

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 N3203327WOP00Pe	FOR FURTHER ACTION		See Form PCT/IPEA/416
International application No. PCT/EP2019/056934	International filing date (day/month/year) 20.03.2019	Priority date (day/month/year) 09.04.2018	
International Patent Classification (IPC) or national classification and IPC INV. H04W36/00			
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>7</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>9</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which have been amended and/or sheets containing rectifications authorized by this Authority, unless those sheets were superseded or cancelled, and any accompanying letters (see Rules 46.5, 66.8, 70.16, 91.2, and Section 607 of the Administrative Instructions).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 ☐ superseded sheets and any accompanying letters, where this Authority either considers that the superseding sheets contain an amendment that goes beyond the disclosure in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 07.02.2020		Date of completion of this report 13.03.2020	
Name and mailing address of the international preliminary examining authority:  European Patent Office P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Fax: +31 70 340 - 3016		Authorized officer Atanasovski, Igor Telephone No. +31 70 340-2286	



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

2-19	as originally filed
1	filed with the demand for preliminary international examination

Claims, Numbers

1-12	filed with the demand for preliminary international examination
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Drawings, Sheets

1-5	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. 13-25
 - ☐ 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)).

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/EP2019/056934

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 03.03.2020 (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>1-12</u>
	No: Claims	
Inventive step (IS)	Yes: Claims	<u>1-12</u>
	No: Claims	
Industrial applicability (IA)	Yes: Claims	<u>1-12</u>
	No: Claims	

2. Citations and explanations (Rule 70.7):

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

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

- D1 ERICSSON: "Handling of mapped EPS QoS parameters in IWK with EPC",
3GPP DRAFT;
23502_CR0108R1_5GS_PH1_(REL-15)_S2-182674_WAS1710_EPS_QOS
__MAPPING_IN_IWK, 3RD GENERATION PARTNERSHIP PROJECT
(3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ;
F-06921 SOPHIA-AN,
vol. SA WG2, no. Montreal, Canada; 20180226 - 20180302 19 March 2018
(2018-03-19), XP051411405,
Retrieved from the Internet:
URL:<http://www.3gpp.org/ftp/Meetings%5F3GPP%5FSYNC/SA/Docs/>
[retrieved on 2018-03-19]
- D2 INTEL ET AL: "23.502: QoS mapping for 5GC-EPC interworking",
3GPP DRAFT; S2-174554_23502_IWK_QOS, 3RD GENERATION
PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ;
650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ;
FRANCE,
vol. SA WG2, no. San Jose Del Cabo, Mexico; 20170626 - 20170630 25
June 2017 (2017-06-25), XP051303400,
Retrieved from the Internet:
URL:http://www.3gpp.org/ftp/Meetings_3GPP_SYNC/SA2/Docs/
[retrieved on 2017-06-25]
- D3 "3rd Generation Partnership Project; Technical Specification Group Services
and System Aspects; Procedures for the 5G System; Stage 2 (Release 15)",
3GPP DRAFT; 23502-F10_CRS_IMPLEMENTEDR2, 3RD GENERATION
PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ;
650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ;
FRANCE, 27 March 2018 (2018-03-27), XP051535224,
Retrieved from the Internet:
URL:<http://www.3gpp.org/ftp/tsg%5Fsa/WG2%5FArch/>

Latest%5FSA2%5FSpecs/DRAFT%5FINTERIM/Archive/
23502%2Df10%5FCRs%5FImplementedR2%2Ezip
[retrieved on 2018-03-27]

- 1 The present application relates to a method (claim 1), device (claim 6) and a non-transitory computer-readable storage medium (claim 12) for session context conversion between mobile network systems.
- 1.1 Document D1 is considered as the closest prior art to claim 1 as it discloses:
*A method comprising:
receiving, at a user equipment while being served by a first system and during protocol data unit session establishment or modification procedure, a message including a default quality of service rule, the default quality of service rule including an access point name aggregate maximum bit rate value; and
when there is an inter-system change from the first system to the second system; (page 5, item 1, page 6, items 6 and 7 and page 7, item 11).*

Claim 1 differs from D1 in the following features:
 - *setting, at the user equipment, the access point name aggregate maximum bit rate value of a session management context for the second system to the received access point name aggregate maximum bit rate value received while being served by the first system;*
- 2 Documents D2-D3 also do not disclose the differentiating features of claim 1. Therefore claim 1 is new Article 33(2) PCT. For the same reasons, corresponding claims 6 and 12 are also new Article 33(2) PCT.
- 3 D1 is regarded as being the closest prior art to the subject-matter of claim 1 because it is from the same technical field and discloses mapping of QoS parameters from 5GS to EPS system.
- 3.1 The technical effect of the distinguishing features is efficient inter-system mapping of QoS parameters performed by the UE and the objective problem can thus be formulated as how to improve the mapping of QoS parameters when the UE handovers from one system to another.

- 3.2 D1 teaches 5G QoS parameters mapping (including APN-AMBR parameters mapping) in order to provide the UE with some communication condition in EPS (4G) when the UE moves from 5G to 4G system. It also teaches that the network carries out all set-up procedures that enter the mapped 5G QoS parameters and, thus also mapped APN-AMBR into force for EPS (4G) and the UE just receives the mapped parameters (including the mapped APN-AMBR) from the network once it moves from one system to another. However, D1 does not show or hint at the shifting responsibility from the network to the UE to carry out the set-up procedure for the APN-AMBR as part of the interworking procedure between 5G and 4G systems.
- 3.3 D2 also discloses mapping of the default QoS rule/EPS bearer after handover of a UE from one system to another where the mapped QoS parameters (including APN-AMBR) are set by the network nodes PGW-C and SMF. It also discloses that the UE uses the EPS QoS parameters assigned by the PGW-C and SMF during the QoS flow establishment when we have 5GS to EPS handover. However, D2 does not show any set-up procedure performed by the UE for mapping the QoS parameters (set-up the APN-AMBR of a session management context) to be used for the second system while the UE is still served by the first system).
- 3.4 Document D3 also teaches session continuity when UE switches from 5GS to EPS system where the QoS parameters are allocated by the core network elements (PGW-C+SMF) and only stored by the UE and it receives an update by the network when there is some change without taking any responsibility in setting the QoS mapping parameters.
- 3.5 Further, even if the person skilled in the art would combine the teachings of document D2 or D3 with document D1 when looking for solutions to improve the mapping of QoS parameters when there is inter-system handover, he will not arrive at the claimed invention because all the documents are using the processing capabilities and the responsibility of the core network elements for mapping the QoS parameters (setting the APN-AMBR) when inter-system handover takes place. i.e. the network sets the APN-AMBR and it maintains the control over the inter-system handover process.
- 3.6 None of the available prior art shows or hints at the efficient inter-system QoS mapping where the UE has the responsibility to set the APN AMBR of the default EPS bearer context using the received APN-AMBR in the parameters of the default QoS rule when served by 5GS system. Therefore, no indication is

provided in documents D1-D3 that the apparatus disclosed in D1 could be modified by including the above-mentioned distinguishing features mentioned in claim 1.

- 3.7 The solution proposed in the present application is, therefore, considered to be not obvious over the available state of the art. As a consequence, the subject-matter of claim 1 is regarded as to fulfil the requirements of Articles 33(2) and (3) PCT.
- 3.8 Corresponding independent claims 6 and 12 are therefore, also regarded as to fulfil the requirements of Articles 33(2) and (3) PCT.
- 3.9 Claims 2-5 and 7-11 are fully dependent on claims 1 and 6 and therefore, they fulfil the requirements of Articles 33(2) and (3) PCT.
- 4 The industrial applicability of the subject-matter of all claims is beyond any doubt (Article 33(4) PCT).

Re Item VII

Certain defects in the international application

- 5 In dependent claim 10, the term "any of claims 6-10" should be read as "any of claims 6-9".

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7 February 2020

PCT Patent Application PCT/EP2019/056934
Applicant: Nokia Technologies Oy

This is in response to the International Search Report and the Written Opinion of the International Searching Authority:

I Requests

As indicated in the Demand form, it is requested to base the further examination on the basis of the following documents:

- Claims 1 to 12 filed under Art. 34 PCT
- Description page 1 filed under Art. 34 PCT
- Description pages 2 to 19 as originally filed
- Drawings as originally filed

If further amendments to the claims are deemed to be necessary to traverse the objections raised in the Written Opinion of the International Searching Authority, a personal communication would be highly appreciated. Therefore, a consultation by telephone is herewith respectfully requested.

II Amendments to the claims

Claim 1 comprises the features original claim 1.

In the second feature group the definite article for the access point name aggregate maximum bit rate (APN-AMBR) value of a session management context for the second system has been replaced by an indefinite article to take into account that there is no antecedent.

Further, claim 1 is now drafted in two-part form.

Claims 2 to 5 remain unamended.

Claim 6 corresponds with original claim 12 and has been amended as set forth above with respect to claim 1.

Claims 7 to 11 remain unamended.

Claim 12 corresponds with original claim 14.

The independent claims are now in two-part form, what traverses the objection raised under section 3.2 of the Written Opinion.

Reference numerals have been included into the claims. This traverses the objection raised under section 3.3 of the Written Opinion

III Amendment to the description

Description page 1 has been amended to mention prior art documents D1 and D2. This traverses the objection raised under section 3.1 of the Written Opinion.

IV Priority

Section 2.1 of the Written Opinion states that document D4 may be of particular relevance in the case of the priority of the present application is invalid.

In this respect it has to be noted that the original claims of the present application are identical with the claims of the provisional application US62/655165. The amended claims submitted herewith are a subset of the original claims and, thus, also have corresponding claims in the provisional application.

As a result, it is readily apparent that the priority of the present application is valid and that prior art document D4 is no prior art.

V Art. 6 PCT

Due to the amendments to the claims, the objections raised in section 4.1 of the Written Opinion does not apply to the presently pending claims.

VI Patentability

Prior art documents D1 and D2 have, as regards the claimed subject-matter, the same disclosure, namely (in the following D1 and D2 are referred to as the prior art):

The prior art discloses that, as defined in the generic portion of the independent claims, that the UE (user equipment) receives, from the network, an APN-AMBR. Particularly, the network maps a Session AMBR of 5G to an APN-AMBR for EPS (4G) and forwards the mapped APN-AMBR to the UE.

The mapping and forwarding process of the prior art involves several network parts and messages exchanged between the network parts and the UE. However, the details in this respect are not relevant here.

What is important to be taken into account is that the prior art and, particularly, the passages of the prior art cited in the Written Opinion in this respect deal with steps carried out by the network to map, inter alia, the APN-AMBR and inform the UE about the mapped AMBR. Like all other 5GQoS parameters, the APN-AMBR mapping is made in order to provide the UE with the same communication condition/boundaries in EPS (4G) when the UE changed to 4G as the UE was provide in 5G.

According to the prior art, the network carries out all set-up procedures that enter the mapped 5GQoS parameters and, thus, also the mapped APN-AMBR into force for EPS (4G). In other words, the prior art network sets the EPS parameter to correspond with the 5G parameters, namely by instructing the target eNB (s. e.g. D1: item 1, page 5; items 6 and 7, page 6; item 11 page 7; D2: items 6 and 7, page 10; item 1, page 11).

According to the prior art, the UE just receives the mapped information/parameters and, thus, also the mapped APN-AMBR(s. e.g. D1: page 4, 3rd paragraph, "... other 5G QoS parameters corresponding to PDN connection, e.g. Session AMBR and QoS rules, are allocated by the PGW-C+SMF and sent to UE in PCO. ..."; page 5, 3rd paragraph, "... the PGW-C+SMF always provides the EPS Bearer ID and the mapped QoS parameters to UE. ..."; same passages can be found in D2).

However, the prior art UE does not carry out any set-up procedure at least with respect to the APN-AMBR. The mapped APN-AMBR has been already set by the network and the UE is just informed about this to operate accordingly. According to the prior art the UE is just adjusting its own operation to be in line with the mapped APN-AMBR.

Contrary thereto, in present invention, it is the UE carrying out the set-up of the mapped APN-AMBR (i.e. the setting of the APN-AMBR for the second system to the received APN-AMBR while being served by the first system). According to the present invention, the UE is actual setting up the APN-AMBR for the second system. The term "setting" in the claims means that the UE acts on the set-up of the second system. This is supported by the original disclosure, which, e.g., states (s. description: page 7, paragraph [027]): "When the UE 150A moves from the 5G radio access node 160 to the 4G radio access node 152 as shown at 150B, this may trigger, as part of interworking between 5G and 4G, the UE 150B to set, at 206, the APN AMBR of a packet data network (PDN) connection from the UE to the corresponding PDN. For example, the UE may set the APN AMBR of the default EPS bearer context using the APN-AMBR received (at 202 while coupled to the 5G core) in the parameters of the default QoS rule in the PDU session context. ..."; page 9, paragraph [033], "The UE may use the APN-AMBR of the PDU session context to set the APN-AMBR of the corresponding default EPS bearer context.")

This feature is not known from the prior art and, hence, the independent claims are new over the prior art.

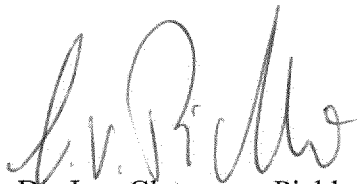
This feature is also not rendered obvious by the prior art. Prior art is based on the fundamental concept where the network is the controlling part instructing/carrying-out the set-up for EPS (4G), while the UE about is merely informed about this set-up, accepts this without making any own decision/action and just obeys to the network. The prior art and, also, D3 does not include any pointer for the skilled person to deviate from this concept. Thus, a combination within the cited prior art documents cannot result in the claimed subject-matter.

Also, with a view on the knowledge of the skilled person, there is no motivation for the skilled person to modify the fundamental concept of the prior art so that responsibility of the network is shifted to the UE. Rather, the skilled person would have refrained from doing so. Shifting responsibility of the network to UE means that network loses control over the affected network parts, where the UE has gained responsibility and control sovereignty. This would result in a situation where the network is not in control of its own parts anymore, a situation the skilled person would always try to avoid.

Further, the APN-AMBR is one of the critical parameters for inter-system change (e.g. handover). Inter-system change procedures shall be "smooth" and fast, i.e. without interruption/loss of the QoS for the UE. According to the prior art, the network controls an inter-system change and, only if all prerequisites for the inter-system change have been met, gives the UE the instruction to actually change the system. Having set the correct

APB-AMBR is essential for an inter-system change to take place. As long as the network sets the APN-AMBR, it maintains control over the inter-system change process. Shifting the APN-AMBR setting to the UE would deprive the network of this control. Then, the network would be required to wait for the UE to have set the APN-AMBR correctly and being informed by the UE accordingly. Only, then the inter-system change could actually take place. This would delay the preparation for inter-system change (due to additional signaling) and would make the inter-system change as a whole to depend from the UE. The latter can be considered as fundamental violation of the concept that the network is the deciding part in inter-system changes.

Thus, in view of the foregoing, we also take the line that the claimed subject-matter is based on inventive step.



Dr.-Ing. Cletus von Pichler
European Patent Attorney

Enc.

- Claims 1 to 12 filed under Art. 34 PCT
- Description page 1 filed under Art. 34 PCT

CLAIMS

1. A method comprising:

5 receiving, at a user equipment (10) while being served by a first system and during protocol data unit session establishment or modification procedure, a message including a default quality of service rule, the default quality of service rule including an access point name aggregate maximum bit rate value;

characterized in that

10 when there is an inter-system change from the first system to the second system, setting, at the user equipment, an access point name aggregate maximum bit rate value of a session management context for the second system to the received access point name aggregate maximum bit rate value received while being served by the first system.

15 2. The method of claim 1, wherein the first system comprises a fifth generation core network, wherein the second system comprises a fourth generation evolved packet system, wherein the inter-system change includes a change from an N1 interface to an S1 interface, and wherein the access point name aggregate maximum bit rate value maintains
20 session continuity during the inter-system change.

3. The method of any of claims 1-2, wherein the message including the access point name aggregate maximum bit rate value is received from a node (400) in the first system.

25 4. The method of claim 3, wherein the node (400) comprises a packet data network gateway-control plane function (PGW-C), a session management function (SMF), and/or a packet data network gateway-control plane function co-located with the session management function (176).

30 5. The method of any of claims 1-4 further comprising:
storing, at the user equipment, the received default quality of service rule including the access point name aggregate maximum bit rate value session context management associated with the first system.

35 6. An apparatus comprising:

means for receiving, at a user equipment (10) while being served by a first system and during protocol data unit session establishment or modification procedure, a message including a default quality of service rule, the default quality of service rule including an
40 access point name aggregate maximum bit rate value;

characterized in that

when there is an inter-system change from the first system to the second system, means for setting, at the user equipment, an access point name aggregate maximum bit rate value of a session management context for the second system to the received access point name aggregate maximum bit rate value received while being served by the first system.

7. The apparatus of claim 6, wherein the first system comprises a fifth generation core network, wherein the second system comprises a fourth generation evolved packet system, wherein the inter-system change includes a change from an N1 interface to an S1 interface, and wherein the access point name aggregate maximum bit rate value maintains session continuity during the inter-system change.

8. The apparatus of any of claims 6-7, wherein the message including the access point name aggregate maximum bit rate value is received from a node (400) in the first system.

9. The apparatus of claim 8, wherein the node (400) comprises a packet data network gateway-control plane function (PGW-C), a session management function (SMF), and/or a packet data network gateway-control plane function co-located with the session management function (176).

10. The apparatus of any of claims 6-10, wherein the apparatus further comprises means to at least:

store the received default quality of service rule including the access point name aggregate maximum bit rate value session context management associated with the first system.

11. The apparatus of claims 6-10, wherein the apparatus comprises or is comprised in a user equipment (10).

12. A non-transitory computer-readable storage medium comprising program code which when executed by at least one processor causes operations comprising:

receiving, at a user equipment (10) while being served by a first system and during protocol data unit session establishment or modification procedure, a message including a default quality of service rule, the default quality of service rule including an access point name aggregate maximum bit rate value;

characterized in that

when there is an inter-system change from the first system to the second system, setting, at the user equipment, an access point name aggregate maximum bit rate value of

a session management context for the second system to the received access point name
aggregate maximum bit rate value received while being served by the first system.

user equipment (10)

SESSION CONTEXT CONVERSION

Field

[1] The subject matter described herein relates to interworking between 5G and 4G.

5

Background

[2] As the cellular system including the 5G network supports an increasing number of devices and services including applications with a wide range of use cases and diverse needs with respect to bandwidth, latency, and reliability requirements, the cellular system may need to prioritize resources across the wireless access network and the core network (and/or for example, prioritizing across the control plane and the user plane) to support differentiation among different service data flows (SDFs). Moreover, the associated quality of service (QoS) requirements may need to be dynamic. The 3GPP document S2-182674 by Ericsson titled "Handling of mapped EPS QoS parameters in IWK with EPC" and the 3GPP document S2-174554 by Intel titled "QoS mapping for 5GC-EPC interworking" both disclose that the network maps a Session AMBR for 5G to an APN-AMBR for EPS.

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Summary

[3] In some example embodiments, there may be provided a method that includes receiving, at a user equipment while being served by a first system and during protocol data unit session establishment or modification procedure, a message including a default quality of service rule, the default quality of service rule including an access point name aggregate maximum bit rate value; and when there is an inter-system change from the first system to the second system, setting, at the user equipment, the access point name aggregate maximum bit rate value of a session management context for the second system to the received access point name aggregate maximum bit rate value received while being served by the first system.

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[4] In some variations, one or more of the features disclosed herein including the following features can optionally be included in any feasible combination. The first system may include a fifth generation core network, the second system may include a fourth generation evolved packet system, the inter-system change includes a change from an N1 interface to an S1

30