

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 182026WO	FOR FURTHER ACTION		See Form PCT/IPEA/416
International application No. PCT/EP2019/058530	International filing date (day/month/year) 04.04.2019	Priority date (day/month/year) 05.04.2018	
International Patent Classification (IPC) or national classification and IPC INV. H04W8/26			
Applicant Nokia Technologies Oy			
1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36. 2. This REPORT consists of a total of <u>5</u> sheets, including this cover sheet. 3. This report is also accompanied by ANNEXES, comprising: a. ☒ (sent to the applicant and to the International Bureau) a total of <u>8</u> sheets, as follows: ☒ sheets of the description, claims and/or drawings which have been amended and/or sheets containing rectifications authorized by this Authority, unless those sheets were superseded or cancelled, and any accompanying letters (see Rules 46.5, 66.8, 70.16, 91.2, and Section 607 of the Administrative Instructions). ☐ sheets containing rectifications, where the decision was made by this Authority not to take them into account because they were not authorized by or notified to this Authority at the time when this Authority began to draw up this report, and any accompanying letters (Rules 66.4bis, 70.2(e), 70.16 and 91.2). ☐ superseded sheets and any accompanying letters, where this Authority either considers that the superseding sheets contain an amendment that goes beyond the disclosure in the international application as filed, or the superseding sheets were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in item 4 of Box No. I and the Supplemental Box (see Rule 70.16(b)). b. ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing, in the form of an Annex C/ST.25 text file, as indicated in the Supplemental Box Relating to Sequence Listing (see paragraph 3ter of Annex C of the Administrative Instructions).			
4. This report contains indications relating to the following items: ☒ Box No. I Basis of the report ☐ Box No. II Priority ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability ☐ Box No. IV Lack of unity of invention ☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement ☐ Box No. VI Certain documents cited ☐ Box No. VII Certain defects in the international application ☐ Box No. VIII Certain observations on the international application			
Date of submission of the demand 14.01.2020		Date of completion of this report 29.09.2020	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Fax: +49 89 2399 - 4465		Authorized officer Domingos, Luis Telephone No. +49 89 2399-7802	



INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/EP2019/058530

Box No. I Basis of the report

1. With regard to the **language**, this report is based on
- ☒ the international application in the language in which it was filed
 - ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of:
 - ☐ international search (under Rules 12.3(a) and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4(a))
 - ☐ international preliminary examination (under Rules 55.2(a) and/or 55.3(a) and (b))
2. With regard to the **elements*** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

Description, Pages

1, 3-16	as originally filed	
2, 2a	filed with the letter of	10-08-2020

Claims, Numbers

1-23	filed with the letter of	10-08-2020
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Drawings, Sheets

1/8-8/8	as originally filed	
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- ☐ a sequence listing - see Supplemental Box Relating to Sequence Listing.
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since either they are considered to go beyond the disclosure as filed, or they were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in the Supplemental Box (Rules 70.2(c) and (c-bis)):
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
5. ☐ This report has been established:
- ☐ taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rules 66.1(d-bis) and 70.2(e)).
 - ☐ without taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91(Rules 66.4bis and 70.2(e)).

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6. ☒ With regard to top-up searches (Rules 66.1 *ter* and 70.2(f)):
- ☒ A top-up search was carried out by this Authority on 31.08.2020 (all discovered documents are listed in the Supplemental Box Relating to Top-up Search).
 - ☐ Additional relevant documents have been discovered during the top-up search.
 - ☐ No top-up search was carried out by this Authority because it would serve no useful purpose.
7. ☐ Supplementary international search report(s) from Authority(ies) has/have been received and taken into account in establishing this report (Rule 45bis.8(b) and (c)).

* If item 4 applies, some or all of those sheets may be marked "superseded".

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	<u>1-23</u>
	No: Claims	
Inventive step (IS)	Yes: Claims	<u>1-23</u>
	No: Claims	
Industrial applicability (IA)	Yes: Claims	<u>1-23</u>
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

1 **Re Item V**

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1.1 Reference is made to the following documents:

- D1 "3rd Generation Partnership Project; Technical Specification Group Core Network and Terminals; Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3 (Release 15)",
3GPP STANDARD; TECHNICAL SPECIFICATION; 3GPP TS 24.501, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE, vol. CT WG1, no. V1.0.0, 15 March 2018 (2018-03-15), pages 1-253, XP051450452,
[retrieved on 2018-03-15]
- D2 WO 2014/053197 A1 (ERICSSON TELEFON AB L M [SE]) 10 April 2014 (2014-04-10)
- D3 NOKIA ET AL: "23.501: SUPI terminology correction",
3GPP DRAFT; S2-175964 (SUPI CORRECTION 23.501), 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE
,
vol. SA WG2, no. Sophia Antipolis, France; 20170821 - 20170825 21 August 2017 (2017-08-21), XP051325809,
Retrieved from the Internet:
URL:http://www.3gpp.org/ftp/Meetings_3GPP_SYNC/SA2/Docs/
[retrieved on 2017-08-21]
- D4 SA WG3: "[DRAFT] LS on Security aspects of ECIES for concealing IMSI or SUPI",
3GPP DRAFT;
S3-171789_DRAFT_LS_OUT_ETSI_SAGE_SUCI_SCHEMES, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE
,

vol. SA WG3, no. Dali, China; 20170807 - 20170811 31 July 2017
(2017-07-31), XP051312271,
Retrieved from the Internet:
URL: [http://www.3gpp.org/ftp/tsg_sa/WG3_Security/
TSGS3_88_Dali/Docs/](http://www.3gpp.org/ftp/tsg_sa/WG3_Security/TSGS3_88_Dali/Docs/)
[retrieved on 2017-07-31]

- 1.2 Sections 9.8.3.3 and 9.8.3.4 of pages 195-197 of document D1 represent the closest prior-art to claims 1, 22 and 23 because they describe the procedure for a UE requesting (see section 9.8.3.3) and obtaining (see section 9.8.3.4) a particular type of mobile identity among two or more existing identity types.
- 1.3 The subject-matter of claims 1, 22 and 23 differs from the disclosure of D1 in that **the UE generates a data structure usable for network access authentication and comprising a plurality of fields specifying a selected subscription identifier type and its associated parameters**.
- 1.4 In view of the technical effect obtained by this difference of **enabling successful authentication of the UE regardless of the identity type used for network access**, it is legitimate to assume that that was the problem underlying the present application.
- 1.5 When confronted with the problem above referred, the skilled person would review the relevant technical literature and would certainly come across document D2, which discloses (see paragraphs 70-73) a Gx interface protocol comprising a data structure comprising a plurality of fields specifying a selected subscription identifier type and its associated parameters.
- 1.6 However, as the data structure of document D2 is for use in the Gx interface only (i. e., for network use) and not at all intended to be used by the UE (in paragraph 67, the UE is described as including the IMSI in a request message), no hint is provided to the skilled person to implement the generation of that data structure in the UE as claimed.
- 1.7 Consequently, an inventive step within the meaning of Article 33(3) PCT is acknowledged for claims 1, 22 and 23, being extendable to the dependent claims 2-21.

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August 10, 2020

Your reference

Our reference
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International Patent Application PCT/EP2019/058530

Applicant: Nokia Technologies OY

Title: UNIFIED SUBSCRIPTION IDENTIFIER MANAGMENT IN COMMUNICATION SYSTEMS

In response to the office action dated July 10, 2020:

A set of amended claims 1 to 23 (intended to replace previous claims 1 to 23) is provided.

Further, amended pages 2 and 2a of the description are provided, intended to replace originally filed pages 2 and 2a.

The set of amended claims and the amended pages of the description are provided in a clean version, and in a version in which changes in comparison to the originally filed set of claims and pages of the description are highlighted.

It is kindly requested to proceed with the examining procedure based on the set of amended claims and the comments below.

I. Disclosure of the amendments

The new independent claim 1 is based on the previous claim 1, wherein the term "*selected subscription identifier field*" is changed to "*selected subscription identifier type*", as proposed in item 1.5 of the written opinion of the international preliminary examining authority, and as was claimed in the originally filed independent apparatus claim 22.

Patent- und Rechtsanwälte

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The new claims 2 to 21 correspond to the previous claims 2 to 21.

The new independent claim 22 is based on the previous claim 22, wherein the term "*selected subscription identifier field*" is changed to "*selected subscription identifier type*", as proposed in item 1.5 of the written opinion of the international preliminary examining authority, and as was claimed in the originally filed independent method claim 1.

The new independent claim 23 is based on the previous claim 23, wherein the term "*selected subscription identifier field*" is changed to "*selected subscription identifier type*", as proposed in item 1.5 of the written opinion of the international preliminary examining authority, and as was claimed in the originally filed independent method claim 23.

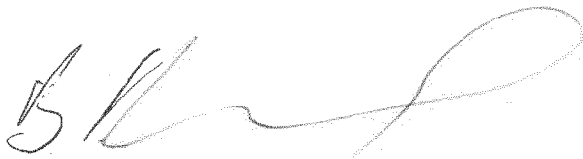
II. Patentability

With regard to item 2.3.3 of the written opinion, Applicant thanks for the proposal of amending the independent claims along the lines of example under item 1.5 of the same written opinion. Applicant has incorporated the proposal of item 1.5 into the independent claims on a word-by-word basis of the proposal.

Further, as stated in item 2.3.3, the description is brought into conformity with the new demand of the independent claims.

III. Final remarks

As a next step, corresponding to item 2.3.3 of the written opinion, it is kindly requested to issue a positive IPER.



Björn Brouwers

Patent Attorney

Enclosure

Set of amended claims (clean version and tracked changes version)

Amended pages of the description (clean version and tracked changes version)

access point (e.g., gNB) provides access for the UE to a core network (CN), which then provides access for the UE to other UEs and/or a data network such as a packet data network (e.g., Internet). Furthermore, 5G network access procedures are described in 3GPP Technical Specification (TS) 23.502, V15.1.0, entitled "Technical Specification Group Services and System Aspects; Procedures for the 5G System," the disclosure of which is incorporated by reference herein in its entirety. Still further, 3GPP Technical Specification (TS) 33.501, V0.7.0, entitled "Technical Specification Group Services and System Aspects; Security Architecture and Procedures for the 5G System," the disclosure of which is incorporated by reference herein in its entirety, further describes security management details associated with a 5G network.

In 5G networks, a 5G compatible UE may include a Concealed Subscription Identifier (SUCI) as described in 3GPP TS 33.501 during the Registration Request procedure described in 3GPP TS 23.502. SUCI is the concealed (encrypted) form of the Subscriber Permanent Identifier (SUPI). In the legacy 4G (LTE) networks, the subscription identifier used is an International Mobile Station Identifier (IMSI) as defined in 3GPP Technical Specification (TS) 23.003, V15.3.0, entitled "Technical Specification Group Core Network and Terminals; Numbering, Addressing and Identification," the disclosure of which is incorporated by reference herein in its entirety. Management of such subscription identifiers can present significant challenges.

3GPP; Technical Specification Group Core Network and Terminals; Non-Access-Stratum (NAS) protocol for 5G Systems (5GS); Stage 3 (Release 15) discloses a method for a User Equipment requesting and obtaining a particular type of mobile identity among existing identity types.

WO 2014/053197 A1 discloses a method of policy control and further discloses enhanced apparatuses enabling the support of user community profiles that apply to a plurality of subscribers. Further, the generation and enforcement of community policy and charging rules derived from the user community profiles and preferably installed upon establishment of a session for a first user is disclosed. Sessions to be established for subsequent users of the plurality of users can be enforced with said community policy and charging rules can be enabled without needs for handling them on an individual basis.

3GPP; 23.501: SUPI terminology correction; 3GPP draft discloses a "Subscriber Permanent Identifier" so that a globally unique 5G Subscriber Permanent Identifier (SUPI) can be allocated to each subscriber in the 5G system.

5 3GPP; SA WG3; LS on Security aspects of ECIES for concealing IMSI or SUPI discloses next generation of mobile networks (called the 5G). A new and general term called the SUPI (Subscription Permanent Identifier) is disclosed which is proposed to be used to denote the globally unique 5G subscription permanent identifier. D4 further proposes to conceal IMSI or SUPI over-the-air in 5G by the ECIES (Elliptic Curve Integrated Encryption
10 Scheme).

Summary

Illustrative embodiments provide improved techniques for managing subscription identifiers in communication systems.

15 For example, in one illustrative embodiment, a method comprises the following step. At given user equipment in a wireless communication system, a unified subscription identifier data structure is constructed. The unified subscription identifier data structure is stored. The unified subscription identifier data structure comprises a plurality of fields that specify a selected one of two or more subscription identifier fields associated with a selected
20 subscription identifier type. The selected one of two or more subscription identifier fields in the unified subscription identifier data structure is used to access one or more networks associated with the wireless

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Amended Claims

What is claimed is:

1. A user equipment (102, 202) for a wireless communication system (100, 200), comprising a processor (212) and memory (216) configured to perform:

5 construct, at the user equipment (102, 202) in the wireless communication system (100, 200), a unified subscription identifier data structure;

 store the unified subscription identifier data structure (400, 600), wherein the unified subscription identifier data structure (400, 600) comprises a plurality of fields (402-426, 602-616) that specify a selected one of two or more subscription identifier fields (300, 310, 320) associated with a selected subscription identifier type; and

10 use the selected one of two or more subscription identifier fields (300, 310, 320) in the unified subscription identifier data structure (400, 600) to access one or more networks associated with the wireless communication system (100, 200) based on an authentication scenario corresponding to the selected subscription identifier type.

15 2. The user equipment (102, 202) of claim 1, wherein the plurality of fields (402-426, 602-616) comprises a subscription identifier type field (414, 608).

20 3. The user equipment (102, 202) of claim 2, wherein a subscription identifier type is selectable from a group comprising a Concealed Subscription Identifier, SUCI, a Subscriber Permanent Identifier, SUPI, and an International Mobile Station Identifier, IMSI.

 4. The user equipment (102, 202) of claim 1, wherein the plurality of fields (402-426, 602-616) comprises a network entity selection parameter field (406, 606).

25 5. The user equipment (102, 202) of claim 4, wherein a network entity (104, 204) performs one or more of a unified data management, UDM, function and an authentication server function, AUSF.

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6. The user equipment (102, 202) of claim 1, wherein the plurality of fields (402-426) comprises an encryption on/off field (408).

7. The user equipment (102, 202) of claim 6, wherein the plurality of fields (402-426) comprises an encryption algorithm identifier field (426).

8. The user equipment (102, 202) of claim 1, wherein the plurality of fields (402-426) comprises a key derivation function field (410).

9. The user equipment (102, 202) of claim 8, wherein the plurality of fields (402-426) comprises a key derivation function parameter field (412).

10. The user equipment (102, 202) of claim 1, wherein the plurality of fields (402-426, 602-616) comprises a mobile country code field (402, 602).

11. The user equipment (102, 202) of claim 1, wherein the plurality of fields (402-426, 602-616) comprises a mobile network code field (404, 604).

12. The user equipment (102, 202) of claim 1, wherein the plurality of fields (402-426) comprises a field specifying a selected curve from an elliptic curve integrated encryption scheme (416).

13. The user equipment (102, 202) of claim 1, wherein the plurality of fields (402-426) comprises an ephemeral public key pair field (418).

14. The user equipment (102, 202) of claim 1, wherein the plurality of fields (402-426, 602-616) comprises a field specifying a length of an encrypted Mobile Station Identification Number, MSIN, field (420, 610).

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15. The user equipment (102, 202) of claim 14, wherein the plurality of fields (402-426, 602-616) comprises an encrypted MSIN field (422, 612).

16. The user equipment (102, 202) of claim 14, wherein the plurality of fields (402-426, 602-616) comprises an MSIN message authentication code field (424, 614).

17. The user equipment (102, 202) of claim 1, wherein the wireless communication system (100, 200) comprises a 5G system.

18. The user equipment (102, 202) of claim 1, further comprising sending the unified subscription identifier data structure (400, 600) to at least one network entity (104, 204) in the wireless communication system (100, 200) to gain access to the one or more networks associated with the wireless communication system (100, 200).

19. The user equipment (102, 202) of claim 1, wherein the plurality of fields (602-616) comprises a profile selection field (616).

20. The user equipment (102, 202) of claim 19, wherein the profile selection field (616) enables the user equipment (102, 202) to notify one or more network entities in the one or more networks associated with the wireless communication system (100, 200) to use pre-established values for one or more selectable parameters associated with the selected subscription identifier field (300, 310, 320).

21. The user equipment (102, 202) of claim 20, further comprising sending the unified subscription identifier data structure (600) with the profile selection field (616) and a reduced set of fields to at least one of the one or more network entities in the wireless communication system (100, 200) to gain access to the one or more networks associated with the wireless communication system (100, 200).

22. A method comprising:

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constructing, at a user equipment (102, 202) in a wireless communication system (100, 200), a unified subscription identifier data structure (400, 600);

storing the unified subscription identifier data structure (400, 600), wherein the unified subscription identifier data structure (400, 600) comprises a plurality of fields (402-426, 602-616) that specify a selected one of two or more subscription identifier fields (300, 310, 320) associated with a selected subscription identifier type; and

using the selected one of two or more subscription identifier fields (300, 310, 320) in the unified subscription identifier data structure (400, 600) to access one or more networks associated with the wireless communication system (100, 200) based on an authentication scenario corresponding to the selected subscription identifier type.

23. A non-transitory computer-readable storage medium having embodied therein executable program code that when executed by a processor (212) causes the processor (212) to:

construct, at a user equipment (102, 202) in a wireless communication system (100, 200), a unified subscription identifier data structure (400, 600);

store the unified subscription identifier data structure (400, 600), wherein the unified subscription identifier data structure (400, 600) comprises a plurality of fields (402-426, 602-616) that specify a selected one of two or more subscription identifier fields (300, 310, 320) associated with a selected subscription identifier type; and

use the selected one of two or more subscription identifier fields (300, 310, 320) in the unified subscription identifier data structure (400, 600) to access one or more networks associated with the wireless communication system (100, 200) based on an authentication scenario corresponding to the selected subscription identifier type.