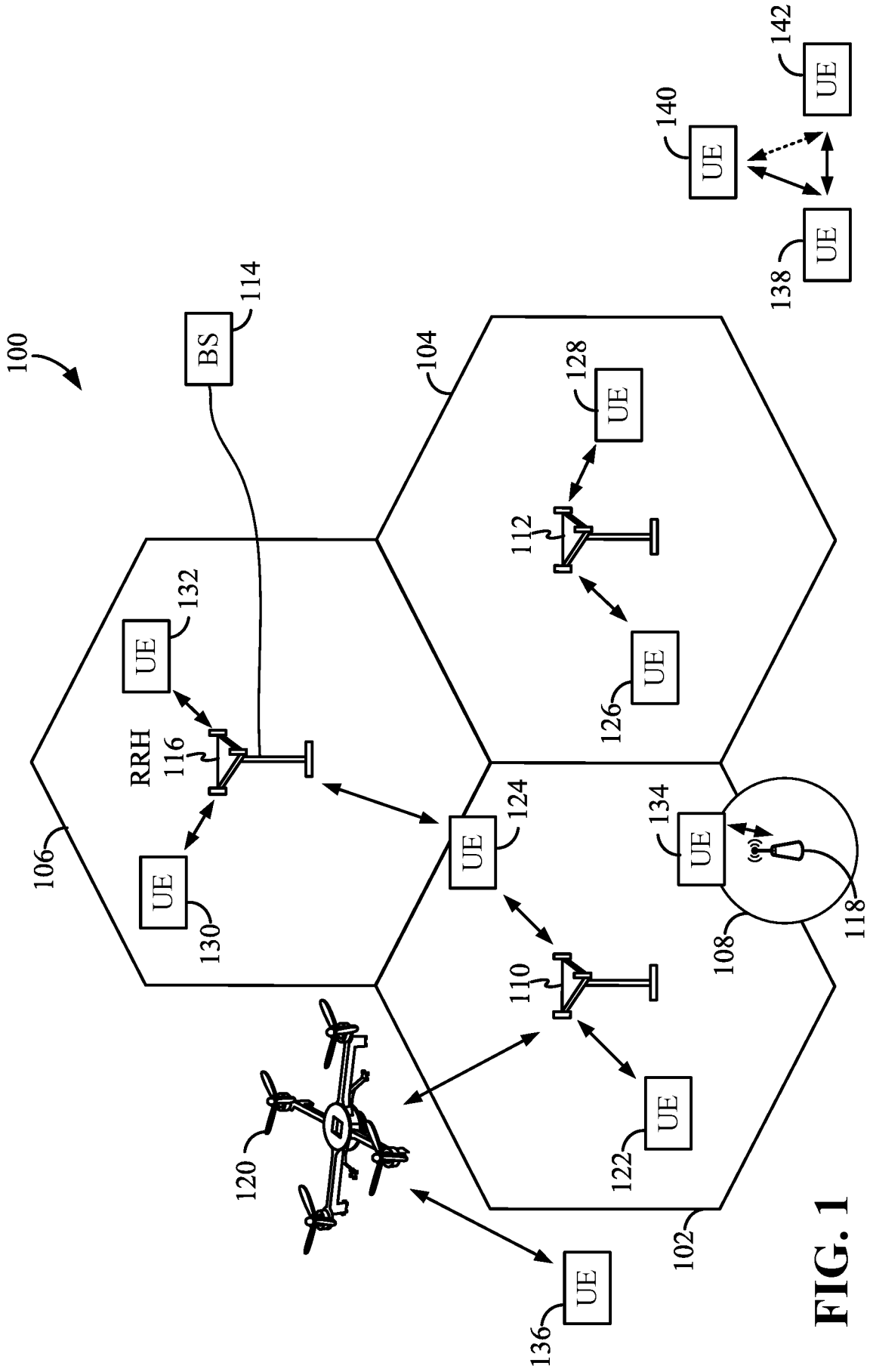
100
BS
114
104
106
102
RRH
116
112
110
108
118
120
UE
130
132
124
126
128
122
134
136
138
140
142

FIG. 1

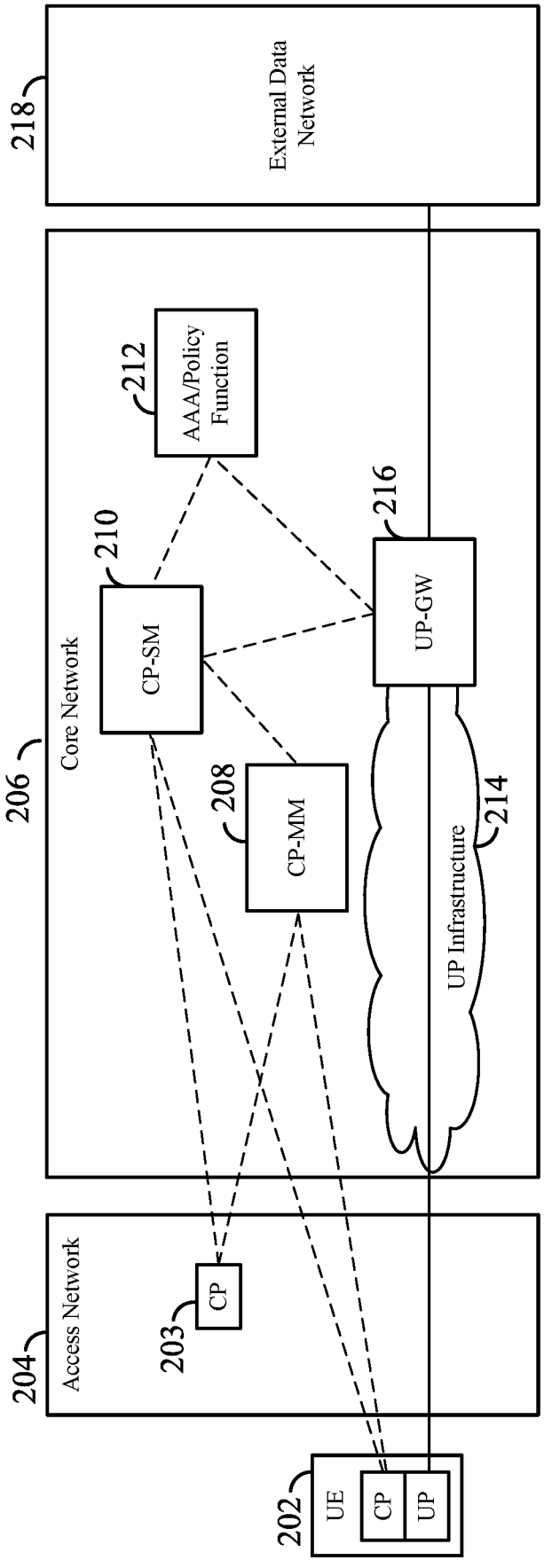

FIG. 2
Reference Architecture

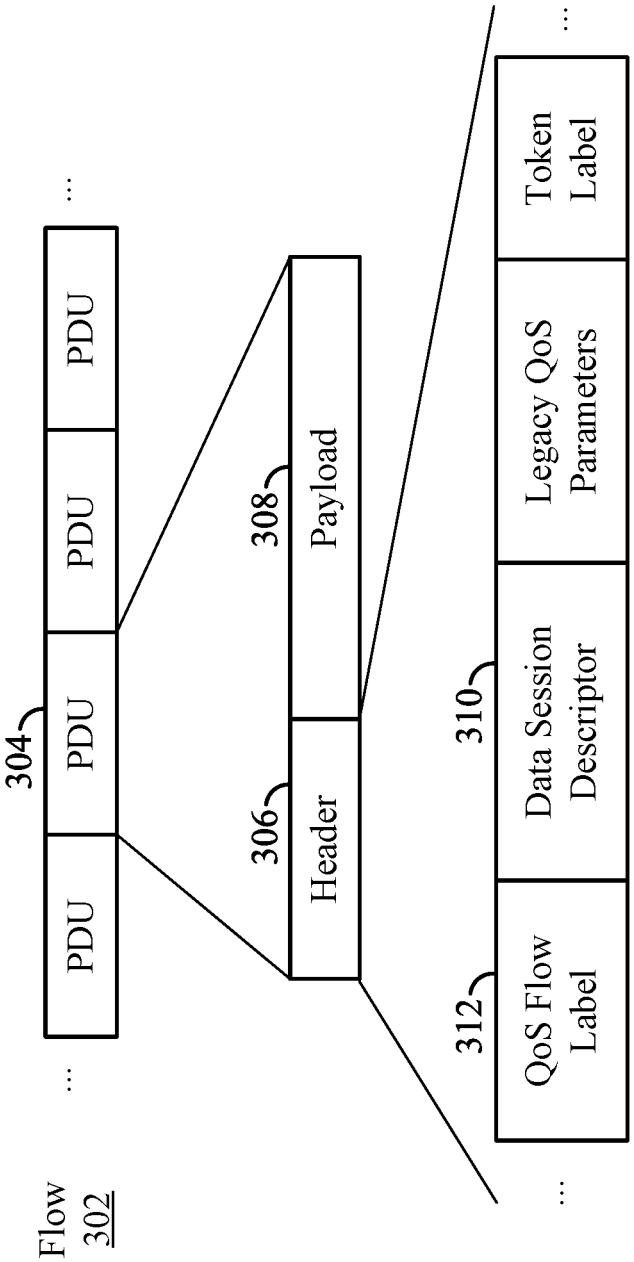
Flow
302
PDU
PDU
PDU
PDU
304
306
Header
308
Payload
310
Data Session
Descriptor
312
QoS Flow
Label
Legacy QoS
Parameters
Token
Label

FIG. 3

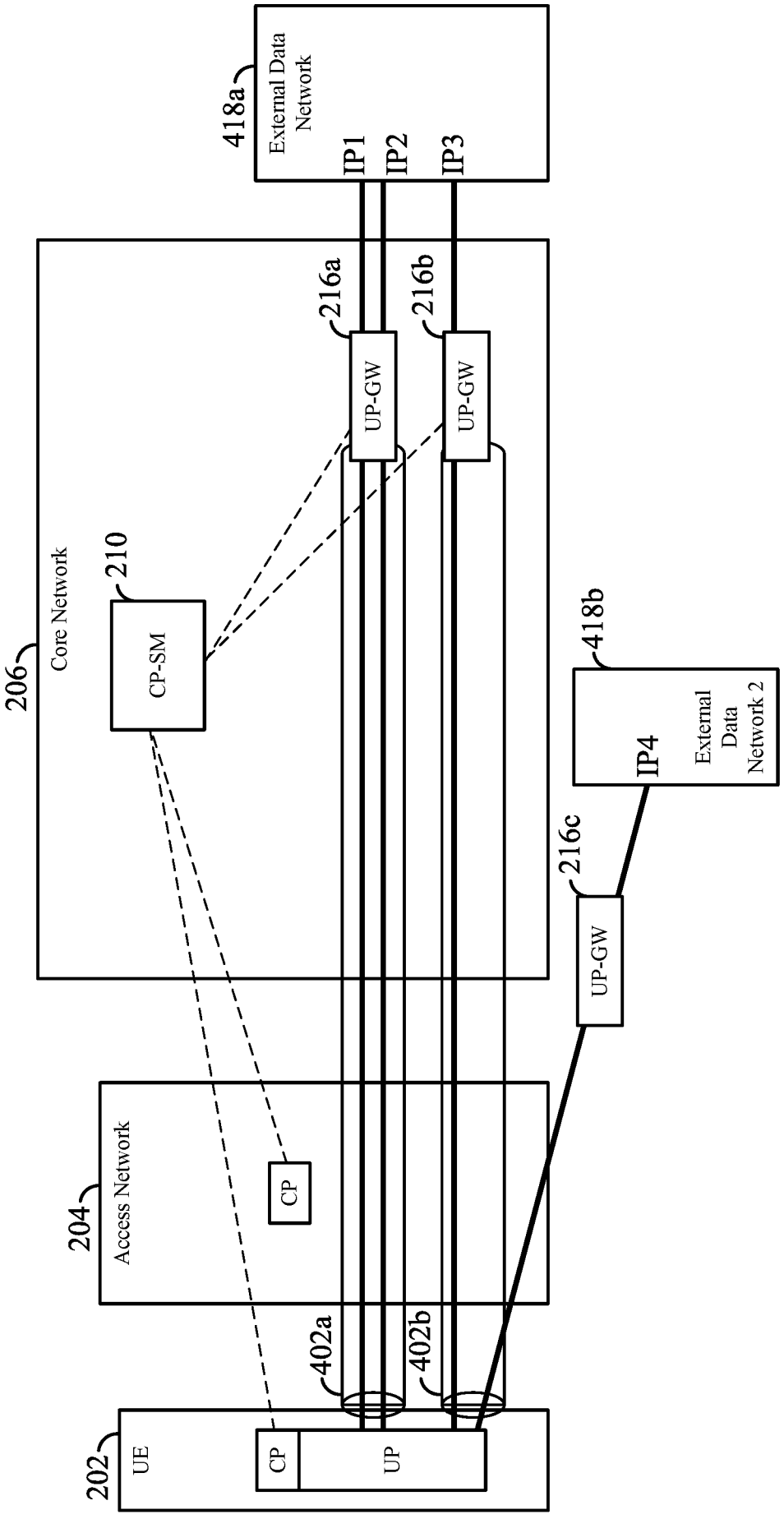
418a
External Data Network
IP1
IP2
IP3
216a
216b
UP-GW
UP-GW
206
Core Network
210
CP-SM
418b
External Data Network 2
IP4
216c
UP-GW
204
Access Network
CP
402a
402b
202
UE
CP
UP

FIG. 4

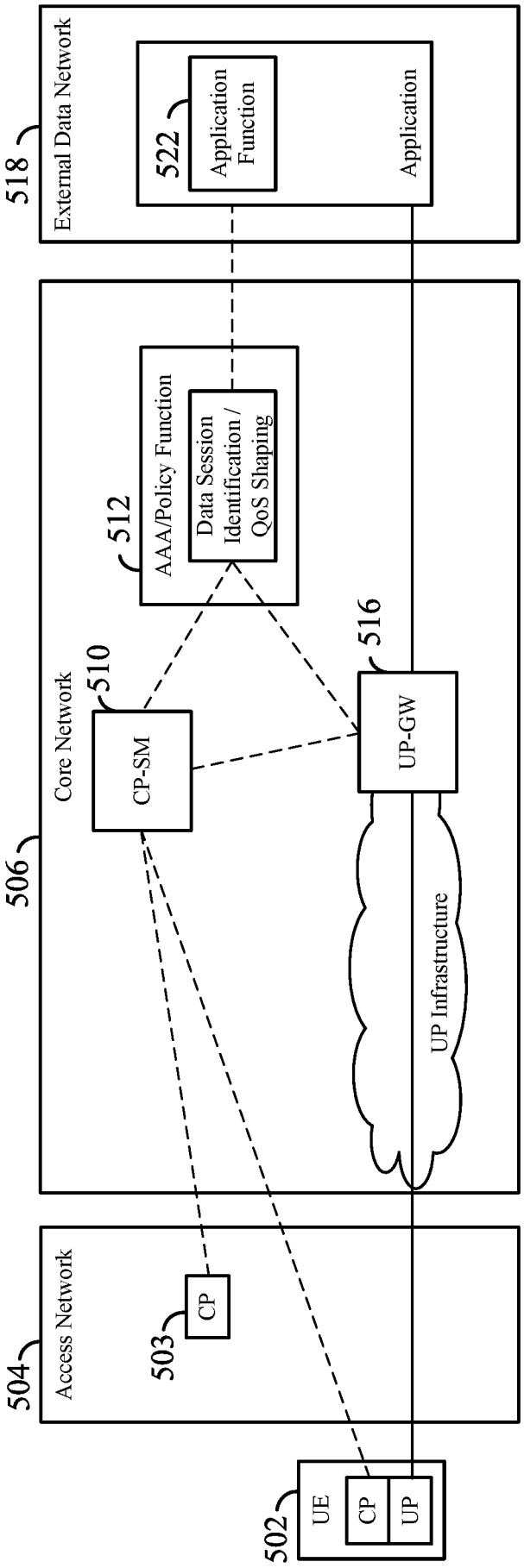

FIG. 5
QoS Model

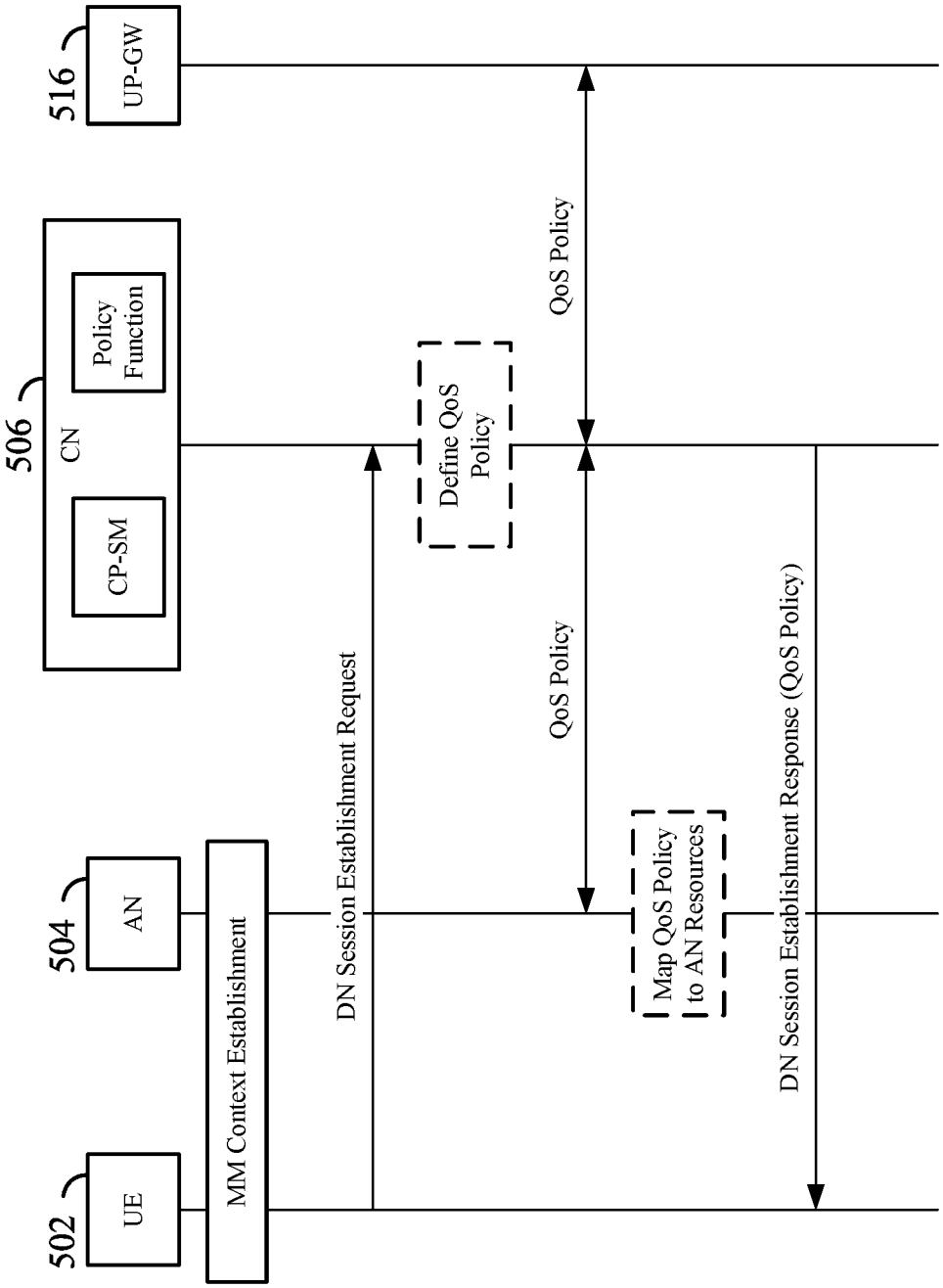

FIG. 6
Data Session Establishment at the time of DN Session Establishment

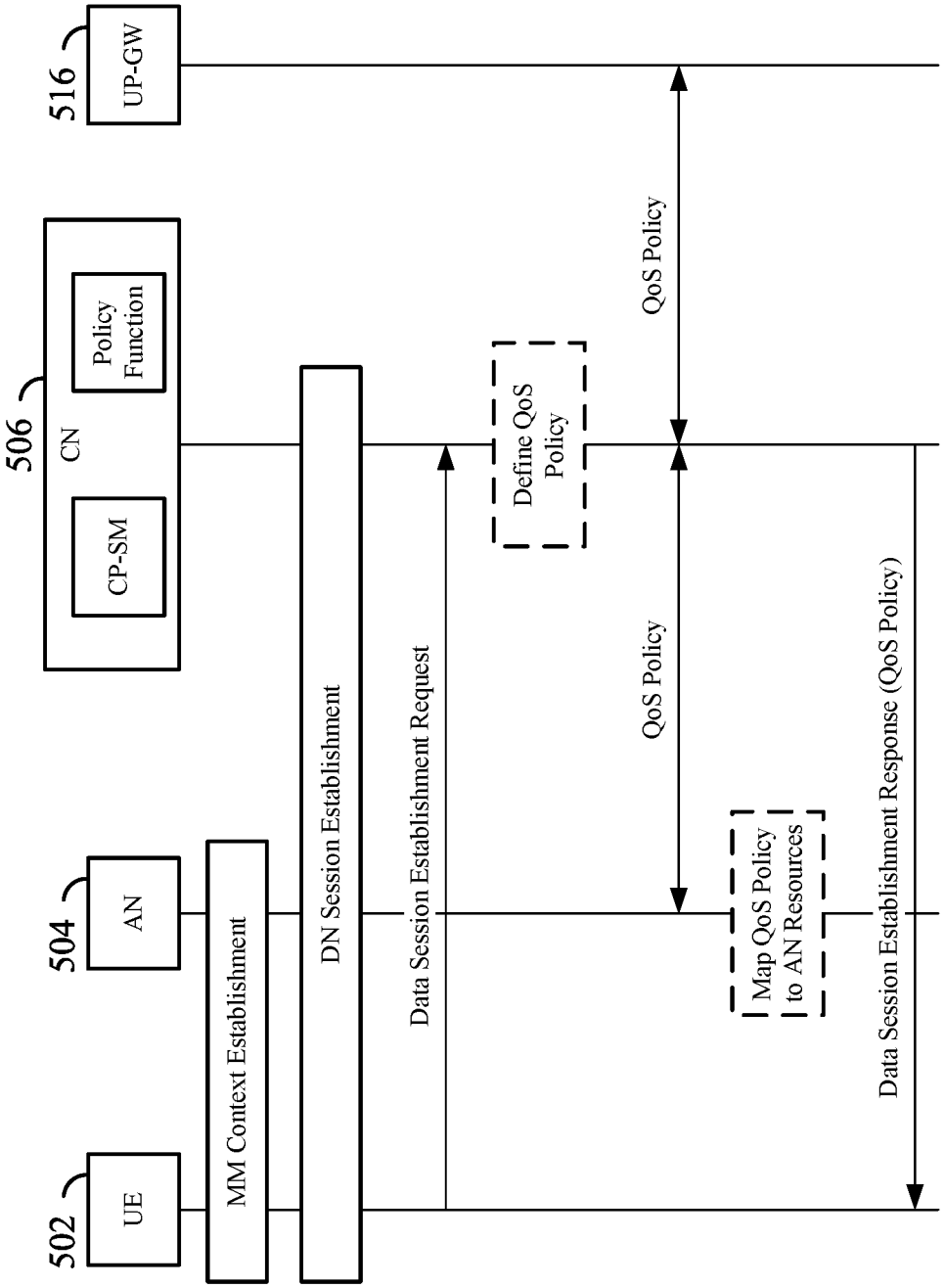

FIG. 7

Data Session Establishment Subsequent to DN Session Establishment

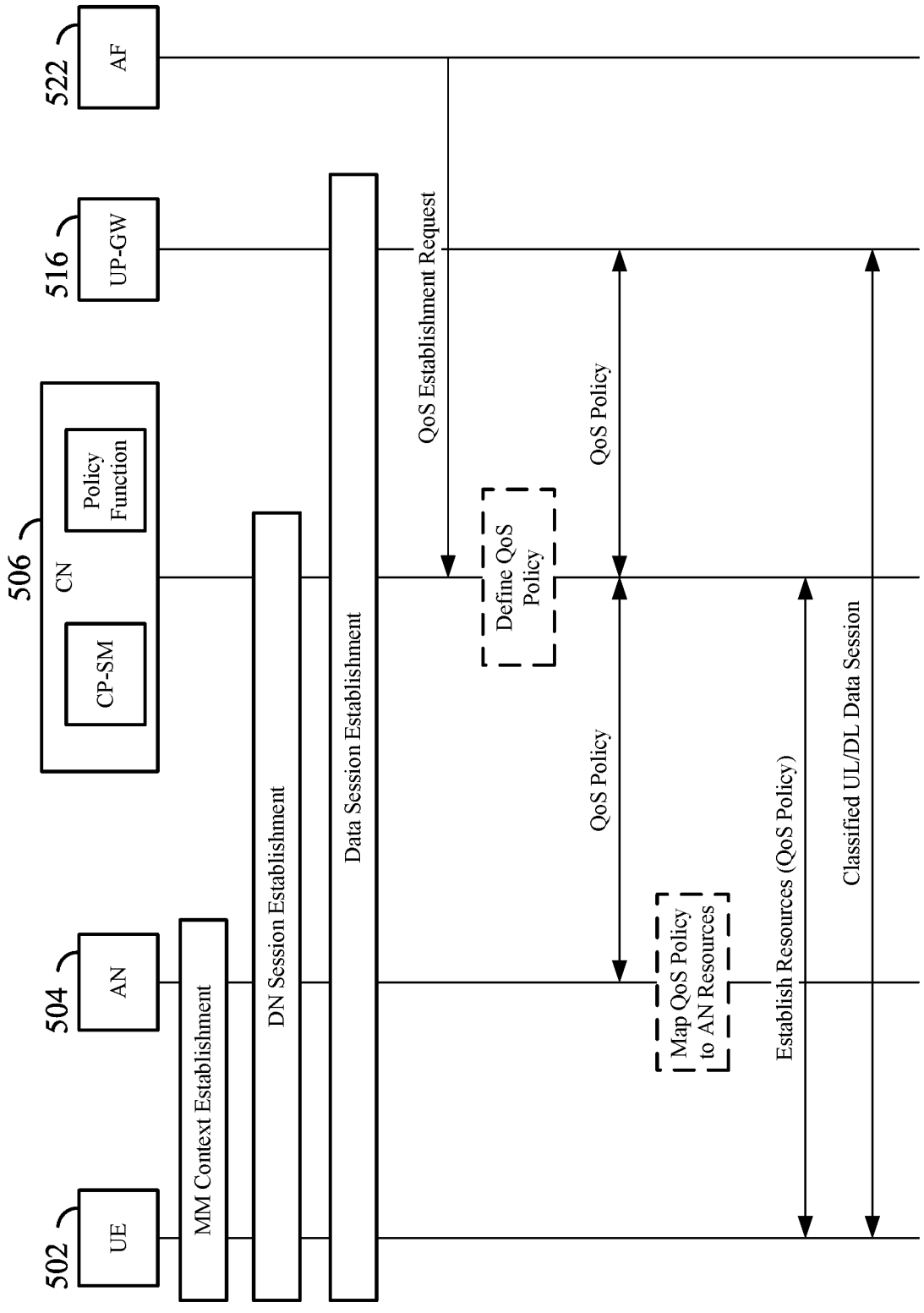

FIG. 8
AF-Triggered Data Session Establishment

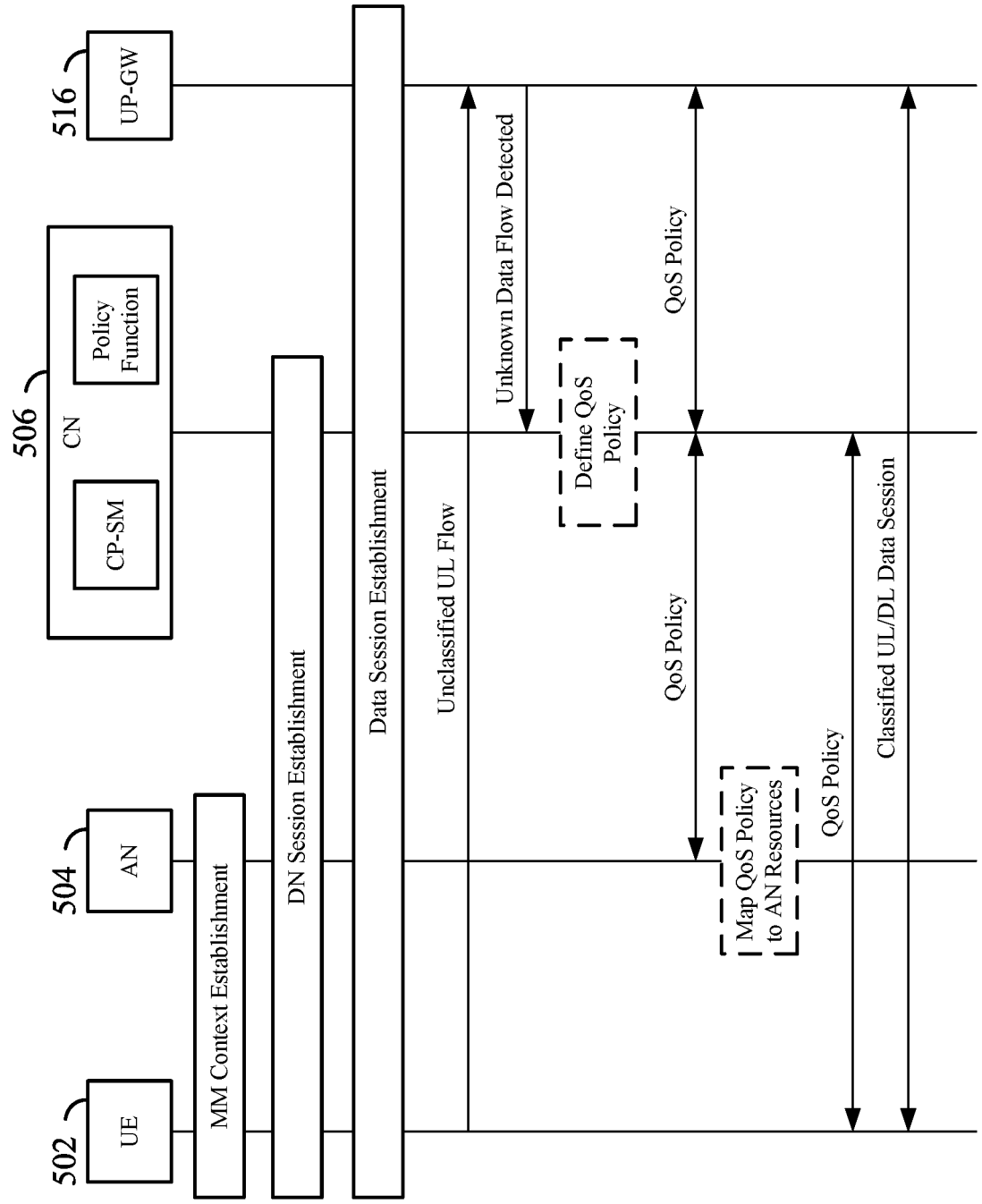

FIG. 9

Data Session Establishment based on CN Detection of Unclassified UL Flow

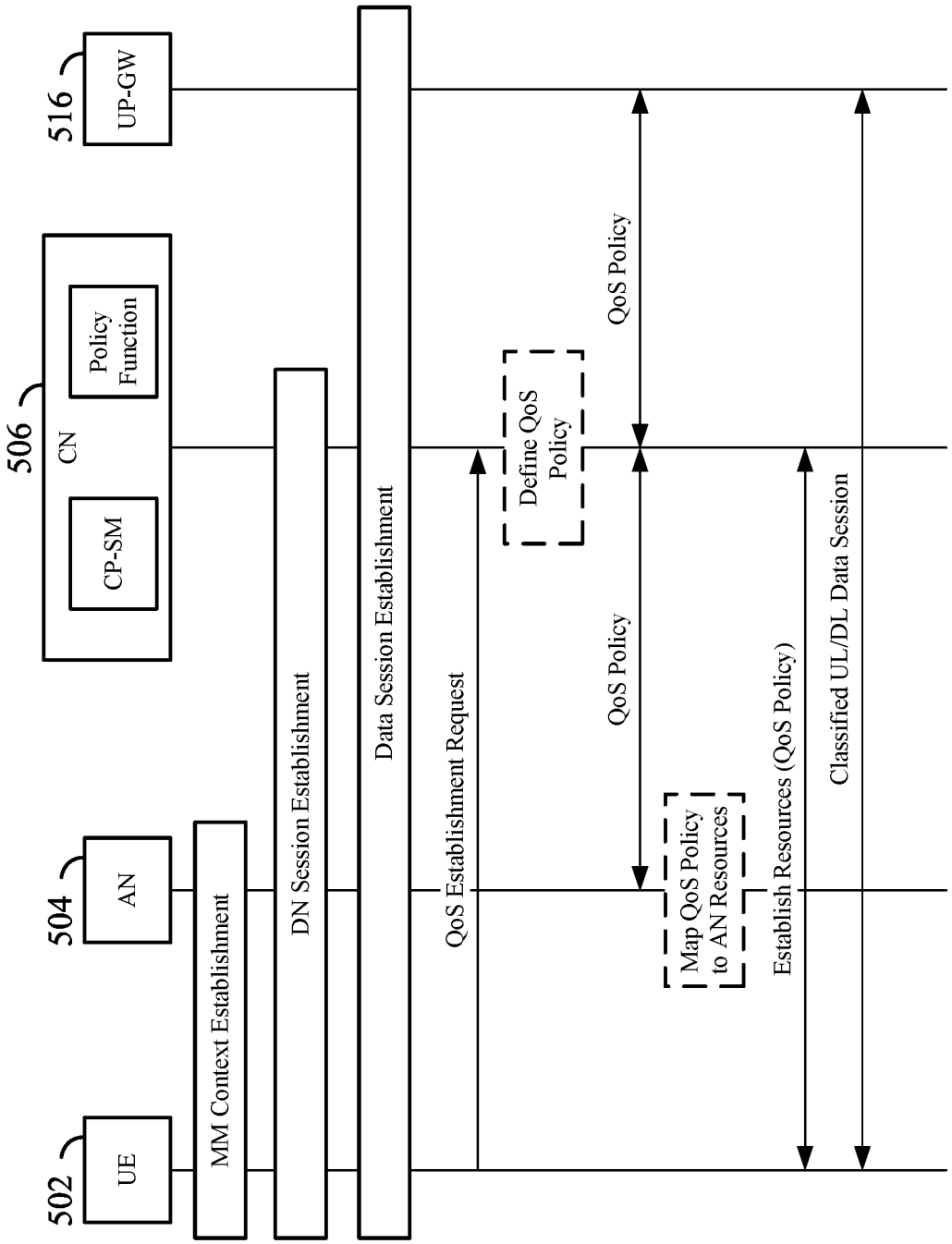

FIG. 10

UE-Triggered Data Session Establishment
(Explicit QoS Request – CP-Based Solution)

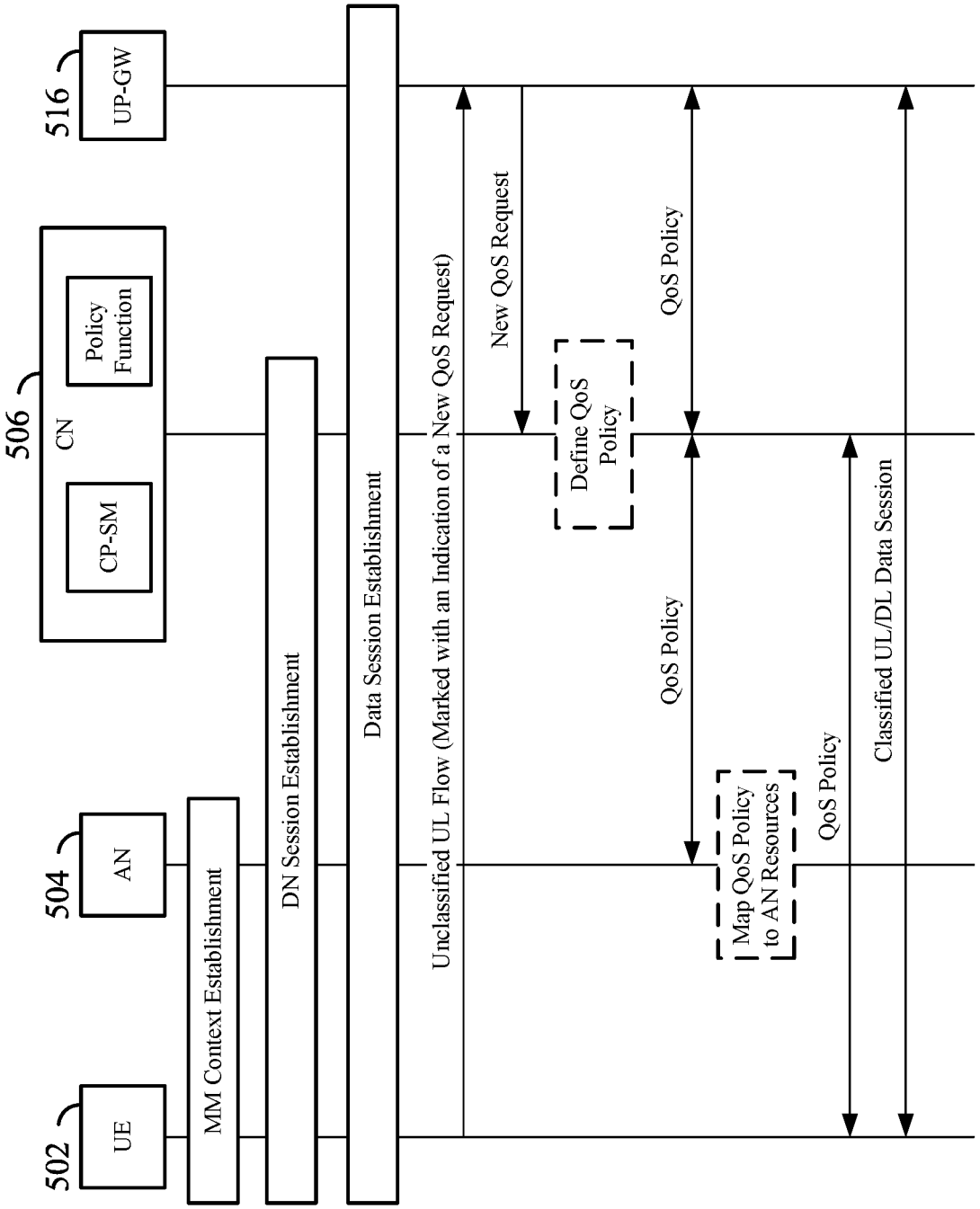

FIG. 11

UE-Triggered Data Session Establishment
(Explicit QoS Request – UP-Based Solution)

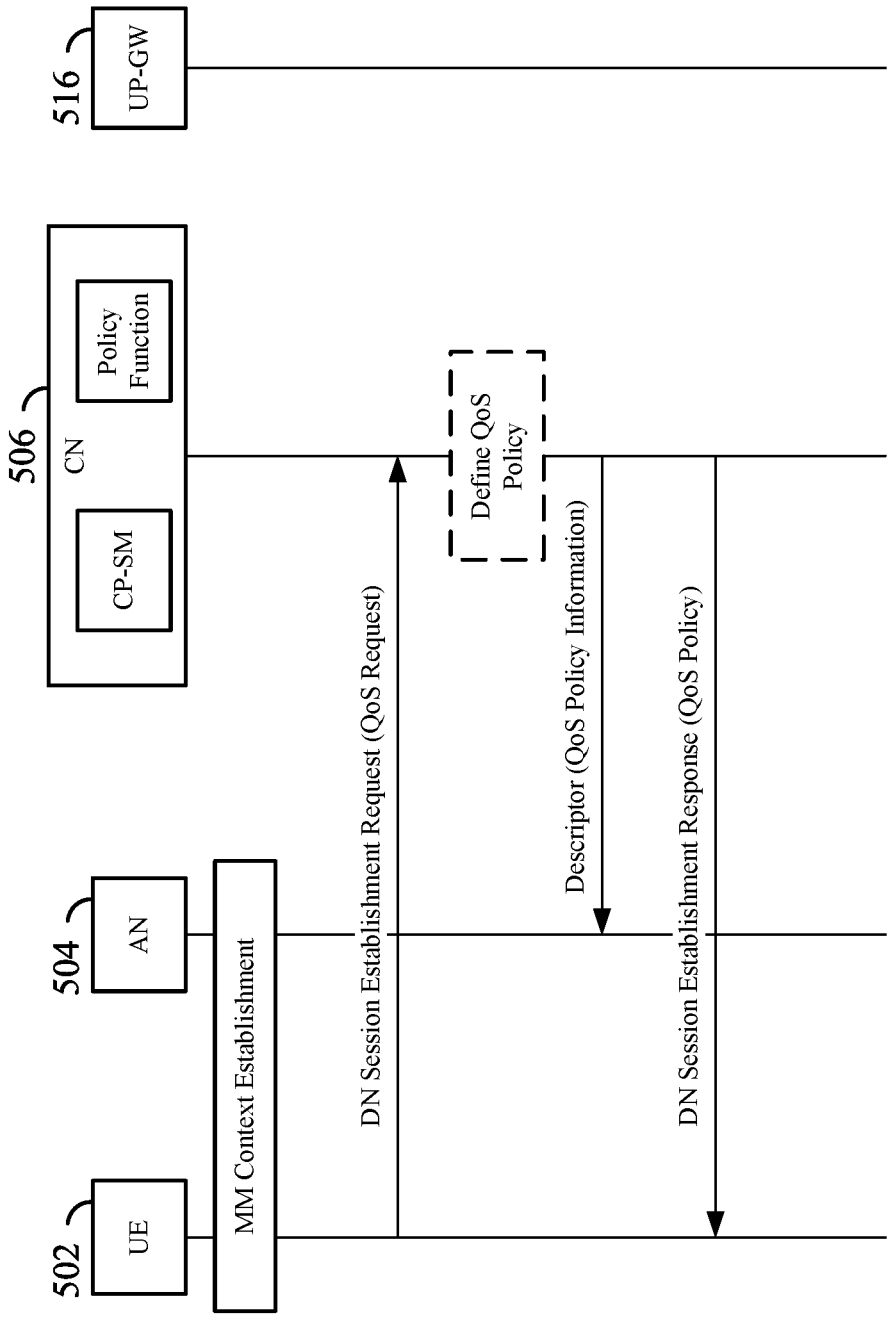

FIG. 12

DN Session Establishment; QoS Policy applies to DN Session; No Data Session Established

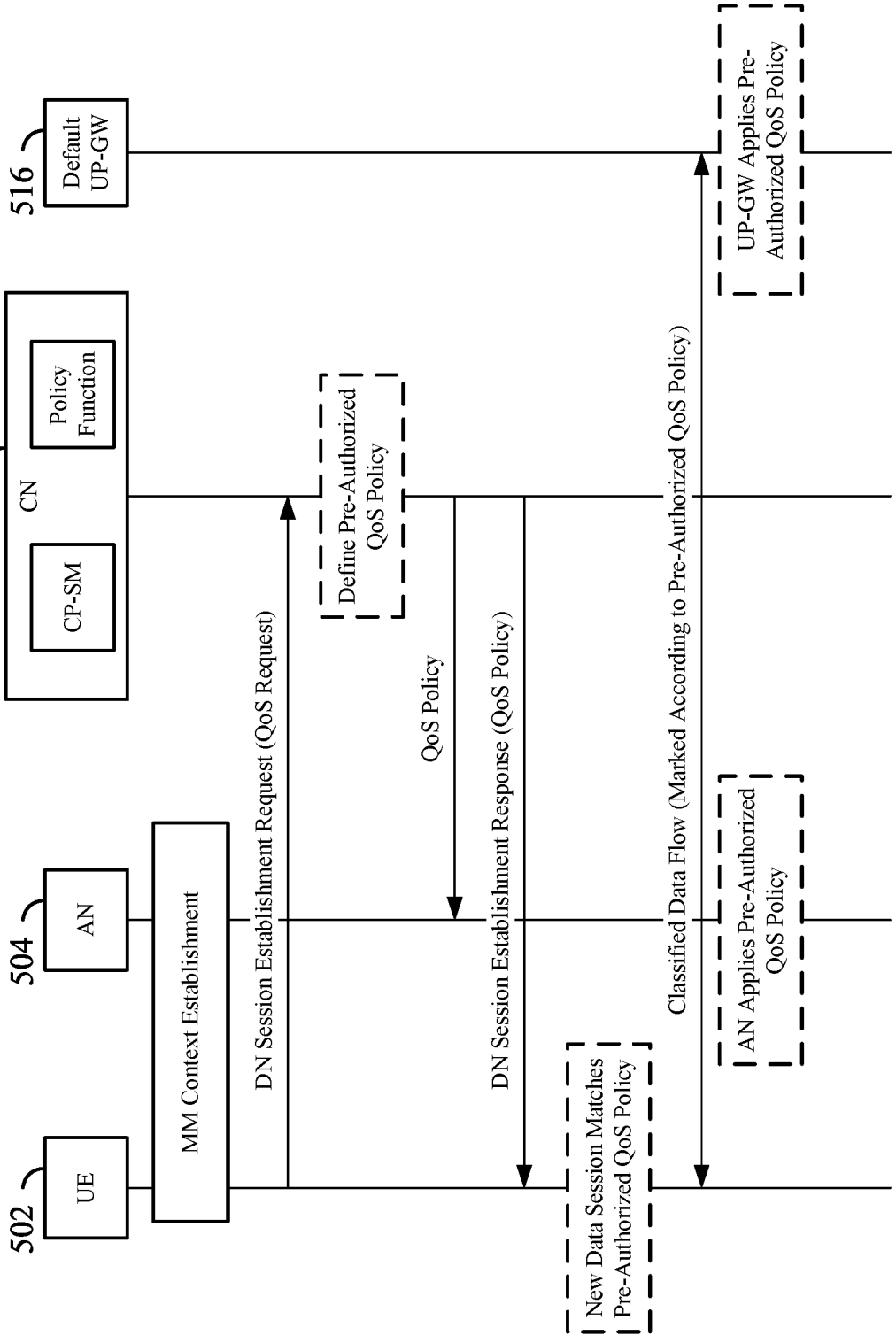

FIG. 13

Pre-Authorized QoS Policy Establishment at DN Session Establishment

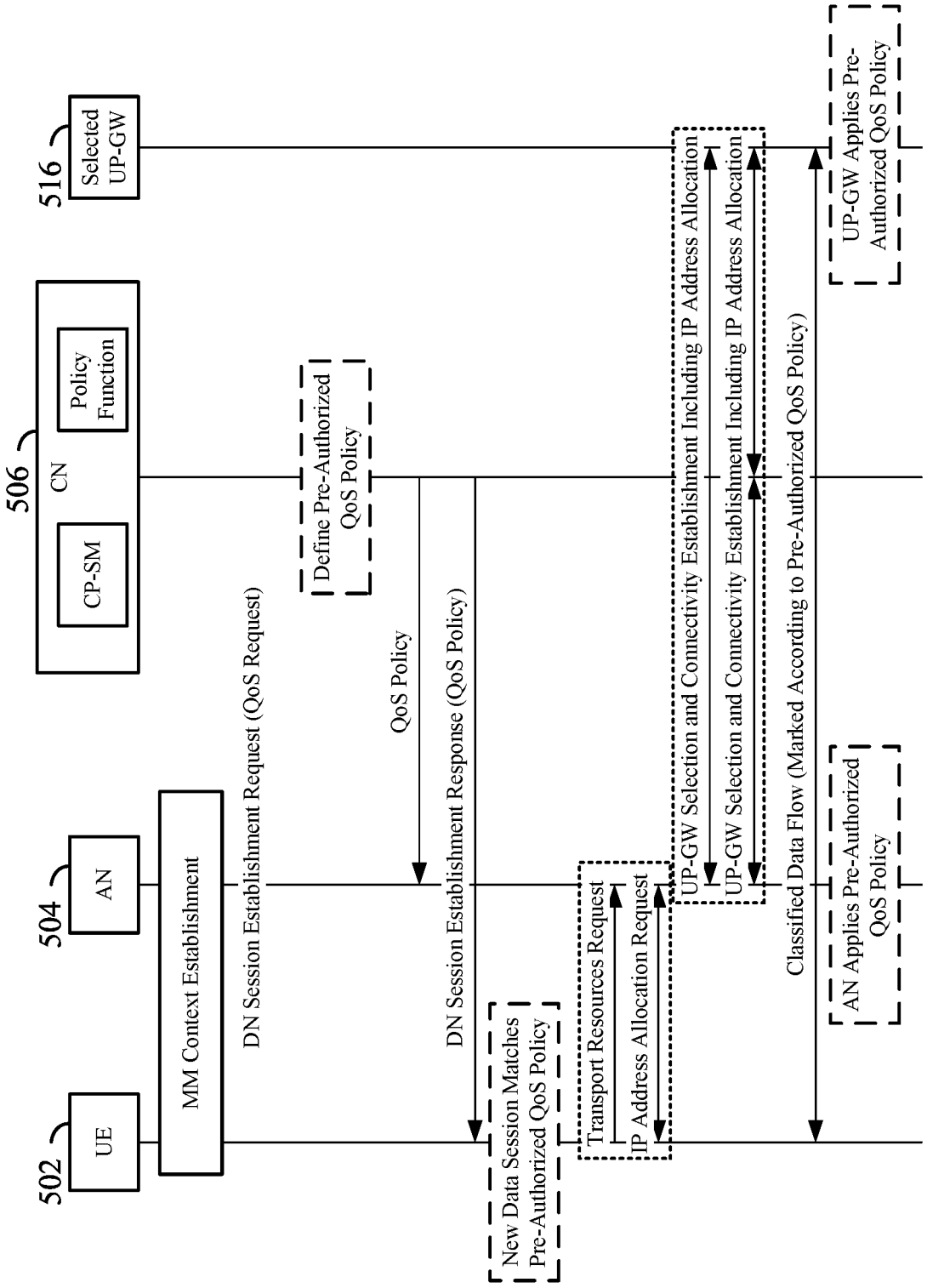

FIG. 14

Pre-Authorized QoS Policy Establishment at DN Session Establishment

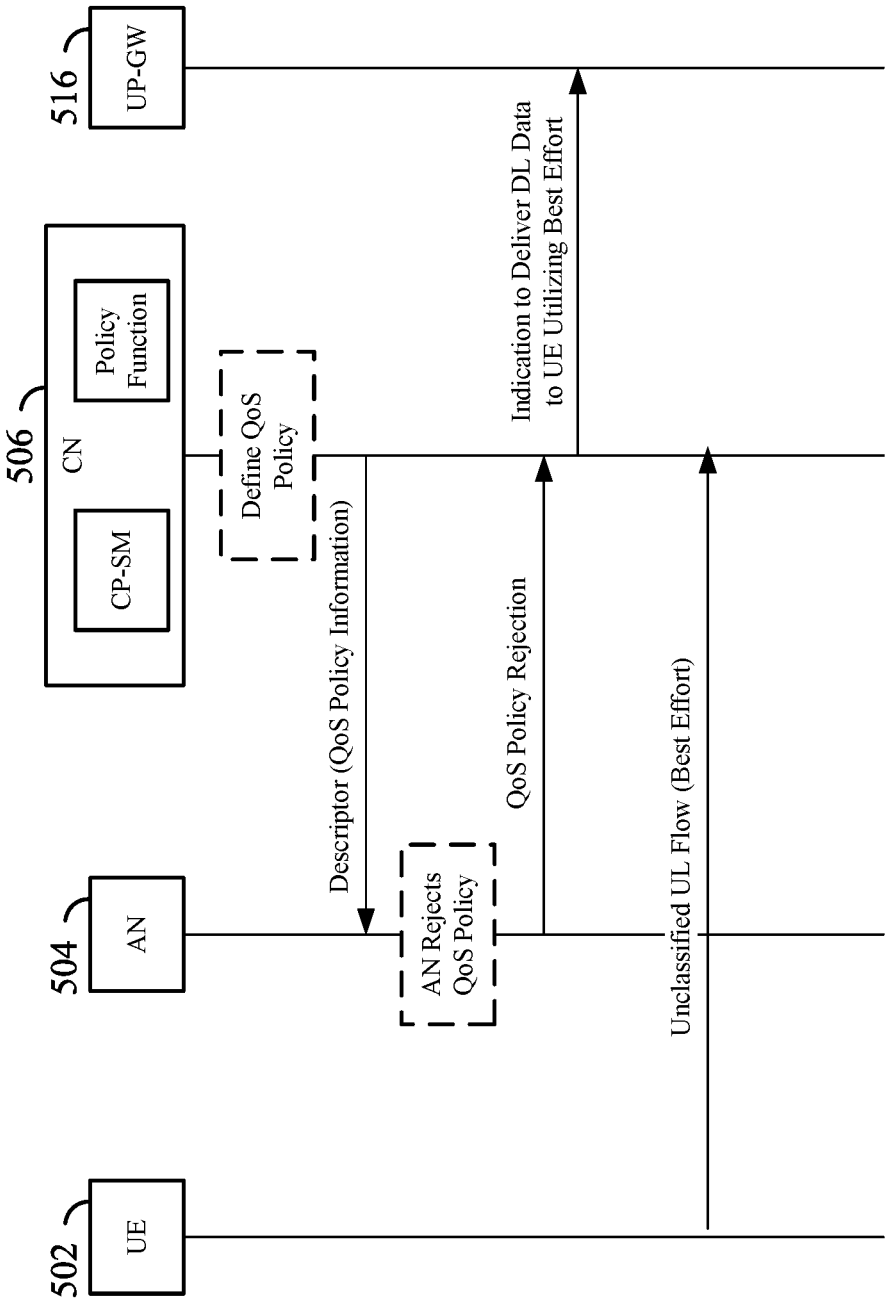

FIG. 15

AN Rejection of QoS Policy

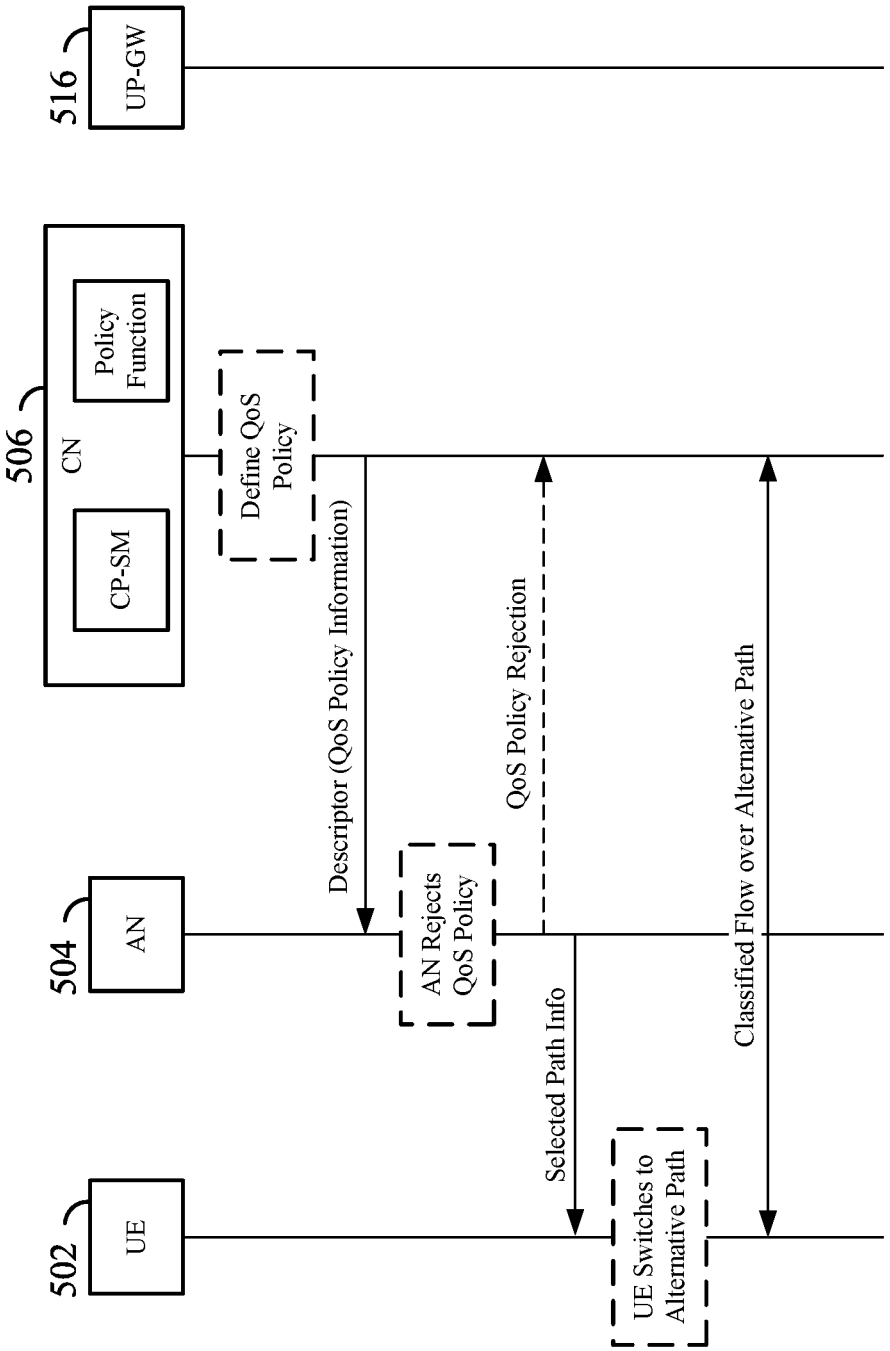

FIG. 16

AN Rejection of QoS Policy

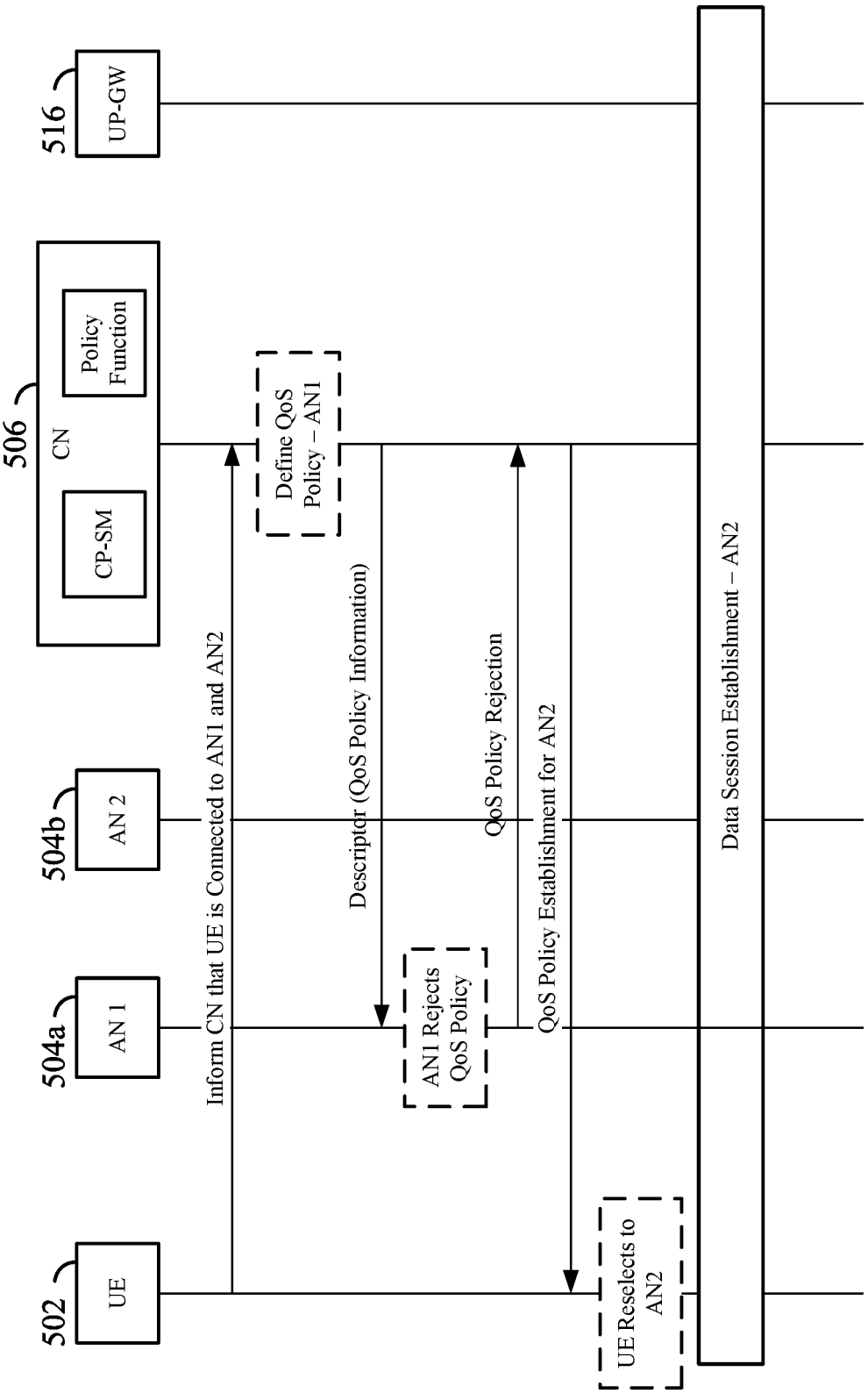

FIG. 17

AN Rejection of QoS Policy

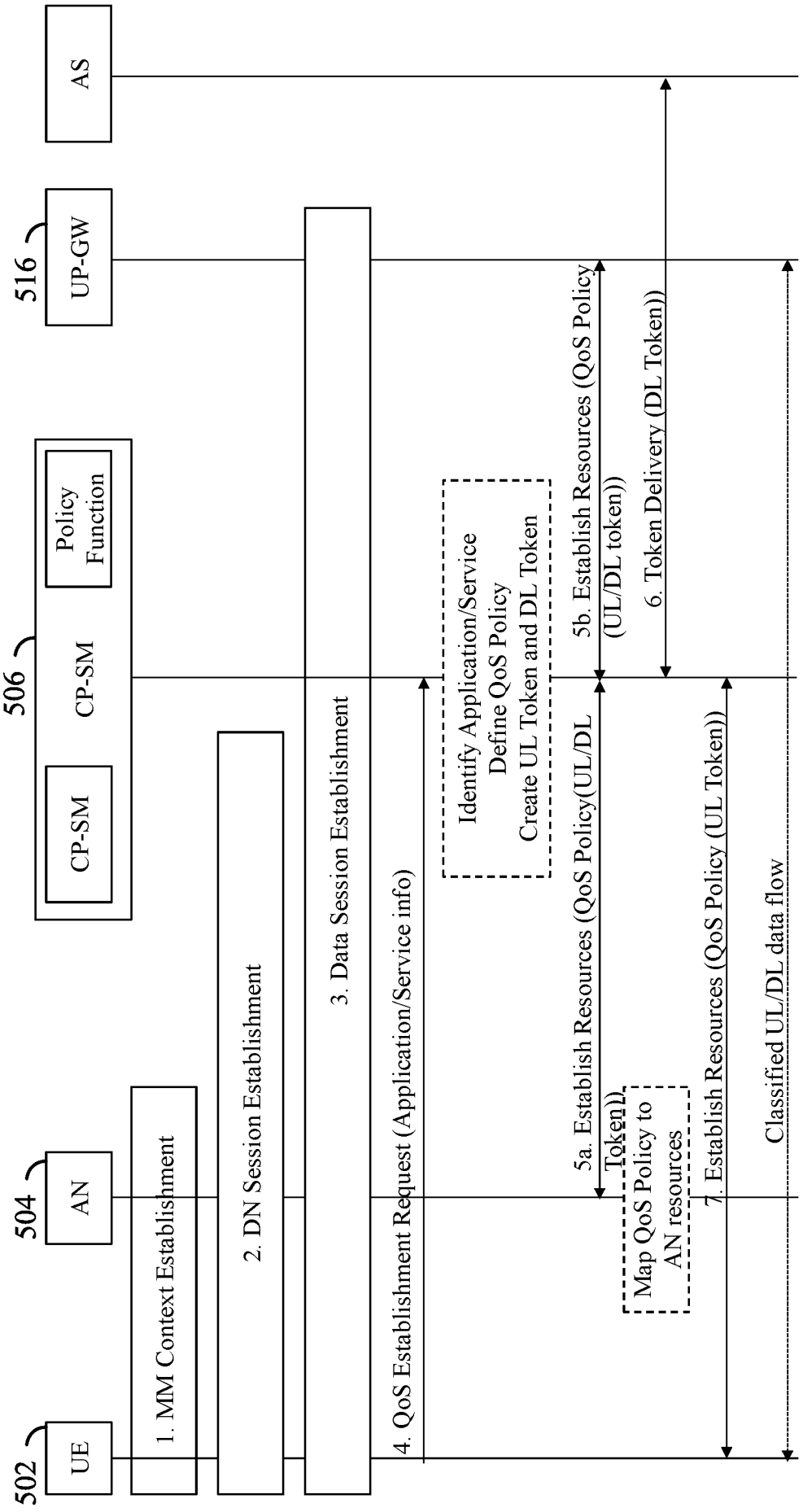
502
UE
504
AN
506
CP-SM
CP-SM
Policy Function
516
UP-GW
AS
1. MM Context Establishment
2. DN Session Establishment
3. Data Session Establishment
4. QoS Establishment Request (Application/Service info)
Identify Application/Service
Define QoS Policy
Create UL Token and DL Token
5a. Establish Resources (QoS Policy(UL/DL Token)),
5b. Establish Resources (QoS Policy (UL/DL token))
6. Token Delivery (DL Token))
Map QoS Policy to AN resources
7. Establish Resources (QoS Policy (UL Token))
Classified UL/DL data flow

FIG. 18

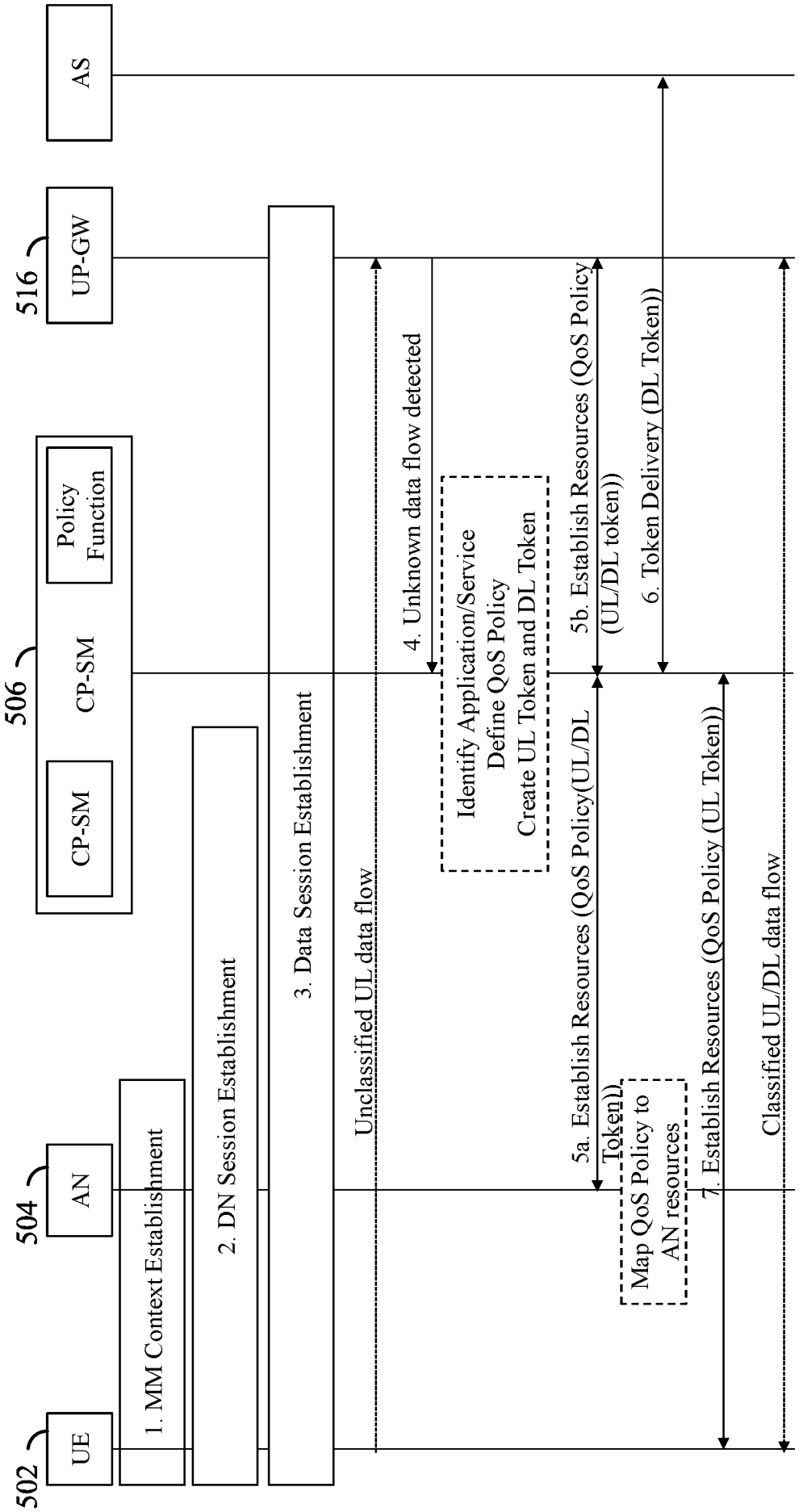
502
UE
504
AN
506
CP-SM
CP-SM
Policy Function
516
UP-GW
AS
1. MM Context Establishment
2. DN Session Establishment
3. Data Session Establishment
Unclassified UL data flow
4. Unknown data flow detected
Identify Application/Service
Define QoS Policy
Create UL Token and DL Token
5a. Establish Resources (QoS Policy(UL/DL Token))
5b. Establish Resources (QoS Policy (UL/DL token))
6. Token Delivery (DL Token))
Map QoS Policy to AN resources
7. Establish Resources (QoS Policy (UL Token))
Classified UL/DL data flow

FIG. 19

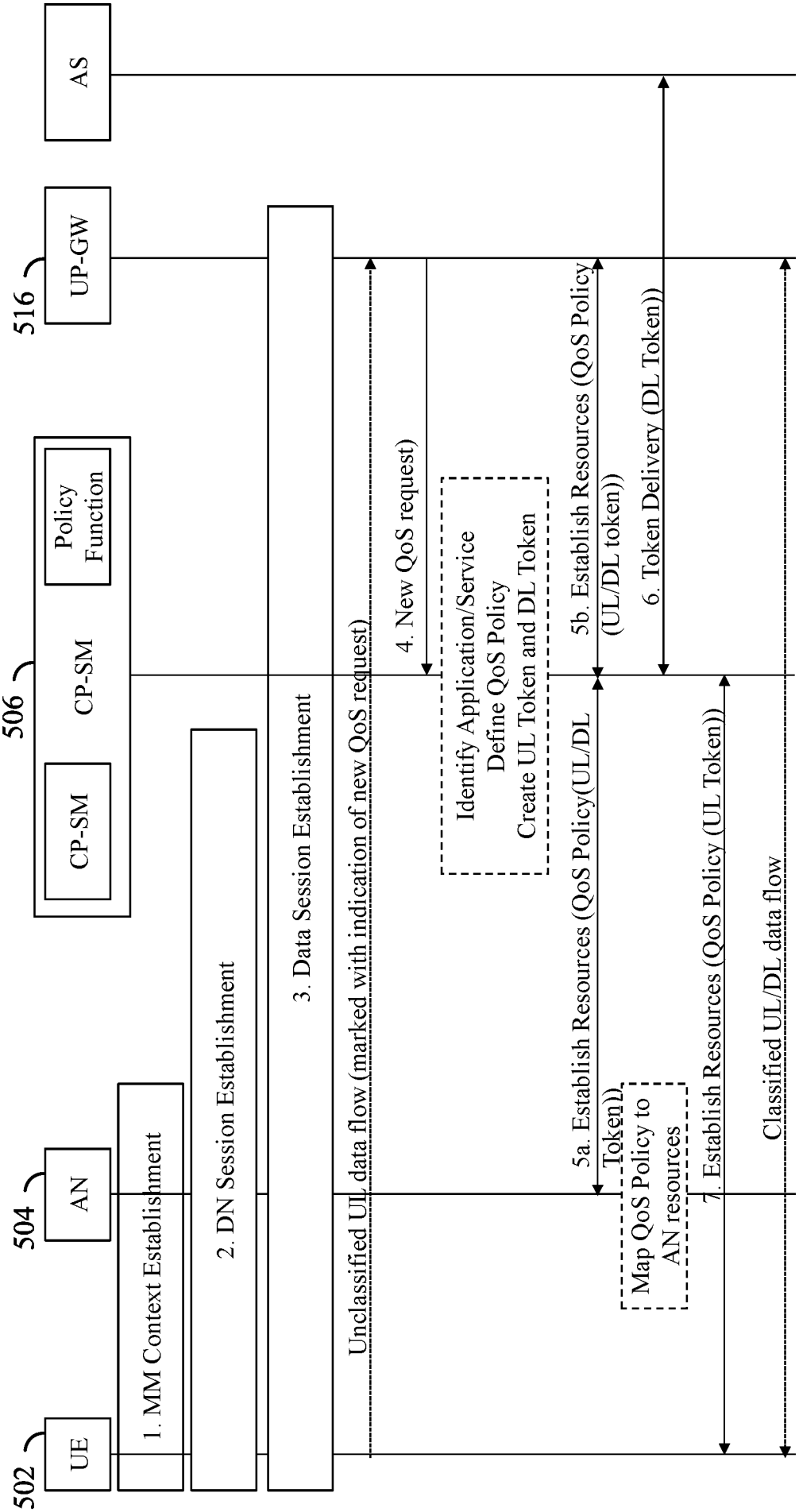
502
UE
504
AN
506
CP-SM
CP-SM
Policy Function
516
UP-GW
AS
1. MM Context Establishment
2. DN Session Establishment
3. Data Session Establishment
Unclassified UL data flow (marked with indication of new QoS request)
4. New QoS request)
Identify Application/Service
Define QoS Policy
Create UL Token and DL Token
5a. Establish Resources (QoS Policy(UL/DL Token))
5b. Establish Resources (QoS Policy (UL/DL token))
6. Token Delivery (DL Token))
Map QoS Policy to AN resources
7. Establish Resources (QoS Policy (UL Token))
Classified UL/DL data flow

FIG. 20

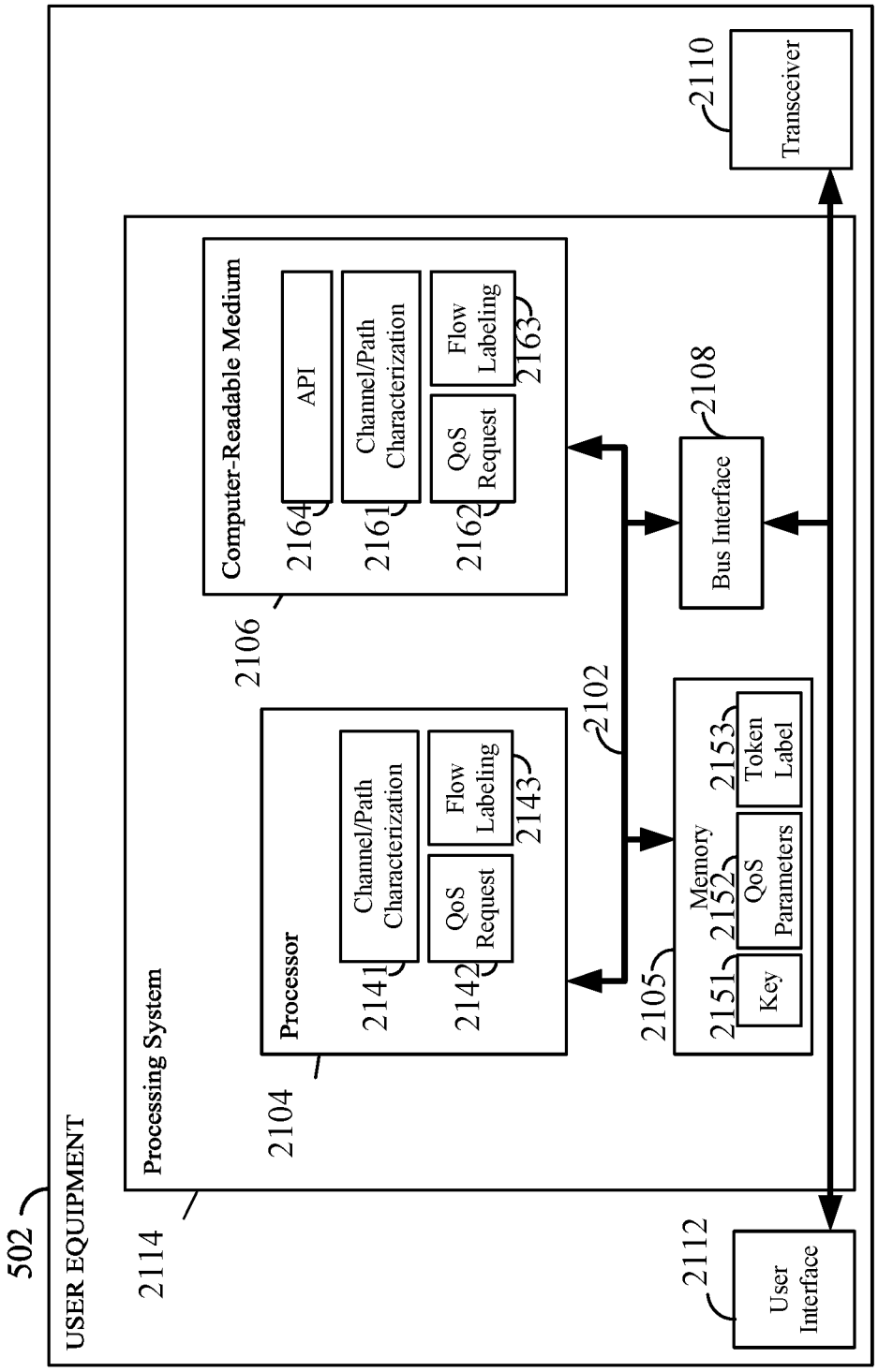
USER EQUIPMENT
502
Processing System
2114
Processor
2104
Channel/Path Characterization
2141
QoS Request
2142
Flow Labeling
2143
Computer-Readable Medium
2106
API
2164
Channel/Path Characterization
2161
QoS Request
2162
Flow Labeling
2163
2102
Memory
2105
Key
2151
QoS Parameters
2152
Token Label
2153
Bus Interface
2108
Transceiver
2110
User Interface
2112

FIG. 21

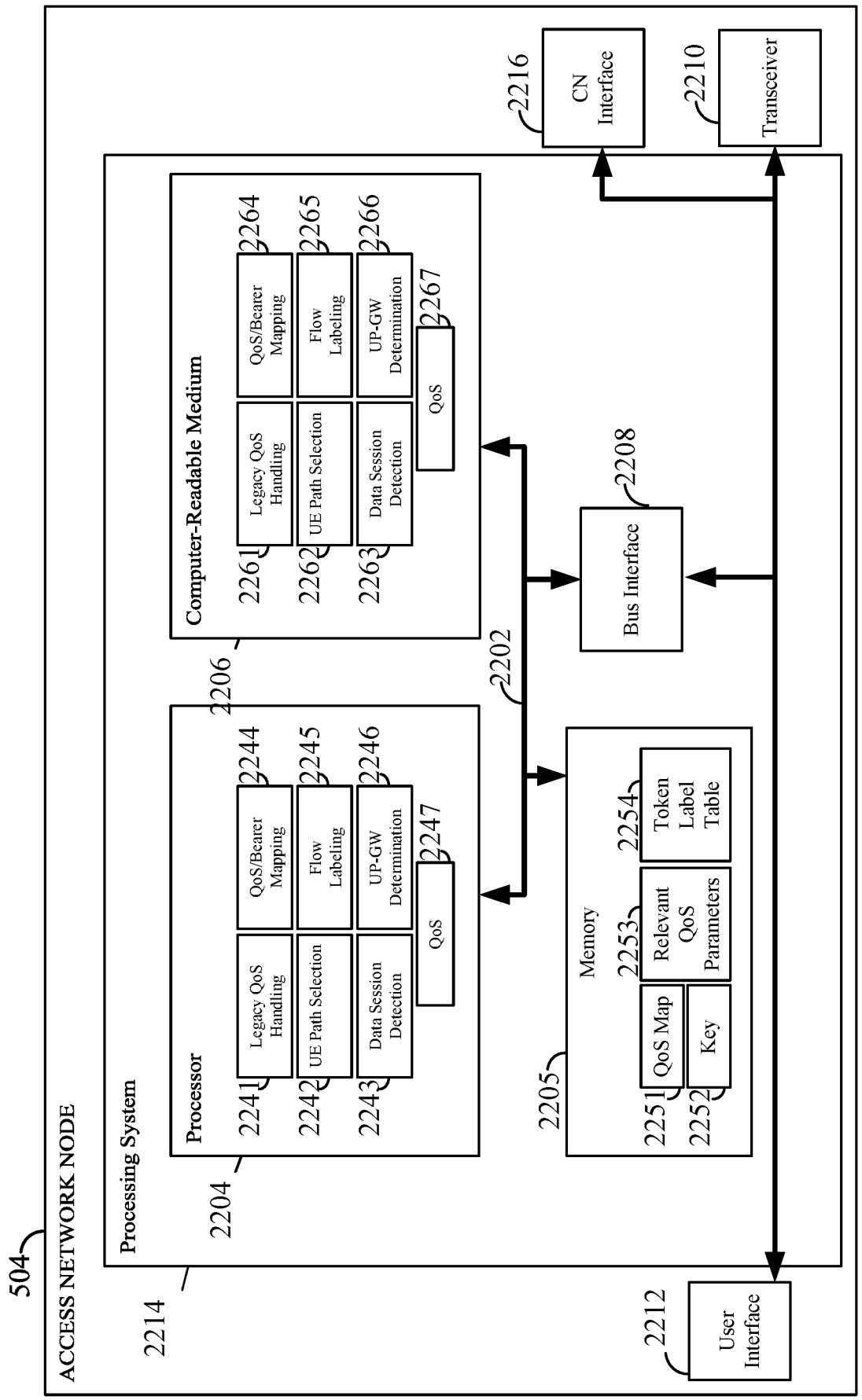
504
ACCESS NETWORK NODE
2214
Processing System
2204
Processor
2241
Legacy QoS Handling
2242
UE Path Selection
2243
Data Session Detection
2244
QoS/Bearer Mapping
2245
Flow Labeling
2246
UP-GW Determination
2247
QoS
2206
Computer-Readable Medium
2261
Legacy QoS Handling
2262
UE Path Selection
2263
Data Session Detection
2264
QoS/Bearer Mapping
2265
Flow Labeling
2266
UP-GW Determination
2267
QoS
2202
2205
Memory
2251
QoS Map
2252
Key
2253
Relevant QoS Parameters
2254
Token Label Table
2208
Bus Interface
2216
CN Interface
2210
Transceiver
2212
User Interface

FIG. 22

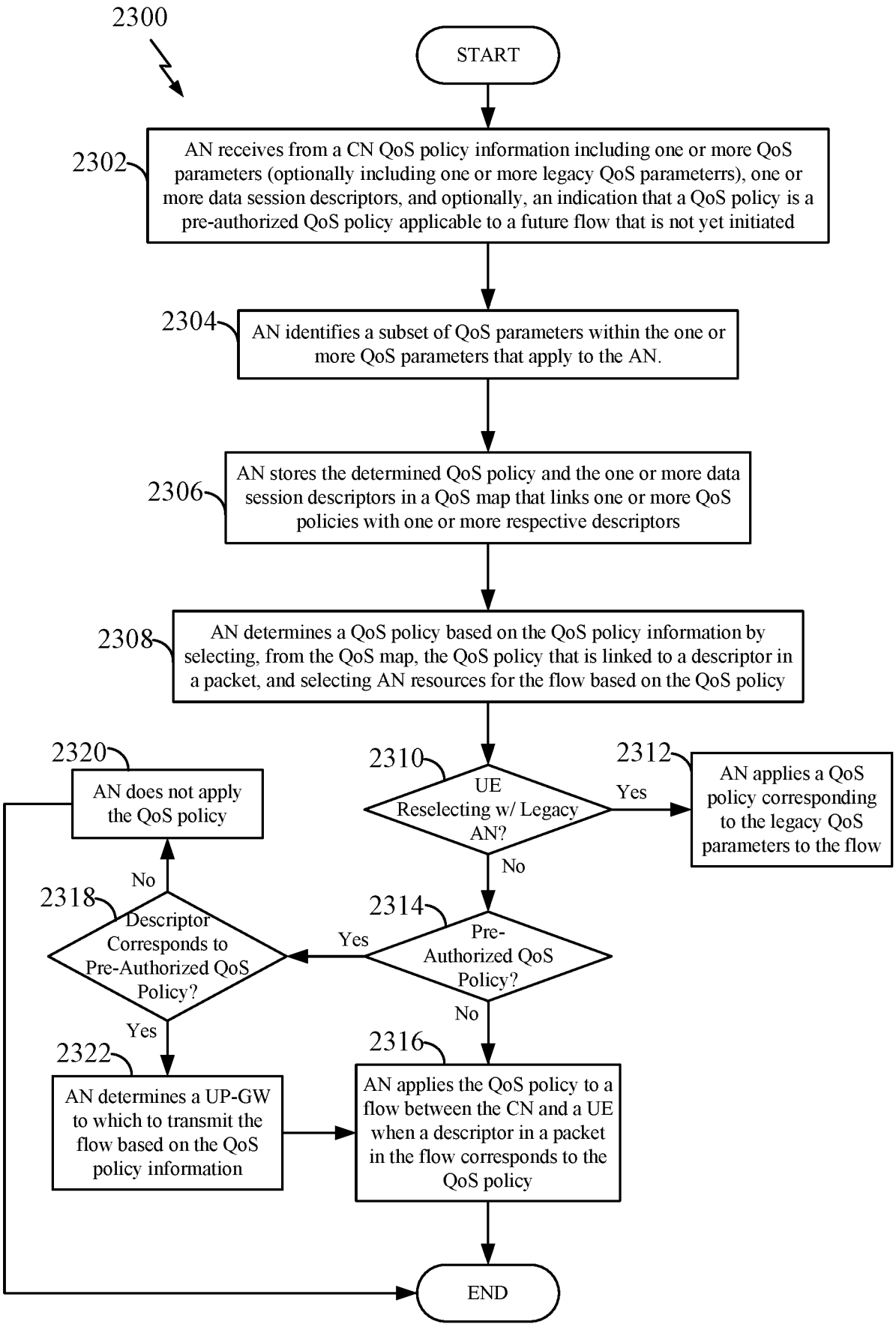
2300
START
2302
AN receives from a CN QoS policy information including one or more QoS parameters (optionally including one or more legacy QoS parameterrs), one or more data session descriptors, and optionally, an indication that a QoS policy is a pre-authorized QoS policy applicable to a future flow that is not yet initiated
2304
AN identifies a subset of QoS parameters within the one or more QoS parameters that apply to the AN.
2306
AN stores the determined QoS policy and the one or more data session descriptors in a QoS map that links one or more QoS policies with one or more respective descriptors
2308
AN determines a QoS policy based on the QoS policy information by selecting, from the QoS map, the QoS policy that is linked to a descriptor in a packet, and selecting AN resources for the flow based on the QoS policy
2310
UE Reselecting w/ Legacy AN?
Yes
2312
AN applies a QoS policy corresponding to the legacy QoS parameters to the flow
No
2314
Pre-Authorized QoS Policy?
Yes
2318
Descriptor Corresponds to Pre-Authorized QoS Policy?
No
2320
AN does not apply the QoS policy
Yes
2322
AN determines a UP-GW to which to transmit the flow based on the QoS policy information
No
2316
AN applies the QoS policy to a flow between the CN and a UE when a descriptor in a packet in the flow corresponds to the QoS policy
END

FIG. 23

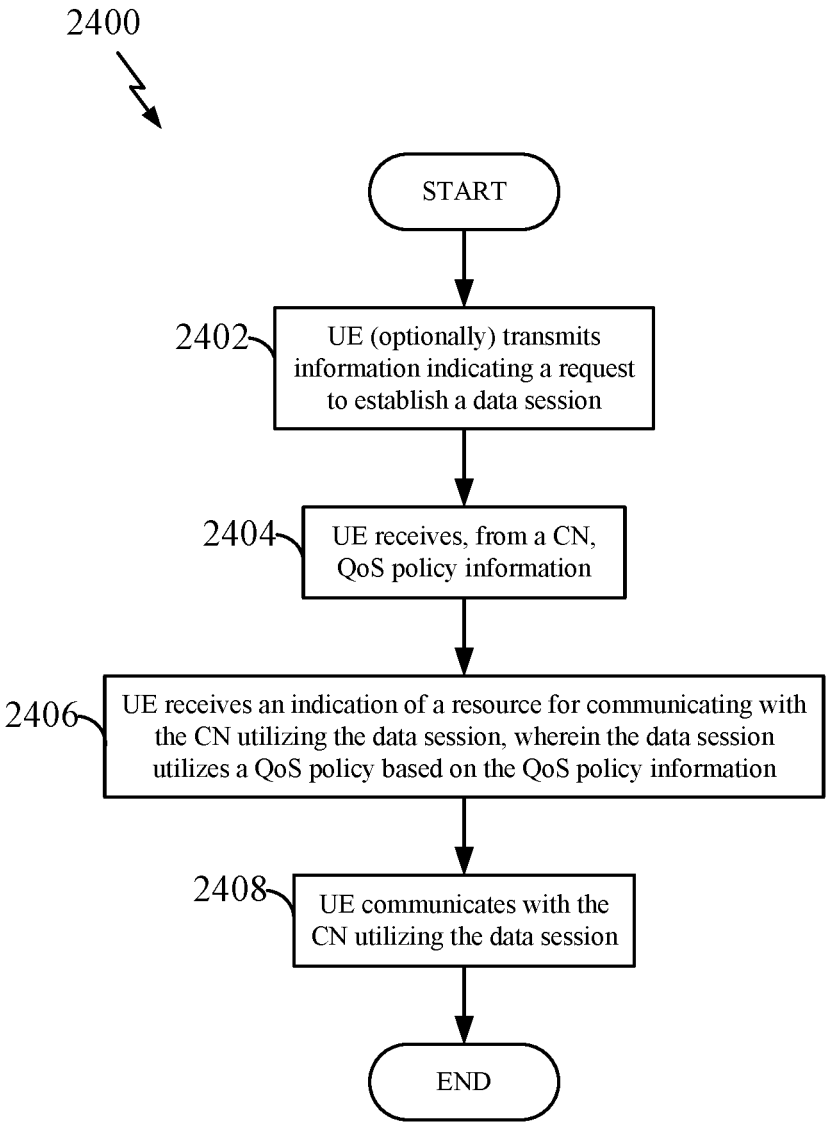
2400
START
2402
UE (optionally) transmits information indicating a request to establish a data session
2404
UE receives, from a CN, QoS policy information
2406
UE receives an indication of a resource for communicating with the CN utilizing the data session, wherein the data session utilizes a QoS policy based on the QoS policy information
2408
UE communicates with the CN utilizing the data session
END

FIG. 24