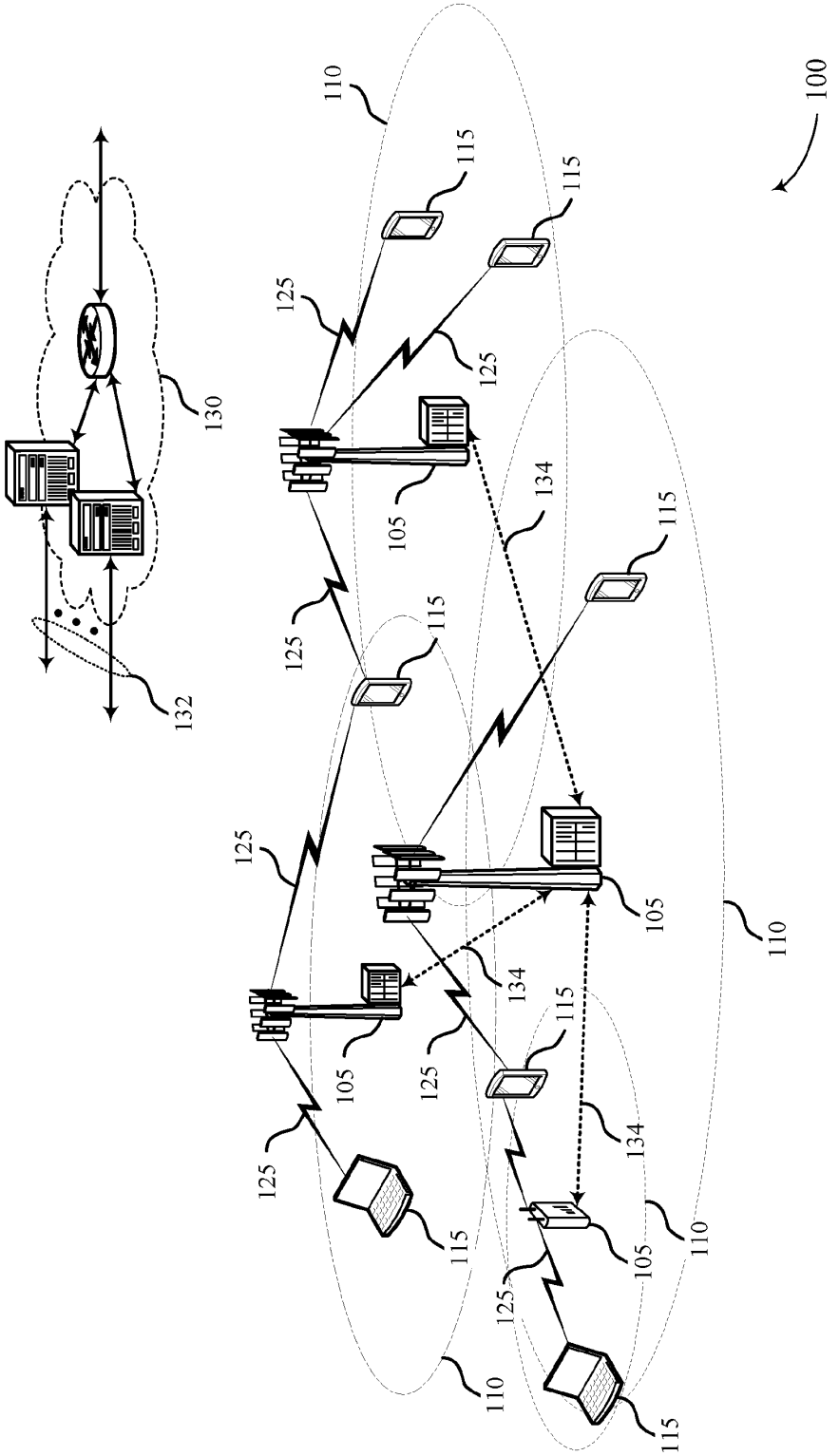

FIG. 1

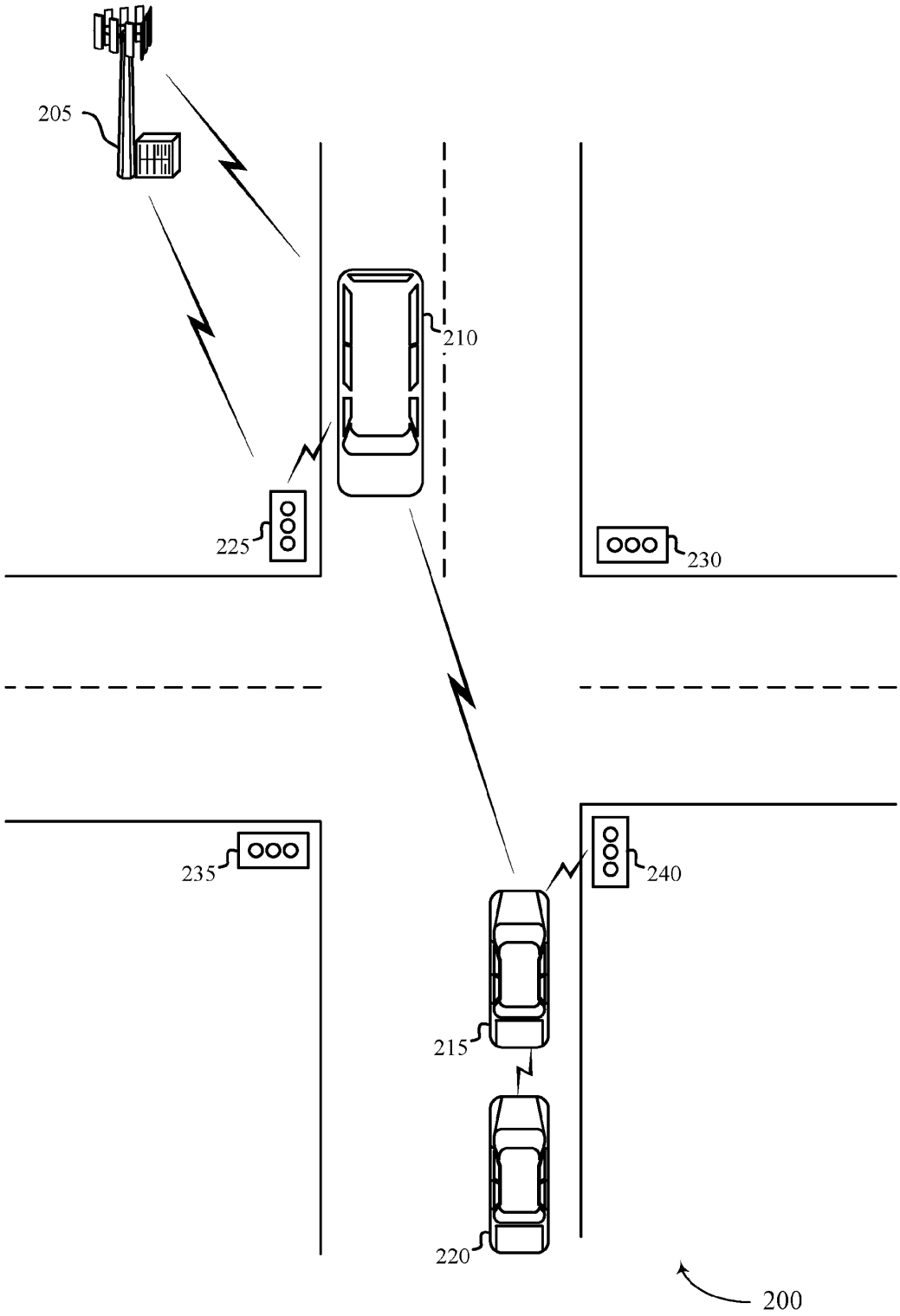

FIG. 2

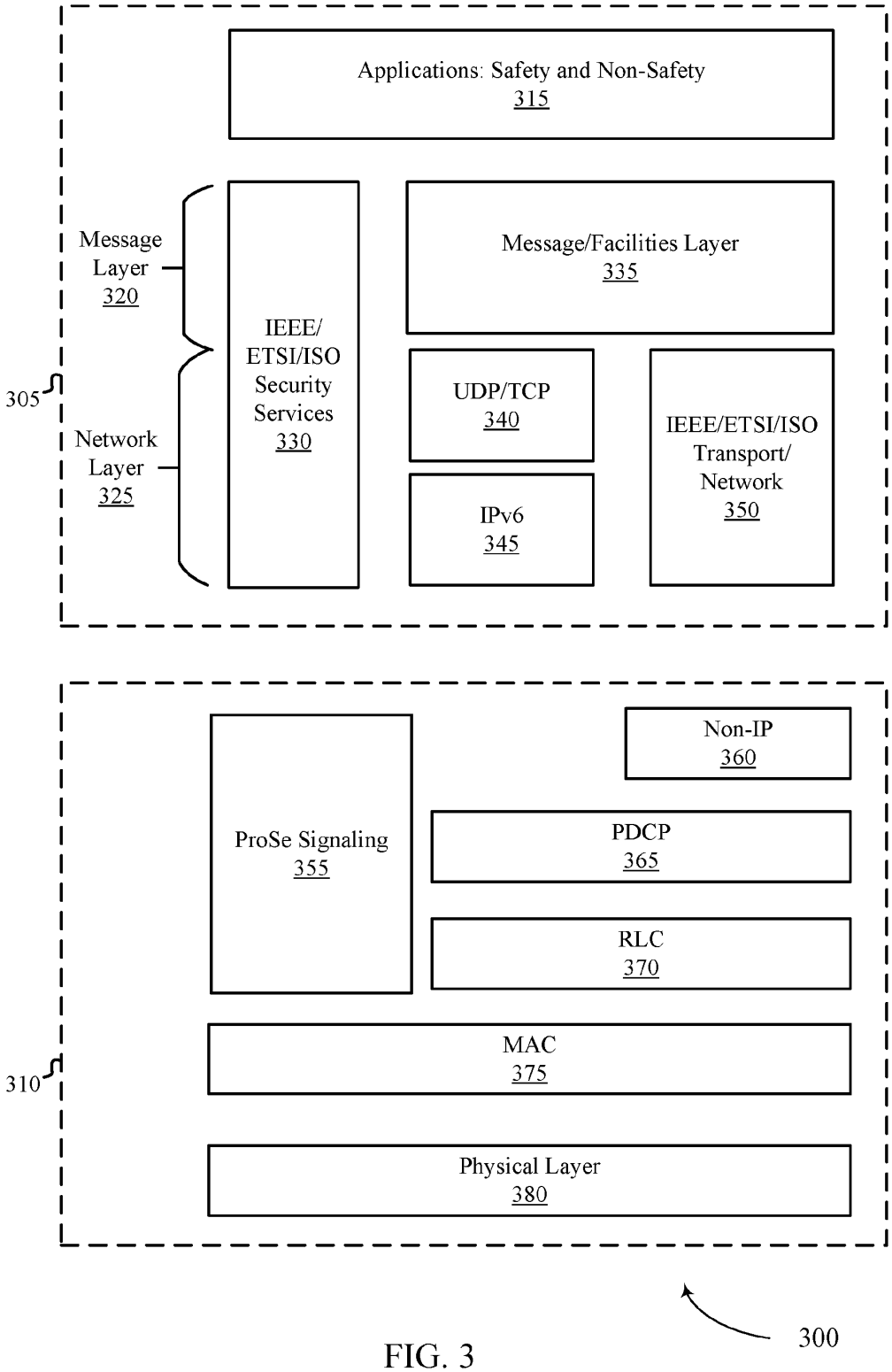
Applications: Safety and Non-Safety
315
Message Layer
320
Network Layer
325
305
IEEE/ ETSI/ISO Security Services
330
Message/Facilities Layer
335
UDP/TCP
340
IPv6
345
IEEE/ETSI/ISO Transport/ Network
350
ProSe Signaling
355
Non-IP
360
PDCP
365
RLC
370
MAC
375
Physical Layer
380
310
300

FIG. 3

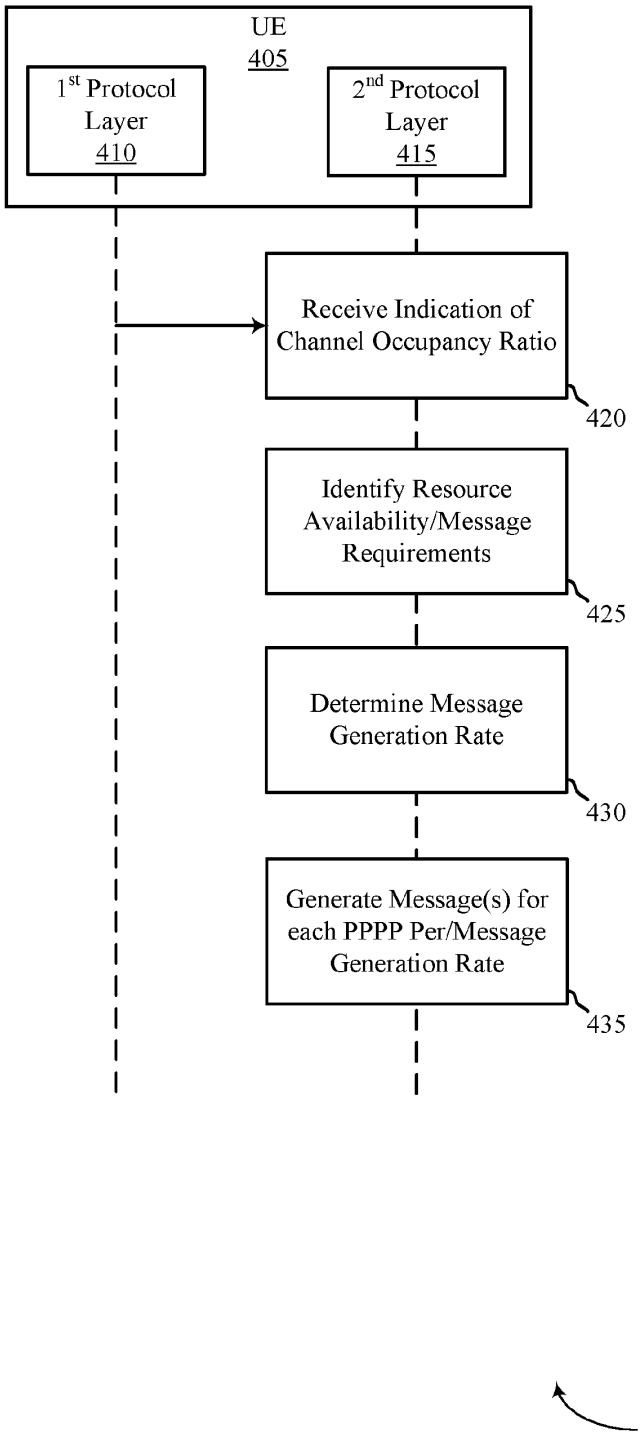
UE
405
1st Protocol Layer
410
2nd Protocol Layer
415
Receive Indication of Channel Occupancy Ratio
420
Identify Resource Availability/Message Requirements
425
Determine Message Generation Rate
430
Generate Message(s) for each PPPP Per/Message Generation Rate
435
400

FIG. 4

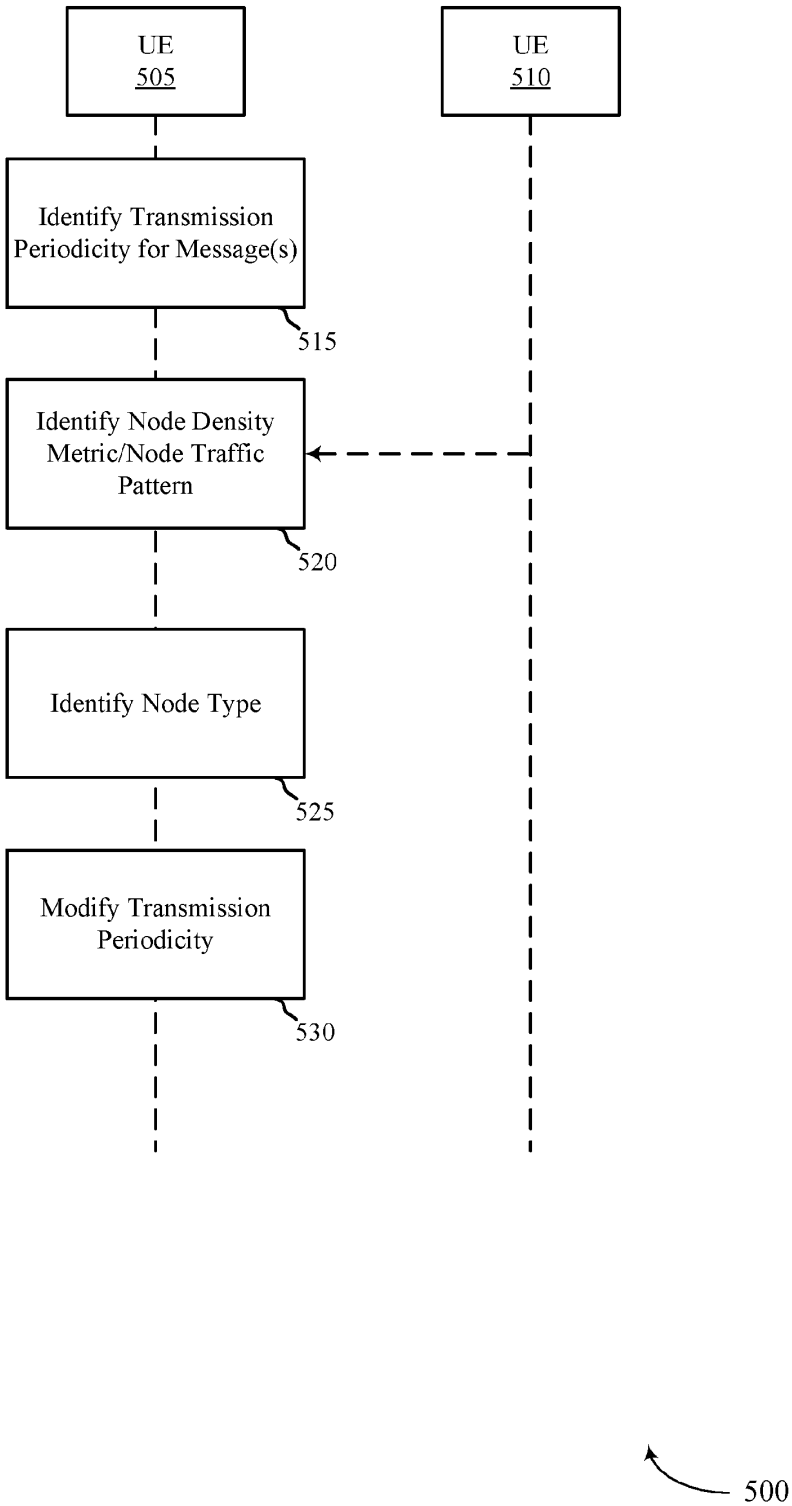
UE
505
UE
510
Identify Transmission Periodicity for Message(s)
515
Identify Node Density Metric/Node Traffic Pattern
520
Identify Node Type
525
Modify Transmission Periodicity
530
500

FIG. 5

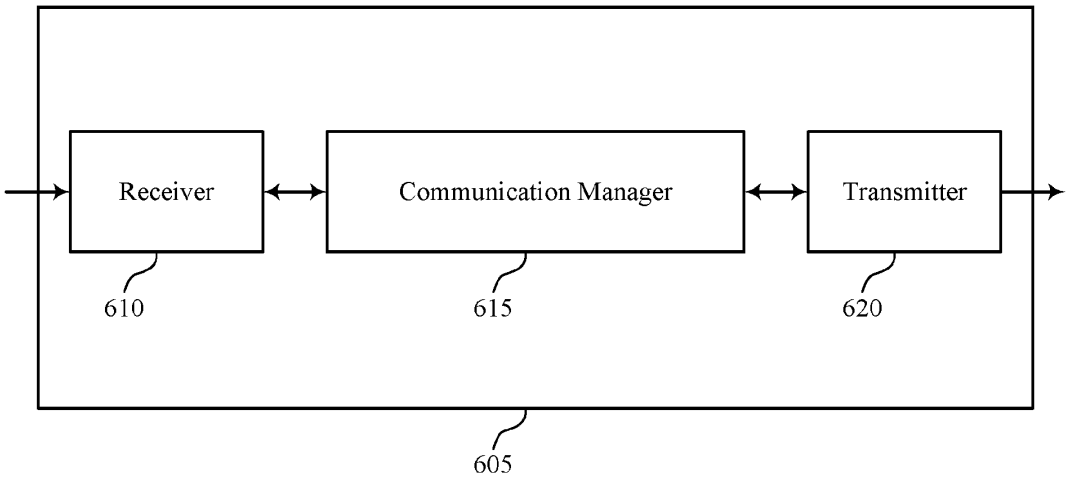
Receiver
Communication Manager
Transmitter
610
615
620
605
600

FIG. 6

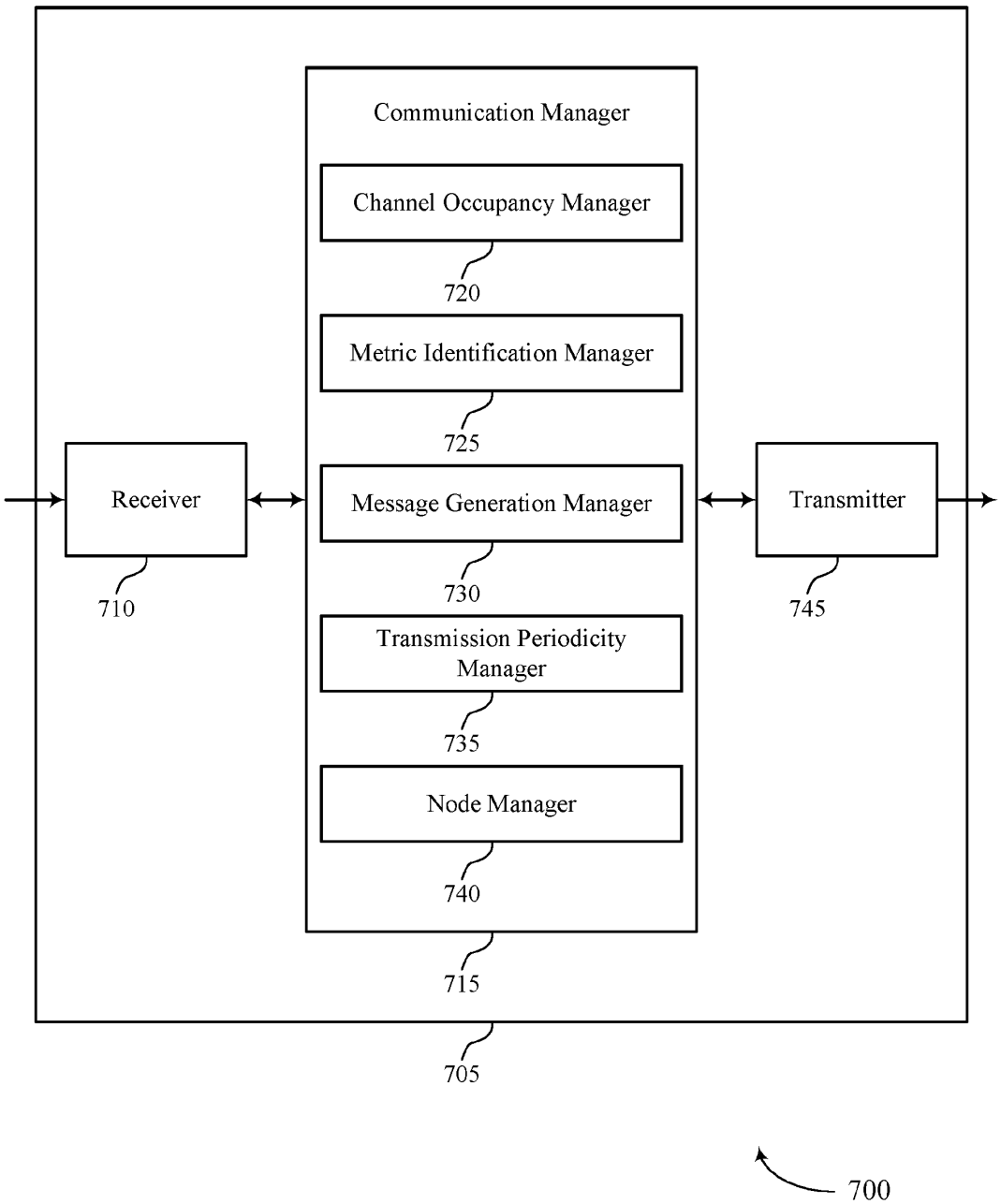
Communication Manager
Channel Occupancy Manager
720
Metric Identification Manager
725
Receiver
Message Generation Manager
Transmitter
710
730
745
Transmission Periodicity Manager
735
Node Manager
740
715
705
700

FIG. 7

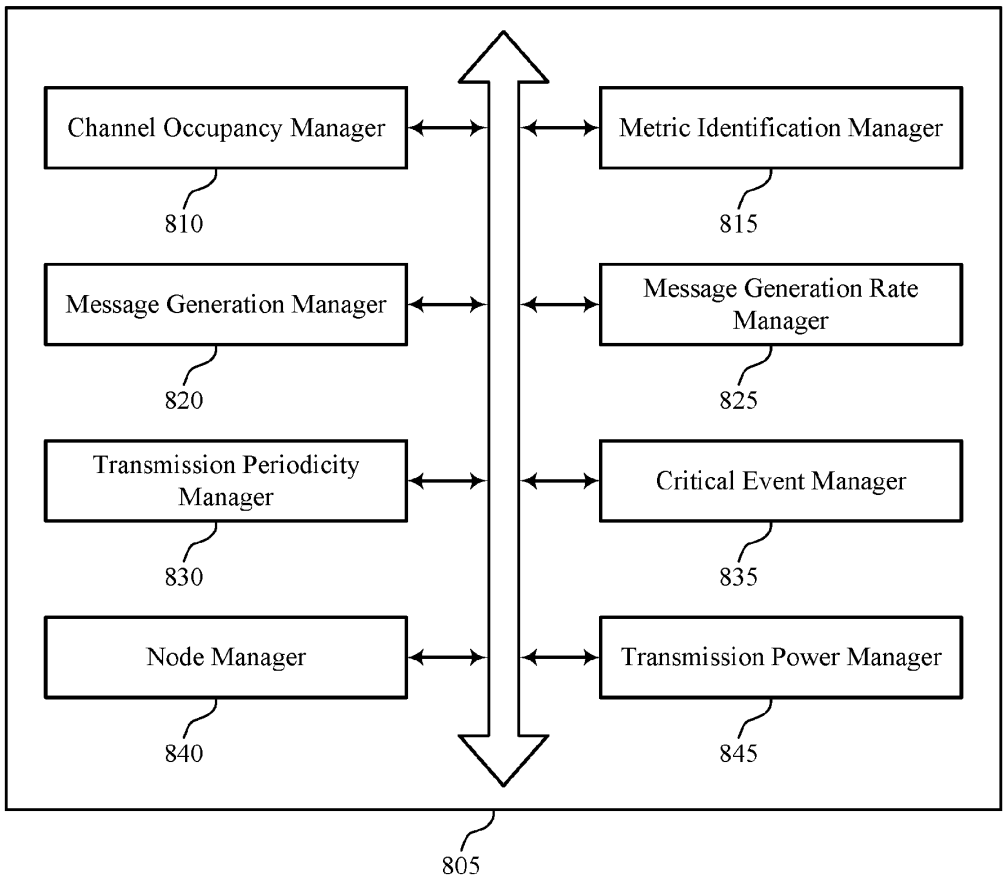
Channel Occupancy Manager
810
Metric Identification Manager
815
Message Generation Manager
820
Message Generation Rate Manager
825
Transmission Periodicity Manager
830
Critical Event Manager
835
Node Manager
840
Transmission Power Manager
845
805
800

FIG. 8

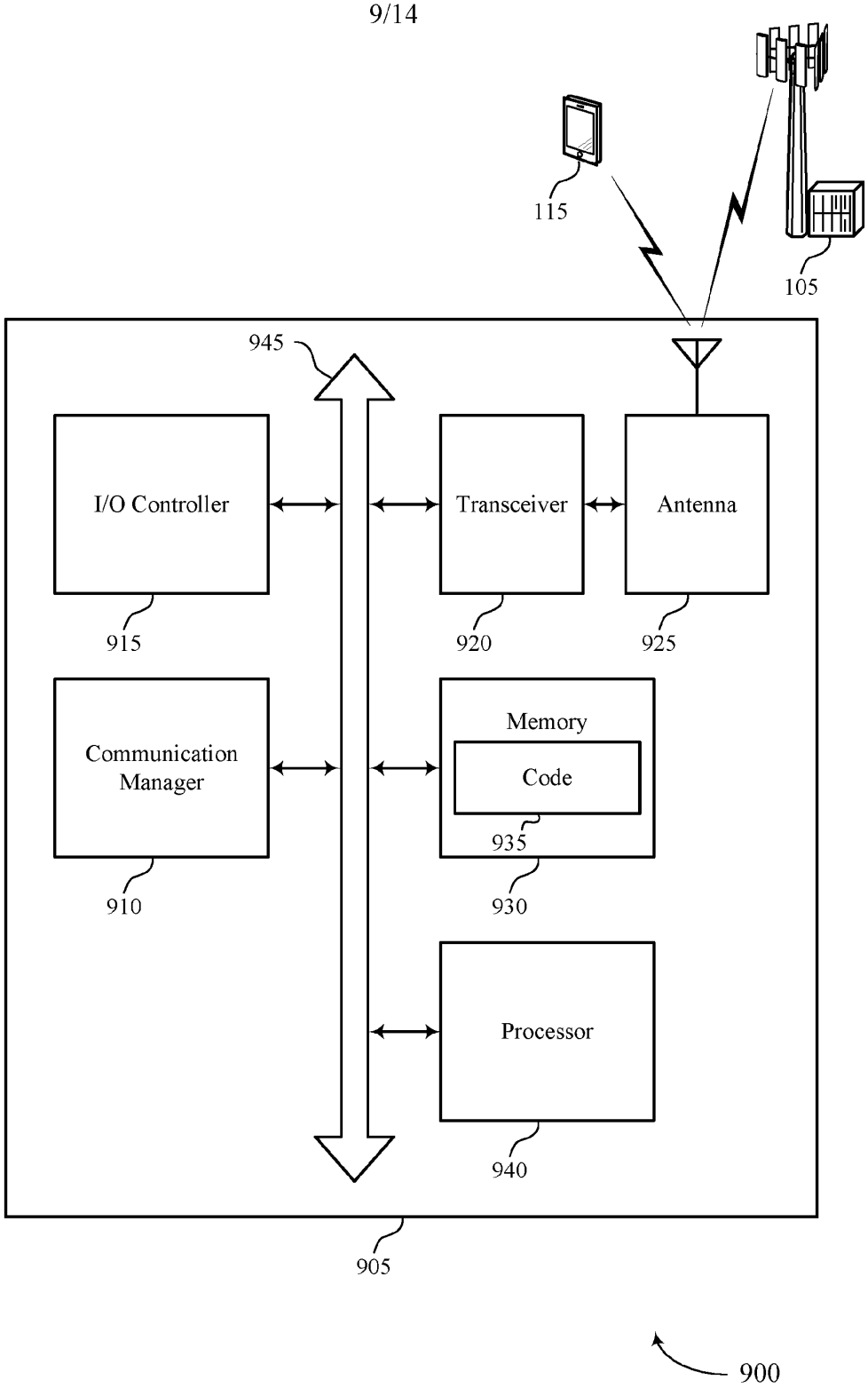
115
105
945
I/O Controller
Transceiver
Antenna
915
920
925
Communication Manager
Memory
Code
935
910
930
Processor
940
905
900

FIG. 9

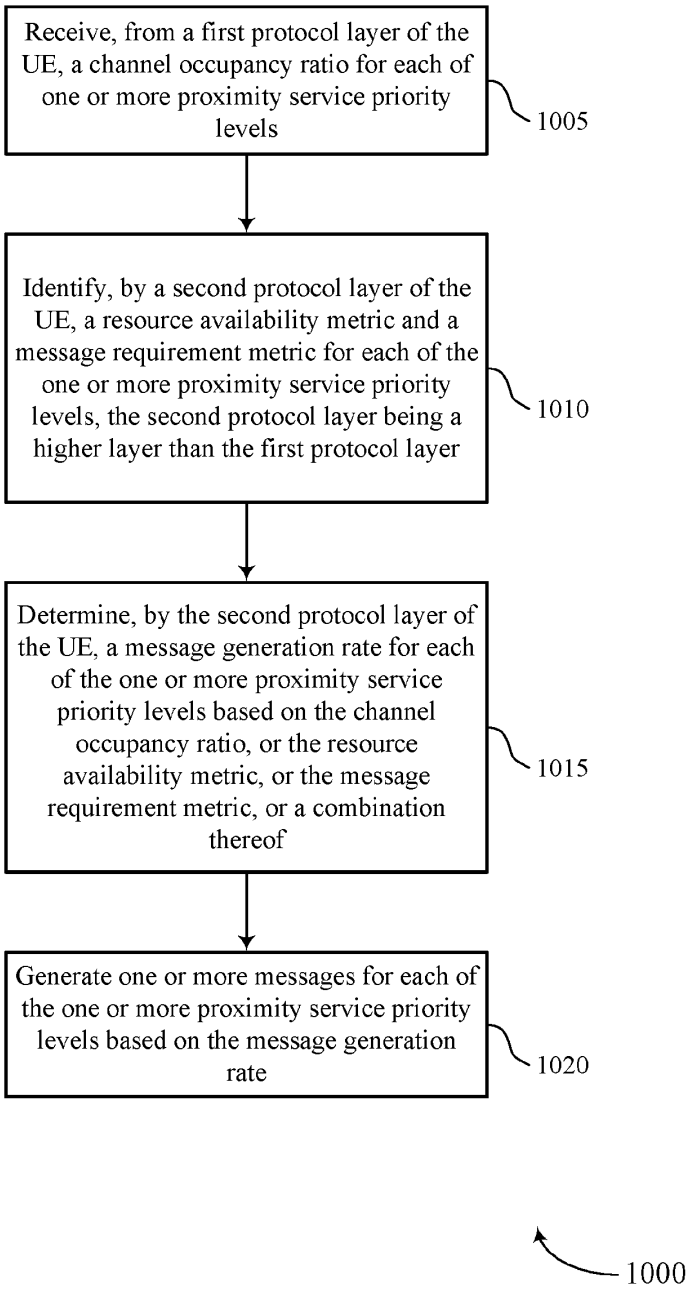
Receive, from a first protocol layer of the UE, a channel occupancy ratio for each of one or more proximity service priority levels
1005
Identify, by a second protocol layer of the UE, a resource availability metric and a message requirement metric for each of the one or more proximity service priority levels, the second protocol layer being a higher layer than the first protocol layer
1010
Determine, by the second protocol layer of the UE, a message generation rate for each of the one or more proximity service priority levels based on the channel occupancy ratio, or the resource availability metric, or the message requirement metric, or a combination thereof
1015
Generate one or more messages for each of the one or more proximity service priority levels based on the message generation rate
1020
1000

FIG. 10

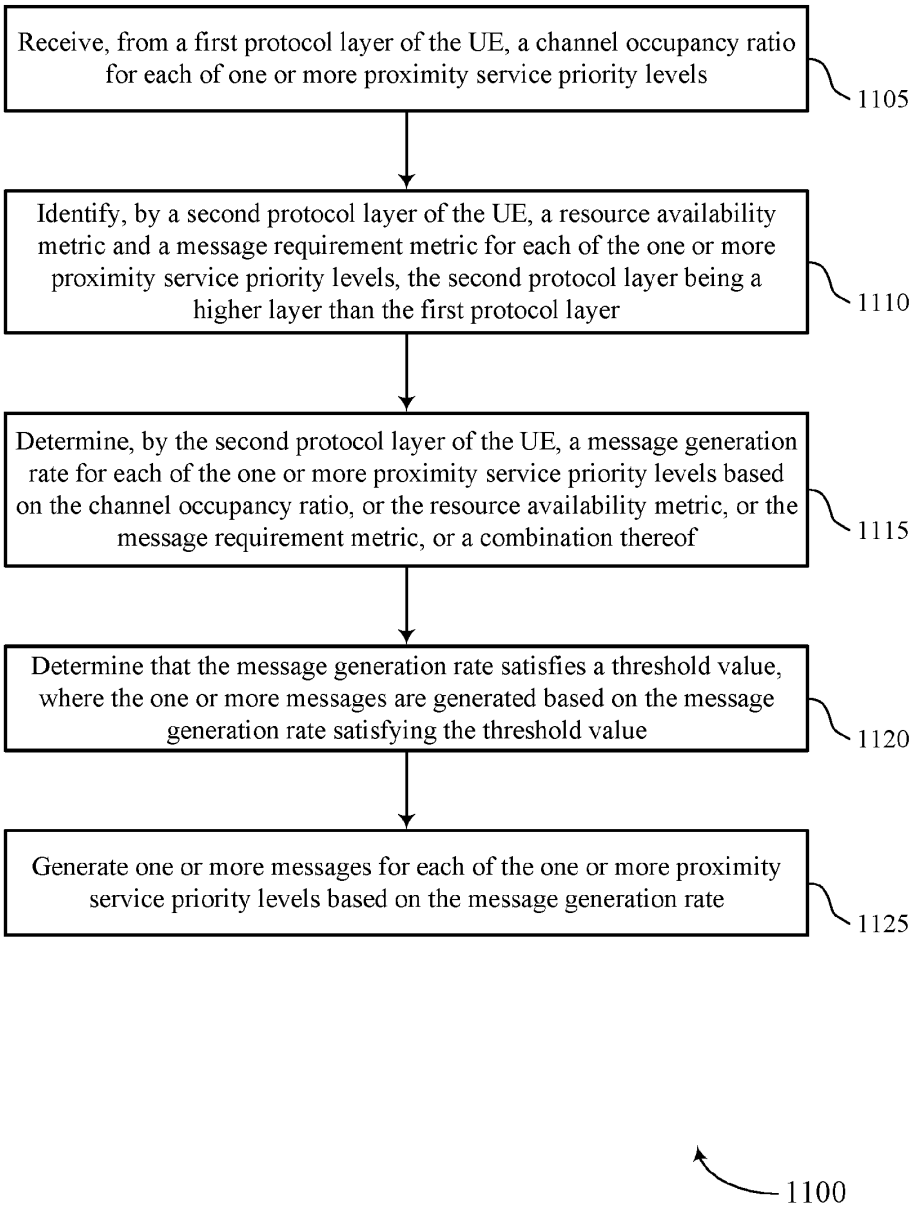
Receive, from a first protocol layer of the UE, a channel occupancy ratio for each of one or more proximity service priority levels
1105
Identify, by a second protocol layer of the UE, a resource availability metric and a message requirement metric for each of the one or more proximity service priority levels, the second protocol layer being a higher layer than the first protocol layer
1110
Determine, by the second protocol layer of the UE, a message generation rate for each of the one or more proximity service priority levels based on the channel occupancy ratio, or the resource availability metric, or the message requirement metric, or a combination thereof
1115
Determine that the message generation rate satisfies a threshold value, where the one or more messages are generated based on the message generation rate satisfying the threshold value
1120
Generate one or more messages for each of the one or more proximity service priority levels based on the message generation rate
1125
1100

FIG. 11

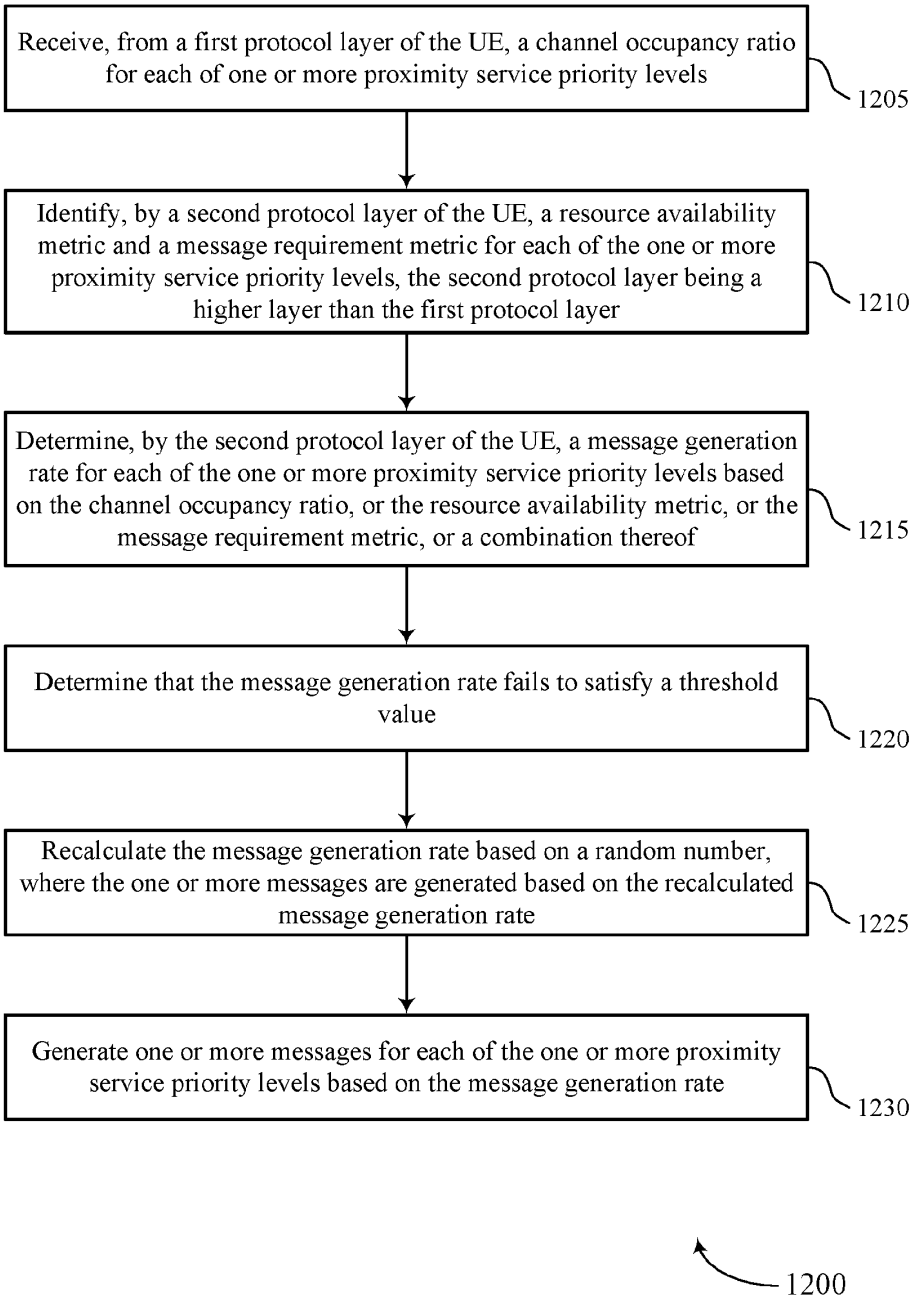
Receive, from a first protocol layer of the UE, a channel occupancy ratio for each of one or more proximity service priority levels
1205
Identify, by a second protocol layer of the UE, a resource availability metric and a message requirement metric for each of the one or more proximity service priority levels, the second protocol layer being a higher layer than the first protocol layer
1210
Determine, by the second protocol layer of the UE, a message generation rate for each of the one or more proximity service priority levels based on the channel occupancy ratio, or the resource availability metric, or the message requirement metric, or a combination thereof
1215
Determine that the message generation rate fails to satisfy a threshold value
1220
Recalculate the message generation rate based on a random number, where the one or more messages are generated based on the recalculated message generation rate
1225
Generate one or more messages for each of the one or more proximity service priority levels based on the message generation rate
1230
1200

FIG. 12

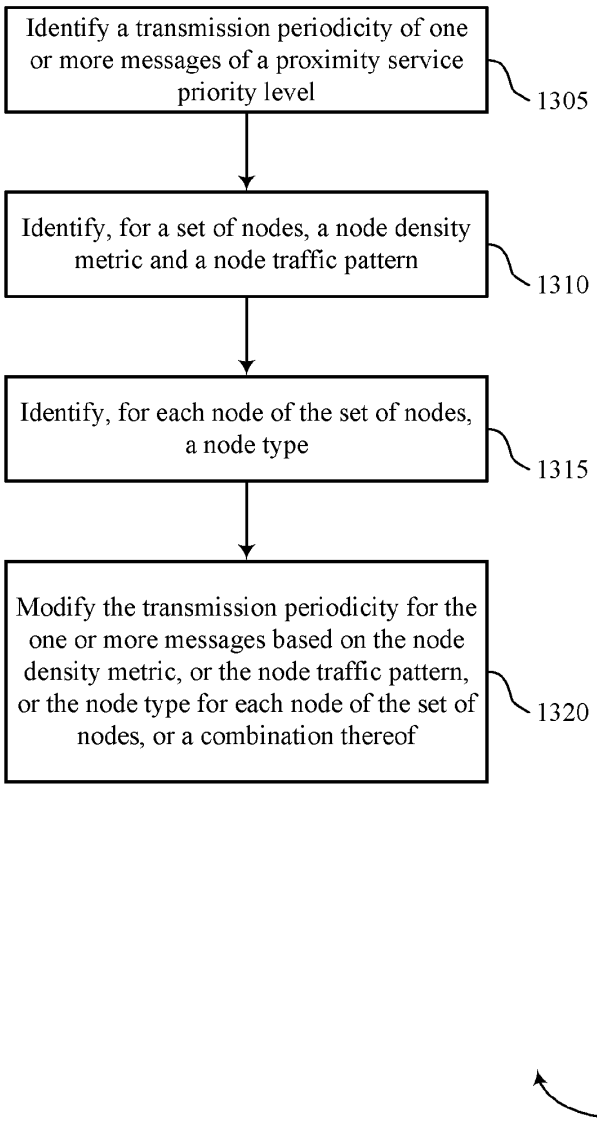
Identify a transmission periodicity of one or more messages of a proximity service priority level
1305
Identify, for a set of nodes, a node density metric and a node traffic pattern
1310
Identify, for each node of the set of nodes, a node type
1315
Modify the transmission periodicity for the one or more messages based on the node density metric, or the node traffic pattern, or the node type for each node of the set of nodes, or a combination thereof
1320
1300

FIG. 13

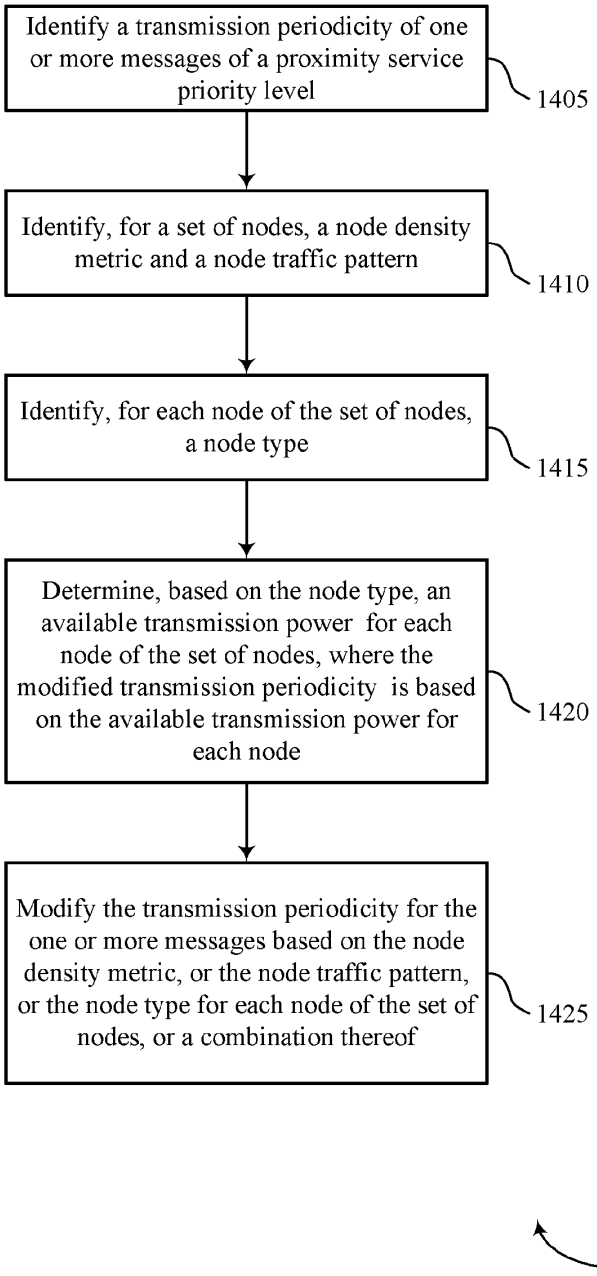
Identify a transmission periodicity of one or more messages of a proximity service priority level
1405
Identify, for a set of nodes, a node density metric and a node traffic pattern
1410
Identify, for each node of the set of nodes, a node type
1415
Determine, based on the node type, an available transmission power for each node of the set of nodes, where the modified transmission periodicity is based on the available transmission power for each node
1420
Modify the transmission periodicity for the one or more messages based on the node density metric, or the node traffic pattern, or the node type for each node of the set of nodes, or a combination thereof
1425
1400

FIG. 14