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(54) **TERMINAL, RADIO COMMUNICATION METHOD, AND BASE STATION**

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(57) **ABSTRACT**

A terminal according to one aspect of the present disclosure includes a receiving section that receives configuration information for positioning included in a specific system information block (SIB), the configuration information being associated with a Public Land Mobile Network (PLMN) ID, and a control section that performs, based on the configuration information, positioning-related control associated with the PLMN ID. According to one aspect of the present disclosure, it is possible to manage flexible communication for operators.

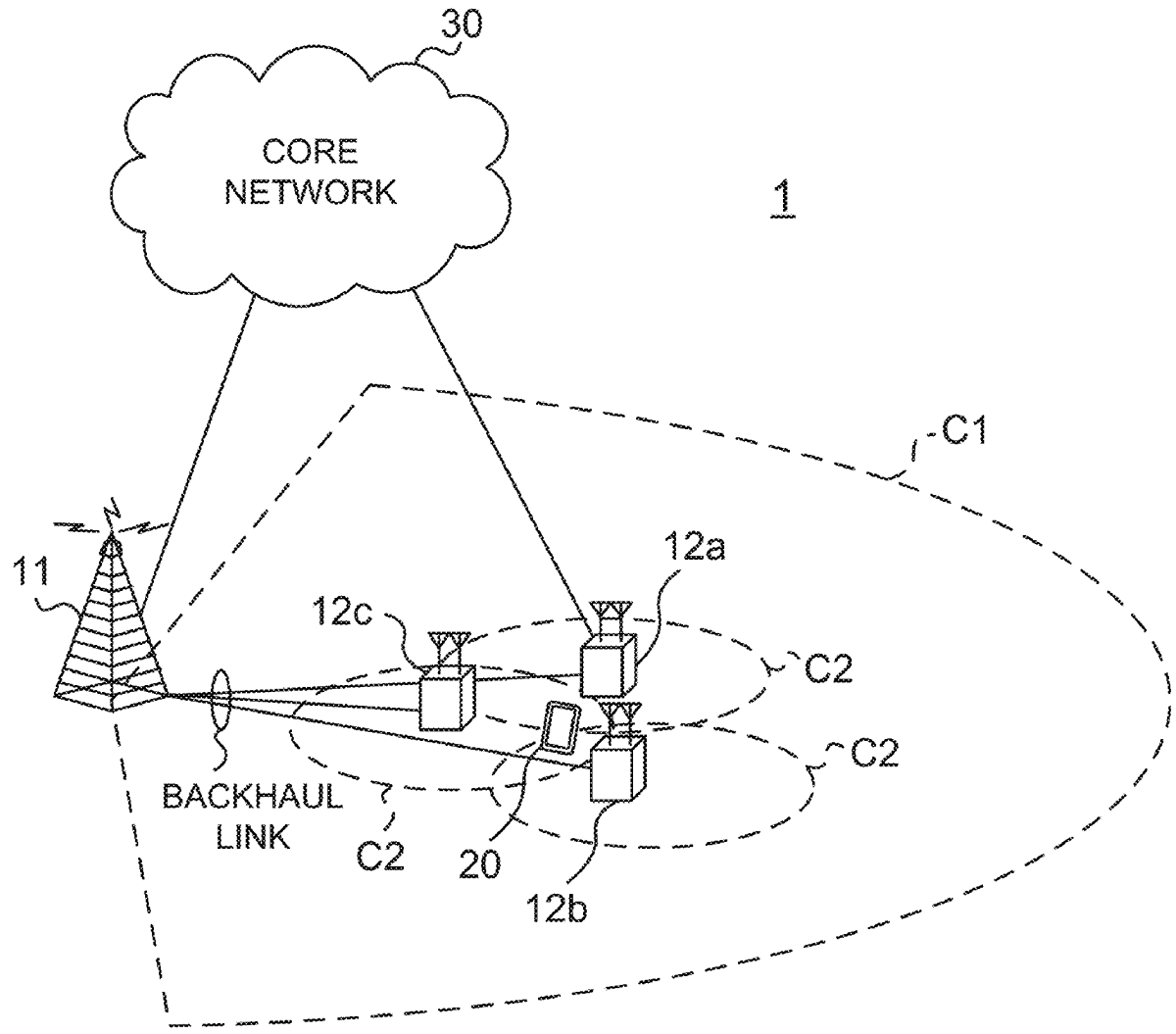


FIG. 1A

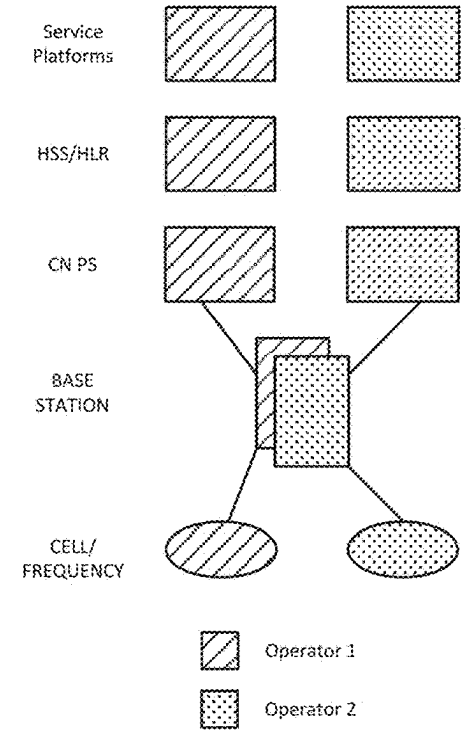


FIG. 1B

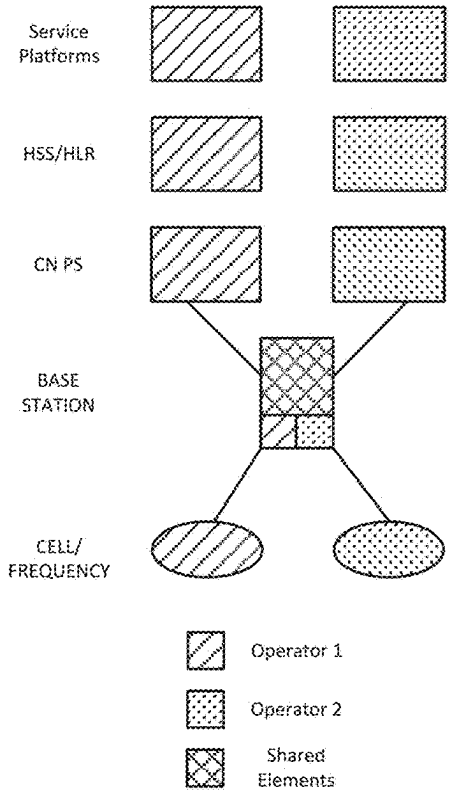


FIG. 1C

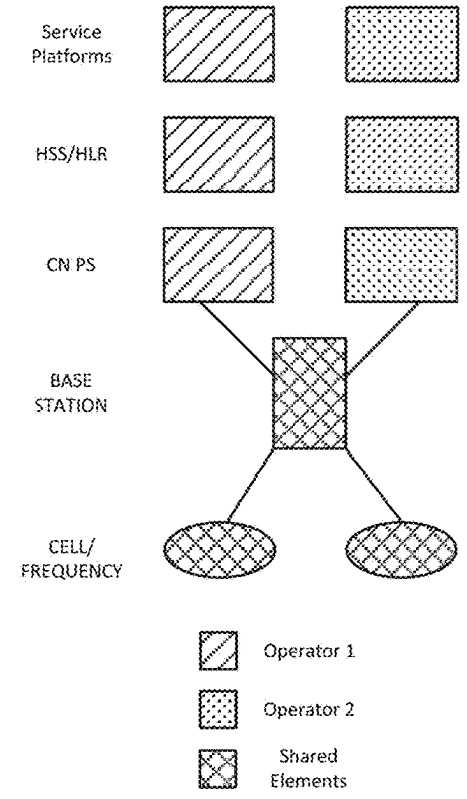


FIG. 1D

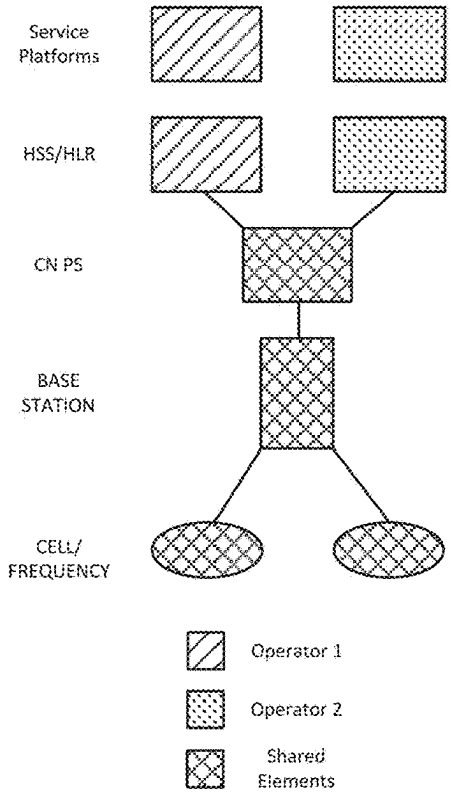
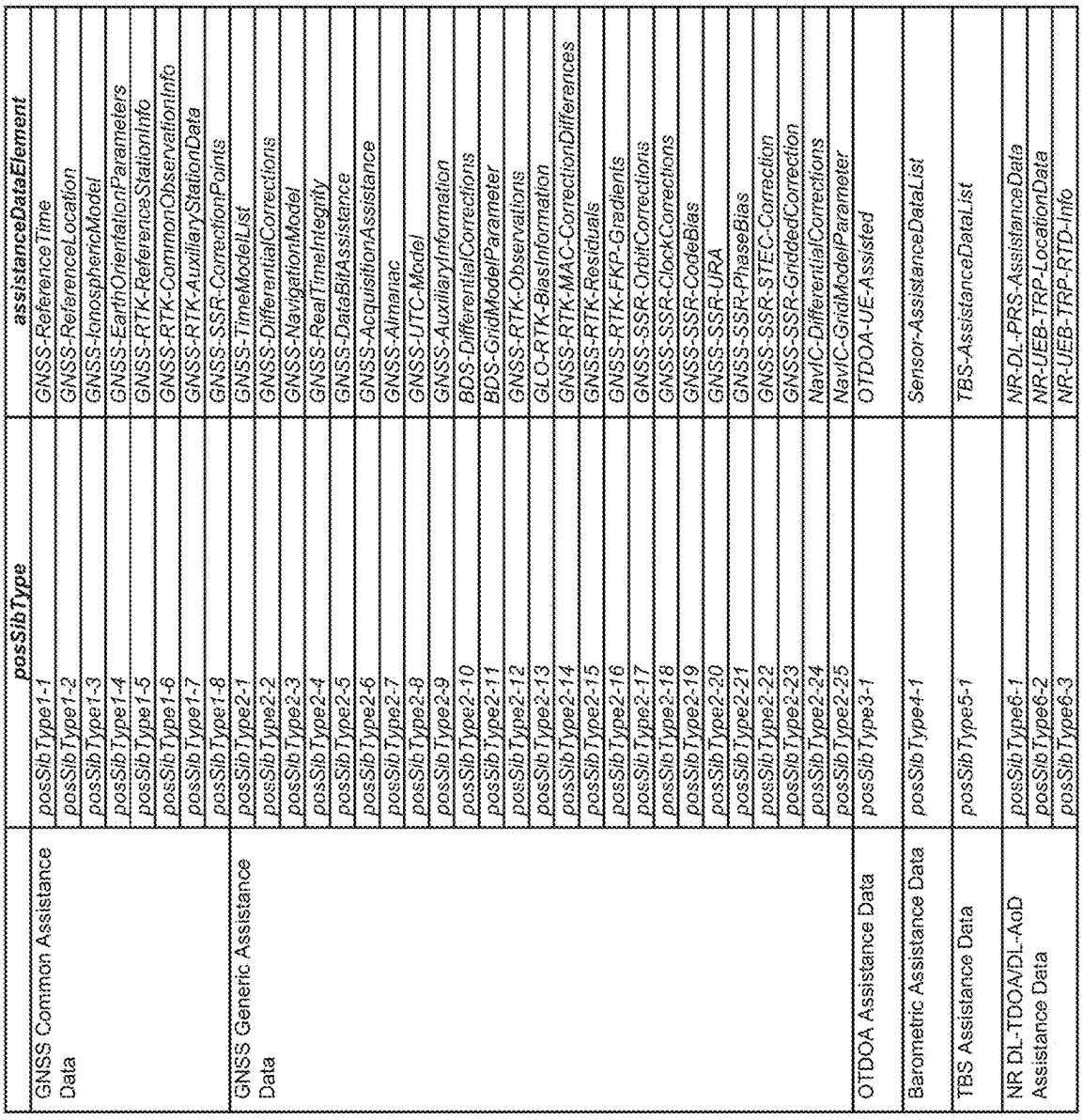


FIG. 2

```
PosSystemInformation-r16-IEs ::= SEQUENCE {
    posSIB-TypeAndInfo-r16      SEQUENCE (SIZE (1..maxSIB)) OF CHOICE {
        posSib1-1-r16               SIBpos-r16,
        posSib1-2-r16               SIBpos-r16,
        posSib1-3-r16               SIBpos-r16,
        posSib1-4-r16               SIBpos-r16,
        posSib1-5-r16               SIBpos-r16,
        posSib1-6-r16               SIBpos-r16,
        posSib1-7-r16               SIBpos-r16,
        posSib1-8-r16               SIBpos-r16,
        posSib2-1-r16               SIBpos-r16,
        posSib2-2-r16               SIBpos-r16,
        posSib2-3-r16               SIBpos-r16,
        posSib2-4-r16               SIBpos-r16,
        posSib2-5-r16               SIBpos-r16,
        posSib2-6-r16               SIBpos-r16,
        posSib2-7-r16               SIBpos-r16,
        posSib2-8-r16               SIBpos-r16,
        posSib2-9-r16               SIBpos-r16,
        posSib2-10-r16              SIBpos-r16,
        posSib2-11-r16              SIBpos-r16,
        posSib2-12-r16              SIBpos-r16,
        posSib2-13-r16              SIBpos-r16,
        posSib2-14-r16              SIBpos-r16,
        posSib2-15-r16              SIBpos-r16,
        posSib2-16-r16              SIBpos-r16,
        posSib2-17-r16              SIBpos-r16,
        posSib2-18-r16              SIBpos-r16,
        posSib2-19-r16              SIBpos-r16,
        posSib2-20-r16              SIBpos-r16,
        posSib2-21-r16              SIBpos-r16,
        posSib2-22-r16              SIBpos-r16,
        posSib2-23-r16              SIBpos-r16,
        posSib3-1-r16               SIBpos-r16,
        posSib4-1-r16               SIBpos-r16,
        posSib5-1-r16               SIBpos-r16,
        posSib6-1-r16               SIBpos-r16,
        posSib6-2-r16               SIBpos-r16,
        posSib6-3-r16               SIBpos-r16,
        ...
    },
    lateNonCriticalExtension    OCTET STRING        OPTIONAL,
    nonCriticalExtension        SEQUENCE {}         OPTIONAL
}
```

FIG. 3



	posSibType	assistanceDataElement
GNSS Common Assistance Data	posSibType1-1	GNSS-ReferenceTime
	posSibType1-2	GNSS-ReferenceLocation
	posSibType1-3	GNSS-IonosphericModel
	posSibType1-4	GNSS-EarthOrientationParameters
	posSibType1-5	GNSS-RTK-ReferenceStationInfo
	posSibType1-6	GNSS-RTK-CommonObservationInfo
	posSibType1-7	GNSS-RTK-AuxiliaryStationData
	posSibType1-8	GNSS-SSR-CorrectionPoints
GNSS Generic Assistance Data	posSibType2-1	GNSS-TimeModelList
	posSibType2-2	GNSS-DifferentialCorrections
	posSibType2-3	GNSS-NavigationModel
	posSibType2-4	GNSS-RealTimeIntegrity
	posSibType2-5	GNSS-DataBitAssistance
	posSibType2-6	GNSS-AcquisitionAssistance
	posSibType2-7	GNSS-Almanac
	posSibType2-8	GNSS-UTC-Model
	posSibType2-9	GNSS-AuxiliaryInformation
	posSibType2-10	BDS-DifferentialCorrections
	posSibType2-11	BDS-GridModelParameter
	posSibType2-12	GNSS-RTK-Observations
	posSibType2-13	GLO-RTK-BiasInformation
	posSibType2-14	GNSS-RTK-MAC-CorrectionDifferences
	posSibType2-15	GNSS-RTK-Residuals
	posSibType2-16	GNSS-RTK-FKP-Gradients
	posSibType2-17	GNSS-SSR-OrbitCorrections
	posSibType2-18	GNSS-SSR-ClockCorrections
	posSibType2-19	GNSS-SSR-CodeBias
	posSibType2-20	GNSS-SSR-URA
	posSibType2-21	GNSS-SSR-PhaseBias
	posSibType2-22	GNSS-SSR-STEC-Correction
	posSibType2-23	GNSS-SSR-GriddedCorrection
	posSibType2-24	NavIC-DifferentialCorrections
	posSibType2-25	NavIC-GridModelParameter
OTDOA Assistance Data	posSibType3-1	OTDOA-UE-Assisted
Barometric Assistance Data	posSibType4-1	Sensor-AssistanceDataList
TBS Assistance Data	posSibType5-1	TBS-AssistanceDataList
NR DL-TDOA/DL-AoD Assistance Data	posSibType6-1	NR-DL-PRS-AssistanceData
	posSibType6-2	NR-UEB-TRP-LocationData
	posSibType6-3	NR-UEB-TRP-RTD-Info

```
PosSI-SchedulingInfo-r16 ::=          SEQUENCE {
   posSchedulingInfoList-r16           SEQUENCE (SIZE (1..maxSI-Message)) OF PosSchedulingInfo-r16,
   posSI-RequestConfig-r16                  SI-RequestConfig                    OPTIONAL,  -- Cond MSG-1
   posSI-RequestConfigSUL-r16               SI-RequestConfig                    OPTIONAL,  -- Cond SUL-MSG-1
   ...
}

PosSchedulingInfo-r16 ::= SEQUENCE {
   offsetToSI-Used-r16          ENUMERATED {true}                              OPTIONAL,  -- Need R
   posSI-Periodicity-r16        ENUMERATED {rf8, rf16, rf32, rf64, rf128, rf256, rf512},
   posSI-BroadcastStatus-r16    ENUMERATED {broadcasting, notBroadcasting},
   posSIB-MappingInfo-r16       PosSIB-MappingInfo-r16,
   ...
}

PosSIB-MappingInfo-r16 ::=   SEQUENCE (SIZE (1..maxSIB)) OF PosSIB-Type-r16

PosSIB-Type-r16 ::=       SEQUENCE {
   encrypted-r16              ENUMERATED { true }                              OPTIONAL,  -- Need R
   gnss-id-r16                GNSS-ID-r16                                      OPTIONAL,  -- Need R
   sbas-id-r16                SBAS-ID-r16                                      OPTIONAL,  -- Need R
   posSibType-r16             ENUMERATED { posSibType1-1, posSibType1-2, posSibType1-3, posSibType1-4, posSibType1-5, posSibType1-6,
                                           posSibType1-7, posSibType1-8, posSibType2-1, posSibType2-2, posSibType2-3, posSibType2-4,
                                           posSibType2-5, posSibType2-6, posSibType2-7, posSibType2-8, posSibType2-9, posSibType2-10,
                                           posSibType2-11, posSibType2-12, posSibType2-13, posSibType2-14, posSibType2-15,
                                           posSibType2-16, posSibType2-17, posSibType2-18, posSibType2-19, posSibType2-20,
                                           posSibType2-21, posSibType2-22, posSibType2-23, posSibType3-1, posSibType4-1,
                                           posSibType5-1,posSibType6-1, posSibType6-2, posSibType6-3,... },
   areaScope-r16              ENUMERATED {true}                                OPTIONAL -- Need S
}

GNSS-ID-r16 ::= SEQUENCE {
   gnss-id-r16                ENUMERATED{gps, sbas, qzss, galileo, glonass, bds, ...},
   ...
}

SBAS-ID-r16 ::= SEQUENCE {
   sbas-id-r16                ENUMERATED { waas, egnos, msas, gagan, ...},
   ...
}
```

FIG. 4

```
PosSI-SchedulingInfo ::=        SEQUENCE {
    plmn-id                         PLMN-Id
    posSchedulingInfoList       SEQUENCE (SIZE (1..maxSI-Message)) OF PosSchedulingInfo,
    posSI-RequestConfig             SI-RequestConfig                OPTIONAL,  -- Cond MSG-1
    posSI-RequestConfigSUL          SI-RequestConfig                OPTIONAL,  -- Cond SUL-MSG-1
    ...
}
```

FIG. 5

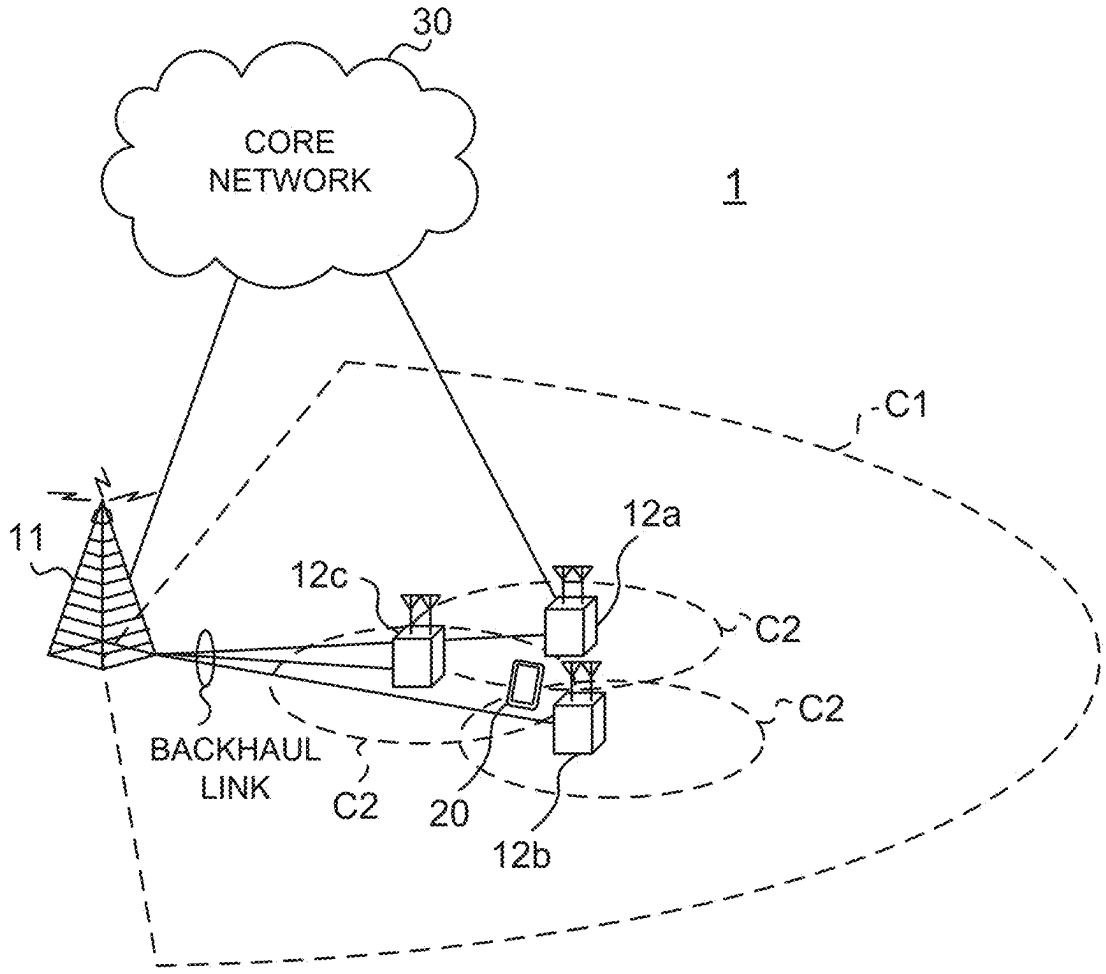


FIG. 6

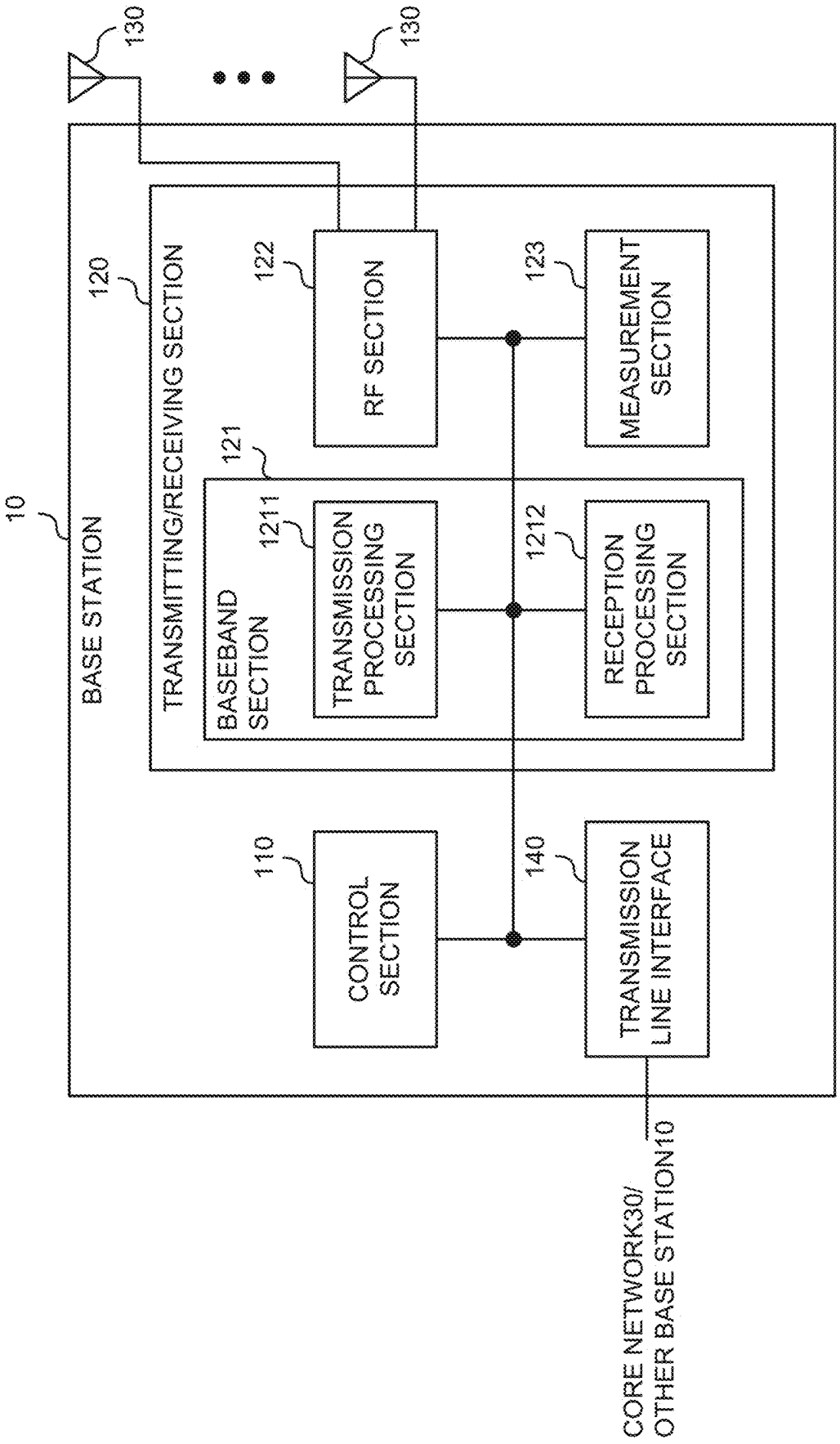

10
BASE STATION
130
130
120
TRANSMITTING/RECEIVING SECTION
122
RF SECTION
123
MEASUREMENT SECTION
121
BASEBAND SECTION
1211
TRANSMISSION PROCESSING SECTION
1212
RECEPTION PROCESSING SECTION
110
CONTROL SECTION
140
TRANSMISSION LINE INTERFACE
CORE NETWORK30/ OTHER BASE STATION10

FIG. 7

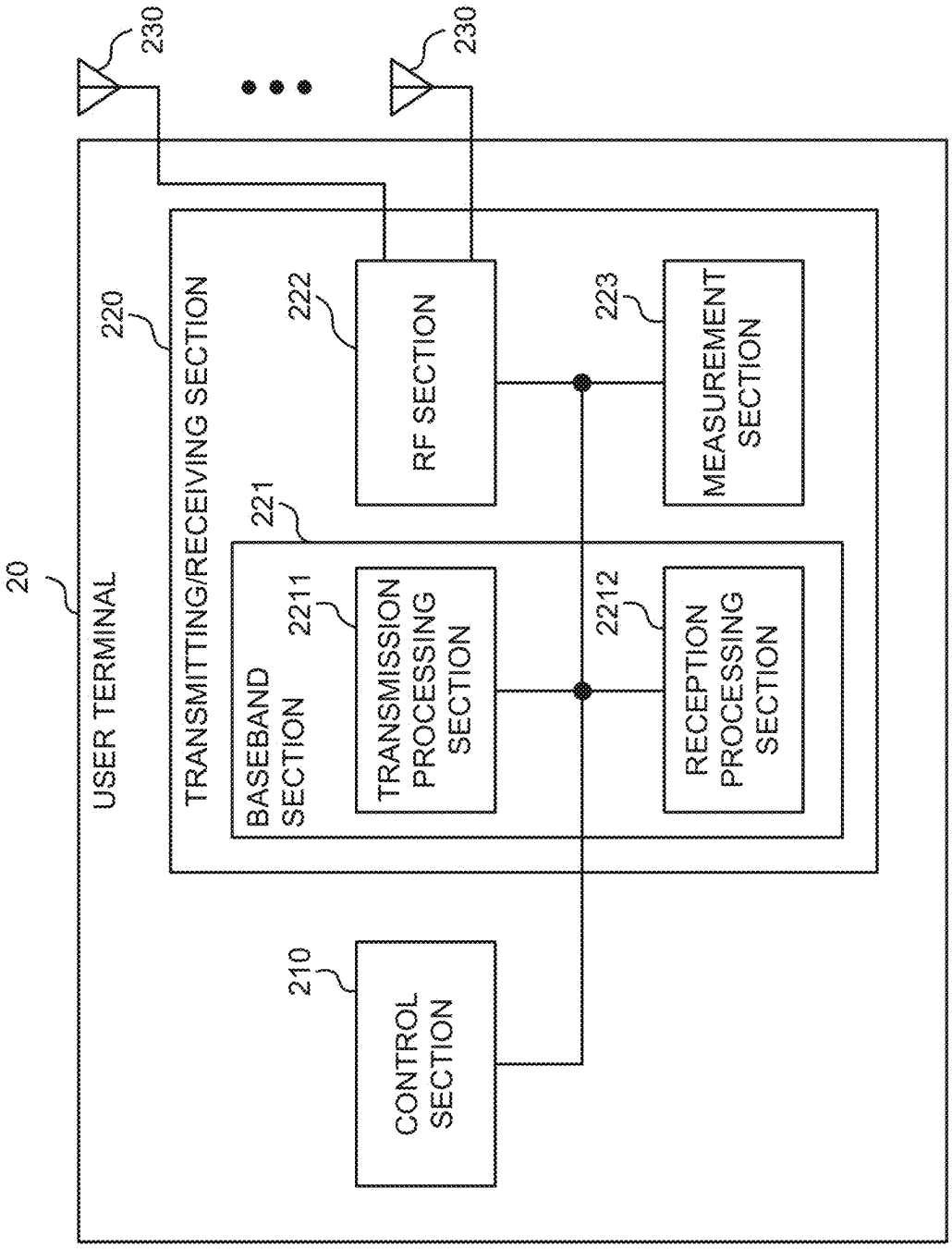

20
USER TERMINAL
230
230
220
TRANSMITTING/RECEIVING SECTION
222
RF SECTION
223
MEASUREMENT SECTION
221
BASEBAND SECTION
2211
TRANSMISSION PROCESSING SECTION
2212
RECEPTION PROCESSING SECTION
210
CONTROL SECTION

FIG. 8

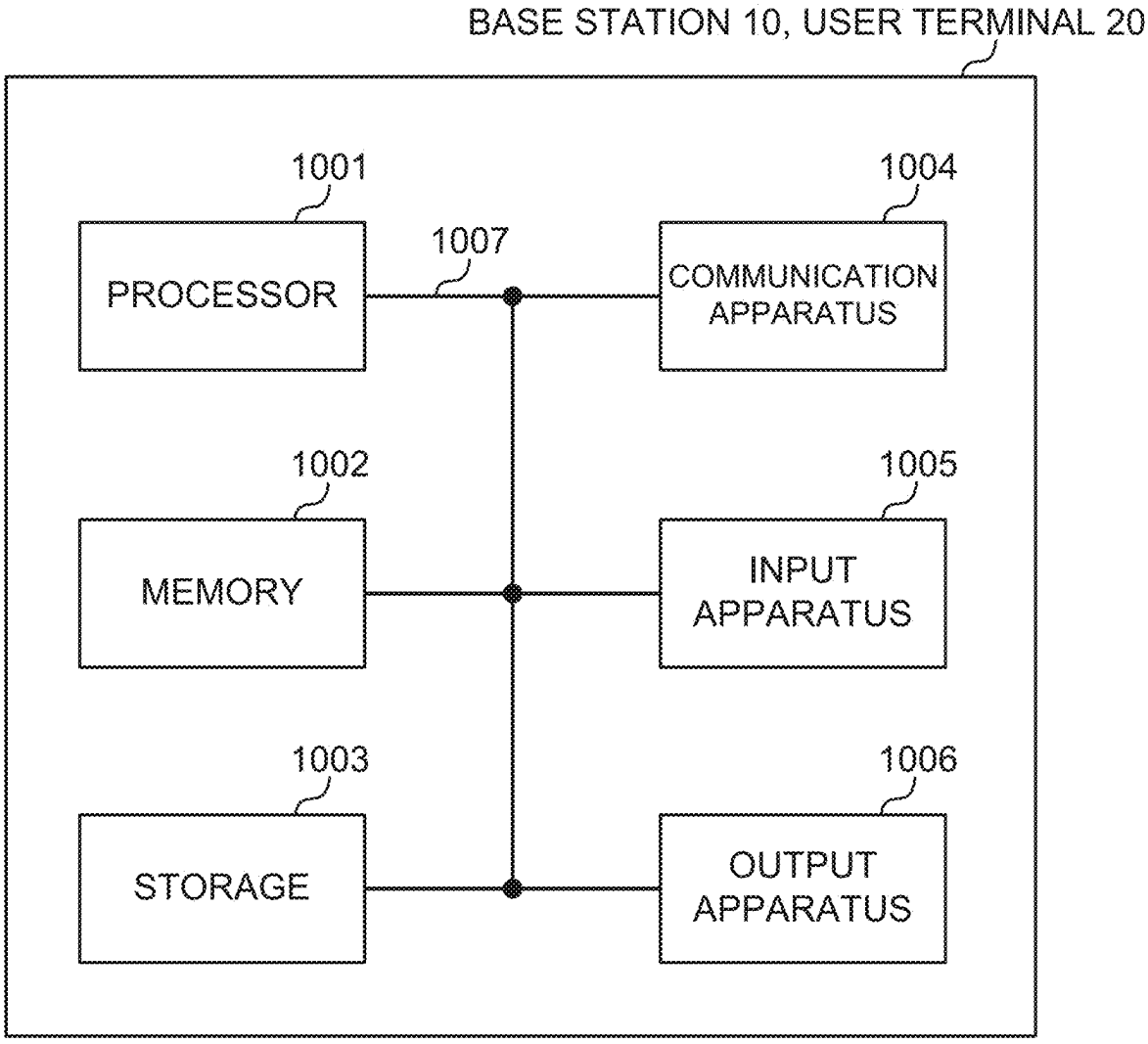

BASE STATION 10, USER TERMINAL 20
1001
PROCESSOR
1007
1004
COMMUNICATION APPARATUS
1002
MEMORY
1005
INPUT APPARATUS
1003
STORAGE
1006
OUTPUT APPARATUS

FIG. 9

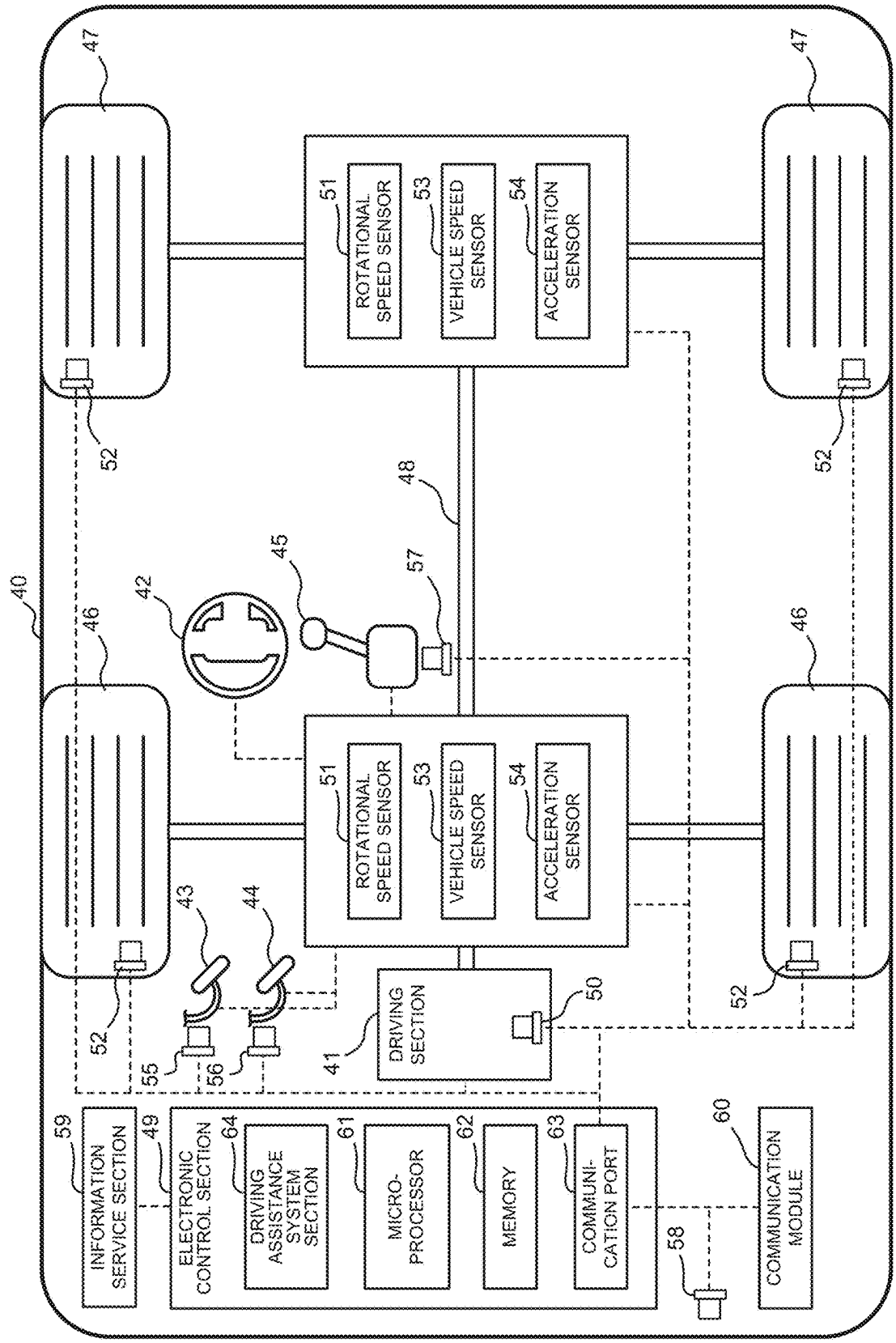

40
47
47
52
52
48
45
42
57
46
46
51
ROTATIONAL SPEED SENSOR
53
VEHICLE SPEED SENSOR
54
ACCELERATION SENSOR
51
ROTATIONAL SPEED SENSOR
53
VEHICLE SPEED SENSOR
54
ACCELERATION SENSOR
43
44
52
52
55
56
41
DRIVING SECTION
50
59
INFORMATION SERVICE SECTION
49
ELECTRONIC CONTROL SECTION
64
DRIVING ASSISTANCE SYSTEM SECTION
61
MICRO-PROCESSOR
62
MEMORY
63
COMMUNI-CATION PORT
58
60
COMMUNICATION MODULE

FIG. 10

TERMINAL, RADIO COMMUNICATION METHOD, AND BASE STATION

TECHNICAL FIELD

[0001] The present disclosure relates to a terminal, a radio communication method, and a base station in next-generation mobile communication systems.

BACKGROUND ART

[0002] In a Universal Mobile Telecommunications System (UMTS) network, the specifications of Long-Term Evolution (LTE) have been drafted for the purpose of further increasing high speed data rates, providing lower latency and so on (see Non-Patent Literature 1). In addition, for the purpose of further high capacity, advancement and the like of the LTE (Third Generation Partnership Project (3GPP) Release (Rel.) 8 and Rel. 9), the specifications of LTE-Advanced (3GPP Rel. 10 to Rel. 14) have been drafted.

[0003] Successor systems of LTE (for example, also referred to as "5th generation mobile communication system (5G)," "5G+ (plus)," "6th generation mobile communication system (6G)," "New Radio (NR)," "3GPP Rel. 15 (or later versions)," and so on) are also under study.

CITATION LIST

Non-Patent Literature

[0004] Non-Patent Literature 1: 3GPP TS 36.300 V8.12.0 "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2 (Release 8)," April, 2010

SUMMARY OF INVENTION

Technical Problem

[0005] For future radio communication systems (for example, Rel. 18 (or later versions)), it is studied that resource sharing is performed for the purpose of higher efficiency of use of frequency bands (existing frequency band and new high-frequency band).

[0006] However, there is a case where configuration for a specific UE is unchangeable for a plurality of operators. In such a case, management of flexible communication for each operator may fail, and suppression of communication quality enhancement may occur.

[0007] Thus, an object of the present disclosure is to provide a terminal, a radio communication method, and a base station that can manage flexible communication for operators.

Solution to Problem

[0008] A terminal according to one aspect of the present disclosure includes a receiving section that receives configuration information for positioning included in a specific system information block (SIB), the configuration information being associated with a Public Land Mobile Network (PLMN) ID, and a control section that performs, based on the configuration information, positioning-related control associated with the PLMN ID.

Advantageous Effects of Invention

[0009] According to one aspect of the present disclosure, it is possible to manage flexible communication for operators.

BRIEF DESCRIPTION OF DRAWINGS

[0010] FIGS. **1**A to **1**D are diagrams to show examples of network sharing.

[0011] FIG. **2** is a diagram to show an example of a configuration of positioning system information in Rel. 16.

[0012] FIG. **3** is a diagram to show an example of correspondence related to parameters of an assistance data SIB element.

[0013] FIG. **4** is a diagram to show an example of a positioning-related RRC parameter defined in Rel. 16.

[0014] FIG. **5** is a diagram to show an example of positioning configuration according to a first embodiment.

[0015] FIG. **6** is a diagram to show an example of a schematic structure of a radio communication system according to one embodiment.

[0016] FIG. **7** is a diagram to show an example of a structure of a base station according to one embodiment.

[0017] FIG. **8** is a diagram to show an example of a structure of a user terminal according to one embodiment.

[0018] FIG. **9** is a diagram to show an example of a hardware structure of the base station and the user terminal according to one embodiment.

[0019] FIG. **10** is a diagram to show an example of a vehicle according to one embodiment,

DESCRIPTION OF EMBODIMENTS

(Resource Sharing)

[0020] For future radio communication systems (for example, Rel. 18 (or later versions)), it is studied that resource sharing is performed for the purpose of higher efficiency of use of frequency bands (existing frequency band and new high-frequency band).

[0021] In the resource sharing, a plurality of operators share a radio access network (RAN) to divide network (NW, for example, base station) investment cost among the operators, thereby allowing a large number of base stations to be installed.

[0022] For example, a plurality of operators share an antenna site (land/pylon or the like), thereby allowing installation cost to be divided among the plurality of operators.

[0023] The plurality of operators share a distributed node (for example, a Distributed Unit (DU))/central node (for example, a Central Unit (CU)) (for example, share hardware infrastructure), thereby allowing unit cost to be divided among the plurality of operators.

[0024] The plurality of operators share a frequency/antenna unit (for example, a Radio Unit (RU)), thereby enabling improvement in resource use efficiency, such as a case that a resource not being used by a certain operator becomes available for another operator, and the like.

[0025] FIGS. **1**A to **1**D are diagrams to show examples of network sharing.

[0026] FIG. **1**A shows an example of site sharing. As shown in FIG. **1**A, in the site sharing, a plurality of operators share an antenna site. On the other hand, each of the plurality of operators independently includes a service platform, HSS

(Home Subscriber Server)/HLR (Home Location Register), core network (CN) packet switching (PS), a base station, and a cell/frequency.

[0027] FIG. **1**B shows an example of MORAN (Multi Operator RAN). As shown in FIG. **1**B, in MORAN, the plurality of operators share part of a base station (for example, a hardware of the base station) in addition to the antenna site. On the other hand, each of the plurality of operators independently includes a service platform, HSS/HLR, CN PS, another part of the base station (for example, software in the base station), and a cell/frequency.

[0028] FIG. **1**C shows an example of MOCN (Multi Operator Core Network). As shown in FIG. **1**C, in MOCN, the plurality of operators share a base station and a cell/frequency. On the other hand, each of the plurality of operators independently includes a service platform, HSS/HLR, and CN PS.

[0029] FIG. **1**D shows an example of GWCN (Gateway Core Network). As shown in FIG. **1**D, in GWCN, the plurality of operators share CN PS, a base station, and a cell/frequency. On the other hand, each of the plurality of operators independently includes a service platform and HSS/HLR.

[0030] In MOCN/GWCN, the plurality of operators share a cell, and thus it is preferable that a configuration is changeable for each operator (for example, for each ID related to a public land mobile network (PLMN) (PLMN ID)).

[0031] For example, in an existing specification, whether initial access to the cell is allowed, a tracking area code, a specific cell ID in the PLMN, and the like can be configured for each PLMN ID.

[0032] On the other hand, for a terminal (User terminal, User Equipment (UE)) in an RRC connected state, operator-dedicated configuration can be configured as RRC configuration, depending on a PLMN ID of the terminal. Specifically, in the resource sharing, when it is desired that some time resources of the shared cell can be used only by a terminal of a specific operator, a terminal of another operator can be configured not to use the some time resources.

(Positioning)

[0033] NR Rel. 16 supports broadcast of positioning system information block (SIB)-based positioning assistance data (broadcast of positioning assistance).

[0034] Positioning system information (PosSystemInformation) includes positioning SIB type and information (posSIB-TypeAndInfo) (see FIG. **2**).

[0035] The positioning SIB type and information (posSIB-TypeAndInfo) indicate any one of posSib1-1 to posSib1-8, posSib2-1 to posSib2-23, posSib3-1, posSib4-1, posSib5-1, and posSib6-1 to posSib6-3.

[0036] posSib1-1 to posSib1-8, posSib2-1 to posSib2-23, posSib3-1, posSib4-1, posSib5-1, and posSib6-1 to posSib6-3 each indicates a parameter (SIBpos) related to SIB positioning.

[0037] SIBpos includes parameters of an assistance data SIB element (assistanceDataSIB-Element).

[0038] Mapping between assistance data (assistanceDataElement) configured by the parameters of the assistance data SIB element (assistanceDataSIB-Element) and positioning SIB types (posSibType) is defined (see FIG. **3**).

[0039] posSibType1-1 to posSibType1-8 are included in GNSS (Global Navigation Satellite system) Common Assistance Data. possibType1-1 to posSibType1-8 correspond to GNSS-ReferenceTime, GNSS-ReferenceLocation, GNSS-IonosphericModel, GNSS-EarthOrientationParameters, GNSS-RTK-ReferenceStationInfo, GNSS-RTK-CommonObservationInfo, GNSS-RTK-AuxiliaryStationData, and GNSS-SSR-CorrectionPoints, respectively.

[0040] GNSS-ReferenceTime is a parameter for identifying system time for GNSS.

[0041] GNSS-ReferenceLocation is a parameter used by a location server providing a priori knowledge related to a location of a target device.

[0042] GNSS-IonosphericModel is a parameter used by the location server providing a parameter for modeling the transmission delay of a GNSS signal via ionosphere.

[0043] GNSS-EarthOrientationParameters are parameters used to provide parameters for constructing ECEF (Earth-Centered, Earth-Fixed) and ECI (Earth-Centered-Inertial) coordinate transformations defined by the location server.

[0044] GNSS-RTK-ReferenceStationInfo is a parameter used by the location server providing the ECEF coordinate of an antenna reference point (ARP) of a stationary reference station for assistance data with a GNSS RTK (Real-Time Kinematic) observation parameter (GNSS-RTK-Observations) provided with antenna description.

[0045] GNSS-RTK-CommonObservationInfo is a parameter used by the location server providing common information applied to GNSS-RTK-Observations.

[0046] GNSS-RTK-AuxiliaryStationData is a parameter used by the location server providing the coordinate of an ARP of an auxiliary reference station opposed to the coordinate provided by an information element "GNSS RIK ReferenceStationInfo."

[0047] GNSS-SSR-CorrectionPoints is a parameter used by the location server providing a list of correction point coordinates or an array of correction points (which may be referred to as a "grid") for which GNSS-SSR-GriddedCorrection is valid.

[0048] posSibType2-1 to posSibType2-25 are included in GNSS Generic Assistance Data. possibType2-1 to posSibType2-25 correspond to GNSS-TimeModelList, GNSS-DifferentialCorrections, GNSS-NavigationModel, GNSS-Real-TimeIntegrity, GNSS-DataBitAssistance, GNSS-AcquisitionAssistance, GNSS-Almanac, GNSS-UTC-Model, GNSS-Auxiliary Information, BDS-DifferentialCorrections, BDS-GridModelParameter, GNSS-RTK-Observations, GLO-RTK-BiasInformation, GNSS-RTK-MAC-CorrectionDifferences, GNSS-RTK-Residuals, GNSS-RTK-FKP-Gradients, GNSS-SSR-OrbitCorrections, GNSS-SSR-ClockCorrections, GNSS-SSR-CodeBias, GNSS-SSR-URA, GNSS-SSR-PhaseBias, GNSS-SSR-STEC-Correction, GNSS-SSR-GriddedCorrection, NavIC-DifferentialCorrections, and NavIC-GridModelParameter, respectively.

[0049] GNSS-TimeModelList is a parameter used by the location server providing time offset between GNSS systems.

[0050] GNSS-DifferentialCorrections is a parameter used by the location server providing a target device with differential GNSS correction for a specific GNSS.

[0051] GNSS-NavigationModel is a parameter used by the location server providing a target device supporting a GNSS with accurate navigation data.

[0052] GNSS-RealTimeIntegrity is a parameter used by the location server providing a parameter for describing a real-time state of GNSS constellations.

[0053] GNSS-DataBitAssistance is a parameter used by the location server providing data bit assistance data of a specific satellite signal for data wipe-off.

[0054] GNSS-AcquisitionAssistance is a parameter used by the location server providing a parameter for enabling fast acquisition of a GNSS signal.

[0055] GNSS-Almanac is a parameter used by the location server providing coarse long-term models of a satellite position and a clock.

[0056] GNSS-UTC-Model is a parameter used by the location server providing a plurality of parameter sets necessary for associating a GNSS system time with Universal Time Coordinate (UTC).

[0057] GNSS-AuxiliaryInformation is a parameter used by the location server providing additional information depending on an ID of a GNSS (GNSS ID).

[0058] BDS-DifferentialCorrections is a parameter used by the location server providing differential correction for a target device of BeiDou Navigation Satellite System (BDS).

[0059] BDS-GridModelParameter is a parameter used by the location server providing ionosphere information for the target device of BDS.

[0060] GNSS-RTK-Observations is a parameter used by the location server providing GNSS reference station observation values (pseudo distance, phase difference, phase difference ratio (Doppler), and carrier-to-noise ratio) of a GNSS signal.

[0061] GLO-RTK-BiasInformation is a parameter used by the location server providing a so-called GLONASS code phase bias value (CPB) for up to all the FDMA (Frequency Division Multiple Access) GLONASS (GNSS) observations.

[0062] GNSS-RTK-MAC-CorrectionDifferences is a parameter used by the location server providing ionospheric and geometric correction difference components of up to 32 pairs of auxiliary reference station(s) and master reference station(s).

[0063] GNSS-RTK-Residuals is a parameter used by the location server providing network RTK correction residual error information.

[0064] GNSS-RTK-FKP-Gradients is a parameter used by the location server providing FKP (Flachen ("a" is "a" with umlaut)-Korrektur-Parameter (area correction parameter in English)) network RTK gradients of distance-dependent errors in the ionosphere, troposphere, orbit, and the like.

[0065] GNSS-SSR-OrbitCorrections is a parameter used by the location server providing radial/along-track/cross-track orbit corrections.

[0066] GNSS-SSR-ClockCorrections is a parameter used by the location server providing a clock correction parameter.

[0067] GNSS-SSR-CodeBias is a parameter used by the location server providing a code bias of the GNSS signal.

[0068] GNSS-SSR-URA is a parameter used by the location server providing quality information of provided SSR (State Space Representation) assistance data.

[0069] GNSS-SSR-PhaseBias is a parameter used by the location server providing a phase bias of the GNSS signal.

[0070] GNSS-SSR-STEC-Correction is a parameter used by the location server providing ionosphere slant delay (STEC) correction.

[0071] GNSS-SSR-GriddedCorrection is a parameter used by the location server providing troposphere delay correction together with a residual part of the STEC correction.

[0072] NavIC-DifferentialCorrections is a parameter used to provide a user with a set of correction terms to be applied to a clock and ephemeris data transmitted from another satellite in an autonavigation mode.

[0073] NavIC-GridModelParameter is a parameter used to provide a grid model parameter.

[0074] possibType3-1 is included in OTDOA (Observed Time Difference Of Arrival) assistance data. possibType3-1 corresponds to OTDOA-UE-Assisted. OTDOA-UE-Assisted includes information related to a reference cell with OTDOA and information related to a neighboring cell with OTDOA.

[0075] posSibType4-1 is included in barometric assistance data. posSibType4-1 corresponds to Sensor-AssistanceDataList. Sensor-AssistanceDataList is a list of Sensor-AssistanceData that are parameters used by the location server applying at least one of assistance data for assisting altitude calculation in the UE and a reason of an error in location identification of a sensor.

[0076] possibType5-1 is included in TBS (Terrestrial Beacon System) assistance data. possibType5-1 corresponds to TBS-AssistanceDataList. TBS-AssistanceDataList is a parameter used by the location server providing the UE with TBS-specific assistance data.

[0077] posSibType6-1 to posSibType6-3 are included in NR Downlink Time Difference Of Arrival (DL-TDOA)/DL-AOD (Downlink Angle-of-Departure) assistance data (NR DL-TDOA/DL-AOD Assistance Data). posSibType6-1 to posSibType6-3 correspond to NR-DL-PRS-AssistanceData, NR-UEB-TRP-LocationData, and NR-UEB-TRP-RTD-Info, respectively.

[0078] NR-DL-PRS-AssistanceData is a parameter used by the location server providing assistance data for a DL positioning reference signal.

[0079] NR-UEB-TRP-LocationData includes information indicating at least one of a location of a TRP and a beam of a DL-PRS.

[0080] NR-UEB-TRP-RTD-Info includes information related to Relative Time Difference (RTD).

[0081] Scheduling information of positioning system information (PosSI-SchedulingInfo) included in system information block 1 (SIB1) is transmitted to the UE.

[0082] The scheduling information of the positioning system information (PosSI-SchedulingInfo) includes at least one of a list of positioning scheduling information (posSchedulingInfoList) and a request configuration of the positioning system information (posSI-RequestConfig/posSI-RequestConfigSUL) (see FIG. **4**).

[0083] The positioning scheduling information (PosSchedulingInfo) includes at least one of information related to offset to system information (offsetToSI-Used), information related to a periodicity of positioning system information in a radio frame (posSI-Periodicity), information indicating whether a system information message is broadcast (posSI-BroadcastStatus), and information related to a list of positioning SIBs (posSIB) to be mapped to system information (posSIB-MappingInfo).

[0084] The information (posSIB-MappingInfo) related to the list of positioning SIBs (posSIB) to be mapped to the system information includes information related to one or more positioning SIB types (PosSIB-Type).

[0085] The information related to positioning SIB type(s) (PosSIB-Type) includes at least one of information (encrypted) indicating that pos-sib-type is encrypted, information indicating an ID of a GNSS corresponding to the positioning SIB (GNSS for the positioning SIB) (gnss-id), information indicating an ID of Satellite Based Augmentation System (SBAS) corresponding to the positioning SIB (SBAS for the positioning SIB) (sbas-id), information indicating a positioning SIB type (posSibType), and information indicating whether the positioning SIB is area-specific (areaScope).

[0086] The information indicating a positioning SIB type (posSibType) may include at least one of possibType1-1 to posSibType1-8, posSibType2-1 to posSibType2-23, posSibType3-1, posSibType4-1, posSibType5-1, and posSibType6-1 to posSibType6-3.

[0087] Incidentally, according to the existing specification, many of the configurations (for example, broadcast information and the like) for a specific UE (for example, a UE in initial access/idle mode) are not given to each operator (for example, PLMN ID), and thus the configurations are unchangeable for the plurality of operators. For example, configuration/provision, for each PLMN ID, of a positioning-related configuration transmitted from a base station (shared base station) fails, and thus the positioning-related configuration is unconfigurable/unchangeable for each operator (in accordance with a policy in each operator).

[0088] Thus, unless the configurations for the specific UE are changeable for the plurality of operators, management of flexible communication for each operator may fail, and suppression of communication quality enhancement may occur.

[0089] Thus, the inventors of the present invention came up with the idea of a method for flexibly applying/configuring a management policy/parameter for operators in more efficient installation/frequency use with resource sharing.

[0090] Embodiments according to the present disclosure will be described in detail with reference to the drawings as follows. The radio communication methods according to respective embodiments may each be employed individually, or may be employed in combination.

[0091] In the present disclosure, "A/B" and "at least one of A and B" may be interchangeably interpreted. In the present disclosure, "A/B/C" may mean "at least one of A, B, and C."

[0092] In the present disclosure, activate, deactivate, indicate, select, configure, update, determine, and the like may be interchangeably interpreted. In the present disclosure, "support," "control," "controllable," "operate," "operable," and the like may be interchangeably interpreted.

[0093] In the present disclosure, radio resource control (RRC), an RRC parameter, an RRC message, a higher layer parameter, a field, an information element (IE), a configuration, and the like may be interchangeably interpreted. In the present disclosure, a Medium Access Control control element (MAC Control Element (CE)), an update command, an activation/deactivation command, and the like may be interchangeably interpreted.

[0094] In the present disclosure, the higher layer signaling may be, for example, any one or combinations of Radio Resource Control (RRC) signaling, Medium Access Control (MAC) signaling, broadcast information, and the like.

[0095] In the present disclosure, the MAC signaling may use, for example, a MAC control element (MAC CE), a MAC Protocol Data Unit (PDU), or the like. The broadcast information may be, for example, a master information block (MIB), a system information block (SIB), minimum system information (Remaining Minimum System Information (RMSI)), other system information (OSI), or the like.

[0096] In the present disclosure, the physical layer signaling may be, for example, downlink control information (DCI), uplink control information (UCI), or the like.

[0097] In the present disclosure, an index, an identifier (ID), an indicator, a resource ID, and the like may be interchangeably interpreted. In the present disclosure, a sequence, a list, a set, a group, a cluster, a subset, and the like may be interchangeably interpreted.

[0098] In the present disclosure, ignore, drop, stop, cancel, puncture, rate-match, postpone, and the like may be interchangeably interpreted.

[0099] In the present disclosure, a specific ID, an ID related to Public Land Mobile Network (PLMN), a PLMN ID, a PLMN identifier, a PLMN Identity, PLMN identifier information, PLMN Identity information, PLMN ID information, information for identifying an operator, an ID for identifying an operator, an ID for each operator, a group ID, a PLMN group ID, and the like may be interchangeably interpreted.

[0100] In the present disclosure, PLMN, an operator, an operator policy, configuration for each operator, and the like may be interchangeably interpreted.

[0101] In the present disclosure, an SIB used for initial access and SIB1 may be interchangeably interpreted. In the present disclosure, an SIB for positioning, a positioning SIB, and a second SIB may be interchangeably interpreted.

(Radio Communication Method)

[0102] The present disclosure below describes, as an example of the specific ID, a PLMN ID, but the name of the specific ID is not limited to this.

[0103] In the present disclosure, the specific ID (for example, the PLMN ID) and a specific parameter (RRC parameter) may be associated with each other.

[0104] For the association, the specific parameter may include a parameter related to the specific ID.

[0105] For the association, another parameter included in the specific parameter may include a parameter related to the specific ID.

[0106] For the association, a new parameter included in the specific parameter may be associated with a parameter related to the specific ID. The new parameter may include the parameter related to the specific ID.

[0107] In the present disclosure, description indicating release defining the RRC parameter may be added to each RRC parameter.

[0108] The description may be, for example, "-r18." An RRC parameter with the description and an RRC parameter without the description may be the same parameter. For example, prach-ConfigurationPeriodScaling-IAB and prach-ConfigurationPeriodScaling-IAB-r18 may mean the same parameter. Note that "-r18" is merely an example, and may be interpreted as any description (for example, "-r17"/"-r19" or the like), or the description may not be added to the RRC parameter.

First Embodiment

[0109] A separate (independent) positioning-related configuration/parameter may be supported for each specific ID (for example, PLMN ID).

[0110] The positioning-related configuration/parameter may be communicated, for example, by using a specific SIB (for example, SIB1/positioning SIB).

[0111] The positioning-related configuration/parameter may be, for example, positioning SIB type and information (which may be referred to as posSIB-TypeAndInfo or information related to a positioning SIB type) communicated by using the positioning SIB.

[0112] For example, the positioning SIB type and information (posSIB-TypeAndInfo) and the specific ID (for example, PLMN ID) may be associated with each other.

[0113] In this case, for example, the positioning SIB type and information (posSIB-TypeAndInfo) may include the specific ID (for example, PLMN ID).

[0114] The positioning-related configuration/parameter may be, for example, an SIB positioning-related parameter (SIBpos) communicated by using SIB1.

[0115] For example, the SIB positioning-related parameter (SIBpos) and the specific ID (for example, PLMN ID) may be associated with each other.

[0116] In this case, the SIB positioning-related parameter (SIBpos) may include the specific ID (for example, PLMN ID).

[0117] Configuration of the specific ID will be described by using FIG. **3** above as an example.

[0118] The specific ID included in the SIB positioning-related parameter (SIBpos) may be configured for each category/classification of assistance data (for example, GNSS Common Assistance Data, GNSS Generic Assistance Data, OTDOA Assistance Data, Barometic Assistance Data, TBS Assistance Data, and NR DL-TODA/DL-AOD Assistance Data).

[0119] The specific ID included in the SIB positioning-related parameter (SIBpos) may be configured for each type of the assistance data (for example, possibTypeX-Y (where X and Y are any integers)).

[0120] The specific ID included in the SIB positioning-related parameter (SIBpos) may be configured for each assistance data element (assistanceDataElement).

[0121] The positioning-related configuration/parameter may be, for example, scheduling information of positioning system information (PosSI-SchedulingInfo) communicated by using SIB1.

[0122] For example, the scheduling information of the positioning system information (PosSI-SchedulingInfo) and the specific ID (for example, PLMN ID) may be associated with each other.

[0123] In this case, for example, the scheduling information of the positioning system information (PosSI-SchedulingInfo) may include the specific ID (for example, PLMN ID).

[0124] The specific ID (for example, PLMN ID) may be associated with at least one information element included in the scheduling information of the positioning system information (PosSI-SchedulingInfo) (or any information element associated with PosSI-SchedulingInfo).

[0125] FIG. **5** is a diagram to show an example of the positioning configuration according to the first embodiment.

[0126] In the example shown in FIG. **5**, PosSI-SchedulingInfo includes a parameter (plmn-id) indicating a PLMN ID.

[0127] By using such an information element as that shown in FIG. **5**, the UE can determine a positioning configuration configured for each PLMN ID.

[0128] Note that the example shown in FIG. **5** shows an example in which PosSI-SchedulingInfo includes a parameter indicating a PLMN ID, but the PLMN ID may be associated with a specific parameter included in PosSI-SchedulingInfo. The parameter included in PosSI-SchedulingInfo may be, for example, at least one of any parameters described in FIG. **4** above.

[0129] According to the first embodiment above, it is possible to appropriately and separately perform positioning-related configuration for each specific ID (for example, PLMN ID).

<Supplement>

[0130] In each embodiment of the present disclosure, respective configurable numbers of RRC parameters (information elements) may be expanded compared with those of Rel. 15/16/17.

[0131] In each embodiment of the present disclosure, respective configurable maximum numbers of RRC parameters (information elements) may be defined.

<Variations>

[0132] The configuration/parameter for each specific ID (for example, PLMN ID) described in each embodiment above is merely an example. In addition to the configuration/parameter described in each embodiment above, any configuration/parameter may be configured/notified for each specific ID (for example, PLMN ID).

[0133] There may be a one-to-one correspondence between a specific ID (for example, PLMN ID) and configuration related to the specific ID. In other words, one configuration may be associated with one specific ID.

[0134] There may be a multiple (one or more)-to-one correspondence between a specific ID (for example, PLMN ID) and configuration related to the specific ID. In other words, one configuration may be associated with a plurality of (one or more) specific IDs (for example, a list of specific IDs).

[0135] In each embodiment of the present disclosure, the cell in which network sharing is performed may be a specific cell. For example, the cell in which network sharing is performed may be an SCell, and network sharing may not be performed in a PCell (SpCell). Alternatively, the cell in which network sharing is performed may be a PCell (SpCell), and network sharing may not be performed in an SCell.

(Supplementary Note)

[0136] Regarding one embodiment of the present disclosure, the following supplementary notes of the invention will be given.

{Supplementary Note 1}

[0137] A terminal including: a receiving section that receives configuration information for positioning included in a specific system information block (SIB), the configuration information being associated with a Public Land

Mobile Network (PLMN) ID; and a control section that performs, based on the configuration information, positioning-related control associated with the PLMN ID.

{Supplementary Note 2}

[0138] The terminal according to supplementary note 1, wherein the specific SIB is a positioning SIB, and the configuration information is at least one of information related to a positioning SIB type transmitted by using the positioning SIB and at least one specific parameter included in the information related to a positioning SIB type.

{Supplementary Note 3}

[0139] The terminal according to supplementary note 1 or 2, wherein the PLMN ID is associated for each category of assistance data notified by using the SIB, for each type of the assistance data, or for each element of the assistance data.

{Supplementary Note 4}

[0140] The terminal according to any one of supplementary notes 1 to 3, wherein the specific SIB is SIB1, and the configuration information is at least one of scheduling information of positioning system information transmitted by using the SIB1 and at least one specific parameter included in the scheduling information of the positioning system information.

(Radio Communication System)

[0141] Hereinafter, a structure of a radio communication system according to one embodiment of the present disclosure will be described. In this radio communication system, the radio communication method according to each embodiment of the present disclosure described above may be used alone or may be used in combination for communication.

[0142] FIG. **6** is a diagram to show an example of a schematic structure of the radio communication system according to one embodiment. The radio communication system **1** may be a system implementing a communication using Long Term Evolution (LTE), 5th generation mobile communication system New Radio (5G NR) and so on the specifications of which have been drafted by Third Generation Partnership Project (3GPP).

[0143] The radio communication system **1** may support dual connectivity (multi-RAT dual connectivity (MR-DC)) between a plurality of Radio Access Technologies (RATs). The MR-DC may include dual connectivity (E-UTRA-NR Dual Connectivity (EN-DC)) between LTE (Evolved Universal Terrestrial Radio Access (E-UTRA)) and NR, dual connectivity (NR-E-UTRA Dual Connectivity (NE-DC)) between NR and LTE, and so on.

[0144] In EN-DC, a base station (eNB) of LTE (E-UTRA) is a master node (MN), and a base station (gNB) of NR is a secondary node (SN). In NE-DC, a base station (gNB) of NR is an MN, and a base station (eNB) of LTE (E-UTRA) is an SN.

[0145] The radio communication system **1** may support dual connectivity between a plurality of base stations in the same RAT (for example, dual connectivity (NR-NR Dual Connectivity (NN-DC)) where both of an MN and an SN are base stations (gNB) of NR).

[0146] The radio communication system **1** may include a base station **11** that forms a macro cell C**1** of a relatively wide coverage, and base stations **12** (**12***a* to **12***c*) that form small cells C**2**, which are placed within the macro cell C**1** and which are narrower than the macro cell C**1**. The user terminal **20** may be located in at least one cell. The arrangement, the number, and the like of each cell and user terminal **20** are by no means limited to the aspect shown in the diagram. Hereinafter, the base stations **11** and **12** will be collectively referred to as "base stations **10**," unless specified otherwise.

[0147] The user terminal **20** may be connected to at least one of the plurality of base stations **10**. The user terminal **20** may use at least one of carrier aggregation (CA) and dual connectivity (DC) using a plurality of component carriers (CCs).

[0148] Each CC may be included in at least one of a first frequency band (Frequency Range 1 (FR1)) and a second frequency band (Frequency Range 2 (FR2)). The macro cell C**1** may be included in FR1, and the small cells C**2** may be included in FR2. For example, FR1 may be a frequency band of 6 GHz or less (sub-6 GHZ), and FR2 may be a frequency band which is higher than 24 GHZ (above-24 GHz). Note that frequency bands, definitions and so on of FR1 and FR2 are by no means limited to these, and for example, FR1 may correspond to a frequency band which is higher than FR2.

[0149] The user terminal **20** may communicate using at least one of time division duplex (TDD) and frequency division duplex (FDD) in each CC.

[0150] The plurality of base stations **10** may be connected by a wired connection (for example, optical fiber in compliance with the Common Public Radio Interface (CPRI), the X2 interface and so on) or a wireless connection (for example, an NR communication). For example, if an NR communication is used as a backhaul between the base stations **11** and **12**, the base station **11** corresponding to a higher station may be referred to as an "Integrated Access Backhaul (IAB) donor," and the base station **12** corresponding to a relay station (relay) may be referred to as an "IAB node."

[0151] The base station **10** may be connected to a core network **30** through another base station **10** or directly. For example, the core network **30** may include at least one of Evolved Packet Core (EPC), 5G Core Network (5GCN), Next Generation Core (NGC), and so on.

[0152] The user terminal **20** may be a terminal supporting at least one of communication schemes such as LTE, LTE-A, 5G, and so on,

[0153] In the radio communication system **1**, an orthogonal frequency division multiplexing (OFDM)-based wireless access scheme may be used. For example, in at least one of the downlink (DL) and the uplink (UL), Cyclic Prefix OFDM (CP-OFDM), Discrete Fourier Transform Spread OFDM (DFT-s-OFDM), Orthogonal Frequency Division Multiple Access (OFDMA), Single Carrier Frequency Division Multiple Access (SC-FDMA), and so on may be used.

[0154] The wireless access scheme may be referred to as a "waveform." Note that, in the radio communication system **1**, another wireless access scheme (for example, another single carrier transmission scheme, another multi-carrier transmission scheme) may be used for a wireless access scheme in the UL and the DL.

[0155] In the radio communication system **1**, a downlink shared channel (Physical Downlink Shared Channel (PDSCH)), which is used by each user terminal **20** on a shared basis, a broadcast channel (Physical Broadcast Chan-

nel (PBCH)), a downlink control channel (Physical Downlink Control Channel (PDCCH)) and so on, may be used as downlink channels.

[0156] In the radio communication system **1**, an uplink shared channel (Physical Uplink Shared Channel (PUSCH)), which is used by each user terminal **20** on a shared basis, an uplink control channel (Physical Uplink Control Channel (PUCCH)), a random access channel (Physical Random Access Channel (PRACH)) and so on may be used as uplink channels.

[0157] User data, higher layer control information, System Information Blocks (SIBs) and so on are communicated on the PDSCH. User data, higher layer control information and so on may be communicated on the PUSCH. The Master Information Blocks (MIBs) may be communicated on the PBCH.

[0158] Lower layer control information may be communicated on the PDCCH. For example, the lower layer control information may include downlink control information (DCI) including scheduling information of at least one of the PDSCH and the PUSCH.

[0159] Note that DCI for scheduling the PDSCH may be referred to as "DL assignment," "DL DCI," and so on, and DCI for scheduling the PUSCH may be referred to as "UL grant," "UL DCI," and so on. Note that the PDSCH may be interpreted as "DL data", and the PUSCH may be interpreted as "UL data".

[0160] For detection of the PDCCH, a control resource set (CORESET) and a search space may be used. The CORESET corresponds to a resource to search DCI. The search space corresponds to a search area and a search method of PDCCH candidates. One CORESET may be associated with one or more search spaces. The UE may monitor a CORESET associated with a certain search space, based on search space configuration.

[0161] One search space may correspond to a PDCCH candidate corresponding to one or more aggregation levels. One or more search spaces may be referred to as a "search space set." Note that a "search space," a "search space set," a "search space configuration," a "search space set configuration," a "CORESET," a "CORESET configuration" and so on of the present disclosure may be interchangeably interpreted.

[0162] Uplink control information (UCI) including at least one of channel state information (CSI), transmission confirmation information (for example, which may be referred to as Hybrid Automatic Repeat reQuest ACKnowledgement (HARQ-ACK), ACK/NACK, and so on), and scheduling request (SR) may be communicated by means of the PUCCH. By means of the PRACH, random access preambles for establishing connections with cells may be communicated.

[0163] Note that the downlink, the uplink, and so on in the present disclosure may be expressed without a term of "link." In addition, various channels may be expressed without adding "Physical" to the head.

[0164] In the radio communication system **1**, a synchronization signal (SS), a downlink reference signal (DL-RS), and so on may be communicated. In the radio communication system **1**, a cell-specific reference signal (CRS), a channel state information-reference signal (CSI-RS), a demodulation reference signal (DMRS), a positioning reference signal (PRS), a phase tracking reference signal (PTRS), and so on may be communicated as the DL-RS.

[0165] For example, the synchronization signal may be at least one of a primary synchronization signal (PSS) and a secondary synchronization signal (SSS). A signal block including an SS (PSS, SSS) and a PBCH (and a DMRS for a PBCH) may be referred to as an "SS/PBCH block," an "SS Block (SSB)," and so on. Note that an SS, an SSB, and so on may be referred to as a "reference signal."

[0166] In the radio communication system **1**, a sounding reference signal (SRS), a demodulation reference signal (DMRS), and so on may be communicated as an uplink reference signal (UL-RS). Note that DMRS may be referred to as a "user terminal specific reference signal (UE-specific Reference Signal)."

(Base Station)

[0167] FIG. **7** is a diagram to show an example of a structure of the base station according to one embodiment. The base station **10** includes a control section **110**, a transmitting/receiving section **120**, transmitting/receiving antennas **130** and a communication path interface (transmission line interface) **140**. Note that the base station **10** may include one or more control sections **110**, one or more transmitting/receiving sections **120**, one or more transmitting/receiving antennas **130**, and one or more communication path interfaces **140**.

[0168] Note that, the present example primarily shows functional blocks that pertain to characteristic parts of the present embodiment, and it is assumed that the base station **10** may include other functional blocks that are necessary for radio communication as well. Part of the processes of each section described below may be omitted.

[0169] The control section **110** controls the whole of the base station **10**. The control section **110** can be constituted with a controller, a control circuit, or the like described based on general understanding of the technical field to which the present disclosure pertains.

[0170] The control section **110** may control generation of signals, scheduling (for example, resource allocation, mapping), and so on. The control section **110** may control transmission and reception, measurement and so on using the transmitting/receiving section **120**, the transmitting/receiving antennas **130**, and the communication path interface **140**. The control section **110** may generate data, control information, a sequence and so on to transmit as a signal, and forward the generated items to the transmitting/receiving section **120**. The control section **110** may perform call processing (setting up, releasing) for communication channels, manage the state of the base station **10**, and manage the radio resources.

[0171] The transmitting/receiving section **120** may include a baseband section **121**, a Radio Frequency (RF) section **122**, and a measurement section **123**. The baseband section **121** may include a transmission processing section **1211** and a reception processing section **1212**. The transmitting/receiving section **120** can be constituted with a transmitter/receiver, an RF circuit, a baseband circuit, a filter, a phase shifter, a measurement circuit, a transmitting/receiving circuit, or the like described based on general understanding of the technical field to which the present disclosure pertains.

[0172] The transmitting/receiving section **120** may be structured as a transmitting/receiving section in one entity, or may be constituted with a transmitting section and a receiving section. The transmitting section may be consti-

tuted with the transmission processing section **1211**, and the RF section **122**. The receiving section may be constituted with the reception processing section **1212**, the RF section **122**, and the measurement section **123**.

[0173] The transmitting/receiving antennas **130** can be constituted with antennas, for example, an array antenna, or the like described based on general understanding of the technical field to which the present disclosure pertains.

[0174] The transmitting/receiving section **120** may transmit the above-described downlink channel, synchronization signal, downlink reference signal, and so on. The transmitting/receiving section **120** may receive the above-described uplink channel, uplink reference signal, and so on.

[0175] The transmitting/receiving section **120** may form at least one of a transmit beam and a receive beam by using digital beam forming (for example, precoding), analog beam forming (for example, phase rotation), and so on.

[0176] The transmitting/receiving section **120** (transmission processing section **1211**) may perform the processing of the Packet Data Convergence Protocol (PDCP) layer, the processing of the Radio Link Control (RLC) layer (for example, RLC retransmission control), the processing of the Medium Access Control (MAC) layer (for example, HARQ retransmission control), and so on, for example, on data and control information and so on acquired from the control section **110**, and may generate bit string to transmit.

[0177] The transmitting/receiving section **120** (transmission processing section **1211**) may perform transmission processing such as channel coding (which may include error correction coding), modulation, mapping, filtering, discrete Fourier transform (DFT) processing (as necessary), inverse fast Fourier transform (IFFT) processing, precoding, digital-to-analog conversion, and so on, on the bit string to transmit, and output a baseband signal.

[0178] The transmitting/receiving section **120** (RF section **122**) may perform modulation to a radio frequency band, filtering, amplification, and so on, on the baseband signal, and transmit the signal of the radio frequency band through the transmitting/receiving antennas **130**.

[0179] On the other hand, the transmitting/receiving section **120** (RF section **122**) may perform amplification, filtering, demodulation to a baseband signal, and so on, on the signal of the radio frequency band received by the transmitting/receiving antennas **130**.

[0180] The transmitting/receiving section **120** (reception processing section **1212**) may apply reception processing such as analog-digital conversion, fast Fourier transform (FFT) processing, inverse discrete Fourier transform (IDFT) processing (as necessary), filtering, de-mapping, demodulation, decoding (which may include error correction decoding), MAC layer processing, the processing of the RLC layer and the processing of the PDCP layer, and so on, on the acquired baseband signal, and acquire user data, and so on.

[0181] The transmitting/receiving section **120** (measurement section **123**) may perform the measurement related to the received signal. For example, the measurement section **123** may perform Radio Resource Management (RRM) measurement, Channel State Information (CSI) measurement, and so on, based on the received signal. The measurement section **123** may measure a received power (for example, Reference Signal Received Power (RSRP)), a received quality (for example, Reference Signal Received Quality (RSRQ), a Signal to Interference plus Noise Ratio (SINR), a Signal to Noise Ratio (SNR)), a signal strength (for example, Received Signal Strength Indicator (RSSI)), channel information (for example, CSI), and so on. The measurement results may be output to the control section **110**.

[0182] The communication path interface **140** may perform transmission/reception (backhaul signaling) of a signal with an apparatus included in the core network **30** or other base stations **10**, and so on, and acquire or transmit user data (user plane data), control plane data, and so on for the user terminal **20**.

[0183] Note that the transmitting section and the receiving section of the base station **10** in the present disclosure may be constituted with at least one of the transmitting/receiving section **120**, the transmitting/receiving antennas **130**, and the communication path interface **140**.

[0184] The transmitting/receiving section **120** may transmit configuration information for positioning included in a specific system information block (SIB), the configuration information being associated with a Public Land Mobile Network (PLMN) ID. The control section **110** may indicate, by using the configuration information, positioning-related control associated with the PLMN ID (first embodiment).

(User Terminal)

[0185] FIG. **8** is a diagram to show an example of a structure of the user terminal according to one embodiment. The user terminal **20** includes a control section **210**, a transmitting/receiving section **220**, and transmitting/receiving antennas **230**. Note that the user terminal **20** may include one or more control sections **210**, one or more transmitting/receiving sections **220**, and one or more transmitting/receiving antennas **230**.

[0186] Note that, the present example primarily shows functional blocks that pertain to characteristic parts of the present embodiment, and it is assumed that the user terminal **20** may include other functional blocks that are necessary for radio communication as well. Part of the processes of each section described below may be omitted.

[0187] The control section **210** controls the whole of the user terminal **20**. The control section **210** can be constituted with a controller, a control circuit, or the like described based on general understanding of the technical field to which the present disclosure pertains.

[0188] The control section **210** may control generation of signals, mapping, and so on. The control section **210** may control transmission/reception, measurement and so on using the transmitting/receiving section **220**, and the transmitting/receiving antennas **230**. The control section **210** generates data, control information, a sequence and so on to transmit as a signal, and may forward the generated items to the transmitting/receiving section **220**.

[0189] The transmitting/receiving section **220** may include a baseband section **221**, an RF section **222**, and a measurement section **223**. The baseband section **221** may include a transmission processing section **2211** and a reception processing section **2212**. The transmitting/receiving section **220** can be constituted with a transmitter/receiver, an RF circuit, a baseband circuit, a filter, a phase shifter, a measurement circuit, a transmitting/receiving circuit, or the like described based on general understanding of the technical field to which the present disclosure pertains.

[0190] The transmitting/receiving section **220** may be structured as a transmitting/receiving section in one entity, or may be constituted with a transmitting section and a

receiving section. The transmitting section may be constituted with the transmission processing section **2211**, and the RF section **222**. The receiving section may be constituted with the reception processing section **2212**, the RF section **222**, and the measurement section **223**.

[0191] The transmitting/receiving antennas **230** can be constituted with antennas, for example, an array antenna, or the like described based on general understanding of the technical field to which the present disclosure pertains.

[0192] The transmitting/receiving section **220** may receive the above-described downlink channel, synchronization signal, downlink reference signal, and so on. The transmitting/receiving section **220** may transmit the above-described uplink channel, uplink reference signal, and so on.

[0193] The transmitting/receiving section **220** may form at least one of a transmit beam and a receive beam by using digital beam forming (for example, precoding), analog beam forming (for example, phase rotation), and so on.

[0194] The transmitting/receiving section **220** (transmission processing section **2211**) may perform the processing of the PDCP layer, the processing of the RLC layer (for example, RLC retransmission control), the processing of the MAC layer (for example, HARQ retransmission control), and so on, for example, on data and control information and so on acquired from the control section **210**, and may generate bit string to transmit.

[0195] The transmitting/receiving section **220** (transmission processing section **2211**) may perform transmission processing such as channel coding (which may include error correction coding), modulation, mapping, filtering, DFT processing (as necessary), IFFT processing, precoding, digital-to-analog conversion, and so on, on the bit string to transmit, and output a baseband signal.

[0196] Note that, whether to apply DFT processing or not may be based on the configuration of the transform precoding. The transmitting/receiving section **220** (transmission processing section **2211**) may perform, for a certain channel (for example, PUSCH), the DFT processing as the above-described transmission processing to transmit the channel by using a DFT-s-OFDM waveform if transform precoding is enabled, and otherwise, does not need to perform the DFT processing as the above-described transmission processing.

[0197] The transmitting/receiving section **220** (RF section **222**) may perform modulation to a radio frequency band, filtering, amplification, and so on, on the baseband signal, and transmit the signal of the radio frequency band through the transmitting/receiving antennas **230**.

[0198] On the other hand, the transmitting/receiving section **220** (RF section **222**) may perform amplification, filtering, demodulation to a baseband signal, and so on, on the signal of the radio frequency band received by the transmitting/receiving antennas **230**.

[0199] The transmitting/receiving section **220** (reception processing section **2212**) may apply reception processing such as analog-digital conversion, FFT processing, IDFT processing (as necessary), filtering, de-mapping, demodulation, decoding (which may include error correction decoding), MAC layer processing, the processing of the RLC layer and the processing of the PDCP layer, and so on, on the acquired baseband signal, and acquire user data, and so on.

[0200] The transmitting/receiving section **220** (measurement section **223**) may perform the measurement related to the received signal. For example, the measurement section **223** may perform RRM measurement, CSI measurement, and so on, based on the received signal. The measurement section **223** may measure a received power (for example, RSRP), a received quality (for example, RSRQ, SINR, SNR), a signal strength (for example, RSSI), channel information (for example, CSI), and so on. The measurement results may be output to the control section **210**.

[0201] Note that the transmitting section and the receiving section of the user terminal **20** in the present disclosure may be constituted with at least one of the transmitting/receiving section **220** and the transmitting/receiving antennas **230**.

[0202] The transmitting/receiving section **220** may receive configuration information for positioning included in a specific system information block (SIB), the configuration information being associated with a Public Land Mobile Network (PLMN) ID. The control section **210** may perform, based on the configuration information, positioning-related control associated with the PLMN ID (first embodiment).

[0203] The specific SIB may be a positioning SIB. The configuration information may be at least one of information related to a positioning SIB type transmitted by using the positioning SIB and at least one specific parameter included in the information related to a positioning SIB type (first embodiment).

[0204] The PLMN ID may be associated for each category of assistance data notified by using the SIB, for each type of the assistance data, or for each element of the assistance data (first embodiment.).

[0205] The specific SIB may be SIB1. The configuration information may be at least one of scheduling information of positioning system information transmitted by using the SIB1 and at least one specific parameter included in the scheduling information of the positioning system information (first embodiment).

(Hardware Structure)

[0206] Note that the block diagrams that have been used to describe the above embodiments show blocks in functional units. These functional blocks (components) may be implemented in arbitrary combinations of at least one of hardware and software. Also, the method for implementing each functional block is not particularly limited. That is, each functional block may be realized by one piece of apparatus that is physically or logically coupled, or may be realized by directly or indirectly connecting two or more physically or logically separate pieces of apparatus (for example, via wire, wireless, or the like) and using these plurality of pieces of apparatus. The functional blocks may be implemented by combining softwares into the apparatus described above or the plurality of apparatuses described above.

[0207] Here, functions include judgment, determination, decision, calculation, computation, processing, derivation, investigation, search, confirmation, reception, transmission, output, access, resolution, selection, designation, establishment, comparison, assumption, expectation, considering, broadcasting, notifying, communicating, forwarding, configuring, reconfiguring, allocating (mapping), assigning, and the like, but function are by no means limited to these. For example, functional block (components) to implement a function of transmission may be referred to as a "transmitting section (transmitting unit)," a "transmitter," and the like. The method for implementing each component is not particularly limited as described above.

[0208] For example, a base station, a user terminal, and so on according to one embodiment of the present disclosure

may function as a computer that executes the processes of the radio communication method of the present disclosure. FIG. **9** is a diagram to show an example of a hardware structure of the base station and the user terminal according to one embodiment. Physically, the above-described base station **10** and user terminal **20** may each be formed as a computer apparatus that includes a processor **1001**, a memory **1002**, a storage **1003**, a communication apparatus **1004**, an input apparatus **1005**, an output apparatus **1006**, a bus **1007**, and so on.

[0209] Note that in the present disclosure, the words such as an apparatus, a circuit, a device, a section, a unit, and so on can be interchangeably interpreted. The hardware structure of the base station **10** and the user terminal **20** may be configured to include one or more of apparatuses shown in the drawings, or may be configured not to include part of apparatuses.

[0210] For example, although only one processor **1001** is shown, a plurality of processors may be provided. Furthermore, processes may be implemented with one processor or may be implemented at the same time, in sequence, or in different manners with two or more processors. Note that the processor **1001** may be implemented with one or more chips.

[0211] Each function of the base station **10** and the user terminals **20** is implemented, for example, by allowing certain software (programs) to be read on hardware such as the processor **1001** and the memory **1002**, and by allowing the processor **1001** to perform calculations to control communication via the communication apparatus **1004** and control at least one of reading and writing of data in the memory **1002** and the storage **1003**.

[0212] The processor **1001** controls the whole computer by, for example, running an operating system. The processor **1001** may be configured with a central processing unit (CPU), which includes interfaces with peripheral apparatus, control apparatus, computing apparatus, a register, and so on. For example, at least part of the above-described control section **110** (**210**), the transmitting/receiving section **120** (**220**), and so on may be implemented by the processor **1001**.

[0213] Furthermore, the processor **1001** reads programs (program codes), software modules, data, and so on from at least one of the storage **1003** and the communication apparatus **1004**, into the memory **1002**, and executes various processes according to these. As for the programs, programs to allow computers to execute at least part of the operations of the above-described embodiments are used. For example, the control section **110** (**210**) may be implemented by control programs that are stored in the memory **1002** and that operate on the processor **1001**, and other functional blocks may be implemented likewise.

[0214] The memory **1002** is a computer-readable recording medium, and may be constituted with, for example, at least one of a Read Only Memory (ROM), an Erasable Programmable ROM (EPROM), an Electrically EPROM (EEPROM), a Random Access Memory (RAM), and other appropriate storage media. The memory **1002** may be referred to as a "register," a "cache," a "main memory (primary storage apparatus)" and so on. The memory **1002** can store executable programs (program codes), software modules, and the like for implementing the radio communication method according to one embodiment of the present disclosure.

[0215] The storage **1003** is a computer-readable recording medium, and may be constituted with, for example, at least one of a flexible disk, a floppy (registered trademark) disk, a magneto-optical disk (for example, a compact disc (Compact Disc ROM (CD-ROM) and so on), a digital versatile disc, a Blu-ray (registered trademark) disk), a removable disk, a hard disk drive, a smart card, a flash memory device (for example, a card, a stick, and a key drive), a magnetic stripe, a database, a server, and other appropriate storage media. The storage **1003** may be referred to as "secondary storage apparatus."

[0216] The communication apparatus **1004** is hardware (transmitting/receiving device) for allowing inter-computer communication via at least one of wired and wireless networks, and may be referred to as, for example, a "network device," a "network controller," a "network card," a "communication module," and so on. The communication apparatus **1004** may be configured to include a high frequency switch, a duplexer, a filter, a frequency synthesizer, and so on in order to realize, for example, at least one of frequency division duplex (FDD) and time division duplex (TDD). For example, the above-described transmitting/receiving section **120** (**220**), the transmitting/receiving antennas **130** (**230**), and so on may be implemented by the communication apparatus **1004**. In the transmitting/receiving section **120** (**220**), the transmitting section **120***a* (**220***a*) and the receiving section **120***b* (**220***b*) can be implemented while being separated physically or logically.

[0217] The input apparatus **1005** is an input device that receives input from the outside (for example, a keyboard, a mouse, a microphone, a switch, a button, a sensor, and so on). The output apparatus **1006** is an output device that allows sending output to the outside (for example, a display, a speaker, a Light Emitting Diode (LED) lamp, and so on). Note that the input apparatus **1005** and the output apparatus **1006** may be provided in an integrated structure (for example, a touch panel).

[0218] Furthermore, these types of apparatus, including the processor **1001**, the memory **1002**, and others, are connected by a bus **1007** for communicating information. The bus **1007** may be formed with a single bus, or may be formed with buses that vary between pieces of apparatus.

[0219] Also, the base station **10** and the user terminals **20** may be structured to include hardware such as a microprocessor, a digital signal processor (DSP), an Application Specific Integrated Circuit (ASIC), a Programmable Logic Device (PLD), a Field Programmable Gate Array (FPGA), and so on, and part or all of the functional blocks may be implemented by the hardware. For example, the processor **1001** may be implemented with at least one of these pieces of hardware.

(Variations)

[0220] Note that the terminology described in the present disclosure and the terminology that is needed to understand the present disclosure may be replaced by other terms that convey the same or similar meanings. For example, a "channel," a "symbol," and a "signal" (or signaling) may be interchangeably interpreted. Also, "signals" may be "messages." A reference signal may be abbreviated as an "RS," and may be referred to as a "pilot," a "pilot signal," and so on, depending on which standard applies. Furthermore, a "component carrier (CC)" may be referred to as a "cell," a "frequency carrier," a "carrier frequency" and so on.

[0221] A radio frame may be constituted of one or a plurality of periods (frames) in the time domain. Each of one

or a plurality of periods (frames) constituting a radio frame may be referred to as a "subframe." Furthermore, a subframe may be constituted of one or a plurality of slots in the time domain. A subframe may be a fixed time length (for example, 1 ms) independent of numerology.

[0222] Here, numerology may be a communication parameter applied to at least one of transmission and reception of a certain signal or channel. For example, numerology may indicate at least one of a subcarrier spacing (SCS), a bandwidth, a symbol length, a cyclic prefix length, a transmission time interval (TTI), the number of symbols per TTI, a radio frame structure, a specific filter processing performed by a transceiver in the frequency domain, a specific windowing processing performed by a transceiver in the time domain, and so on.

[0223] A slot may be constituted of one or a plurality of symbols in the time domain (Orthogonal Frequency Division Multiplexing (OFDM) symbols, Single Carrier Frequency Division Multiple Access (SC-FDMA) symbols, and so on). Furthermore, a slot may be a time unit based on numerology.

[0224] A slot may include a plurality of mini-slots. Each mini-slot may be constituted of one or a plurality of symbols in the time domain. A mini-slot may be referred to as a "sub-slot." A mini-slot may be constituted of symbols less than the number of slots. A PDSCH (or PUSCH) transmitted in a time unit larger than a mini-slot may be referred to as "PDSCH (PUSCH) mapping type A." A PDSCH (or PUSCH) transmitted using a mini-slot may be referred to as "PDSCH (PUSCH) mapping type B."

[0225] A radio frame, a subframe, a slot, a mini-slot, and a symbol all express time units in signal communication. A radio frame, a subframe, a slot, a mini-slot, and a symbol may each be called by other applicable terms. Note that time units such as a frame, a subframe, a slot, mini-slot, and a symbol in the present disclosure may be interchangeably interpreted.

[0226] For example, one subframe may be referred to as a "TTI," a plurality of consecutive subframes may be referred to as a "TTI," or one slot or one mini-slot may be referred to as a "TTI." That is, at least one of a subframe and a TTI may be a subframe (1 ms) in existing LTE, may be a shorter period than 1 ms (for example, 1 to 13 symbols), or may be a longer period than 1 ms. Note that a unit expressing TTI may be referred to as a "slot," a "mini-slot," and so on instead of a "subframe."

[0227] Here, a TTI refers to the minimum time unit of scheduling in radio communication, for example. For example, in LTE systems, a base station schedules the allocation of radio resources (such as a frequency bandwidth and transmit power that are available for each user terminal) for the user terminal in TTI units. Note that the definition of TTIs is not limited to this.

[0228] TTIs may be transmission time units for channel-encoded data packets (transport blocks), code blocks, or codewords, or may be the unit of processing in scheduling, link adaptation, and so on. Note that, when TTIs are given, the time interval (for example, the number of symbols) to which transport blocks, code blocks, codewords, or the like are actually mapped may be shorter than the TTIS.

[0229] Note that, in the case where one slot or one mini-slot is referred to as a TTI, one or more TTIs (that is, one or more slots or one or more mini-slots) may be the minimum time unit of scheduling. Furthermore, the number of slots (the number of mini-slots) constituting the minimum time unit of the scheduling may be controlled.

[0230] A TTI having a time length of 1 ms may be referred to as a "normal TTI" (TTI in 3GPP Rel. 8 to Rel. 12), a "long TTI," a "normal subframe," a "long subframe," a "slot" and so on. A TTI that is shorter than a normal TTI may be referred to as a "shortened TTI," a "short TTI," a "partial or fractional TTI," a "shortened subframe," a "short subframe," a "mini-slot," a "sub-slot," a "slot" and so on.

[0231] Note that a long TTI (for example, a normal TTI, a subframe, and so on) may be interpreted as a TTI having a time length exceeding 1 ms, and a short TTI (for example, a shortened TTI and so on) may be interpreted as a TTI having a TTI length shorter than the TTI length of a long TTI and equal to or longer than 1 ms.

[0232] A resource block (RB) is the unit of resource allocation in the time domain and the frequency domain, and may include one or a plurality of consecutive subcarriers in the frequency domain. The number of subcarriers included in an RB may be the same regardless of numerology, and, for example, may be 12. The number of subcarriers included in an RB may be determined based on numerology.

[0233] Also, an RB may include one or a plurality of symbols in the time domain, and may be one slot, one mini-slot, one subframe, or one TTI in length. One TTI, one subframe, and so on each may be constituted of one or a plurality of resource blocks.

[0234] Note that one or a plurality of RBs may be referred to as a "physical resource block (Physical RB (PRB))," a "sub-carrier group (SCG)," a "resource element group (REG)," a "PRB pair," an "RB pair" and so on.

[0235] Furthermore, a resource block may be constituted of one or a plurality of resource elements (REs). For example, one RE may correspond to a radio resource field of one subcarrier and one symbol.

[0236] A bandwidth part (BWP) (which may be referred to as a "fractional bandwidth," and so on) may represent a subset of contiguous common resource blocks (common RBs) for certain numerology in a certain carrier. Here, a common RB may be specified by an index of the RB based on the common reference point of the carrier. A PRB may be defined by a certain BWP and may be numbered in the BWP.

[0237] The BWP may include a UL BWP (BWP for the UL) and a DL BWP (BWP for the DL). One or a plurality of BWPs may be configured in one carrier for a UE.

[0238] At least one of configured BWPs may be active, and a UE does not need to assume to transmit/receive a certain signal/channel outside active BWPs. Note that a "cell," a "carrier," and so on in the present disclosure may be interpreted as a "BWP".

[0239] Note that the above-described structures of radio frames, subframes, slots, mini-slots, symbols, and so on are merely examples. For example, structures such as the number of subframes included in a radio frame, the number of slots per subframe or radio frame, the number of mini-slots included in a slot, the numbers of symbols and RBs included in a slot or a mini-slot, the number of subcarriers included in an RB, the number of symbols in a TTI, the symbol length, the cyclic prefix (CP) length, and so on can be variously changed.

[0240] Also, the information, parameters, and so on described in the present disclosure may be represented in absolute values or in relative values with respect to certain

values, or may be represented in another corresponding information. For example, radio resources may be specified by certain indices.

[0241] The names used for parameters and so on in the present disclosure are in no respect limiting. Furthermore, mathematical expressions that use these parameters, and so on may be different from those expressly disclosed in the present disclosure. For example, since various channels (PUCCH, PDCCH, and so on) and information elements can be identified by any suitable names, the various names allocated to these various channels and information elements are in no respect limiting.

[0242] The information, signals, and so on described in the present disclosure may be represented by using any of a variety of different technologies. For example, data, instructions, commands, information, signals, bits, symbols, chips, and so on, all of which may be referenced throughout the herein-contained description, may be represented by voltages, currents, electromagnetic waves, magnetic fields or particles, optical fields or photons, or any combination of these.

[0243] Also, information, signals, and so on can be output in at least one of from higher layers to lower layers and from lower layers to higher layers. Information, signals, and so on may be input and/or output via a plurality of network nodes.

[0244] The information, signals, and so on that are input and/or output may be stored in a specific location (for example, a memory) or may be managed by using a management table. The information, signals, and so on to be input and/or output can be overwritten, updated, or appended. The information, signals, and so on that are output may be deleted. The information, signals, and so on that are input may be transmitted to another apparatus.

[0245] Reporting of information is by no means limited to the aspects/embodiments described in the present disclosure, and other methods may be used as well. For example, reporting of information in the present disclosure may be implemented by using physical layer signaling (for example, downlink control information (DCI), uplink control information (UCI)), higher layer signaling (for example, Radio Resource Control (RRC) signaling, broadcast information (master information block (MIB), system information blocks (SIBs), and so on), Medium Access Control (MAC) signaling and so on), and other signals or combinations of these.

[0246] Note that physical layer signaling may be referred to as "Layer 1/Layer 2 (L1/L2) control information (L1/L2 control signals)," "L1 control information (L1 control signal)," and so on. Also, RRC signaling may be referred to as an "RRC message," and can be, for example, an RRC connection setup message, an RRC connection reconfiguration message, and so on. Also, MAC signaling may be reported using, for example, MAC control elements (MAC CEs).

[0247] Also, reporting of certain information (for example, reporting of "X holds") does not necessarily have to be reported explicitly, and can be reported implicitly (by, for example, not reporting this certain information or reporting another piece of information).

[0248] Determinations may be made in values represented by one bit (0 or 1), may be made in Boolean values that represent true or false, or may be made by comparing numerical values (for example, comparison against a certain value).

[0249] Software, whether referred to as "software," "firmware," "middleware," "microcode," or "hardware description language," or called by other terms, should be interpreted broadly to mean instructions, instruction sets, code, code segments, program codes, programs, subprograms, software modules, applications, software applications, software packages, routines, subroutines, objects, executable files, execution threads, procedures, functions, and so on.

[0250] Also, software, commands, information, and so on may be transmitted and received via communication media. For example, when software is transmitted from a website, a server, or other remote sources by using at least one of wired technologies (coaxial cables, optical fiber cables, twisted-pair cables, digital subscriber lines (DSL), and so on) and wireless technologies (infrared radiation, microwaves, and so on), at least one of these wired technologies and wireless technologies are also included in the definition of communication media.

[0251] The terms "system" and "network" used in the present disclosure can be used interchangeably. The "network" may mean an apparatus (for example, a base station) included in the network.

[0252] In the present disclosure, the terms such as "precoding," a "precoder," a "weight (precoding weight)," "quasi-co-location (QCL)," a "Transmission Configuration Indication state (TCI state)," a "spatial relation," a "spatial domain filter," a "transmit power," "phase rotation," an "antenna port," an "antenna port group," a "layer," "the number of layers," a "rank," a "resource," a "resource set," a "resource group," a "beam," a "beam width," a "beam angular degree," an "antenna," an "antenna element," a "panel," and so on can be used interchangeably.

[0253] In the present disclosure, the terms such as a "base station (BS)," a "radio base station," a "fixed station," a "NodeB," an "eNB (eNodeB)," a "gNB (gNodeB)," an "access point," a "transmission point (TP)," a "reception point (RP)," a "transmission/reception point (TRP)," a "panel," a "cell," a "sector," a "cell group," a "carrier," a "component carrier," and so on can be used interchangeably. The base station may be referred to as the terms such as a "macro cell," a "small cell," a "femto cell," a "pico cell," and so on.

[0254] A base station can accommodate one or a plurality of (for example, three) cells. When a base station accommodates a plurality of cells, the entire coverage area of the base station can be partitioned into multiple smaller areas, and each smaller area can provide communication services through base station subsystems (for example, indoor small base stations (Remote Radio Heads (RRHs))). The term "cell" or "sector" refers to part of or the entire coverage area of at least one of a base station and a base station subsystem that provides communication services within this coverage.

[0255] In the present disclosure, a case that a base station transmits information to a terminal and a case that the base station indicates, for the terminal, control/operation based on the information may be interchangeably interpreted.

[0256] In the present disclosure, the terms "mobile station (MS)," "user terminal," "user equipment (UE)," and "terminal" may be used interchangeably.

[0257] A mobile station may be referred to as a "subscriber station," "mobile unit," "subscriber unit," "wireless unit," "remote unit," "mobile device," "wireless device," "wireless communication device," "remote device," "mobile subscriber station," "access terminal," "mobile terminal,"

"wireless terminal," "remote terminal," "handset," "user agent," "mobile client," "client," or some other appropriate terms in some cases.

[0258] At least one of a base station and a mobile station may be referred to as a "transmitting apparatus," a "receiving apparatus," a "radio communication apparatus," and so on. Note that at least one of a base station and a mobile station may be a device mounted on a moving object or a moving object itself, and so on.

[0259] The moving object is a movable object with any moving speed, and naturally a case where the moving object is stopped is also included. Examples of the moving object include a vehicle, a transport vehicle, an automobile, a motorcycle, a bicycle, a connected car, a loading shovel, a bulldozer, a wheel loader, a dump truck, a fork lift, a train, a bus, a trolley, a rickshaw, a ship and other watercraft, an airplane, a rocket, a satellite, a drone, a multicopter, a quadcopter, a balloon, and an object mounted on any of these, but these are not restrictive. The moving object may be a moving object that autonomously travels based on a direction for moving.

[0260] The moving object may be a vehicle (for example, a car, an airplane, and the like), may be a moving object which moves unmanned (for example, a drone, an automatic operation car, and the like), or may be a robot (a manned type or unmanned type). Note that at least one of a base station and a mobile station also includes an apparatus which does not necessarily move during communication operation. For example, at least one of a base station and a mobile station may be an Internet of Things (IoT) device such as a sensor.

[0261] FIG. **10** is a diagram to show an example of a vehicle according to one embodiment. A vehicle **40** includes a driving section **41**, a steering section **42**, an accelerator pedal **43**, a brake pedal **44**, a shift lever **45**, right and left front wheels **46**, right and left rear wheels **47**, an axle **48**, an electronic control section **49**, various sensors (including a current sensor **50**, a rotational speed sensor **51**, a pneumatic sensor **52**, a vehicle speed sensor **53**, an acceleration sensor **54**, an accelerator pedal sensor **55**, a brake pedal sensor **56**, a shift lever sensor **57**, and an object detection sensor **58**), an information service section **59**, and a communication module **60**.

[0262] The driving section **41** includes, for example, at least one of an engine, a motor, and a hybrid of an engine and a motor. The steering section **42** at least includes a steering wheel, and is configured to steer at least one of the front wheels **46** and the rear wheels **47**, based on operation of the steering wheel operated by a user.

[0263] The electronic control section **49** includes a microprocessor **61**, a memory (ROM, RAM) **62**, and a communication port (for example, an input/output (IO) port) **63**. The electronic control section **49** receives, as input, signals from the various sensors **50** to **58** included in the vehicle. The electronic control section **49** may be referred to as an Electronic Control Unit (ECU).

[0264] Examples of the signals from the various sensors **50** to **58** include a current signal from the current sensor **50** for sensing current of a motor, a rotational speed signal of the front wheels **46**/rear wheels **47** acquired by the rotational speed sensor **51**, a pneumatic signal of the front wheels **46**/rear wheels **47** acquired by the pneumatic sensor **52**, a vehicle speed signal acquired by the vehicle speed sensor **53**, an acceleration signal acquired by the acceleration sensor **54**, a depressing amount signal of the accelerator pedal **43** acquired by the accelerator pedal sensor **55**, a depressing amount signal of the brake pedal **44** acquired by the brake pedal sensor **56**, an operation signal of the shift lever **45** acquired by the shift lever sensor **57**, and a detection signal for detecting an obstruction, a vehicle, a pedestrian, and the like acquired by the object detection sensor **58**.

[0265] The information service section **59** includes various devices for providing (outputting) various pieces of information such as drive information, traffic information, and entertainment information, such as a car navigation system, an audio system, a speaker, a display, a television, and a radio, and one or more ECUs that control these devices. The information service section **59** provides various pieces of information/services (for example, multimedia information/multimedia service) for an occupant of the vehicle **40**, using information acquired from an external apparatus via the communication module **60** and the like.

[0266] The information service section **59** may include an input device (for example, a keyboard, a mouse, a microphone, a switch, a button, a sensor, a touch panel, and the like) for receiving input from the outside, or may include an output device (for example, a display, a speaker, an LED lamp, a touch panel, and the like) for implementing output to the outside.

[0267] A driving assistance system section **64** includes various devices for providing functions for preventing an accident and reducing a driver's driving load, such as a millimeter wave radar, Light Detection and Ranging (LiDAR), a camera, a positioning locator (for example, a Global Navigation Satellite System (GNSS) and the like), map information (for example, a high definition (HD) map, an autonomous vehicle (AV) map, and the like), a gyro system (for example, an inertial measurement apparatus (inertial measurement unit (IMU)), an inertial navigation apparatus (inertial navigation system (INS)), and the like), an artificial intelligence (AI) chip, and an AI processor, and one or more ECUs that control these devices. The driving assistance system section **64** transmits and receives various pieces of information via the communication module **60**, and implements a driving assistance function or an autonomous driving function.

[0268] The communication module **60** can communicate with the microprocessor **61** and the constituent elements of the vehicle **40** via the communication port **63**. For example, via the communication port **63**, the communication module **60** transmits and receives data (information) to and from the driving section **41**, the steering section **42**, the accelerator pedal **43**, the brake pedal **44**, the shift lever **45**, the right and left front wheels **46**, the right and left rear wheels **47**, the axle **48**, the microprocessor **61** and the memory (ROM, RAM) **62** in the electronic control section **49**, and the various sensors **50** to **58**, which are included in the vehicle **40**.

[0269] The communication module **60** can be controlled by the microprocessor **61** of the electronic control section **49**, and is a communication device that can perform communication with an external apparatus. For example, the communication module **60** performs transmission and reception of various pieces of information to and from the external apparatus via radio communication. The communication module **60** may be either inside or outside the electronic control section **49**. The external apparatus may be, for example, the base station **10**, the user terminal **20**, or the

like described above. The communication module **60** may be, for example, at least one of the base station **10** and the user terminal **20** described above (may function as at least one of the base station **10** and the user terminal **20**).

[0270] The communication module **60** may transmit at least one of signals from the various sensors **50** to **58** described above input to the electronic control section **49**, information obtained based on the signals, and information based on an input from the outside (a user) obtained via the information service section **59**, to the external apparatus via radio communication. The electronic control section **49**, the various sensors **50** to **58**, the information service section **59**, and the like may be referred to as input sections that receive input. For example, the PUSCH transmitted by the communication module **60** may include information based on the input.

[0271] The communication module **60** receives various pieces of information (traffic information, signal information, inter-vehicle distance information, and the like) transmitted from the external apparatus, and displays the various pieces of information on the information service section **59** included in the vehicle. The information service section **59** may be referred to as an output section that outputs information (for example, outputs information to devices, such as a display and a speaker, based on the PDSCH received by the communication module **60** (or data/information decoded from the PDSCH)).

[0272] The communication module **60** stores the various pieces of information received from the external apparatus in the memory **62** that can be used by the microprocessor **61**. Based on the pieces of information stored in the memory **62**, the microprocessor **61** may perform control of the driving section **41**, the steering section **42**, the accelerator pedal **43**, the brake pedal **44**, the shift lever **45**, the right and left front wheels **46**, the right and left rear wheels **47**, the axle **48**, the various sensors **50** to **58**, and the like included in the vehicle **40**.

[0273] Furthermore, the base station in the present disclosure may be interpreted as a user terminal. For example, each aspect/embodiment of the present disclosure may be applied to the structure that replaces a communication between a base station and a user terminal with a communication between a plurality of user terminals (for example, which may be referred to as "Device-to-Device (D2D)," "Vehicle-to-Everything (V2X)," and the like). In this case, user terminals **20** may have the functions of the base stations **10** described above. The words such as "uplink" and "downlink" may be interpreted as the words corresponding to the terminal-to-terminal communication (for example, "sidelink"). For example, an uplink channel, a downlink channel and so on may be interpreted as a sidelink channel.

[0274] Likewise, the user terminal in the present disclosure may be interpreted as base station. In this case, the base station **10** may have the functions of the user terminal **20** described above.

[0275] Actions which have been described in the present disclosure to be performed by a base station may, in some cases, be performed by upper nodes of the base station. In a network including one or a plurality of network nodes with base stations, it is clear that various operations that are performed to communicate with terminals can be performed by base stations, one or more network nodes (for example, Mobility Management Entities (MMEs), Serving-Gateways (S-GWs), and so on may be possible, but these are not limiting) other than base stations, or combinations of these.

[0276] The aspects/embodiments illustrated in the present disclosure may be used individually or in combinations, which may be switched depending on the mode of implementation. The order of processes, sequences, flowcharts, and so on that have been used to describe the aspects/embodiments in the present disclosure may be re-ordered as long as inconsistencies do not arise. For example, although various methods have been illustrated in the present disclosure with various components of steps in exemplary orders, the specific orders that are illustrated herein are by no means limiting.

[0277] The aspects/embodiments illustrated in the present disclosure may be applied to Long Term Evolution (LTE), LTE-Advanced (LTE-A), LTE-Beyond (LTE-B), SUPER 3G, IMT-Advanced, 4th generation mobile communication system (4G), 5th generation mobile communication system (5G), 6th generation mobile communication system (6G), xth generation mobile communication system (xG (where x is, for example, an integer or a decimal)), Future Radio Access (FRA), New-Radio Access Technology (RAT), New Radio (NR), New radio access (NX), Future generation radio access (FX), Global System for Mobile communications (GSM (registered trademark)), CDMA 2000, Ultra Mobile Broadband (UMB), IEEE 802.11 (Wi-Fi (registered trademark)), IEEE 802.16 (WiMAX (registered trademark)), IEEE 802.20, Ultra-WideBand (UWB), Bluetooth (registered trademark), systems that use other adequate radio communication methods and next-generation systems that are enhanced, modified, created, or defined based on these. A plurality of systems may be combined (for example, a combination of LTE or LTE-A and 5G, and the like) and applied.

[0278] The phrase "based on" (or "on the basis of") as used in the present disclosure does not mean "based only on" (or "only on the basis of"), unless otherwise specified. In other words, the phrase "based on" (or "on the basis of") means both "based only on" and "based at least on" ("only on the basis of" and "at least on the basis of").

[0279] Reference to elements with designations such as "first," "second," and so on as used in the present disclosure does not generally limit the quantity or order of these elements. These designations may be used in the present disclosure only for convenience, as a method for distinguishing between two or more elements. Thus, reference to the first and second elements does not imply that only two elements may be employed, or that the first element must precede the second element in some way.

[0280] The term "judging (determining)" as in the present disclosure herein may encompass a wide variety of actions. For example, "judging (determining)" may be interpreted to mean making "judgments (determinations)" about judging, calculating, computing, processing, deriving, investigating, looking up, search and inquiry (for example, searching a table, a database, or some other data structures), ascertaining, and so on.

[0281] Furthermore, "judging (determining)" may be interpreted to mean making "judgments (determinations)" about receiving (for example, receiving information), transmitting (for example, transmitting information), input, output, accessing (for example, accessing data in a memory), and so on.

[0282] In addition, "judging (determining)" as used herein may be interpreted to mean making "judgments (determinations)" about resolving, selecting, choosing, establishing, comparing, and so on. In other words, "judging (determining)" may be interpreted to mean making "judgments (determinations)" about some action.

[0283] In addition, "judging (determining)" may be interpreted as "assuming," "expecting," "considering," and the like.

[0284] "The maximum transmit power" according to the present disclosure may mean a maximum value of the transmit power, may mean the nominal maximum transmit power (the nominal UE maximum transmit power), or may mean the rated maximum transmit power (the rated UE maximum transmit power).

[0285] The terms "connected" and "coupled," or any variation of these terms as used in the present disclosure mean all direct or indirect connections or coupling between two or more elements, and may include the presence of one or more intermediate elements between two elements that are "connected" or "coupled" to each other. The coupling or connection between the elements may be physical, logical, or a combination thereof. For example, "connection" may be interpreted as "access."

[0286] In the present disclosure, when two elements are connected, the two elements may be considered "connected" or "coupled" to each other by using one or more electrical wires, cables and printed electrical connections, and, as some non-limiting and non-inclusive examples, by using electromagnetic energy having wavelengths in radio frequency regions, microwave regions, (both visible and invisible) optical regions, or the like.

[0287] In the present disclosure, the phrase "A and B are different" may mean that "A and B are different from each other." Note that the phrase may mean that "A and B are each different from C." The terms "separate," "be coupled," and so on may be interpreted similarly to "different."

[0288] When terms such as "include," "including," and variations of these are used in the present disclosure, these terms are intended to be inclusive, in a manner similar to the way the term "comprising" is used. Furthermore, the term "or" as used in the present disclosure is intended to be not an exclusive disjunction.

[0289] For example, in the present disclosure, when an article such as "a," "an," and "the" in the English language is added by translation, the present disclosure may include that a noun after these articles is in a plural form.

[0290] In the present disclosure, "equal to or smaller than," "smaller than," "equal to or larger than," "larger than," "equal to," and the like may be interchangeably interpreted. In the present disclosure, words such as "good," "poor," "large," "small," "high," "low," "early," "late," "wide," "narrow," and the like may be interchangeably interpreted irrespective of positive degree, comparative degree, and superlative degree. In the present disclosure, expressions obtained by adding "i-th" (i is any integer) to words such as "good," "poor," "large," "small," "high," "low," "early," "late," "wide," "narrow," and the like may be interchangeably interpreted irrespective of positive degree, comparative degree, and superlative degree (for example, "highest" may be interpreted as "i-th highest," and vice versa).

[0291] In the present disclosure, "of," "for," "regarding," "related to," "associated with," and the like may be interchangeably interpreted.

[0292] Now, although the invention according to the present disclosure has been described in detail above, it should be obvious to a person skilled in the art that the invention according to the present disclosure is by no means limited to the embodiments described in the present disclosure. The invention according to the present disclosure can be implemented with various corrections and in various modifications, without departing from the spirit and scope of the invention defined by the recitations of claims. Consequently, the description of the present disclosure is provided only for the purpose of explaining examples, and should by no means be construed to limit. the invention according to the present disclosure in any way.

1. A terminal comprising:

a receiving section that receives configuration information for positioning included in a specific system information block (SIB), the configuration information being associated with a Public Land Mobile Network (PLMN) ID; and

a control section that performs, based on the configuration information, positioning-related control associated with the PLMN ID.

2. The terminal according to claim **1**, wherein

the specific SIB is a positioning SIB, and

the configuration information is at least one of information related to a positioning SIB type transmitted by using the positioning SIB and at least one specific parameter included in the information related to a positioning SIB type.

3. The terminal according to claim **1**, wherein

the PLMN ID is associated for each category of assistance data notified by using the SIB, for each type of the assistance data, or for each element of the assistance data.

4. The terminal according to claim **1**, wherein

the specific SIB is SIB1, and

the configuration information is at least one of scheduling information of positioning system information transmitted by using the SIB1 and at least one specific parameter included in the scheduling information of the positioning system information.

5. A radio communication method for a terminal, the radio communication method comprising:

receiving configuration information for positioning included in a specific system information block (SIB), the configuration information being associated with a Public Land Mobile Network (PLMN) ID; and

performing, based on the configuration information, positioning-related control associated with the PLMN ID.

6. A base station comprising:

a transmitting section that transmits configuration information for positioning included in a specific system information block (SIB), the configuration information being associated with a Public Land Mobile Network (PLMN) ID; and

a control section that indicates, by using the configuration information, positioning-related control associated with the PLMN ID.

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