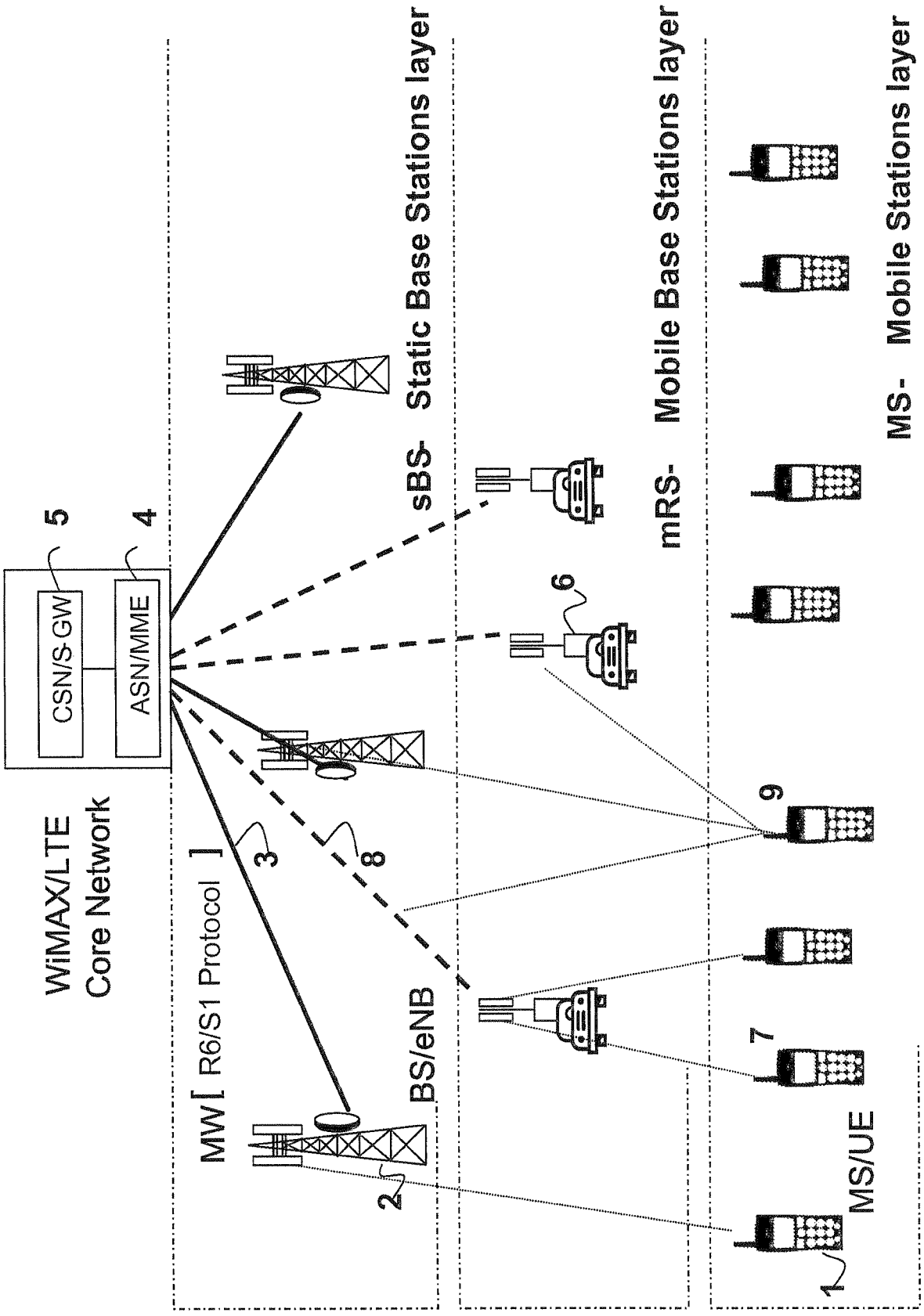

WiMAX/LTE
Core Network
CSN/S-GW
ASN/MME
5
4
MW[R6/S1 Protocol]
3
8
BS/eNB
sBS- Static Base Stations layer
mRS- Mobile Base Stations layer
MS- Mobile Stations layer
2
6
9
7
MS/UE
1

Fig. 1

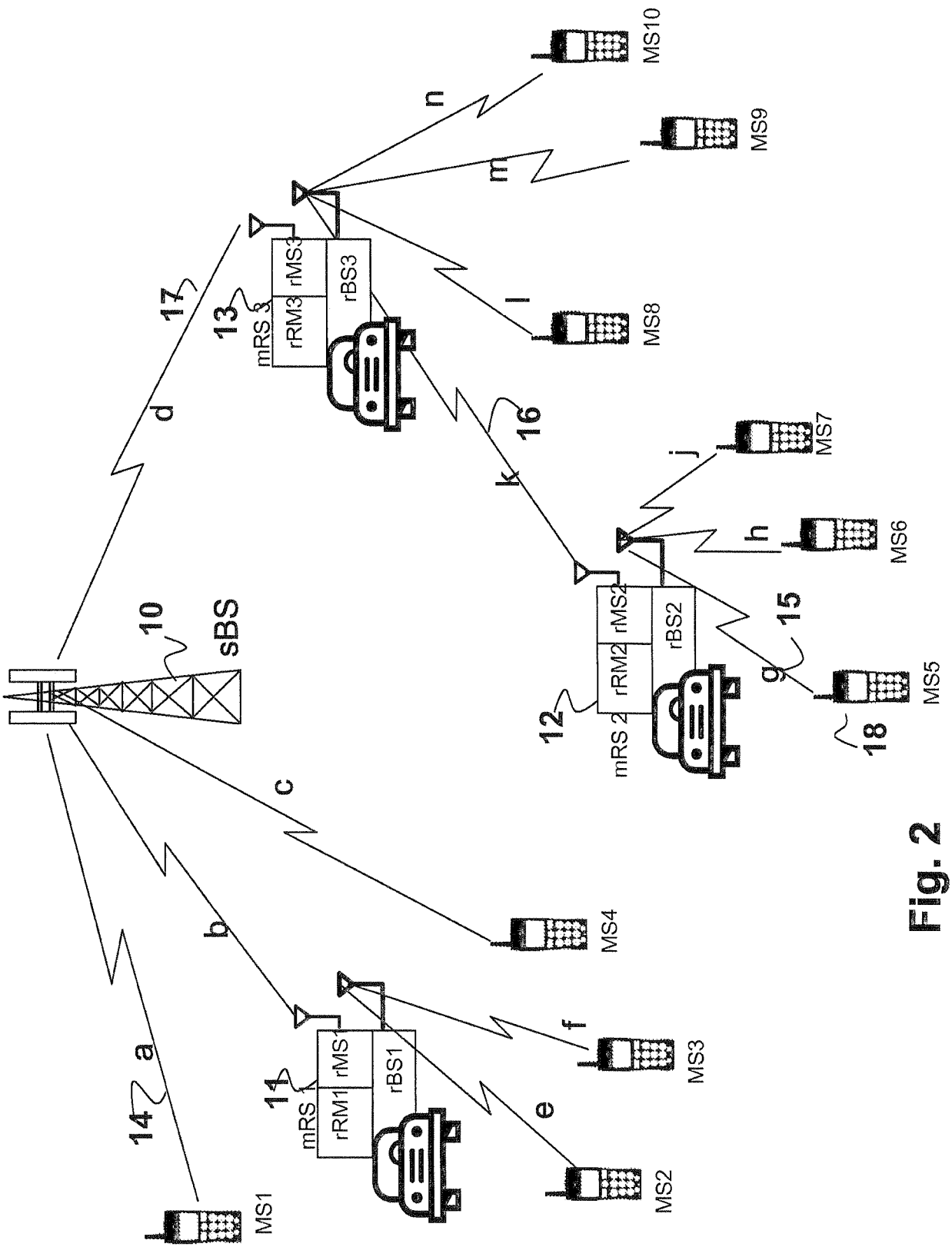

sBS
10
MS1
MS2
MS3
MS4
MS5
MS6
MS7
MS8
MS9
MS10
mRS 1
rRM1
rMS1
rBS1
mRS 2
rRM2
rMS2
rBS2
mRS 3
rRM3
rMS3
rBS3
a
b
c
d
e
f
g
h
j
k
l
m
n
11
12
13
14
15
16
17
18

Fig. 2

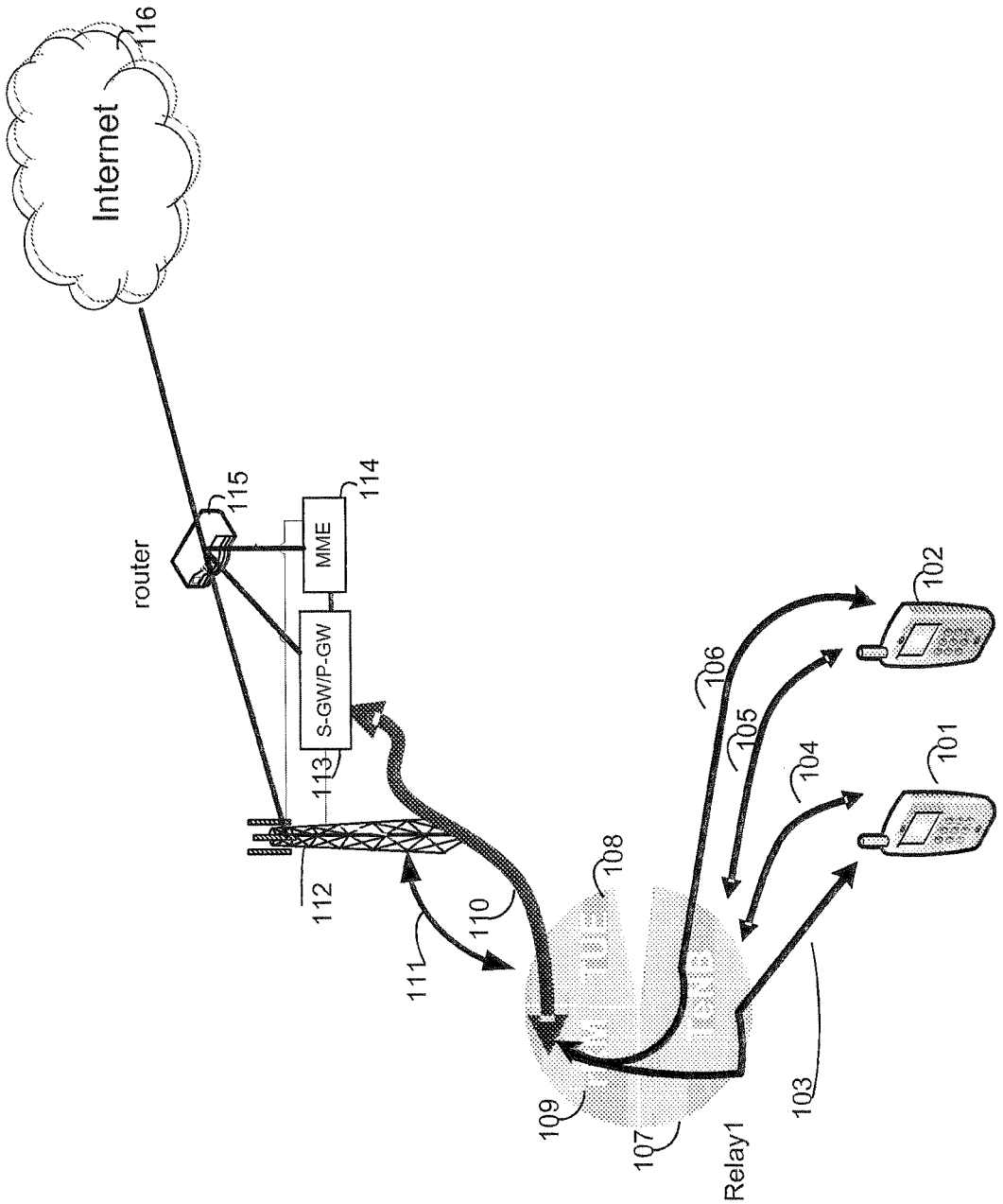

Internet
116
router
115
MME
114
S-GW/P-GW
113
112
111
110
108
109
107
Relay1
103
106
105
104
102
101

Fig. 3

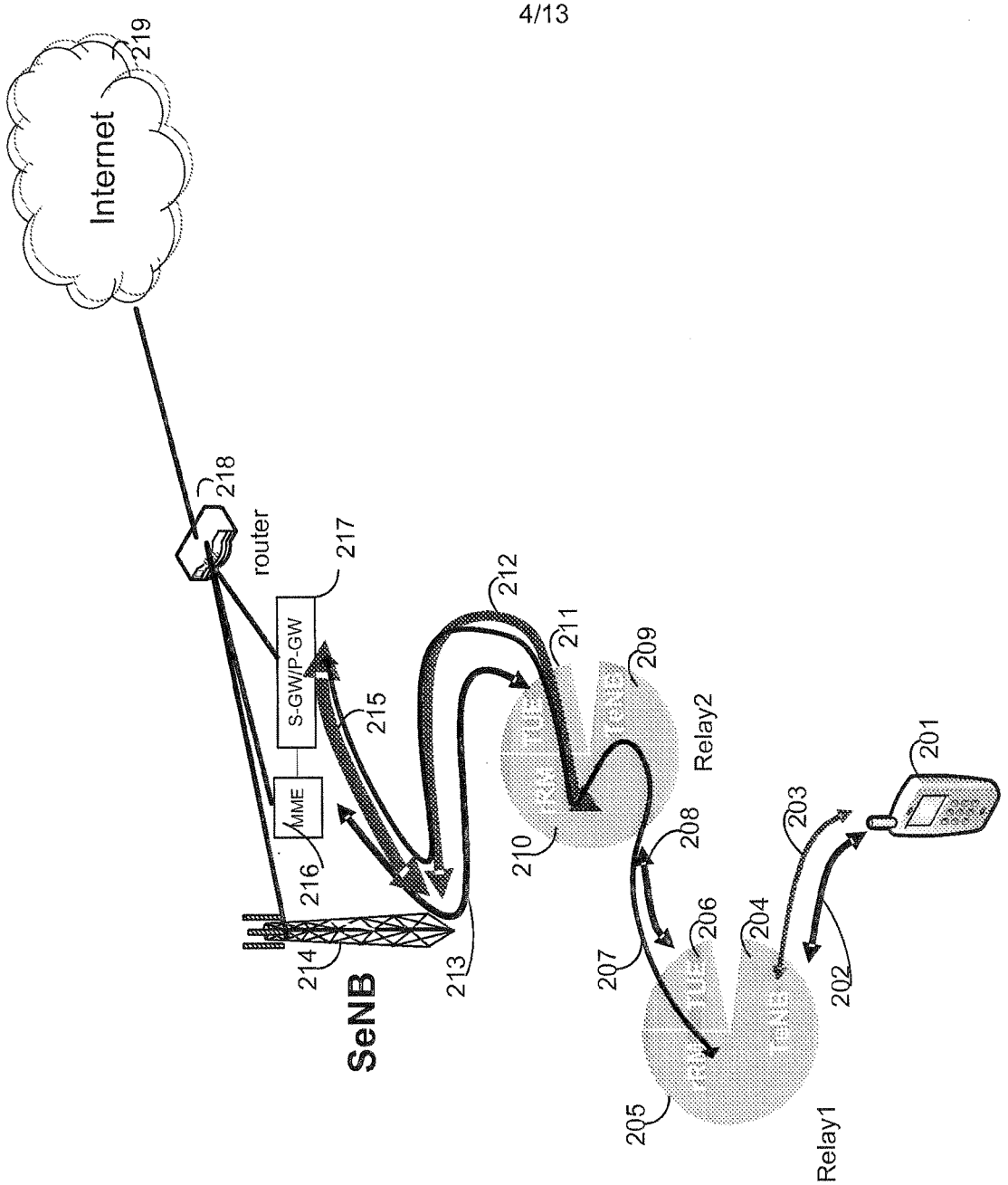

Internet
219
218
router
217
S-GW/P-GW
MME
216
215
212
211
209
Relay2
210
208
207
206
204
203
201
214
SeNB
213
205
202
Relay1

Fig. 4

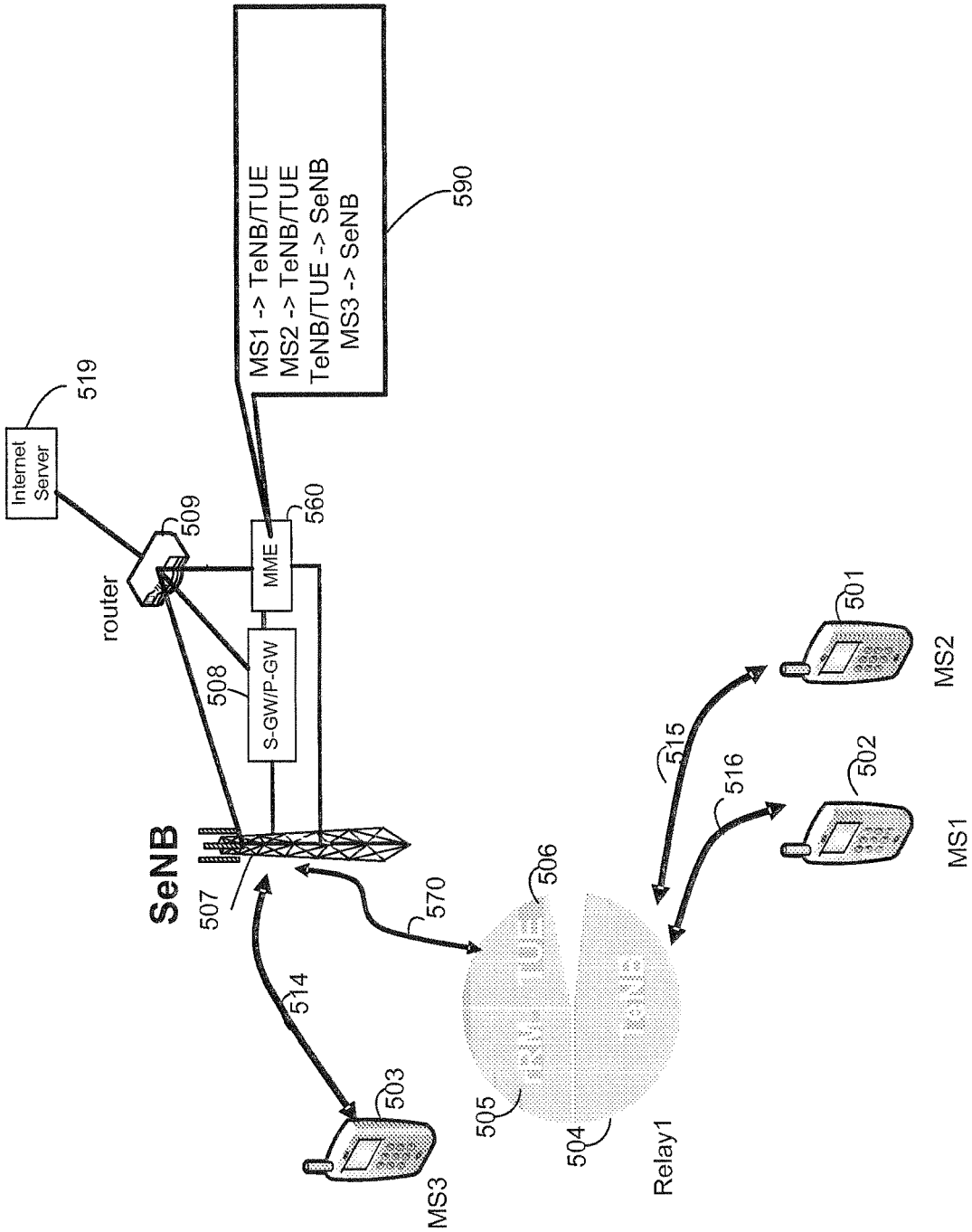

MS1 -> TeNB/TUE
MS2 -> TeNB/TUE
TeNB/TUE -> SeNB
MS3 -> SeNB
590
Internet Server
519
router
509
MME
560
S-GW/P-GW
508
SeNB
507
570
514
503
MS3
505
506
504
Relay1
515
516
501
MS2
502
MS1

Fig. 5

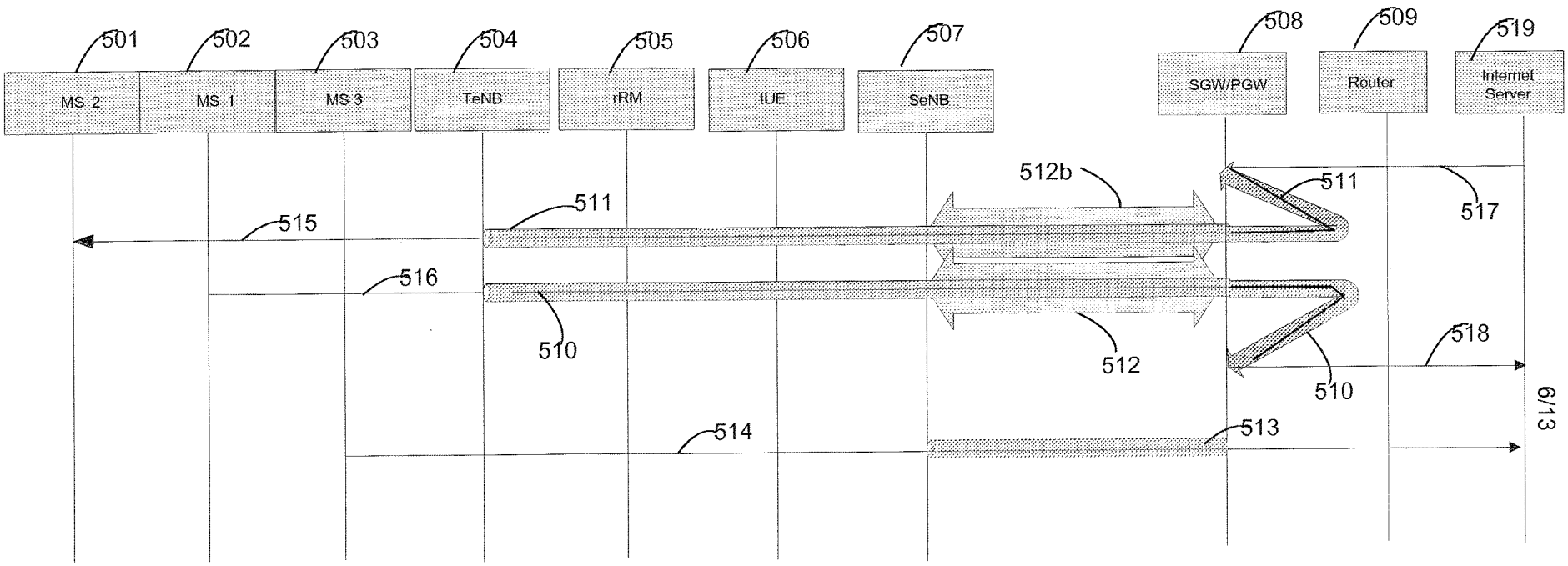

501
502
503
504
505
506
507
508
509
519
MS 2
MS 1
MS 3
TeNB
rRM
tUE
SeNB
SGW/PGW
Router
Internet Server
512b
511
517
515
511
516
510
512
518
510
514
513

Fig. 6

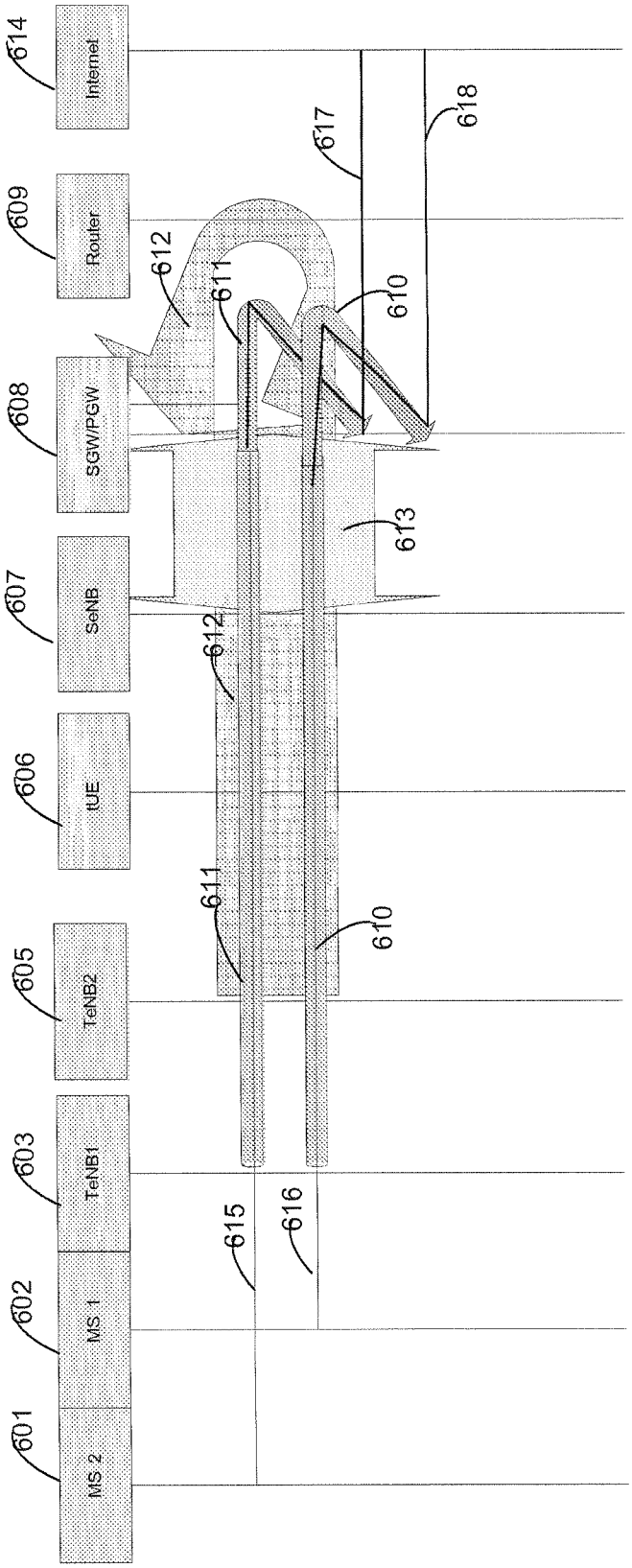

614
Internet
609
Router
608
SGW/PGW
607
SeNB
606
tUE
605
TeNB2
603
TeNB1
602
MS 1
601
MS 2
612
611
610
617
618
613
612
611
610
615
616

Fig. 7

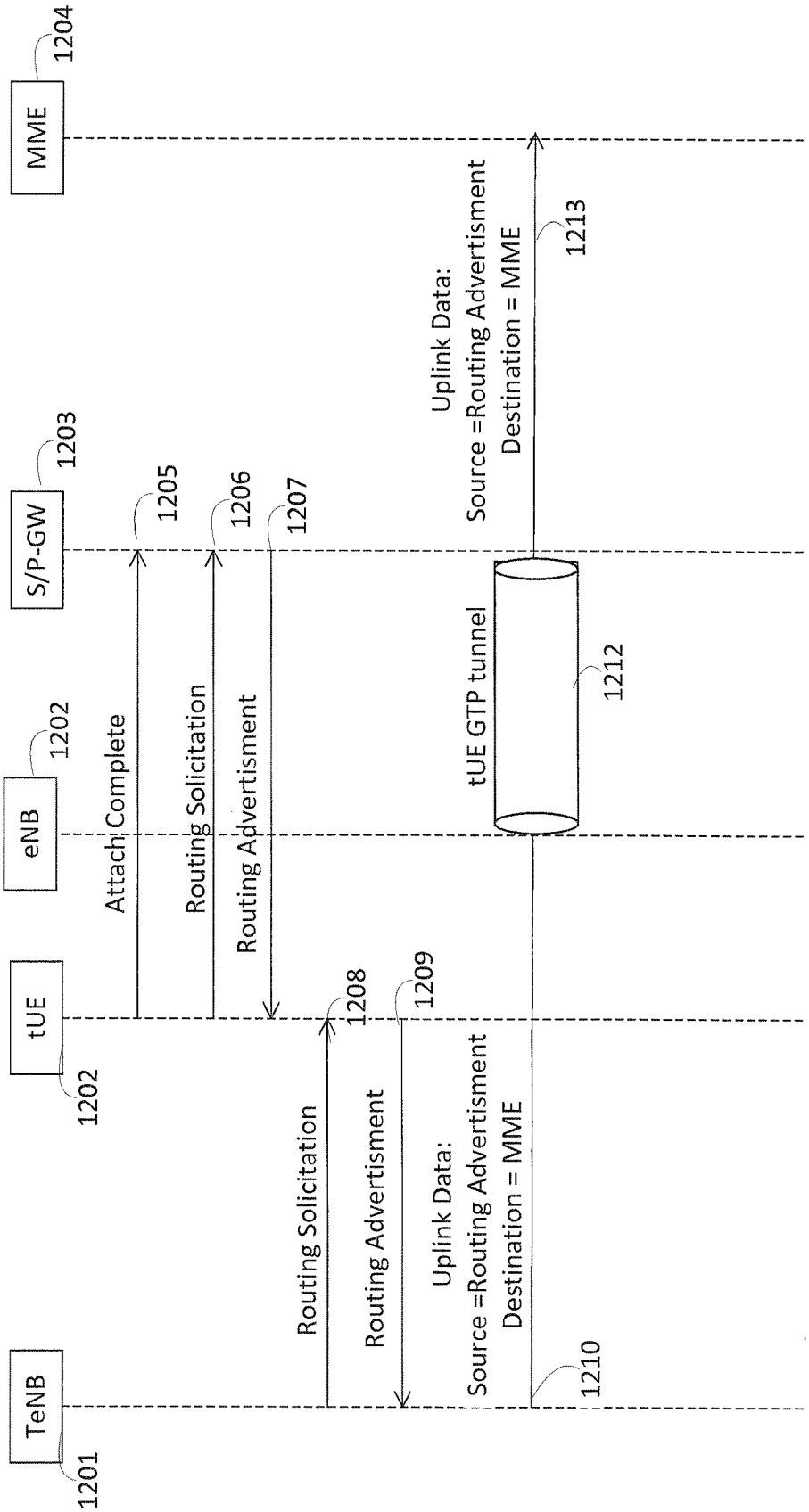

TeNB
1201
tUE
1202
eNB
1202
S/P-GW
1203
MME
1204
Attach Complete
1205
Routing Solicitation
1206
Routing Advertisment
1207
Routing Solicitation
1208
Routing Advertisment
1209
Uplink Data:
Source =Routing Advertisment
Destination = MME
1210
tUE GTP tunnel
1212
Uplink Data:
Source =Routing Advertisment
Destination = MME
1213

Fig. 8

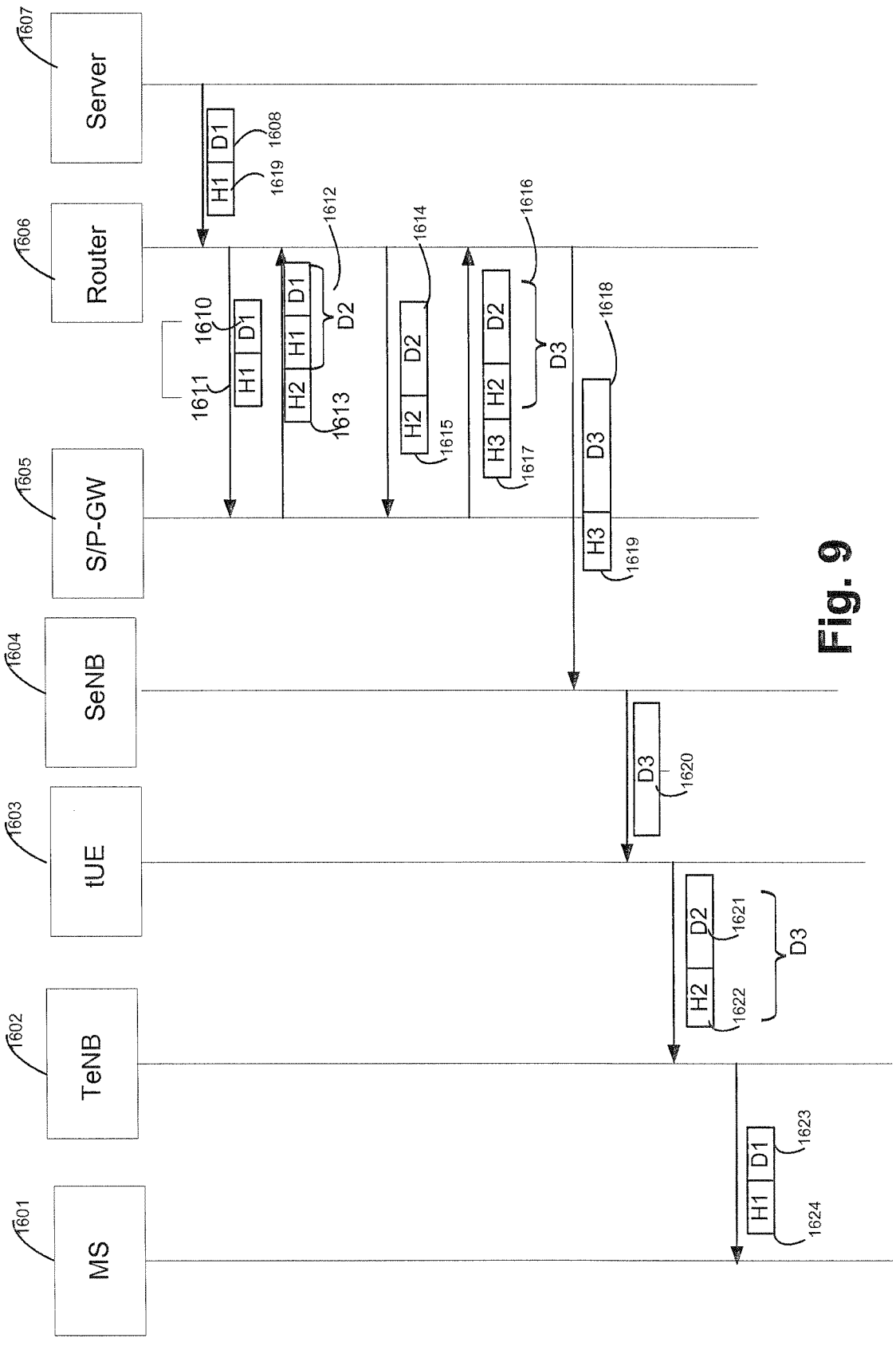

1607
Server
1606
Router
1605
S/P-GW
1604
SeNB
1603
tUE
1602
TeNB
1601
MS
H1
D1
1608
1619
1610
1611
1612
D2
1613
1614
1615
1616
D3
H2
H3
1617
1618
1620
1621
1622
1623
1624

Fig. 9

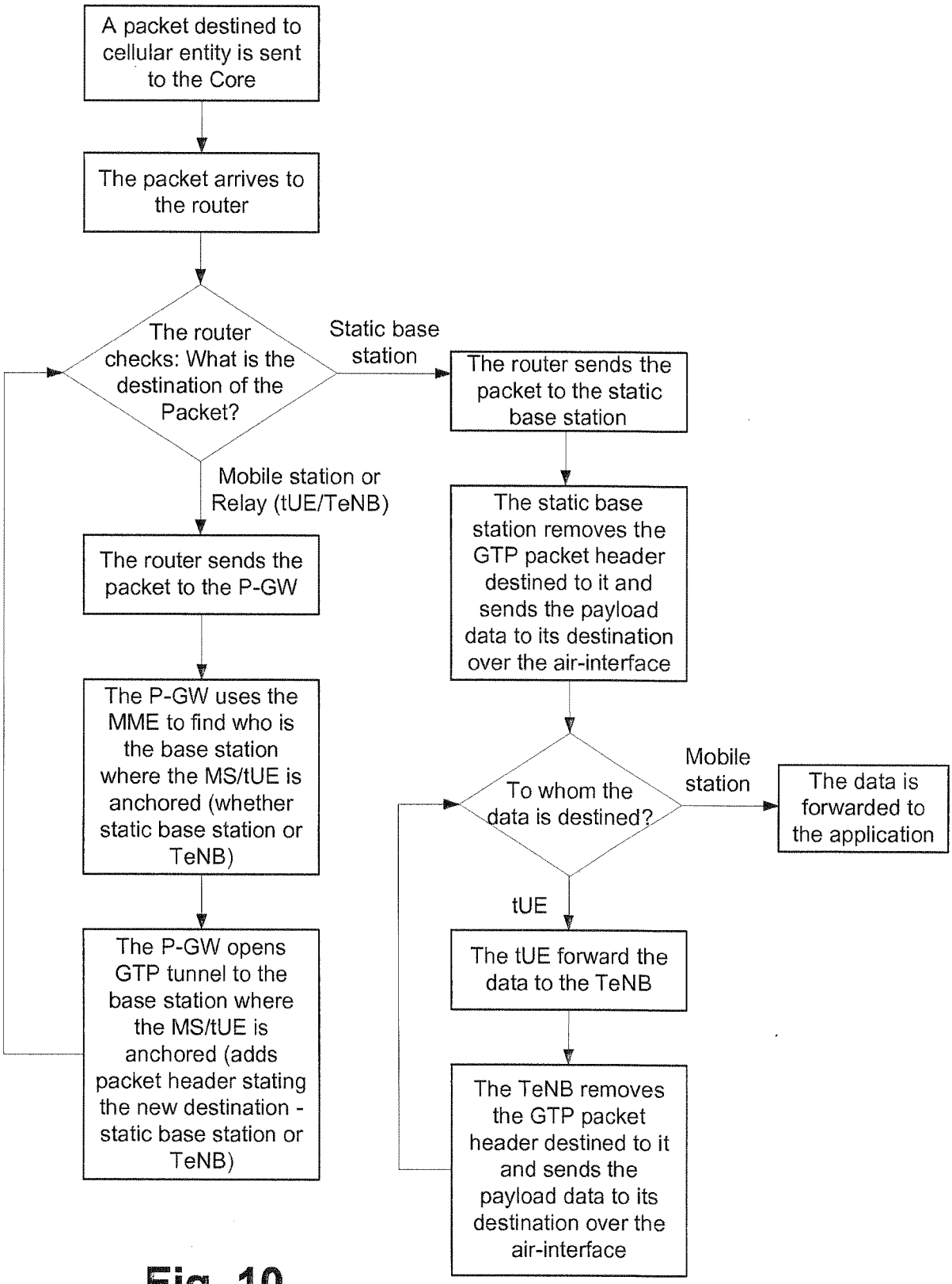

A packet destined to cellular entity is sent to the Core
The packet arrives to the router
The router checks: What is the destination of the Packet?
Static base station
The router sends the packet to the static base station
Mobile station or Relay (tUE/TeNB)
The router sends the packet to the P-GW
The P-GW uses the MME to find who is the base station where the MS/tUE is anchored (whether static base station or TeNB)
The P-GW opens GTP tunnel to the base station where the MS/tUE is anchored (adds packet header stating the new destination - static base station or TeNB)
The static base station removes the GTP packet header destined to it and sends the payload data to its destination over the air-interface
To whom the data is destined?
Mobile station
The data is forwarded to the application
tUE
The tUE forward the data to the TeNB
The TeNB removes the GTP packet header destined to it and sends the payload data to its destination over the air-interface

Fig. 10

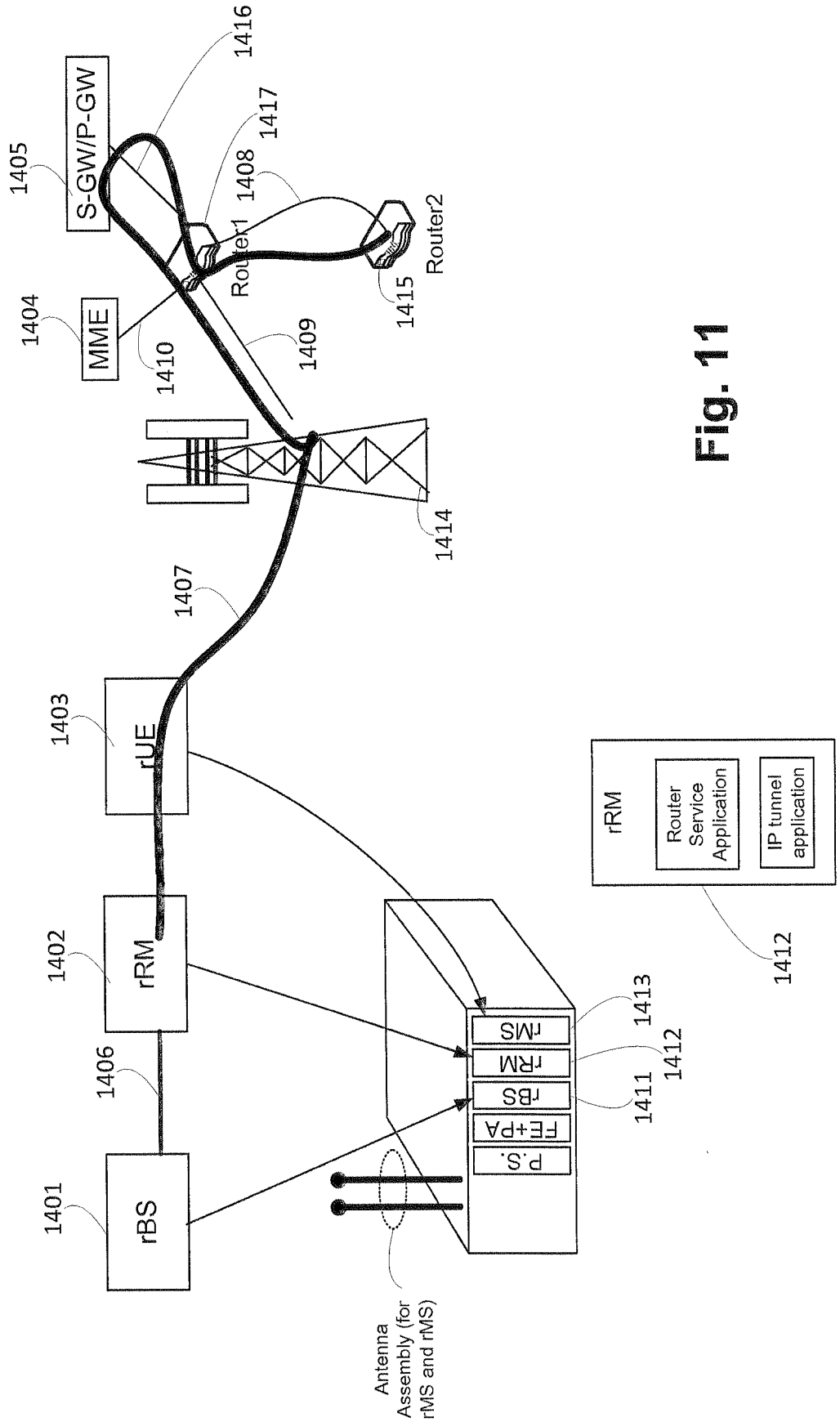

1405
S-GW/P-GW
1416
1417
1408
Router1
Router2
1415
1404
MME
1410
1409
1414
1407
1403
rUE
1402
rRM
1406
1401
rBS
rMS
rRM
rBS
FE+PA
P.S.
1413
1412
1411
Antenna Assembly (for rMS and rMS)
rRM
Router Service Application
IP tunnel application
1412

Fig. 11

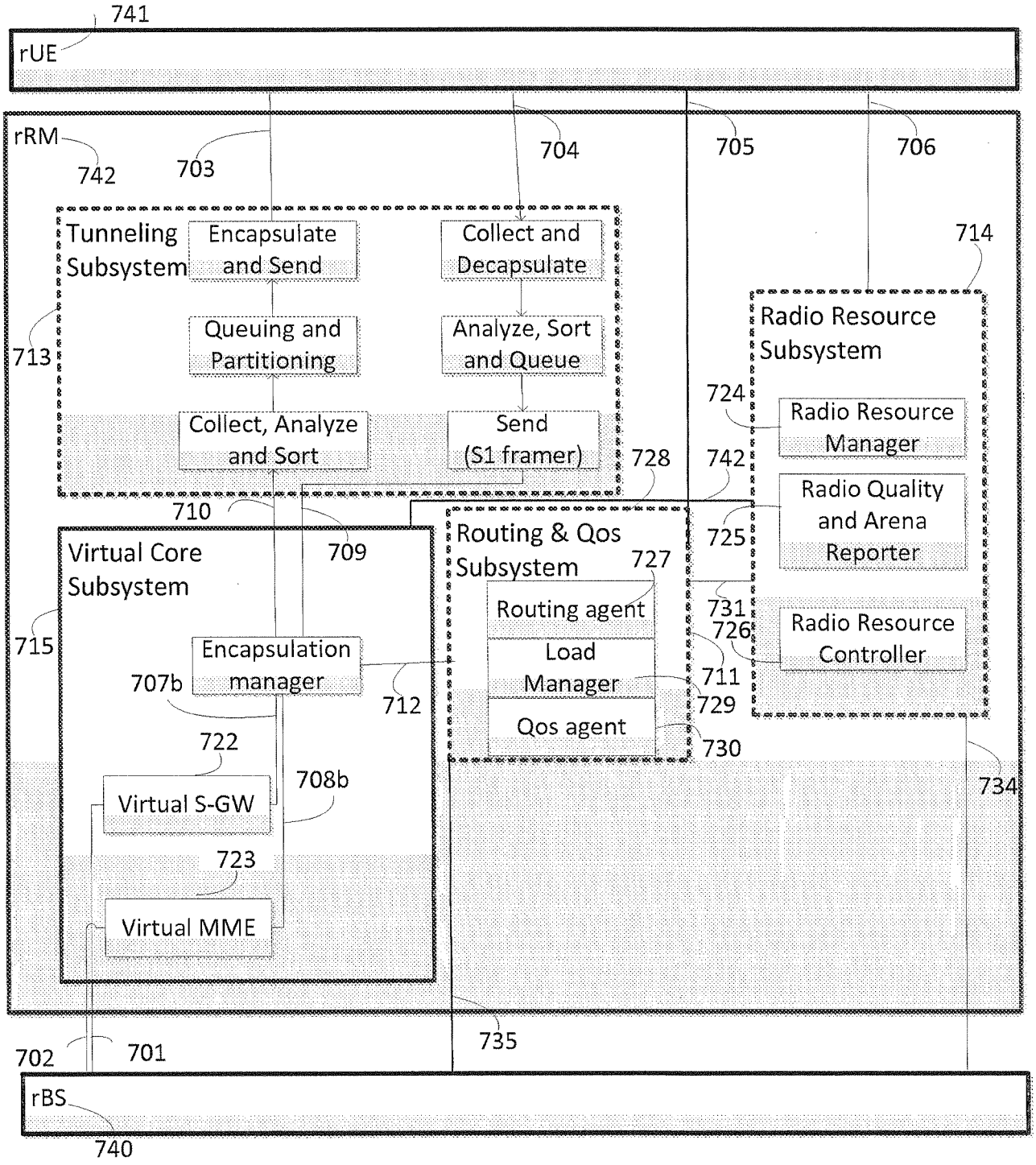

741
rUE
rRM
742
703
704
705
706
Tunneling Subsystem
Encapsulate and Send
Collect and Decapsulate
Queuing and Partitioning
Analyze, Sort and Queue
Collect, Analyze and Sort
Send (S1 framer)
713
710
709
728
714
Radio Resource Subsystem
724
Radio Resource Manager
742
Radio Quality and Arena Reporter
725
731
726
Radio Resource Controller
Routing & Qos Subsystem
727
Routing agent
Load Manager
Qos agent
711
729
730
Virtual Core Subsystem
715
Encapsulation manager
707b
712
722
Virtual S-GW
708b
723
Virtual MME
734
735
702
701
rBS
740

Fig. 12

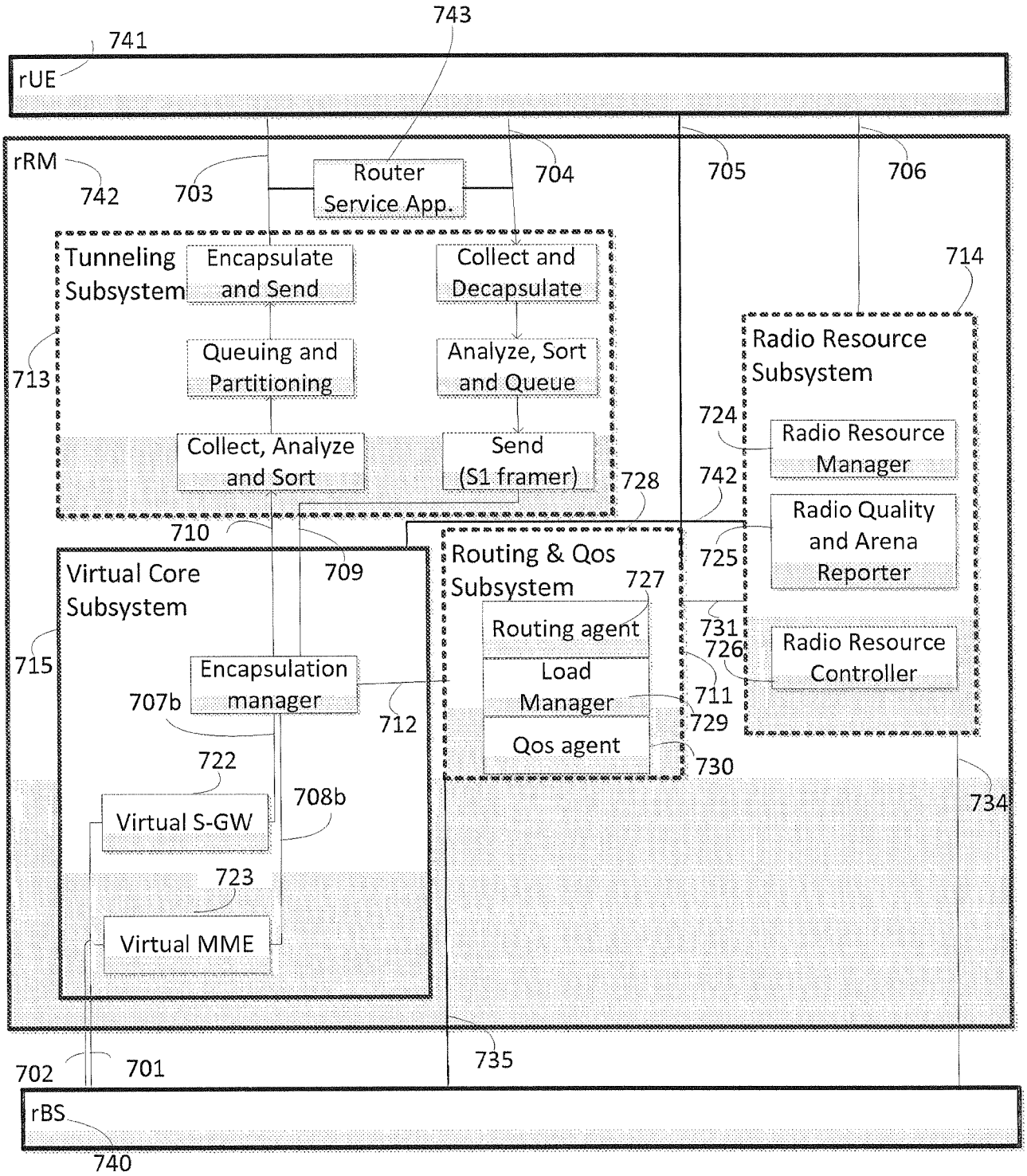

743
741
rUE
rRM
742
703
Router
Service App.
704
705
706
Tunneling
Subsystem
Encapsulate
and Send
Collect and
Decapsulate
714
Radio Resource
Subsystem
713
Queuing and
Partitioning
Analyze, Sort
and Queue
724
Radio Resource
Manager
Collect, Analyze
and Sort
Send
(S1 framer)
728
742
Radio Quality
and Arena
Reporter
710
709
Routing & Qos
Subsystem
727
725
Virtual Core
Subsystem
Routing agent
731
726
715
Encapsulation
manager
Load
Manager
Radio Resource
Controller
707b
712
711
729
Qos agent
730
722
734
708b
Virtual S-GW
723
Virtual MME
735
702
701
rBS
740

Fig. 13