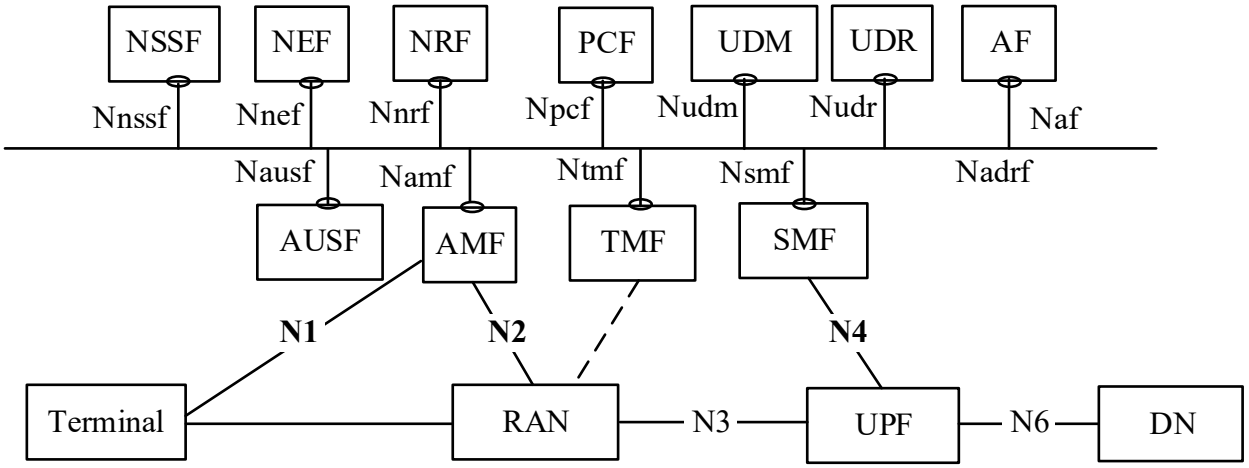

NSSF
NEF
NRF
PCF
UDM
UDR
AF
Nnssf
Nnef
Nnrf
Npcf
Nudm
Nudr
Naf
Nausf
Namf
Ntmf
Nsmf
Nadrf
AUSF
AMF
TMF
SMF
N1
N2
N4
Terminal
RAN
N3
UPF
N6
DN

FIG. 1

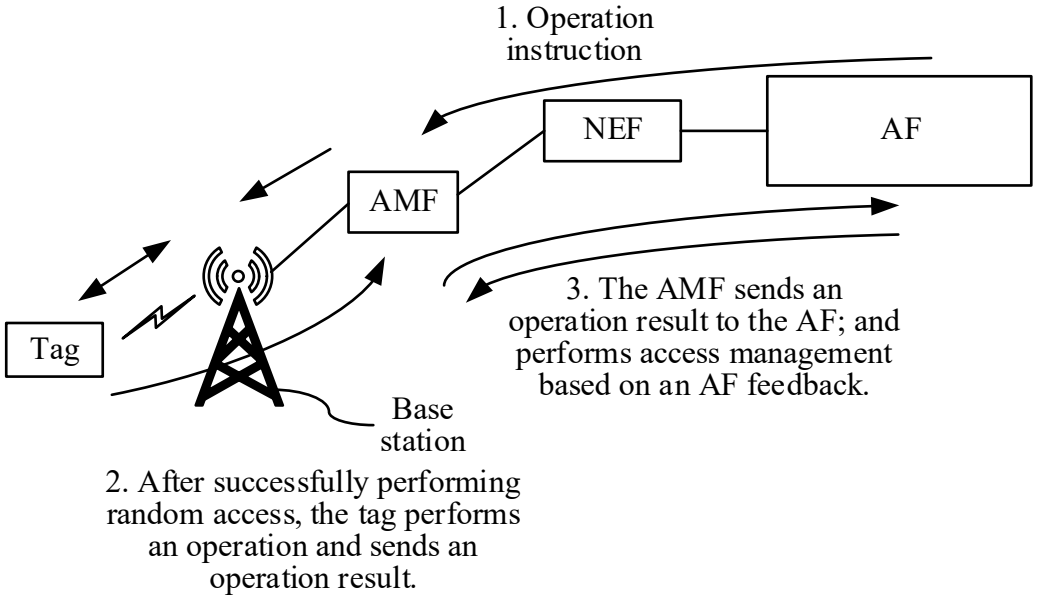

1. Operation instruction
NEF
AF
AMF
3. The AMF sends an operation result to the AF; and performs access management based on an AF feedback.
Tag
Base station
2. After successfully performing random access, the tag performs an operation and sends an operation result.

FIG. 2

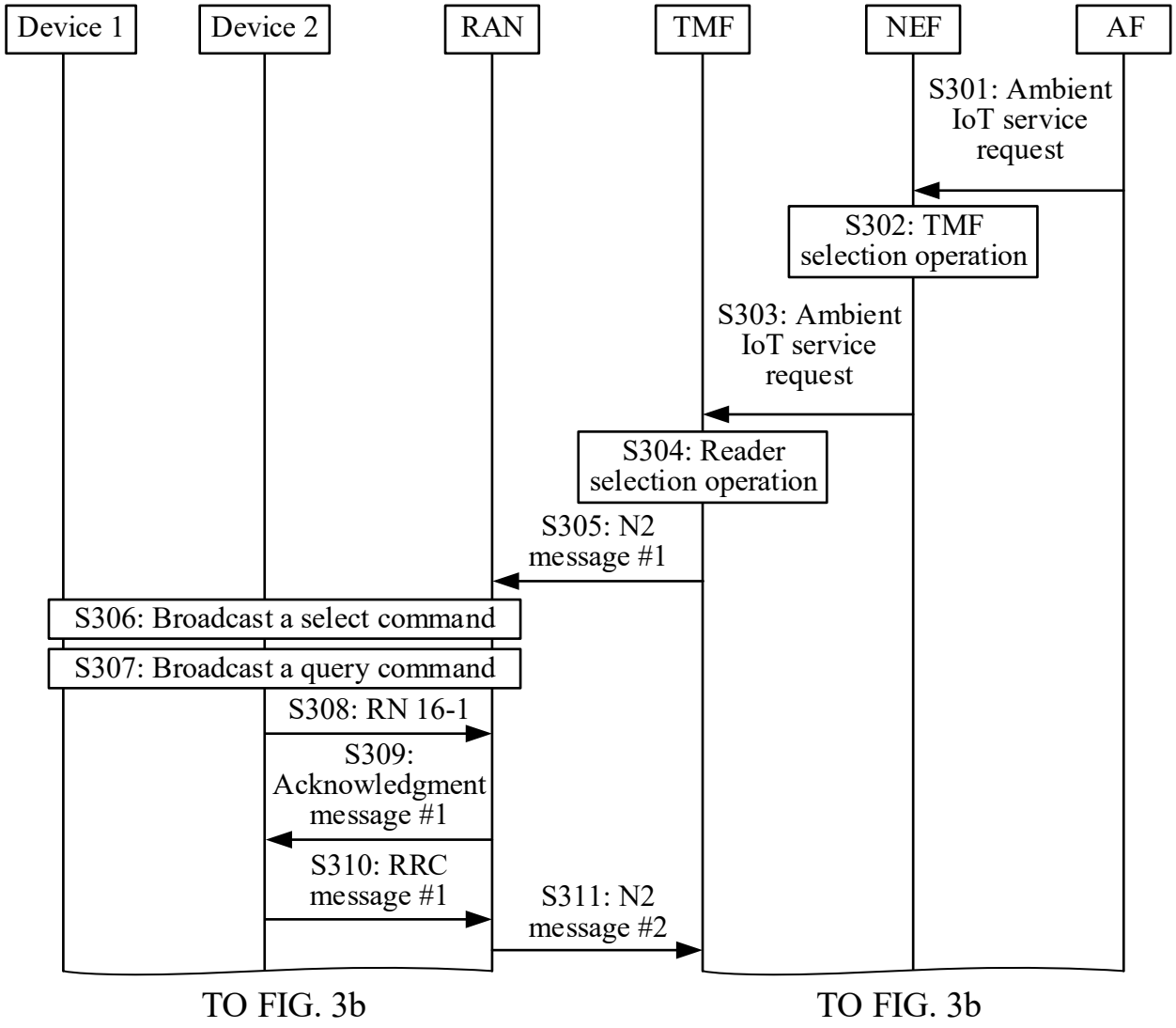

Device 1
Device 2
RAN
TMF
NEF
AF
S301: Ambient IoT service request
S302: TMF selection operation
S303: Ambient IoT service request
S304: Reader selection operation
S305: N2 message #1
S306: Broadcast a select command
S307: Broadcast a query command
S308: RN 16-1
S309: Acknowledgment message #1
S310: RRC message #1
S311: N2 message #2
TO FIG. 3b
TO FIG. 3b

FIG. 3a

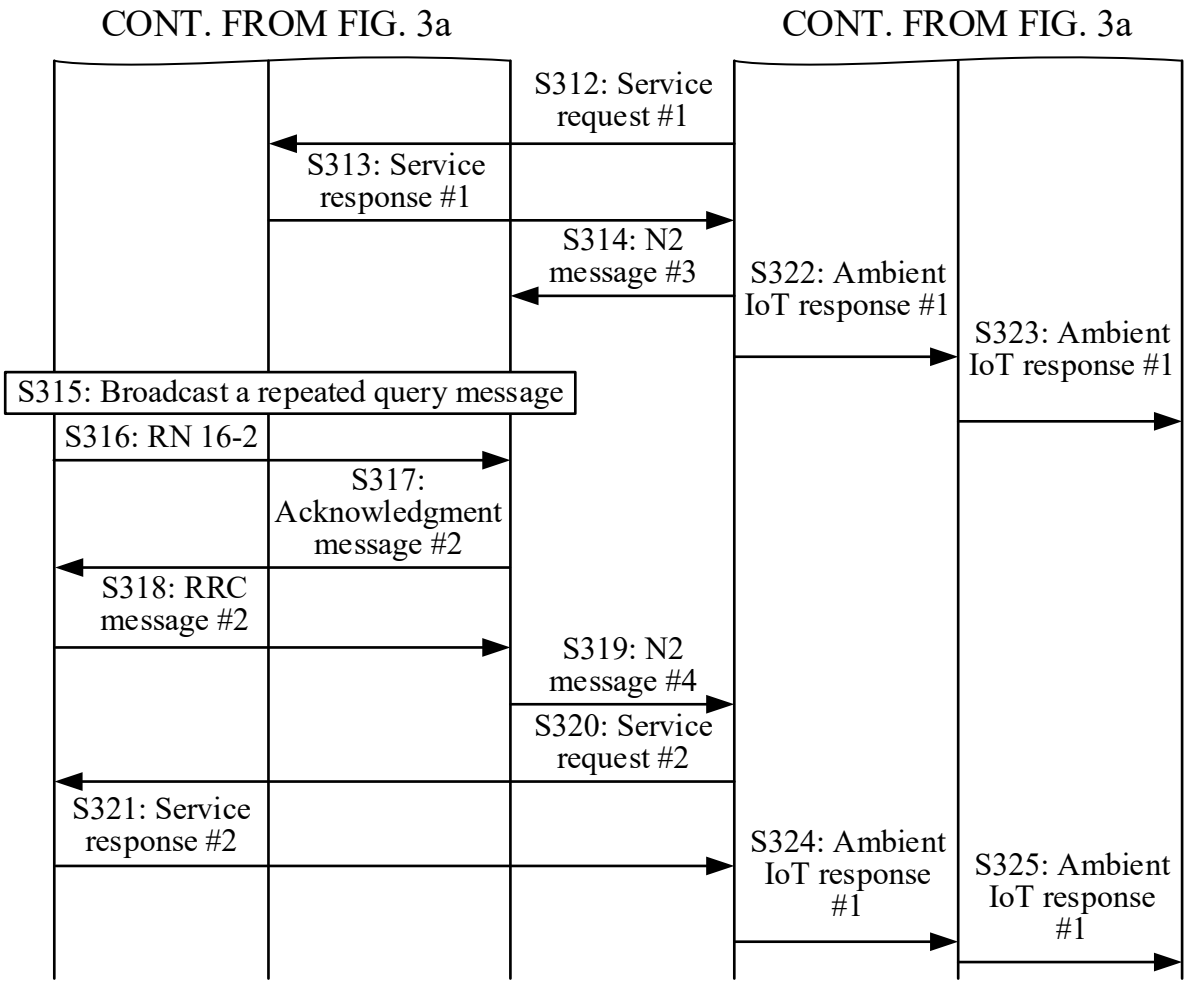

CONT. FROM FIG. 3a
CONT. FROM FIG. 3a
S312: Service request #1
S313: Service response #1
S314: N2 message #3
S322: Ambient IoT response #1
S323: Ambient IoT response #1
S315: Broadcast a repeated query message
S316: RN 16-2
S317: Acknowledgment message #2
S318: RRC message #2
S319: N2 message #4
S320: Service request #2
S321: Service response #2
S324: Ambient IoT response #1
S325: Ambient IoT response #1

FIG. 3b

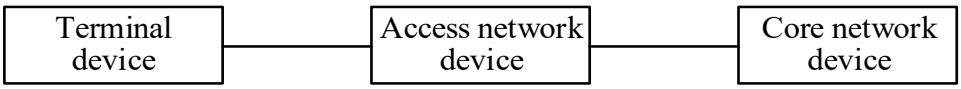

Terminal device
Access network device
Core network device

FIG. 4

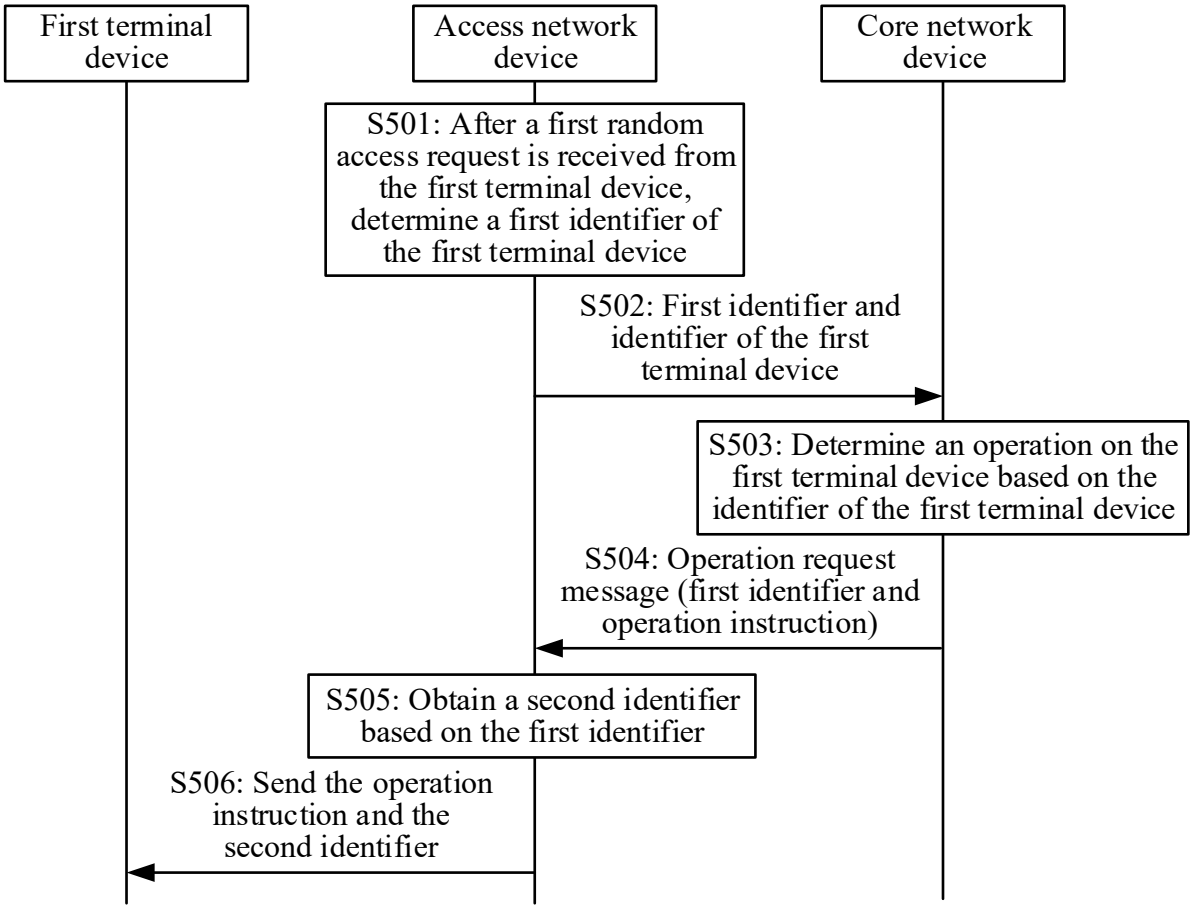

First terminal device
Access network device
Core network device
S501: After a first random access request is received from the first terminal device, determine a first identifier of the first terminal device
S502: First identifier and identifier of the first terminal device
S503: Determine an operation on the first terminal device based on the identifier of the first terminal device
S504: Operation request message (first identifier and operation instruction)
S505: Obtain a second identifier based on the first identifier
S506: Send the operation instruction and the second identifier

FIG. 5

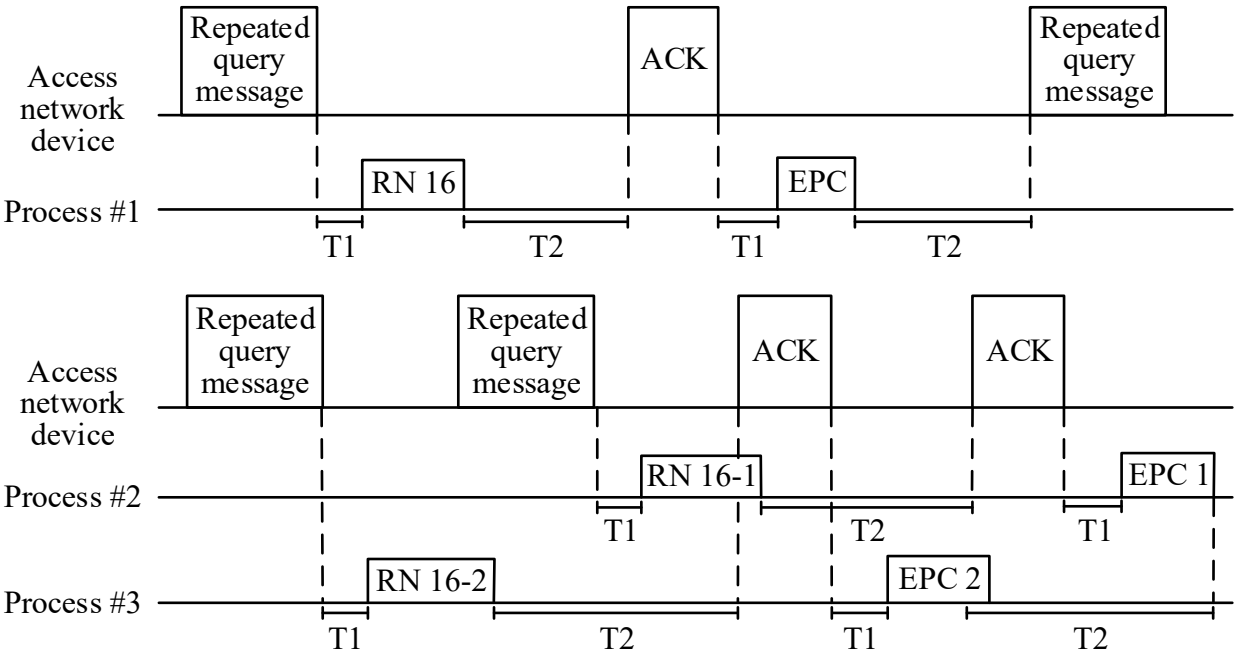

Access network device
Repeated query message
ACK
Repeated query message
Process #1
RN 16
EPC
T1
T2
T1
T2
Access network device
Repeated query message
Repeated query message
ACK
ACK
Process #2
RN 16-1
EPC 1
T1
T2
T1
Process #3
RN 16-2
EPC 2
T1
T2
T1
T2

FIG. 6

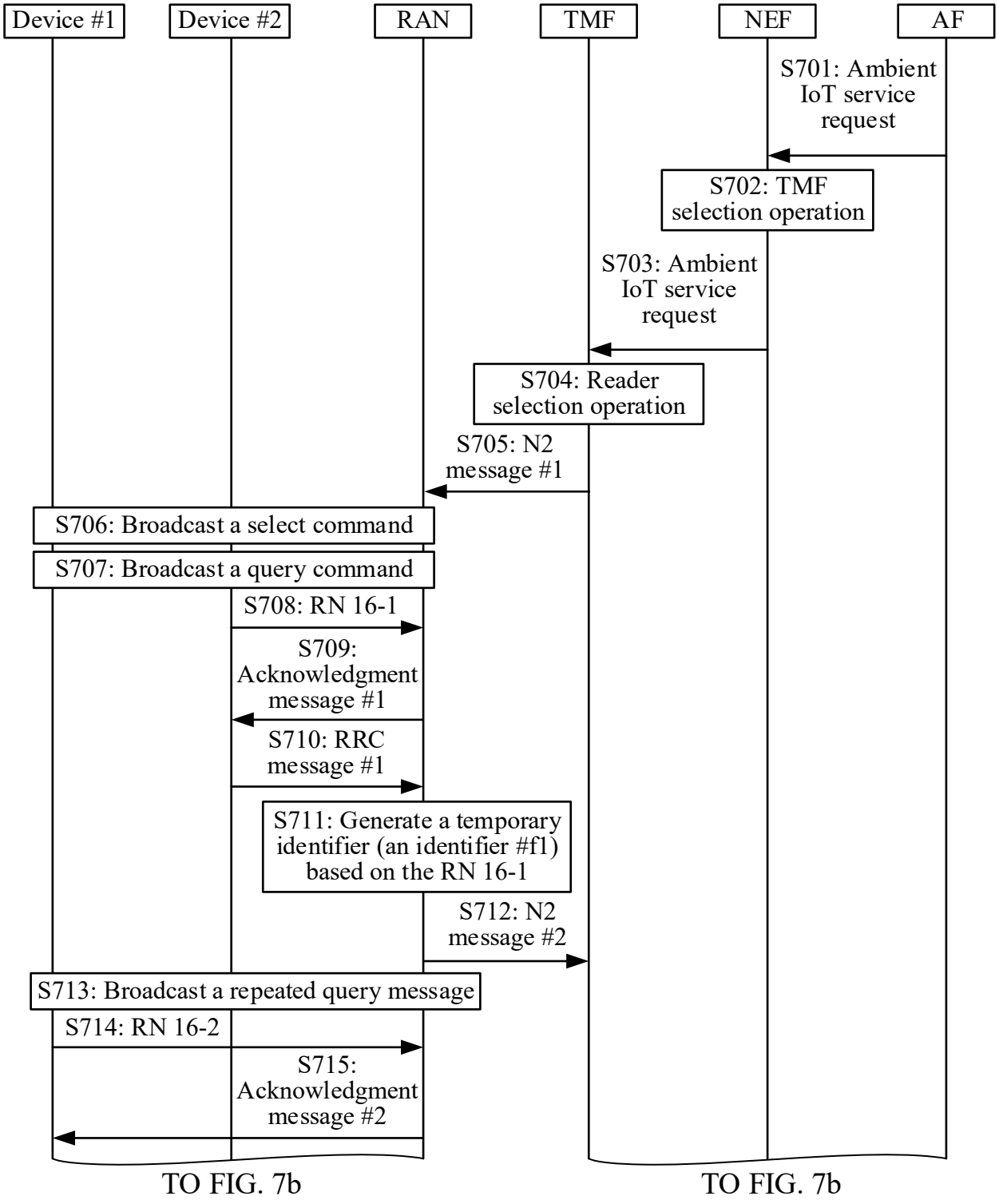

Device #1
Device #2
RAN
TMF
NEF
AF
S701: Ambient IoT service request
S702: TMF selection operation
S703: Ambient IoT service request
S704: Reader selection operation
S705: N2 message #1
S706: Broadcast a select command
S707: Broadcast a query command
S708: RN 16-1
S709: Acknowledgment message #1
S710: RRC message #1
S711: Generate a temporary identifier (an identifier #f1) based on the RN 16-1
S712: N2 message #2
S713: Broadcast a repeated query message
S714: RN 16-2
S715: Acknowledgment message #2
TO FIG. 7b
TO FIG. 7b

FIG. 7a

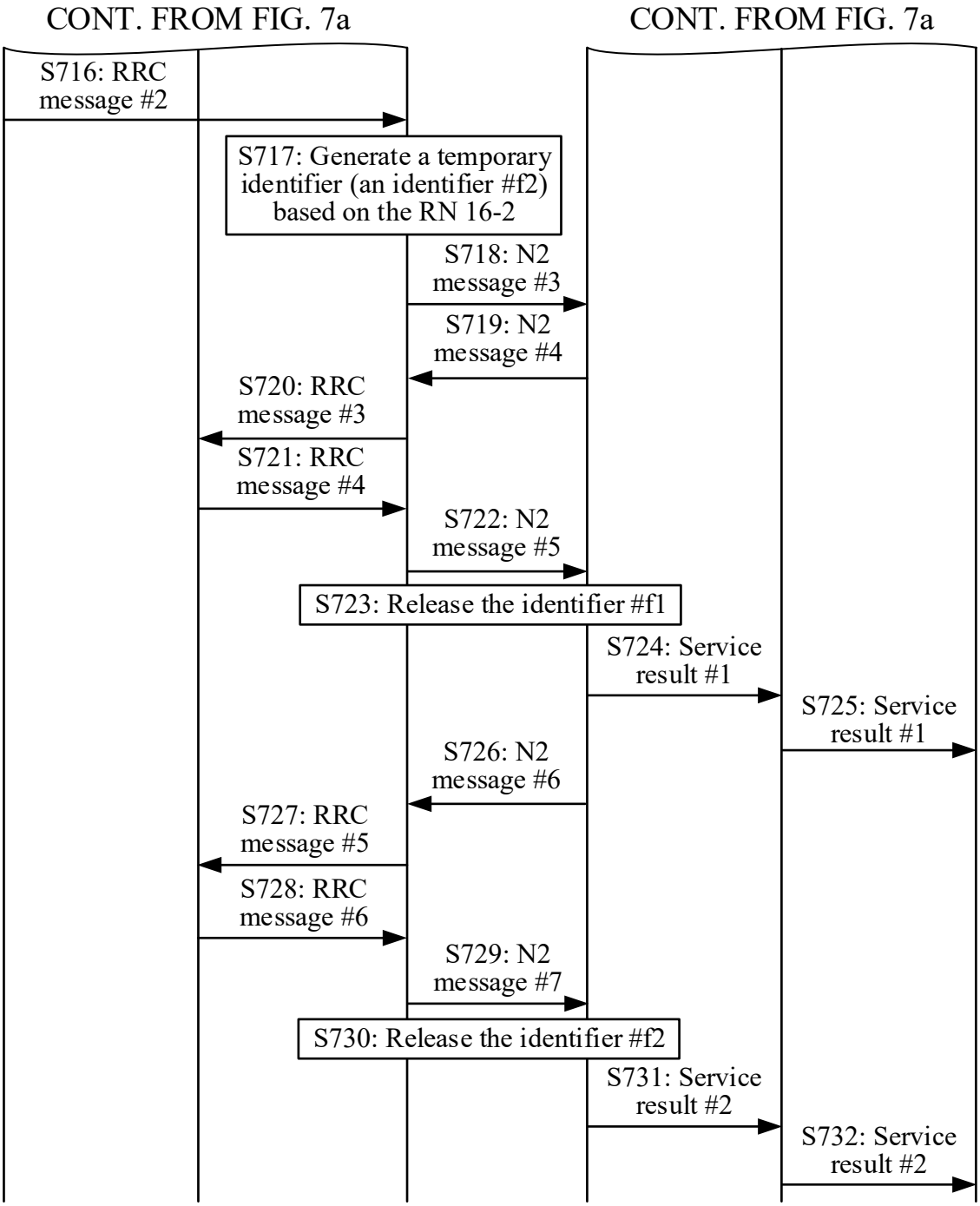

CONT. FROM FIG. 7a
CONT. FROM FIG. 7a
S716: RRC message #2
S717: Generate a temporary identifier (an identifier #f2) based on the RN 16-2
S718: N2 message #3
S719: N2 message #4
S720: RRC message #3
S721: RRC message #4
S722: N2 message #5
S723: Release the identifier #f1
S724: Service result #1
S725: Service result #1
S726: N2 message #6
S727: RRC message #5
S728: RRC message #6
S729: N2 message #7
S730: Release the identifier #f2
S731: Service result #2
S732: Service result #2

FIG. 7b

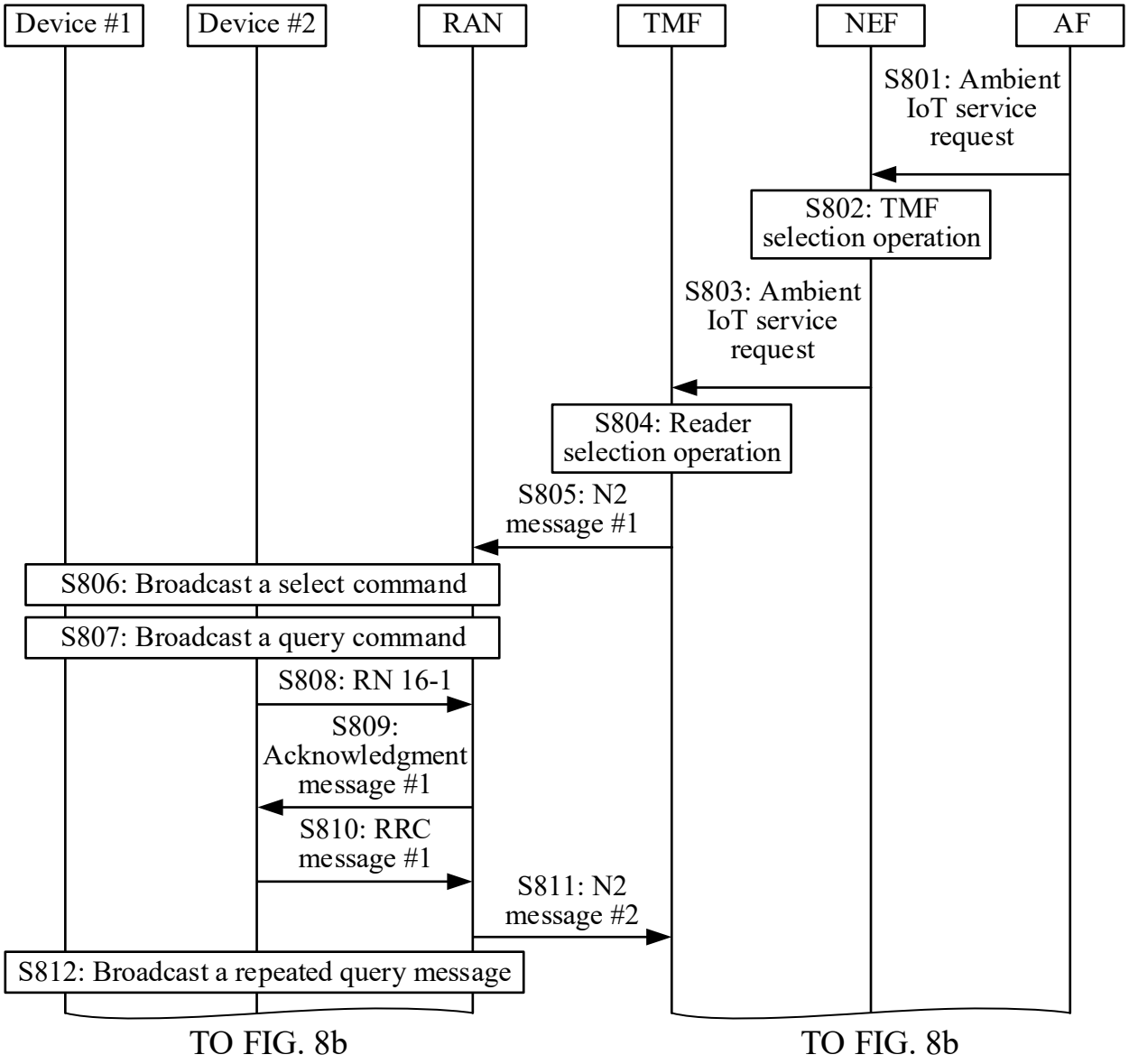

Device #1
Device #2
RAN
TMF
NEF
AF
S801: Ambient IoT service request
S802: TMF selection operation
S803: Ambient IoT service request
S804: Reader selection operation
S805: N2 message #1
S806: Broadcast a select command
S807: Broadcast a query command
S808: RN 16-1
S809: Acknowledgment message #1
S810: RRC message #1
S811: N2 message #2
S812: Broadcast a repeated query message
TO FIG. 8b
TO FIG. 8b

FIG. 8a

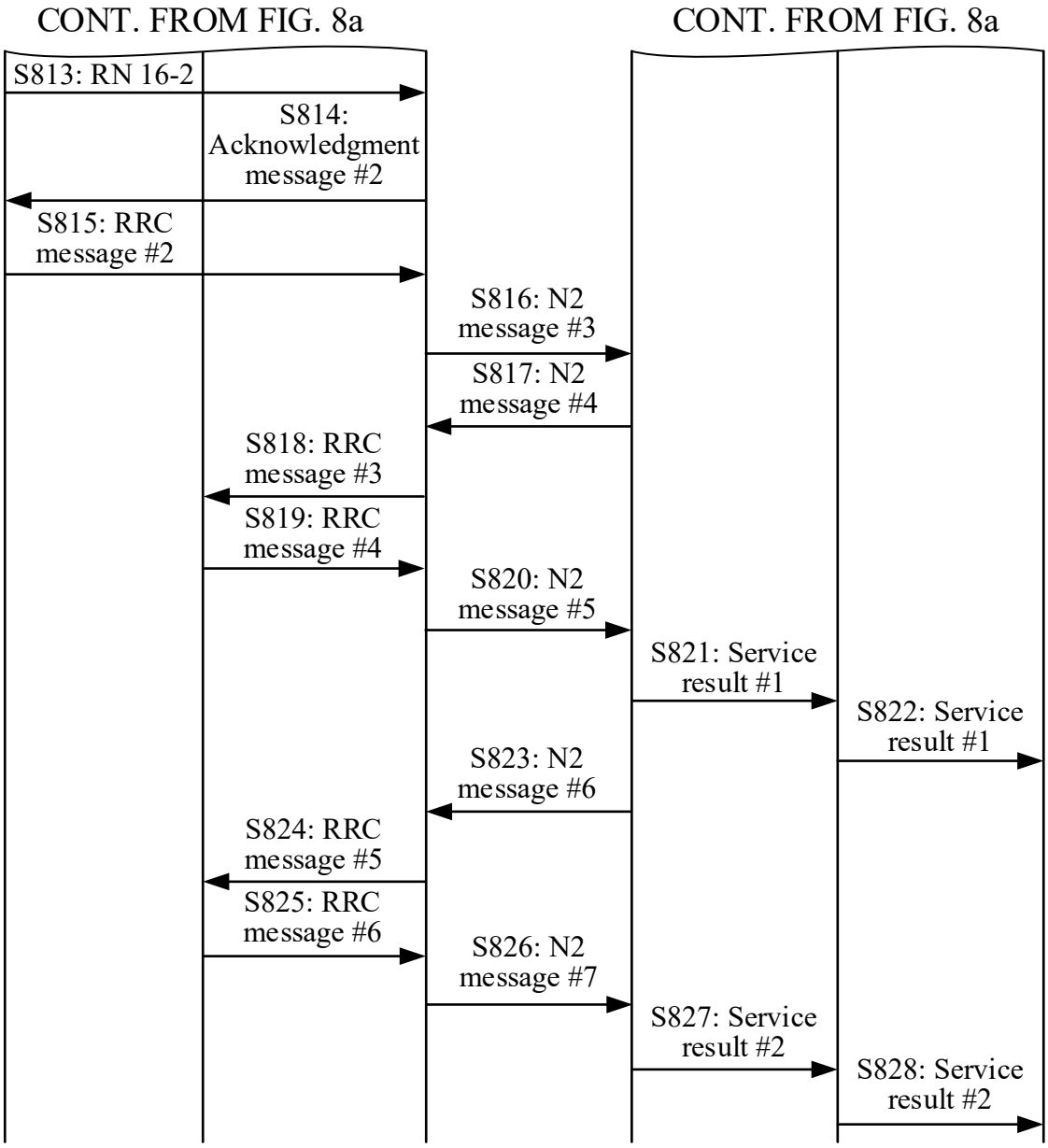

CONT. FROM FIG. 8a
CONT. FROM FIG. 8a
S813: RN 16-2
S814: Acknowledgment message #2
S815: RRC message #2
S816: N2 message #3
S817: N2 message #4
S818: RRC message #3
S819: RRC message #4
S820: N2 message #5
S821: Service result #1
S822: Service result #1
S823: N2 message #6
S824: RRC message #5
S825: RRC message #6
S826: N2 message #7
S827: Service result #2
S828: Service result #2

FIG. 8b

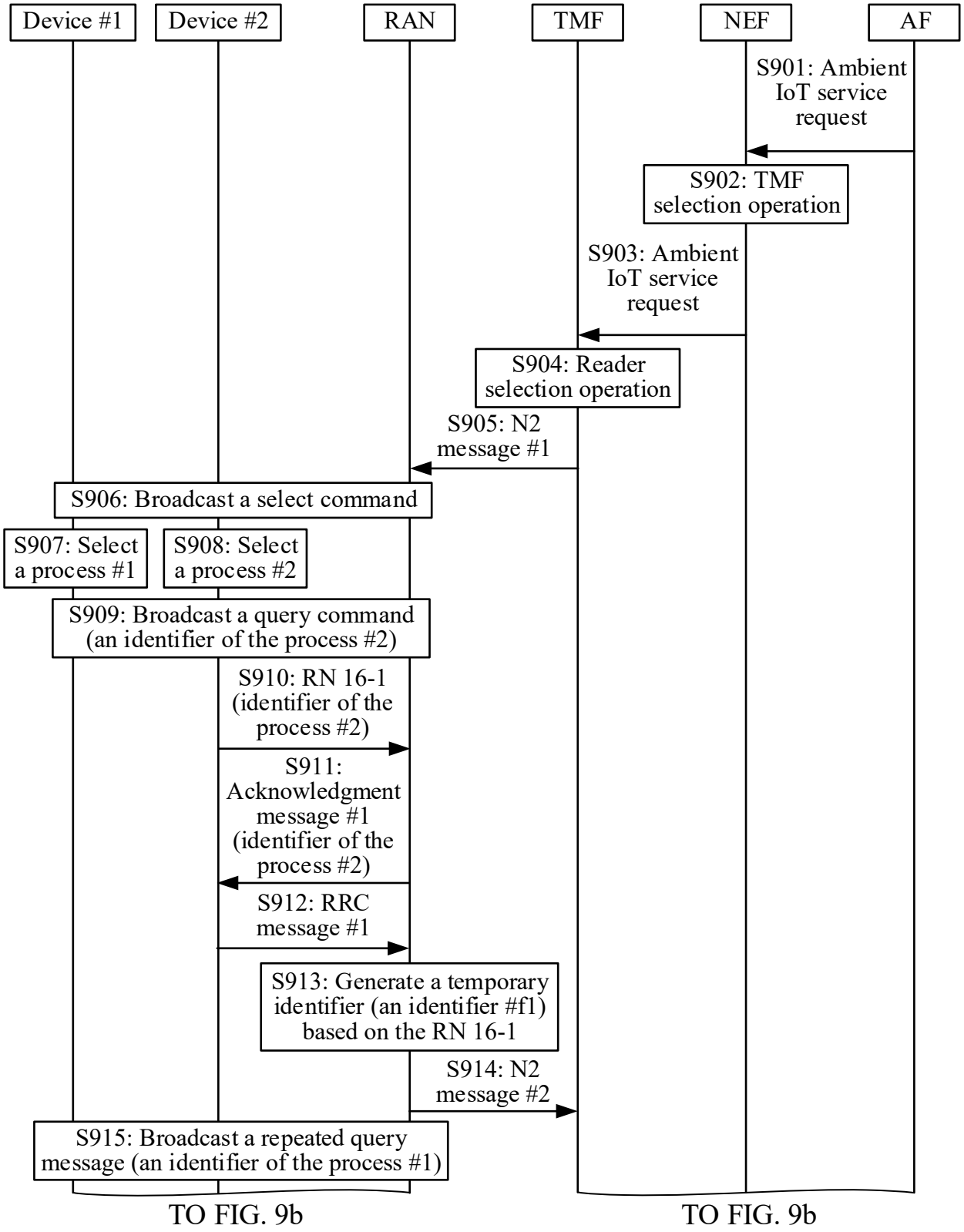

Device #1
Device #2
RAN
TMF
NEF
AF
S901: Ambient IoT service request
S902: TMF selection operation
S903: Ambient IoT service request
S904: Reader selection operation
S905: N2 message #1
S906: Broadcast a select command
S907: Select a process #1
S908: Select a process #2
S909: Broadcast a query command (an identifier of the process #2)
S910: RN 16-1 (identifier of the process #2)
S911: Acknowledgment message #1 (identifier of the process #2)
S912: RRC message #1
S913: Generate a temporary identifier (an identifier #f1) based on the RN 16-1
S914: N2 message #2
S915: Broadcast a repeated query message (an identifier of the process #1)
TO FIG. 9b
TO FIG. 9b

FIG. 9a

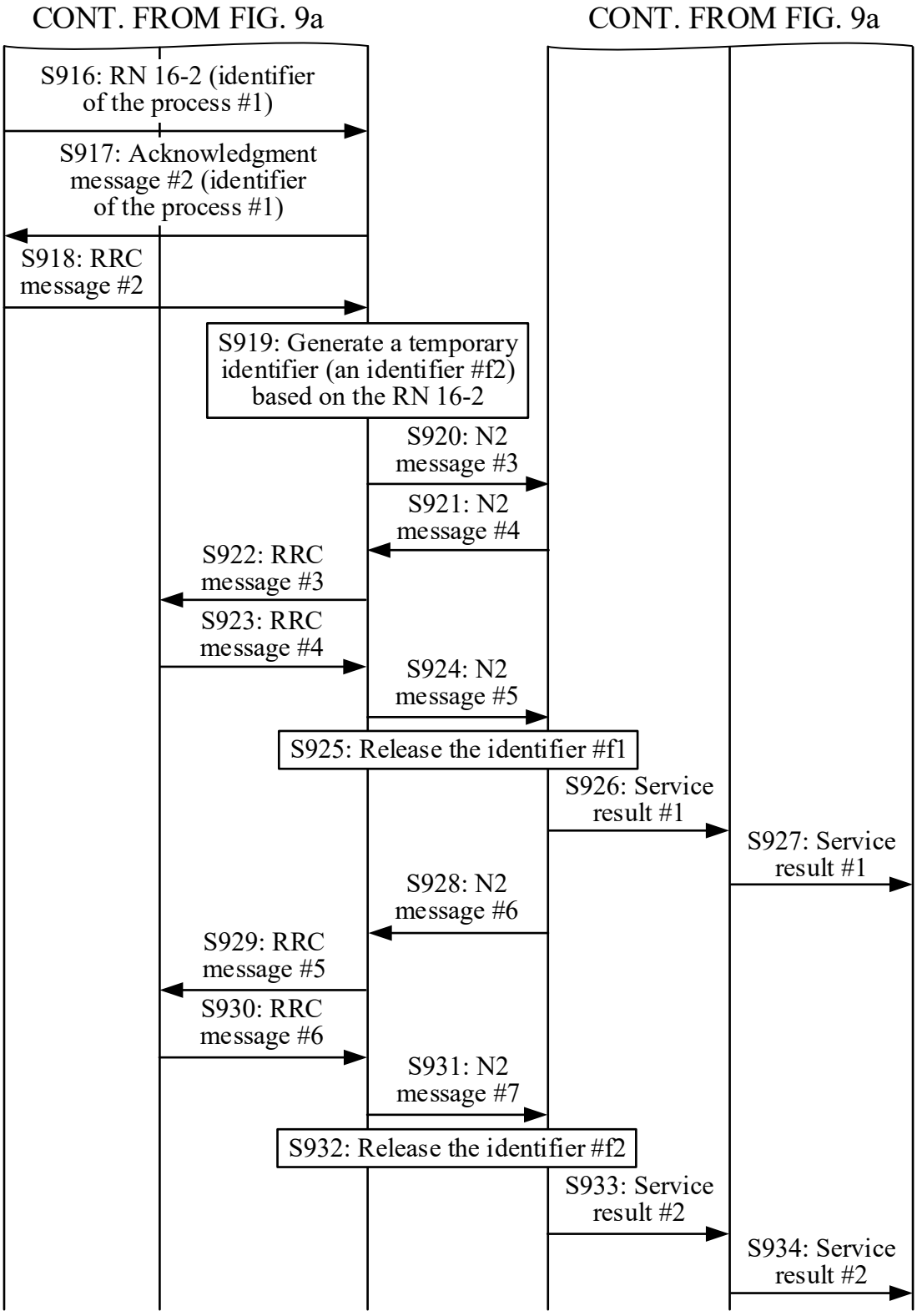

CONT. FROM FIG. 9a
CONT. FROM FIG. 9a
S916: RN 16-2 (identifier of the process #1)
S917: Acknowledgment message #2 (identifier of the process #1)
S918: RRC message #2
S919: Generate a temporary identifier (an identifier #f2) based on the RN 16-2
S920: N2 message #3
S921: N2 message #4
S922: RRC message #3
S923: RRC message #4
S924: N2 message #5
S925: Release the identifier #f1
S926: Service result #1
S927: Service result #1
S928: N2 message #6
S929: RRC message #5
S930: RRC message #6
S931: N2 message #7
S932: Release the identifier #f2
S933: Service result #2
S934: Service result #2

FIG. 9b

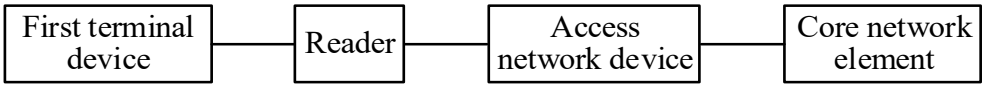

First terminal device
Reader
Access network device
Core network element

FIG. 10

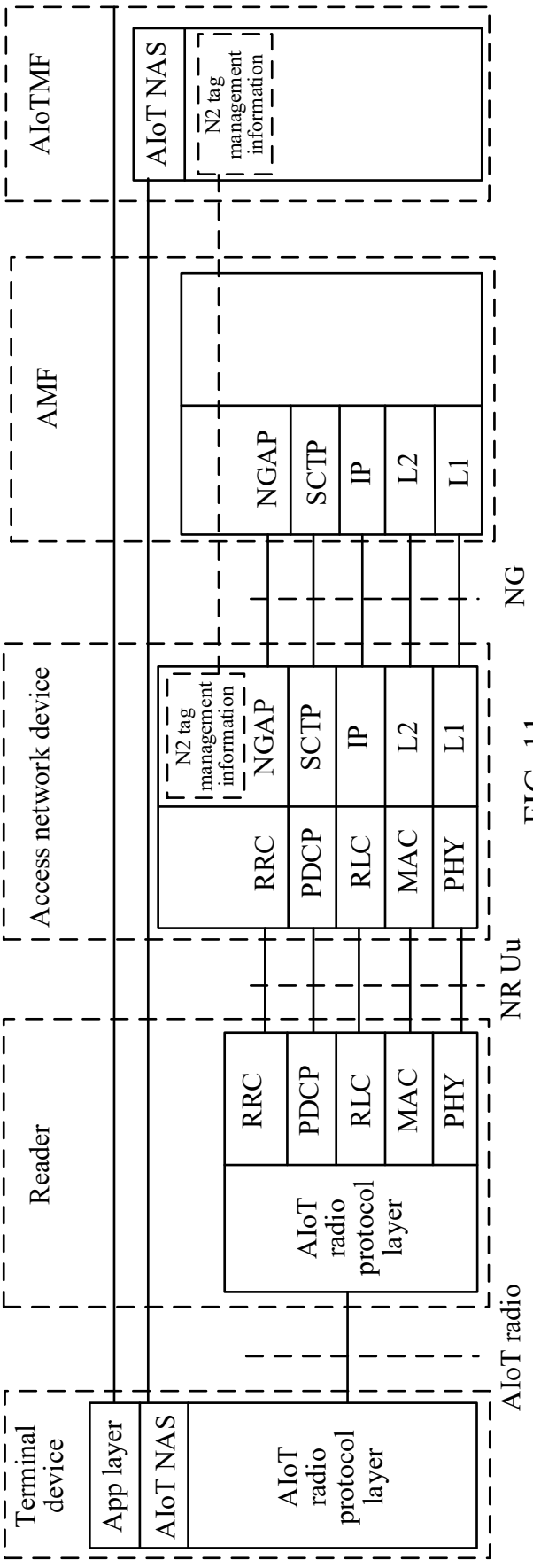

Terminal device
App layer
AIoT NAS
AIoT radio protocol layer
Reader
RRC
PDCP
RLC
MAC
PHY
AIoT radio protocol layer
AIoT radio
Access network device
N2 tag management information
NGAP
SCTP
IP
L2
L1
NR Uu
AMF
NGAP
SCTP
IP
L2
L1
NG
AIoTMF
AIoT NAS
N2 tag management information

FIG. 11

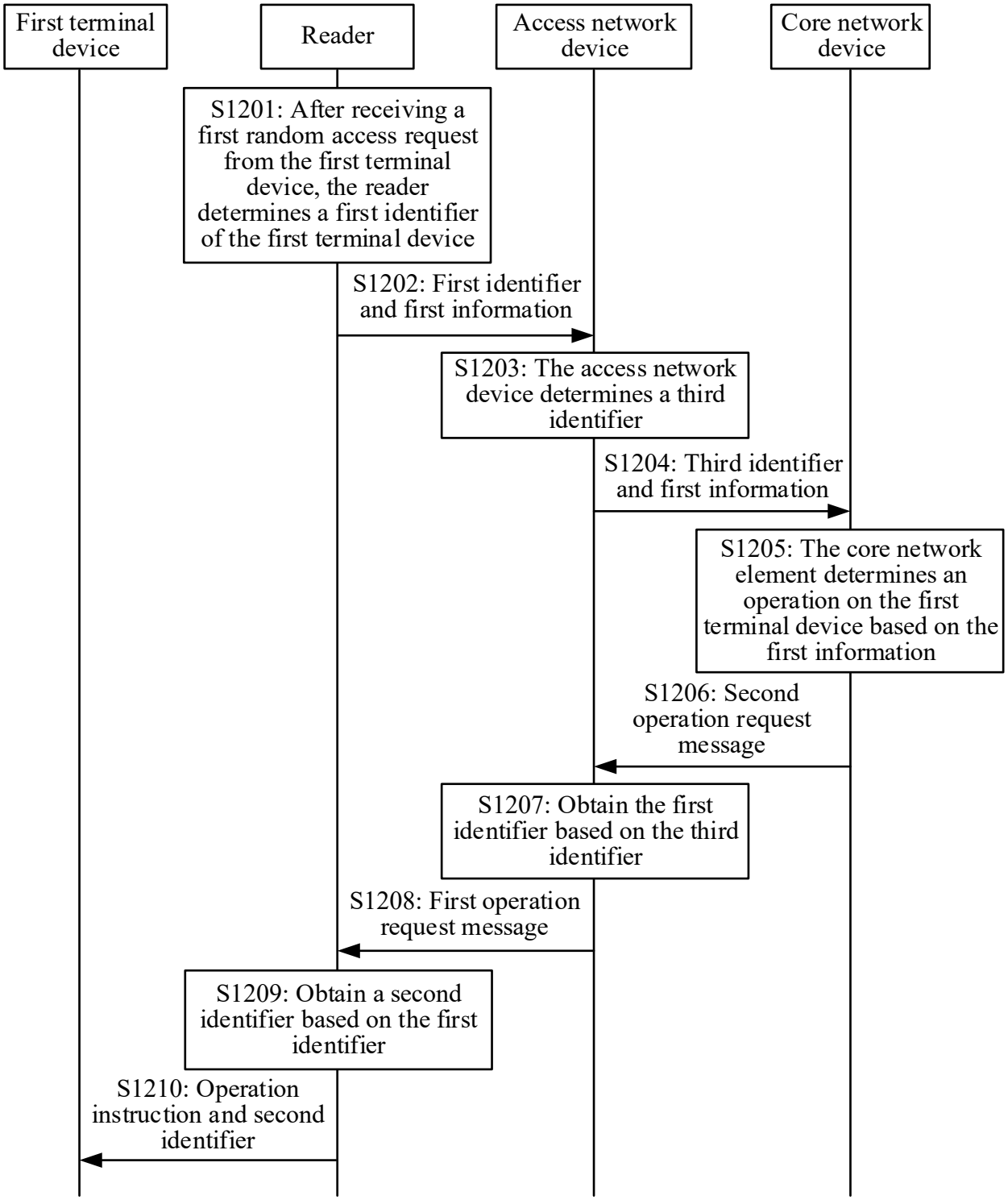

First terminal device
Reader
Access network device
Core network device
S1201: After receiving a first random access request from the first terminal device, the reader determines a first identifier of the first terminal device
S1202: First identifier and first information
S1203: The access network device determines a third identifier
S1204: Third identifier and first information
S1205: The core network element determines an operation on the first terminal device based on the first information
S1206: Second operation request message
S1207: Obtain the first identifier based on the third identifier
S1208: First operation request message
S1209: Obtain a second identifier based on the first identifier
S1210: Operation instruction and second identifier

FIG. 12

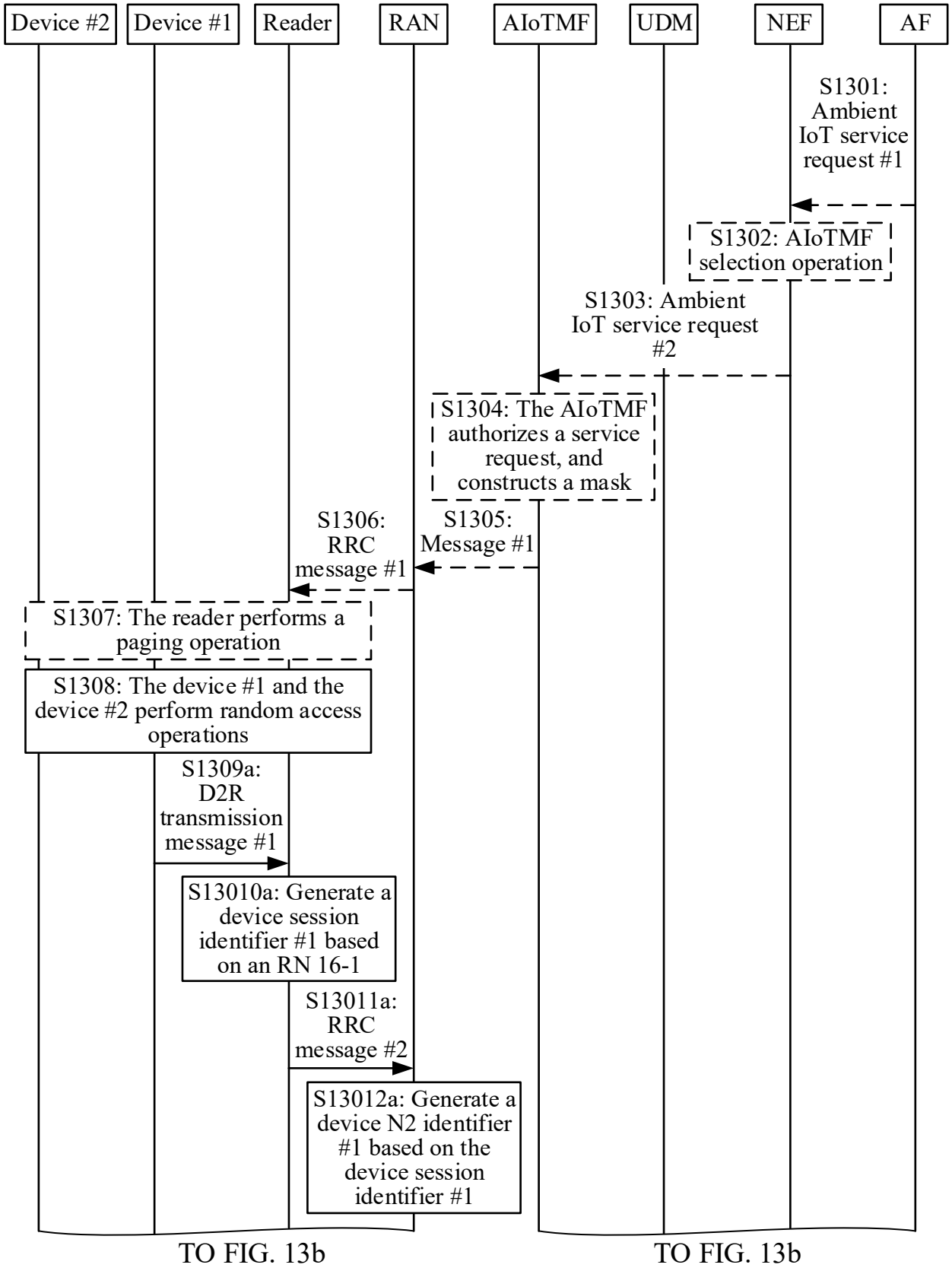

Device #2
Device #1
Reader
RAN
AIoTMF
UDM
NEF
AF
S1301: Ambient IoT service request #1
S1302: AIoTMF selection operation
S1303: Ambient IoT service request #2
S1304: The AIoTMF authorizes a service request, and constructs a mask
S1305: Message #1
S1306: RRC message #1
S1307: The reader performs a paging operation
S1308: The device #1 and the device #2 perform random access operations
S1309a: D2R transmission message #1
S13010a: Generate a device session identifier #1 based on an RN 16-1
S13011a: RRC message #2
S13012a: Generate a device N2 identifier #1 based on the device session identifier #1
TO FIG. 13b
TO FIG. 13b

FIG. 13a

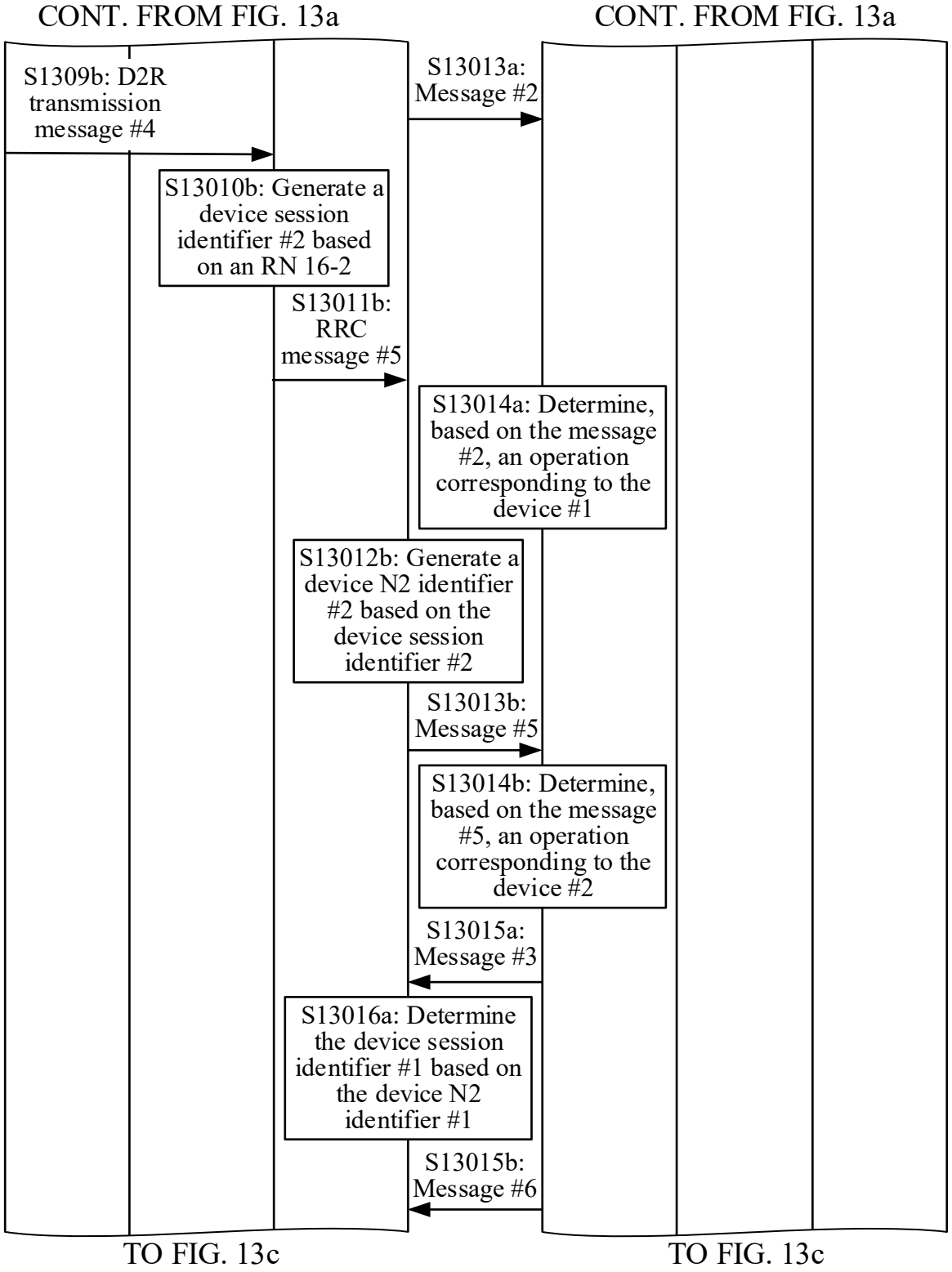

CONT. FROM FIG. 13a
CONT. FROM FIG. 13a
S1309b: D2R transmission message #4
S13013a: Message #2
S13010b: Generate a device session identifier #2 based on an RN 16-2
S13011b: RRC message #5
S13014a: Determine, based on the message #2, an operation corresponding to the device #1
S13012b: Generate a device N2 identifier #2 based on the device session identifier #2
S13013b: Message #5
S13014b: Determine, based on the message #5, an operation corresponding to the device #2
S13015a: Message #3
S13016a: Determine the device session identifier #1 based on the device N2 identifier #1
S13015b: Message #6
TO FIG. 13c
TO FIG. 13c

FIG. 13b

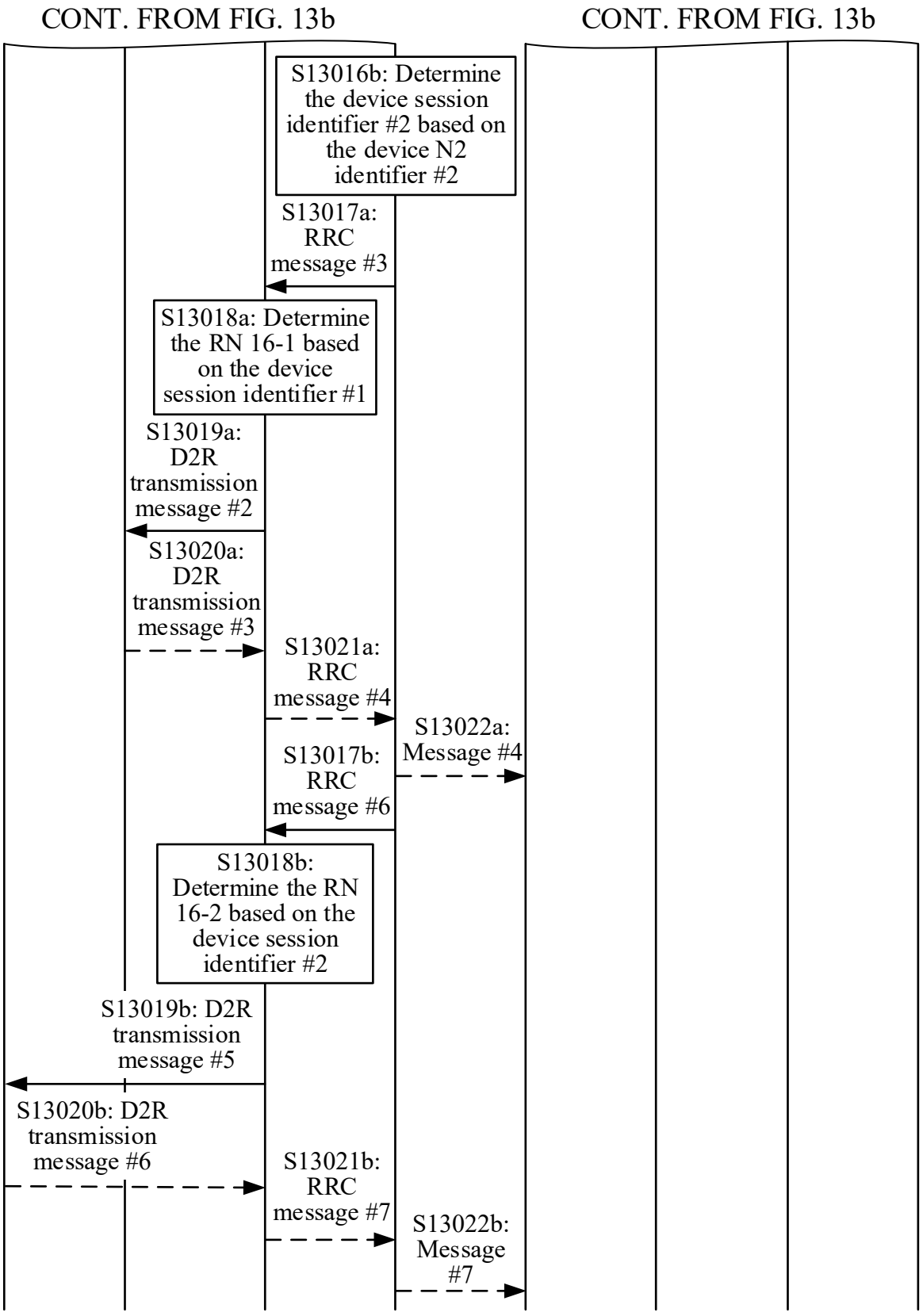

CONT. FROM FIG. 13b
CONT. FROM FIG. 13b
S13016b: Determine the device session identifier #2 based on the device N2 identifier #2
S13017a: RRC message #3
S13018a: Determine the RN 16-1 based on the device session identifier #1
S13019a: D2R transmission message #2
S13020a: D2R transmission message #3
S13021a: RRC message #4
S13022a: Message #4
S13017b: RRC message #6
S13018b: Determine the RN 16-2 based on the device session identifier #2
S13019b: D2R transmission message #5
S13020b: D2R transmission message #6
S13021b: RRC message #7
S13022b: Message #7

FIG. 13c

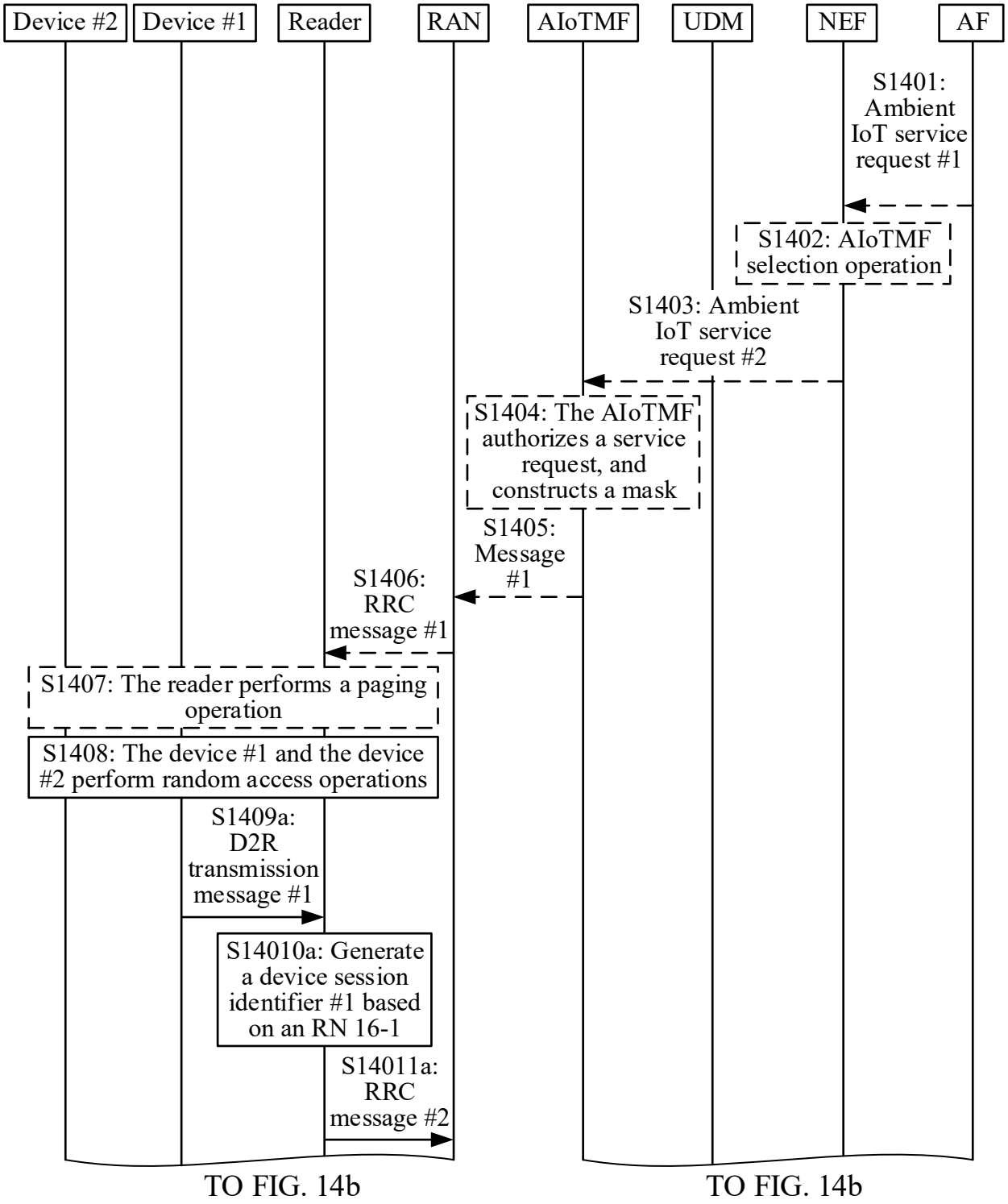

Device #2
Device #1
Reader
RAN
AIoTMF
UDM
NEF
AF
S1401: Ambient IoT service request #1
S1402: AIoTMF selection operation
S1403: Ambient IoT service request #2
S1404: The AIoTMF authorizes a service request, and constructs a mask
S1405: Message #1
S1406: RRC message #1
S1407: The reader performs a paging operation
S1408: The device #1 and the device #2 perform random access operations
S1409a: D2R transmission message #1
S14010a: Generate a device session identifier #1 based on an RN 16-1
S14011a: RRC message #2
TO FIG. 14b
TO FIG. 14b

FIG. 14a

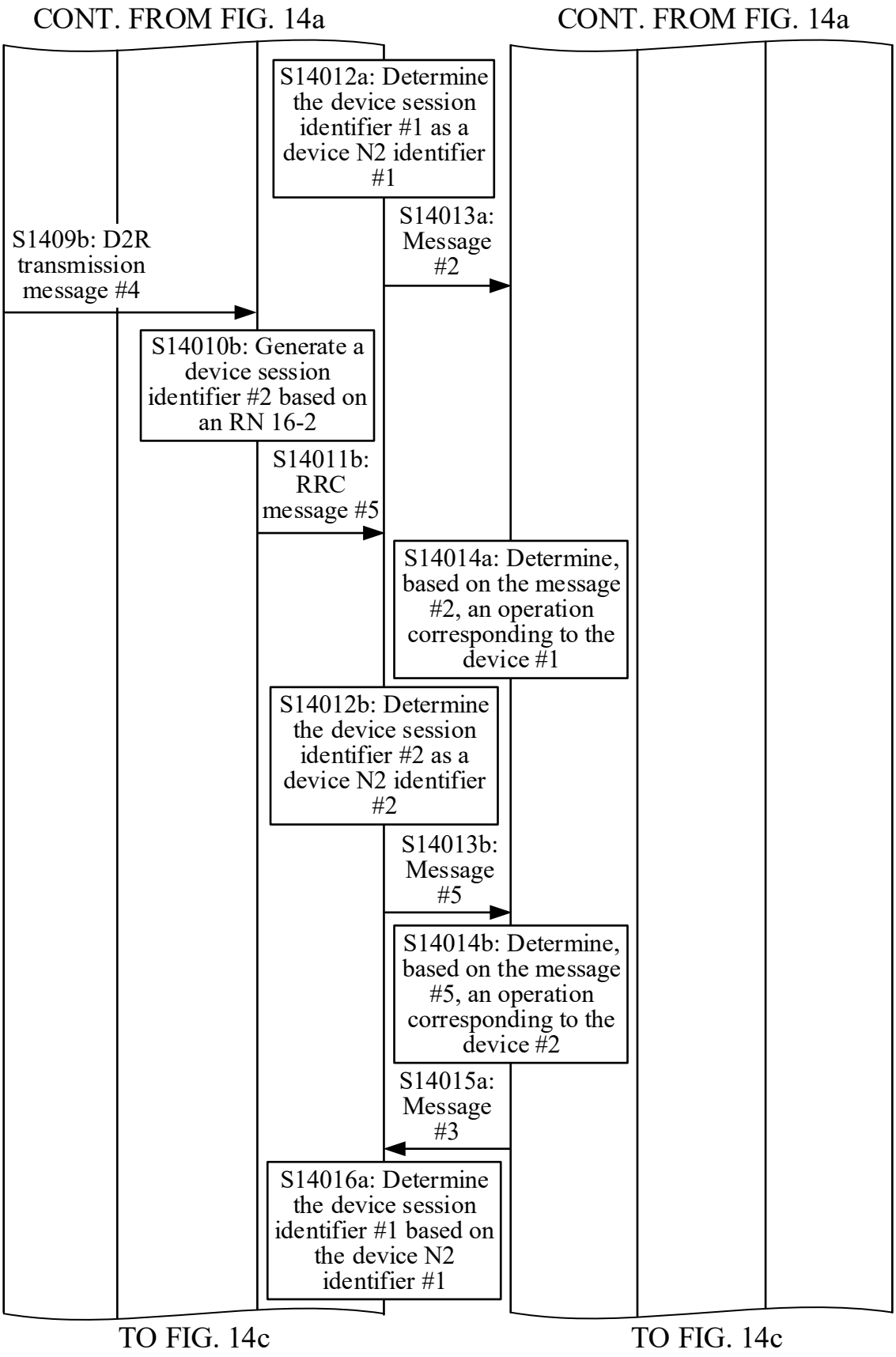

CONT. FROM FIG. 14a
CONT. FROM FIG. 14a
S14012a: Determine the device session identifier #1 as a device N2 identifier #1
S14013a: Message #2
S1409b: D2R transmission message #4
S14010b: Generate a device session identifier #2 based on an RN 16-2
S14011b: RRC message #5
S14014a: Determine, based on the message #2, an operation corresponding to the device #1
S14012b: Determine the device session identifier #2 as a device N2 identifier #2
S14013b: Message #5
S14014b: Determine, based on the message #5, an operation corresponding to the device #2
S14015a: Message #3
S14016a: Determine the device session identifier #1 based on the device N2 identifier #1
TO FIG. 14c
TO FIG. 14c

FIG. 14b

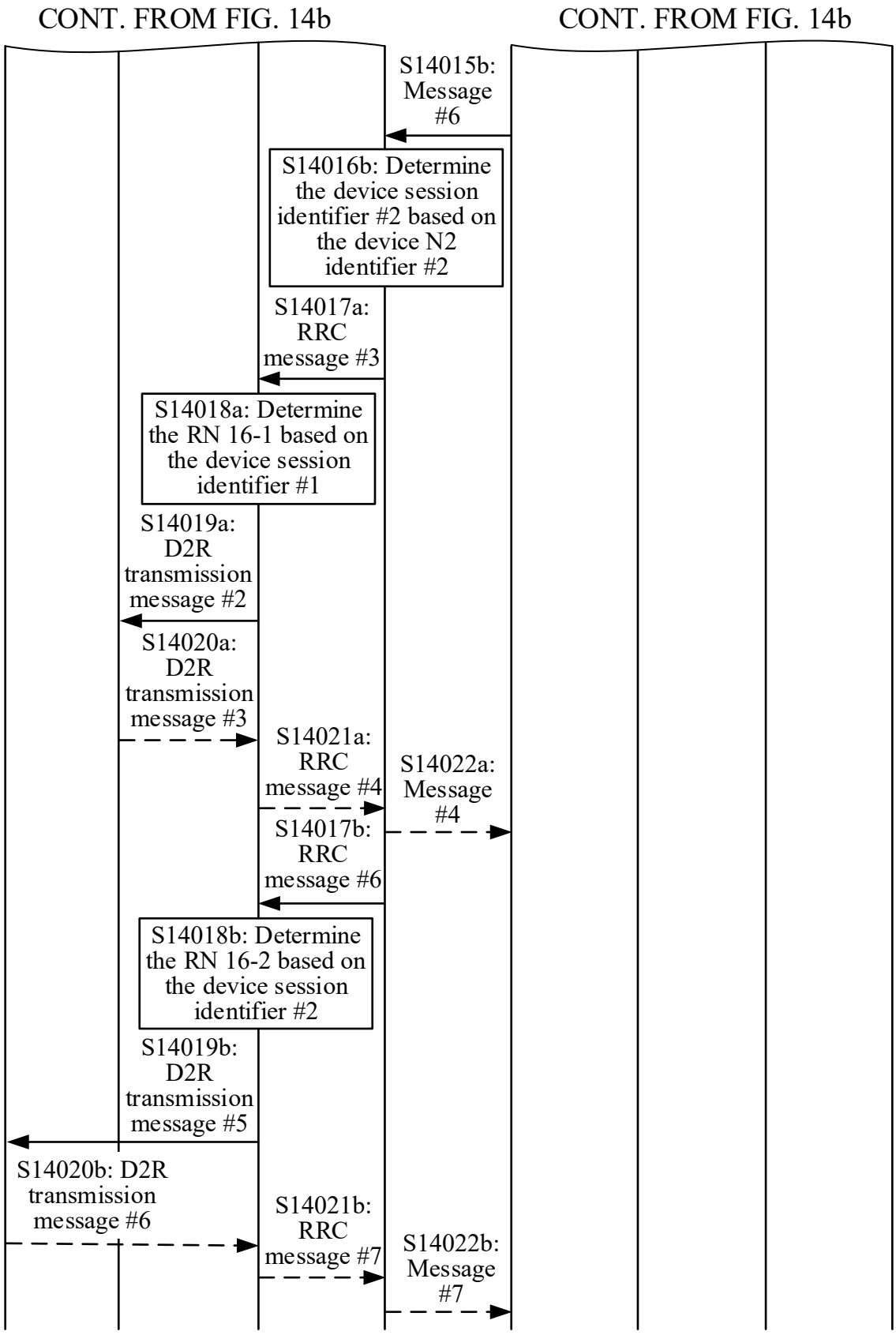

CONT. FROM FIG. 14b
CONT. FROM FIG. 14b
S14015b: Message #6
S14016b: Determine the device session identifier #2 based on the device N2 identifier #2
S14017a: RRC message #3
S14018a: Determine the RN 16-1 based on the device session identifier #1
S14019a: D2R transmission message #2
S14020a: D2R transmission message #3
S14021a: RRC message #4
S14022a: Message #4
S14017b: RRC message #6
S14018b: Determine the RN 16-2 based on the device session identifier #2
S14019b: D2R transmission message #5
S14020b: D2R transmission message #6
S14021b: RRC message #7
S14022b: Message #7

FIG. 14c

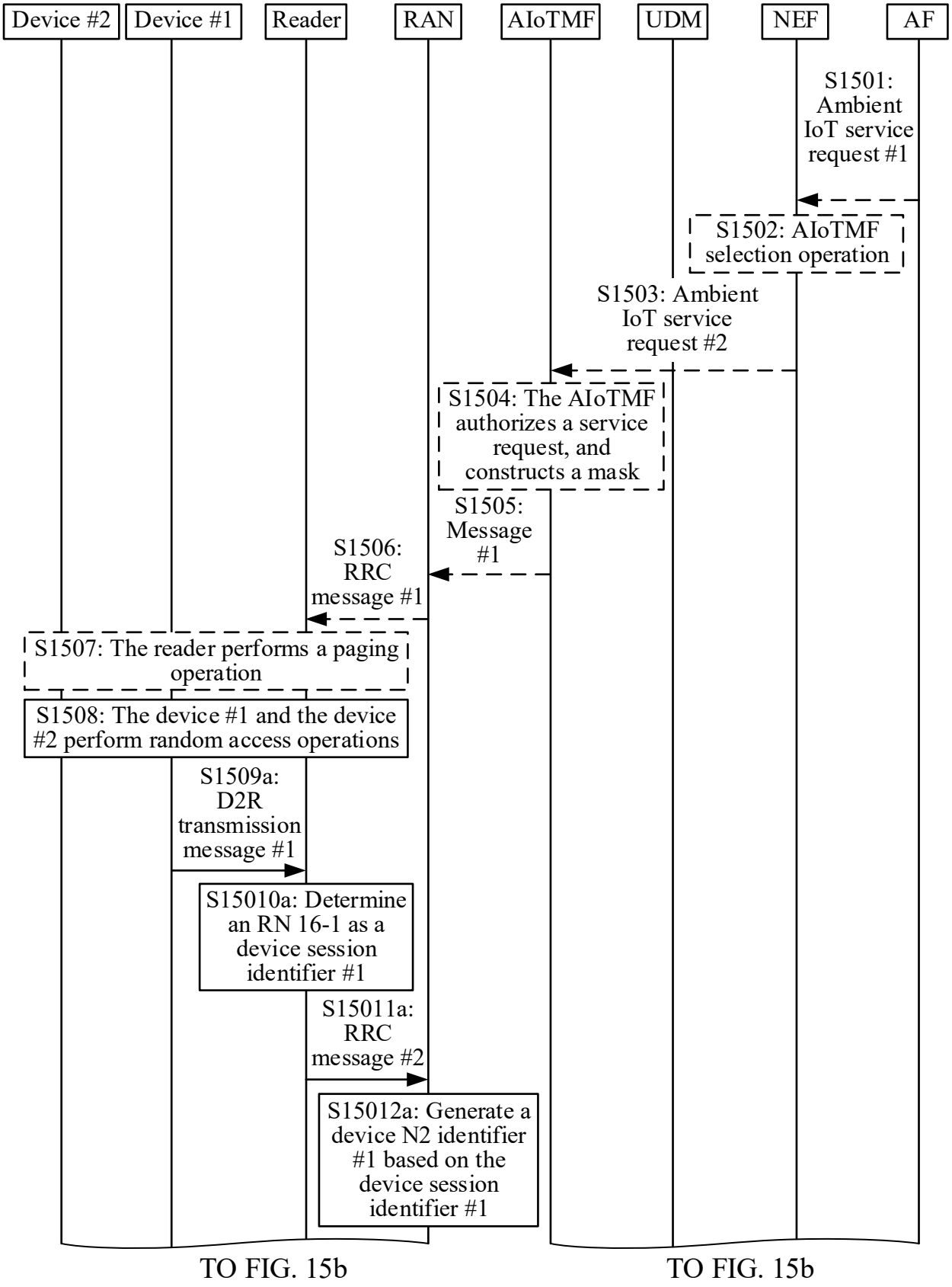

Device #2
Device #1
Reader
RAN
AIoTMF
UDM
NEF
AF
S1501: Ambient IoT service request #1
S1502: AIoTMF selection operation
S1503: Ambient IoT service request #2
S1504: The AIoTMF authorizes a service request, and constructs a mask
S1505: Message #1
S1506: RRC message #1
S1507: The reader performs a paging operation
S1508: The device #1 and the device #2 perform random access operations
S1509a: D2R transmission message #1
S15010a: Determine an RN 16-1 as a device session identifier #1
S15011a: RRC message #2
S15012a: Generate a device N2 identifier #1 based on the device session identifier #1
TO FIG. 15b
TO FIG. 15b

FIG. 15a

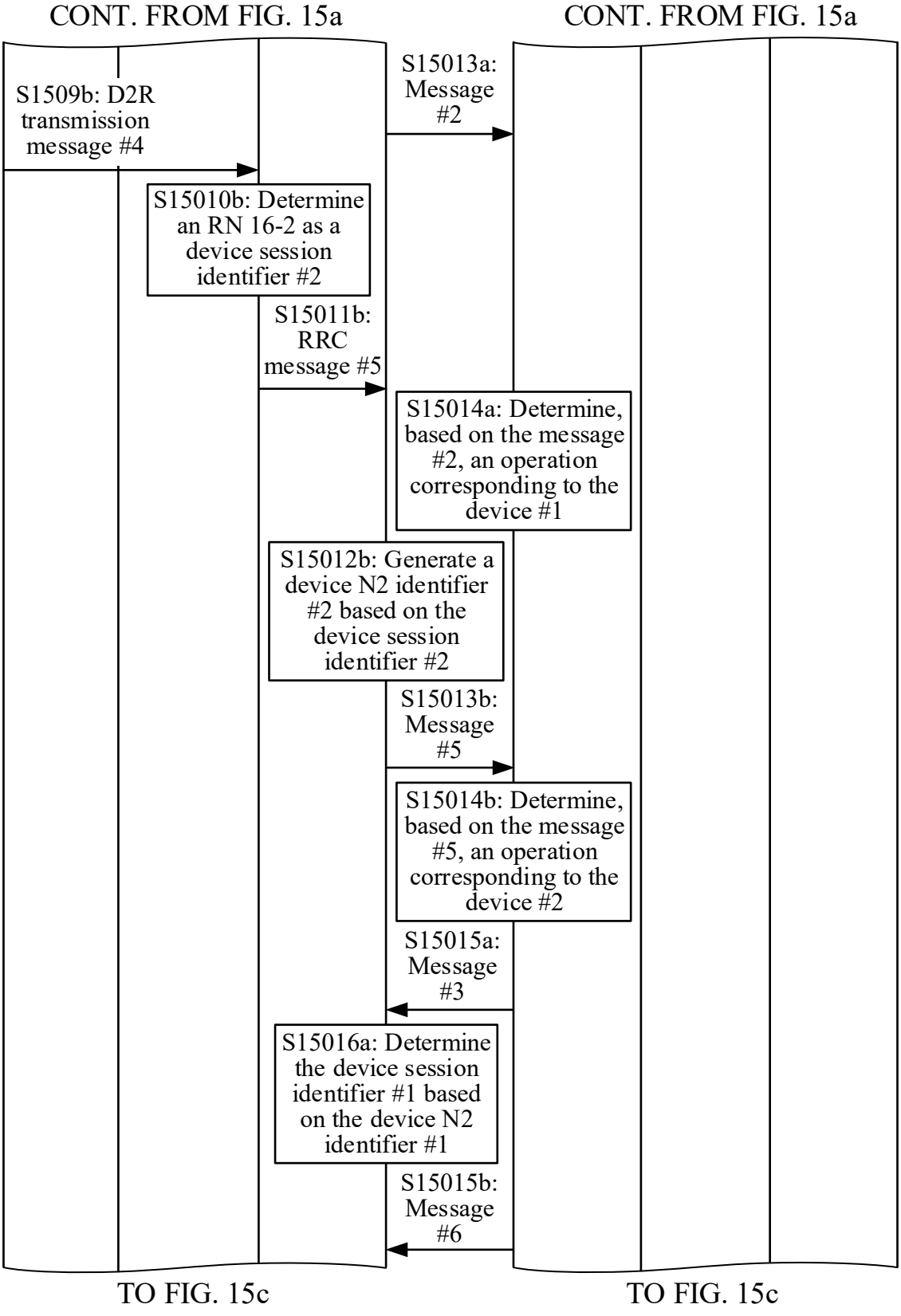

CONT. FROM FIG. 15a
CONT. FROM FIG. 15a
S1509b: D2R transmission message #4
S15013a: Message #2
S15010b: Determine an RN 16-2 as a device session identifier #2
S15011b: RRC message #5
S15014a: Determine, based on the message #2, an operation corresponding to the device #1
S15012b: Generate a device N2 identifier #2 based on the device session identifier #2
S15013b: Message #5
S15014b: Determine, based on the message #5, an operation corresponding to the device #2
S15015a: Message #3
S15016a: Determine the device session identifier #1 based on the device N2 identifier #1
S15015b: Message #6
TO FIG. 15c
TO FIG. 15c

FIG. 15b

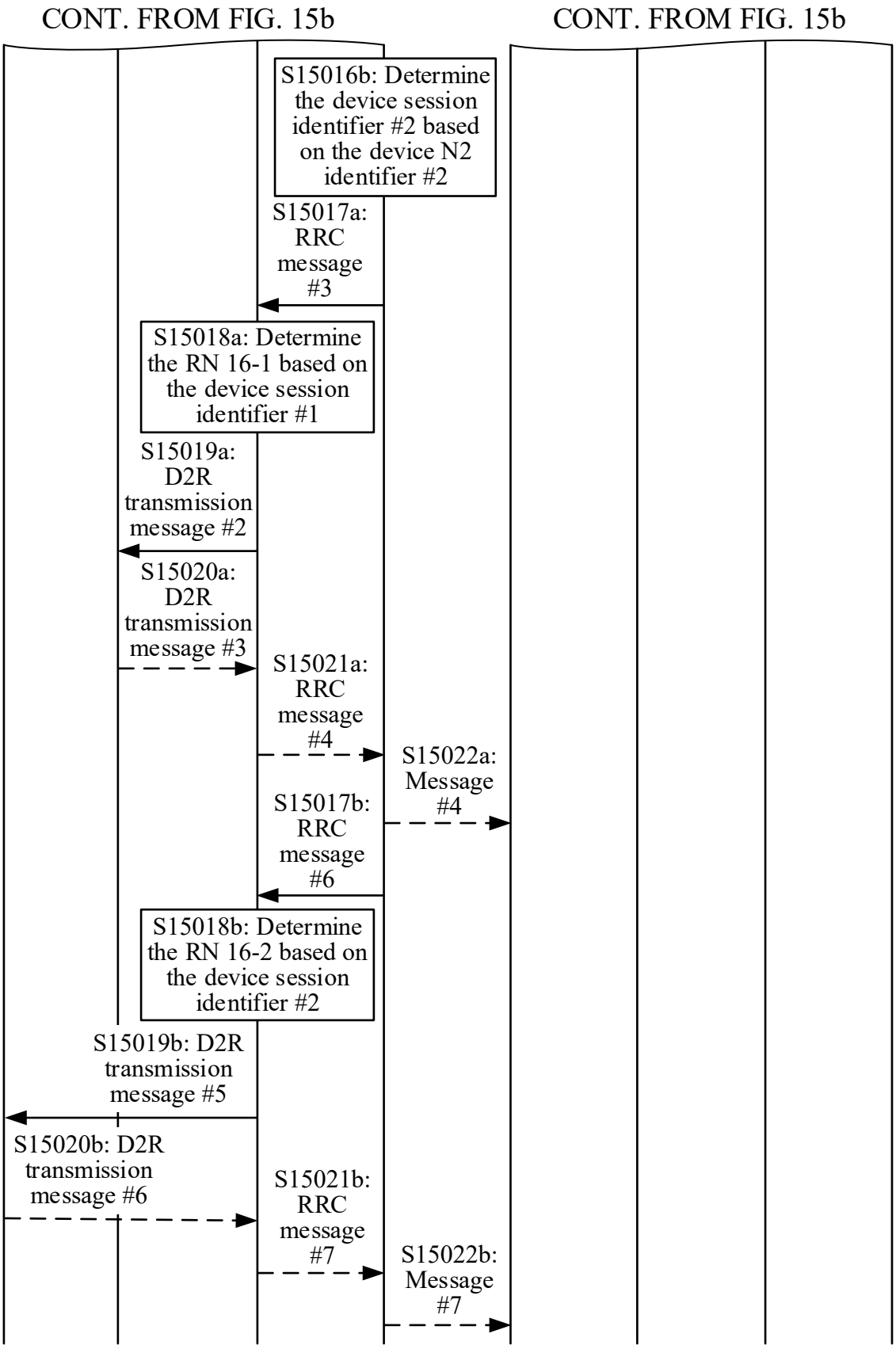

CONT. FROM FIG. 15b
CONT. FROM FIG. 15b
S15016b: Determine the device session identifier #2 based on the device N2 identifier #2
S15017a: RRC message #3
S15018a: Determine the RN 16-1 based on the device session identifier #1
S15019a: D2R transmission message #2
S15020a: D2R transmission message #3
S15021a: RRC message #4
S15022a: Message #4
S15017b: RRC message #6
S15018b: Determine the RN 16-2 based on the device session identifier #2
S15019b: D2R transmission message #5
S15020b: D2R transmission message #6
S15021b: RRC message #7
S15022b: Message #7

FIG. 15c

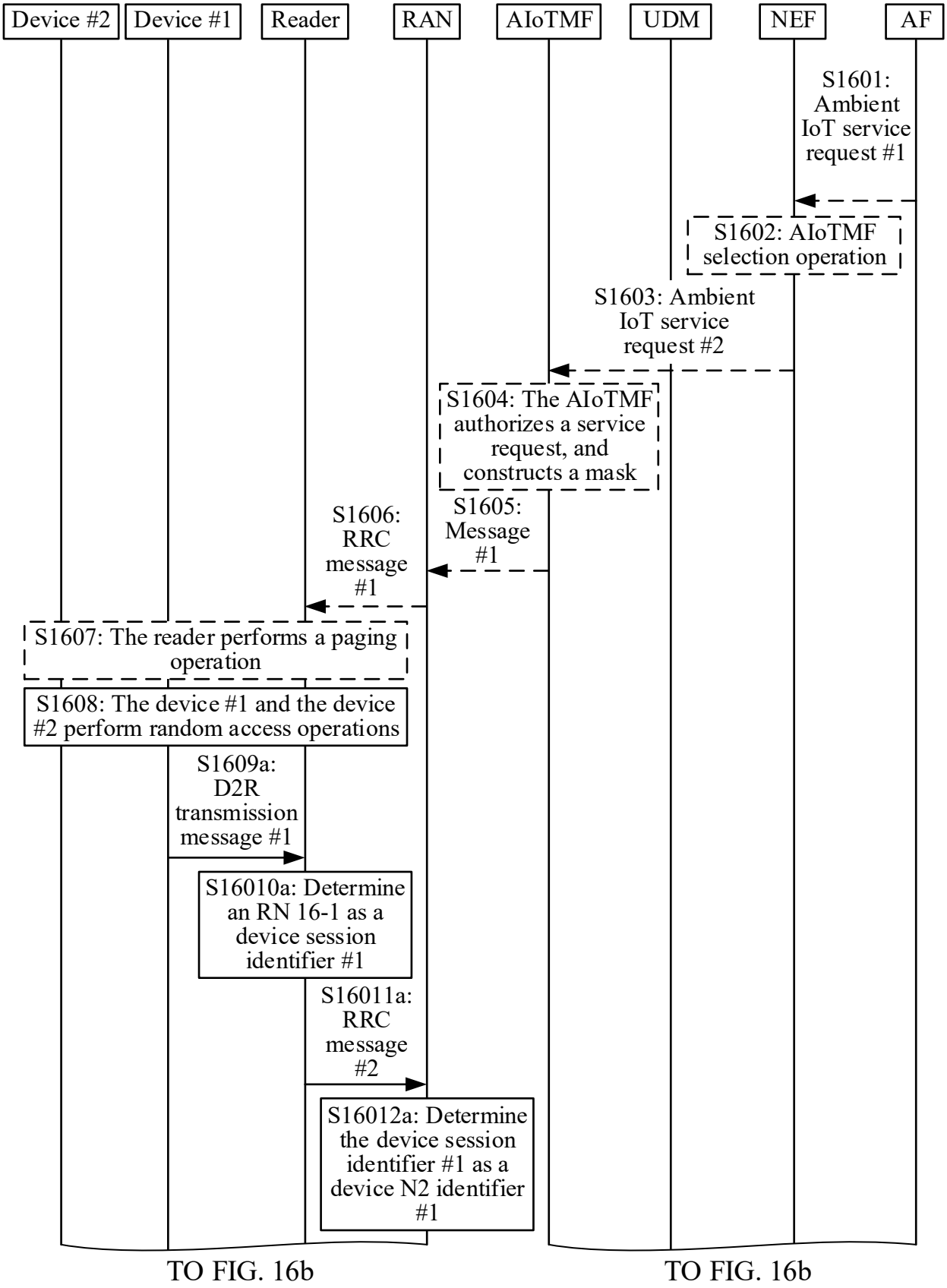

Device #2
Device #1
Reader
RAN
AIoTMF
UDM
NEF
AF
S1601: Ambient IoT service request #1
S1602: AIoTMF selection operation
S1603: Ambient IoT service request #2
S1604: The AIoTMF authorizes a service request, and constructs a mask
S1605: Message #1
S1606: RRC message #1
S1607: The reader performs a paging operation
S1608: The device #1 and the device #2 perform random access operations
S1609a: D2R transmission message #1
S16010a: Determine an RN 16-1 as a device session identifier #1
S16011a: RRC message #2
S16012a: Determine the device session identifier #1 as a device N2 identifier #1
TO FIG. 16b
TO FIG. 16b

FIG. 16a

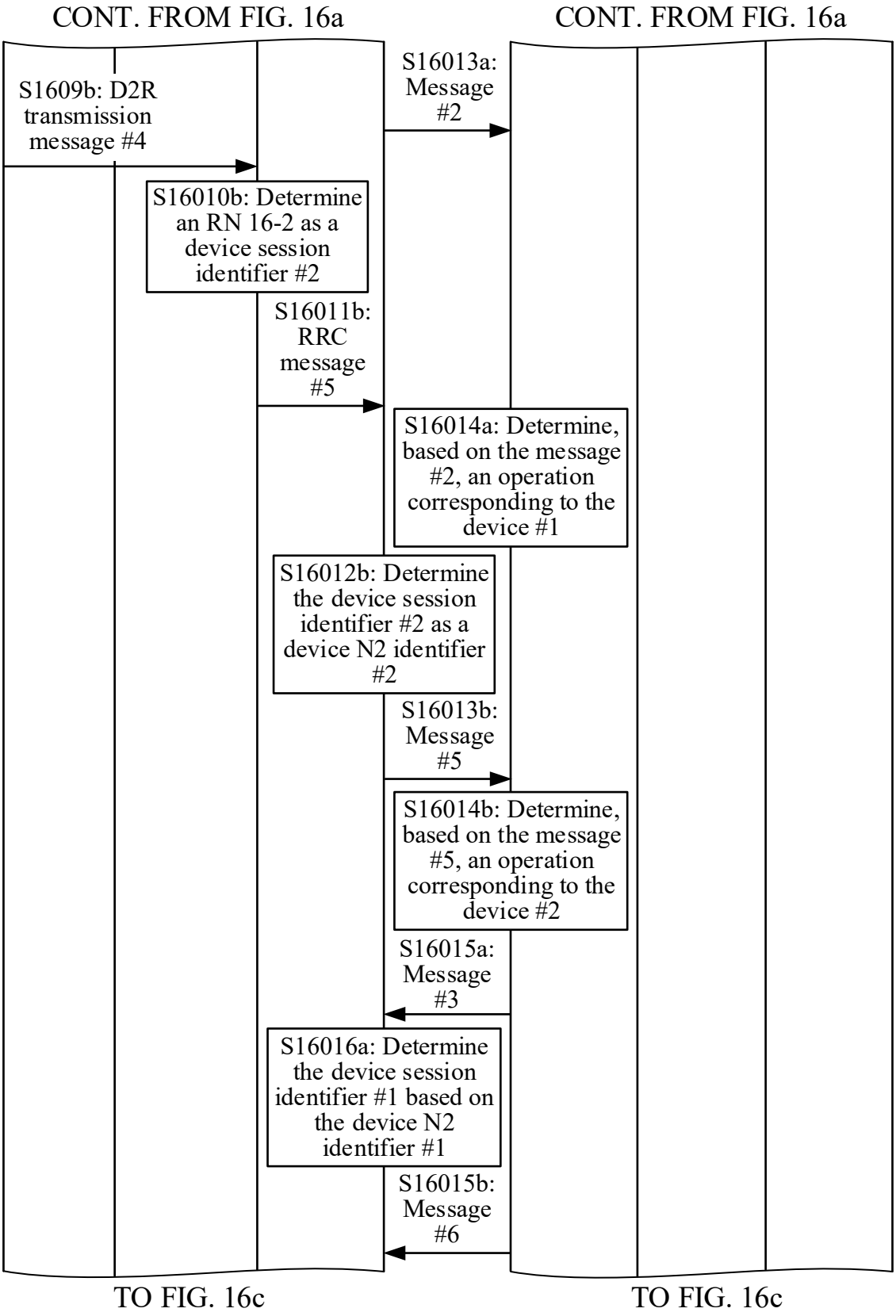

CONT. FROM FIG. 16a
CONT. FROM FIG. 16a
S1609b: D2R transmission message #4
S16013a: Message #2
S16010b: Determine an RN 16-2 as a device session identifier #2
S16011b: RRC message #5
S16014a: Determine, based on the message #2, an operation corresponding to the device #1
S16012b: Determine the device session identifier #2 as a device N2 identifier #2
S16013b: Message #5
S16014b: Determine, based on the message #5, an operation corresponding to the device #2
S16015a: Message #3
S16016a: Determine the device session identifier #1 based on the device N2 identifier #1
S16015b: Message #6
TO FIG. 16c
TO FIG. 16c

FIG. 16b

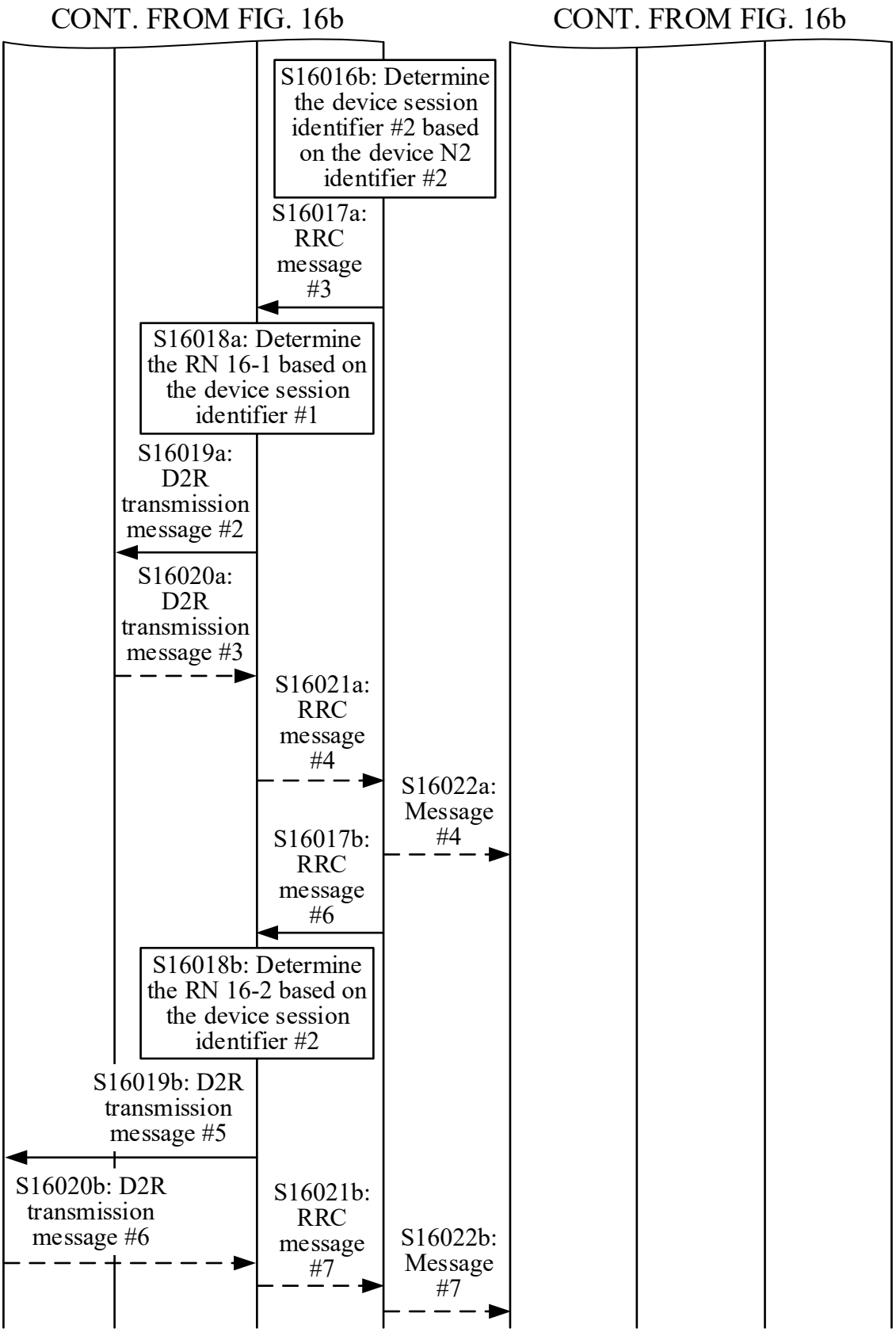

CONT. FROM FIG. 16b
CONT. FROM FIG. 16b
S16016b: Determine the device session identifier #2 based on the device N2 identifier #2
S16017a: RRC message #3
S16018a: Determine the RN 16-1 based on the device session identifier #1
S16019a: D2R transmission message #2
S16020a: D2R transmission message #3
S16021a: RRC message #4
S16022a: Message #4
S16017b: RRC message #6
S16018b: Determine the RN 16-2 based on the device session identifier #2
S16019b: D2R transmission message #5
S16020b: D2R transmission message #6
S16021b: RRC message #7
S16022b: Message #7

FIG. 16c

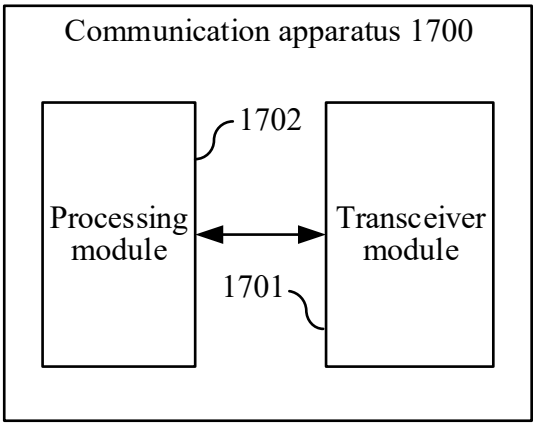

Communication apparatus 1700
1702
Processing module
Transceiver module
1701

FIG. 17

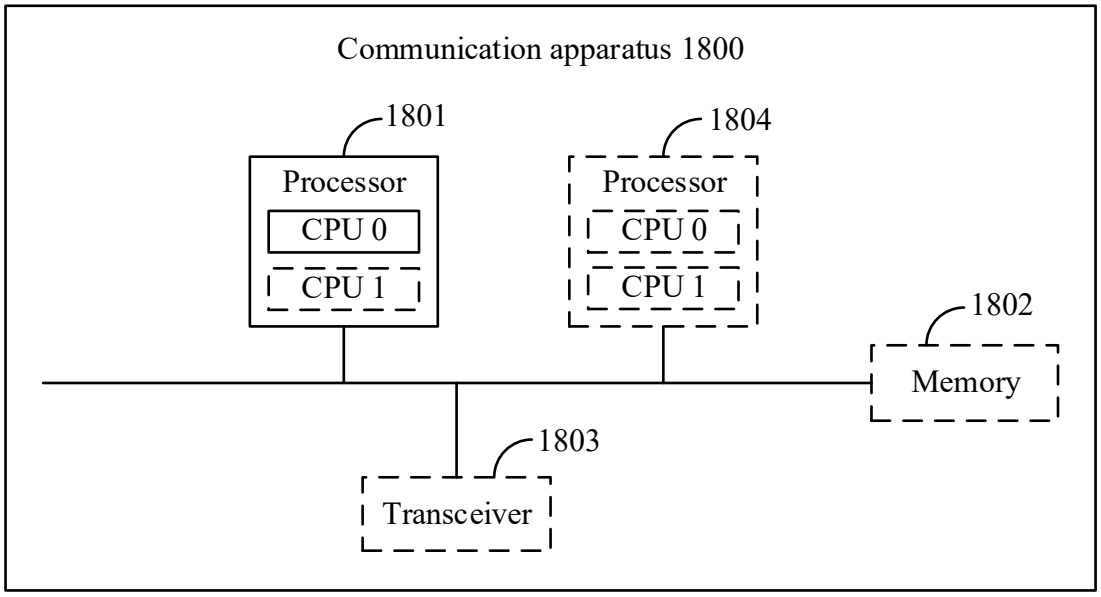

Communication apparatus 1800
1801
Processor
CPU 0
CPU 1
1804
Processor
CPU 0
CPU 1
1802
Memory
1803
Transceiver

FIG. 18