(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 250 593 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
27.09.2023 Bulletin 2023/39

(21) Application number: **22783905.7**

(22) Date of filing: **28.03.2022**

(51) International Patent Classification (IPC):
H04B 7/185 *(2006.01)*

(86) International application number:
PCT/CN2022/083498

(87) International publication number:
WO 2022/213838 (13.10.2022 Gazette 2022/41)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **09.04.2021 CN 202110383608**

(71) Applicant: **IPlook Networks Co., Ltd.**
Guangzhou, Guangdong 510700 (CN)

(72) Inventors:
- **WU, Yunpu**
  Guangzhou, Guangdong 510700 (CN)
- **XIE, Wanyi**
  Guangzhou, Guangdong 510700 (CN)
- **ZHU, Youlin**
  Guangzhou, Guangdong 510700 (CN)
- **WANG, Zhen**
  Guangzhou, Guangdong 510700 (CN)
- **QIN, Hai**
  Guangzhou, Guangdong 510700 (CN)
- **BU, Zhanhui**
  Guangzhou, Guangdong 510700 (CN)

(74) Representative: **Meyer, Thorsten**
Meyer Patentanwaltskanzlei
Pfarrer-Schultes-Weg 14
89077 Ulm (DE)

(54) SATELLITE TERMINAL ACCESS MANAGEMENT METHOD, CORE NETWORK, COMPUTER APPARATUS, AND STORAGE MEDIUM

(57) The present application discloses a satellite terminal access management method in a space-ground integrated information network, a core network, a computer apparatus, and a storage medium. The satellite terminal access management method comprises the steps of: querying a redis database according to a first Beidou grid code corresponding to the location of a satellite terminal; determining a first tracking area code according to the query result; performing access management on the satellite terminal according to the first tracking area code, etc., wherein the redis database stores a mapping relationship between Beidou grid codes and tracking area codes in the form of a data relationship tree. By means of converting location information into tracking area codes applicable to a core network, the core network of the present application can conduct operations such as adding, deleting, modifying and checking according to a found first tracking area code, so as to further carry out the access management of a satellite terminal, avoid generating overly long links, and simplify the access matching process. The present application is widely used in the technical field of mobile communication.

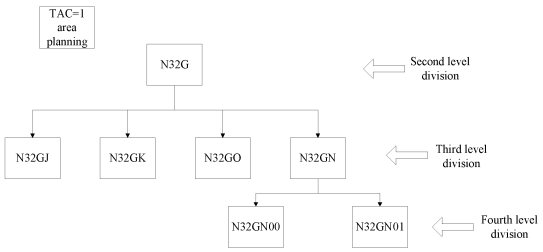

FIG. 1

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Description

CROSS-REFERENCE TO RELATED APPLICATION

[0001] The present application claims the priority of a Chinese patent application No. 202110383608.7, filed April 9, 2021, titled of "Satellite Terminal Access Management Method, Core Network, Computer Apparatus and Storage Medium", the entire content of which is incorporated herein by reference.

TECHNICAL FIELD

[0002] This application relates to the technical field of mobile communication, and in particular to a satellite terminal access management method in a space-ground integrated information network, a core network, a computer apparatus and a storage medium.

BACKGROUND

[0003] Space-ground integrated information network mainly consists of a core network, a space base station (communication satellite), a satellite terminal (mobile terminal) and other components. In the operation process of the space-ground integrated information network, it is necessary to carry out the process of satellite terminal accessing to the core network, which is also called the process of satellite terminal registering with the core network. In response to the access or registration request of the satellite terminal, the core network implements the access management strategy. Specifically, the location information of the satellite terminal is an important factor to be considered in the access management strategy, so it's required for the core network to determine the location information of the satellite terminal. However, longitude and latitude information is used in the positioning system of the satellite terminal, which does not match the common data format of the core network in the existing technical framework, it is difficult for the core network to perform operations such as create, retrieve, update or delete based on the longitude and latitude information, thus affecting the access management to the satellite terminal.

SUMMARY OF THE INVENTION

[0004] In view of at least one of the above technical problems, the purpose of this application is to provide a satellite terminal access management method in a space-ground integrated information network, a core network, a computer apparatus and a storage medium.

[0005] As one aspect, the embodiment of the present application includes a satellite terminal access management method in a space-ground integrated information network, including:

obtaining an access registration request submitted by a satellite terminal;

obtaining a first Beidou grid code corresponding to a location of the satellite terminal;

querying a redis database according to the first Beidou grid code, wherein the redis database is stored with mapping relationships between a plurality of Beidou grid codes and a plurality of tracking area codes in a form of a data relationship tree, the tracking area codes are located in a root node of the data relationship tree, and the Beidou grid codes are located in a leaf node of the data relationship tree;

determining a first tracking area code according to a query result of the redis database;

performing access management on the satellite terminal according to the first tracking area code.

[0006] As one aspect, the embodiment of the present application includes

[0007] Further, determining a first tracking area code according to a query result of the redis database includes:

when a corresponding tracking area code is found in the redis database, determining the corresponding tracking area code as the first tracking area code,

[0008] Further, determining a first tracking area code according to a query result of the redis database further includes:

when no corresponding tracking area code is found in the redis database, determining the first tracking area code according to the first Beidou grid code by using a longest path algorithm.

[0009] Further, determining the first tracking area code according to the first Beidou grid code by using a longest path algorithm includes:

finding a target Beidou grid code from the plurality of Beidou grid codes stored in the redis database, wherein a longest path is formed between the target Beidou grid code and the first Beidou grid code;

determining the tracking area code in the data relationship tree where the target Beidou grid code is located as the first tracking area code.

[0010] Further, performing access management on the satellite terminal according to the first tracking area code includes:

when the first tracking area code is detected in a preset restriction list, performing restricted access on the satellite terminal.

[0011] Further, the satellite terminal access management method in a space-ground integrated information network further includes:

obtaining an electronic map;

converting longitude and latitude information in the electronic map into Beidou grid codes;

generating the data relationship tree according to the Beidou grid code which are planned and conversed based on tracking area codes, wherein the data relationship tree is configured to represent map-

ping relationships between the Beidou grid codes and the tracking area codes;

storing the data relationship tree into the redis database.

[0012] As another aspect, the embodiment of the present application includes a core network configured to implement the satellite terminal access management method.

[0013] As one more aspect, the embodiment of the present application includes a computer apparatus including a memory for storing at least one program and a processor for loading at least one program to execute the satellite terminal access management method when executed by a processor

[0014] As one more aspect, the embodiment of the present application includes a storage medium having a processor-executable program stored thereon, and the processor-executable program configured to implement the satellite terminal access management method when executed by a processor.

[0015] The beneficial effects of this application follow. The satellite terminal access management method according to the present embodiment converts the location information used in the positioning system of the satellite terminal into the tracking area code applicable to the core network, accordingly the core network may perform operations such as create, retrieve, update or delete based on the first tracking area code found, so as to perform access management on the satellite terminal. The method can avoid every query of electronic map and every area matching with UDM of satellite terminal for each online satellite terminal, thereby avoiding excessively long links and simplifying the access matching process.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] FIG. 1 and FIG. 2 are schematic diagrams of a data relationship tree according to an embodiment of the present application.

DETAILED DESCRIPTION OF ILLUSTRATED EMBODIMENTS

[0017] In the present embodiment, a satellite terminal access management method in a space-ground integrated information network may be implemented by a 5G core network or other more advanced core networks. Specifically, the satellite terminal access management method may be implemented by a specific network element in the core network, such as an AMF network element, or by a special computer apparatus.

[0018] The satellite terminal access management method in a space-ground integrated information network includes the following steps:

S1, obtaining an access registration request submitted by a satellite terminal;

S2, obtaining a first Beidou grid code corresponding to a location of the satellite terminal;

S3, querying a redis database according to the first Beidou grid code, wherein the redis database is stored with mapping relationships between a plurality of Beidou grid codes and a plurality of tracking area codes in a form of a data relationship tree, the tracking area codes are located in a root node of the data relationship tree, and the Beidou grid codes are located in a leaf node of the data relationship tree;

S4, determining a first tracking area code according to a query result of the redis database; and

S5, performing access management on the satellite terminal according to the first tracking area code.

[0019] In the present embodiment, before performing Steps S1-S5, a redis database may be established, by the following steps:

P1, obtaining an electronic map;

P2, converting longitude and latitude information in the electronic map into Beidou grid codes;

P3, generating the data relationship tree according to the Beidou grid codes which are planned and conversed based on the tracking area code, wherein the data relationship tree is configured to represent mapping relationships between the Beidou grid codes and the tracking area codes;

P4, storing the data relationship tree into the redis database.

[0020] In Step P1, the core network obtains the electronic map for the usually active area of the satellite terminal at the initialization stage, and the electronic map contains longitude and latitude information described for the locations of various points.

[0021] In Step P2, the longitude and latitude information is converted into Beidou grid codes such as in the form of N32G, according to the technical specifications of the Beidou navigation system. In the present embodiment, Beidou grid codes such as N32G, N32GJ, N32GK, N32GO, N32GN, N32GN00 and N32GN01 may be converted and obtained through the core network, and the areas represented by these Beidou grid codes are all located in the same area which is proceeded with the first level division according to a tracking area code (TAC). Specifically, the area with the Beidou grid codes N32G and N32H are located in the same area with the tracking area code of 1, codes N32H and N32G belong to the second level division for this area, and codes N32GJ, N32GK, N32GO and N32GN belong to the third level division for the corresponding area of code N32G, and codes N32GN00 and N32GN01 belong to the fourth level division for the corresponding area of code N32GN. Referring to FIG. 1 and FIG. 2, these tracking area codes and Beidou grid codes form a tree-like data structure. The tracking area codes are located at the root node of the data relationship tree, and the Beidou grid codes are

located at the leaf node of the data relationship tree. A tracking area code corresponding to a known Beidou grid code may be queried in the data relationship tree.

[0022] In Step P3 and P4, the mapping relationships between Beidou grid codes and tracking area codes are stored in the redis database in the form of data relationship tree as shown in FIG. 1 and FIG. 2, by the core network.

[0023] After Steps P1-P4 are executed, the core network obtains a redis database stored with the data relationship tree, in which the mapping relationships between a plurality of Beidou grid codes and a plurality of tracking area codes are stored. Steps S1-S5 may be executed based on Steps P1-P4.

[0024] In Step S1, the core network obtains the access registration request submitted by the satellite terminal through the communication satellite. Specifically, the satellite terminal sends the access registration request to the communication satellite, and then the communication satellite sends the access registration request to the core network. The access registration request may include location information of the satellite terminal.

[0025] In Step S2, the first Beidou grid code may be directly collected or generated by the satellite terminal, or obtained according to the longitude and latitude information of the satellite terminal through its own positioning system. When the longitude and latitude information is included in the access registration request, it's necessary for the core network to convert the longitude and latitude information into the format of Beidou grid code, so as to obtain the first Beidou grid code.

[0026] In Step S3, the redis database obtained in Steps P1-P4 is queried, by taking the first Beidou grid code as a query condition. Once a Beidou grid code identical with the first Beidou grid code is found in the redis database, the corresponding tracking area code can be queried, that's because a many-to-one relationship between Beidou grid codes and tracking area codes is presented in the redis database. Therefore, the query results of redis database include that: the first tracking area code corresponding to the first Beidou grid code is found in the redis database; or no first tracking area code corresponding to the first Beidou grid code is found in the redis database.

[0027] For example, in the case that the redis database only stores the data relationship tree shown in FIG. 1 and FIG. 2, when the first Beidou grid code is N32GN01, then the corresponding first tracking area code is queried as TAC=1. When the first Beidou grid code is N32GN02, then no corresponding first tracking area code is queried. In this case, the first tracking area code may be determined by using a longest path algorithm according to the first Beidou grid code. Specifically, a target Beidou grid code can be found out from the plurality of Beidou grid codes stored in the redis database, wherein the longest path is formed between the target Beidou grid code and the first Beidou grid code. For example, in all the Beidou grid codes shown in FIG. 1 and FIG. 2, the path formed between the Beidou grid code N32GK and the first Beidou grid code N32GN02 is longer than that formed between the first Beidou grid code N32GN02 and any of other Beidou grid codes, then the Beidou grid code N32GK is determined as the target Beidou grid code in this embodiment, and the tracking area code in the data relationship tree where the target Beidou grid code N32GK is located (i.e., the data relationship tree shown in FIG. 1 and FIG. 2) is TAC=1, so the tracking area code TAC=1 is determined as the first tracking area code.

[0028] By using the longest path algorithm to determine the first tracking area code according to the first Beidou grid code, the first Beidou grid code can be still matched to the corresponding first tracking area code when no Beidou grid code identical with the first Beidou grid code exists in the data relationship tree. Moreover, since there is the longest path between the first Beidou grid code and the target Beidou grid code, interference in the matching process can be avoided.

[0029] In the present embodiment, by executing Steps S1-S4, the core network converts the location information used in the positioning system of the satellite terminal into the tracking area code applicable to the core network, accordingly the core network may perform operations such as create, retrieve, update or delete based on the first tracking area code found, so as to further perform access management on the satellite terminal. Specifically, the core network may query whether the first tracking area code exists in a preset restriction list. If the first tracking area code exists in the restriction list, the core network restricts the access to satellite terminals. If the first tracking area code is not found in the restriction list, the core network allows the access and registration of satellite terminals. Based on the above, optionally, the core network may also determine whether to perform paging or differential charging operations and the like on the satellite terminal, by judging whether the first tracking area code exists in other lists.

[0030] Differing from the technical scheme in the prior art which determines the location of the satellite terminal by querying the electronic map so as to determine whether the satellite terminal access is restricted, the satellite terminal access management method according to the present embodiment can avoid every query of electronic map and every area matching with UDM of satellite terminal for each on-line satellite terminal, so as to avoid excessively long links and simplify the access matching process.

[0031] A Computer program can be written according to the satellite terminal access management method in the present embodiment, into a memory of a computer apparatus or an independent storage medium. After the computer program is read, a processor can be instructed to execute the satellite terminal access management method in the embodiment, so as to achieve the same technical effect as the method embodiment.

[0032] It should be noted that, unless otherwise specified, when one feature is described to be "fixed" or "connected" to another feature, these features may be directly

or indirectly fixed or connected. In addition, the position descriptions of "up", "down", "left" and "right" used in this disclosure are only used in terms of the positions of the components in the attached drawings. Singular forms of "a", "an", "one", "said" and "the" in the disclosure are also intended to include their plural forms, unless the context clearly indicates otherwise. In addition, unless otherwise specified, all technical and scientific terms used in these embodiments have the same meaning as would normally be understood by a person skilled in the technical field. The terms used in these embodiments statement are intended only to describe specific embodiments and are not intended to restrict this application. The term "and/or" as used in this embodiment may include any combination of one or more related listed items.

[0033] It should be understood that although the terms first, second, third, etc. may be used to describe various components in this disclosure, these components should not be limited to these terms. These terms are used only to distinguish components of the same type from each other. For example, the first component may also be referred to as the second component, and similarly the second binary component may be referred to as the first component, without leaving the scope of this disclosure. The use for any or all examples or exemplary language ("for example", "such as", etc.) provided by this disclosure is intended only to better illustrate the embodiments of this application and does not limit the scope of this application, unless otherwise required.

[0034] It should be recognized that embodiments of this application may be realized or implemented by computer hardware, a combination of hardware and software, or computer instructions stored in a non-temporary computer readable memory. The method may be implemented in a computer program using standard programming techniques including a non-temporary computer readable storage medium configured with a computer program, and the storage medium is configured to enable the computer to operate in a specific and predefined manner according to the method described in the specific embodiment and the accompanying drawings. Each program may be implemented in a high-level procedural or object-oriented programming language to communicate with computer systems. However, the program may be implemented in assembly or machine language if desired. In any case, the language may be a compiled or interpreted language. In addition, the program may be run on a programmed ASIC for this purpose.

[0035] Furthermore, the operations of the processes described in this embodiment may be performed in any appropriate order, unless otherwise directed by this embodiment or otherwise clearly contradicted by the context. The procedures described in this embodiment (or variations and/or combinations thereof) may be executed under the control of one or more computer systems configured with executable instructions and may be implemented as code (e.g., executable instructions, one or more computer programs, or one or more applications) jointly executed on one or more processors, by hardware or a combination thereof. The computer program may include multiple instructions that may be executed by one or more processors.

[0036] Further, the method may be operationally connected to any type of suitable computing platform, including but not limited to personal computers, minicomputers, mainframes, workstations, networks or distributed computing environments, separate or integrated computer platforms, or communications with charged particle tools or other imaging devices. All aspects of this application may be implemented in machine-readable code stored on non-temporary storage media or devices, whether removable or integrated into a computing platform, such as a hard disk, an optical read and/or write storage media, a RAM, a ROM, etc., may be readable by a programmable computer. The storage medium or devices, when read by the computer, may be configured to operate the computer to perform the process described here. In addition, all or parts of machine-readable codes may be transmitted over wired or wireless networks. Where such media include instructions or programs that implement the steps described above in combination with a microprocessor or other data processors, the application described in the embodiments may include these and other different types of non-temporary computer readable storage media. This application also includes the computer itself when programmed in accordance with the methods and techniques described in this application.

[0037] A computer program may be applied to the input data to perform the function described in this embodiment, thereby transforming the input data to generate output data stored in a non-volatile memory. The output information may also be applied to one or more output devices such as displays. In the preferred embodiment of this application, the transformed data represents physical and tangible objects, including specific visual depictions of physical and tangible objects generated on the displays.

[0038] The above mentioned are only better embodiments of this application, and this application is not limited to the above embodiments. Any modifications, equivalent replacements improvements made within the spirit and principles of this application to achieve the same technical effects by the same means shall be included in the scope of protection of this application. The technical scheme and/or implementation mode may be modified and varied in a variety of ways within the protection scope of this application.

Claims

1. A satellite terminal access management method in a space-ground integrated information network, comprising:

   obtaining an access registration request submit-

ted by a satellite terminal;
obtaining a first Beidou grid code corresponding to a location of the satellite terminal;
querying a redis database according to the first Beidou grid code, wherein the redis database is stored with mapping relationships between a plurality of Beidou grid codes and a plurality of tracking area codes in a form of a data relationship tree, the tracking area codes are located in a root node of the data relationship tree, and the Beidou grid codes are located in a leaf node of the data relationship tree;
determining a first tracking area code according to a query result of the redis database;
performing access management on the satellite terminal according to the first tracking area code.

2. The satellite terminal access management method in a space-ground integrated information network according to claim 1, wherein said determining a first tracking area code according to a query result of the redis database comprises:
when a corresponding tracking area code is found in the redis database, determining the corresponding tracking area code as the first tracking area code.

3. The satellite terminal access management method in a space-ground integrated information network according to claim 2, wherein said determining a first tracking area code according to a query result of the redis database further comprises:
when no corresponding tracking area code is found in the redis database, determining the first tracking area code according to the first Beidou grid code by using a longest path algorithm.

4. The satellite terminal access management method in a space-ground integrated information network according to claim 3, wherein said determining the first tracking area code according to the first Beidou grid code by using a longest path algorithm comprises:

finding a target Beidou grid code from the plurality of Beidou grid codes stored in the redis database, wherein a longest path is formed between the target Beidou grid code and the first Beidou grid code;
determining the tracking area code in the data relationship tree where the target Beidou grid code is located as the first tracking area code.

5. The satellite terminal access management method in a space-ground integrated information network according to claim 1, wherein said performing access management on the satellite terminal according to the first tracking area code comprises:
when the first tracking area code is detected in a preset restriction list, performing restricted access on the satellite terminal.

6. The satellite terminal access management method in a space-ground integrated information network according to any of claims 1-5, further comprising:

obtaining an electronic map;
converting longitude and latitude information in the electronic map into Beidou grid codes;
generating the data relationship tree according to the Beidou grid code which are planned and conversed based on tracking area codes, wherein the data relationship tree is configured to represent mapping relationships between the Beidou grid codes and the tracking area codes;
storing the data relationship tree into the redis database.

7. A core network, **characterized in that**, the core network is configured to implement the satellite terminal access management method in a space-ground integrated information network according to any of claims 1-6.

8. A computer apparatus, comprising a memory for storing at least one program and a processor for loading said at least one program to execute the method according to any of claims 1-6 when executed by a processor.

9. A storage medium, having a processor-executable program stored thereon, and the processor-executable program being configured to implement the method according to any of claims 1-6 when executed by a processor.

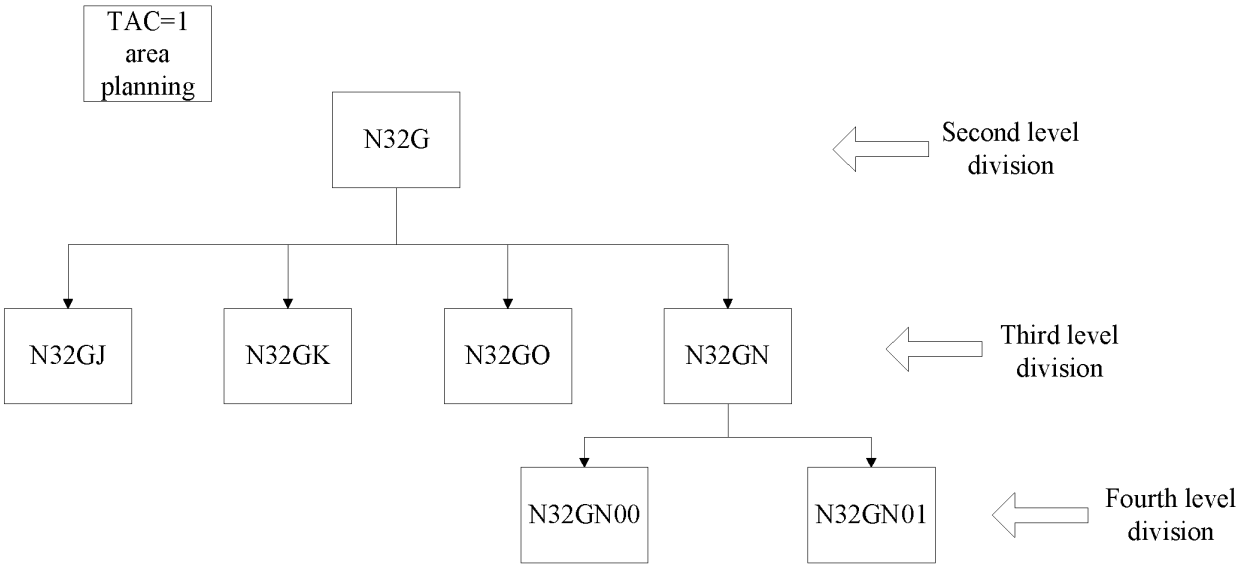
TAC=1 area planning
N32G
Second level division
N32GJ
N32GK
N32GO
N32GN
Third level division
N32GN00
N32GN01
Fourth level division

FIG. 1

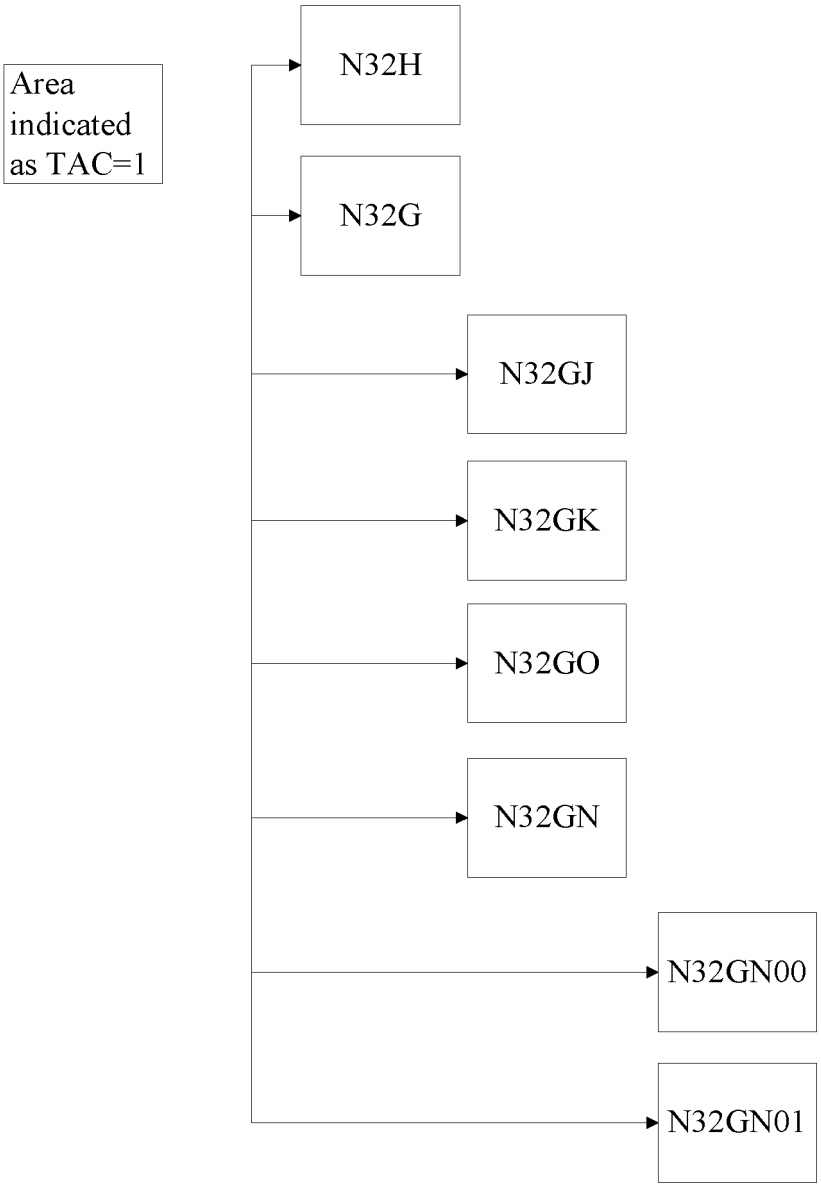
Area indicated as TAC=1
N32H
N32G
N32GJ
N32GK
N32GO
N32GN
N32GN00
N32GN01

FIG. 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2022/083498

A. CLASSIFICATION OF SUBJECT MATTER

H04B 7/185(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNTXT; EPTXT; USTXT; WOTXT; CNABS; VEN; CNKI: 卫星, 终端, 北斗, 网格码, 接入, 跟踪区域码, satellite, terminal, beidou, network, grid, code, access, track, area

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 113179489 A (GUANGZHOU IPLOOK TECHNOLOGIES CO., LTD.) 27 July 2021 (2021-07-27) claims 1-9	1-9
A	CN 112015851 A (GEOVIS TECHNOLOGY CO., LTD.) 01 December 2020 (2020-12-01) entire description	1-9
A	CN 111586582 A (HUAWEI TECHNOLOGIES CO., LTD.) 25 August 2020 (2020-08-25) description, paragraph [0068]	1-9
A	US 2015163867 A1 (RECKER, M. V et al.) 11 June 2015 (2015-06-11) entire description	1-9

☐ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
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"P" document published prior to the international filing date but later than the priority date claimed

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
07 June 2022	**14 June 2022**
Name and mailing address of the ISA/CN **China National Intellectual Property Administration (ISA/CN)** **No. 6, Xitucheng Road, Jimenqiao, Haidian District, Beijing 100088, China** Facsimile No. **(86-10)62019451**	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2022/083498

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 113179489 A	27 July 2021	None	
CN 112015851 A	01 December 2020	None	
CN 111586582 A	25 August 2020	None	
US 2015163867 A1	11 June 2015	US 2018184506 A1	28 June 2018
		US 10912178 B1	02 February 2021
		US 2018263098 A1	13 September 2018
		US 10999914 B1	04 May 2021
		US 2016249439 A1	25 August 2016
		US 2018249561 A1	30 August 2018
		US 10448491 B1	15 October 2019
		US 2018295706 A1	11 October 2018
		US 2018049300 A1	15 February 2018
		US 2012080944 A1	05 April 2012
		US 2018192501 A1	05 July 2018
		US 2018177032 A1	21 June 2018

Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CN 202110383608 **[0001]**