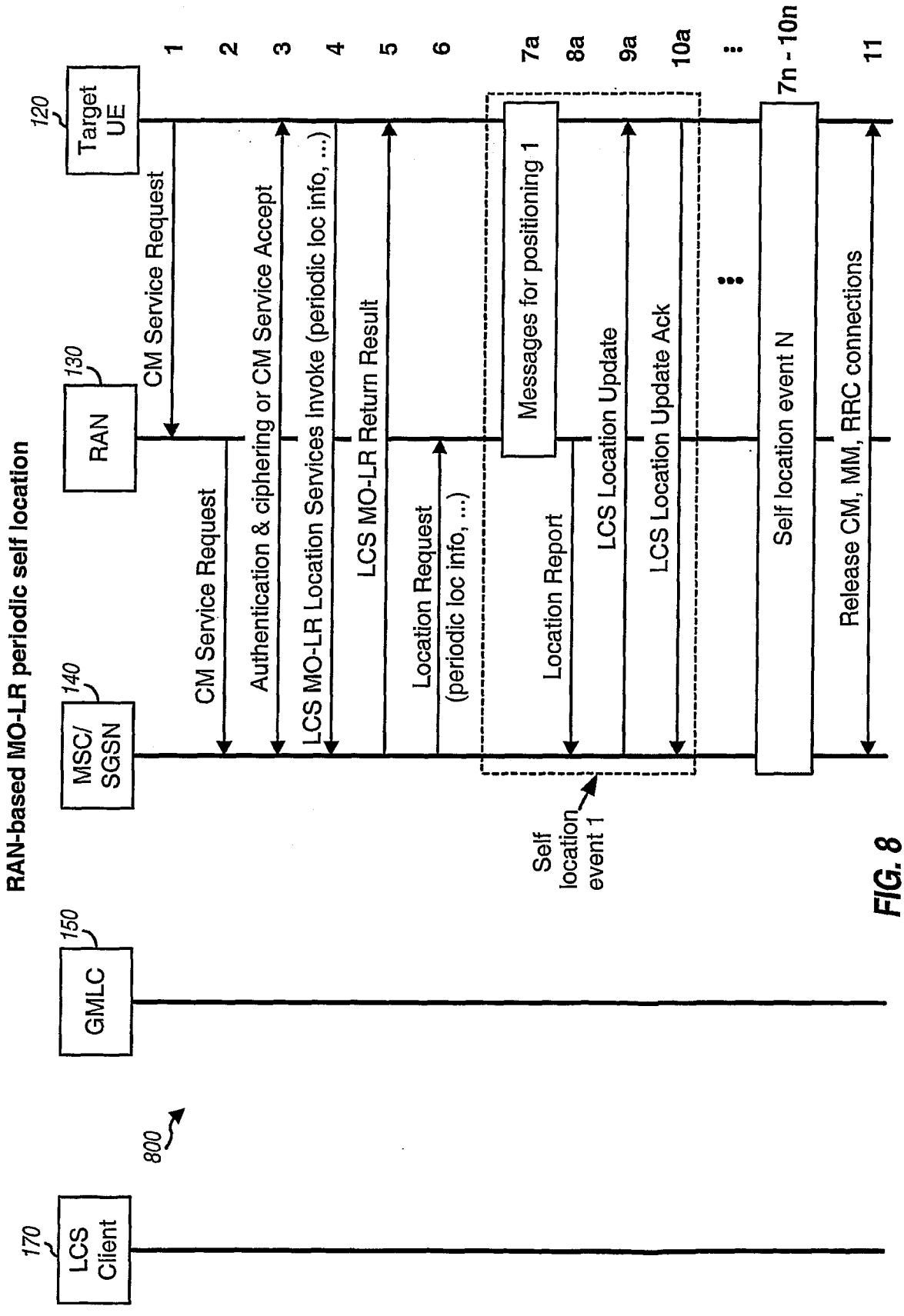

RAN-based MO-LR periodic self location
800
170
LCS Client
150
GMLC
140
MSC/ SGSN
130
RAN
120
Target UE
1
2
3
4
5
6
7a
8a
9a
10a
...
7n - 10n
11
CM Service Request
Authentication & ciphering or CM Service Accept
LCS MO-LR Location Services Invoke (periodic loc info, ...)
LCS MO-LR Return Result
Location Request (periodic loc info, ...)
Messages for positioning 1
Location Report
LCS Location Update
LCS Location Update Ack
...
Self location event N
Release CM, MM, RRC connections
Self location event 1

FIG. 8

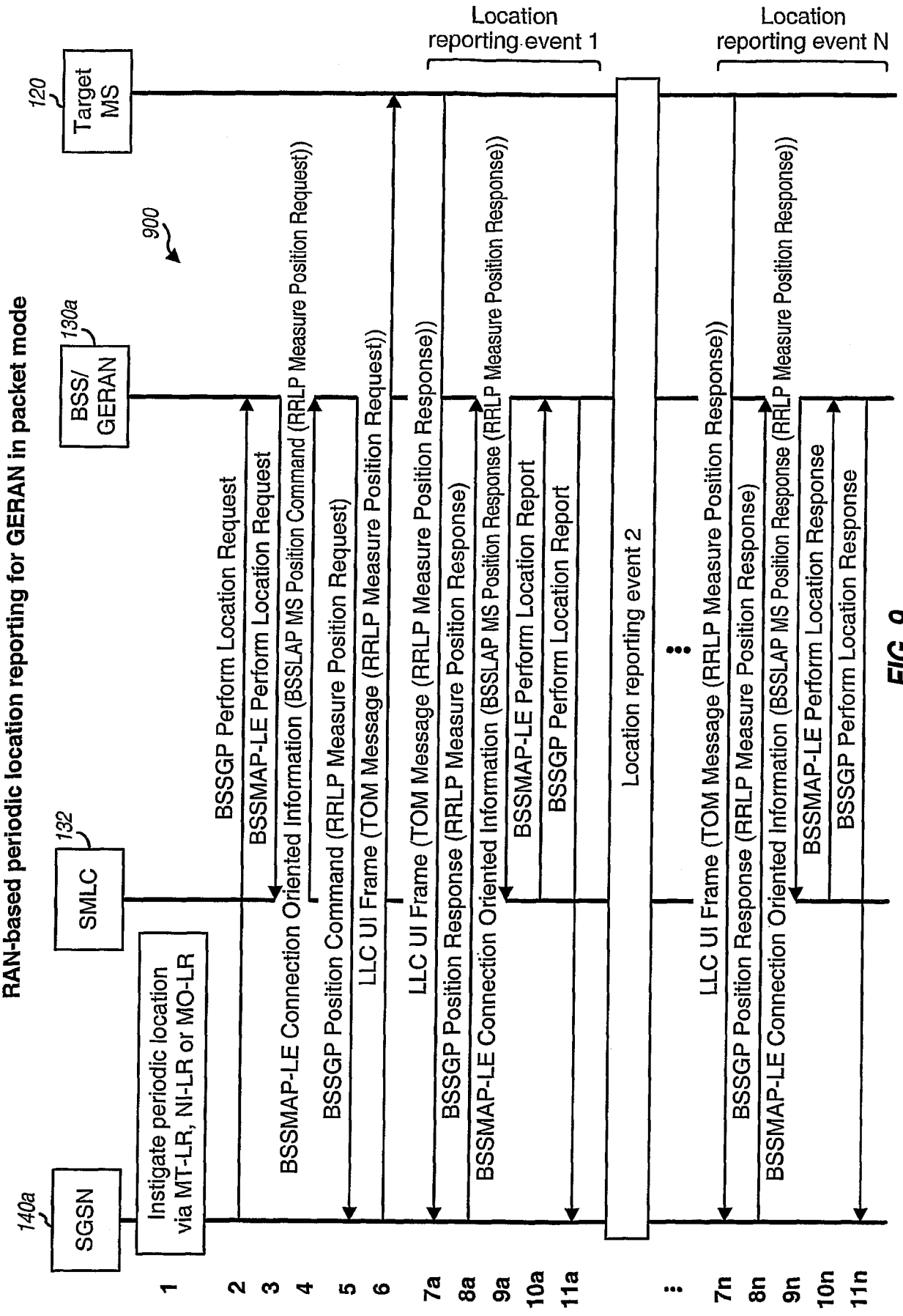

RAN-based periodic location reporting for GERAN in packet mode
SGSN
140a
SMLC
132
BSS/ GERAN
130a
Target MS
120
900
Location reporting event 1
Location reporting event N
Instigate periodic location via MT-LR, NI-LR or MO-LR
BSSGP Perform Location Request
BSSMAP-LE Perform Location Request
BSSMAP-LE Connection Oriented Information (BSSLAP MS Position Command (RRLP Measure Position Request))
BSSGP Position Command (RRLP Measure Position Request)
LLC UI Frame (TOM Message (RRLP Measure Position Request))
LLC UI Frame (TOM Message (RRLP Measure Position Response))
BSSGP Position Response (RRLP Measure Position Response)
BSSMAP-LE Connection Oriented Information (BSSLAP MS Position Response (RRLP Measure Position Response))
BSSMAP-LE Perform Location Report
BSSGP Perform Location Report
Location reporting event 2
LLC UI Frame (TOM Message (RRLP Measure Position Response))
BSSGP Position Response (RRLP Measure Position Response)
BSSMAP-LE Connection Oriented Information (BSSLAP MS Position Response (RRLP Measure Position Response))
BSSMAP-LE Perform Location Response
BSSGP Perform Location Response
1
2
3
4
5
6
7a
8a
9a
10a
11a
7n
8n
9n
10n
11n

FIG. 9

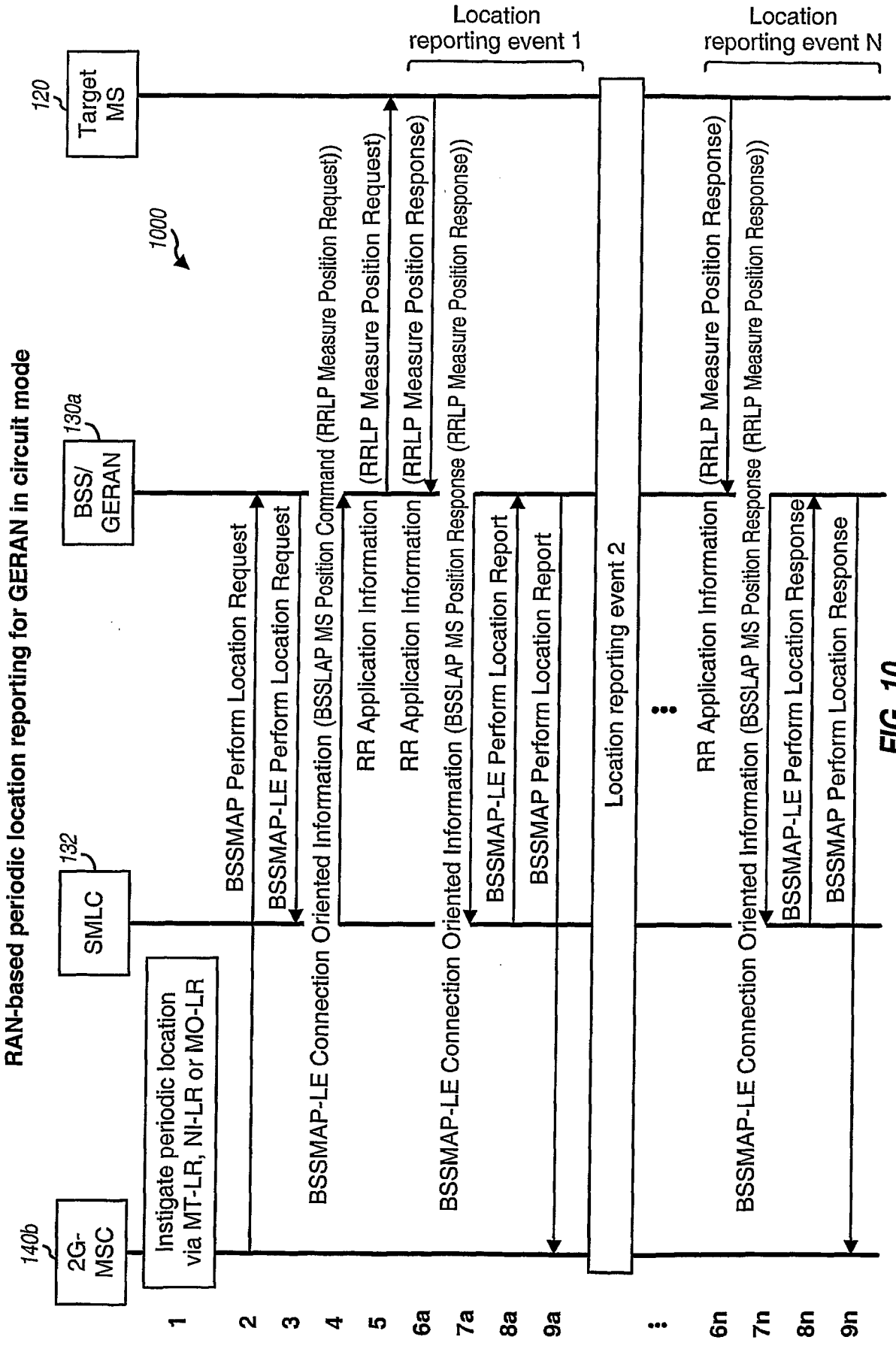

RAN-based periodic location reporting for GERAN in circuit mode
1000
140b
2G-MSC
132
SMLC
130a
BSS/GERAN
120
Target MS
Location reporting event 1
Location reporting event N
Instigate periodic location via MT-LR, NI-LR or MO-LR
BSSMAP Perform Location Request
BSSMAP-LE Perform Location Request
BSSMAP-LE Connection Oriented Information (BSSLAP MS Position Command (RRLP Measure Position Request))
RR Application Information (RRLP Measure Position Request)
RR Application Information (RRLP Measure Position Response)
BSSMAP-LE Connection Oriented Information (BSSLAP MS Position Response (RRLP Measure Position Response))
BSSMAP-LE Perform Location Report
BSSMAP Perform Location Report
Location reporting event 2
RR Application Information (RRLP Measure Position Response)
BSSMAP-LE Connection Oriented Information (BSSLAP MS Position Response (RRLP Measure Position Response))
BSSMAP-LE Perform Location Response
BSSMAP Perform Location Response
1
2
3
4
5
6a
7a
8a
9a
...
6n
7n
8n
9n

FIG. 10

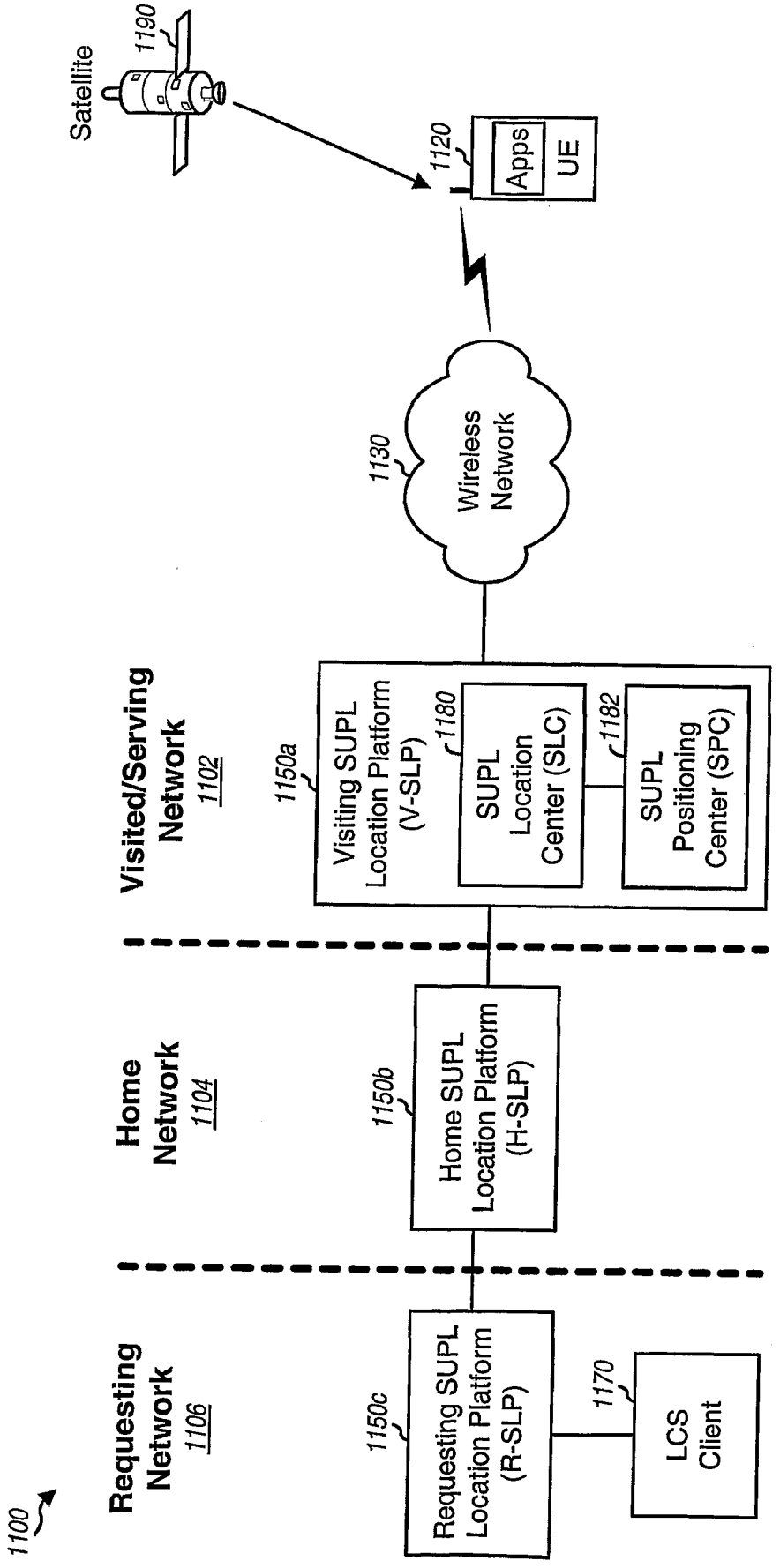

1100
Requesting Network 1106
Home Network 1104
Visited/Serving Network 1102
Satellite
1190
1120
Apps
UE
1130
Wireless Network
1150a
Visiting SUPL Location Platform (V-SLP)
1180
SUPL Location Center (SLC)
1182
SUPL Positioning Center (SPC)
1150b
Home SUPL Location Platform (H-SLP)
1150c
Requesting SUPL Location Platform (R-SLP)
1170
LCS Client

FIG. 11

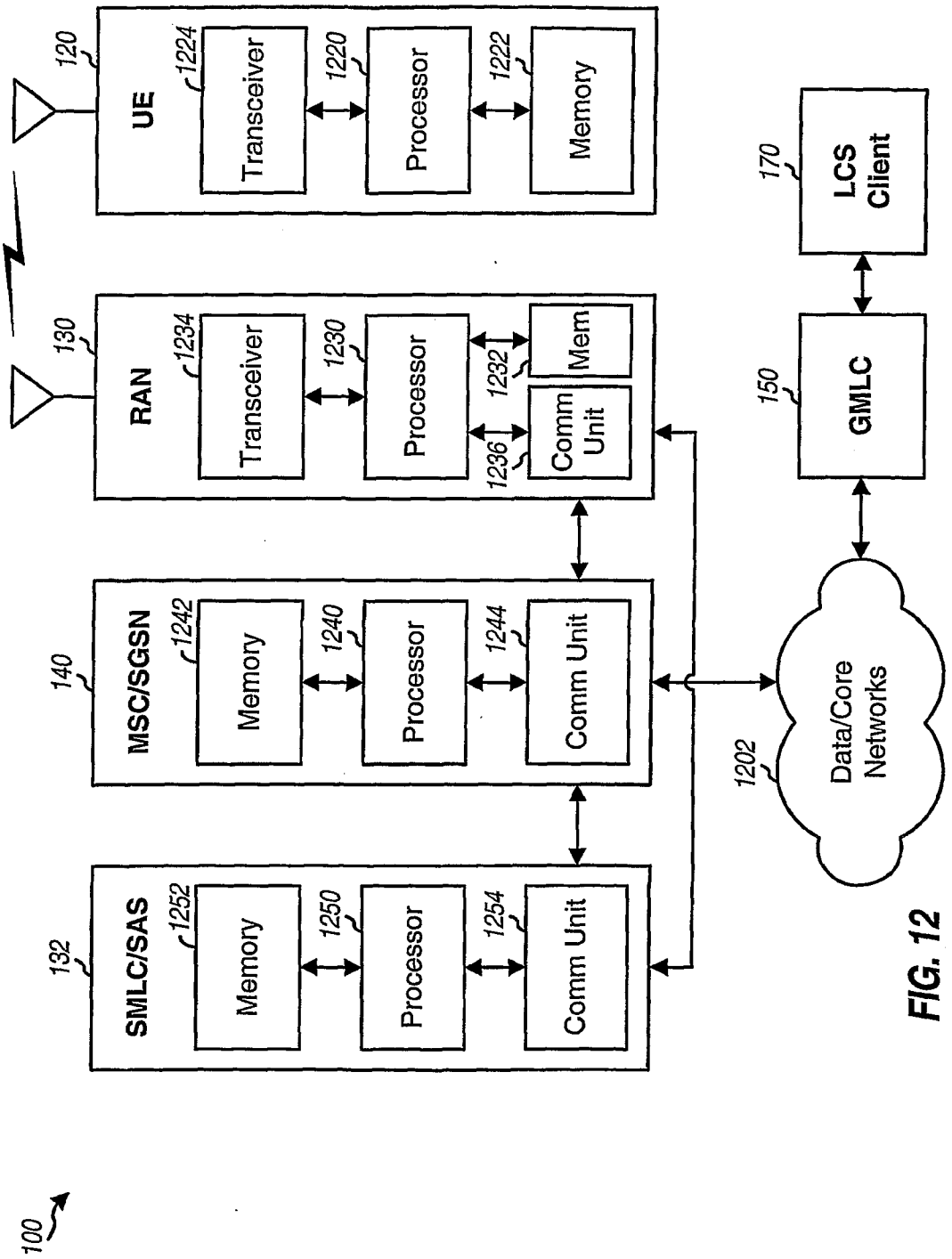

100
UE
120
Transceiver
1224
Processor
1220
Memory
1222
RAN
130
Transceiver
1234
Processor
1230
Mem
1232
Comm Unit
1236
MSC/SGSN
140
Memory
1242
Processor
1240
Comm Unit
1244
SMLC/SAS
132
Memory
1252
Processor
1250
Comm Unit
1254
Data/Core Networks
1202
GMLC
150
LCS Client
170

FIG. 12