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PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP2017/074698	28.09.2017	

International Patent Classification (IPC) or both national classification and IPC
INV. H04W36/00 H04W76/04 ADD. H04W92/20

Applicant
NOKIA TECHNOLOGIES OY

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ 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 Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and 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

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notifed the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:	Date of completion of this opinion	Authorized Officer
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WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/EP2017/074698

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ 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 (Rules 12.3(a) and 23.1 (b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:

   a. ☐ forming part of the international application as filed:

      ☐ in the form of an Annex C/ST.25 text file.

      ☐ on paper or in the form of an image file.

   b. ☐ furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.

   c. ☐ furnished subsequent to the international filing date for the purposes of international search only:

      ☐ in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).

      ☐ on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	3-7, 9-11, 14-18, 20-24
	No:	Claims	1, 2, 8, 12, 13, 19
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-24
Industrial applicability (IA)	Yes:	Claims	1-24
	No:	Claims	

2. Citations and explanations

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

D1 Patrik Rugeland ET AL: "5G PPP mmMAGIC Architectural enablers and concepts for mm-wave RAN integration", 29 March 2017, XP055424624

D2 HAILU SOFONIAS ET AL: "Hybrid paging and location tracking scheme for inactive 5G UEs", 2017 EUROPEAN CONFERENCE ON NETWORKS AND COMMUNICATIONS (EUCNC), IEEE, 12 June 2017 (2017-06-12), pages 1-6, XP033122294, DOI: 10.1109/EUCNC.2017.7980730

D3 ERICSSON: "Signalling flows for paging and resume for RRC_INACTIVE", 3GPP DRAFT; R2-1700536 - SIGNALLING FLOWS FOR PAGING AND RESUME FOR RRC_INACTIVE vol. RAN WG2, no. Spokane, Wa; 20170117 - 20170119 17 January 2017 (2017-01-17), XP051211108

D4 Eiko Seidel: "3GPP 5G RAN Study Completed", 31 March 2017 (2017-03-31), XP055425158, Retrieved from the Internet on 2017-11-15 URL:http://www.nomor.de/uploads/6d/ca/6dca62aa90c67f23a89822f614b6c59b/2017-03-3GPP-5G-RAN-Study-Completed-v1-0.pdf

D5 HUAWEI: "S1 Context fetch for Light Connection", 3GPP DRAFT; R3-162759 S1 CONTEXT FETCH vol. RAN WG3, no. Reno, Nevada; 20161114 - 20161118 14 November 2016 (2016-11-14), XP051178863

D6 US 2017/078940 A1 (ZHANG XIAOWEI [JP] ET AL) 16 March 2017

D7 EP 2 426 976 A1 (NTT DOCOMO INC [JP]) 7 March 2012 (2012-03-07)

1 Independent claims

The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 1, 3, 8, 12, 14, 19, 23 and 24 is not new in the sense of Article 33(2) PCT or does not involve an inventive step in the sense of Article 33(3) PCT.

1.1 Claim 12

D1 discloses a method, comprising

checking if a terminal is in an inactive state in a notification area (page 12, section 4.2: "*RRC_INACTIVE*"),

monitoring if the terminal moves from a last visited cell of the notification area (page 23, section 5.3: "*UE in inactive mode can freely reselect to other cells within the configured tracking area index list (TAI-list)*") to a new cell outside the notification area (page 23, section 5.3: "*UE in RRC_INACTIVE selects a cell outside the configured TAI-list*");

instructing the terminal to provide an anchor base station identifier of an anchor base station, a context identifier of a context for the terminal (this step is implicitly disclosed in D1 by the mere concept of "context fetch" as explained on page 12, section 4.2: "*the UE and gNB maintains configurations obtained in RRC_CONNECTED related to e.g. AS context, security, and radio bearers (..) the UE can resume its old configurations (..) the old UE context can be reused, whichever cell the UE has re-selected must be able to retrieve the context from the old cell*" (..) "*context fetch*"), and at least one of a last visited cell identifier of the last visited cell (page 13, section 4.2: "*the UE reports its previously visited cells*") and a last visited base station identifier of a last visited base station to the new base station if the terminal is in the inactive state and moves from the last visited cell to the new cell (page 23, section 5.3: "*UE in inactive mode can freely reselect to other cells*").

Therefore, the subject-matter of claim 12 is not new over D1 in the sense of Article 33(2) PCT, and the requirements of Article 33(1) PCT are therefore not met.

Moreover, without prejudice to the above, D2 also discloses the subject matter of claim 12 on figure 2 and section III, page 2: "*the UE sends a RTA Update Request message that is integrity protected using the AS security context that is stored in the UE and the anchor gNB. The message includes shortMAC-I for UE authentication, the current UE's RTA list and Resume ID that contains the address of the anchor gNB*", wherein the RAN tracking

area, RTA, in D1 is construed as the RAN notification area, RNA, in the application and wherein the RTA list contains all the cells in the areas ("*RTA list that the UE may move without updating its location*"), which necessarily means that it contains the last visited cells in the notification area.

Therefore, the subject-matter of claim 12 is not new over D2 in the sense of Article 33(2) PCT, and the requirements of Article 33(1) PCT are therefore not met.

1.2 Claim 14

D3 is regarded as being the prior art closest to the subject-matter of claim 14, and discloses a method, comprising

monitoring if a new base station receives, from a terminal, location update information for the terminal, an anchor base station identifier of an anchor base station, a context identifier of a context (page 4, section 2.3, step 2: "*the UE provides the Resume ID*"), and at least one of a last visited cell identifier of a last visited cell and a last visited base station identifier of a last visited base station (page 2, section 2.1: "*additional information may provided in this message (e.g. (..) a list of Cell IDs*)", wherein the last visited cell in the application is construed as the "*Serving RAN node*" in D3 and wherein the "*list of Cell IDs*" implicitly contains the Cell ID(s) corresponding to the "*Serving RAN node*" which delivers the RRCConnectionSuspend to the terminal);

checking if a first direct connection between the new base station and the anchor base station exists (page 4, section 2.3, step 3: "*the New Serving RAN node realises that it has no Xn connection to the eNB indicated in the Resume ID*") if the location update information and the anchor base station identifier are received (this condition is implicitly disclosed in D3 since the sequence message chart presents a chronological path from step/message 1 to step/message 7);

instructing the new base station to request the context from the anchor base station (page 4, section 2.3, step 7: "*The New Serving RAN node triggers the path switch procedure (as if* it would have received UE context data via Xn)*") ~~via the last visited base station~~ if the first direct connection does not exist and the at least one of the last visited cell identifier and the last visited base station identifier is received (these two conditions are implicitly disclosed in D3 since the sequence message chart presents a chronological path from step/message 1 to step/message 7);

wherein the request for the context from the anchor base station comprises the anchor base station identifier and the context identifier (as indicated above*, this step is similar to the legacy situation where the first direct connection exists, see section 2.2, pages 2 and 3, step 3: "*3. The New Serving RAN node attempts to retrieve the UE Context by triggering the Xn Retrieve UE Context procedure*").

The subject-matter of claim 14 therefore differs from D3 in that it additionally comprises the step of requesting the context **via** the last visited base station.

The technical effect of this difference is to avoid the context request to go up to the core network.

The objective technical problem to be solved by the present claimed invention may therefore be regarded as to keep the signalling relating to context retrieval in the RAN.

It should first be noticed that the concept of RRC_INACTIVE introduced in the 5G standardization work is re-using the one of "LTE lightly connected" used in LTE Rel. 14, as this is defined in D4. The skilled person would therefore naturally looked in the field of light connection in wireless communication networks and would find the 3GPP contribution D5 since its title is eloquent.

D5 teaches that an assessment is performed regarding the existence of a direct connection between the new base station and the anchor base station (page 1, section 2: "*maybe no X2 exists between anchor eNB and serving eNB*") and, in case no X2 exists, the message should be routed through the S1 interface to be fetched at the MME (Proposal 1: "*support S1 UE context fetch to allow the new eNB to get UE context from anchor eNB **via** S1 interface*"). In particular, as illustrated in figure 1, the last serving base station of the terminal in the notification area is a neighbor of the new base station.

However, in case such a S1 interface does not exist, as it is illustrated in figure 1, it appears as **necessary** to route the request the context through neighboring base stations i.e. through a direct interface.

In order to demonstrate this logical implication, document D6 is used for illustrating purpose: Figure 1 and paragraphs [0033] in D6 contemplates the precise situation where a base station does not have a S1(-MME) connection. In such a case, D6 teaches on paragraph [0063] that "*the SeNB 30 sends Path Switch Request message to the MME 40 **via** the MeNB 20*". Even if the Applicant would argue that in figure 1 of D6, an alternative route would be

from the new base station (construed as the SeNB in D6) to the S-GW, such a route would necessarily goes as well **via** the other base station (construed as the MeNB in D6) since S-GW and MME do not share any interface.

Therefore it would be obvious for the person skilled in the art wishing to avoid the context request to go up to the core network to apply the teaching of D5 to the disclosure of D3.

Therefore also, the subject-matter of claim 14 does not involve an inventive step within the meaning of Article 33(3) PCT, and the requirements of Article 33(1) PCT are therefore not met.

1.3 Claim 19

The subject-matter of claim 19 discloses a base station acting as a proxy and transferring UE Context information between a requesting base station (the new base station) and a servicing/answering base station (the anchor base station). Such a legacy base station is disclosed in D7, figure 3 and paragraphs [0031] to [0033].

1.4 Claims 1, 3, 8, 23 and 24

Independent claims 1, 3 and 8, on the one hand, and 23 and 24, on the other hand, define, respectively, three corresponding apparatuses and two computer program products which have been specifically adapted to perform the steps of the method defined in, respectively, claims 12, 14 and 19, and claims 12 to 22. Therefore the same objection previously raised for the lack of novelty and/or inventive step regarding claims 12, 14 and 19 correspondingly applies to claims 1, 3, 8, 23 and 24.

2 Dependent claims

Dependent claims 2, 4-7, 9-11, 13, 15-18 and 20-22 do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of Article 33(1) PCT with respect to novelty, in the sense of Article 33(2) PCT, and/or inventive step in the sense of Article 33(3) PCT. In particular:

2.1 Claims 2, 5, 13, 16

D1 discloses location tracking on page 22, section 5.1.6, D2 discloses location tracking updates in its abstract and D5 discloses RAN based paging area update on page 1.

2.2 Claims 4, 15

Claims 4 and 15 define how a base station could resolve a base station identifier from a cell identifier. It is well-known in the art that a cell-ID is associated with a base station since a base station is identified with one or more cell-ID(s).

2.3 Claims 6, 7, 17, 18

Xn interface is in 5G the equivalent of X2 interface in LTE and D3 disclose both of these concepts on page 2, section 2.2 (see title of the section).

2.4 Claims 9-11, 20-22

D7 discloses that the connection between the last visited base station and the anchor base station is X2, which is, in LTE technology, the equivalent to Xn in 5G. Furthermore, it would be obvious for the skilled person to not forward a message arriving at a forwarding entity in case the destination address of the message is the forwarding entity itself. Most IP protocol stack implementation, such as the Linux one, do indeed perform such a check – *is the destination address of the IP packet reachable locally on the entity itself?* – before contacting an external default routing gateway.

Re Item VII

Certain defects in the international application

1 Independent claims {1, 12}, {3, 14}, {8,19} are not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from respective prior art {D1 or D2}, {D3}, {D7} being placed in the preamble (Rule 6.3(b)(i) PCT) and the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).

2 The steps and features of independent claim 1, 3, 8, 12, 14, 19, 23 and 24 are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

3 The relevant background art disclosed in D1 or D2, D3, D7 should be acknowledged in the description (Rule 5.1(a)(ii) PCT).

4 There is an obvious error in the description of the present application: On page 10, second paragraph, instead of "Anhor" the reader should understand "Anchor".

Re Item VIII

Certain observations on the international application

1 The expression "instructing the new base station to request the context from the anchor base station **via** the last visited base station" used in claims 3 and 14 is unclear and leaves the reader in doubt as to the meaning of the technical feature to which it refers, thereby rendering the definition of the subject-matter of said claim unclear (Article 6 PCT).

This expression supposes that there is a connection between the new base station and the last visited base station and it is unclear how the invention should be carried out in case such a connection does not exist.

In the light of the description on page 10, paragraph 5, it is indeed explained that the connection between the two base stations, BSs, could go via the core network, CN, and such a fall back strategy appears as **essential** since, otherwise, the successful performance of the invention appears to depend on chance that means on an hypothetical connection between the new BS and the last serving BS.

What is more, in case the context fetch request goes from the new base station, via the CN, via the last serving base station, up to the anchor base station, it appears then that the invention does not distinguishes itself from the prior art, referred and acknowledged as "the 'best existing' solution" on page 3 in the description of the present application since, in such a case, the invention recites a request which goes indeed via the AMF in the core network.

It therefore appears that the existence of a **direct** connection between the new base station and the last serving base station appears as essential. Since independent claims 3 and 14 do not contain this feature which is indeed found in, respectively, dependent claims 6 and 17, they do not meet the requirement following from Article 6 PCT taken in combination with Rule 6.3(b) PCT that any independent claim must contain all the technical features essential to the definition of the invention.

2 Dependent claims 5 and 16 are unclear (Article 6 PCT) because they attempt to define features or steps at an apparatus (i.e. a new base station) with reference to another distinct entity, namely a terminal. It is indeed unclear how the new base station could influence, predict or expect that the information received from the terminal would be in a certain message or form.

3 The step of transmitting the at least three information items in the location update information is defined in a dependent claim 2, depending on claim 1, while it is defined in the **in**dependent claim 3.

It therefore appears that the various independent claims do not define the same corresponding features, which is either a sign of lack of unity (Rule 13.1 PCT) or a sign of lack of essential feature (Article 6 PCT).

The Applicant is informed that International Search Authorities such as the EPO require that inter-related independent claims in a same category should be corresponding.