PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1
Stylesheet Version v1.2

EPAS ID: PAT8216218

SUBMISSION TYPE:	NEW ASSIGNMENT
NATURE OF CONVEYANCE:	EXCLUSIVE LICENSE WITH ALL SUBSTANTIAL RIGHT

CONVEYING PARTY DATA

Name	Execution Date
KT CORPORATION	12/23/2022

RECEIVING PARTY DATA

Name:	PEGASUS WIRELESS INNOVATION LLC
Street Address:	20319 KIAWAH ISLAND DR
City:	ASHBURN
State/Country:	VIRGINIA
Postal Code:	20147

PROPERTY NUMBERS Total: 92

Property Type	Number
Patent Number:	9894644
Patent Number:	9998269
Patent Number:	10181931
Patent Number:	10306546
Patent Number:	10341806
Patent Number:	10728693
Patent Number:	10085249
Patent Number:	10568071
Patent Number:	11082957
Patent Number:	10432361
Patent Number:	10742364
Patent Number:	10644819
Patent Number:	10412731
Patent Number:	10616889
Patent Number:	10581560
Patent Number:	11197309
Patent Number:	10892867
Patent Number:	11431460
Patent Number:	11431461
Patent Number:	11115976

Property Type	Number
Patent Number:	10849111
Patent Number:	11330573
Patent Number:	10237084
Patent Number:	10735967
Patent Number:	10708893
Patent Number:	9713094
Patent Number:	10178626
Patent Number:	10091736
Patent Number:	9461771
Patent Number:	9629010
Patent Number:	10009161
Patent Number:	11258532
Patent Number:	10791530
Patent Number:	11569958
Patent Number:	11363548
Patent Number:	11115157
Patent Number:	10925079
Patent Number:	10506630
Patent Number:	11405942
Patent Number:	11044743
Patent Number:	11765735
Patent Number:	10856307
Patent Number:	10869303
Patent Number:	10897720
Patent Number:	10609699
Patent Number:	11240785
Patent Number:	11160051
Patent Number:	10715290
Patent Number:	10966253
Patent Number:	10594460
Patent Number:	10638463
Patent Number:	11219000
Patent Number:	10715283
Patent Number:	10616916
Patent Number:	10764099
Patent Number:	10868702
Patent Number:	10952206
Patent Number:	11540272

Property Type	Number
Patent Number:	10979190
Patent Number:	11671218
Patent Number:	10284404
Patent Number:	10616024
Patent Number:	10721765
Patent Number:	10721031
Patent Number:	10958380
Patent Number:	10805050
Patent Number:	10616834
Patent Number:	9497666
Patent Number:	9832806
Patent Number:	10334657
Patent Number:	10420067
Patent Number:	10159025
Patent Number:	10667322
Patent Number:	10986530
Patent Number:	10511994
Patent Number:	10448386
Patent Number:	10721118
Patent Number:	10880222
Patent Number:	11044777
Patent Number:	11627631
Patent Number:	11012911
Patent Number:	10869236
Patent Number:	10708968
Patent Number:	10616932
Patent Number:	10660004
Patent Number:	10869243
Patent Number:	10470159
Patent Number:	10499376
Patent Number:	10812230
Patent Number:	10873671
Patent Number:	11178573
Patent Number:	10772148

CORRESPONDENCE DATA

Fax Number:

Correspondence will be sent to the e-mail address first; if that is unsuccessful, it will be sent using a fax number, if provided; if that is unsuccessful, it will be sent via US Mail.

Phone:	4349062975
Email:	yoon@pegasuswi.com
Correspondent Name:	YEASUN YOON
Address Line 1:	20319 KIAWAH ISLAND DR
Address Line 4:	ASHBURN, VIRGINIA 20147

ATTORNEY DOCKET NUMBER:	ASSIGNMENT KT PEGASUS 01
NAME OF SUBMITTER:	YEASUN YOON
SIGNATURE:	/yoon/
DATE SIGNED:	10/11/2023
	This document serves as an Oath/Declaration (37 CFR 1.63).

Total Attachments: 33

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PATENT RIGHTS ASSIGNMENT

WHEREAS, **KT Corporation**, having a place of business at KT Kwanghwamun Bldg, East 33, Jong-ro 3-gil, Seoul, Korea 03155 (hereinafter "Assignor") is the sole owner of any and all patents and/or patent applications in the Patent Families listed in Schedule 1 annexed hereto (collectively referred to as the "Patents"). Herein, the term "Patent Families" means a collection of (i) a patent or a patent application; (ii) any and all foreign counterparts of the patent or the patent application described in (i); (iii) any divisionals, continuations, continuations-in-part, reissues, reexaminations, utility models, parents, or extensions, relating to any of the patents and patent applications described in (i) and (ii);, and (iv) any patent or patent application whose priority is based upon or in common with any patents and patent applications described in (i), (ii) and (ii).

WHEREAS, **Pegasus Wireless Innovation LLC**, having a place of business at 20319 Kiawah island Drive Ashburn VA 20147 USA (hereinafter "Purchaser") is desirous of acquiring all substantial rights in and to the Patents; and

Now, Therefore,

For good and valuable consideration, the receipt of which is hereby acknowledged, Assignor does hereby sell, assign, transfer and set over to Assignee, subject to existing encumbrances, (a) an exclusive, worldwide license to import, manufacture, have manufactured, use, lease, sell, offer to sell, or otherwise dispose of products encompassed by one or more claims of the Patents; (b) the exclusive right to: (i) enforce the Patents; (ii) sublicense or otherwise grant rights under the Patents; (iii) collect and receive damages, royalties, injunctive relief, and/or settlements for past, current, and future infringements of and to the Patents; (iv) sue or otherwise assert causes of action for the past, current,

and future infringements of and to the Patents; (v) control the prosecution of the Patents before any patent office in the world; (vi) indulge infringement of the Patents; and (c) any and all other substantial rights to and in the Patents necessary and sufficient under any applicable law or precedent to confer standing to Assignee and permit Assignee to initiate any actions on its own.

Assignor has executed this Assignment by its duly authorized representative.

KT Corporation

By: 閔燦皓.

Name: Chanho Min

Title: Team Manager

Date: 12/23/2022

SCHEDULE 1

No.	REF-NO	Country	Application/Issue No.	Application/issue date
1	P20130686	Provisional Application	10-2013-0114759	2013.09.26
	P20140028	KR Application	10-2014-0007262	2014.01.21
		KR Issue	10-1940344	2019.01.14
	P20130686PC	PCT	PCT/KR2014/008216	2014.09.02
	P20130686US	US Application	15/024,862	2016.03.25
		US Issue	9,894,644	2018.02.13
	P20130686CN	CN Application	201480053323.5	2016.03.25
		CN Issue	CN105659511B	2019.02.12
2	P20130687	Provisional Application	10-2013-0114763	2013.09.26
	P20130953	Provisional Application	10-2013-0138703	2013.11.15
	P20140134	KR Application	10-2014-0027531	2014.03.10
		KR Issue	10-1561838	2015.10.14
	P20140134P1	KR Application(DA)	10-2015-0139479	2015.10.05
		KR Issue(DA)	10-1645898	2016.07.28
	P20130687PC	PCT	PCT/KR2014/008708	2014.09.18
	P20130687US	US Application	15/024,873	2016.03.25
		US Issue	10,432,361	2019.10.01
	P20130687USC1	US Application(CA)	16/542,513	2019.08.16
		US Issue(CA)	10,742,364	2020.08.11
	P20130687CN	CN Application	201480053584.7	2016.03.28

3	P20130698	Provisional Application	10-2013-0115367	2013.09.27
	P20140216	KR Application	10-2014-0057938	2014.05.14
		KR Issue	10-1904572	2018.09.27
	P20130698PC	PCT	PCT/KR2014/008765	2014.09.22
	P20130698US	US Application	15/025,262	2016.03.25
		US Issue	10,181,931	2018.01.15
	P20130698CN	CN Application	201480053321.6	2016.03.25
		CN Issue	CN105594139B	2019.10.25
4	P20130737	Provisional Application	10-2013-0118593	2013.10.04
	P20131006	Provisional Application	10-2013-0142479	2013.11.21
	P20140221	KR Application	10-2014-0067128	2014.06.02
		KR Issue	10-1919636	2018.11.12
	P20140221PC	PCT	PCT/KR2014/008995	2014.09.26
	P20140221US	US Application	15/026,260	2016.03.31
		US Issue	9,998,269	2018.06.12
	P20140221CN	CN Application	201480054504.X	2016.04.01
		CN Issue	CN105659514B	2018.06.01
5	P20140587	Provisional Application	10-2014-0101467	2014.08.07
	P20150161	KR Application	10-2015-0094846	2015.07.02
		KR Issue	10-1875255	2018.06.29
	P20140587PC	PCT	PCT/KR2015/008037	2015.07.31
	P20140587US	US Application	15/501,263	2017.02.02
		US Issue	10,644,819	2020.05.05

	P20140587USD1	US Application(DA)	16/832,151	2020.03.27
	P20140587CN	CN Application	201580042296.6	2017.02.06
		CN Issue	CN106664697B	2020.06.16
6	P20150017	Provisional Application	10-2015-0008486	2015.01.19
	P20150734	Provisional Application	10-2015-0135899	2015.09.24
	P20150844	KR Application	10-2016-0005012	2016.01.15
		KR Issue	10-1856304	2018.05.02
	P20150017PC	PCT	PCT/KR2016/000494	2016.01.18
	P20150017US	US Application	15/544,363	2017.07.18
		US Issue	10,306,546	2019.05.28
	P20150017CN	CN Application	201680004482.5	2017.06.23
		CN Issue	CN107113149B	2020.12.08
7	P20150278	Provisional Application	10-2015-0068715	2015.05.18
	P20150609	Provisional Application	10-2015-0114876	2015.08.13
	P20160030	KR Application	10-2016-0027594	2016.03.08
		KR Issue	10-1956978	2019.03.05
	P20150278PC	PCT	PCT/KR2016/005215	2016.05.17
	P20150278US	US Application	15/569,133	2017.10.25
		US Issue	10,341,806	2019.07.02
	P20150278USC1	US Application(CA)	16/412,376	2019.05.14
		US Issue(CA)	10,728,693	2020.07.28
	P20150278CN	CN Application	201680006425.0	2017.07.19

		CN Issue	CN107211238B	2020.11.06
8	P20150724	Provisional Application	10-2015-0135756	2015.09.24
	P20150865	Provisional Application	10-2015-0162286	2015.11.19
	P20160287	KR Application	10-2016-0098858	2016.08.03
		KR Issue	10-1896766	2018.09.03
	P20150724US	US Application	15/260,373	2016.09.09
		US Issue	10,085,249	2018.09.25
	P20150724CN	CN Application	201610806693.2	2016.09.06
		CN Issue	CN106559161B	2019.01.04
9	P20160067	Provisional Application	10-2016-0014509	2016.02.04
	P20160076	Provisional Application	10-2016-0015050	2016.02.05
	P20160169	Provisional Application	10-2016-0039529	2016.03.31
	P20160548	KR Application	10-2016-0117138	2016.09.12
		KR Issue	10-1910245	2018.10.15
	P20160067US	US Application	15/415,781	2017.01.25
		US Issue	10,568,071	2020.02.18
	P20160067CN	CN Application	201710021966.9	2017.01.12
10	P20160126	Provisional Application	10-2016-0030172	2016.03.14
	P20160855	KR Application	10-2017-0022956	2017.02.21
		KR Issue	10-2237525	2021.04.01
	P20160126PC	PCT	PCT/KR2017/002535	2017.03.08
	P20160126US	US Application	16/084,594	2018.09.13

		US Issue	11,197,309	2021.12.07
	P20160126CN	CN Application	201780017398.1	2018.09.14
		CN Issue	CN 108781154B	2021.12.14
11	P20160143	Provisional Application	10-2016-0037224	2016.03.28
	P20160856	KR Application	10-2017-0022964	2017.02.21
		KR Issue	10-2065432	2020.01.07
	P20160143PC	PCT	PCT/KR2017/002536	2017.03.08
	P20160143US	US Application	16/088,914	2018.09.27
		US Issue	10,892,867	2021.01.12
	P20160143CN	CN Application	201780013601.8	2018.08.27
		CN Issue	CN 108702280 B	
12	P20160240	Provisional Application	10-2016-0051737	2016.04.27
	P20160818	KR Application	10-2016-0171232	2016.12.15
		KR Issue	10-1963483	2019.03.22
	P20160240US	US Application	15/497,362	2017.04.26
		US Issue	10,412,731	2019.09.10
	P20160240USC1	US Application(CA)	16/529,789	2019.08.02
		US Issue(CA)	10,616,889	2020.04.07
	P20160240CN	CN Application	201710280467.X	2017.04.26
		CN Issue	CN 107317662 B	2020.12.08
13	P20160257	Provisional Application	10-2016-0055676	2016.05.04
	P20160265	Provisional Application	10-2016-0058317	2016.05.12

	P20170206	KR Application	10-2017-0056206	2017.05.02
		KR Issue	10-2120976	2020.06.03
	P20170207	KR Application	10-2017-0056011	2017.05.02
		KR Issue	10-2093906	2020.03.20
	P20160257PC	PCT	PCT/KR2017/004702	2017.05.02
	P20160257US	US Application	16/098,812	2018.11.02
		US Issue	11,431,460	2022.08.30
	P20160257CN	CN Application	201780027159.4	2018.11.01
		CN Issue	CN 109075949 B	2021.12.14
	P20170207P1	KR Application(DA)	10-2020-0031570	2020.03.13
		KR Issue(DA)	10-2121009	2020.06.03
	P20160257USD1	US Application(DA)	16/179,863	2018.11.02
		US Issue(DA)	11,431,460	2022.08.30
	P20160257CND1	CN Application(DA)	201811307533.9	2018.11.05
		CN Issue(DA)	CN 109547182 B	2021.07.23
14	P20160645	Provisional Application	10-2016-0116784	2016.09.09
	P20170334	KR Application	10-2017-0098820	2017.08.04
		KR Issue	10-2120856	2020.06.03
	P20160645PC	PCT	PCT/KR2017/008734	2017.08.11
	P20160645US	US Application	16/331,969	2019.03.09
		US Issue	11,115,976	2021.09.07
	P20160645CN	CN Application	201780055337.4	2019.03.08
		CN Issue	CN 109691000 B	2021.11.05

15	P20160670	Provisional Application	10-2016-0122509	2016.09.23
	P20170648	KR Application	10-2017-0118923	2017.09.15
		KR Issue	10-2186397	2020.11.27
	P20160670PC	PCT	PCT/KR2017/010496	2017.09.22
	P20160670US	US Application	16/335,717	2019.03.22
		US Issue	10,849,111	2020.11.24
	P20160670CN	CN Application	201780058930.4	2019.03.25
		CN Issue	CN 109792315 B	2021.10.26
16	P20160683	Provisional Application	10-2016-0127089	2016.09.30
	P20170199	KR Application	10-2017-0080594	2017.06.26
		KR Issue	10-2085195	2020.02.28
	P20160683US	US Application	15/716,568	2017.09.27
		US Issue	10,581,560	2020.03.03
	P20160683CN	CN Application	201710795343.5	2017.09.06
		CN Issue	CN 107888333 B	2020.12.08
17	P20140174	Provisional Application	10-2014-0033579	2014.03.21
	P20140196	Provisional Application	10-2014-0034955	2014.03.25
	P20140207	Provisional Application	10-2014-0037394	2014.03.31
	P20140784	KR Application	10-2014-0175190	2014.12.08
		KR Issue	10-1722300	2017.03.27
	P20140174PC	PCT	PCT/KR2015/002021	2015.03.03
	P20140174US	US Application	14/664,853	2015.03.21
		US Issue	9,629,010	2017.04.18

	P20140174USC1	US Application(CA)	15/454,020	2017.03.09
		US Issue(CA)	10,009,161	2018.06.26
	P20140174CN	CN Application	201580006948.0	2016.08.02
		CN Issue	CN 106063214 B	2019.07.02
	P20140174CND1	CN Application(DA)	201910480118.1	2019.06.04
		CN Issue(DA)	CN 110149169 B	2021.12.14
18	P20140253	Provisional Application	10-2014-0046986	2014.04.18
	P20141039	KR Application	10-2015-0021154	2015.02.11
		KR Issue	10-1674791	2016.11.03
	P20140253US	US Application	14/687,865	2015.04.15
		US Issue	10091736	2018.10.02
	P20140253CN	CN Application	201510188805.8	2015.04.20
		CN Issue	CN 105007616 B	2019.09.24
19	P20160508	Provisional Application	10-2016-0089972	2016.07.15
	P20170351	KR Application	10-2017-0087597	2017.07.11
		KR Issue	10-2178412	2020.11.09
	P20160508PC	PCT	PCT/KR2017/007466	2017.07.12
	P20160508US	US Application	16/316,774	2019.01.10
		US Issue	10,791,530	2020.09.29
	P20160508EP	EP Application	17827948.5	2018.12.28
	P20160508CN	CN Application	201780041919.7	2019.01.04
		CN Issue	CN 109417422 B	

20	P20160627	Provisional Application	10-2016-0112748	2016.09.01
	P20170169	KR Application	10-2017-0059543	2017.05.12
		KR Issue	10-2123233	2020.06.10
	P20160627PC	PCT	PCT/KR2017/008944	2017.08.17
	P20160627US	US Application	16/318,466	2019.01.17
		US Issue	11,044,743	2021.06.22
	P20160627USC1	US Application(CA)	17/307,945	2021.05.04
	P20160627EP	EP Application	17846885.6	2018.12.28
	P20160627CN	CN Application	201780039745.0	2018.12.26
		CN Issue	CN 109328481 B	
21	P20160720	Provisional Application	10-2016-0130101	2016.10.07
	P20170649	KR Application	10-2017-0124261	2017.09.26
		KR Issue	10-2156672	2020.09.10
	P20160720PC	PCT	PCT/KR2017/010863	2017.09.28
	P20160720US	US Application	16/340,096	2019.04.05
		US Issue	11,038,735	2021.06.15
	P20160720USC1	US Application(CA)	17/314,034	2021.05.06
		US Issue(CA)		
	P20160720USC1C1	US Application(CA)	18/078,965	2022.12.11
		US Issue(CA)		
	P20160720EP	EP Application	17858693.9	2019.04.16
	P20160720CN	CN Application	201780061902.8	2019.04.04
		CN Issue	CN 109792429 B	2021.12.14

22	P20160768	Provisional Application	10-2016-0141451	2016.10.27
	P20170778	Provisional Application	10-2017-0130023	2017.10.11
	P20170798	KR Application	10-2017-0139598	2017.10.25
		KR Issue	10-2057127	2019.12.12
	P20160768PC	PCT	PCT/KR2017/011958	2017.10.27
	P20160768US	US Application	16/344,947	2019.04.25
		US Issue	11,115,157	2021.09.07
	P20160768USC1	US Application(CA)	17/379,977	2021.07.19
	P20160768EP	EP Application	17865477.8	2019.04.26
	P20160768CN	CN Application	201780062118.9	2019.04.08
		CN Issue	CN 109804692 B	2022.07.15
23	P20160836	Provisional Application	10-2016-0152659	2016.11.16
	P20170803	KR Application	10-2017-0151983	2017.11.15
		KR Issue	10-2156668	2020.09.10
	P20160836PC	PCT	PCT/KR2017/012992	2017.11.16
	P20160836US	US Application	16/349,874	2019.05.14
		US Issue	11,405,942	2022.08.02
	P20160836CN	CN Application	201780069729.6	2019.05.10
24	P20160837	Provisional Application	10-2016-0152587	2016.11.16
	P20170804	KR Application	10-2017-0153125	2017.11.16
		KR Issue	10-2195869	2020.12.21
	P20160837PC	PCT	PCT/KR2017/013045	2017.11.16
	P20160837US	US Application	16/461,640	2019.05.16

		US Issue	11,240,785	2022.02.01
	P20160837USC1	US Application(CA)	17/543,675	2021.12.06
	P20160837EP	EP Application	17871249.3	2019.05.27
	P20160837CN	CN Application	201780070560.6	2019.05.15
25	P20160768	Provisional Application	10-2016-0141451	2016.10.27
	P20170778	Provisional Application	10-2017-0130023	2017.10.11
	P20170142	Provisional Application	10-2017-0037553	2017.03.24
	P20170428	Provisional Application	10-2017-0079911	2017.06.23
	P20170808	KR Application(병합)	10-2017-0139885	2017.10.26
		KR Issue(병합)	10-2162591	2020.09.28
	P20170142PC	PCT	PCT/KR2017/011968	2017.10.27
	P20170142US	US Application	16/340,460	2019.04.09
		US Issue	10,925,079	2021.02.16
	P20170142EP	EP Application	17865212.9	2019.04.26
	P20170142CN	CN Application	201780066539.9	2019.04.26
		CN Issue	CN 109891988 B	2022.08.09
26	P20170011	Provisional Application	10-2017-0002589	2017.01.06
	P20170296	Provisional Application	10-2017-0066632	2017.05.30
	P20170933	KR Application	10-2018-0001157	2018.01.04
		KR Issue	10-2114096	2020.05.18
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		US Issue	11,160,051	2021.10.26
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	P20170011CN	CN Application	201880004512.1	2019.05.22
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27	P20170132	Provisional Application	10-2017-0035615	2017.03.21
	P20170866	Provisional Application	10-2017-0101169	2017.08.09
	P20170935	KR Application	10-2018-0014576	2018.02.06
		KR Issue	10-2043996	2019.11.06
	P20170935P1	KR Application(DA)	10-2019-0135870	2019.10.29
		KR Issue(DA)	10-2206761	2021.01.19
	P20170132US	US Application	15/924,553	2018.03.19
		US Issue	10,856,307	2020.12.01
	P20170132CN	CN Application	201810236651.9	2018.03.21
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	P20170479	Provisional Application	10-2017-0082920	2017.06.29
	P20170622	Provisional Application	10-2017-0101782	2017.08.10
	P20170132	Provisional Application	10-2017-0035615	2017.03.21
	P20170866	Provisional Application	10-2017-0101169	2017.08.09
	P20180049	KR Application	10-2018-0018656	2018.02.14
		KR Issue	10-2100483	2020.04.07

	P20170479US	US Application	15/923,658	2018.03.16
		US Issue	10,869,303	2020.12.15
	P20170479CN	CN Application	201810217863.2	2018.03.16
		CN Issue	CN 108633072 B	8/26/2022
29	P20170142	Provisional Application	10-2017-0037553	2017.03.24
	P20170428	Provisional Application	10-2017-0079911	2017.06.23
	P20170800	KR Application	10-2017-0139604	2017.10.25
		KR Issue	10-2010019	2019.08.06
	P20170428US	US Application	15/934,927	2018.03.23
		US Issue	10,506,630	2019.12.10
	P20170428CN	CN Application	201810251436.6	2018.03.26
		CN Issue	CN 108633076 B	
30	P20170318	Provisional Application	10-2017-0067957	2017.05.31
	P20180018	KR Application	10-2018-0035572	2018.03.28
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	P20170318US	US Application	15/990,895	2018.05.29
		US Issue	10,805,050	2020.10.13
	P20170318CN	CN Application	201810524233.X	2018.05.28
		CN Issue	CN 108988984 B	2021.07.09
31	P20170531	Provisional Application	10-2017-0089654	2017.07.14
	P20180193	KR Application	10-2018-0054207	2018.05.11
		KR Issue	10-2128964	2020.06.25
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	P20170531CN	CN Application	201810756991.4	2018.07.11
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	P20170621	Provisional Application	10-2017-0102577	2017.08.11
	P20180204	KR Application	10-2018-0057278	2018.05.18
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		US Issue	10,594,460	2020.03.17
	P20170594CN	CN Application	201810801096.X	2018.07.20
		CN Issue	CN 109309558 B	2021.10.08
33	P20170764	Provisional Application	10-2017-0128188	2017.09.29
	P20170916	Provisional Application	10-2017-0162728	2017.11.30
	P20180207	KR Application	10-2018-0077270	2018.07.03
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		KR Issue(DA)	10-2246988	2021.04.26
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		US Issue	10,638,463	2020.04.28
	P20170764USD1	US Application(DA)	16/826,482	2020.03.23
		US Issue(DA)	11,219,000	2022.01.04
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		CN Issue	CN 109586883 B	2021.11.05

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	P20180507	KR Application	10-2018-0132306	2018.10.31
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	P20180014US	US Application	16/241,086	2019.01.07
		US Issue	11,258,532	2022.02.22
	P20180014USC1	US Application(CA)	17/565,353	2021.12.29
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	P20180014CN	CN Application	201910011509.9	2019.01.07
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		US Issue	11,330,573	2022.05.10
	P20150004CN	CN Application	201680004054.2	2017.06.08
		CN Issue	CN 107005903 B	2021.01.15
36	P20160666	Provisional Application	10-2016-0122506	2016.09.23
	P20170333	KR Application	10-2017-0104068	2017.08.17
		KR Issue	10-2001301	2019.07.11
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		US Issue	10,334,657	2019.06.25

	P20160666CN	CN Application	201710864759.8	2017.09.22
		CN Issue	CN 108307543 B	2021.06.15
37	P20150003	Provisional Application	10-2015-0002930	2015.01.08
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		KR Issue	10-1866619	2018.06.04
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		US Issue	10,237,084	2019.03.19
	P20150003CN	CN Application	201580066326.7	2017.06.06
		CN Issue	CN 107005820 B	2020.11.03
38	P20130110	Provisional Application	10-2013-0034603	2013.03.29
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		KR Issue	10-1632277	2016.06.15
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		US Issue	9497666	2016.11.15
	P20130110CN	CN Application	201480019499.9	2015.09.29
		CN Issue	CN 105103613 B	2018.12.25
39	P20130124	Provisional Application	10-2013-0036870	2013.04.04
	P20130843	Provisional Application	10-2013-0130502	2013.10.30
	P20131105	KR Application	10-2013-0161241	2013.12.23
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		KR Issue(DA)	10-2133255	2020.07.07
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	P20160805EP	EP Application	17867340.6	2019.05.16
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		CN Issue	CN 109906630 B	9/16/2022
41	P20170009	Provisional Application	10-2017-0002440	2017.01.06
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		US Issue	10,880,222	2020.12.29
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43	P20160264	Provisional Application	10-2016-0058157	2016.05.12
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44	P20170082	Provisional Application	10-2017-0027919	2017.03.03
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		US Issue	11,012,911	2021.05.18
45	P20170144	Provisional Application	10-2017-0037934	2017.03.24
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		KR Issue	10-2174936	2020.10.30

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		KR Issue	10-2115233	2020.05.20
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		US Issue	10,708,968	2020.07.07
47	P20180026	Provisional Application	10-2018-0006980	2018.01.19
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		US Issue	10,812,230	2020.10.20
48	P20150254	Provisional Application	10-2015-0067848	2015.05.15
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49	P20130907	Provisional Application	10-2013-0135867	2013.11.08
	P20140043	Provisional Application	10-2014-0012709	2014.02.04
	P20140224	KR Application	10-2014-0088948	2014.07.15
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		US Issue(CA)	10,178,626	2019.01.08
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	P20140208	Provisional Application	10-2014-0037398	2014.03.31
	P20140325	Provisional Application	10-2014-0059630	2014.05.19
	P20140785	KR Application	10-2014-0175182	2014.12.08
		KR Issue	10-1632354	2016.06.15
	P20140175PC	PCT	PCT/KR2015/002022	2015.03.03
	P20140175US	US Application	14/664,854	2015.03.21
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	P20140175CN	CN Application	201580006949.5	2016.08.02
		CN Issue	CN 106464647 B	2019.09.13
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	P20170314CN	CN Application	201810531289.8	2018.05.29
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53	P20160663	Provisional Application	10-2016-0122503	2016.09.23
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		KR Issue	10-2127753	2020.06.23
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54	P20160696	Provisional Application	10-2016-0127093	2016.09.30
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		US Issue	11,363,548	2022.06.14
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55	P20160790	Provisional Application	10-2016-0143013	2016.10.31
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		KR Issue	10-2114940	2020.05.19
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		US Issue(CA)	11540272	2022.12.08
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56	P20160806	Provisional Application	10-2016-0146950	2016.11.04
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	P20160806DE	DE Application	17866547.7	2019.05.13
		DE Issue	3537794	2021.09.08
	P20160806GB	GB Application	17866547.7	2019.05.13
		GB Issue	3537794	2021.09.08
	P20160806FR	FR Application	17866547.7	2019.05.13
		FR Issue	3537794	2021.09.08
	P20160806CN	CN Application	201780067632.1	2019.04.30
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		US Issue	10,897,720	2021.01.19

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	P20170622	Provisional Application	10-2017-0101782	2017.08.10
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	P20170131CN	CN Application	201810217772.9	2018.03.16
		CN Issue	CN 108633071 B	8/23/2022
59	P20170303	Provisional Application	10-2017-0065379	2017.05.26
	P20170451	Provisional Application	10-2017-0081411	2017.06.27
	P20180017	KR Application	10-2018-0037938	2018.04.02
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		US Issue	10,979,190	2021.04.13

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		CN Issue	CN 108966181 B	2021.07.23
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		KR Issue	10-2114919	2020.05.19
	P20180097P1	KR Application(DA)	10-2020-0034779	2020.03.23
		KR Issue(DA)	10-2198758	2020.12.29
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		US Issue	10,284,404	2019.05.07
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61	P20170741	Provisional Application	10-2017-0118757	2017.09.15
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		KR Issue	10-2198015	2020.12.28
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		US Issue	10,616,834	2020.04.07
	P20170741CN	CN Application	201811085562.5	2018.09.17
62	P20170743	Provisional Application	10-2017-0118409	2017.09.15
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		KR Issue	10-2193191	2020.12.14

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63	P20170765	Provisional Application	10-2017-0128177	2017.09.29
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	P20180532	Provisional Application	10-2018-0084727	2018.07.20
	P20180540	KR Application	10-2018-0092635	2018.08.08
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		US Issue	10,721,765	2020.07.21
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64	P20170795	Provisional Application	10-2017-0128513	2017.10.02
	P20180084	Provisional Application	10-2018-0022186	2018.02.23
	P20180208	KR Application	10-2018-0096773	2018.08.20
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		US Issue	10,715,283	2020.07.14
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		CN Issue	CN 109600212 B	2021.08.31
65	P20140677	Provisional Application	10-2014-0119263	2014.09.05
	P20150247	KR Application	10-2015-0094021	2015.07.01

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		US Issue	10,735,967	2020.08.04
	P20140677CN	CN Application	201580047094.0	2017.03.02
		CN Issue	CN 106717045 B	2021.03.05
66	P20150098	Provisional Application	10-2015-0032665	2015.03.09
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		KR Issue	10-1987525	2019.06.03
	P20150098PC	PCT	PCT/KR2016/002281	2016.03.08
	P20150098US	US Application	15/556,028	2017.09.06
		US Issue	10,708,893	2020.07.07
	P20150098CN	CN Application	201680013808.0	2017.09.05
		CN Issue	CN 107431592 B	2020.07.07
67	P20160241	Provisional Application	10-2016-0054935	2016.05.03
	P20170025	KR Application	10-2017-0044062	2017.04.05
		KR Issue	10-2016106	2019.08.23
	P20160241US	US Application	15/498,607	2017.04.27
		US Issue	10,420,067	2019.09.17
	P20160241CN	CN Application	201710282167.5	2017.04.26
		CN Issue	CN 107360561 B	2020.09.11
68	P20160249	Provisional Application	10-2016-0054937	2016.05.03
	P20160250	Provisional Application	10-2016-0054936	2016.05.03

	P20170178	KR Application	10-2017-0053295	2017.04.26
		KR Issue	10-2057212	2019.12.12
	P20160249PC	PCT	PCT/KR2017/004432	2017.04.26
	P20160249US	US Application	16/098,841	2018.11.02
		US Issue	10,667,322	2020.05.26
	P20160249CN	CN Application	201780027502.5	2018.11.02
		CN Issue	CN 109076496 B	2021.09.03
69	P20160251	Provisional Application	10-2016-0054930	2016.05.03
	P20170076	KR Application	10-2017-0045815	2017.04.10
		KR Issue	10-2005910	2019.07.25
	P20160251US	US Application	15/582,906	2017.05.01
		US Issue	10,159,025	2018.12.18
	P20160251CN	CN Application	201710291278.2	2017.04.28
		CN Issue	CN 107343299 B	2021.01.05
70	P20170098	Provisional Application	10-2017-0030764	2017.03.10
	P20170317	Provisional Application	10-2017-0068074	2017.05.31
	P20170896	Provisional Application	10-2017-0152149	2017.11.15
	P20180044	KR Application	10-2018-0026611	2018.03.07
		KR Issue	10-2065137	2020.01.06
	P20170098PC	PCT	PCT/KR2018/002750	2018.03.08
	P20170098US	US Application	16/349,259	2019.05.10
		US Issue	10,986,530	2021.04.20
	P20170098CN	CN Application	201880004237.3	2019.05.06

		CN Issue	CN 109937587 B	2022.06.14
71	P20170397	Provisional Application	10-2017-0076126	2017.06.15
	P20170930	KR Application	10-2018-0051293	2018.05.03
		KR Issue	10-2023672	2019.09.16
	P20170397US	US Application	16/004,783	2018.06.11
		US Issue	10,511,994	2019.12.17
	P20170397CN	CN Application	201810612491.3	2018.06.14
	P20170397CN	CN Issue	CN 109151878 B	2021.12.14
72	P20160282	Provisional Application	10-2016-0062068	2016.05.20
	P20160481	KR Application	10-2016-0088331	2016.07.13
		KR Issue	10-2100491	2020.04.07
	P20160481PC	PCT	PCT/KR2017/007452	2017.07.12
	P20160481US	US Application	16/316,092	2019.01.08
		US Issue	10,869,243	2020.12.15
73	P20170018	Provisional Application	10-2017-0005590	2017.01.12
	P20170938	KR Application	10-2018-0002947	2018.01.09
		KR Issue	10-2117098	2020.05.25
	P20170018PC	PCT	PCT/KR2018/000518	2018.01.11
	P20170018US	US Application	16/343,819	2019.04.22
		US Issue	10,660,004	2020.05.19
74	P20170234	Provisional Application	10-2017-0054983	2017.04.28
	P20170673	KR Application	10-2018-0000256	2018.01.02
		KR Issue	10-1957087	2019.03.05
	P20170234US	US Application	15/967,512	2018.04.30

		US Issue	10,772,148	2020.09.08
75	P20170238	Provisional Application	10-2017-0057299	2017.05.08
	P20180146	KR Application	10-2018-0036753	2018.03.29
		KR Issue	10-2066689	2020.01.09
	P20170238US	US Application	15/969,858	2018.05.03
		US Issue	10,470,159	2019.11.05
76	P20170389	Provisional Application	10-2017-0076924	2017.06.16
	P20180250	KR Application	10-2018-0053053	2018.05.09
		KR Issue	10-2042036	2019.11.01
	P20170389US	US Application	16/007,050	2018.06.13
		US Issue	10,499,376	2019.12.03
77	P20180202	Provisional Application	10-2018-0039897	2018.04.05
	P20190047	KR Application	10-2019-0020835	2019.02.22
		KR Issue	10-2206773	2021.01.19
	P20180202US	US Application	16/373,808	2019.04.03
		US Issue	10,873,671	2020.12.22
78	P20180557	Provisional Application	10-2018-0090004	2018.08.01
	P20190287	KR Application	10-2019-0075402	2019.06.25
		KR Issue	10-2198010	2020.12.28
	P20180557US	US Application	16/528,980	2019.08.01
		US Issue	11,178,573	2021.11.16
79	P20160807	가출원	10-2016-0146955	2016.11.04
	P20170669	KR 출원	10-2017-0135215	2017.10.18

		KR 등록	10-2130999	2020.07.01
	P20160807PC	PCT 국제출원	PCT/KR2017/012003	2017.10.27
	P20160807US	US 출원	16/347,571	2019.05.03
	P20160807EP	EP 출원	17867332.3	2019.05.13
	P20160807CN	CN 출원	201780067633.6	2019.04.30
80	P20170184	가출원	10-2017-0047545	2017.04.12
	P20170239	가출원	10-2017-0056477	2017.05.02
	P20170507	가출원	10-2017-0086107	2017.07.06
	P20180096	정규출원	10-2018-0034955	2018.03.27
	P20170184US	US 출원	15/951,349	2018.04.12
		US 등록	10,958,380	2021.03.23
	P20170184USC1	US 출원(CA)	17/173,097	2021.02.10
	P20170184CN	CN 출원	201810318869.9	2018.04.11

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United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/314,064	05/07/2021	Sung-pyo HONG	KT-0007-CA1-CS

CONFIRMATION NO. 5482

82727
KILE PARK REED & HOUTTEMAN PLLC
JAE Y PARK
1101 30th Street, N.W.
Suite 500
Washington, DC 20007

POWER OF ATTORNEY NOTICE

OC000000059899156

Date Mailed: 07/31/2023

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 07/24/2023.

- The Power of Attorney to you in this application has been revoked by the applicant. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/sltorres/

Petitioners' Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00036; U.S. Patent No. 11,627,631
Page 38 of 433

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/314,064	05/07/2021	Sung-pyo HONG	KT-0007-CA1-CS

CONFIRMATION NO. 5482

190803
Insight Law Group, PLLC
8287 Spring Leaf Ct.
Vienna, VA 22182

POA ACCEPTANCE LETTER

OC000000059899201

Date Mailed: 07/31/2023

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 07/24/2023.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/sltorres/

PTO/AIA/80 (07-17)
Approved for use through 02/31/2021. OMB 0651-0035
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POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:

[X] Practitioners associated with Customer Number: 190803

OR

[ ] Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(c).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:

[X] The address associated with Customer Number: 190803

OR

[ ]

Firm or individual name: Insight Law Group, PLLC (Attn: Seung Ho Lee)		
Address: 8287 Spring Leaf Ct.		
City: Vienna	State: VA	Zip: 22182
Country: United States		
Telephone: (571) 277-3336	Email: prosecution@insight-pat.com	

Assignee name and address: KT CORPORATION
90, Buljeong-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, 13606, Republic of Korea

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of the practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee.

Signature	閔燦浩	Date	Nov. 18, 2022
Name	Min, Chan-ho	Telephone	+82-10-9530-8965
Title	Director		

This collection of information is required by 37 CFR 1.31, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public, which is to update (and by the USPTO to process) the file of a patent or reexamination proceeding. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PTO/AIA/96 (08-12)
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STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: KT Corporation

Application No./Patent No.: 17/314,064 Filed/Issue Date: 05/07/2021

Titled: METHOD FOR PROCESSING DATA ON BASIS OF NETWORK SLICE, AND APPARATUS THEREFOR

KT Corporation, a corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☑ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☑ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 056176, Frame 0589, or for which a copy thereof is attached.

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

2. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450**.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

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5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☑ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Seung Ho Lee/	July 24, 2023
Signature	Date
Seung Ho Lee	69,919
Printed or Typed Name	Title or Registration Number

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	48342272
Application Number:	17314064
International Application Number:	
Confirmation Number:	5482
Title of Invention:	METHOD FOR PROCESSING DATA ON BASIS OF NETWORK SLICE, AND APPARATUS THEREFOR
First Named Inventor/Applicant Name:	Sung-pyo HONG
Customer Number:	82727
Filer:	Seung Ho Lee
Filer Authorized By:	
Attorney Docket Number:	KT-0007-CA1-CS
Receipt Date:	24-JUL-2023
Filing Date:	07-MAY-2021
Time Stamp:	23:57:49
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	01_KT-GPOA.PDF	998720 dc500ad047f41bcdcccf0bc736315dd5de2151a2	no	2

Warnings:

Information:					
2	Assignee showing of ownership per 37 CFR 3.73	02_aia373_KT007C1_17314064.pdf	118079 302e2f6db8fa53ed48b19276d05e5305610110c1	no	3
Warnings:					
Information:					
		Total Files Size (in bytes):	1116799		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/314,064	04/11/2023	11627631	KT-0007-CA1-CS	5482

82727 7590 03/22/2023

KILE PARK REED & HOUTTEMAN PLLC
JAE Y PARK
1101 30th Street, N.W.
Suite 500
Washington, DC 20007

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 99 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Patents Stakeholder Experience (OPSE), Stakeholder Support Division (SSD) at (571)-272-4200.

INVENTOR(s) (Please see PAIR WEB site http://pair.uspto.gov for additional inventors):

Sung-pyo HONG, Seoul, KOREA, REPUBLIC OF;
Woo-jin CHOI, Seoul, KOREA, REPUBLIC OF;

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

KT CORPORATION, Gyeonggi-do, KOREA, REPUBLIC OF;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

126667 7590 12/05/2022
INVENSTONE PATENT, LLC
7925 Jones Branch Dr Suite 3100-A
McLean, VA 22102

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/314,064	05/07/2021	Sung-pyo HONG	KT21-0119C1	5482

TITLE OF INVENTION: METHOD FOR PROCESSING DATA ON BASIS OF NETWORK SLICE, AND APPARATUS THEREFOR

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	03/06/2023

EXAMINER	ART UNIT	CLASS-SUBCLASS
PHAM, BRENDA H	2412	370-254000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 KILE PARK REED & HOUTTEMAN PLLC
2
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: KT CORPORATION

(B) RESIDENCE: (CITY and STATE OR COUNTRY): SEONGNAM-SI, REPUBLIC OF KOREA

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☒ Issue Fee ☐ Publication Fee (if required) ☐ 4b. Method of Advance Order - # of Copies _____

Payment: *(Please first reapply any previously paid fee shown above)*

☒ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 505622

5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Jae Y. Park/ Date March 6, 2023

Typed or printed name Jae Y. Park Registration No. 62629

PTOL-85 Part B (08-18) Approved for use through 01/31/2020 OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Petitioners' Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00036; U.S. Patent No. 11,627,631
Page 48 of 433

Electronic Patent Application Fee Transmittal					
Application Number:	17314064				
Filing Date:	07-May-2021				
Title of Invention:	METHOD FOR PROCESSING DATA ON BASIS OF NETWORK SLICE, AND APPARATUS THEREFOR				
First Named Inventor/Applicant Name:	Sung-pyo HONG				
Filer:	Jae Y. Park/EJ Yoon				
Attorney Docket Number:	KT-0007-CA1-CS				
Filed as Large Entity					
Filing Fees for Utility under 35 USC 111(a)					
Description		**Fee Code**	**Quantity**	**Amount**	**Sub-Total in USD($)**
Basic Filing:					
Pages:					
Claims:					
Miscellaneous-Filing:					
Petition:					
Patent-Appeals-and-Interference:					
Post-Allowance-and-Post-Issuance:					

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
PUBL. FEE- EARLY, VOLUNTARY, OR NORMAL	1504	1	0	0
UTILITY APPL ISSUE FEE	1501	1	1200	1200
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**1200**

Electronic Acknowledgement Receipt	
EFS ID:	47632288
Application Number:	17314064
International Application Number:	
Confirmation Number:	5482
Title of Invention:	METHOD FOR PROCESSING DATA ON BASIS OF NETWORK SLICE, AND APPARATUS THEREFOR
First Named Inventor/Applicant Name:	Sung-pyo HONG
Customer Number:	82727
Filer:	Jae Y. Park/EJ Yoon
Filer Authorized By:	Jae Y. Park
Attorney Docket Number:	KT-0007-CA1-CS
Receipt Date:	06-MAR-2023
Filing Date:	07-MAY-2021
Time Stamp:	16:14:08
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1200
RAM confirmation Number	E202336G15068679
Deposit Account	505622
Authorized User	EJ Yoon
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	PartB_KT0007CA1.pdf	974635 112e76d350476029a5f2a31e25c7ceca29a162a6	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	40152 b164c912c530658440c96d64d3d7c1f6fdec2eed	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	1014787		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/314,064	05/07/2021	Sung-pyo HONG	KT21-0119C1

CONFIRMATION NO. 5482

190803
Insight Law Group, PLLC
8287 Spring Leaf Ct.
Vienna, VA 22182

POWER OF ATTORNEY NOTICE

OC000000137170708

Date Mailed: 01/11/2023

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 01/06/2023.

- The Power of Attorney to you in this application has been revoked by the applicant. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/zabraha/

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/314,064	05/07/2021	Sung-pyo HONG	KT21-0119C1

CONFIRMATION NO. 5482

82727
KILE PARK REED & HOUTTEMAN PLLC
JAE Y PARK
1101 30th Street, N.W.
Suite 500
Washington, DC 20007

POA ACCEPTANCE LETTER

OC000000137170718

Date Mailed: 01/11/2023

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 01/06/2023.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/zabraha/

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82B (07-13)
Approved for use through 03/31/2021. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 82727

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

KT Corporation

☐ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature	[signature]	Date (Optional)	Dec. 20 2022
Name	CHAN Ho MIN		
Title	Director		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ Total of forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82A (07-13)
Approved for use through 03/31/2021. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	17/314,064
Filing Date	05/07/2021
First Named Inventor	Sung-pyo HONG
Title	METHOD FOR PROCESSING DATA ON BASIS OF NETWORK SLICE, AND APPARATUS THEREFOR
Art Unit	2412
Examiner Name	BRENDA H PHAM
Attorney Docket Number	KT21-0119C1

SIGNATURE of Applicant or Patent Practitioner

Signature	/Jae Y. Park/	Date (Optional)	2023-01-06
Name	Jae Y. Park	Registration Number	62629
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

☑ *Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Electronic Acknowledgement Receipt	
EFS ID:	47329974
Application Number:	17314064
International Application Number:	
Confirmation Number:	5482
Title of Invention:	METHOD FOR PROCESSING DATA ON BASIS OF NETWORK SLICE, AND APPARATUS THEREFOR
First Named Inventor/Applicant Name:	Sung-pyo HONG
Customer Number:	190803
Filer:	Jae Y. Park/EJ Yoon
Filer Authorized By:	Jae Y. Park
Attorney Docket Number:	KT21-0119C1
Receipt Date:	06-JAN-2023
Filing Date:	07-MAY-2021
Time Stamp:	13:02:53
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	POA_KT_KT-0007-CA1-CS.PDF	104169 94d9861d844e5e3a7b9d7abc8eb14f1f21b8bb39	no	1

Warnings:

Information:					
2	Power of Attorney	POA_Transmittal_KT-0007-CA1-CS.pdf	319122 0d20cd49451d8fe0931e8ea2321bb7f20863e214	no	1
Warnings:					
Information:					
			Total Files Size (in bytes):	423291	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/314,064	05/07/2021	Sung-pyo HONG	KT21-0119C1

CONFIRMATION NO. 5482

190803
Insight Law Group, PLLC
8287 Spring Leaf Ct.
Vienna, VA 22182

POA ACCEPTANCE LETTER

OC000000137022121

Date Mailed: 12/15/2022

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 12/09/2022.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/hsarwari/

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/314,064	05/07/2021	Sung-pyo HONG	KT21-0119C1

CONFIRMATION NO. 5482

126667
INVENSTONE PATENT, LLC
7925 Jones Branch Dr Suite 3100-A
McLean, VA 22102

POWER OF ATTORNEY NOTICE

OC000000137022116

Date Mailed: 12/15/2022

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 12/09/2022.

- The Power of Attorney to you in this application has been revoked by the applicant. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/hsarwari/

Petitioners' Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00036; U.S. Patent No. 11,627,631
Page 60 of 433

PTO/AIA/80 (07-17)
Approved for use through 07/31/2021. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no person is required to respond to a collection of information unless it displays a valid OMB control number

POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:

[X] Practitioners associated with Customer Number: 190803

OR

[ ] Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(c).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:

[X] The address associated with Customer Number: 190803

OR

[ ]

Firm or individual name: Insight Law Group, PLLC (Attn: Seung Ho Lee)		
Address: 8287 Spring Leaf Ct.		
City: Vienna	State: VA	Zip: 22182
Country: United States		
Telephone: (571) 277-3336	Email: prosecution@insight-pat.com	

Assignee name and address: KT CORPORATION
90, Buljeong-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, 13606, Republic of Korea

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of the practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee.

Signature	閔燦鎬	Date	Nov. 18, 2022
Name	Min, Chan-ho	Telephone	+82-10-9530-8965
Title	Director		

This collection of information is required by 37 CFR 1.31, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public, which is to update (and by the USPTO to process) the file of a patent or reexamination proceeding. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 18 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	47182333
Application Number:	17314064
International Application Number:	
Confirmation Number:	5482
Title of Invention:	METHOD FOR PROCESSING DATA ON BASIS OF NETWORK SLICE, AND APPARATUS THEREFOR
First Named Inventor/Applicant Name:	Sung-pyo HONG
Customer Number:	126667
Filer:	Seung Ho Lee
Filer Authorized By:	
Attorney Docket Number:	KT21-0119C1
Receipt Date:	09-DEC-2022
Filing Date:	07-MAY-2021
Time Stamp:	23:42:32
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Assignee showing of ownership per 37 CFR 3.73	KT006C1_aia0096_17314064_373.pdf	118082 58134f51f0c2bc26631cb6984f1be33bcc4543f0	no	3
Warnings:					

Information:					
2	Power of Attorney	KT-GPOA.PDF	998720 dc500ad047f41bcdcccf0bc736315dd5de2151a2	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	1116802	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: KT CORPORATION

Application No./Patent No.: 17/314,064 Filed/Issue Date: 05/07/2021

Titled: METHOD FOR PROCESSING DATA ON BASIS OF NETWORK SLICE, AND APPARATUS THEREFOR

KT CORPORATION, a corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☑ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☑ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 056176, Frame 0589, or for which a copy thereof is attached.

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

2. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450**.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☑ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Seung Ho Lee/	December 9, 2022
Signature	Date
Seung Ho Lee	69,919
Printed or Typed Name	Title or Registration Number

Privacy Act Statement

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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

126667 7590 12/05/2022
INVENSTONE PATENT, LLC
7925 Jones Branch Dr Suite 3100-A
McLean, VA 22102

EXAMINER	
PHAM, BRENDA H	
ART UNIT	PAPER NUMBER
2412	

DATE MAILED: 12/05/2022

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/314,064	05/07/2021	Sung-pyo HONG	KT21-0119C1	5482

TITLE OF INVENTION: METHOD FOR PROCESSING DATA ON BASIS OF NETWORK SLICE, AND APPARATUS THEREFOR

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	03/06/2023

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PTOL-85 (Rev. 02/11)

Petitioners' Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00036; U.S. Patent No. 11,627,631
Page 68 of 433

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

126667 7590 12/05/2022
INVENSTONE PATENT, LLC
7925 Jones Branch Dr Suite 3100-A
McLean, VA 22102

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/314,064	05/07/2021	Sung-pyo HONG	KT21-0119C1	5482

TITLE OF INVENTION: METHOD FOR PROCESSING DATA ON BASIS OF NETWORK SLICE, AND APPARATUS THEREFOR

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	03/06/2023

EXAMINER	ART UNIT	CLASS-SUBCLASS
PHAM, BRENDA H	2412	370-254000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ❑Issue Fee ❑Publication Fee (if required) ❑Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

PTOL-85 Part B (08-18) Approved for use through 01/31/2020 OMB 0651-0033 U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Petitioners' Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00036; U.S. Patent No. 11,627,631
Page 69 of 433

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/314,064	05/07/2021	Sung-pyo HONG	KT21-0119C1	5482

126667 7590 12/05/2022

INVENSTONE PATENT, LLC
7925 Jones Branch Dr Suite 3100-A
McLean, VA 22102

EXAMINER	
PHAM, BRENDA H	
ART UNIT	PAPER NUMBER
2412	

DATE MAILED: 12/05/2022

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

PTOL-85 (Rev. 02/11)

Petitioners' Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00036; U.S. Patent No. 11,627,631
Page 70 of 433

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

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4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 17/314,064	Applicant(s) HONG et al.	
	Examiner BRENDA H PHAM	Art Unit 2412	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to 10 November 2022.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are 1-18 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☑ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☑ All b) ☐ Some* c) ☐ None of the:

   1. ☑ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/BRENDA H PHAM/ Primary Examiner, Art Unit 2412	/BRENDA H PHAM/ Primary Examiner, Art Unit 2412

Petitioners' Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00036; U.S. Patent No. 11,627,631
Page 72 of 433

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/314,064	HONG et al.
	Examiner	Art Unit
	BRENDA H PHAM	2412

CPC - Searched*		
Symbol	Date	Examiner
H04W76/27.cpc. H04L41/0806.cpc. H04W36/0072.cpc. H04W36/08.cpc. H04W4/70.cpc. H04W72/085.cpc.	09/14/2022	b.p.

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
PE2E search	09/14/2022	b.p.
Double patent search	09/14/2022	b.p.
inventors search	09/14/2022	b.p.
applicant/assignees search	09/14/2022	b.p.
CPC search	09/14/2022	b.p.
PE2E updated search	11/22/2022	b.p.

/BRENDA H PHAM/ Primary Examiner, Art Unit 2412	/BRENDA H PHAM/ Primary Examiner, Art Unit 2412

Petitioners' Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00036; U.S. Patent No. 11,627,631
Page 73 of 433

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/314,064	HONG et al.
	Examiner	Art Unit
	BRENDA H PHAM	2412

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
	H04W76/27.cpc. H04L41/0806.cpc. H04W36/0072.cpc. H04W36/08.cpc. H04W4/70.cpc. H04W72/085.cpc.	11/22/2022	b.p.
	PE2E search	11/22/2022	b.p.

/BRENDA H PHAM/ Primary Examiner, Art Unit 2412	/BRENDA H PHAM/ Primary Examiner, Art Unit 2412

Petitioners' Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00036; U.S. Patent No. 11,627,631
Page 74 of 433

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/314,064	HONG et al.
	Examiner	**Art Unit**
	BRENDA H PHAM	2412

CPC								
Symbol							**Type**	**Version**
H04W	/	76	/	27			F	2018-02-01
H04L	/	41	/	0806			I	2013-01-01
H04W	/	36	/	0072			I	2013-01-01
H04W	/	36	/	08			I	2013-01-01
H04W	/	72	/	085			I	2013-01-01
H04W	/	4	/	70			A	2018-02-01

CPC Combination Sets								
Symbol					**Type**	**Set**	**Ranking**	**Version**
	/		/					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	18	
/BRENDA H PHAM/ Primary Examiner, Art Unit 2412	22 November 2022	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1 & 3

U.S. Patent and Trademark Office — Part of Paper No.: 20221122

Petitioners' Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00036; U.S. Patent No. 11,627,631
Page 75 of 433

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/314,064	HONG et al.
	Examiner	**Art Unit**
	BRENDA H PHAM	2412

INTERNATIONAL CLASSIFICATION				
CLAIMED				
H04W	/	76	/	27

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	18	
/BRENDA H PHAM/ Primary Examiner, Art Unit 2412	22 November 2022	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1 & 3

U.S. Patent and Trademark Office — Part of Paper No.: 20221122

Petitioners' Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00036; U.S. Patent No. 11,627,631
Page 76 of 433

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/314,064	HONG et al.
	Examiner	**Art Unit**
	BRENDA H PHAM	2412

☑ Claims renumbered in the same order as presented by applicant ☐ CPA ☑ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	18	
/BRENDA H PHAM/ Primary Examiner, Art Unit 2412	22 November 2022	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1 & 3

U.S. Patent and Trademark Office — Part of Paper No.: 20221122

Petitioners' Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00036; U.S. Patent No. 11,627,631
Page 77 of 433

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	249	(hand$over SAME slice SAME reject$4)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); EPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/22 10:37 AM
L2	36	(hand$over SAME slice SAME reject$4).clm.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); EPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/22 10:37 AM
L3	84	(hand$over SAME slice SAME PDU).clm.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); EPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/11/22 10:37 AM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

Petitioners' Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00036; U.S. Patent No. 11,627,631
Page 78 of 433

Doc Code: DIST.E.FILE **Document Description: Electronic Terminal Disclaimer - Filed**	PTO/SB/26 U.S. Patent and Trademark Office Department of Commerce

Electronic Petition Request	**TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A "PRIOR" PATENT**
Application Number	17314064
Filing Date	07-May-2021
First Named Inventor	Sung-pyo HONG
Attorney Docket Number	KT21-0119C1
Title of Invention	METHOD FOR PROCESSING DATA ON BASIS OF NETWORK SLICE, AND APPARATUS THEREFOR

☒ Filing of terminal disclaimer does not obviate requirement for response under 37 CFR 1.111 to outstanding Office Action

☒ This electronic Terminal Disclaimer is not being used for a Joint Research Agreement.

Owner	Percent Interest
KT CORPORATION	100%

The owner(s) with percent interest listed above in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of prior patent number(s)

11044777

as the term of said prior patent is presently shortened by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the prior patent are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the owner does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the prior patent, "as the term of said prior patent is presently shortened by any terminal disclaimer," in the event that said prior patent later:
- expires for failure to pay a maintenance fee;
- is held unenforceable;
- is found invalid by a court of competent jurisdiction;
- is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
- has all claims canceled by a reexamination certificate;
- is reissued; or
- is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

◉ Terminal disclaimer fee under 37 CFR 1.20(d) is included with Electronic Terminal Disclaimer request.

○ I certify, in accordance with 37 CFR 1.4(d)(4), that the terminal disclaimer fee under 37 CFR 1.20(d) required for this terminal disclaimer has already been paid in the above-identified application.	
Applicant claims the following fee status: ○ Small Entity ○ Micro Entity ◉ Regular Undiscounted I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.	
THIS PORTION MUST BE COMPLETED BY THE SIGNATORY OR SIGNATORIES I certify, in accordance with 37 CFR 1.4(d)(4) that I am: ◉ An attorney or agent registered to practice before the Patent and Trademark Office who is of record in this application Registration Number 57889 ○ A sole inventor ○ A joint inventor; I certify that I am authorized to sign this submission on behalf of all of the inventors as evidenced by the power of attorney in the application ○ A joint inventor; all of whom are signing this request	
Signature	/Daniel J. Chung/
Name	Daniel J. Chung

*Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner).
Form PTO/SB/96 may be used for making this certification. See MPEP § 324.

Electronic Patent Application Fee Transmittal

Application Number:	17314064
Filing Date:	07-May-2021
Title of Invention:	METHOD FOR PROCESSING DATA ON BASIS OF NETWORK SLICE, AND APPARATUS THEREFOR
First Named Inventor/Applicant Name:	Sung-pyo HONG
Filer:	Daniel Chung
Attorney Docket Number:	KT21-0119C1

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
STATUTORY OR TERMINAL DISCLAIMER	1814	1	170	170
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		170

Doc Code: DISQ.E.FILE
Document Description: Electronic Terminal Disclaimer – Approved

Application No.: 17314064

Filing Date: 07-May-2021

Applicant/Patent under Reexamination: HONG

Electronic Terminal Disclaimer filed on November 10, 2022

☒ APPROVED

This patent is subject to a terminal disclaimer

☐ DISAPPROVED

Approved/Disapproved by: Electronic Terminal Disclaimer automatically approved by EFS-Web

U.S. Patent and Trademark Office

Electronic Acknowledgement Receipt	
EFS ID:	46996603
Application Number:	17314064
International Application Number:	
Confirmation Number:	5482
Title of Invention:	METHOD FOR PROCESSING DATA ON BASIS OF NETWORK SLICE, AND APPARATUS THEREFOR
First Named Inventor/Applicant Name:	Sung-pyo HONG
Customer Number:	126667
Filer:	Daniel Chung
Filer Authorized By:	
Attorney Docket Number:	KT21-0119C1
Receipt Date:	10-NOV-2022
Filing Date:	07-MAY-2021
Time Stamp:	05:58:01
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$170
RAM confirmation Number	E2022A0657554540
Deposit Account	602040
Authorized User	Daniel CHUNG
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Terminal Disclaimer-Filed (Electronic)	eTerminal-Disclaimer.pdf	41316 27868c3cd7277fdf712201b9bb3913b14afa53cb	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	37960 c98d974c3d56f98bc0dfa5154b77736655222db5	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	79276		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:	Sung-pyo HONG et al.	Examiner: BRENDA H PHAM
Application No.:	17/314,064	Group Art Unit: 2412
Filing Date:	05/07/2021	Confirmation No.: 5482
For:	METHOD FOR PROCESSING DATA ON BASIS OF NETWORK SLICE, AND APPARATUS THEREFOR	

Mail Stop AMENDMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT UNDER 37 C.F.R. 1.111

In response to the Office Action dated October 14, 2022, please consider the following:

Remarks begin on page 2.

REMARKS

Application status

Claims 1-18 are currently pending.

Provisional rejection of claims 1-18 on the ground of non-statutory double patenting as being unpatentable over claims 1-16 of U.S. Patent No. 11,044,777

Applicant files herewith a terminal disclaimer relative to patent No. 11,044,777. Thus, the double patenting rejection is moot.

Allowable subject matter

Applicant thanks Examiner for indicating that claims 1-18 contain allowable subject matter. The rejected claims 1-18 are withdrawn by this Amendment.

Namely, Applicant respectfully requests the Examiner to issue a 'Notice of Allowance' in a next Office Action.

Conclusion

In view of the present amendment and the above discussion, Applicant respectfully submits that the present application is in condition for allowance, the pending claims are believed to be in condition for allowance and an early issuance of a Notice of Allowance is respectfully requested.

Petitioners' Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00036; U.S. Patent No. 11,627,631
Page 87 of 433

No additional fees are believed to be necessitated by this response. If any other fees are determined to be due with this filing, the Director is authorized to charge any such fees, or credit any overpayment, to our Deposit Account No. 602040, referencing the Docket No. stated above.

Respectfully Submitted,

Date: November 10, 2022

By /Daniel J. Chung/
Daniel J. Chung
Registration No. 57,889

INVENSTONE PATENT, LLC
7925 Jones Branch Dr Suite 3100-A
McLean VA 22102
703-879-5205

Petitioners' Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00036; U.S. Patent No. 11,627,631
Page 88 of 433

Electronic Acknowledgement Receipt	
EFS ID:	46996600
Application Number:	17314064
International Application Number:	
Confirmation Number:	5482
Title of Invention:	METHOD FOR PROCESSING DATA ON BASIS OF NETWORK SLICE, AND APPARATUS THEREFOR
First Named Inventor/Applicant Name:	Sung-pyo HONG
Customer Number:	126667
Filer:	Daniel Chung
Filer Authorized By:	
Attorney Docket Number:	KT21-0119C1
Receipt Date:	10-NOV-2022
Filing Date:	07-MAY-2021
Time Stamp:	05:53:21
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		KT21-0119C1_P20160805USC1_Response-OA1.pdf	23573 c450b40699d1659b317bd534c05bb5ee0c1d6a47	yes	3

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Request for Reconsideration-After Non-Final Rejection	1	1
	Applicant Arguments/Remarks Made in an Amendment	2	3
Warnings:			
Information:			
	Total Files Size (in bytes):	23573	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/314,064	05/07/2021	Sung-pyo HONG	KT21-0119C1	5482

126667 7590 10/14/2022

INVENSTONE PATENT, LLC
7925 Jones Branch Dr Suite 3100-A
McLean, VA 22102

EXAMINER	
PHAM, BRENDA H	

ART UNIT	PAPER NUMBER
2412	

NOTIFICATION DATE	DELIVERY MODE
10/14/2022	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

dan@invenstonepat.com
mail@invenstonepat.com

Office Action Summary	Application No. 17/314,064	Applicant(s) HONG et al.	
	Examiner BRENDA H PHAM	Art Unit 2412	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 07 May 2021.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-18 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-18 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☑ The drawing(s) filed on 07 May 2021 is/are: a)☑ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☑ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☑ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☑ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

Petitioners' Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00036; U.S. Patent No. 11,627,631
Page 92 of 433

DETAILED ACTION

Notice of Pre-AIA or AIA Status

1. The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

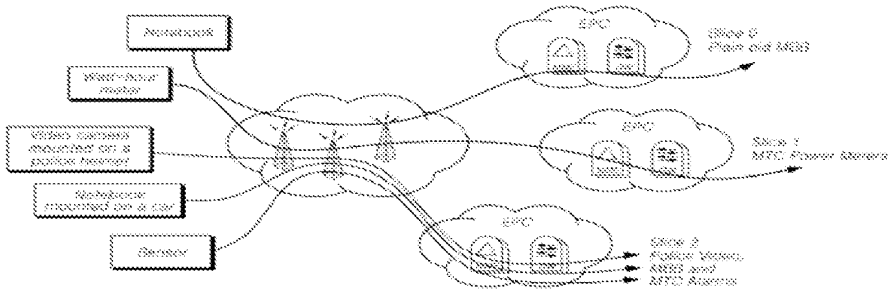
2. Claims 1-18 are pending.

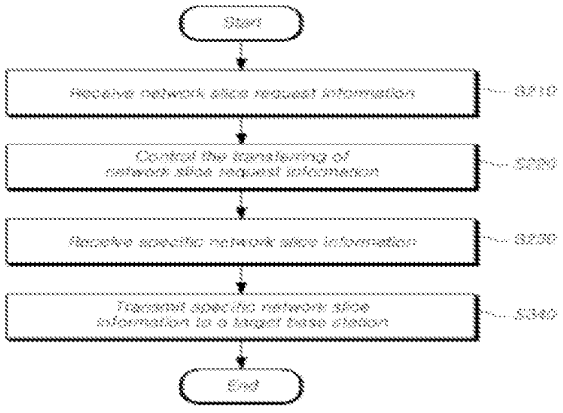
Information Disclosure Statement (IDS)

3. The information disclosure statement (IDS) submitted on 16 December 2021, 25 November 2021 and 7 May 2021 is being considered by the examiner.

4. Figures and 3 of the application illustrate the claimed invention.

FIG. 1





Double Patenting

5. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions of the AIA as explained in MPEP § 2159. See MPEP § 2146 *et seq.* for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit www.uspto.gov/patent/patents-forms. The filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp.

6. Claims 1-18 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-16 of U.S. Patent No. 11,044,777 B2. Although the claims at issue are not identical, they are not patentably distinct from each other because claims 1-18 of the application encompass the claimed invention in US 11,044,777 B2

Application claim 1:	US 11,044,777 B2-claim 1:
A method for transmitting and receiving data, the method comprising: deciding, by a source base station (BS), whether to perform a handover; transmitting, from the source BS to target BS, a handover request message when it is decided to perform the handover, wherein the handover request message includes network slice information; and receiving, by the source BS from the target BS, a handover request confirmation message in response to the handover request message, wherein, if one or more protocol data unit (PDU) sessions are associated with one or more network slices that are not supported by the target BS, the handover request confirmation message includes information for indicating a rejection of the one or more PDU sessions by the target BS.	.....receiving specific network slice information that is configured based on the network slice request information from the core network entity; transmitting the specific network slice information which is included in a handover request message to a target base station; and when a protocol data unit (PDU) session associated with a network slice that the target base station does not support is included in the specific network slice information, receiving a handover request confirmation message including information for indicating the PDU session associated with the network slice not supported by the target base station from the target base station.

Allowable Subject Matter

7. Claims 1-18 would be allowable if a timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) be used to overcome the rejection based on nonstatutory double patenting.

8. The following is a statement of reasons for the indication of allowable subject matter:

The closest prior art made of record: VRZIC et al. (US 2016/0353465 A1) disclose method and apparatus for performing a network slice handover from a first operator infrastructure to a second operator infrastructure to a second operator infrastructure. The method includes receiving a handover request from a network slice associated with the first operator infrastructure.

The prior art made of record fails to disclose wherein, if one or more protocol data unit (PDU) sessions are associated with one or more network slices that are not supported by the target BS, the handover request confirmation message includes information for indicating a rejection of the one or more PDU session by the target BS.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to BRENDA H PHAM whose telephone number is (571)272-3135. The examiner can normally be reached 571-272-3135.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Charles Jiang can be reached on 571-270-7191. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of published or unpublished applications may be obtained from Patent Center. Unpublished application information in Patent Center is available to registered users. To file and manage patent submissions in Patent Center, visit: https://patentcenter.uspto.gov. Visit https://www.uspto.gov/patents/apply/patent-center for more information about Patent Center and https://www.uspto.gov/patents/docx for information about filing in DOCX format. For additional questions, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

BRENDA H. PHAM
Primary Examiner
Art Unit 2412

/BRENDA H PHAM/
Primary Examiner, Art Unit 2412

Notice of References Cited	Application/Control No. 17/314,064	Applicant(s)/Patent Under Reexamination HONG et al.	
	Examiner BRENDA H PHAM	Art Unit 2412	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20160353465-A1	12-2016	VRZIC; Sophie	H04W28/0221	1/1
*	B	US-11044777-B2	06-2021	Hong; Sung-pyo	H04W36/0072	1/1
	C					
	D					
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Petitioners' Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00036; U.S. Patent No. 11,627,631
Page 98 of 433

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	17/314,064	HONG et al.
	Examiner	Art Unit
	BRENDA H PHAM	2412

CPC - Searched*		
Symbol	Date	Examiner
H04W76/27.cpc. H04L41/0806.cpc. H04W36/0072.cpc. H04W36/08. cpc. H04W4/70.cpc. H04W72/085.cpc.	09/14/2022	b.p.

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
PE2E search	09/14/2022	b.p.
Double patent search	09/14/2022	b.p.
inventors search	09/14/2022	b.p.
applicant/assignees search	09/14/2022	b.p.
CPC search	09/14/2022	b.p.

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

/BRENDA H PHAM/ Primary Examiner, Art Unit 2412	

Petitioners' Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00036; U.S. Patent No. 11,627,631
Page 99 of 433

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	17314064
Filing Date	2021-05-07
First Named Inventor	Sung-pyo HONG
Art Unit	
Examiner Name	
Attorney Docket Number	KT21-0119C1

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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	1							

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NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /B.H.P/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17314064
	Filing Date	2021-05-07
	First Named Inventor	Sung-pyo HONG
	Art Unit	
	Examiner Name	
	Attorney Docket Number	KT21-0119C1

	1	NEC ET AL: "Updated interim agreements on session management", 3GPP DRAFT; S2-166281_6109_5718_NG_SM-INTERIMAGR-V02	

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature	/BRENDA H PHAM/ (09/14/2022)	Date Considered	09/14/2022

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /B.H.P/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17314064
	Filing Date	2021-05-07
	First Named Inventor	Sung-pyo HONG
	Art Unit	
	Examiner Name	
	Attorney Docket Number	KT21-0119C1

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Daniel CHUNG/	Date (YYYY-MM-DD)	2021-12-16
Name/Print	Daniel CHUNG	Registration Number	57889

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /B.H.P/

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /B.H.P/

Petitioners' Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00036; U.S. Patent No. 11,627,631
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PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	1124	(handover SAME slice SAME (base ADJ station))	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); EPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/14 01:31 PM
L2	102	L1 AND @ad<="20160311"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); EPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/14 01:31 PM
L3	15	L1 AND @ad<="20160311"	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/14 01:33 PM
L4	3358	(handover SAME slice) AND network	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); EPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/14 01:38 PM
L5	102	L3 AND @ad<="20161103"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA,	OR	ON	ON	2022/09/14 01:39 PM

Petitioners' Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00036; U.S. Patent No. 11,627,631
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			EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); EPO; DERWENT; IBM_TDB)				
L6	1741	(handover SAME slice) SAME request$4	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); EPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/14 01:41 PM
L7	672	(handover SAME slice) SAME request$4	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/14 01:42 PM
L8	1020	(handover SAME slice) AND (base ADJ station)	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/14 02:49 PM
L9	65	L8 AND @ad<="20161103"	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/14 02:49 PM
L10	881	(hand$over SAME (network near4 slice))	(US-PGPUB; USPAT)	OR	ON	ON	2022/09/14 03:17 PM
L11	131	L10 AND @ad<="20161103"	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); EPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/09/14 03:20 PM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

Petitioners' Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00036; U.S. Patent No. 11,627,631
Page 105 of 433

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	
Filing Date	
First Named Inventor	Sung-pyo HONG
Art Unit	
Examiner Name	
Attorney Docket Number	KT21-0119C1

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	1	20200305054	A1	2020-09-24	ZEE et al.	
	2	20180007552	A1	2018-01-04	Bae; Beomsik	
	3	20180124854	A1	2018-05-03	MYHRE; Elena	
	4	20160353465	A1	2016-12-01	VRZIC; Sophie	
	5	20170367036	A1	2017-12-21	Chen; Wei	

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	6	20180139660	A1	2018-05-17	Stefan Rommer et al.	
	7	20140198768	A1	2014-07-17	Gene Beck HAHN et al.	
	8	20140199982	A1	2014-07-17	Gene Beck HAHN et al.	

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	1	2016/162480	WO	A1	2016-10-13	TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)		

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	1	HUAWEI, "Solution for Selection of Network Slice and CN entity", R3-162594, 3GPP TSG-RAN WG3 Meeting #93bis, Sophia Antipolis, France, 10 -14 October 2016	
	2	HUAWEI et al., "RRC support for network slicing", R2-163595, 3GPP TSG-RAN WG2 Meeting #94, Nanjing, China, 23-27 May, 2016	
	3	EUROPEAN PATENT OFFICE, European Search Report of corresponding EP Patent Application No. 17867340.6, May 12, 2020	

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	4	3GPP, "3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Study on Architecture for Next Generation System (Release 14)", 3GPP TR 23.799 V1 .0.0, September 2016	
	5	ERICSSON, "Solution for selection of a network slice instance", S2-161480, SA WG2 Meeting #114, 11-15 April 2016, Sophia Antipolis, pp. 1-4	
	6	QUALCOMM INCORPORATED, "Solution for key issue 1 on Network Slicing: Network Slice and Network Functions Selection based on evolved eDECOR model", S2-162339, SA WG2 Meeting #115, 23 - 27 May 2016, Nanjing, P.R. China, PP- 1-7	
	7	SAMSUNG, "Solution for Network Slice Selection based on the NG UE's service context", S2-162622, SA WG2 Meeting #115, 23 - 27 May 2016, Nanjing, P.R. China, pp. 1-4	

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Signature	/Daniel CHUNG/	Date (YYYY-MM-DD)	2021-05-07
Name/Print	Daniel CHUNG	Registration Number	57889

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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

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Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00036; U.S. Patent No. 11,627,631
Page 110 of 433

Bibliographic Data

Application No: 17/314,064

Foreign Priority claimed: (●) Yes ( ) No

35 USC 119 (a-d) conditions met: [✓] Yes [ ] No [ ] Met After Allowance

Verified and Acknowledged: /BRENDA H PHAM/ Examiner's Signature | Initials

Title: METHOD FOR PROCESSING DATA ON BASIS OF NETWORK SLICE, AND APPARATUS THEREFOR

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
05/07/2021	370	2412	KT21-0119C1
RULE			

APPLICANTS

KT CORPORATION, Gyeonggi-do, KOREA, REPUBLIC OF

INVENTORS

Sung-pyo HONG, Seoul, KOREA, REPUBLIC OF

Woo-jin CHOI, Seoul, KOREA, REPUBLIC OF

CONTINUING DATA

This application is a CON of 16346987 05/02/2019 PAT 11044777

16346987 is a 371 of PCT/KR2017/012319 11/02/2017

FOREIGN APPLICATIONS

KOREA, REPUBLIC OF KR10-2016-0146054 11/03/2016

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UNITED STATES

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Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

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Application Number	17314064
Filing Date	2021-05-07
First Named Inventor	Sung-pyo HONG
Art Unit	
Examiner Name	
Attorney Docket Number	KT21-0119C1

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	1	20150256861	A1	2015-09-10	Oyman	
	2	20130051315	A1	2013-02-28	ARZELIER et al.	

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	1	101803234	CN	A	2010-08-11	LG ELECTRONICS INC		
	2	102711174	CN	A	2012-10-03	INTEL MOBILE COMM CO LTD		

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	3	2016162480	WO	A1	2016-10-13	ERICSSON TELEFON AB L M		

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	1	A Chinese Office Action issued on November 11, 2021 in connection with Chinese Patent Application No. 201780068268.0 which corresponds to the above-referenced U.S. application.	X

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	1	NEC ET AL: "Updated interim agreements on session management", 3GPP DRAFT; S2-166281_6109_5718_NG_SM-INTERIMAGR-V02	

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5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

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Electronic Acknowledgement Receipt

EFS ID:	44542115
Application Number:	17314064
International Application Number:	
Confirmation Number:	5482
Title of Invention:	METHOD FOR PROCESSING DATA ON BASIS OF NETWORK SLICE, AND APPARATUS THEREFOR
First Named Inventor/Applicant Name:	Sung-pyo HONG
Customer Number:	126667
Filer:	Daniel Chung/judy Kim
Filer Authorized By:	Daniel Chung
Attorney Docket Number:	KT21-0119C1
Receipt Date:	16-DEC-2021
Filing Date:	07-MAY-2021
Time Stamp:	20:33:46
Application Type:	Utility under 35 USC 111(a)

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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	IDS_SB08.pdf	1034367 bdaa2fb3518918644166d166b410c0bc6ad9ba1	no	4

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2	Non Patent Literature	S2-166281.pdf	91877 372ebace6c7dcad4a06f5a2fb59f0dcf20084ec2	no	2
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(Not for submission under 37 CFR 1.99)

Application Number	17314064
Filing Date	2021-05-07
First Named Inventor	Sung-pyo HONG
Art Unit	
Examiner Name	
Attorney Docket Number	KT21-0119C1

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	1	101803234	CN	A	2010-08-11	LG ELECTRONICS INC		
	2	102711174	CN	A	2012-10-03	INTEL MOBILE COMM CO LTD		

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	17314064
	Filing Date	2021-05-07
	First Named Inventor	Sung-pyo HONG
	Art Unit	
	Examiner Name	
	Attorney Docket Number	KT21-0119C1

	3	2016162480	WO	A1	2016-10-13	ERICSSON TELEFON AB L M		

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	1	A Chinese Office Action issued on November 11, 2021 in connection with Chinese Patent Application No. 201780068268.0 which corresponds to the above-referenced U.S. application.	X

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[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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	Application Number	17314064
	Filing Date	2021-05-07
	First Named Inventor	Sung-pyo HONG
	Art Unit	
	Examiner Name	
	Attorney Docket Number	KT21-0119C1

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That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

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See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

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Signature	/Daniel CHUNG/	Date (YYYY-MM-DD)	2021-11-25
Name/Print	Daniel CHUNG	Registration Number	57889

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Espacenet

CN101803234A Method for performinig random access process in wireless communication system

Applicants: LG ELECTRONICS INC

Inventors: EUNJONG LEE,DOO-HYUN SUNG,JAEHOON CHUNG,GYU CHO HAN,KYUJIN PARK

Classifications:
IPC ***H04B7/26;***

CPC **H04W72/042 (KR); H04W74/006 (EP,KR); H04W74/0833 (KR); H04W74/0841 (KR); H04W76/10 (KR); H04W76/27 (KR);** H04W72/042 (EP); H04W74/0833 (EP); H04W76/10 (EP);

Priorities: KR20080007768A 2008-01-25; KR2008005286W 2008-09-08; US97317707P 2007-09-18

Application: CN200880106843A·2008-09-08

Publication: CN101803234A·2010-08-11

Published as: CN101803234A;**CN101803234B; KR101382748B1; KR20090081728A; US2011032889A1; US8325755B2; WO2009038300A1**

Method for performinig random access process in wireless communication system

Abstract

A method of performing a random access process in a wireless communication system includes transmitting a random access preamble, receiving a random access response including uplink radio resource allocation information for multiple transmission time intervals (TTIs) in response to the random access preamble, transmitting a radio resource control (RRC) connection request message according to the uplink radio resource allocation information, and transmitting a non-access stratum (NAS) service request message according to the uplink radio resource allocation information.

Petitioners' Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00036; U.S. Patent No. 11,627,631
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(19)中华人民共和国国家知识产权局

(12)发明专利申请

(10)申请公布号 CN 101803234 A
(43)申请公布日 2010.08.11

(21)申请号 200880106843.2
(22)申请日 2008.09.08
(30)优先权数据
10-2008-0007768 2008.01.25 KR
60/973,177 2007.09.18 US
(85)PCT申请进入国家阶段日
2010.03.12
(86)PCT申请的申请数据
PCT/KR2008/005286 2008.09.08
(87)PCT申请的公布数据
WO2009/038300 EN 2009.03.26
(71)申请人 LG电子株式会社
地址 韩国首尔
(72)发明人 李银终 成斗铉 郑载薰 赵汉奎 朴奎镇
(74)专利代理机构 北京三友知识产权代理有限公司 11127
代理人 李辉
(51)Int.Cl.
H04B 7/26(2006.01)

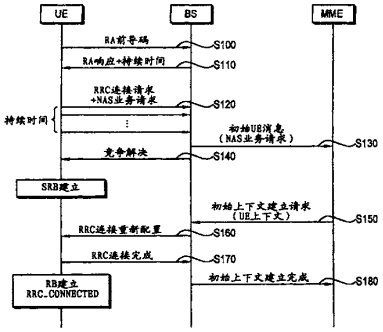
权利要求书 1 页 说明书 10 页 附图 10 页

(54)发明名称

在无线通信系统中执行随机接入处理的方法

(57)摘要

一种在无线通信系统中执行随机接入处理的方法，该方法包括以下步骤：发送随机接入前导码；接收响应于所述随机接入前导码的随机接入响应，该随机接入响应包括针对多个传输时间间隔(TTI)的上行链路无线资源分配信息；根据所述上行链路无线资源分配信息，来发送无线资源控制(RRC)连接请求消息；以及根据所述上行链路无线资源分配信息，来发送非接入层(NAS)业务请求消息。



CN 101803234 A

Petitioners' Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00036; U.S. Patent No. 11,627,631
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1. 一种在无线通信系统中执行随机接入处理的方法，该方法包括以下步骤：

发送随机接入前导码；

接收响应于所述随机接入前导码的随机接入响应，该随机接入响应包括针对多个传输时间间隔（TTI）的上行链路无线资源分配信息；

根据所述上行链路无线资源分配信息，来发送无线资源控制（RRC）连接请求消息；以及

根据所述上行链路无线资源分配信息，来发送非接入层（NAS）业务请求消息。

2. 根据权利要求 1 所述的方法，其中，按照串接的方式发送所述 NAS 业务请求消息与所述 RRC 连接请求消息。

3. 根据权利要求 1 所述的方法，其中，根据所述上行链路无线资源分配信息来对所述 NAS 业务请求消息进行分段，并且随后通过多个子帧来进行发送。

4. 根据权利要求 3 所述的方法，其中，所述多个子帧在时间上是连续的。

5. 根据权利要求 3 所述的方法，其中，所述多个子帧在时间上是不连续的。

6. 根据权利要求 1 所述的方法，该方法还包括以下步骤：接收响应于所述 RRC 连接请求消息的竞争解决消息，其中，所述 NAS 业务请求消息是在接收到所述竞争解决消息之后发送的。

7. 根据权利要求 6 所述的方法，其中，所述 RRC 连接请求消息包括用于竞争解决的初始 UE 标识。

8. 根据权利要求 1 所述的方法，其中，通过上行链路共享信道（UL-SCH）来发送所述 RRC 连接请求消息与所述 NAS 业务请求消息。

9. 一种执行随机接入的方法，该方法包括以下步骤：

接收 RRC 连接请求消息；

在接收到所述 RRC 连接请求消息之后，分配上行链路无线资源；

发送响应于所述 RRC 连接请求消息的竞争解决消息，以由 RRC 层向 MAC 层指示用于 NAS 业务请求消息的所述上行链路无线资源；以及

发送关于所述上行链路无线资源的信息。

10. 根据权利要求 9 所述的方法，该方法还包括以下步骤：通过使用所述上行链路无线资源来接收所述 NAS 业务请求消息。

Petitioners' Exhibit 1002
Nokia of America Corp., et al. v. KT Corporation, et al.
Case No. IPR2025-00036; U.S. Patent No. 11,627,631
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在无线通信系统中执行随机接入处理的方法

技术领域

[0001] 本发明涉及无线通信，更具体地说，涉及执行随机接入处理的方法。

背景技术

[0002] 基于宽带码分多址 (WCDMA) 无线接入技术的第三代合作伙伴计划 (3GPP) 移动通信系统已经在全世界广泛部署。作为 WCDMA 演进的第一阶段的高速下行链路分组接入 (HSDPA) 为 3GPP 提供了在中期发展中具有很强竞争力的无线接入技术。然而，由于无线接入技术根据用户和供应商的要求和期望不断发展，所以需要 3GPP 中的新技术演进来提高竞争力。

[0003] 总体上，在基站 (BS) 的覆盖范围内存在一个或更多个小区。在一个小区中可以存在多个用户设备 (UE)。UE 通过执行随机接入处理来接入网络。可以在 UE 调整与网络的时间同步时、或在 UE 在没有用于上行链路通信的无线资源的情况下获得了无线资源时，使用随机接入处理。

[0004] 当 UE 开机以初始接入新的小区时，对 UE 进行下行链路同步，并且 UE 接收到要接入的小区的系统信息。根据接收到的系统信息，UE 通过随机接入信道 (RACH) 向 BS 请求用于发送无线资源控制 (RRC) 连接请求消息的上行链路无线资源。BS 接收针对上行链路无线资源的请求，并且将适当的无线资源分配给 UE，使得 UE 能够发送 RRC 连接请求消息。随后，UE 通过使用该无线资源来将 RRC 连接请求消息发送到 BS。BS 发送用于表示 UE 的随机接入成功的消息。在成功地执行了随机接入之后，UE 可以向网络发送控制消息。然而，为了 UE 能够发送和接收实际的用户数据，在 UE 与网络之间必须完全地建立 RRC 连接。介于 UE 与网络之间的 RRC 连接是通过对作为 RRC 层的上层的非接入层 (NAS :Non-Access Stratum) 进行设置而完全建立的。为此，UE 向 BS 发送 NAS 业务请求消息，而 BS 将该消息发送到网络。NAS 业务请求消息是用于请求设置 NAS 层、以使得能够在 UE 与网络之间发送用户数据的消息。

[0005] 总体上，对于执行用于从空闲状态切换到活动状态的 RRC 连接建立处理所需要的延时是 100ms 或更短。在 RRC 连接建立处理中，网络与 BS 之间的延时会随着网络功能的发展而显著地变化。预计延时不会更短。然而，目前还没有明确地提出满足 RRC 连接建立处理中所需要的延时的机制。

[0006] 用于执行 UE 与网络之间的 RRC 连接建立处理的时长等于用户直接体验到的延时。需要将该延时最小化，以提高系统质量。因此，需要一种以最小延时来提高系统质量的方法。

发明内容

[0007] 本发明提供了一种有效地执行随机接入处理的方法。

[0008] 在一个方面中，提供了一种在无线通信系统中执行随机接入处理的方法，该方法包括以下步骤 :发送随机接入前导码 ;接收响应于所述随机接入前导码的随机接入响应，

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该随机接入响应包括针对多个传输时间间隔 (TTI) 的上行链路无线资源分配信息 ;根据所述上行链路无线资源分配信息,来发送无线资源控制 (RRC) 连接请求消息 ;以及根据所述上行链路无线资源分配信息,来发送非接入层 (NAS) 业务请求消息。

[0009] 在另一个方面中,提供了一种执行随机接入的方法,该方法包括以下步骤 :接收 RRC 连接请求消息 ;发送响应于所述 RRC 连接请求消息的竞争解决消息,以由 RRC 层向 MAC 层指示用于 NAS 业务请求消息的所述上行链路无线资源 ;以及发送关于所述上行链路无线资源的信息。

[0010] 根据本发明,即使在 RRC 连接建立处理中信道状态较差的情况下,仍然也可以将非接入层 (NAS) 业务请求消息和无线资源控制 (RRC) 连接请求消息一起发送。另外,可以在无需额外的请求消息的情况下分配用于发送 NAS 业务请求消息的无线资源。因此,可以减小 RRC 连接建立处理的延时。

附图说明

[0011] 图 1 示出了无线通信系统的结构。

[0012] 图 2 是示出了演进通用陆地无线接入网 (E-UTRAN) 和演进分组核心 (EPC) 之间的功能划分的图。

[0013] 图 3 是示出了用户设备的构成元件的框图。

[0014] 图 4 是示出了用户面的无线协议架构的图。

[0015] 图 5 是示出了控制面的无线协议架构的图。

[0016] 图 6 是示出了根据本发明的一个实施方式的无线资源控制 (RRC) 连接建立处理的流程图。

[0017] 图 7 是示出了根据本发明的另一个实施方式的 RRC 连接建立处理的流程图。

[0018] 图 8 是示出了根据本发明的另一个实施方式的 RRC 连接建立处理的流程图。

[0019] 图 9 是示出了根据本发明的另一个实施方式的 RRC 连接建立处理的流程图。

[0020] 图 10 是示出了用于发送非接入层 (NAS) 消息的示例性处理的流程图。

[0021] 图 11 是示出了根据本发明的一个实施方式的用于发送 NAS 消息的处理的流程图。

具体实施方式

[0022] 图 1 示出了无线通信系统的结构。该无线通信系统可以具有演进通用移动通信系统 (E-UMTS) 的网络结构。E-UMTS 可以称为长期演进 (LTE) 系统。可以广泛地部署这种无线通信系统,以提供诸如语音、分组数据等各种通信服务。

[0023] 参照图 1,演进 UMTS 陆地无线接入网 (E-UTRAN :Evolved-UMTSTerrestrial Radio Access Network) 包括至少一个提供控制面和用户面的基站 (BS)20。

[0024] 用户设备 (UE)10 可以是固定的或移动的,并且可以使用其它术语来表示用户设备,诸如移动台 (MS)、用户终端 (UT)、用户台 (SS)、无线设备等。BS 20 通常是与用户设备 10 进行通信的固定站,并且可以使用其它术语来表示 BS 20,诸如演进节点 B(e-NB)、基站收发机系统 (BTS :Base Transceiver System)、接入点等。在 BS 20 的覆盖范围内存在一个或更多个小区。在 BS 20 之间可以使用用于发送用户业务或控制业务的接口。以下,将“下行 (DL)”定义为从 BS 20 至 UE 10 的通信链路,将“上行 (UL)”定义为从 UE 10 至 BS 20

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的通信链路。

[0025] BS 20 通过 X2 接口彼此连接。BS 20 还通过 S1 接口连接到演进分组核心 (EPC)，更具体地说，连接到移动性管理实体 (MME :MobilityManagement Entity)/ 服务网关 (S-GW)30。S1 接口支持 BS 20 与 MME/S-GW 30 之间的多对多的关系。

[0026] 图 2 是示出了 E-UTRAN 与 EPC 之间的功能划分的框图。

[0027] 参照图 2，带斜线的框表示无线协议层，白框表示控制面的功能实体。

[0028] BS 执行以下功能 :(1) 无线资源管理 (RRM) 功能，诸如无线承载控制、无线准入控制、连接移动性控制、以及向 UE 动态地分配资源 ;(2) 互联网协议 (IP) 报头压缩和用户数据流加密 ;(3) 将用户面数据路由到 S-GW ;(4) 寻呼消息的调度和传输 ;(5) 广播信息的调度和传输 ;以及 (6) 移动性及调度的测量和测量报告设置。

[0029] MME 执行以下功能 :(1) 将寻呼消息传播给多个 BS ;(2) 安全性控制 ;(3) 空闲状态移动性控制 ;(4)S-GW 承载控制 ;以及 (5) 非接入层 (NAS) 信令的加密与完整性保护。

[0030] S-GW 网关执行以下功能 :(1) 针对寻呼终止用户面分组 ;以及 (2) 切换用户面以支持 UE 的移动性。

[0031] 图 3 是示出了 UE 的构成元件的框图。UE 50 包括处理器 51、存储器 52、射频 (RF) 单元 53、显示单元 54 以及用户接口单元 55。在处理器 51 中实现了无线接口协议的各个层。处理器 51 提供控制面与用户面。可以在处理器 51 中实现各个层的功能。存储器 52 连接到处理器 51，并存储操作系统、应用程序及一般文件。显示单元 54 显示 UE 50 的各种信息，并且可使用公知的元件，诸如液晶显示器 (LCD) 或有机发光二极管 (OLED) 等。可以使用诸如键盘、触摸屏等公知的用户接口的组合来构成用户接口单元 55。RF 单元 53 连接到处理器 51，并发送和 / 或接收无线信号。

[0032] 基于在通信系统中公知的开放系统互连 (OSI :Open SystemInterconnection) 模型的下三层，可以将 UE 与网络之间的无线接口协议的各个层划分为 L1 层 (第一层)、L2 层 (第二层) 及 L3 层 (第三层)。物理层 (简称 PHY 层) 属于第一层，并且通过物理信道提供信息传送服务。无线资源控制 (RRC :radio resource control) 层属于第三层，并用于控制 UE 与网络之间的无线资源。UE 与网络经由 RRC 层来交换 RRC 消息。

[0033] 图 4 是示出了用户面的无线协议架构的框图。图 5 是示出了控制面的无线协议架构的框图。图 4 和图 5 例示了 UE 与 E-UTRAN 之间的无线接口协议的架构。数据面是用于用户数据传输的协议栈，控制面是用于控制信号传输的协议栈。

[0034] 参照图 4 和图 5，PHY 层属于第一层，并且通过物理信道向上层提供信息传送服务。PHY 层通过传输信道与介质访问控制 (MAC) 层 (即，PHY 层的上一层) 相连。通过传输信道在 MAC 层与 PHY 层之间传送数据。在不同的物理层 (即，发射机的物理层与接收机的物理层) 之间，通过物理信道传送数据。可以使用正交频分复用 (OFDM :orthogonalfrequency division multiplexing) 来对物理层进行调制。可以使用时间和 / 或频率作为无线资源。

[0035] MAC 层属于第二层，并且通过逻辑信道来向无线链路控制 (RLC :Radio Link Control) 层 (即，MAC 层的上一层) 提供服务。第二层中的 RLC 层支持可靠的数据传送。根据数据传送方法，在 RLC 层中存在三种操作模式，即，透明模式 (TM :Transparent Mode)、非确认模式 (UM :Unacknowledged Mode) 以及确认模式 (AM :Acknowledged Mode)。TMRLC 是在设置 RLC 协议数据单元 (PDU) 时没有向从上层发送来的 RLC 业务数据单元 (SDU) 增加开

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销的模式。PDU 表示从当前层发送到其它层的块数据的单位。由于 RLC 允许 SDU 的透明通过 (transparent passing)，因此将其称为 TM RLC。UM RLC 使得接收方在通过将包括序号 (SN) 在内的 PDU 报头附加到各个 PDU 的方式进行传输时，能够获知丢失了哪一个 PDU。AM RLC 提供双向数据传输服务，并且在 RLC PDU 传送失败时支持重传。

[0036] 分组数据汇聚协议 (PDCP :Packet Data Convergence Protocol) 层属于第二层，并且执行报头压缩功能。当发送诸如 IPv4 分组或 IPv6 分组的 IP 分组时，IP 分组的报头可能包含较大的且不必要的控制信息。PDCP 层减小 IP 分组的报头的尺寸，以高效地传输 IP 分组。

[0037] 仅在控制面中定义了属于第三层的无线资源控制 (RRC) 层。RRC 层用于与对无线承载 (RB) 的配置、重新配置及释放相关联地控制逻辑信道、传输信道及物理信道。RB 表示由第二层提供的、用于在用户设备与网络之间传输数据的服务。当在 UE 的 RRC 层与网络的 RRC 层之间建立了 RRC 连接时，可以说 UE 处在 RRC 连接模式中。当尚未建立 RRC 连接时，可以说用户设备处在 RRC 空闲模式中。

[0038] 非接入层 (NAS) 属于 RRC 层的上一层，并且用于执行会话管理和移动性管理等。

[0039] 下行链路传输信道是用于从网络向 UE 发送数据的信道。下行链路控制信道的示例包括 :用于发送系统信息的广播信道 (BCH) ;用于发送寻呼消息的寻呼信道 (PCH) ;以及用于发送用户业务或控制消息的下行链路共享信道 (DL-SCH)。可在 DL-SCH 或下行链路多播信道 (MCH) 上发送下行链路多播或广播业务、或控制消息。上行链路传输信道用于从 UE 向网络发送数据。上行链路传输信道的示例包括 :用于发送初始控制消息的随机接入信道 (RACH) ;以及用于发送用户业务或控制消息的上行链路共享信道 (UL-SCH)。

[0040] BS 管理一个或更多个小区的无线资源。可将一个小区配置成具有诸如 1.25MHz、2.5MHz、5MHz、10MHz、20MHz 的各个带宽中的一种带宽，并且向各个 UE 提供下行链路或上行链路传输服务。在该情况下，可将不同的小区配置成提供不同的带宽。可以通过使用各个频率、按照各个小区在地理上彼此交叠的方式，来实现小区配置。BS 使用系统信息来向 UE 通知用于网络接入的基本信息。系统信息包括对于 UE 接入 BS 需要知道的必要信息。因此，UE 在接入 BS 之前必须完全地接收到系统信息，并且必须始终保持有最近的系统信息。由于系统信息必须对一个小区内的全部 UE 所获知，因此 BS 周期性地发送系统信息。

[0041] 映射到传输信道的逻辑信道的示例包括广播信道 (BCCH)、寻呼控制信道 (PCCH)、公共控制信道 (CCCH)、多播控制信道 (MCCH)、多播业务信道 (MTCH)、专用控制信道 (DCCH) 等。

[0042] 图 6 是示出了根据本发明的一个实施方式的 RRC 连接建立处理的流程图。

[0043] 参照图 6，根据从 BS 接收到的系统信息或根据包括在寻呼消息中的信息，UE 选择可用的 RACH 签名和 RACH 时机 (RACH occasion)，随后向 BS 发送随机接入前导码 (步骤 S100)。随机接入前导码是通过 RACH 发送。随机接入前导码是在发送时从多个前导码中随机地选出的。当 UE 处于空闲状态时，UE 从待连接的小区接收用于初始网络进入 (entry) 的系统信息，并且通过 RACH 将随机接入前导码发送到 BS。

[0044] 响应于该随机接入前导码，BS 发送随机接入响应 (步骤 S110)。随机接入响应包括时间偏移信息 (即，时间提前 (TA))、用于传送 RRC 连接请求消息的上行链路无线资源分配信息 (即，UL 授权)、上行链路无线资源的持续时间信息、RRC 连接请求消息的小区 - 无

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线网络临时标识 (C-RNTI) 等。

[0045] 上行链路无线资源的持续时间是指用于对与 RRC 连接请求消息彼此串接而发送的 NAS 业务请求消息进行分段并随后发送的发送次数。也就是说，持续时间信息表示与用于发送 RRC 连接请求消息和 NAS 业务请求消息的多个传输时间间隔 (TTI) 有关的信息。上行链路无线资源分配信息是指用于多个 TTI 的上行链路无线资源。TTI 表示发射机通过在时域内集中地调度数据的方式来发送数据的传输单位。例如，当发射机通过使用预定的频域和时域范围以子帧为单位执行调度以发送数据时，TTI 可以是用于发送子帧的时间单位。多个 TTI 表示以分散的方式通过多个 TTI 来发送数据。也就是说，当将 n 个 TTI 指定为多个 TTI 时，在 n 个子帧（其中，n 是大于零的整数）上承载并传送 RRC 连接请求消息和 NAS 业务请求消息。在该情况下，持续时间信息可以表示通过时间上连续的 n 个子帧或时间上不连续的 n 个子帧来传送 RRC 连接请求消息和 NAS 业务请求消息。BS 对多个 TTI 的上行链路无线资源执行调度，并且向 UE 报告多个 TTI 的上行链路无线资源分配信息。UE 可以在 RRC 层中将 RRC 连接请求消息和 NAS 业务请求消息划分成 n 个段，并且通过 n 个子帧来发送这些段。

[0046] 同时，BS 通过使用系统信息和寻呼信息来向 UE 报告关于随机接入前导码标识符的信息。随机接入前导码标识符用于标识随机接入响应，并且可以称为随机接入 - 无线网络临时标识 (RA-RNTI)。可以通过 DL-SCH 来发送随机接入响应。可以通过物理专用控制信道 (PDCCH) 或 DL L1/L1 控制信道（或 DL L1/L2 控制信令）来发送 RA-RNTI。RA-RNTI 指示了通过 DL-SCH 所发送的随机接入响应。

[0047] 在接收到随机接入响应之后，UE 根据包括在随机接入响应中的无线资源分配信息来发送 RRC 连接请求消息（步骤 S120）。在该情况下，UE 发送与 RRC 连接请求消息彼此串接的 NAS 业务请求消息。在发送时，按照持续时间信息所指定的 n 次（即，针对 n 个 TTI），来对 RRC 连接请求消息和 NAS 业务请求消息进行分段。

[0048] UE 对通过 PDCCH 所发送的 RA-RNTI 进行监视，并且读取相应的 DL-SCH 消息。随后，UE 根据与使用 DL-SCH 消息所发送的随机接入响应有关的信息，来发送 RRC 连接请求消息和 NAS 业务请求消息。可以通过 UL-SCH 来发送 RRC 连接请求消息和 NAS 业务请求消息。UE 可以按照在持续时间信息所指定的 n 个 TTI 期间、通过所分配的上行链路无线资源通过将 RRC 连接请求消息和 NAS 业务请求消息划分成 n 个数据段的方式，来发送 RRC 连接请求消息和 NAS 业务请求消息。UE 可以在持续时间信息所指定的 TTI 期间同时发送 RRC 连接请求消息和 NAS 业务请求消息，而与信道条件无关。

[0049] RRC 连接请求消息包括用于竞争解决的初始 UE 标识，并且可以通过使用混合自动重传请求 (HARQ) 来发送 RRC 连接请求消息。由于使用了 RLC TM，所以并不在 RLC 层中对 RRC 连接请求消息进行分段。NAS 业务请求消息是当 MME 向 BS 发送关于无线承载 (RB) 建立的信息时所使用的重要消息。实现了 RB 建立，使得可以在 BS 与 UE 之间发送用户面数据。

[0050] 在接收到 RRC 连接请求消息和 NAS 业务请求消息之后，BS 向 MME 发送初始 UE 消息（步骤 S130）。初始 UE 消息包括 UE 发送给 BS 的 NAS 业务请求消息。BS 将 NAS 信息直接发送给 MME。NAS 信息是除了用于竞争解决的必要信息以外的剩余信息。也就是说，NAS 业务请求消息是 UE 与 MME 之间的 NAS 消息，并且可以由 BS 不加以处理地直接进行发送。

[0051] 在从 UE 接收到 RRC 连接请求消息之后，BS 向 UE 发送竞争解决消息（步骤 S140）。

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竞争解决消息通过 DL-SCH 发送。为了报告 UE 所执行的随机接入处理是否成功，BS 发送包括成功进行随机接入的 UE 的标识符在内的竞争解决消息。随后，在接收到包括 UE 标识符在内的竞争解决消息之后，UE 知道随机接入成功，因而继续后续步骤。信令无线承载 (SRB：signaling radio bearer) 是用于发送控制面数据的无线承载。针对成功进行随机接入的 UE 来建立 SRB。在基于竞争的随机接入中，竞争解决消息通知了哪个 UE 成功进行随机接入以及哪个 UE 随机接入失败，因此随机接入失败的 UE 可以更迅速地再次执行随机接入处理。这称为早期 (early) 竞争解决。

[0052] 在从 BS 接收到 NAS 消息之后，MME 向 BS 发送包括 UE 上下文信息在内的初始上下文建立请求消息（步骤 S150）。UE 上下文信息针对用于在 BS 与 UE 之间发送用户面数据的 RB 建立。

[0053] BS 基于 UE 上下文信息来向 UE 发送 RRC 连接重新配置消息（步骤 S160）。RRC 连接重新配置消息包括用于 UE 与 BS 之间的 RRC 连接建立的信息。

[0054] UE 完成用于与 BS 的数据通信的全部建立，并且向 BS 发送 RRC 连接完成消息（步骤 S170）。UE 建立了用于传送用户面数据的 RB，并且进入 RRC_CONNECTED 状态。UE 开始与 BS 进行数据通信。

[0055] BS 向 MME 发送初始上下文建立完成消息，因此完全地建立了与 MME 的连接（步骤 S180）。

[0056] 要求在少于 100ms 或更短的延迟时间内完成 RRC 连接建立处理。为了减小 RRC 连接建立处理的延迟时间，必须更快地执行 NAS 业务请求。在同时发送 RRC 连接请求消息和 NAS 业务请求消息时，可以在 BS 与 UE 之间建立起 SRB 之前发送 NAS 信息，由此减小延迟时间。然而，位于小区边缘的 UE 或信道环境较差的 UE 不能通过针对 RRC 连接请求消息所分配的上行链路无线资源来一起发送 NAS 业务请求消息。例如，在较差的信道环境中，如果没有使用 HARQ，则 UE 可以通过针对 RRC 连接请求消息所分配的上行链路无资源来发送具有 24 个比特的尺寸的消息，而如果使用了 HARQ 两次，则 UE 可以发送具有大约 72 个比特的尺寸的消息。因此，UE 不能同时发送 RRC 连接请求消息和 NAS 业务请求消息。在 BS 与 UE 之间建立 SRB 之后，UE 可以单独地发送 NAS 业务请求消息。也就是说，将传送 NAS 业务请求消息延迟了用于在 BS 与 UE 之间建立 SRB 的时间，并且用于 RRC 连接建立处理的延迟时间增大。在所提出的方法中，提供了 RRC 连接请求消息的持续时间信息，使得即使在信道环境较差时仍然也可以同时发送 RRC 连接请求消息和 NAS 业务请求消息，因此可以减小 RRC 连接建立处理的延迟时间。

[0057] 图 7 是示出了根据本发明的另一个实施方式的 RRC 连接建立处理的流程图。

[0058] 参照图 7，根据从 BS 接收到的系统信息或根据包括在寻呼消息中的信息，UE 选择可用的 RACH 签名和 RACH 时机，随后向 BS 发送随机接入前导码（步骤 S200）。

[0059] 响应于该随机接入前导码，BS 发送随机接入响应（步骤 S210）。随机接入响应包括时间偏移信息（即，时间提前 (TA)）、用于传送 RRC 连接请求消息的上行链路无线资源分配信息（即，UL 授权）、NAS 业务请求消息的持续时间信息、以及 RRC 连接请求消息的 C-RNTI。NAS 业务请求消息的持续时间可以是与用于对 NAS 业务请求消息进行分段并随后进行发送的多个 TTI 有关的信息。多个 TTI 可以表示用于承载并发送 NAS 业务请求消息的多个子帧。多个 TTI 可以表示时间上连续的 n 个子帧或时间上不连续的 n 个子帧。

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[0060] 在接收到随机接入响应之后，UE 根据包括在随机接入响应中的无线资源分配信息来发送 RRC 连接请求消息（步骤 S220）。UE 对通过 PDCCH 所发送的 RA-RNTI 进行监视，并且读取相应的 DL-SCH 消息。随后，UE 根据与使用 DL-SCH 消息所发送的随机接入响应有关的信息，来发送 RRC 连接请求消息。

[0061] 在从 UE 接收到 RRC 连接请求消息之后，BS 向 UE 发送竞争解决消息（步骤 S230）。竞争解决消息通过 DL-SCH 发送。针对已接收到竞争解决消息的 UE 来建立信令无线承载 (SRB)，该信令无线承载是用于发送控制面数据的无线承载。

[0062] UE 向 BS 发送 NAS 业务请求消息（步骤 S240）。根据该 NAS 业务请求消息，MME 向 BS 发送 RB 建立信息。使用 RB 建立信息，使得可以在 BS 与 UE 之间发送用户面数据。NAS 业务请求消息可以使用由持续时间信息所指定的上行链路无线资源来发送。根据持续时间信息来将 NAS 业务请求消息划分成 n 个段，因此，可以通过 n 个子帧（即，n 个 TTI），来发送 NAS 业务请求消息。UE 可以通过多个 TTI、按照更有效的方式来发送大量的 NAS 信息。

[0063] 在接收到 NAS 业务请求消息之后，BS 向 MME 发送初始 UE 消息（步骤 S250）。初始 UE 消息包括 UE 发送给 BS 的 NAS 业务请求消息。

[0064] 在从 BS 接收到 NAS 消息之后，MME 向 BS 发送包括 UE 上下文信息在内的初始上下文建立请求消息（步骤 S260）。UE 上下文信息针对用于在 BS 与 UE 之间发送用户面数据的 RB 建立。

[0065] BS 基于 UE 上下文信息来向 UE 发送 RRC 连接重新配置消息（步骤 S270）。RRC 连接重新配置消息包括用于 UE 与 BS 之间的 RRC 连接建立的信息。

[0066] UE 完成用于与 BS 的数据通信的全部建立，并且向 BS 发送 RRC 连接完成消息（步骤 S280）。UE 建立了用于传送用户面数据的 RB，并且进入 RRC_CONNECTED 状态。UE 开始与 BS 进行数据通信。

[0067] BS 向 MME 发送初始上下文建立完成消息，因而完全地建立了与 MME 的连接（步骤 S290）。

[0068] 图 8 是示出了根据本发明的另一个实施方式的 RRC 连接建立处理的流程图。

[0069] 参照图 8，根据从 BS 接收到的系统信息或根据包括在寻呼消息中的信息，UE 选择可用的 RACH 签名和 RACH 时机，随后向 BS 发送随机接入前导码（步骤 S300）。

[0070] 响应于该随机接入前导码，BS 发送随机接入响应（步骤 S310）。随机接入响应包括时间偏移信息（即，时间提前 (TA)）、用于传送 RRC 连接请求消息的上行链路无线资源分配信息（即，UL 授权）、NAS 业务请求消息的持续时间信息、以及 RRC 连接请求消息的 C-RNTI。NAS 业务请求消息的持续时间信息可以是用于发送 NAS 业务请求消息的上行链路无线资源分配信息。持续时间信息可以表示以下这种多个 TTI：在发送了 RRC 连接请求消息之后、在该多个 TTI 之后使用上行链路无线资源来发送 NAS 业务请求消息。

[0071] 在接收到随机接入响应之后，UE 根据包括在随机接入响应中的无线资源分配信息来发送 RRC 连接请求消息（步骤 S320）。UE 对通过 PDCCH 所发送的 RA-RNTI 进行监视，并且读取相应的 DL-SCH 消息。随后，UE 根据与使用 DL-SCH 消息所发送的随机接入响应有关的信息，来发送 RRC 连接请求消息。

[0072] 在从 UE 接收到 RRC 连接请求消息之后，BS 向 UE 发送竞争解决消息（步骤 S330）。竞争解决消息通过 DL-SCH 发送。针对已接收到竞争解决消息的 UE 来建立信令无线承载

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(SRB)，该信令无线承载是用于发送控制面数据的无线承载。

[0073] UE 向 BS 发送 NAS 业务请求消息（步骤 S340）。根据该 NAS 业务请求消息，MME 向 BS 发送 RB 建立信息。使用 RB 建立信息，使得可以在 BS 与 UE 之间发送用户面数据。NAS 业务请求消息可以使用由持续时间信息所指定的上行链路无线资源来发送。可以在 SRB 建立之前分配用于 NAS 业务请求消息的上行链路无线资源，使得可以更快速地执行 NAS 业务请求消息的传输。

[0074] 在接收到 NAS 业务请求消息之后，BS 向 ME 发送初始 UE 消息（步骤 S350）。初始 UE 消息包括 UE 发送给 BS 的 NAS 业务请求消息。

[0075] 在从 BS 接收到 NAS 消息之后，MME 向 BS 发送包括 UE 上下文信息在内的初始上下文建立请求消息（步骤 S360）。UE 上下文信息针对用于在 BS 与 UE 之间发送用户面数据的 RB 建立。

[0076] BS 基于 UE 上下文信息来向 UE 发送 RRC 连接重新配置消息（步骤 S370）。RRC 连接重新配置消息包括用于 UE 与 BS 之间的 RRC 连接建立的信息。

[0077] UE 完成用于与 BS 的数据通信的全部建立，并且向 BS 发送 RRC 连接完成消息（步骤 S380）。UE 建立了用于传送用户面数据的 RB，并且进入 RRC_CONNECTED 状态。UE 开始与 BS 进行数据通信。

[0078] BS 向 MME 发送初始上下文建立完成消息，因而完全地建立了与 MME 的连接（步骤 S390）。

[0079] 图 9 是示出了根据本发明的另一个实施方式的 RRC 连接建立处理的流程图。

[0080] 参照图 9，根据从 BS 接收到的系统信息或根据包括在寻呼消息中的信息，UE 选择可用的 RACH 签名和 RACH 时机，随后向 BS 发送随机接入前导码（步骤 S400）。

[0081] 响应于该随机接入前导码，BS 发送随机接入响应（步骤 S410）。随机接入响应包括时间偏移信息（即，时间提前 (TA)）、用于传送 RRC 连接请求消息的上行链路无线资源分配信息（即，UL 授权）、以及 RRC 连接请求消息的 C-RNTI。

[0082] 在接收到随机接入响应之后，UE 根据包括在随机接入响应中的无线资源分配信息来发送 RRC 连接请求消息（步骤 S420）。UE 对通过 PDCCH 所发送的 RA-RNTI 进行监视，并且读取相应的 DL-SCH 消息。随后，UE 根据与使用 DL-SCH 消息所发送的随机接入响应有关的信息，来发送 RRC 连接请求消息。

[0083] 在从 UE 接收到 RRC 连接请求消息之后，BS 向 UE 发送竞争解决消息（步骤 S430）。竞争解决消息包括 NAS 业务请求消息的无线资源分配信息（即，资源授权）。针对已接收到竞争解决消息的 UE 来建立信令无线承载 (SRB)，该信令无线承载是用于发送控制面数据的无线承载。当建立了 SRB 时，确保了 UE 发送 NAS 业务请求消息。因此，BS 为 NAS 业务请求消息分配无线资源，而无需从 UE 接收额外的无线资源请求。

[0084] UE 向 BS 发送 NAS 业务请求消息（步骤 S440）。根据该 NAS 业务请求消息，MME 向 BS 发送 RB 建立信息。使用 RB 建立信息，使得可以在 BS 与 UE 之间发送用户面数据。NAS 业务请求消息可以根据与竞争解决消息一起发送的无线资源分配信息来发送。可以在 SRB 建立之前分配用于 NAS 业务请求消息的上行链路无线资源，使得可以更快速地执行 NAS 业务请求消息的传输。

[0085] 在接收到 NAS 业务请求消息之后，BS 向 MME 发送初始 UE 消息（步骤 S450）。初始

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UE 消息包括 UE 发送给 BS 的 NAS 业务请求消息。

[0086] 在从 BS 接收到 NAS 消息之后，MME 向 BS 发送包括 UE 上下文信息在内的初始上下文建立请求消息（步骤 S460）。UE 上下文信息针对用于在 BS 与 UE 之间发送用户面数据的 RB 建立。

[0087] BS 基于 UE 上下文信息来向 UE 发送 RRC 连接重新配置消息（步骤 S470）。RRC 连接重新配置消息包括用于 UE 与 BS 之间的 RRC 连接建立的信息。

[0088] UE 完成用于与 BS 的数据通信的全部建立，并且向 BS 发送 RRC 连接完成消息（步骤 S480）。UE 建立了用于传送用户面数据的 RB，并且进入 RRC_CONNECTED 状态。UE 开始与 BS 进行数据通信。

[0089] BS 向 MME 发送初始上下文建立完成消息，因而完全地建立了与 MME 的连接（步骤 S490）。

[0090] 图 10 是示出了用于发送 NAS 消息的示例性处理的流程图。这里，在 RRC 连接建立处理中发送针对 UE 和 BS 的各个层的消息。

[0091] 参照图 10，UE 响应于随机接入前导码而接收随机接入响应，并且发送 RRC 连接请求消息（步骤 S510）。RRC 连接请求消息通过位于 UE 的 RRC 层与 BS 的 RRC 层之间的 RRC 信令来进行发送。RRC 连接请求消息包括用于竞争解决的初始 UE 标识。HARQ 可以用于发送 RRC 连接请求消息。由于将 RLC TM 用于 RRC 连接请求消息，所以并不在 RLC 层中对 RRC 连接请求消息进行分段。

[0092] 在从 UE 接收到 RRC 连接请求消息之后，BS 向 UE 发送竞争解决消息（步骤 S520）。竞争解决消息通过位于 UE 的 RRC 层与 BS 的 RRC 层之间的 RRC 信令来进行发送。当 UE 接收到竞争解决消息时，针对 UE 来建立信令无线承载 (SRB)，该信令无线承载是用于发送控制面数据的无线承载。结果，UE 可以发送 NAS 消息。

[0093] UE 的 NAS 层将 NAS 业务请求消息发送到下层（步骤 S530）。根据该 NAS 业务请求消息，MME 向 BS 发送 RB 建立信息。使用该 RB 建立信息，使得可以在 BS 与 UE 之间发送用户面数据。经由 RRC 层将 NAS 业务请求消息发送到 RLC 层。在 RLC 层中，将 NAS 业务请求消息发送到 MAC 层的缓冲器。随后，MAC 层认识到存在待发送的数据。

[0094] UE 的 MAC 层向 BS 的 MAC 层发送 NAS 业务请求消息的资源请求消息（步骤 S540）。UE 的 MAC 层请求用于发送 NAS 业务请求消息的上行链路无线资源。

[0095] 响应于 UE 的无线资源请求，BS 的 MAC 层向 UE 的 MAC 层发送资源授权消息（步骤 S550）。

[0096] 在接收到无线资源分配消息之后，UE 通过使用所分配的无线资源经由 PHY 层来发送存储在 MAC 层的缓冲器中的 NAS 业务请求消息（步骤 S560）。

[0097] 在建立了作为用于发送控制面数据的无线承载的 SRB 之后，可以发送 NAS 消息。因此，UE 可以在接收到竞争解决消息之后、请求 BS 分配用于发送 NAS 业务请求消息的无线资源，并且通过使用所分配的资源来发送 NAS 业务请求消息。然而，在接收到竞争解决消息之后，可以保证 UE 始终发送 NAS 业务请求消息。因此，可以不需要对用于 NAS 业务请求消息的无线资源进行请求和确认的处理。现在将描述更有效地发送 NAS 消息的方法。

[0098] 图 11 是示出了根据本发明一个实施方式的发送 NAS 消息的处理的流程图。这里，在 RRC 连接建立处理中发送针对 UE 和 BS 的各个层的消息。

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[0099] 参照图 11，UE 响应于随机接入前导码而接收随机接入响应，并且发送 RRC 连接请求消息（步骤 S610）。RRC 连接请求消息通过位于 UE 的 RRC 层与 BS 的 RRC 层之间的 RRC 信令来进行发送。RRC 连接请求消息包括用于竞争解决的初始 UE 标识。HARQ 可以用于发送 RRC 连接请求消息。由于将 RLC TM 用于 RRC 连接请求消息，所以并不在 RLC 层中对 RRC 连接请求消息进行分段。

[0100] 在从 UE 接收到 RRC 连接请求消息之后，BS 向 UE 发送竞争解决消息（步骤 S620）。竞争解决消息通过位于 UE 的 RRC 层与 BS 的 RRC 层之间的 RRC 信令来进行发送。在该情况下，BS 在接收到 RRC 连接请求消息之后分配上行链路无线资源。RRC 层指示 MAC 层为要由 UE 发送的 NAS 业务请求消息分配无线资源。也就是说，无需额外地从 UE 接收到 NAS 业务请求消息的无线资源请求消息，可以在接收到 RRC 连接请求消息时自动地分配用于 NAS 业务请求消息的无线资源。

[0101] BS 的 MAC 层向 UE 的 MAC 层发送资源授权消息（步骤 S630）。

[0102] 在接收到竞争解决消息的 UE 中建立了 SRB，并且使用所分配的无线资源来发送 NAS 业务请求消息（步骤 S640）。将 NAS 业务请求消息从 UE 的 NAS 层发送到下层，并且将其直接发送到 BS，而无需在 MAC 层的缓冲器中等候。也就是说，所提出的发送 NAS 业务请求消息的方法相对于传统的发送 NAS 业务请求消息的方法的优点在于，不需要必须执行无线资源请求。在所提出的方法中，可以减小在建立了 SRB 之后执行无线资源请求 / 确认处理时所发生的开销。因此，可以减小执行 RRC 连接建立处理所需要的时间。在从空闲状态转换到活动状态之后，UE 可以通过随机接入处理来建立 SRB，并且当在上行链路中发送第一 NAS 消息时可以直接地发送第一 NAS 消息，而无需额外地请求用于第一 NAS 消息的无线资源。因此，可以减小用于执行 RRC 连接建立处理的时间。

[0103] 以上已经描述了在 RRC 连接建立处理中，通过设置传送 NAS 业务请求消息的持续时间，来通过多个 TTI 发送 NAS 业务请求消息。不仅可以在 RRC 连接建立处理中发送 NAS 业务请求消息时使用这种方法，而且，还可以在信道条件较差的环境内在要求准确传送信息的通信处理中通过使用持续时间信息来通过多个 TTI 以分散的方式发送信息时使用这种方法。

[0104] 上述各项功能都可由处理器（诸如基于被编码为执行这些功能的软件、程序代码等的微处理器、控制器、微控制器、专用集成电路 (ASIC) 等）来执行。基于对本发明的说明，对于本领域技术人员而言，这些代码的计划、开发和执行都是显而易见的。

[0105] 虽然为了例示的目的而公开了本发明的实施方式，但是本领域技术人员可以理解的是，可以在不脱离本发明的范围的情况下做出各种修改、增加和替换。因此，本发明的实施方式并不限于上述实施方式，而是由所附权利要求及其等同物的全部范围限定。

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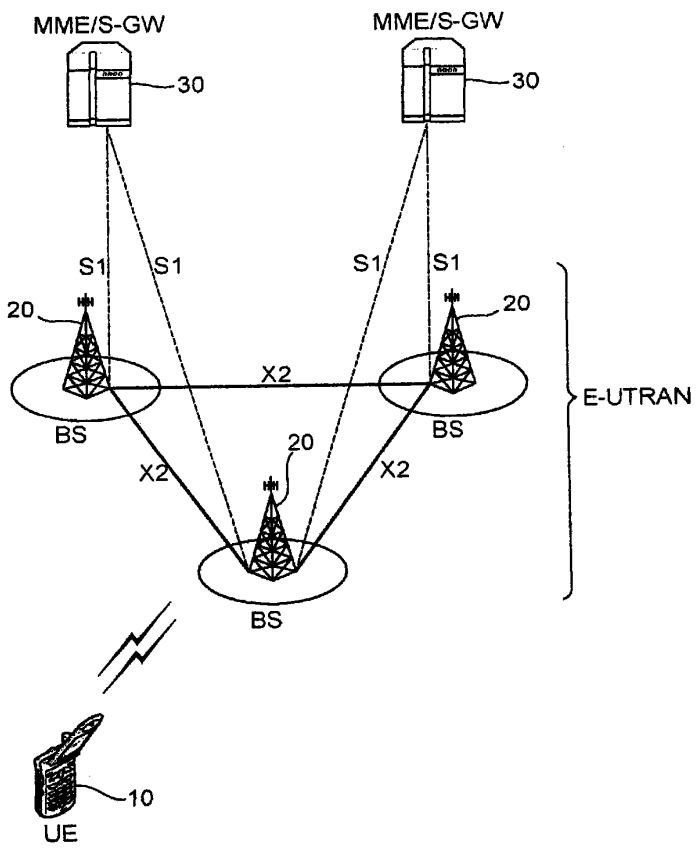


图 1

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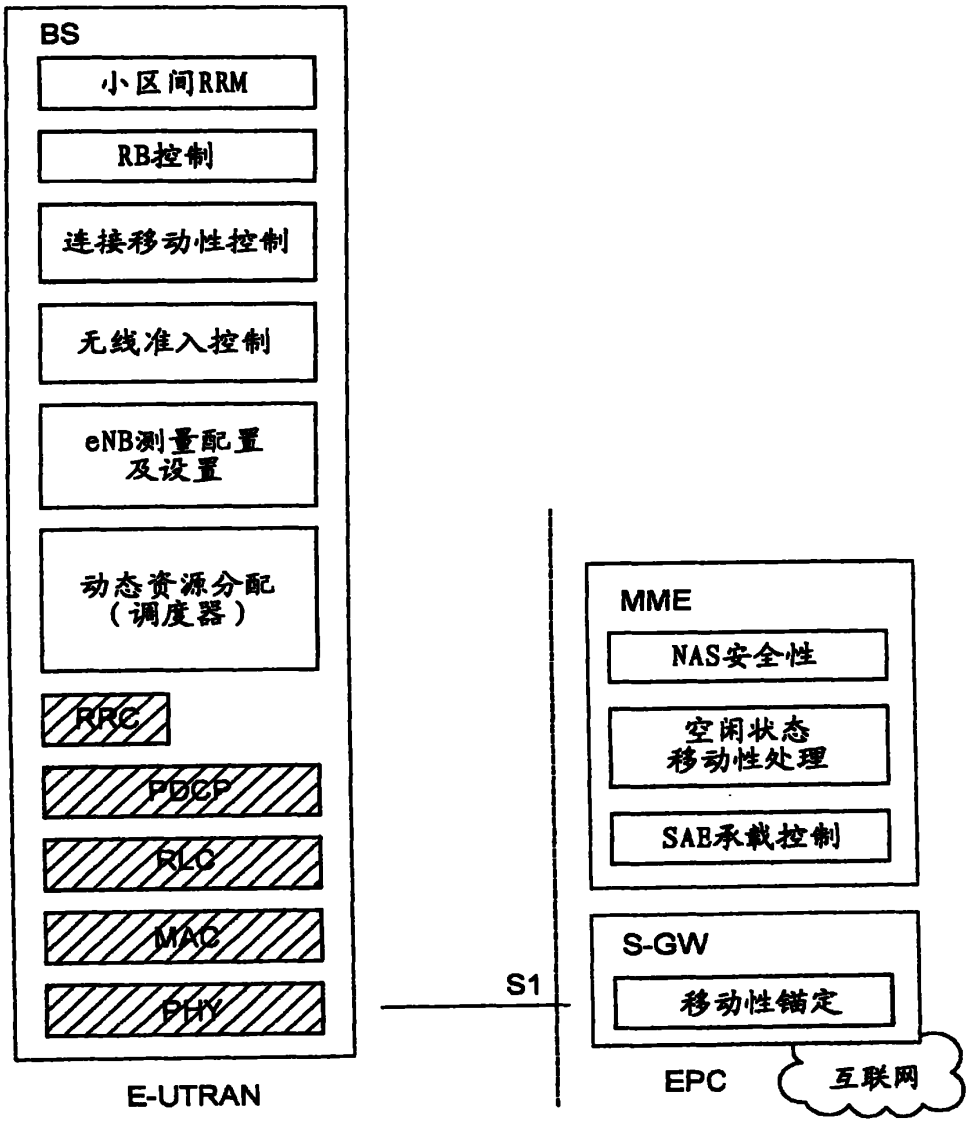


图 2

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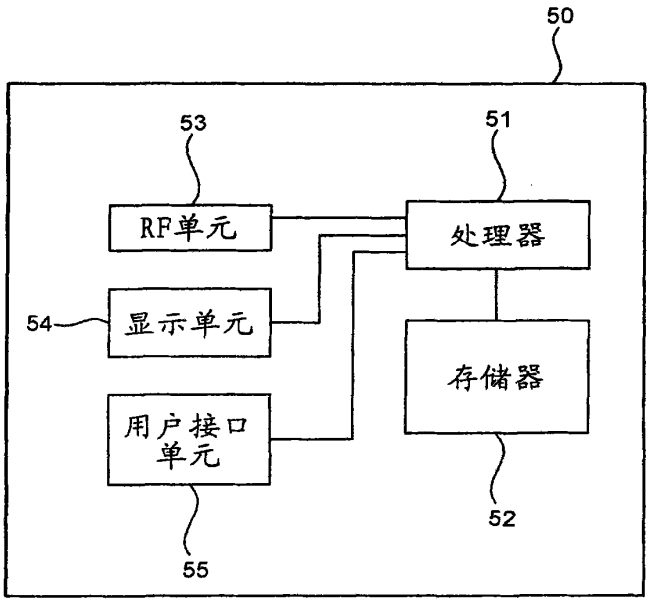


图 3

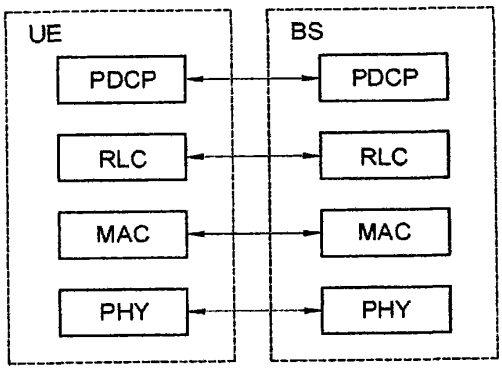


图 4

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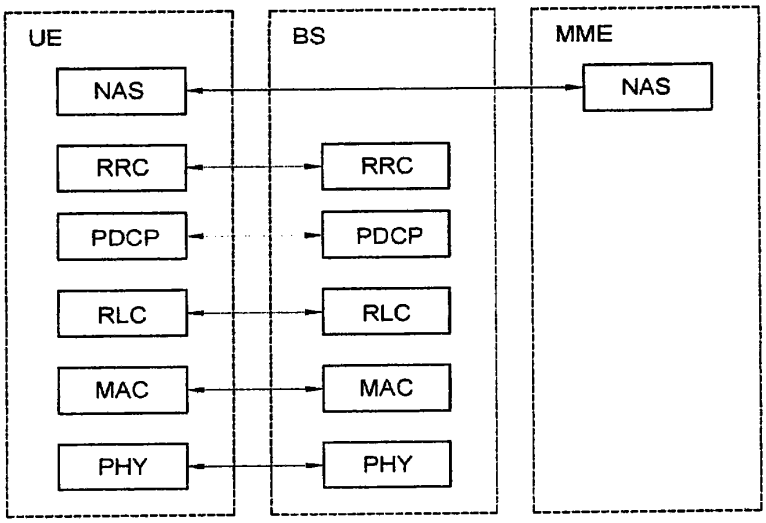


图 5

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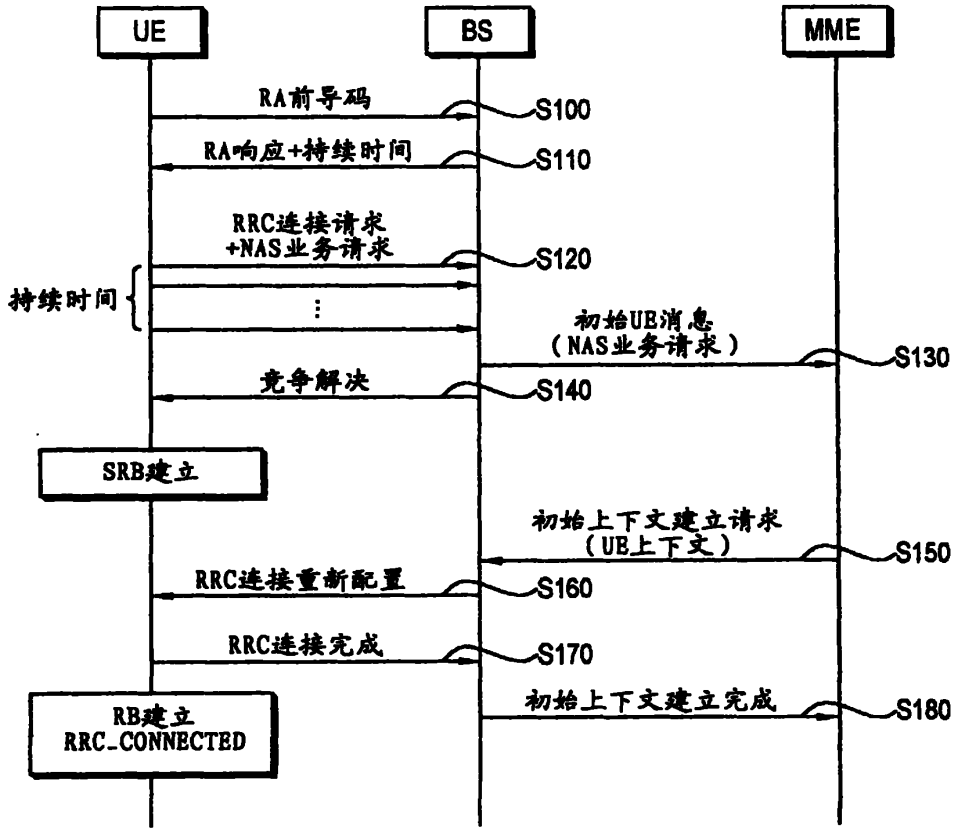


图 6

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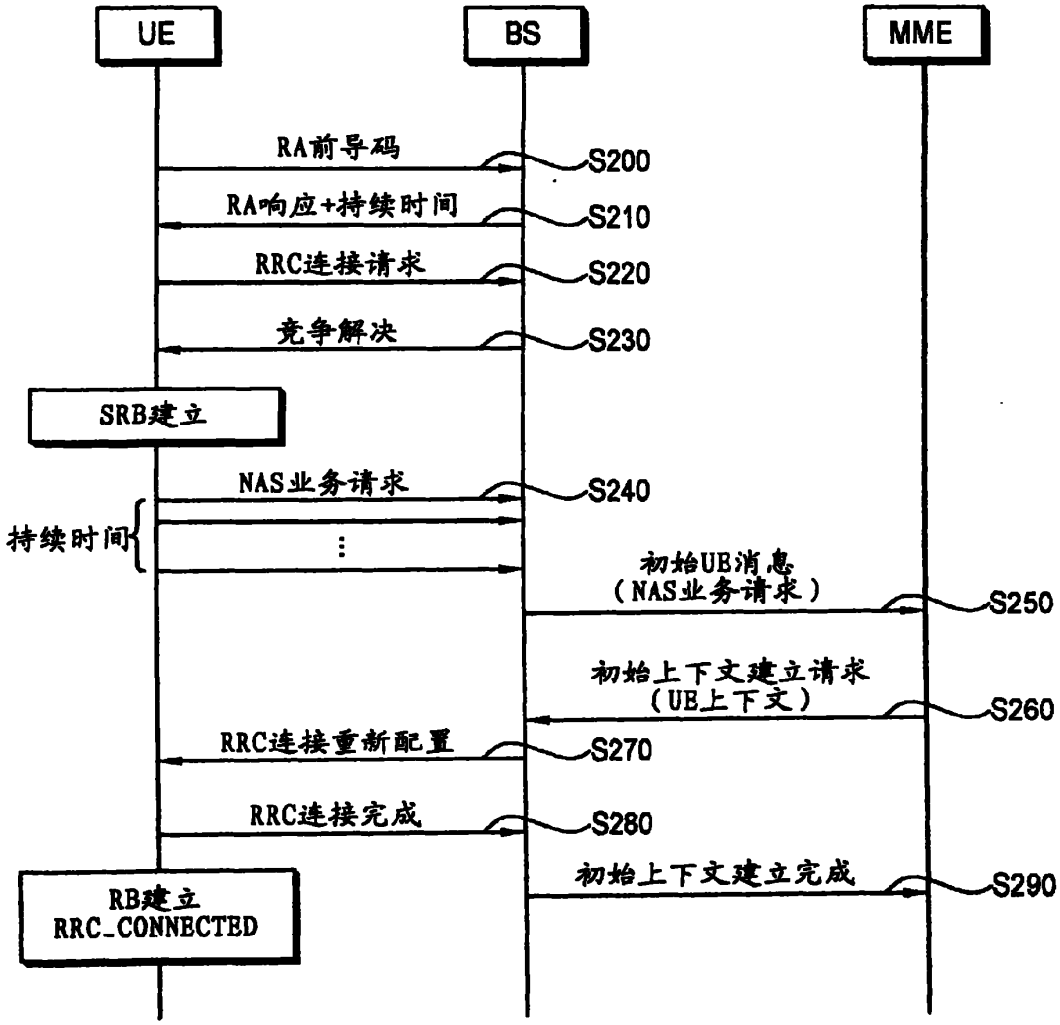


图 7

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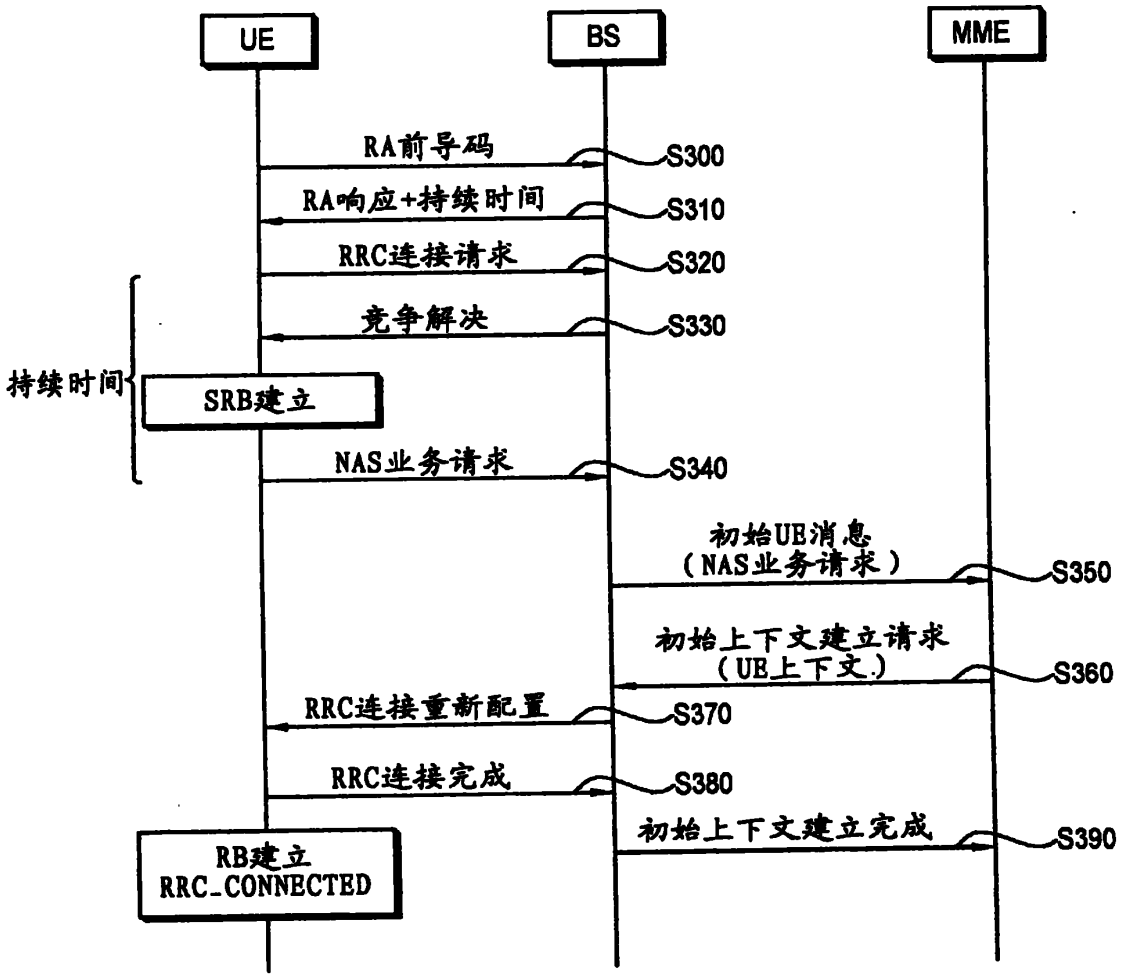


图 8

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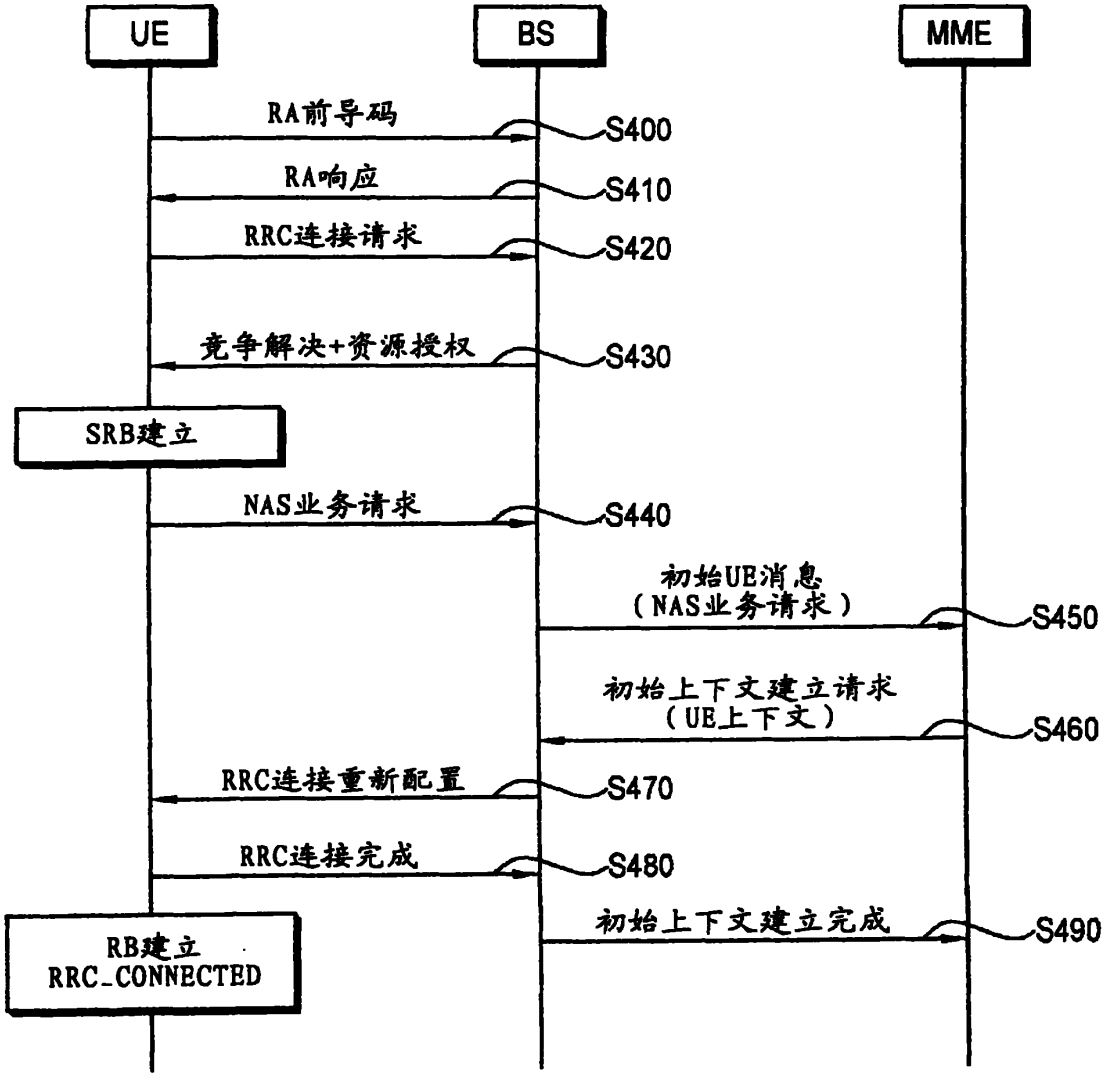


图 9

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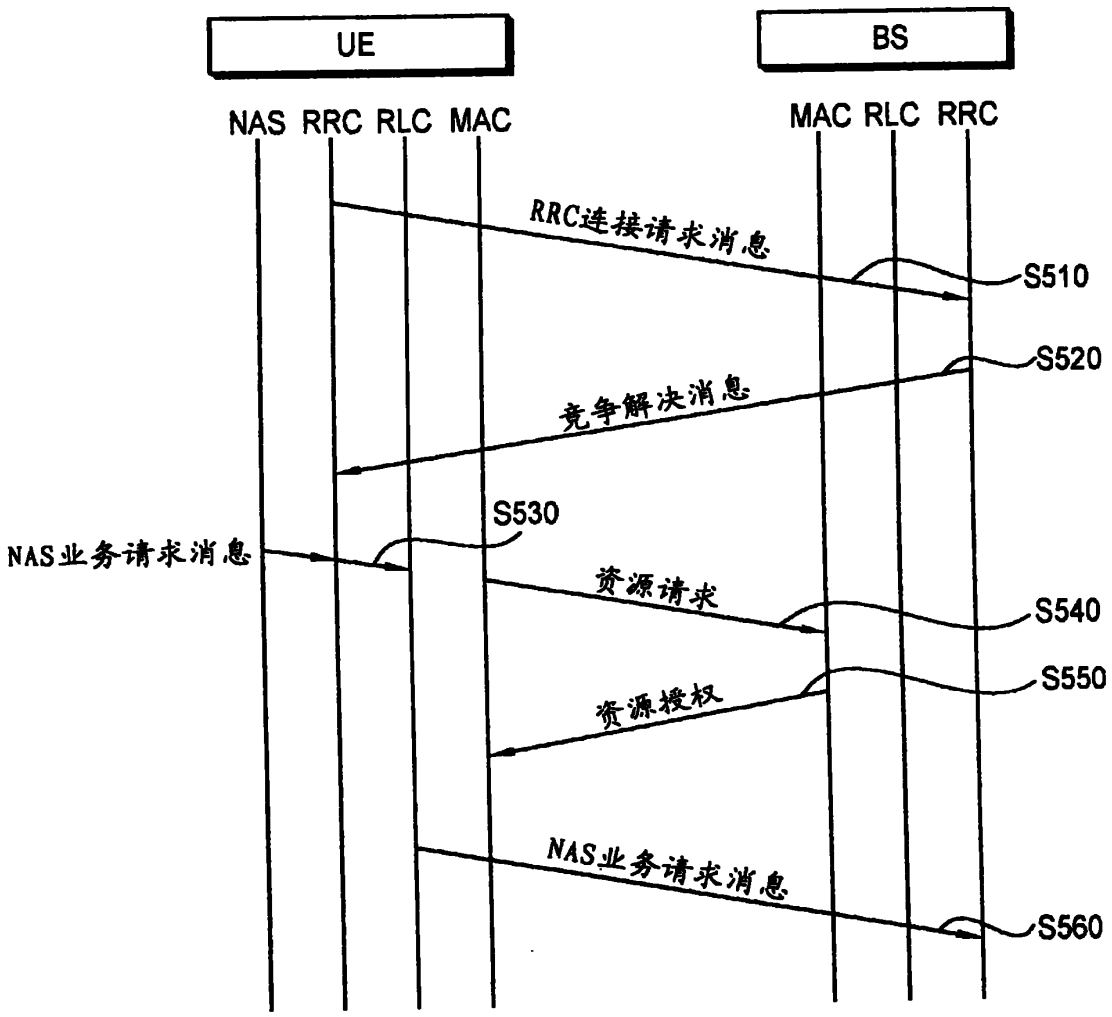


图 10

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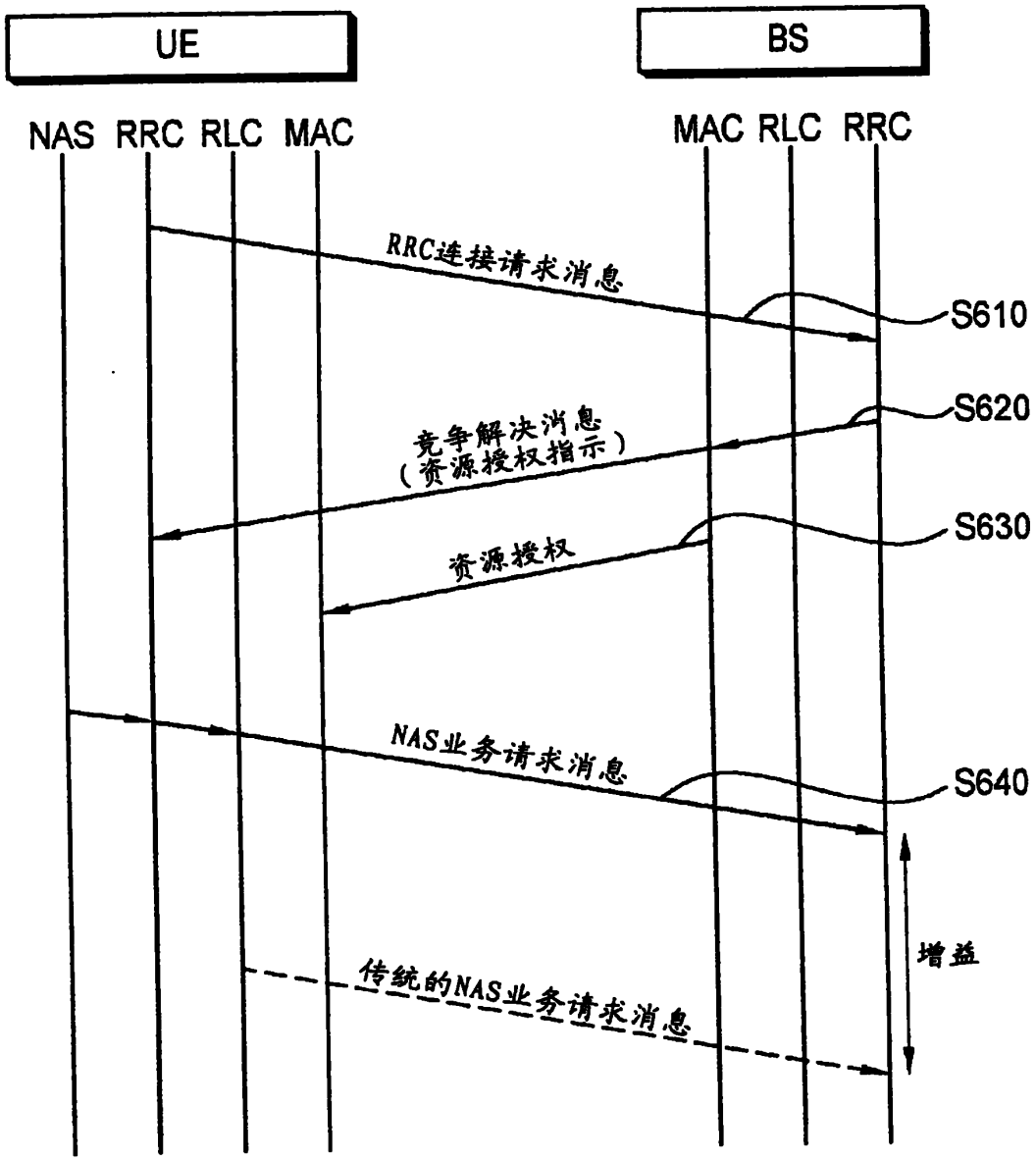


图 11

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Espacenet

CN102711174A Communication terminal, method for exchanging data, and method for establishing a communication connection

Applicants: INTEL MOBILE COMM CO LTD

Inventors: HYUNG-NAM CHOI,MAIK BIENAS,ANDREAS SCHMIDT

Classifications:
IPC ***H04W28/06; H04W76/02; H04W76/06;***

CPC **H04W88/04 (EP);** H04W72/0406 (EP);

Priorities: US201113072838A 2011-03-28

Application: CN201210085759A·2012-03-28

Publication: CN102711174A·2012-10-03

Published as: CN102711174A;**CN102711174B; US2012250601A1**

Communication terminal, method for exchanging data, and method for establishing a communication connection

Abstract

A communication terminal is described comprising a communication module configured to establish an NAS bearer connection between the communication terminal and a core network of a cellular mobile communication network and a controller configured to control the communication terminal to dedicatedly use the NAS bearer connection to exchange data between at least one second communication terminal communicating with the communication terminal and the core network.

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(19)中华人民共和国国家知识产权局

(12)发明专利申请

(10)申请公布号 CN 102711174 A
(43)申请公布日 2012.10.03

(21)申请号 201210085759.5

(22)申请日 2012.03.28

(30)优先权数据
13/072,838 2011.03.28 US

(71)申请人 英特尔移动通信有限公司
地址 德国诺伊比贝格

(72)发明人 M. 比纳斯 崔荧男 A. 施密特

(74)专利代理机构 中国专利代理(香港)有限公司 72001
代理人 段俊峰 卢江

(51)Int.Cl.
H04W 28/06(2009.01)
H04W 76/02(2009.01)
H04W 76/06(2009.01)

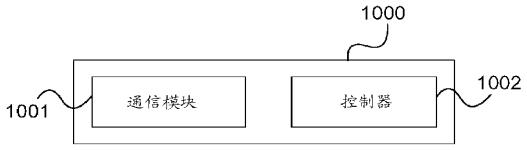
权利要求书 2 页 说明书 16 页 附图 15 页

(54)发明名称

通信终端和设备、交换数据的方法及建立通信连接的方法

(57)摘要

本发明涉及通信终端和设备、交换数据的方法及建立通信连接的方法。描述了一种通信终端，包括：通信模块，其被配置为在所述通信终端与蜂窝移动通信网络的核心网之间建立 NAS 承载连接；以及控制器，其被配置为控制所述通信终端专门使用所述 NAS 承载连接来在与所述通信终端进行通信的至少一个第二通信终端与所述核心网之间交换数据。



CN 102711174 A

1. 一种通信终端，包括：

通信模块，其被配置为在所述通信终端与蜂窝移动通信网络的核心网之间建立 NAS 承载连接；

控制器，其被配置为控制所述通信终端专门使用所述 NAS 承载连接来在与所述通信终端进行通信的至少一个第二通信终端与所述核心网之间交换数据。

2. 根据权利要求 1 所述的通信终端，其中，所述控制器被配置为控制所述通信终端专门使用所述 NAS 承载连接来仅在所述至少一个第二通信终端与所述核心网之间交换数据。

3. 根据权利要求 1 所述的通信终端，其中，所述控制器被配置为控制所述通信终端专门使用所述 NAS 承载连接来在所述至少一个第二通信终端与所述核心网之间中继数据。

4. 根据权利要求 1 所述的通信终端，其中，所述通信终端是移动通信终端。

5. 根据权利要求 4 所述的通信终端，其中，所述通信终端是所述蜂窝移动通信网络的订户终端。

6. 根据权利要求 1 所述的通信终端，其中，所述 NAS 承载连接是通过 EPS 承载而提供的通信连接。

7. 根据权利要求 1 所述的通信终端，其中，所述通信终端被配置为使用第一无线电接入技术并使用第一频带与所述核心网进行通信，并且被配置为使用第二无线电接入技术并使用第二频带与所述至少一个第二通信终端进行通信。

8. 根据权利要求 7 所述的移动终端，其中，所述第一无线电接入技术与所述第二无线电接入技术不同。

9. 根据权利要求 7 所述的移动终端，其中，所述第一无线电接入技术是蜂窝移动通信网络无线电接入技术。

10. 根据权利要求 9 所述的通信终端，其中，所述第一无线电接入技术是 LTE 无线电接入技术。

11. 根据权利要求 7 所述的通信终端，其中，所述第二无线电接入技术是局域网无线电接入技术。

12. 根据权利要求 11 所述的通信终端，其中，所述第二无线电接入技术是 WLAN 无线电接入技术。

13. 根据权利要求 7 所述的通信终端，其中，所述第一频带与所述第二频带不同。

14. 根据权利要求 7 所述的通信终端，其中，所述通信终端被配置为使用所述第二无线电接入技术和所述第二频带来操作无线电小区。

15. 根据权利要求 1 所述的通信终端，还包括：信令电路，其被配置为向所述蜂窝移动通信网络发信号通知所述 NAS 承载连接将与所述至少一个第二通信终端相关联。

16. 根据权利要求 1 所述的通信终端，还包括：信令电路，其被配置为向所述蜂窝移动通信网络发信号通知要释放与所述至少一个第二通信终端相关联的 NAS 承载连接。

17. 根据权利要求 1 所述的通信终端，其中，所述控制器被配置为控制所述通信终端使用所述 NAS 承载连接、根据与所述 NAS 承载连接相关联的服务质量来在所述至少一个第二通信终端与所述核心网之间交换数据。

18. 根据权利要求 1 所述的通信终端，其中，所述通信模块被配置为在所述通信终端与所述核心网之间建立另外的 NAS 承载连接。

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19. 根据权利要求 18 所述的通信终端，其中，所述控制器被配置为控制所述通信终端专门使用所述 NAS 承载连接在所述至少一个第二通信终端中的第二通信终端与所述核心网之间交换数据并专门使用所述另外的 NAS 承载连接在所述至少一个第二通信终端中的另一通信终端与所述核心网之间交换数据。

20. 根据权利要求 18 所述的通信终端，其中，所述控制器被配置为控制所述通信终端使用所述 NAS 承载连接、根据与所述另外的 NAS 承载连接相关联的服务质量来交换数据。

21. 根据权利要求 20 所述的通信终端，其中，同所述 NAS 承载连接相关联的服务质量与同所述另外的 NAS 承载连接相关联的服务质量不同。

22. 一种用于交换数据的方法，包括 ：

在通信终端与蜂窝移动通信网络的核心网之间建立 NAS 承载连接 ；

控制所述通信终端专门使用所述 NAS 承载连接来在与所述通信终端进行通信的至少一个第二通信终端与所述核心网之间交换数据。

23. 一种通信设备，包括 ：

接收机，其被配置为从第一通信终端接收在所述第一通信终端与蜂窝移动通信网络的核心网之间建立 NAS 承载连接并将所述 NAS 承载连接与同所述第一通信终端进行通信的至少一个第二通信终端相关联的请求 ；以及

控制器，其被配置为在所述第一通信终端与所述核心网之间建立 NAS 承载连接，并将所述 NAS 承载连接与所述至少一个第二通信终端相关联。

24. 根据权利要求 23 所述的通信设备，还包括 ：无线电模块，其使用所述 NAS 承载连接、经由所述第一通信终端来与所述至少一个第二通信终端交换数据。

25. 根据权利要求 23 所述的通信设备，其中，所述接收机还被配置为接收释放所述 NAS 承载连接的请求，以及所述控制器被配置为响应于释放请求而释放所述 NAS 承载连接。

26. 根据权利要求 23 所述的通信设备，其中，所述通信设备是所述蜂窝移动通信网络的网络实体。

27. 一种用于建立通信连接的方法，包括 ：

从第一通信终端接收在所述第一通信终端与蜂窝移动通信网络的核心网之间建立 NAS 承载连接并将所述 NAS 承载连接与同所述第一通信终端进行通信的至少一个第二通信终端相关联的请求 ；

在所述第一通信终端与所述核心网之间建立 NAS 承载连接 ；以及

将所述 NAS 承载连接与所述至少一个第二通信终端相关联。

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通信终端和设备、交换数据的方法及建立通信连接的方法

技术领域

[0001] 实施例总体涉及一种通信终端、一种用于交换数据的方法、一种通信设备以及一种用于建立通信连接的方法。

背景技术

[0002] 在无线通信网络中，由于各种原因(例如覆盖区的扩展、更高效的无线电资源使用、或者通信质量的提高)，通信终端可以充当中继节点(即，中继通信设备)。在通信网络中使用中继的灵活且高效的方式是所期望的。

附图说明

[0003] 在附图中，贯穿不同视图，相似的参考标记一般指代相同的部分。附图不一定按比例绘制，而是重点一般在于示意本发明的原理。在以下描述中，参照以下附图来描述各个实施例，在附图中：

图 1 示出了根据实施例的通信系统。

[0004] 图 2 示出了根据实施例的状态转移图。

[0005] 图 3 示出了根据实施例的协议结构。

[0006] 图 4 示出了根据实施例的通信系统。

[0007] 图 5 示出了根据实施例的消息流图。

[0008] 图 6 示出了根据实施例的协议结构。

[0009] 图 7 示出了根据实施例的通信系统。

[0010] 图 8 示出了根据实施例的协议栈架构。

[0011] 图 9 示出了根据实施例的协议栈架构。

[0012] 图 10 示出了根据实施例的通信终端。

[0013] 图 11 示出了根据实施例的流程图。

[0014] 图 12 示出了根据实施例的消息流图。

[0015] 图 13 示出了根据实施例的协议架构。

[0016] 图 14 示出了根据实施例的消息流图。

[0017] 图 15 示出了根据实施例的消息流图。

具体实施方式

[0018] 以下详细描述参照附图，附图以示意的方式示出了可实施本发明的具体细节和实施例。充分详细地描述这些实施例，以使本领域技术人员能够实施本发明。在不脱离本发明的范围的前提下，可以利用其他实施例，并且可以进行结构、逻辑和电气改变。各个实施例不必互斥，这是由于可以将一些实施例与一个或多个其他实施例进行组合以形成新实施例。

[0019] 3GPP（第 3 代合作伙伴计划）已经将 LTE（长期演进）引入到 UMTS（通用移动电信

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系统)标准的发布8版本中。利用LTE,通过改进系统容量和频谱效率,针对分组数据传输进一步优化了UMTS空中接口。特别地,显著地提高了最大净传输速率,即在下行链路传输方向上提高至300 Mbps以及在上行链路传输方向上提高至75 Mbps。此外,LTE支持1.4、3、5、10、15和20 MHz的可扩缩带宽,并且在下行链路中基于多接入方法OFDMA/TDMA(正交频分多址/时分多址)并在上行链路中基于SC-FDMA/TDMA(单载波频分多址/TDMA)。OFDMA/TDMA是多载波多接入方法,其中,向订户提供了频谱中的所定义的数目的子载波以及定义的传输时间以用于数据传输的目的。已经将LTE UE(用户设备)的针对传输和接收的RF带宽能力设置为20 MHz。物理资源块(PRB)是LTE中定义的用于物理信道的分配的基线单位。物理资源块包括12个子载波乘以6或7个OFDMA/SC-FDMA码元的矩阵。将一个OFDMA/SC-FDMA码元和一个子载波的对表示为资源单元。

[0020] 图1示出了根据实施例的通信系统100。

[0021] 根据该实施例,通信系统100是根据LTE的网络架构来配置的。通信系统100还可以是根据另一通信标准(例如,根据UMTS(通用移动电信系统)、GSM(全球移动通信系统)、CDMA2000(CDMA:码分多址)或FOMA(自由移动接入))配置的。

[0022] 通信系统100包括无线电接入网(在该示例中,根据LTE,其为E-UTRAN,即演进UMTS陆地无线电接入网)101和核心网(在该示例中,根据LTE,其为EPC,即演进分组核心)102。E-UTRAN 101可以包括基(收发器)站(在该示例中,根据LTE,其为eNodeB,即eNB)103。每个基站103为E-UTRAN 101的一个或多个移动无线电小区104提供了无线电覆盖。

[0023] 位于移动无线电小区104中的移动终端(在该示例中,根据LTE,其为UE,即用户设备)105可以经由在该移动无线电小区中提供覆盖(换言之,在该移动无线电小区中操作)的基站103与核心网102和其他移动终端105进行通信。

[0024] 基于多接入方法,通过空中接口106,在基站103与位于由基站103操作的移动无线电小区104中的移动终端之间传输控制和用户数据。

[0025] 基站103通过X2接口107彼此互连。基站还通过S1接口108连接至核心网(演进分组核心)102,更具体地,连接至MME(移动性管理实体)109和服务网关(S-GW)110。

[0026] MME负责控制位于E-UTRAN 101的覆盖区中的移动终端105的移动性以及承载(bearer)管理功能,而S-GW 110负责:i)处理用户数据在移动终端105与核心网102之间的传输;以及ii)按照(per)移动终端、PDN(分组数据网络)和QCI(服务质量标识符)的上行链路和下行链路计费。在根据LTE的核心网102的该示例(即,EPC——演进分组核心)中,MME 109和S-GW 110连接至提供与外部分组数据网络(例如因特网112)的连接性的核心网102的PDN GW(分组数据网络网关)111(还被称作P-GW)。此外,PDN GW 111负责对移动终端105的IP地址分配以及上行链路和下行链路服务级计费。

[0027] 在一个实施例中,根据LTE,通信系统100支持以下类型的双工方法:全双工FDD(频分双工)、半双工FDD和TDD(时分双工)。

[0028] 根据全双工FDD,使用两个分离的频带进行上行链路(UL)传输(即,从移动终端105至基站103的传输)和下行链路(DL)传输(即,从基站103至移动终端105的传输),并且可以同时进行这两个传输。根据半双工FDD,也使用两个分离的频带进行上行链路和下行链路传输,但是这两个传输在时间上不重叠。根据TDD,使用相同频带进行上行链路和下行链路二者中的传输。在时间帧内,可以在下行链路与上行链路之间交替地切换传输方向。

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[0029] 为了高效地控制移动终端 105 与基站（eNodeB）103 之间的无线电资源和通信连接，在一个实施例中，根据 LTE，在 RRC 协议层处指定了两个连接状态：状态 RRC_IDLE（也被称作空闲模式）和状态 RRC_CONNECTED（也被称作已连接模式）。在图 2 中示意了这些 RRC 状态以及这些状态之间的转移。

[0030] 图 2 示出了根据实施例的状态转移图 200。

[0031] 例如，当在相应移动终端 105 与相应基站 103 之间建立通信连接时，进行从 RRC_IDLE 状态 203 至 RRC_CONNECTED 状态 204 的第一状态转移 201。

[0032] 例如，当相应移动终端 105 与相应基站 103 之间的通信连接被释放时，进行从 RRC_CONNECTED 状态 204 至 RRC_IDLE 状态 203 的第二状态转移 202。

[0033] 例如，RRC_CONNECTED 状态 204 和 RRC_IDLE 状态 203 可以被表征如下。

- RRC_IDLE：
- 未建立 RRC 连接；
- 网络（即，E-UTRAN 101 和 / 或核心网 102）在跟踪区域级别（跟踪区域定义了无线电小区 104 组，其中，处于 RRC_IDLE 状态的移动终端 105 注册至该无线电小区 104，并且其中，在进入通信尝试的情况下寻呼移动终端 105）知道 UE 位置（即，相应移动终端 105 的位置）；
- 移动终端 105 执行小区（重）选择；
- 移动终端 105 获取在无线电小区 104 中广播的系统信息；
- 移动终端 105 和基站 103 未在上行链路和下行链路中传输用户和控制数据；
- 移动终端 105 监视寻呼信道，以接收与进入呼叫或对系统信息的修改有关的通知；
- RRC_CONNECTED：
- 在移动终端 105 与基站 103 之间建立 RRC 连接；
- 移动终端 105 仅连接至一个无线电小区 104，并基于由移动终端 105 报告的测量（例如，检测到的相邻无线电小区 104 的参考信号的接收信号强度），通过显式切换和小区改变命令来执行网络控制的移动性；
- 网络在小区区域级别知道移动终端 105 位置；
- 移动终端 105 获取在无线电小区中广播的系统信息；
- 在上行链路和下行链路中传输用户和控制数据；
- 移动终端 105 监视寻呼信道，以接收与对系统信息的修改有关的通知。

[0034] 将 RRC 连接定义为移动终端 105 和基站 103 中的 RRC 对等实体之间的点对点双向连接。根据一个实施例，在移动终端与基站之间不存在或存在一个 RRC 连接。

[0035] 在图 3 中示意了根据 LTE 的空中接口 106（被表示为 Uu 空中接口）的无线电协议架构。

[0036] 图 3 示出了根据实施例的协议结构 300。

[0037] 协议结构 300 还被称作接入层（AS）。在逻辑上将 Uu 空中接口划分为三个协议层。在移动终端 105 和基站 103 中均实现确保并提供相应协议层的功能的实体。

[0038] 协议结构包括物理层 PHY 301 作为最底层，PHY 301 表示根据 OSI（开放系统互连）参考模型的协议层 1（L1）。物理层 301 之上布置的协议层是数据链路层 302，其表示根据 OSI 参考模型的协议层 2（L2）。详细地，数据链路层 302 包括多个子层，即，介质接入控制（MAC）子层 303、无线电链路控制（RLC）子层 304 和分组数据汇聚协议（PDCP）子层 305。Uu

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空中接口的最顶层是网络层 306，其为根据 OSI 参考模型的协议层 3（L3）并包括无线电资源控制（RRC）层 307。

[0039] 每个协议（子）层 301 至 307 经由定义的服务接入点 308 至 311 给其上的协议（子）层提供它的服务。

[0040] 为了提供对协议层架构的更好理解，向服务接入点提供了总体上合乎习惯且明确的名称：PHY 经由传输信道将其服务提供给 MAC，MAC 经由逻辑信道将其服务提供给 RLC，以及 RLC 根据 RLC 模式（as function of the RLC mode）将其服务作为数据传送提供给 RRC 和 PDCP，所述 RLC 模式即 TM（透明模式）、UM（未应答模式）和 AM（应答模式）。此外，PDCP 经由无线电承载将其服务提供给 RRC 层 307 和用户平面上层（upper layers），具体地，经由信令无线电承载（SRB）将其服务提供给 RRC 307 并经由数据无线电承载（DRB）将其服务提供给用户平面上层。LTE 当前支持最多 3 个 SRB 和 11 个 DRB。

[0041] 不仅在水平方向上将如图 3 所示的 LTE 无线电协议架构分割为上述协议层 301 至 307，而且在垂直方向上将其分割为控制平面（C 平面）312 和用户平面（U 平面）313。控制平面的实体用于处理信令数据在移动终端 105 与基站 103 之间的交换，特别地，所述信令数据是建立、重新配置和释放物理信道、传输信道、逻辑信道、信令无线电承载和数据无线电承载所需要的，而用户平面的实体用于处理用户数据在移动终端 105 与基站 103 之间的交换。

[0042] 每个协议层 301 至 307 具有特定的规定功能：

• 特别地，物理层（或 PHY 层）301 负责：i）传输信道上的检错；ii）传输信道的信道编码 / 解码；iii）混合 ARQ（自动重传请求）软合并；iv）编码后的传输信道到物理信道上的映射；v）物理信道的调制和解调。

[0043] • 特别地，MAC 层 303 负责：i）逻辑信道与传输信道之间的映射；ii）通过 HARQ 而进行的纠错；iii）逻辑信道优先化；iv）传输格式选择。

[0044] • 特别地，RLC 层 304 负责：i）通过 ARQ 而进行的纠错；ii）RLC SDU（服务数据单元）的级联、分段和重新组装；iii）RLC 数据 PDU（协议数据单元）的重新分段和重新排序。此外，对 RLC 进行建模，使得针对每个无线电承载（数据或信令）存在独立的 RLC 实体。

[0045] • PDCP 层 305 负责 IP（网际协议）数据流的首部压缩和解压缩、用户平面数据和控制平面数据的加密和解密、以及控制平面数据的完整性保护和完整性验证。对 PDCP 进行建模，使得每个无线电承载（即，数据无线电承载和信令无线电承载，除信令无线电承载 SRB0 外）与一个 PDCP 实体相关联。根据无线电承载特性（即，单向或双向）和 RLC 模式，每个 PDCP 实体与一个或两个 RLC 实体相关联。

[0046] • RRC 层 307 负责移动终端 105 与基站 103 之间的控制平面信令，并特别执行以下功能：i）系统信息的广播；ii）寻呼；iii）物理信道、传输信道、逻辑信道、信令无线电承载和数据无线电承载的建立、重新配置和释放。信令无线电承载用于在移动终端 105 与基站 103 之间交换 RRC 消息。

[0047] 如果位于 LTE 无线电小区 104 中的移动终端 105 正使用由移动通信网络（即，无线电接入网 101 和核心网 102）提供的例如与外部分组数据网络（PDN）（如因特网 112）的端对端通信服务，则核心网 102 基于相关通信服务的质量准则，在所定义的 QoS（服务质量）下提供该通信服务。这是通过在移动终端 105 与核心网 102 之间建立 EPS（演进分组系统）

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承载上下文来进行的。EPS 承载可以被定义为移动终端 105 与核心网 102（包括 MME 109、S-GW 110 和 PDN 网关 111）之间的与特定 QoS 属性相关联的信息传输路径。

[0048] 这在图 4 中被示意。

[0049] 图 4 示出了根据实施例的通信系统 400。

[0050] 通信系统 400 包括作为 E-UTRAN 403 的一部分的基站 402 和移动终端 401，E-UTRAN 403 与图 1 的无线电接入网 101 类似。此外，通信布置 400 包括 MME 和 / 或 S-GW 404 和 P-GW 405 作为 EPC 406 的一部分，EPC 406 与图 1 的核心网 102 类似。此外，通信系统 400 包括作为因特网 408 的一部分的对等实体 407，例如因特网 408 中的服务器计算机。

[0051] 端对端服务 409 可以由移动终端 401 与对等实体 407 之间的通信网络（包括无线电接入网 403 和核心网 406）提供。

[0052] 端对端服务 409 还可以被视为分组数据网络连接。

[0053] 端对端服务 409 是通过 EPS 承载 410 来提供的，EPS 承载 410 在建立、释放和维护方面的管理是在 NAS（非接入层）级别或网络层上处理的，网络层是根据 OSI 参考模型的协议层 3（L3）。

[0054] 在无线电空中接口级别或接入层级别上，将 EPS 承载 410 映射至数据无线电承载（DRB）411。详细地，将 EPS 承载 410 的 QoS 属性转换为数据无线电承载 411 的 QoS 属性，例如保证比特率、最大比特率、RLC 模式和逻辑信道优先级。

[0055] 图 4 可以被视为从移动终端的角度示出了 EPS 承载服务架构。

[0056] 在一个实施例中，根据 LTE，定义了两种类型的 EPS 承载：缺省承载和专用承载。建立缺省承载以给移动终端 105 提供与 PDN（例如因特网 112）的总是连通的（always-on）IP 连接性，并且在 PDN 连接的整个寿命期间保持建立该缺省承载。所建立的到相同 PDN 的任何附加 EPS 承载被称作专用承载。根据一个实施例，建立或修改专用承载的决定仅可以由核心网 102 做出，并且，承载级别 QoS 属性始终由核心网 102 指派。

[0057] 根据一个实施例，每个 EPS 承载与 QoS 类标识符（QCI）相关联，QCI 是用作对控制 EPS 承载级别分组转发处理的节点特定参数（例如调度权重、接纳阈值、队列管理阈值、链路层协议配置等）的引用的标量。根据 LTE，定义了具有用于对通信服务进行分类的对应特性的九个标准化 QoS 类标识符，这九个标准化 QoS 类标识符在其具体传输属性和质量需求方面不同。在表 1 中示意了标准化 QCI 值到标准化特性的一对一映射。

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QCI	资源类型	优先级	分组延迟预算	分组差错丢失率	示例服务
1	GBR	2	100 ms	10^{-2}	会话语音
2		4	150 ms	10^{-3}	会话视频（实况流传输）
3		3	50 ms	10^{-3}	实时游戏
4		5	300 ms	10^{-6}	非会话视频（缓冲流传输）
5	非 GBR	1	100 ms	10^{-6}	IMS 信令
6		6	300 ms	10^{-6}	视频（缓冲流传输）基于 TCP（例如，www、电子邮件、聊天、ftp、p2p 文件共享、渐进视频等）
7		7	100 ms	10^{-3}	语音、视频（实况流传输）、交互式游戏
8		8	300 ms	10^{-6}	视频（缓冲流传输）、基于 TCP（例如，www、电子邮件、聊天、ftp、p2p 文件共享、渐进视频等）
9		9			

表 1。

[0058] 表 1 中指示的资源类型确定是否永久分配与服务相关的专用网络资源。在“GBR”资源类型的情况下，在承载建立 / 修改时永久分配与保证比特率（GBR）值（即，可期望由 GBR 承载提供的比特率）相关的专用网络资源。在“非 GBR”资源类型的情况下，在承载建立 / 修改时不永久分配专用网络资源。根据一个实施例，专用承载可以是 GBR 或非 GBR 承载，而缺省承载仅可以是非 GBR 承载。根据一个实施例，每个 QCI（GBR 和非 GBR）与优先级级别相关联。优先级级别 1 是最高优先级级别，并且优先级级别 9 是最低优先级级别。优先级级别的目的在于：允许例如基站 103 在来自一个移动终端的不同数据流之间以及在来自不同移动终端的不同数据流之间适当调度。分组延迟预算（PDB）定义了可以在移动终端 105 与核心网 102 之间延迟分组的时间的上界。对于特定 QCI，PDB 的值在上行链路和下行链路中相同。PDB 的目的在于：支持调度和链路层功能的配置（例如，调度优先级权重和 HARQ 目标操作点的设置）。分组差错丢失率（PELR）定义了已由发送器在链路层协议（如 RLC）级别处理但未由对应接收器成功传送至上层（如 PDCP）的数据分组（例如 IP 分组）的比率的上界。PELR 的目的在于：允许适当的链路层协议配置（例如 E-UTRAN 中的 RLC 和 HARQ）。对于特定 QCI，PELR 的值在上行链路和下行链路中相同。

[0059] 以下，参照图 5 来描述处于 RRC_IDLE 状态的移动终端（例如处于空闲模式的移动终端 105）发起与外部分组数据网络（PDN）（例如因特网 112）建立通信服务（“移动始发数据呼叫”）的示例缺省 EPS 承载建立过程。

[0060] 图 5 示出了根据实施例的消息流图 500。

[0061] 该消息流在例如与移动终端 105 相对应的移动终端 501、例如与操作移动终端 501 所处的无线电小区 104 的基站 103 相对应的基站 502、例如与 MME 109 相对应的 MME 503、例如与 S-GW 110 相对应的 S-GW 504 和例如与 P-GW 111 相对应的 P-GW 505 之间进行。

[0062] 作为图 5 所示的过程的结果，在移动终端 501 和通信网络（包括无线电接入网和核心网，无线电接入网具有基站 502，核心网包括 MME 503、S-GW 504 和 P-GW 505）中建立与

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特定 QoS 属性相关联的(与非 GBR 资源类型相对应的)缺省 EPS 承载和数据无线电承载,给移动终端 501 指派 IP 地址,使得其可以与 PDN (例如因特网)进行通信,并且相应地配置接入层协议层 1 至 3,使得可以在通信连接的持续时间内、在该 QoS 下、在 RRC_CONNECTED 状态中提供通信服务。

[0063] 详细地,缺省 EPS 承载建立过程包括以下内容。

[0064] 在 506 中,由于需要为通信服务建立 RRC 连接,移动终端 501 向基站 502 发送包括作为建立理由的“移动始发数据呼叫”在内的 RRC 连接请求消息 507。

[0065] 在 508 中,基站 502 接受该请求,并向移动终端 501 发送 RRC 连接设立消息 509,其中配置专用无线电资源以便建立信令无线电承载 1 (SRB1), SRB1 用于 RRC 消息(其可以包括附带的 NAS 消息)以及用于 NAS 消息,全都使用 DCCH 逻辑信道。

[0066] 在 510 中,移动终端 501 向基站 502 发送 RRC 连接设立完成消息 511,以确认 RRC 连接建立的成功完成。与 RRC 连接设立完成消息 511 一起,移动终端 501 在信息元 DedicatedInfoNAS 内向通信网络(即,向基站 502)发送 NAS PDN 连接性请求消息 512,以发起 PDN 连接的建立。

[0067] 在 513 中,在与 NAS PDN 连接性请求消息 512 一起接收到 RRC 连接设立完成消息 511 后,基站 502 提取 NAS PDN 连接性请求消息 512 并将其传递至 MME 503。

[0068] 在 514 中, MME 接收 PDN 连接性请求消息 512 并为与移动终端 501 相关联的缺省 EPS 承载分配缺省 EPS 承载 QoS(即,用于上行链路和下行链路的 QCI 和最大比特率)和 EPS 承载标识(例如,作为 EPS 承载的唯一标识符的四比特值)。然后,其创建一创建会话请求消息 515 (包括移动终端 501 的 IMSI (国际移动订户标识)、移动终端 501 的 MSISDN (移动订户综合服务数字网)号码、缺省 EPS 承载 QoS 以及 EPS 承载标识),并向 S-GW 504 发送创建会话请求消息 515。

[0069] 在 516 中, S-GW 504 将创建会话请求消息 515 转发至 P-GW 505。

[0070] 在 517 中,P-GW 505 存储接收到的参数并利用包括被指派给移动终端 501 的 IP 地址的创建会话响应消息 518 进行响应。

[0071] 在 519 中, S-GW 504 将创建会话响应消息 518 转发至 MME 503。

[0072] 在 520 中, MME 503 接收创建会话响应消息 518。结果,其创建激活缺省 EPS 承载上下文请求消息 521 (包括 EPS 承载 QoS、EPS 承载标识以及向移动终端 501 分配的 IP 地址),并经由基站 502 将其发送至移动终端 501 以请求对缺省 EPS 承载上下文的激活。

[0073] 在 522 中,基站 502 经由在 DCCH 上映射的 SRB1 将激活缺省 EPS 承载上下文请求消息 521 转发至移动终端 501。与激活缺省 EPS 承载上下文请求消息 521 (其为 NAS 消息)一起,基站 502 发送 RRC 连接重新配置消息 523,其包括根据所指派的 QoS 属性的 MAC 层和 PHY 层配置以及数据无线电承载的专用无线电资源配置。

[0074] 在 524 中,移动终端 501 利用 RRC 连接重新配置完成消息 525 进行响应,以确认 RRC 连接重新配置的成功完成。

[0075] 在 526 中,在处理了接收到的激活缺省 EPS 承载上下文请求消息 521 之后,移动终端 501 发送 UL 信息传送消息 527,以将激活缺省 EPS 承载上下文接受消息 528(其为 NAS 消息)传输至通信网络(即,至基站 502)。利用激活缺省 EPS 承载上下文接受消息 528,移动终端 501 对缺省 EPS 承载上下文的激活进行应答。

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[0076] 在529中，基站502从UL信息传送消息527提取激活缺省EPS承载上下文接受消息528，并将其传递至MME 503。此时，建立缺省EPS承载和数据无线电承载，使得移动终端501可以开始传输其数据。

[0077] 在图6中示意了由图5所示的过程引起的用于上行链路的无线电协议架构配置。

[0078] 图6示出了根据实施例的协议结构600。

[0079] 与参照图3描述的协议结构300类似，协议结构600包括物理层601、MAC层602、RLC层603、PDCP层604和RRC层605，并且还可以在垂直方向上被划分为C平面606和U平面607。

[0080] 在U平面607中，使用DTCH逻辑信道609将通信服务映射至数据无线电承载DRB1 608。在C平面中，配置了三个SRB 610：

- SRB0用于RRC消息，使用CCCH逻辑信道；
- SRB1用于RRC消息(其可以包括附带的NAS消息)以及用于SRB2建立前的NAS消息，全都使用DCCH逻辑信道；
- SRB2用于NAS消息，使用DCCH逻辑信道。SRB2具有比SRB1更低的优先级，并由无线电接入网101在安全性激活之后配置。

[0081] 除SRB0外，所有其他信令和数据无线电承载与一个PDCP实体相关联，这是由于针对SRB0不需要PDCP功能。物理层601经由映射至PUSCH物理信道613的USCH传输信道612将其服务提供给MAC层602，在PUSCH物理信道613上，通过Uu空中接口106将来自USCH 612的数据传输至基站103。

[0082] 关于世界范围内持续增加数目的移动订户，对移动服务存在增长的需要，尤其是对分组交换数据服务存在增长的需要。为了满足该需要并容易地给其用户提供对多种服务和应用的接入，根据一个实施例，移动终端可以支持多个无线电接入技术(RAT)，例如根据3G UMTS、2G GSM、WLAN和蓝牙的无线电接入技术。从通信网络运营商的角度来看，对以合理的成本提供增强的覆盖、容量和小区边缘吞吐量存在富有挑战性的需要。

[0083] 异构和多RAT网络表示满足该富有挑战性的需要的颠覆性方案，其中，增强的覆盖、容量和小区边缘吞吐量由不同类型的小区(例如宏小区、微微小区、毫微微小区)和RAT(例如LTE、UMTS、GSM、WLAN、蓝牙)提供。异构和多RAT网络的基本思想可以从以下看到：将业务从根据第一无线电接入技术且在第一(例如已许可的昂贵的)频谱中操作的宏无线电小区卸载至根据第二无线电接入技术且在第二(例如未许可的便宜的)频谱中操作的该宏无线电小区内的小区域无线电小区。

[0084] 在图7中示意了使用两种不同无线电接入技术的异构网络部署情形的示例。

[0085] 图7示出了根据实施例的通信系统700。

[0086] 与以上参照图1描述的通信系统100类似，通信系统700包括：基站701，其操作(宏)无线电小区702；核心网704，其包括MME/S-GW 703(即，MME、S-GW或者包括这两个功能的组件)和PDN-GW 714，其经由SGi接口706将核心网704连接至因特网705。基站701是无线电接入网(在该示例中根据LTE)的一部分，并经由S1接口707连接至核心网704。

[0087] 基站701作为LTE eNB提供宏小区覆盖，并在已许可的频谱(即，由无线电接入网和核心网704的运营商许可)中操作。第一移动终端708位于移动无线电小区702中。第一移动终端708是使用短距离RAT(诸如例如WLAN或蓝牙)且在未许可的频谱(例如ISM

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(工业科学医疗)频带)中操作的双 RAT LTE 中继移动终端,并为机会网络 709 提供附加的小区域覆盖。机会网络 709 包括第二移动终端 710 和第三移动终端 711。

[0088] 机会网络 709 是使用与 LTE 不同的 RAT 来操作的,并可以由蜂窝通信网络(包括无线电接入网和核心网 704)在不论何时不论何地需要它的情况下动态建立和控制,并可能以合理的成本将移动服务传送至移动订户。在机会网络 709 中,ON 终端(即,第二移动终端和第三移动终端)710、711 经由空中接口 713 (例如根据 WLAN 或蓝牙)连接至中继移动终端(即,第一移动终端)708,并且,中继移动终端 708 自身经由 LTE Uu 空中接口 712 连接至基站 701 (并且从而连接至蜂窝通信网络)。

[0089] ON 终端 710、711 对移动服务的接入由中继移动终端 708 维护。这意味着 :从 ON 终端 710、711 的角度来看,可以将中继移动终端 708 视为对在 ON 终端 710、711 与蜂窝通信网络之间交换的数据进行路由的网络节点(例如移动热点)。

[0090] 此外,中继移动终端 708 自身还可以接入移动服务。因此,从协议架构的观点来看,中继移动终端 708 必须支持(至少)两个协议栈。这在图 8 和 9 中示意。

[0091] 图 8 示出了根据实施例的协议栈架构 800。

[0092] 协议栈架构 800 是在使用 WLAN 来操作机会网络 709 的情况下使用的。

[0093] 对于 LTE 空中接口 712,协议栈架构 800 包括第一物理层 801、第一 MAC 层 802、RLC 层 803、PDCP 层 804、RRC 层 805 和 NAS 层 806。对于面向 ON 终端 710、711 的空中接口 713(在该示例中,其为 WLAN 空中接口),协议栈架构 800 包括第二物理层 807、第二 MAC 层 808、LLC 层 809 和 IP 层 810。

[0094] 图 9 示出了根据实施例的协议栈架构 900。

[0095] 协议栈架构 900 是在使用蓝牙来操作机会网络 709 的情况下使用的。

[0096] 对于 LTE 空中接口 712,协议栈架构 900 包括第一物理层 901、第一 MAC 层 902、RLC 层 903、PDCP 层 904、RRC 层 905 和 NAS 层 906。对于面向 ON 终端 710、711 的空中接口 713(在该示例中,其为蓝牙空中接口),协议栈架构 900 包括第二物理层 907、第二 MAC 层 908、LMP (链路管理)层 909、HCI (主机控制器接口)层 910、L2CAP (逻辑链路和控制适配协议)层 911 和 IP 层 912。

[0097] 可以在免许可的 ISM 频带(2.4-2.4835 GHz)中操作根据 IEEE 802.11b 或 802.11g 的 WLAN (无线 LAN 连接性的标准)和蓝牙(短距离连接性的标准)。这两种系统均将 TDD 用作双工方案。在 WLAN 中,将 ISM 频带分为三个不重叠的射频(RF)信道,每个信道具有 22 MHz 带宽,并且对于 WLAN 设备与接入点(在该示例中,其为 ON 终端 710、711 和中继终端 708 之一)之间的数据传输使用一个特定 RF 信道。在蓝牙中,从 2.402 GHz 开始将 ISM 频带分为 79 个 RF 信道,每个信道具有 1 MHz 带宽。对于两个蓝牙设备之间的数据传输,根据跳频方案,使用所有 79 个 RF 信道。此外,为了最小化在 ISM 频带中同时操作蓝牙和 WLAN 时对 WLAN 的干扰,可以根据自适应跳频方案来执行两个蓝牙设备之间的数据传输,其中,避免了当前由 WLAN 使用的特定 RF 信道。

[0098] 当前在 LTE 中未规定异构和多 RAT 网络(例如通信系统 700)的概念。对于 LTE 中的标准化解决方案,存在许多方面。LTE 中尚未规定的一个方面涉及 :建立和维护通过中继终端 708 与核心网 704 相连接的 ON 终端 710、711 的 EPS 承载上下文。如上所述,EPS 承载被用于使用通信服务。

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[0099] 一种方案可以是：将 ON 终端 710、711 的 EPS 承载上下文与中继移动终端 708 的现有的(一个或多个)EPS 承载上下文相关联。这种方案是可行的，但显现出以下缺陷：当使用该方案时，可能不能对中继移动终端 708 和 ON 终端 710、711 进行有区别的 QoS 和计费控制。

[0100] 根据一个实施例，提出了一种用于建立和维护 ON 终端的 EPS 承载上下文的解决方案，其允许在异构和多 RAT 网络部署中进行有区别的 QoS 和计费控制。

[0101] 图 10 示出了根据实施例的通信终端 1000。

[0102] 通信终端 1000 包括：通信模块 1001，其被配置为在通信终端与蜂窝移动通信网络的核心网之间建立 NAS 承载连接。

[0103] 通信终端 1000 还包括：控制器 1002，其被配置为控制该通信终端以专门使用 NAS 承载连接来在与该通信终端进行通信的至少一个第二通信终端(例如，通信终端 1000 是第一通信终端)与核心网之间交换数据。

[0104] 在一个实施例中，换言之，作为移动通信网络的中继通信设备而操作的通信终端在 NAS 级别上(即，在比接入层(AS)级别更高的层上，换言之，在 AS 协议之上的层上)与移动通信网络的核心网建立通信连接，该通信终端仅将该通信连接用于中继数据，而例如不用于其自身所使用的数据，例如其自身处理或要处理的有用数据或用于该通信终端自身所使用的通信服务的数据(包括有用数据和 / 或控制数据)。换言之，该通信终端保持与核心网的至少一个通信连接用于中继，并保持与核心网的至少一个通信连接用于其他目的，例如用于在其自身(即，例如其自身生成或要处理的非中继数据)与核心网之间交换数据。

[0105] 根据一个实施例，控制器被配置为控制通信终端专门使用 NAS 承载连接来仅在该至少一个第二通信终端与核心网之间交换数据。

[0106] 根据一个实施例，控制器被配置为控制通信终端专门使用 NAS 承载连接来在该至少一个第二通信终端与核心网之间中继数据。

[0107] 通信终端可以是移动通信终端，例如蜂窝移动通信网络的订户终端。

[0108] 根据一个实施例，NAS 承载连接是通过 EPS 承载而提供的通信连接。

[0109] 根据一个实施例，通信终端被配置为使用第一无线电接入技术并使用第一频带与核心网进行通信，并被配置为使用第二无线电接入技术并使用第二频带与该至少一个第二通信终端进行通信。

[0110] 例如，第一无线电接入技术与第二无线电接入技术不同。

[0111] 第一无线电接入技术可以是蜂窝移动通信网络无线电接入技术。例如，第一无线电接入技术是 LTE 无线电接入技术。

[0112] 第二无线电接入技术可以是局域网无线电接入技术。例如，第二无线电接入技术是 WLAN 无线电接入技术。

[0113] 第一频带可以与第二频带不同。

[0114] 通信终端可以被配置为使用第二无线电接入技术和第二频带来操作无线电小区。

[0115] 通信终端还可以包括：信令电路，其被配置为向蜂窝移动通信网络发信号通知 NAS 承载连接将与该至少一个第二通信终端相关联。

[0116] 信令电路还可以被配置为向蜂窝移动通信网络发信号通知与该至少一个第二通信终端相关联的 NAS 承载连接要被释放。

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[0117] 根据一个实施例，控制器被配置为控制通信终端使用 NAS 承载连接、根据与 NAS 承载连接相关联的服务质量在该至少一个第二通信终端与核心网之间交换数据。

[0118] 根据一个实施例，通信模块被配置为在通信终端与核心网之间建立另外的 NAS 承载连接。

[0119] 根据一个实施例，控制器被配置为控制通信终端专门使用该 NAS 承载连接在该至少一个第二通信终端中的第二通信终端与核心网之间交换数据并且专门使用该另外的 NAS 承载连接在该至少一个第二通信终端中的另一通信终端与核心网之间交换数据。

[0120] 根据一个实施例，控制器被配置为控制通信终端使用该 NAS 承载连接、根据与该另外的 NAS 承载连接相关联的服务质量来交换数据。

[0121] 根据一个实施例，同该 NAS 承载连接相关联的服务质量与同该另外的 NAS 承载连接相关联的服务质量不同。

[0122] 例如，通信终端 1000 执行如图 11 所示的方法。

[0123] 图 11 示出了根据实施例的流程图 1100。

[0124] 流程图 1100 示意了用于交换数据的方法。

[0125] 在 1101 中，建立通信终端与蜂窝移动通信网络的核心网之间的 NAS 承载连接。

[0126] 在 1102 中，控制通信终端专门使用 NAS 承载连接来在与该通信终端进行通信的至少一个第二通信终端与核心网之间交换数据。

[0127] 根据一个实施例，提供了一种通信设备，包括：接收机，被配置为从第一通信终端接收在第一通信终端与蜂窝移动通信网络的核心网之间建立 NAS 承载连接并将 NAS 承载连接与同第一通信终端进行通信的至少一个第二通信终端相关联的请求；以及控制器，被配置为(例如响应于该请求)在第一通信终端与核心网之间建立 NAS 承载连接，并且(例如响应于该请求)将 NAS 承载连接与该至少一个第二通信终端相关联。

[0128] 该通信设备还可以包括：无线电模块，其使用 NAS 承载连接、经由第一通信终端与该至少一个第二通信终端交换数据。

[0129] 根据一个实施例，接收机还被配置为接收释放 NAS 承载连接的请求，以及控制器被配置为响应于该释放请求而释放 NAS 承载连接。

[0130] 根据一个实施例，通信设备是蜂窝移动通信网络的网络实体。

[0131] 根据一个实施例，提供了一种用于建立通信连接的方法，包括：从第一通信终端接收在第一通信终端与蜂窝移动通信网络的核心网之间建立 NAS 承载连接并将 NAS 承载连接与同第一通信终端进行通信的至少一个第二通信终端相关联的请求；在第一通信终端与核心网之间建立 NAS 承载连接；以及将 NAS 承载连接与该至少一个第二通信终端相关联。

[0132] 应当注意，在通信终端 1000 的上下文中描述的实施例对图 11 所示的用于交换数据的方法、通信设备和用于建立通信连接的方法类似有效，反之亦然。

[0133] 根据一个实施例，通信终端 1000 建立并维护 ON 终端的 EPS 承载上下文，从而允许异构和多 RAT 网络部署中的有区别的 QoS 和计费控制。以下参照图 7 所示的通信系统 700 来描述这一点。

[0134] 根据一个实施例，在通信系统 700 中执行以下 NAS 信令以建立和维护 ON 终端 710、711 的 EPS 承载。

[0135] • 中继移动终端 708 将 PDN 连接性关联请求消息发送至移动通信网络以发起用于

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ON 终端 710、711 的 PDN 连接的建立并将 PDN 连接与中继终端 708 相关联。在该消息中，包括 ON 终端 710、711 的一个或多个标识，例如 IMSI 和 / 或 MSISDN。

[0136] • 中继终端 708 将 PDN 连接性释放请求消息发送至移动通信网络以释放与中继终端 708 相关联的用于 ON 终端 710、711 的 PDN 连接。在该消息中，包括 ON 终端 710、711 的一个或多个标识（例如 IMSI 和 / 或 MSISDN）以及要释放的 EPS 承载标识和 IP 地址。

[0137] • 此外，根据一个实施例，利用信息元“ON 终端标识”来扩展如上参照图 5 所述的 NAS 消息激活缺省 EPS 承载上下文请求（由 MME 703 发送至中继终端 708）、激活缺省 EPS 承载上下文接受（由中继终端 708 发送至 MME 703）、去激活 EPS 承载上下文请求（由 MME 703 发送至中继终端 708）和去激活 EPS 承载上下文接受（由中继终端 708 发送至 MME 703）。当针对 ON 终端 710、711 而不针对中继终端 708 执行缺省 EPS 承载建立或 EPS 承载去激活时，设置该信息元。

[0138] 根据一个实施例，关于 AS（接入层）C 平面配置，引入用于建立和修改 ON 特定数据无线电承载的上行链路 RRC 连接重新配置请求消息。该消息还包含用于携带 NAS 消息的信息元“DedicatedInfoNAS”。该消息由中继终端 708 发送至基站 701。

[0139] 根据一个实施例，关于 AS（接入层）U 平面配置：

• 在中继终端 708 中，与用于中继终端 708 自身的数据无线电承载分离地建立并维护用于 ON 终端 710、711 的数据无线电承载。

[0140] • 对于 ON 终端 710、711 或使用具有相同 QoS 属性的通信服务的 ON 终端 710、711 的组配置 ON 特定数据无线电承载。每个 ON 特定数据无线电承载由明确的 QoS 属性（例如最大比特率、RLC 模式和逻辑信道优先级）表征。

[0141] 以下，参照图 7 所示的通信系统 700 来描述实施例，其中，假定移动通信网络是在下行链路中基于 OFDMA/TDMA、在上行链路中基于 SC-FDMA/TDMA 的 LTE 网络，并在 FDD 模式中操作。此外，如参照图 7 所述，假定第一移动终端 708 是双 RAT 中继终端，以及第二移动终端 710 和第三移动终端 711 是 ON 终端（经由短距离无线电技术与中继终端 708 进行通信，并且从而是由中继终端 709 操作的机会网络 709 的一部分）并位于由基站 701 操作的 LTE 宏无线电小区 702 中。

[0142] 以下参照图 12 来描述根据一个实施例的 EPS 承载激活的示例。

[0143] 图 12 示出了根据实施例的消息流图 1200。

[0144] 消息流在与中继终端 708 相对应的中继终端 1201、与操作移动终端 501 所处的无线电小区 104 的基站 701 相对应的基站 1202、例如与 MME/S-GW 703 相对应的 MME 1203 和 S-GW 1204 以及与 PDN-GW 714 相对应的 P-GW 1205 之间进行。

[0145] 假定中继终端 1201 处于 RRC_CONNECTED 状态并正在使用与外部分组数据网络（如因特网 705）的两个通信服务。此外，作为移动热点，中继终端 1201 使用 WLAN 向 ON 中端 710、711 提供与因特网 705 的连接性。假定 ON 终端 710、711 作为 WLAN 客户端连接至中继终端 1201 以得到对因特网服务的接入。结果，机会网络 709 由中继终端 1201 设立，并且针对两个 ON 终端 710、711（也被称作 WLAN 客户端 #1 和 WLAN 客户端 #2）执行缺省 EPS 承载建立过程，如下所述。

[0146] 在 1206 中，在中继终端 1201 从两个 ON 终端 710、711 接收到接入通信服务的连接请求之后，其向基站 1202 发送 RRC 连接重新配置请求消息 1207 以请求 ON 特定数据无线电

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承载的建立。

[0147] 与 RRC 连接重新配置请求消息 1207 一起，中继终端 1201 在信息元“DedicatedInfoNAS”内将 PDN 连接性关联请求消息 1208(其为 NAS 消息)发送至基站 1202，以发起用于两个 ON 终端 710、711 的 PDN 连接的建立并将 PDN 连接与中继终端 1201 相关联。在 PDN 连接性关联请求消息 1208 中，包括 ON 终端 710、711 的标识(例如每个 ON 终端 710、711 的 IMSI 和 / 或 MSISDN)。

[0148] 在 1209 中，在与 PDN 连接性关联请求消息 1208 一起接收到 RRC 连接重新配置请求消息 1207 后，基站 1202 提取 PDN 连接性关联请求消息 1208 并将其传递至 MME 1203。

[0149] 在 1210 中，MME 1203 接收 PDN 连接性关联请求消息 1208，并为每个 ON 终端分配缺省 EPS 承载 QoS (例如用于上行链路和下行链路的 QCI 和最大比特率) 和 EPS 承载标识(例如作为 EPS 承载的唯一标识符的四比特值)。然后，其创建创建会话请求消息 1211 (包括 ON 终端 710、711 的 IMSI 和 / 或 MSISDN、缺省 EPS 承载 QoS 和 EPS 承载标识)，并将创建会话请求消息 1211 发送至 S-GW 1204。

[0150] 在 1212 中，S-GW 1204 将创建会话请求消息 1211 转发至 P-GW 1205。

[0151] 在 1213 中，P-GW 1205 存储接收到的参数，并利用包括被指派给每个 ON 终端 710、711 的 IP 地址的创建会话响应消息 1214 进行响应。

[0152] 在 1215 中，S-GW 1204 将创建会话响应消息 1214 转发至 MME 1203。

[0153] MME 1203 接收创建会话响应消息 1214。结果，在 1216 中，其创建激活缺省 EPS 承载上下文请求消息 1217 (包括每个 ON 终端的 IP 地址、EPS 承载 QoS 和 EPS 承载标识)，并经由基站 1202 将其发送至中继终端 1201 以请求对用于每个 ON 终端 710、711 的缺省 EPS 承载上下文的激活。

[0154] 在 1218 中，基站 1202 经由在 DCCH 上映射的 SRB1 将激活缺省 EPS 承载上下文请求消息 1217 转发至中继终端 1201。与激活缺省 EPS 承载上下文请求消息 1217 一起，基站 1202 发送 RRC 连接重新配置消息 1219，其包括根据每个 ON 终端 710、711 的所指派的 QoS 属性的数据无线电承载的专用无线电资源配置。在该示例中，基站 1202 配置两个数据无线电承载，这是由于 ON 终端 710、711 正在使用 QCI 资源类型“非 GBR”的两个不同服务。

[0155] 在 1220 中，移动终端 1201 利用 RRC 连接重新配置完成消息 1221 进行响应，以确认 RRC 连接重新配置的成功完成。

[0156] 在 1222 中，在处理了接收到的激活缺省 EPS 承载上下文请求消息 1217 之后，中继终端 1201 发送上行链路信息传送消息 1223，以将激活缺省 EPS 承载上下文接受消息 1224 (其为 NAS 消息) 传输至通信网络(具体地，基站 1202)。利用激活缺省 EPS 承载上下文接受消息 1224，中继终端 1201 对用于这两个 ON 终端 710、711 的缺省 EPS 承载上下文的激活进行应答。

[0157] 在 1225 中，基站 1202 从上行链路信息传送消息 1223 提取激活缺省 EPS 承载上下文接受消息 1224，并将其传递至 MME 1203。此时，在通信网络中建立用于这两个 ON 终端 710、711 的缺省 EPS 承载和数据无线电承载，并将缺省 EPS 承载和数据无线电承载与中继终端 1201 相关联，使得这两个 ON 终端 710、711 可以开始通过中继终端 1201 将其数据传输至通信网络。

[0158] 在图 13 中示意了由图 12 所示的过程引起的、在中继终端 708 中用于上行链路的

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无线电协议架构。

[0159] 图 13 示出了根据实施例的协议架构 1300。

[0160] 协议架构 1300 包括物理层 1301、MAC 层 1302、RLC 层的 RLC 实体 1303 以及 PDCP 层的 PDCP 实体 1304。协议架构 1300 可以被划分为 C 平面 1305 和 U 平面 1306。

[0161] 在 U 平面 1306 中，配置了总体四个数据无线电承载：用于中继终端 708 自身的 DRB1 和 DRB2、用于第二移动终端（ON 终端 #1）710 的 DRB3 和用于第三移动终端（ON 终端 #2）711 的 DRB4。第一阴影块 1307 指示用于处理中继终端 708 的数据的 PDCP 实体和 RLC 实体，第二阴影块 1308 指示用于处理第二移动终端 710 的数据的 PDCP 实体和 RLC 实体，以及第三阴影块 1309 指示用于处理第三移动终端 711 的数据的 PDCP 实体和 RLC 实体。

[0162] 以下，描述如下示例：其中，第三移动终端（ON 终端 #2；WLAN 客户端 #2）711 结束其通信服务，使得需要对其建立的缺省 EPS 承载进行去激活（即，释放）。在图 14 中示意了对应的 EPS 承载去激活过程。

[0163] 图 14 示出了根据实施例的消息流图 1400。

[0164] 信令流在与中继终端 708 相对应的中继终端 1401、与基站 701 相对应的基站 1402 和与 MME/S-GW 703 相对应的 MME 1403 之间进行。

[0165] 在 1404 中，中继终端 1401 向基站 1402 发送 RRC 连接重新配置请求消息 1405 以请求 ON 特定数据无线电承载的重新配置，即，释放曾被配置用于第三移动终端 711 的 DRB4（参见图 13）。

[0166] 与 RRC 连接重新配置请求消息 1405 一起，中继终端 1401 在信息元“DedicatedInfoNAS”内将 PDN 连接性释放请求消息 1406（其为 NAS 消息）发送至通信网络（具体地，至基站 1402），以发起对用于第三移动终端 711 的 PDN 连接的去激活。在 PDN 连接性释放请求消息 1406 中，包括第三移动终端 711 的标识（例如 IMSI 和 / 或 MSISDN）以及第三移动终端 711 的 EPS 承载标识和 IP 地址。

[0167] 在 1407 中，在与 PDN 连接性释放请求消息 1406 一起接收到 RRC 连接重新配置请求消息 1405 后，基站 1402 提取 PDN 连接性释放请求消息 1406 并将其传递至 MME 1403。

[0168] 在 1408 中，MME 1403 接收 PDN 连接性释放请求消息 1406。在处理之后，其创建去激活 EPS 承载上下文请求消息 1409 以请求对用于第三移动终端 711 的所指示的缺省 EPS 承载的去激活，并将去激活 EPS 承载上下文请求消息 1409 发送至中继终端 1401。在该上下文中，MME 1403 还创建并向 PDN-GW 714 发送对应的消息，以去激活相应 PDN 连接并释放被指派给第三移动终端 711 的 IP 地址。

[0169] 在 1410 中，基站 1402 经由在 DCCH 上映射的 SRB1 将去激活 EPS 承载上下文请求消息 1409 转发至中继终端 1401。与去激活 EPS 承载上下文请求消息 1409 一起，基站 1402 发送 RRC 连接重新配置消息 1411 以释放曾为第三移动终端 711 配置的 DRB4。

[0170] 在 1412 中，移动终端 1401 利用 RRC 连接重新配置完成消息 1413 进行响应，以确认 RRC 连接重新配置的成功完成。

[0171] 在 1414 中，在处理了接收到的去激活 EPS 承载上下文请求消息 1409 之后，中继终端 1401 发送上行链路信息传送消息 1415，以将去激活 EPS 承载上下文接受消息 1416（其为 NAS 消息）传输至通信网络。利用去激活 EPS 承载上下文接受消息 1416，中继终端 1401 对用于第三移动终端 711 的 EPS 承载上下文的去激活进行应答。

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[0172] 在 1417 中，基站 1402 从上行链路信息传送消息 1415 提取去激活 EPS 承载上下文接受消息 1416，并将其传递至 MME 1403。此时，在通信网络中对用于第三移动终端 711 的 EPS 承载和数据无线电承载进行去激活 / 释放。

[0173] 以下，针对以下情况给出示例：其中，将用于第二移动终端 710 和第三移动终端 711 的现有 EPS 承载上下文与中继移动终端 708 重新关联。这可以例如在以下情况时完成：当第二移动终端 710 和第三移动终端 711 是双 RAT 终端（例如配备有 LTE 和 WLAN 调制解调器二者）并已经使用其 LTE 调制解调器在 LTE 宏小区 702 中开始其通信服务，并且，例如，由于宏小区 702 中的无线电资源的短缺，通信网络已经决定将来自第二移动终端 710 和第三移动终端 711 的业务卸载至中继终端 708（即，使第二移动终端 710 和第三移动终端 711 经由中继终端 708 与无线电接入网进行通信）时。在图 15 中示意了用于第二移动终端 710 和第三移动终端 711 的对应 EPS 承载重新关联过程。

[0174] 图 15 示出了根据实施例的消息流图 1500。

[0175] 信令流在与中继终端 708 相对应的中继终端 1501、与基站 701 相对应的基站 1502 和与 MME/S-GW 703 相对应的 MME 1503 之间进行。

[0176] 在 1504 中，中继终端 1501 向基站 1502 发送 RRC 连接重新配置请求消息 1505 以请求 ON 特定数据无线电承载的重新配置。

[0177] 与 RRC 连接重新配置请求消息 1505 一起，中继终端 1501 在信息元“DedicatedInfoNAS”内将 PDN 连接性关联请求消息（其为 NAS 消息）1506 发送至通信网络（具体地，至基站 1502），以发起用于第二移动终端 710 和第三移动终端 711 的现有 PDN 连接与中继终端 1501 的重新关联。在 PDN 连接性关联请求消息 1506 中，包括第二移动终端 710 和第三移动终端 711 的标识（例如 IMSI 和 / 或 MSISDN）以及第二移动终端 710 和第三移动终端 711 的 EPS 承载标识和 IP 地址。

[0178] 在 1507 中，在与 PDN 连接性关联请求消息 1506 一起接收到 RRC 连接重新配置请求消息 1505 后，基站 1502 提取 PDN 连接性关联请求消息 1506 并将其传递至 MME 1503。

[0179] 在 1508 中，MME 1503 执行用于第二移动终端 710 和第三移动终端 711 的现有 PDN 连接与中继终端 1501 的重新关联，并创建激活缺省 EPS 承载上下文请求消息 1509，并经由基站 1502 将激活缺省 EPS 承载上下文请求消息 1509 发送至中继终端 1501，以请求对用于第二移动终端 710 和第三移动终端 711 的缺省 EPS 承载上下文的激活。

[0180] 在 1510 中，基站 1502 经由在 DCCH 上映射的 SRB1 将激活缺省 EPS 承载上下文请求消息 1509 转发至中继终端 1501。与激活缺省 EPS 承载上下文请求消息 1509 一起，基站 1502 发送 RRC 连接重新配置消息 1511，其包括根据第二移动终端 710 和第三移动终端 711 的所指派的 QoS 属性的数据无线电承载的专用无线电资源配置。基站 1502 配置两个数据无线电承载，这是由于第二移动终端 710 和第三移动终端 711 正在使用 QCI 资源类型“非 GBR”的两个不同服务。

[0181] 在 1512 中，移动终端 1501 利用 RRC 连接重新配置完成消息 1513 进行响应，以确认 RRC 连接重新配置的成功完成。

[0182] 在 1514 中，在处理了接收到的激活缺省 EPS 承载上下文请求消息 1509 之后，中继终端 1501 发送上行链路信息传送消息 1515，以将激活缺省 EPS 承载上下文接受消息 1516（其为 NAS 消息）传输至通信网络。利用激活缺省 EPS 承载上下文接受消息 1516，中继终端

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1501 对用于第二移动终端 710 和第三移动终端 711 的缺省 EPS 承载上下文的激活进行应答。

[0183] 在 1517 中，基站 1502 从上行链路信息传送消息 1515 提取激活缺省 EPS 承载上下文接受消息 1516，并将其传递至 MME 1503。此时，将用于第二移动终端 710 和第三移动终端 711 的缺省 EPS 承载和数据无线电承载与中继终端 1501 重新关联，使得这两个移动终端 710、711 可以开始通过中继终端 1501 将其数据传输至通信网络。

[0184] 中继终端 1501 中所得到的用于上行链路的无线电协议架构与由图 12 所示的过程引起的无线电协议架构(即，图 13 所示的无线电协议架构)相同。具体地，如上所述，在 U 平面 1306 中，配置了总体四个数据无线电承载：用于中继终端 1501 自身的 DRB1 和 DRB2、用于第二移动终端 710 的 DRB3 和用于第三移动终端 711 的 DRB4。

[0185] 尽管参照特定实施例具体示出和描述了本发明，但是本领域技术人员应当理解，在不脱离如所附权利要求限定的本发明的精神和范围的前提下，可以对本发明进行形式和细节上的各种改变。因此，本发明的范围由所附权利要求指示，并且，因此意在包含落在权利要求的等同物的含义和范围内的所有改变。

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Case No. IPR2025-00036; U.S. Patent No. 11,627,631
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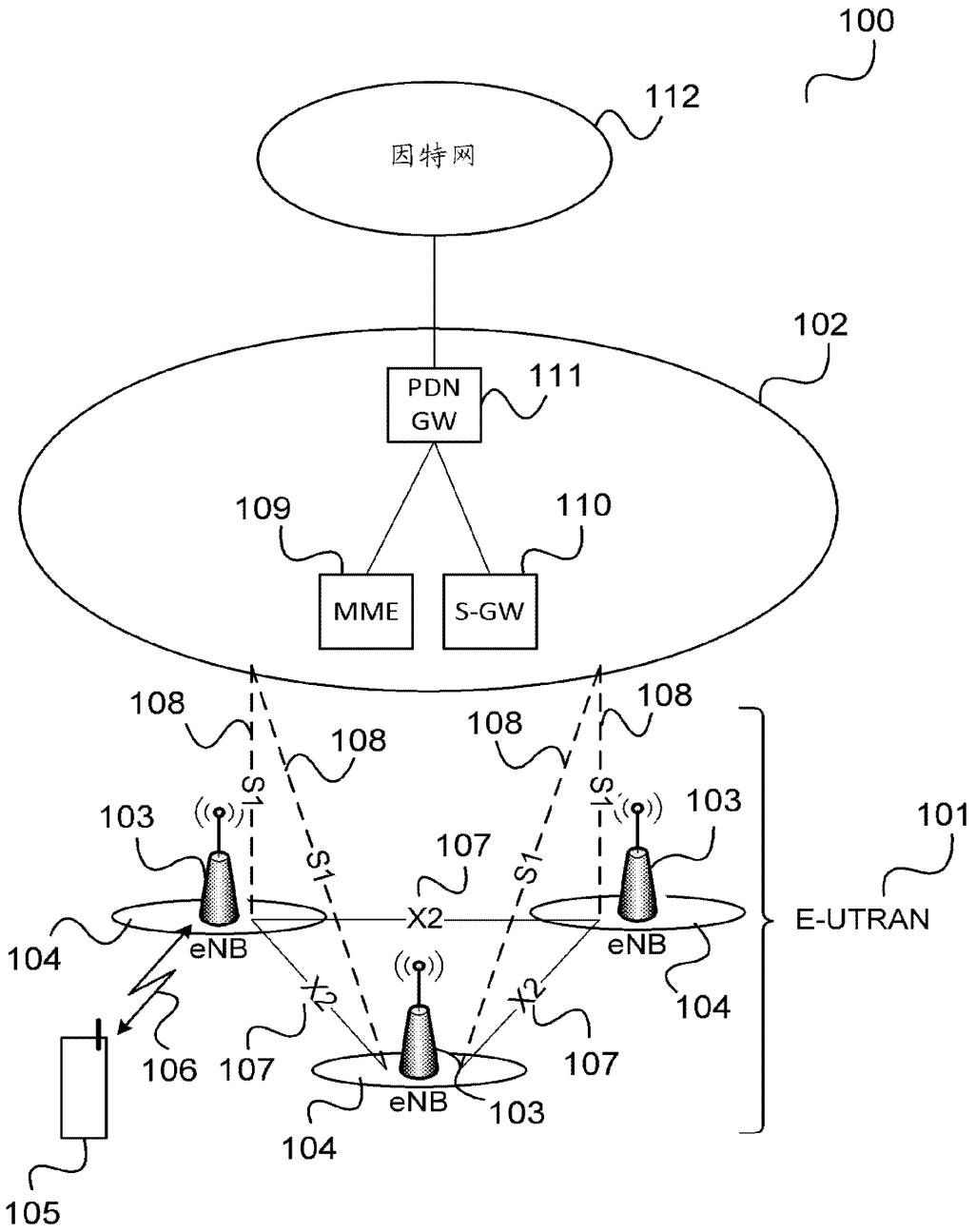


图 1

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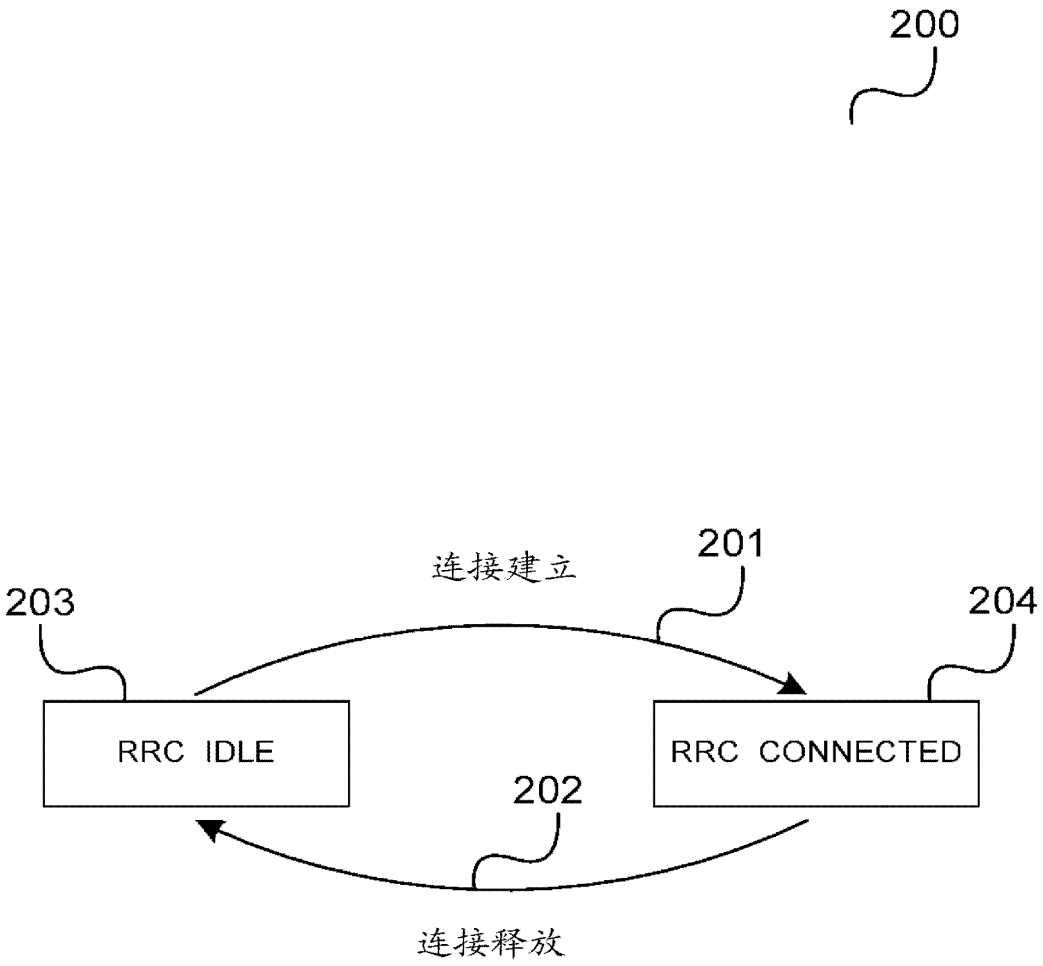


图 2

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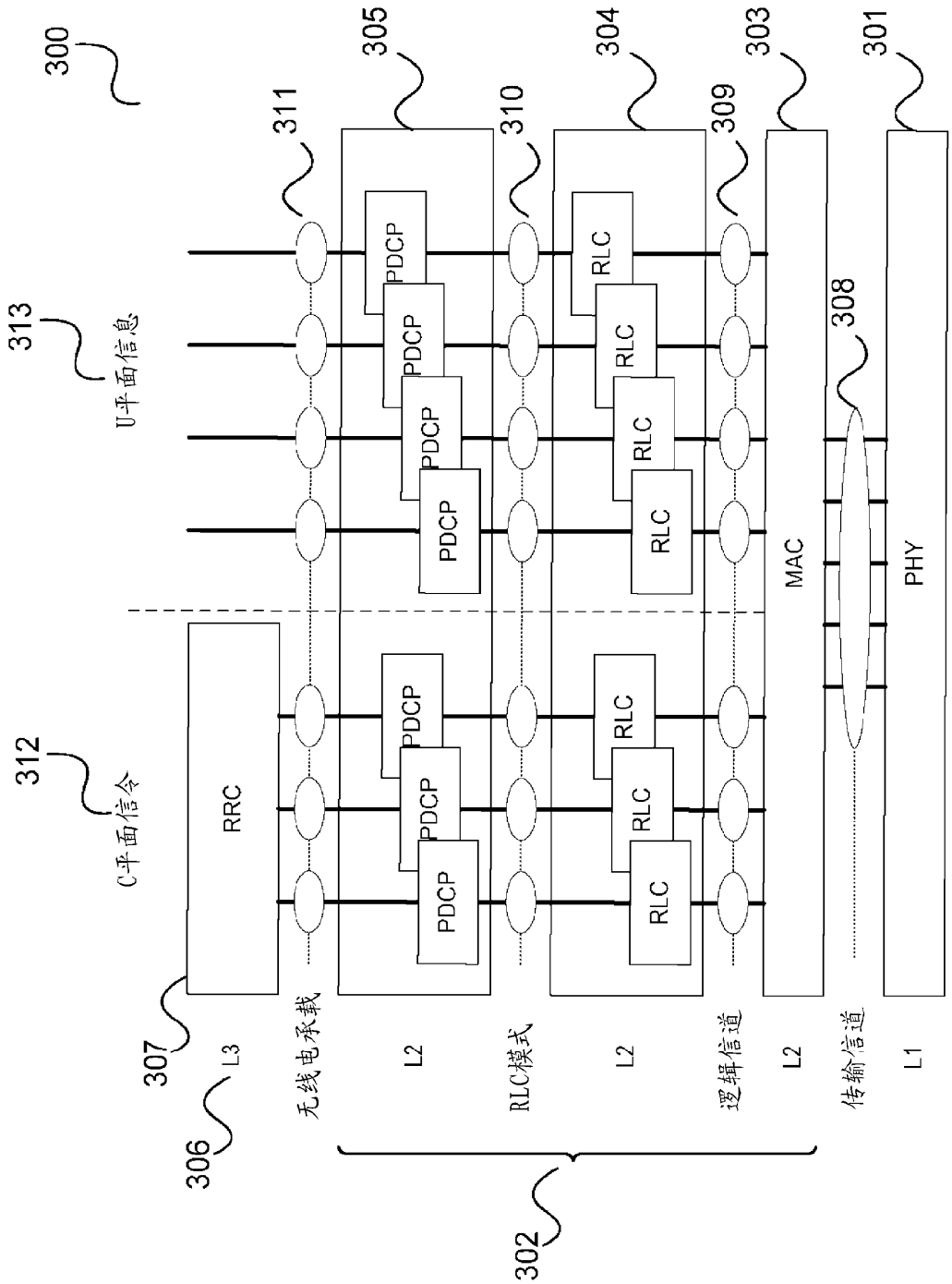


图 3

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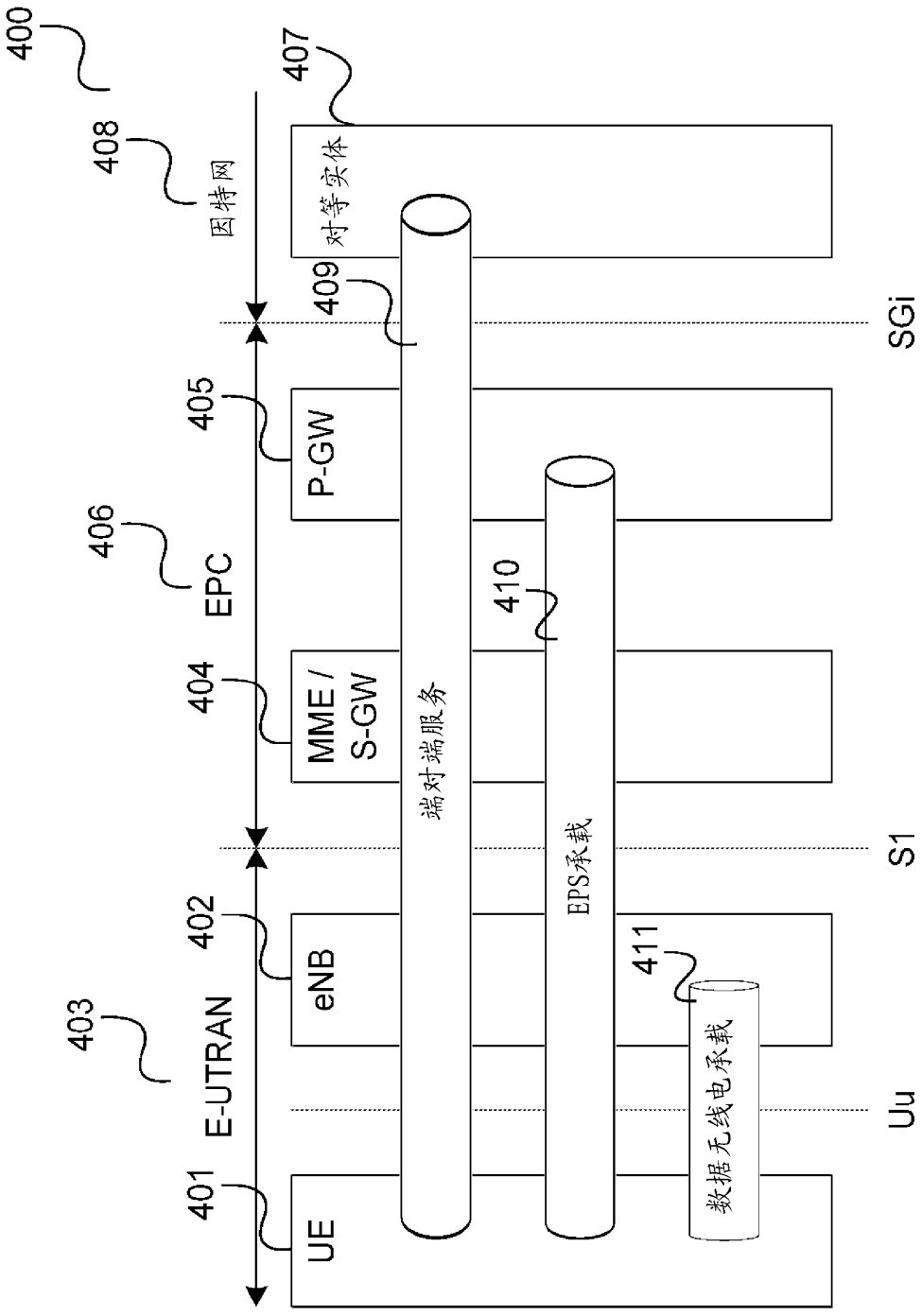


图 4

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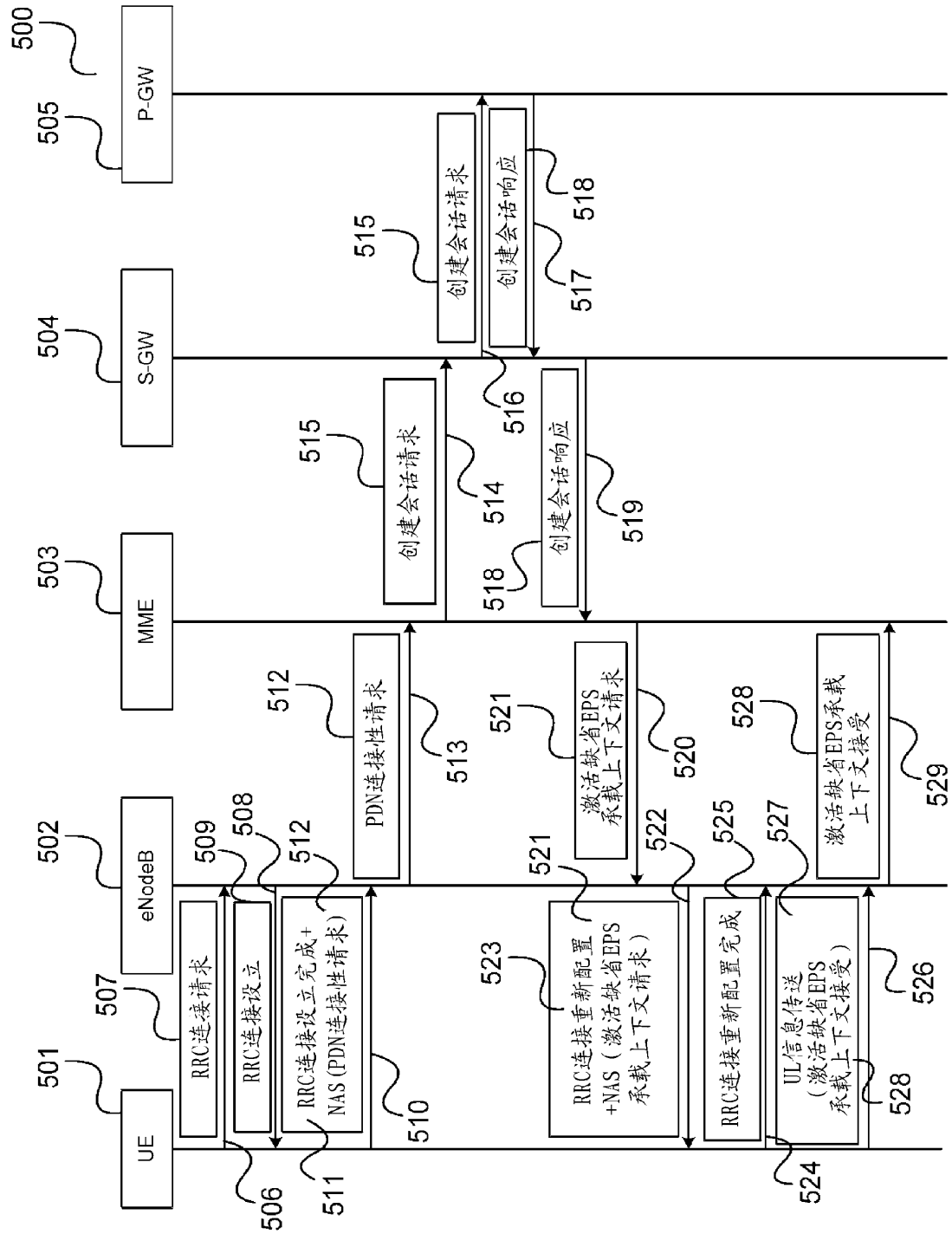


图 5

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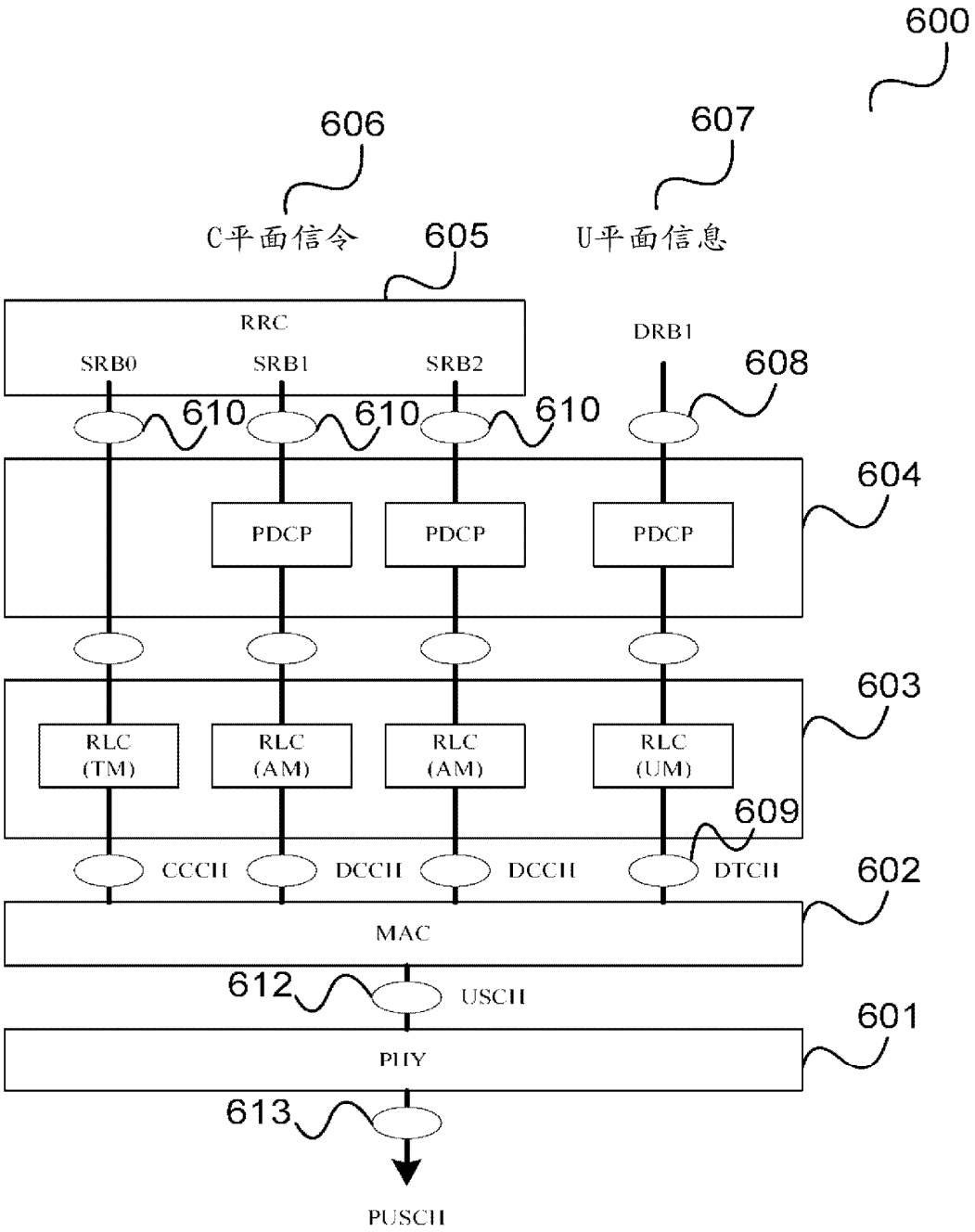


图 6

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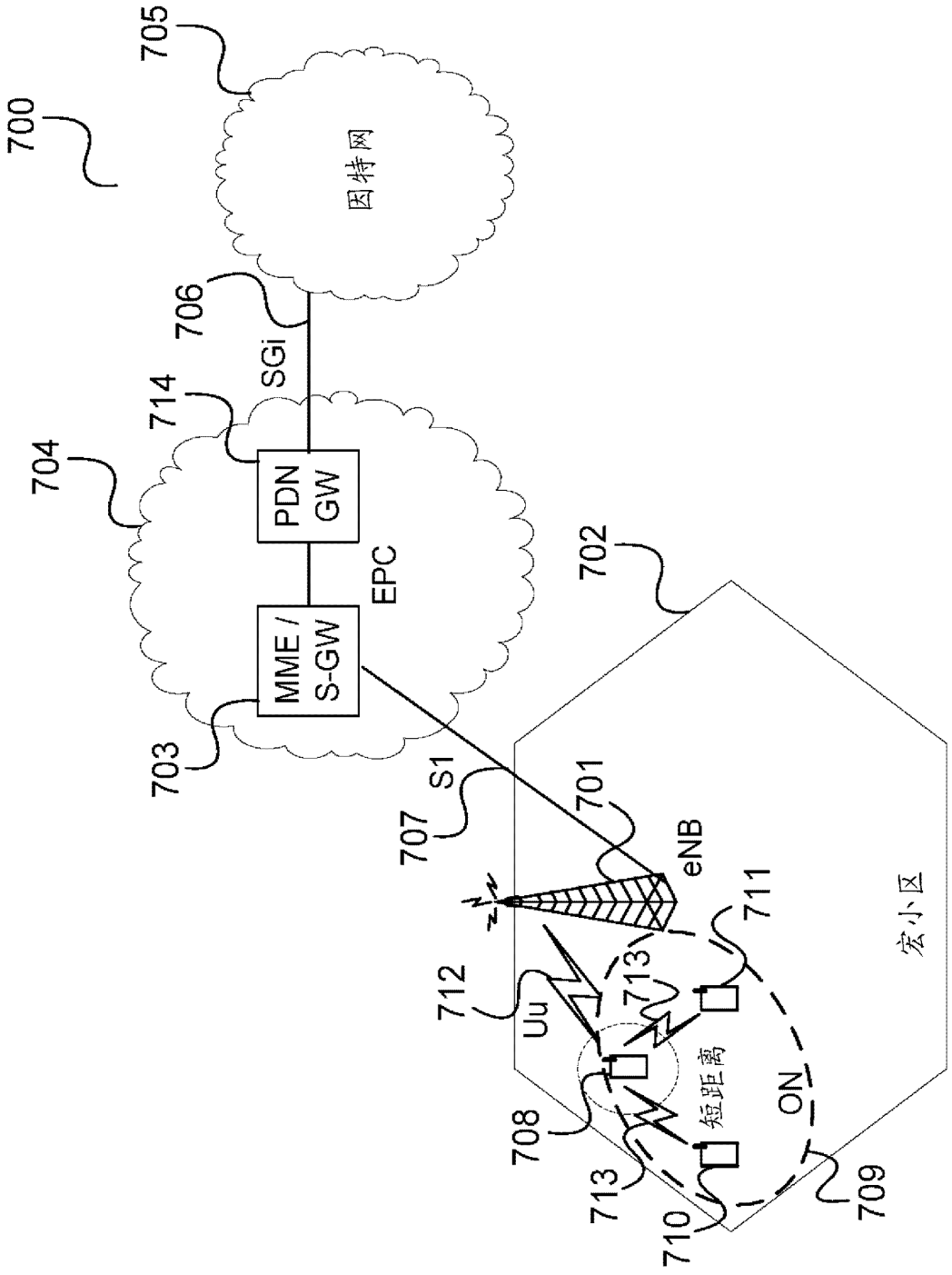


图 7

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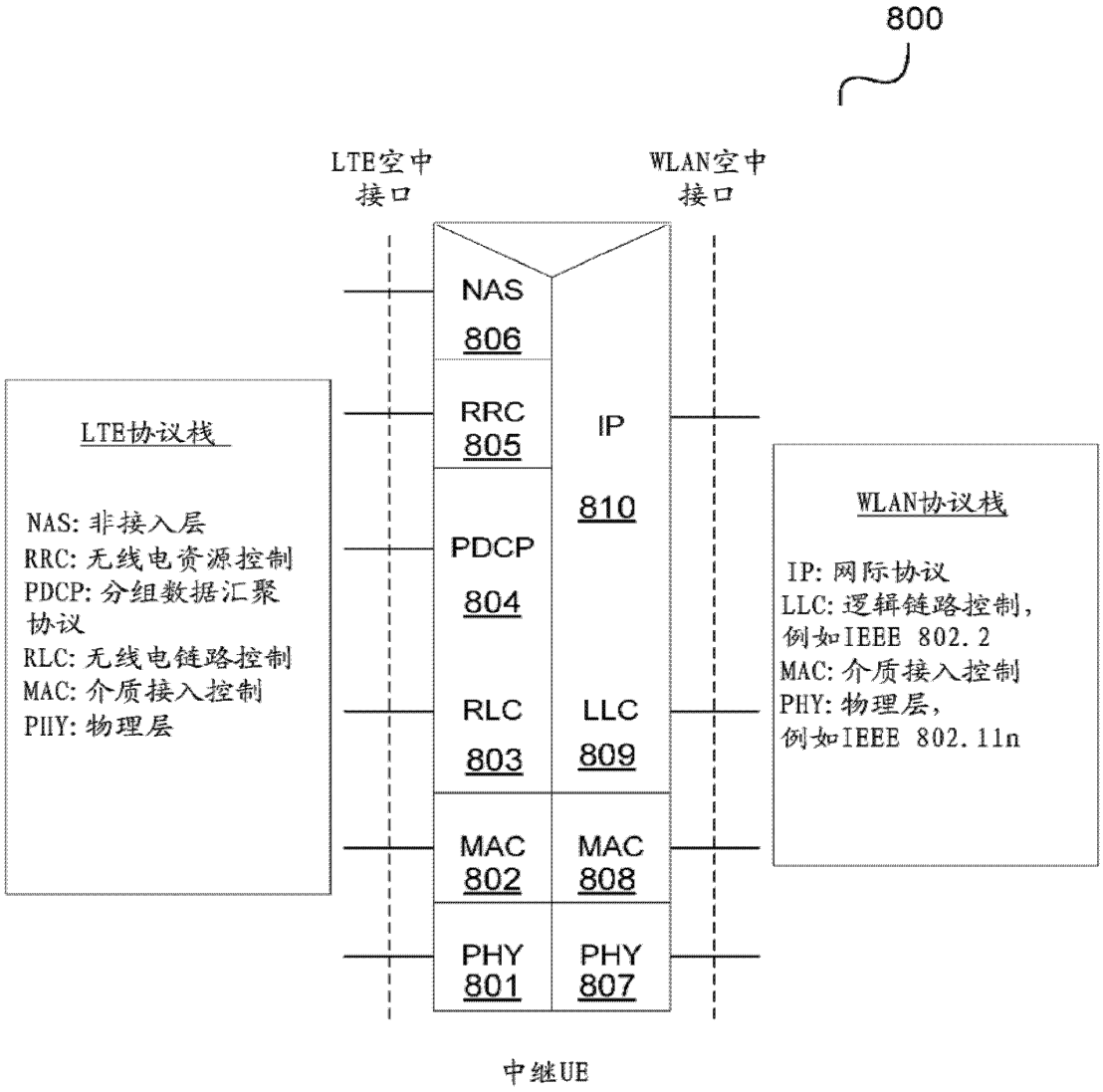


图 8

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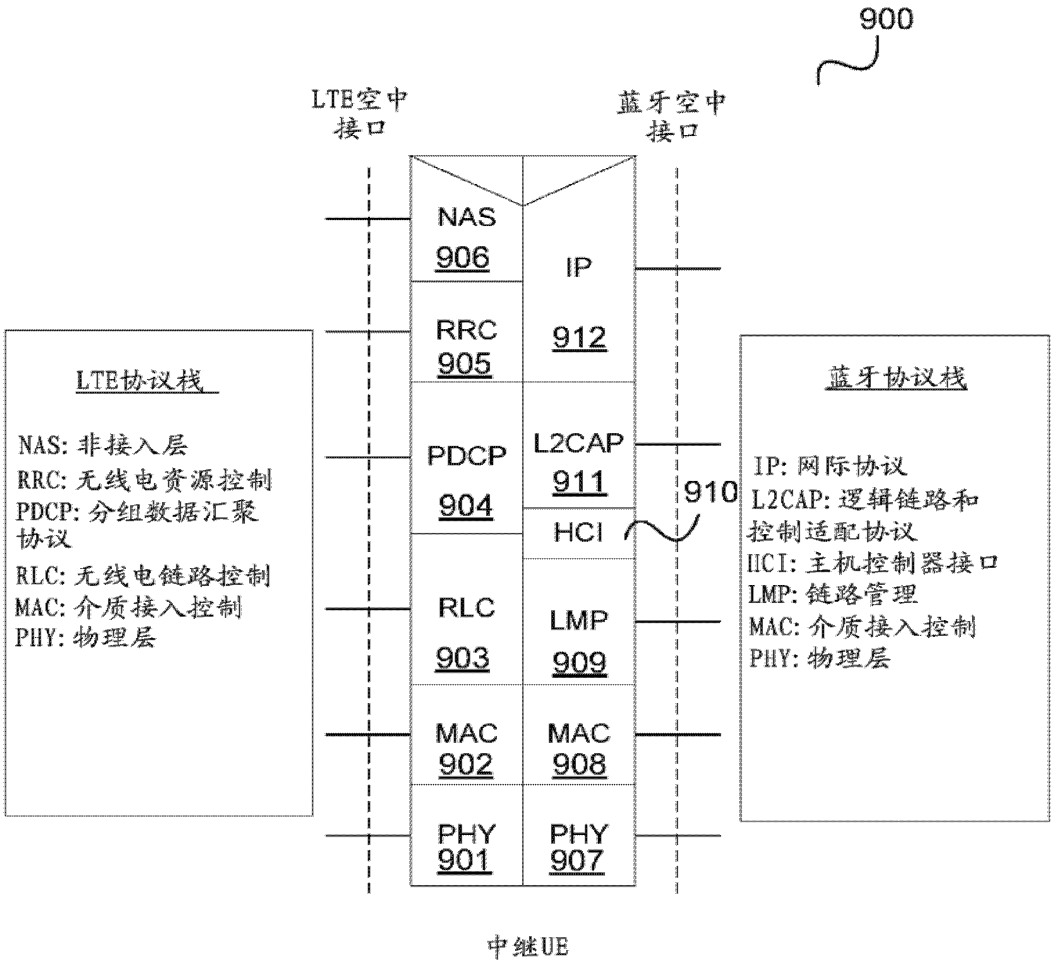


图 9

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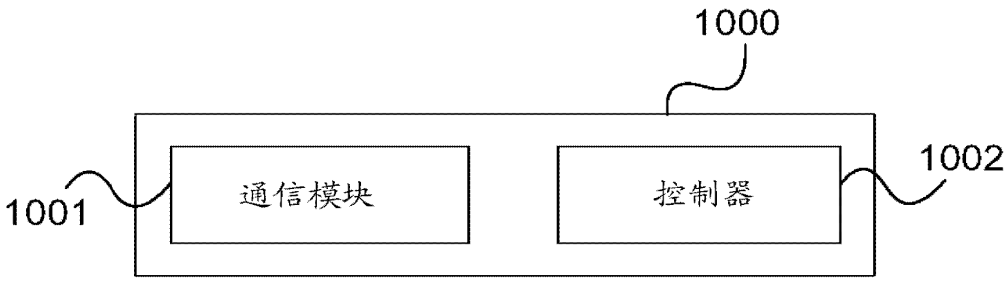


图 10

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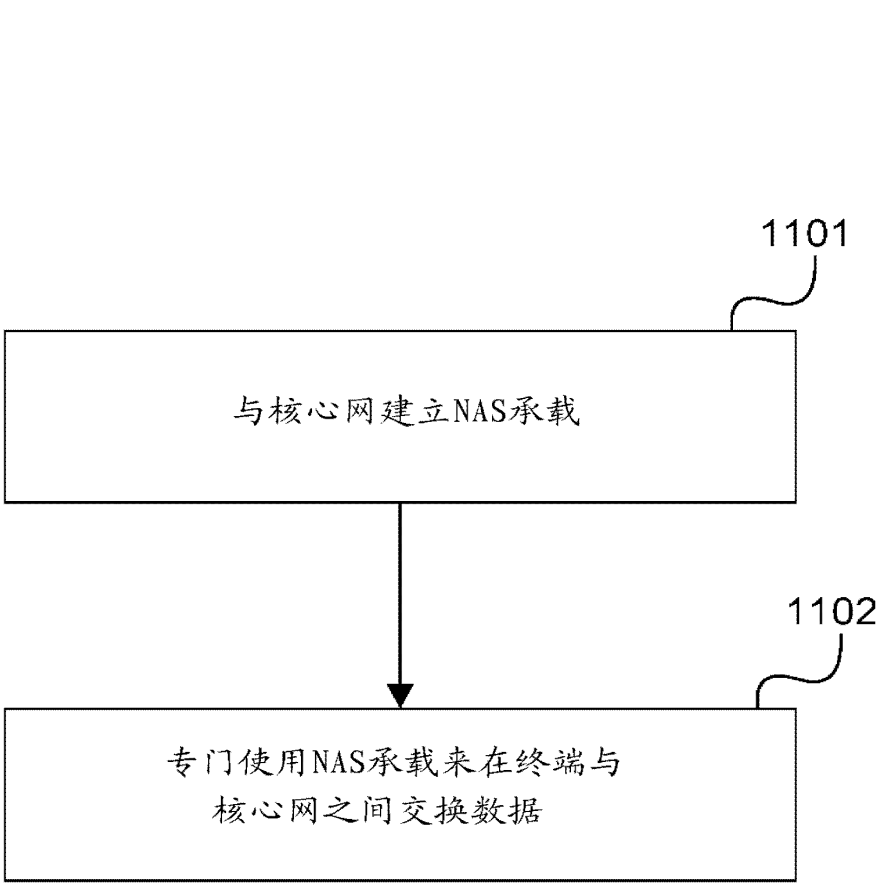


图 11

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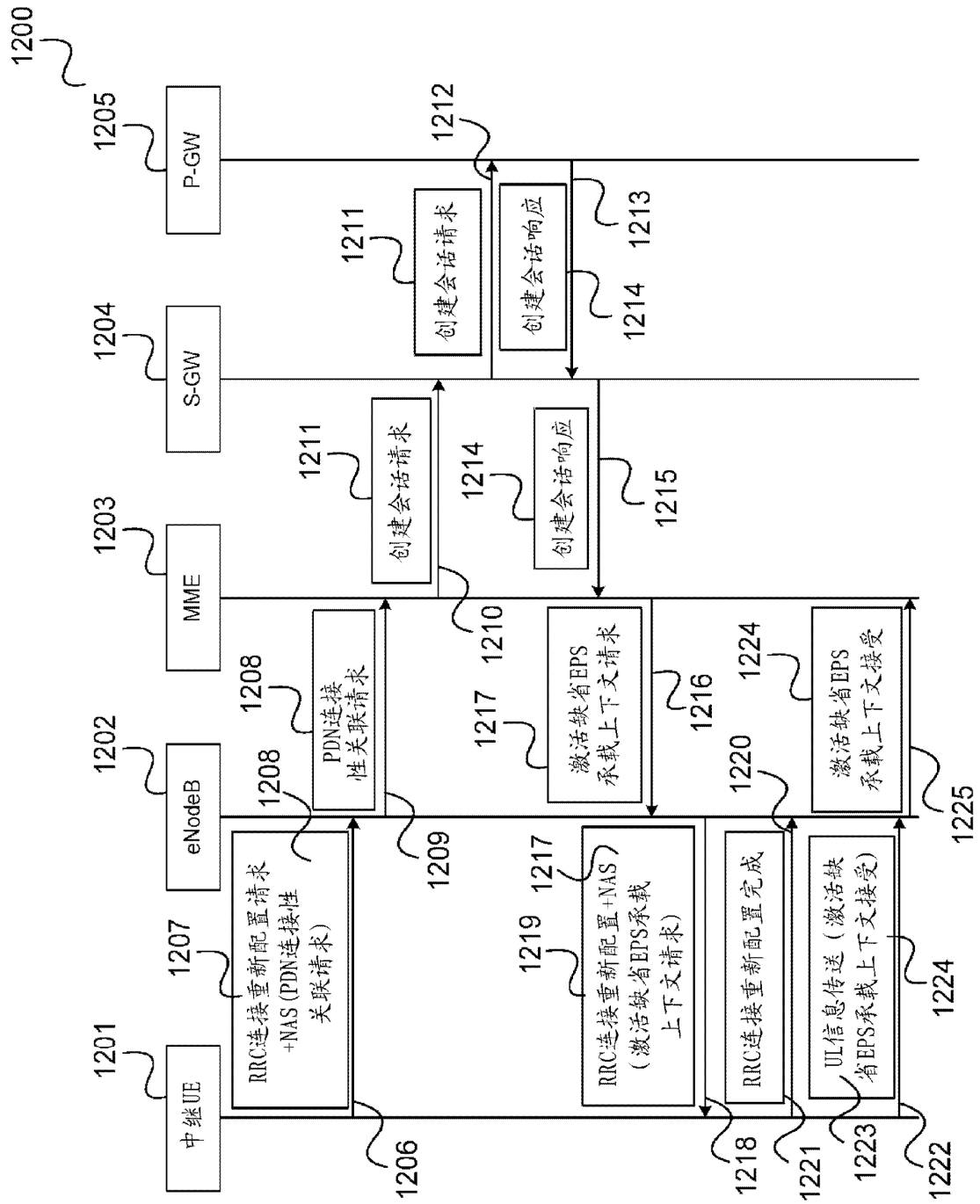


图 12

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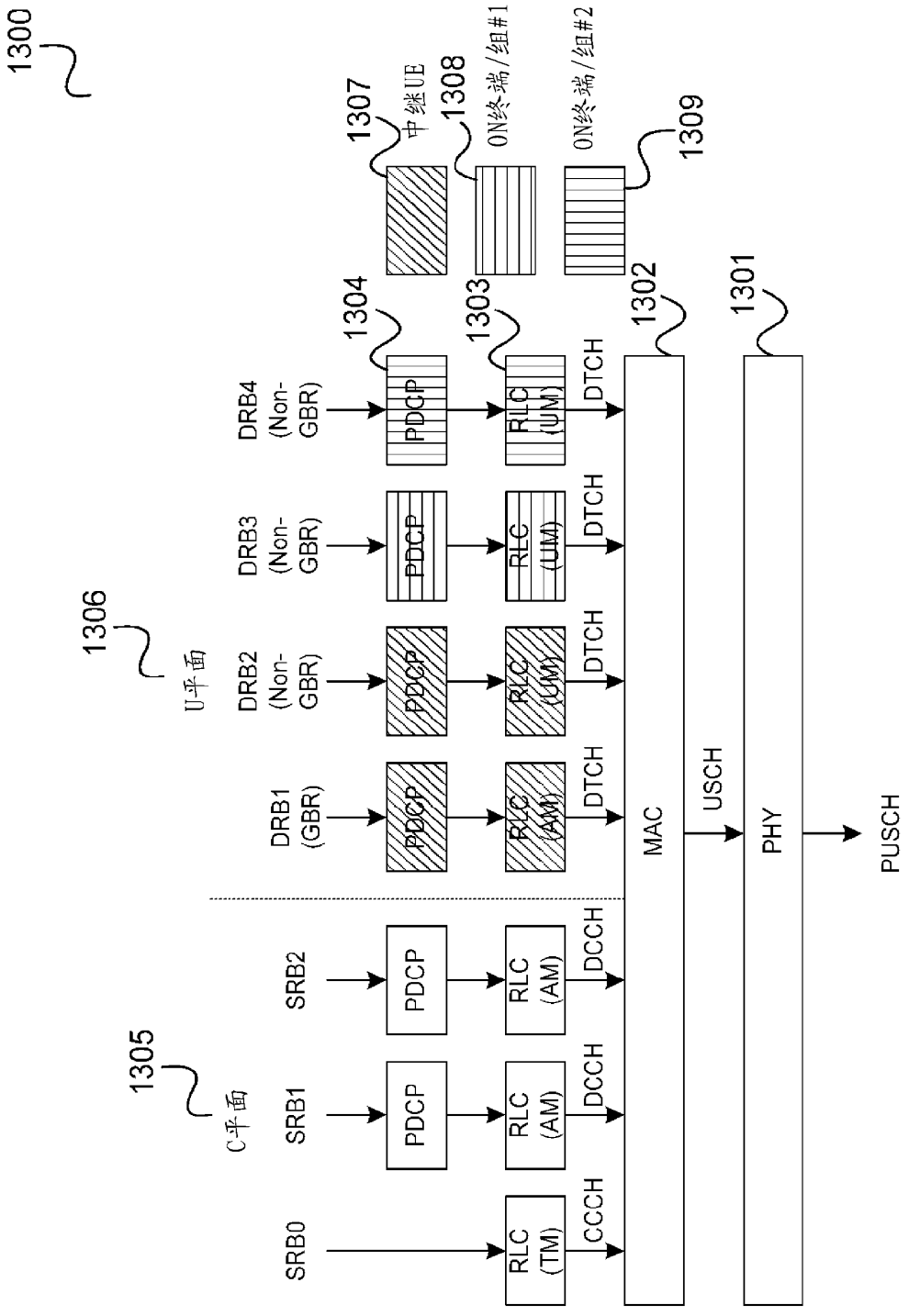


图 13

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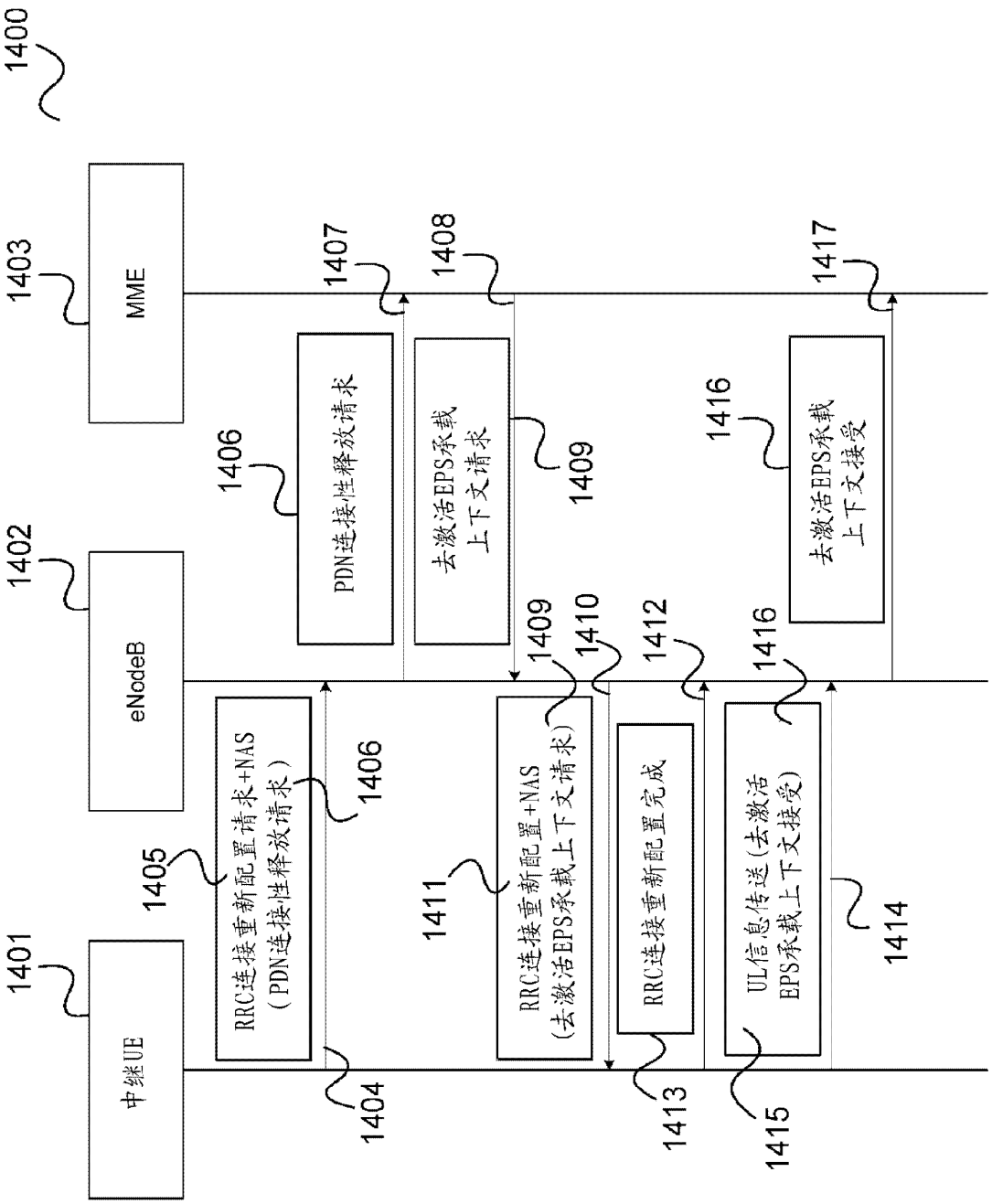


图 14

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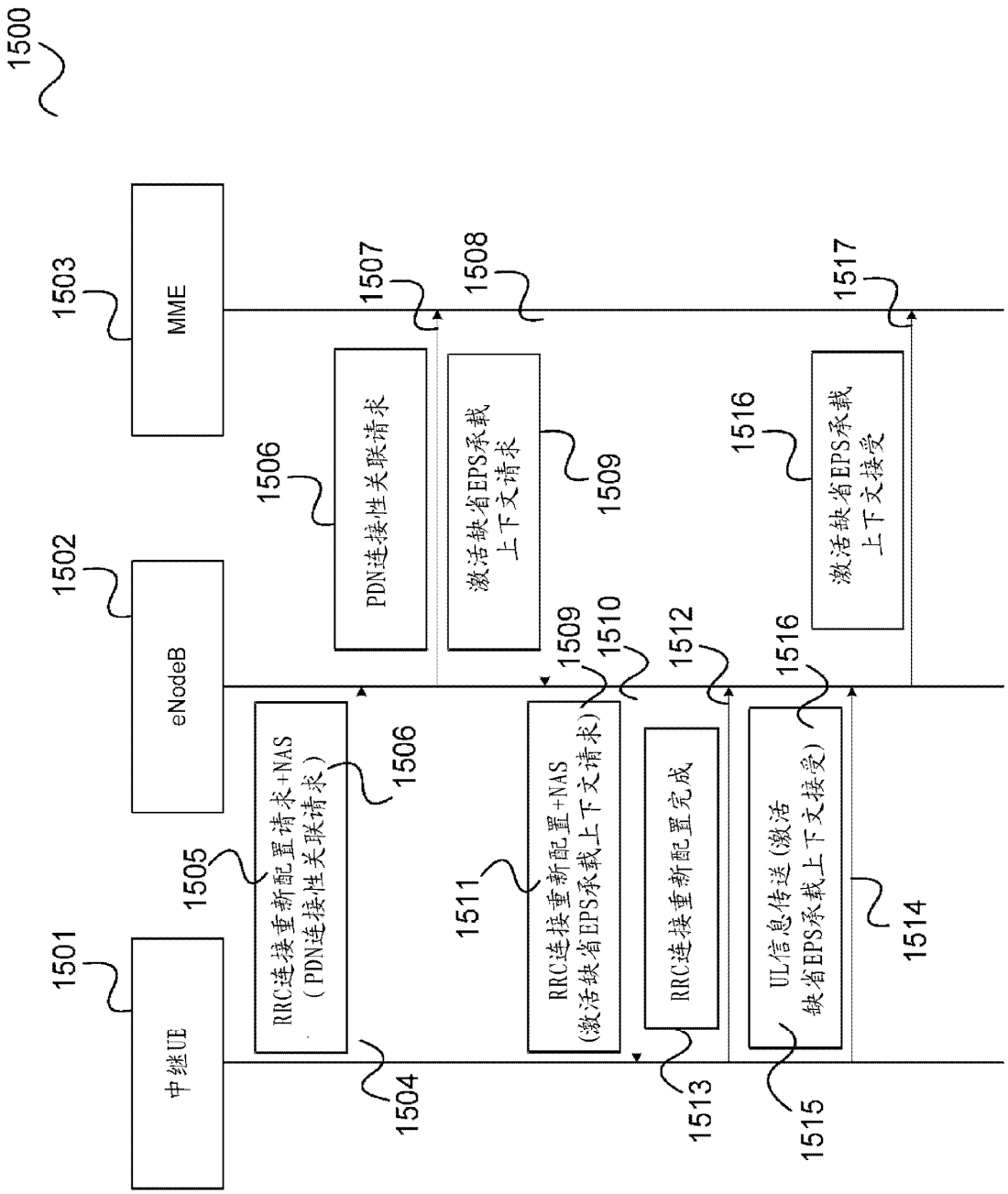


图 15

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Espacenet

WO2016162480A1 METHODS AND NETWORK NODES FOR NETWORK PARTITION PRESERVATION AT INTER-ACCESS HANDOVERS

Applicants: ERICSSON TELEFON AB L M (PUBL) [SE]

Inventors: ROMMER STEFAN [SE],BASILIER HENRIK [SE],CAGENIUS TORBJÖRN [SE],MILDH GUNNAR [SE],NILSSON GUNNAR [SE],NORELL LENNART [SE],RUNE GÖRAN [SE],SANDER ANN-CHRISTINE [SE]

Classifications:
IPC ***H04W48/18;*** *H04W36/14;*

CPC **H04W36/0022 (US); H04W36/14 (CN); H04W36/32 (US); H04W48/18 (EP,CN); H04W60/04 (US); H04W8/04 (US);** H04W36/14 (EP);

Priorities: US201562144759P 2015-04-08

Application: EP2016057755W·2016-04-08

Publication: WO2016162480A1·2016-10-13

Published as: **CN107409339A; CN107409339B; EP3281454A1; EP3281454B1; US10117137B2; US2018139660A1;** WO2016162480A1

METHODS AND NETWORK NODES FOR NETWORK PARTITION PRESERVATION AT INTER-ACCESS HANDOVERS

Abstract

A method is performed in a network control entity that manages network connections for a network. The method includes receiving a network attachment request from a network access entity or a user equipment for connecting the user equipment to the network. The method further includes obtaining a network partition ID associated with the UE, the network partition ID identifying a network partition that includes a predetermined group of network entities included in the network. The method also includes transmitting, to a network storage entity, a notification containing the network partition ID.

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(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
13 October 2016 (13.10.2016)

WIPO | PCT

(10) International Publication Number
WO 2016/162480 A1

(51) International Patent Classification:
H04W 48/18 (2009.01) *H04W 36/14* (2009.01)

(21) International Application Number:
PCT/EP2016/057755

(22) International Filing Date:
8 April 2016 (08.04.2016)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
62/144759 8 April 2015 (08.04.2015) US

(71) Applicant: **TELEFONAKTIEBOLAGET LM ERICSSON (PUBL)** [SE/SE]; S-164 83 Stockholm (SE).

(72) Inventors: **ROMMER, Stefan**; Skogsrydsgatan 7, S-42674 Västra Frölunda (SE). **BASILIER, Henrik**; Blockvägen 6, S-18734 Täby (SE). **CAGENIUS, Torbjörn**; Stackvägen 16B, S-19134 Sollentuna (SE). **MILDH, Gunnar**; Koltrastvägen 28, S-19255 Sollentuna (SE). **NILSSON, Gunnar**; Mistelvägen 6, S-18160 Lidingö (SE). **NORELL, Lennart**; Pukslagargatan 5 A, S-12530 Älvsjö (SE). **RUNE, Göran**; Sandgårdsgatan 5A, S-582 52 Linköping (SE). **SANDER, Ann-Christine**; Verkmästaregatan 1, S-41757 Göteborg (SE).

(74) Agent: **ERICSSON**; Patent Development Torshamnsgatan 21-23, 164 80 Stockholm (SE).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

(54) Title: METHODS AND NETWORK NODES FOR NETWORK PARTITION PRESERVATION AT INTER-ACCESS HANDOVERS

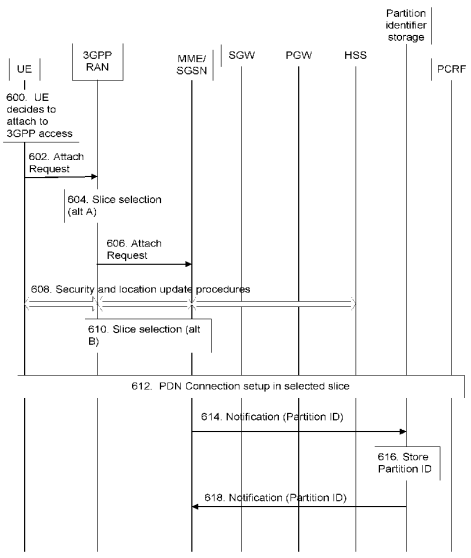


FIG. 6

(57) Abstract: A method is performed in a network control entity that manages network connections for a network. The method includes receiving a network attachment request from a network access entity or a user equipment for connecting the user equipment to the network. The method further includes obtaining a network partition ID associated with the UE, the network partition ID identifying a network partition that includes a predetermined group of network entities included in the network. The method also includes transmitting, to a network storage entity, a notification containing the network partition ID.

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METHODS AND NETWORK NODES FOR NETWORK PARTITION PRESERVATION AT INTER-ACCESS HANDOVERS

TECHNICAL FIELD

[001] This disclosure relates generally to network partitions at inter-access handovers and, more particularly, to methods and network nodes for network partition preservation at inter-access handovers.

BACKGROUND

[002] Existing networks (e.g., 2G, 3G, 4G, WLAN etc., and evolution thereof) and future Radio Access and Core Networks (5G, 6G, etc.) require solutions for supporting optimized network functionality for addressing new use cases for cellular technologies.

[003] Evolved Packet System (EPS) is the Evolved 3GPP Packet Switched Domain and consists of Evolved Packet Core (EPC) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN). EPS also supports packet switched access over GSM/EDGE Radio Access (GERA), Universal Terrestrial Radio Access (UTRA) and Wireless Local Area Network (WLAN).

[004] Fig.1 illustrates an example EPC architecture for 3GPP accesses (GERAN, UTRAN and E-UTRAN), which includes, for example, a PGW (PDN Gateway), SGW (Serving Gateway), PCRF (Policy and Charging Rules Function), MME (Mobility Management Entity), HSS (Home Subscriber Service) and user equipment (UE). The LTE radio access, E-UTRAN, consists of one more eNBs. Fig. 1 illustrates the architecture for 3GPP accesses. In these types of accesses, the radio interface is specified by 3GPP (e.g., E-UTRA).

[005] Fig. 2 illustrates an example E-UTRAN architecture. The E-UTRAN consists of eNBs, providing the E-UTRA user plane (PDCP/RLC/MAC/PHY) and control plane (RRC) protocol terminations towards the UE. The eNBs are interconnected with each other by means of the X2 interface. The eNBs are also connected by means of the S1 interface to the EPC (Evolved Packet Core), more specifically to the MME (Mobility Management Entity) by means of the S1-MME interface and to the Serving Gateway (S-GW) by means of the S1-U interface.

[006] Fig. 3 illustrates an example EPC architecture that also takes into account non-3GPP accesses. In non-3GPP accesses, the radio interface is not specified by 3GPP (e.g., WLAN). A non-3GPP access may be treated as trusted or untrusted. Whether a non-3GPP access should be treated as trusted or untrusted depends on, for example, security considerations and operator policies. In this regard, a trusted access may be managed by an operator (e.g., an operator hotspot) whereas, an untrusted access is not managed by the operator (e.g., a Wi-Fi access point at home). In a non-3GPP access, a security gateway (ePDG) is used between the non-3GPP domain and the operator's network. The UE sets up a secure tunnel to the ePDG, where there is a S2b interface between ePDG and PGW. A trusted 3GPP access hosts a gateway in the non-3GPP domain. For WLAN, the gateway is denoted Trusted WLAN Gateway (TWAG), where there is a S2a interface between TWAG and PGW.

[007] Future networks are expected to support new use cases going beyond the basic support for voice services and mobile broadband (MBB) currently supported by existing cellular networks (e.g., 2G/3G/4G). An example new use case includes evolution of MBB including evolved communication services, cloud services, and extended mobility

and coverage. Another example new use case includes mission critical machine type communication including intelligent traffic systems, smart grid, and industrial applications. Another example new use case includes massive machine type communication including sensors/actuators and capillary networks. Another example new use case includes media including efficient on-demand media delivery, media awareness, and efficient support for broadcast services.

[008] These use cases are expected to have different performance requirements (e.g., bit-rates, latencies, mobility, availability, etc.) as well as other network requirements affecting the network architecture and protocols. Supporting these new use cases may require that new players and business relations are needed compared to existing cellular technologies. For example, it is expected that future networks should address the needs of enterprise services, governments services (e.g., national safety, verticals industries (e.g., industry automation, transportation), and residential users. These different users and services are also expected to place new requirements on the network.

[009] Accordingly, it is expected that new services with a wide range of heterogeneous requirements need to be supported. There is a need to be able to support these new services in a cost efficient way using common network infrastructure (e.g., radio, transport, networking, processing, and storage) and functional components (e.g., mobility manager) applied to specific business segments (e.g., verticals with specific requirements), while still making it possible to optimize the network when it comes to deployment, functionality needed, scalability, etc. for these new services. Additionally, it is desired by one of ordinary skill in the art to provide isolation between the different

business segments of the common network infrastructure to prevent one user associated with one or more services from causing problems to other users and services.

[0010] In some 3GPP solutions, an operator may deploy one (or more) dedicated core networks (DÉCOR) (also referred to as “network partitions” or “slices”) within a PLMN with each core network dedicated for a specific type(s) of subscriber or device. The DECOR solution enables an SGSN or MME initially handling a UE to redirect a UE to a specific dedicated core network (e.g., a different SGSN or MME) based on subscription information and operator configuration, without requiring the UEs to be modified. A limitation of this 3GPP solution is that it only works when the UE connects via a 3GPP access, and no support is available in case the UE connects via WLAN integrated to EPC using S2a/S2b interfaces.

[0011] A particular problem not addressed by the existing solutions for network partitioning or slicing is how to ensure that the selected network partition is preserved as the UE moves between 3GPP access (e.g., LTE) and WLAN access. One particular problem in this case is that the network partition selection mechanism may differ between access types. For example, when selecting a dedicated core network (e.g., network partition) based on DECOR, the MME/SGSN may take into account information that is only available in 3GPP access and that is not available in WLAN access (e.g., UE CATEGORY and Low Access Priority Indicator). When network partition selection is instead based on extra information in the signaling from the UE to the network (e.g., in case the UE provides some kind of network partition type or identity), there may still be multiple instances of a single network partition type and a partition selection function in

the network may direct the UE to one particular partition instance. This may result in the network partition (instance) selected in 3GPP access differing from the network partition (instance) selected in another access such as WLAN.

[0012] Thus, there is no guarantee that the network partition selection in 3GPP access and WLAN access always gives the same result. This is particularly a problem when handover between 3GPP and WLAN access is supported were the UE would need to be served by the same network partition (instance) in both accesses.

SUMMARY

[0013] According to some embodiments, a method is performed in a network control entity that manages network connections for a network. The method includes receiving a network attachment request from a network access entity or a user equipment for connecting the user equipment to the network. The method further includes obtaining a network partition ID associated with the UE, the network partition ID identifying a network partition that includes a predetermined group of network entities included in the network. The method also includes transmitting, to a network storage entity, a notification containing the network partition ID.

[0014] In some embodiments, a method is performed in a network access entity operating in a first network access technology. The method includes receiving, from a user equipment (UE), a request to connect to the network access entity, the request being part of a handover procedure from a second access technology to the first access technology. The method includes transmitting, to a network storage entity in response to receiving the request to connect to the network access entity, a request for a network

partition ID that identifies a network partition including a predetermined group of network entities, the request including at least an identity of the UE. The method includes receiving, from the network storage entity, a response message including the network partition ID. The method further includes selecting the network partition in accordance with the network partition ID.

[0015] According to some embodiments, a network control entity that manages network connections for a network includes one or more processors and a non-transitory computer readable medium coupled to the one or more processors, where the non-transitory computer readable medium contains instructions executable by the one or more processors. The network control entity is operative to receive a network attachment request from a network access entity or a user equipment for connecting the user equipment to the network. The network control entity is further operative to obtain a network partition ID associated with the UE, the network partition ID identifying a network partition that includes a predetermined group of network entities included in the network. The network control entity is also operative to transmit, to a network storage entity, a notification containing the network partition ID.

[0016] In some embodiments, a network access entity operating in a first network access technology includes one or more processors and a non-transitory computer readable medium coupled to the processor, where the non-transitory computer readable medium contains instructions executable by the one or more processors. The network access entity is operative to receive, from a user equipment (UE), a request to connect to the network access entity, the request being part of a handover procedure from a second access technology to the first access technology. The network access entity is

further operative to transmit, to a network storage entity in response to receiving the request to connect to the network access entity, a request for a network partition ID that identifies a network partition including predetermined group of network entities, the request including at least an identity of the UE. The network access entity is operative to receive, from the network storage entity, a response message including the network partition ID. The network access entity is operative to select the network partition in accordance with the network partition ID.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] The accompanying drawings, which are incorporated herein and form part of the specification, illustrate various embodiments of the present disclosure and, together with the description, further serve to explain the principles of the disclosure and to enable a person skilled in the pertinent art to make and use the embodiments disclosed herein. In the drawings, like reference numbers indicate identical or functionally similar elements.

[0018] Fig. 1 is an illustration of an EPC architecture for 3GPP accesses.

[0019] Fig. 2 is an illustration of an E-UTRAN architecture.

[0020] Fig. 3 is an illustration of an EPS system including 3GPP and non-3GPP accesses.

[0021] Fig. 4 is an illustration of an exemplary wireless communication system in accordance with exemplary embodiments.

[0022] Fig. 5 is an illustration of network partitioning in accordance with exemplary embodiments.

[0023] Figs. 6-11 are exemplary signal flow diagrams.

[0024] Fig. 12 is an exemplary flow chart illustrating a process according to some embodiments.

[0025] Fig. 13 is an exemplary flow chart illustrating a process according to some embodiments.

[0026] Fig. 14 is an exemplary diagram of a network node;

[0027] Fig. 15 is an exemplary diagram of an access node

[0028] Fig. 16 is an exemplary diagram of a wireless communication device.

DETAILED DESCRIPTION

[0029] According to some embodiments, an identifier of the network partition (i.e., slice) that has been selected in a first access network (e.g., WLAN) is stored in a network entity when the UE connects via that first access network. Later, when the UE moves from that first access network (e.g. WLAN) to a second access network with another access technology (e.g., 3GPP access), the second access network retrieves the identifier and uses that identifier as the network partition identifier instead of doing a completely new network partition selection. In some embodiments, the network entity storing the network partition identifier may be the HSS, but it could also be a different network entity. In some embodiments, the network partition identifier is applicable to mobility between 3GPP access and non-3GPP access in general. For example, the network partition identifier is applicable between a 3GPP access and a WLAN access, where the WLAN access is integrated to EPC using the S2a or S2b reference points.

[0030] Referring to Figure 4, a wireless communication deployment 400 in accordance with exemplary embodiments includes an access node 404 serving a wireless

communication device (WCD) 406. Examples of WCDs include, but are not limited to, mobile telephones, user equipments (UEs), personal digital assistants, electronic readers, portable electronic tablets, wireless sensors, machine communication devices, personal computers, and laptop computers. Furthermore, the device 406 may be a legacy UE. Access node 404 may be, for example, a base station, an eNodeB, a WLAN Access Point, relay node, or gateway type device, and is capable of communicating with device 406, along with any additional elements suitable to support wireless communication between wireless communication devices or between a wireless communication device and another communication device, such as landline telephone. The access node 404 may be in communication with, for instance via a network 402, one or more control nodes 408, such as a Radio Network Controller (RNC), a Mobility Management Entity (MME), a Mobile Switching Center (MSC), a WLAN Access Gateway, evolved Packet Data Gateway (ePDG) or Base Station Subsystem (BSS). Although node 408 is explicitly identified as a control node, each of nodes 404, 406, and 408 may be understood as a "control" node to the extent that it includes a control unit or otherwise implements control functions.

[0031] In some embodiments, when the wireless communication deployment 400 is WLAN, the access node 404 is a WLAN Access Point (AP) and the control node 408 is a ePDG. In some embodiments, the WLAN AP may not directly communicate with the control node 408 (e.g., the AP may not be aware of the control node). In this scenario, the UE communication with the control node 408 over the WLAN AP.

[0032] Fig. 5 illustrates an embodiment of network partitioning, where the EPC is dived into several different parts also called slices, where different network partitions supports

different services and handles different users. The actual functional components of the different network partitions may be supported on the same infrastructure (e.g. when using Network Functional Virtualization NFV) or the components can use different hardware.

[0033] Fig. 5 illustrates an example EPC network with an MBB partition (502A) connected to cloud 528, a Voice over LTE (VoLTE) partition (502B) connected to cloud 530, a first Machine-Type (MTC) partition (502C), and a second MTC partition (502D) each connected to cloud 532. As illustrated in Fig. 5, each of the partitions is in communication with an eNB 504. The MBB partition 502(a) includes, for example, a MME 506, a SGW 508, a PGW 510, a Policy Control Rules Function (PCRF) 512, a Home Subscriber Server (HSS) 514, and an operation support systems (OSS) node 516. The VoLTE partition 502B includes, for example, gateways 518 and 520 and OSS node 522. The first MTC partition 502C includes, for example, an MTC node 524 that facilitates communication between eNB 504 and network 532. The first MTC partition 502C further includes OSS node 526. The second MTC partition 502D may include a similar group of nodes as the first MTC partition 502C.

[0034] According to some embodiments, network partitioning may be deployed in several different layers of the network. Partitioning between the RAN and EPC assumes a common RAN and radio interface supporting several different EPC partitions. Other possible places to deploy network partitioning includes between S-GW and PDN GW, or between network layer and service layer (e.g., IMS).

[0035] In some embodiments, a common base architecture supports the network partitions of the network. As an example, a common base architecture may include a

common RAN architecture and RAN interface (e.g., radio, S1 interface etc.). Furthermore, in some embodiments, the network includes mechanisms for network partition selection including how the UE is assigned to a specific network partition at an initial connection.

[0036] According to some embodiments, a network partition is a (logical) partition of the network, used, e.g., for resource allocation, isolation, operational efficiencies, optimization, business relevance, or to improve TTM/TTC. The network partition may include a group of nodes logically associated with the partition.

[0037] In some embodiments, a base partition is the first network partition to which the UE connects and is responsible for authenticating the UE towards the network. Different UEs could be associated with different Base Partitions. In some embodiments, a resource instance is a physical or virtual resource used as a building block for network partitions, which can be dedicated or shared amongst network partitions.

[0038] According to some embodiments, in EPC network partitioning, (i) the interface between the RAN and CN can be common for all network partitions and can be based on the S1 interface between E-UTRAN and EPC; (ii) one base partition can connect to more than one RAN, thus providing RAN mobility functionality inside the Base Partition; (iii) one RAN can connect to more than one base partition; (iv) the base partition selected for the UE may be verified through subscription data; (v) network partitioning is applicable for any cellular access (2G/3G/4G/5G etc. and for Wi-Fi); (vi) it is not required that a UE must re-attach to a partition upon moving between partitions; and (vii) both virtualized and non-virtualized environments are supported.

[0039] According to some embodiments, an identifier of the network partition that has been selected in a first access network (e.g. WLAN) is stored in a network node. Later, when the UE moves from that first access network (e.g. WLAN) to a second access network with another access technology (e.g. 3GPP access), the second access network uses the network partition identifier, that was stored in the network node, as the network partition identifier. In some embodiments, the network entity storing the network partition identity is the HSS. In some embodiments, the second access network retrieves the stored network partition identifier when the UE performs handover to the second access network.

[0040] According to some embodiments, at an initial attachment, an identifier for the selected network partition is provided to a network node for storage. This network node may be, for example, the HSS. Fig. 6 illustrates an embodiment of a call flow for an initial attachment over E-UTRAN. In some embodiments, the steps illustrated in Fig. 6 are also applicable when the UE makes an initial attach in another access technology (e.g., WLAN).

[0041] Step 600. The UE decides to attach to 3GPP access.

[0042] Step 602. The UE sends an attach request to a network access node (e.g., 3GPP RAN).

[0043] Step 604. The network partition is selected. In some embodiments, the UE may provide a partition ID that is used by the RAN when selecting a suitable network partition. In some embodiments, the attach request may include an indication for the access node to select the network partition. Furthermore, in some embodiments, the access node may be configured to perform the network partition selection.

[0044] Step 606. The network access node sends an attachment request to a mobility management node (e.g., MME, SGSN).

[0045] Step 608. Security and location update procedures are performed.

[0046] Step 610. In some embodiments, network partition selection may be performed in the network based on, for example, UE subscription data. In some embodiments, step 610 includes a redirection of the UE to another mobility management node in a target network partition. Step 610 may be performed in lieu of step 604.

[0047] Step 612. PDN connection is performed for the selected network partition.

[0048] Step 614. The mobility management node transmits, to a partition identifier storage node, a notification including a Partition ID associated with the selected partition.

[0049] Step 616. The partition identifier storage node stores the Partition ID.

[0050] Step 618. The partition identifier storage node transmits a notification response to the mobility management node.

[0051] Fig. 7 illustrates an embodiment of a call flow for initial attach over E-UTRAN where the network partition identity is stored in HSS.

[0052] Steps 700-708 correspond to steps 600-608 in Fig. 6.

[0053] Step 710. The mobility management node transmits an update location request to the HLR/HSS.

[0054] Step 712. The mobility management node receives an update location acknowledgment from the HLR/HSS. In some embodiments, the update location acknowledgement includes subscription data.

[0055] Step 714 corresponds to step 610 in Fig. 6. In some embodiments, the network partition is selected using the subscription data received in the update location acknowledgment.

[0056] Step 716. The mobility management node transmits a Create Session Request to the PGW via the SGW.

[0057] Step 718. IP-CAN session establishment is performed.

[0058] Step 720. The mobility management node receives a create session response from the PGW via the SGW.

[0059] Step 722. RRC setup is performed.

[0060] Step 724. Modify bearer request/response sent between mobility management node and SGW.

[0061] Step 726. The mobility management node transmits, to a partition identifier storage node, a notification including a (i) Partition ID associated with the selected partition and (ii) a PGW ID. The PGW ID may be used when the UE makes a handover to the target access node.

[0062] Step 728. The HLR/HSS stores the stores the Partition ID and PGW ID.

[0063] Step 730. The mobility management node receives a notification response from the HLR/HSS.

[0064] According to some embodiments, when the UE moves from one first access technology to another second access technology (e.g. from E-UTRAN to WLAN), the target access network uses the Partition ID stored in the network as the network partition selected for this connection.

[0065] Fig. 8 illustrates an embodiment of a call flow for handover to trusted WLAN. As understood by one of ordinary skill in the art, even though the call flow illustrates handover to trusted WLAN as an example, the solution is also applicable to handover to untrusted WLAN (e.g. the TWAG / TWAP is replaced by ePDG). Additionally, as understood by one of ordinary skill in the art, the call flow illustrated in Fig. 8 is also applicable for handover to 3GPP access.

[0066] Step 800. The UE makes a decision to move to WLAN.

[0067] Step 802. WLAN association is performed between the UE and WLAN access point (AP).

[0068] Step 804. WLAN AP or TWAG or TWAP transmits a network partition identity request to the partition identifier storage node. In some embodiments, the network partition identity request includes an identity of the UE, where the network partition identifier storage node uses the identity of the UE to identify the appropriate network partition identity. In some embodiments, the partition ID is included in an authentication request to the HLR/HSS.

[0069] Step 806. WLAN AP or TWAG or TWAP receives a network partition identity response including the partition ID.

[0070] Step 808. WLAN AP or TWAG or TWAP selects the network partition based on the received stored Partition ID. In some embodiments, the partition ID is associated with a network partition selected by the UE prior to the UE moving to the WLAN. For example, the partition ID is associated with a network partition selected by the UE when the UE was connected to another WLAN or a 3GPP network. Thus, using the partition

ID ensures that the same network partition as in source WLAN access or source 3GPP access is used.

[0071] Step 810. EAP authentication is performed.

[0072] Step 812. PDN connection setup is performed in the selected network partition.

[0073] In some embodiments, steps 804-806 may be performed after step 812.

[0074] Fig. 9 illustrates an embodiment of a call flow where the Partition ID is stored in HSS.

[0075] Steps 900-902 correspond to steps 800-802 in Fig. 8.

[0076] Step 904. EAP authentication is performed. Step 906. Subscription data (including Partition Id., credentials, etc.) is provided from the HSS to the AAA.

[0077] Step 908. WLAN AP receive an access accept message from 3GPP AAA. In some embodiments, the access accept message includes a EAP success indication and subscription data including a Partition ID.

[0078] Step 910. WLAN AP selects network partition based on partition ID received in the subscription data. In some embodiments, the partition ID is associated with a network partition selected by the UE prior to the UE moving to the 3GPP network. For example, the partition ID is associated with a network partition selected by the UE when the UE was connected to another WLAN or a 3GPP network.

[0079] Step 912. TWAG/TWAP transmits create session request to the PGW via the SGW.

[0080] Step 914. IP-CAN session establishment is performed.

[0081] Step 916. TWAG/TWAP receives create session response from the PGW via the SGW.

[0082] Fig. 10 illustrates an embodiment of a call flow when the UE performs handover to a 3GPP network.

[0083] Step 1000. The UE makes a decision to move to a 3GPP network.

[0084] Step 1002. 3GPP RAN receives a attach request from the UE.

[0085] Step 1004. 3GPP RAN transmits a network partition identity request to the partition identifier storage node. In some embodiments, the network partition identity request includes an identity of the UE, where the partition identifier storage node uses the identity of the UE to identify the appropriate network partition identity.

[0086] Step 1006. 3GPP RAN receives a network partition identity response including the partition ID.

[0087] Step 1008. 3GPP RAN selects the network partition based on the received Partition ID. In some embodiments, the partition ID is associated with a network partition selected by the UE prior to the UE moving to the WLAN. For example, the partition ID is associated with a network partition selected by the UE when the UE was connected to another 3GPP network or a WLAN. Thus, using the partition ID ensures that the same network partition as in source 3GPP access or source WLAN is used.

[0088] Step 1010. 3GPP RAN transmits an attach request to a mobility management node (e.g., MME or SGSN).

[0089] Step 1012. Security and location update procedures are performed.

[0090] Step 1014. PDN connection setup in selected network partition is performed.

[0091] Fig. 11 illustrates an embodiment of a call flow where the HLR/HSS stores the partition identifier.

[0092] Steps 1100-1102 correspond to steps 1000-1002 in Fig. 10.

[0093] Step 1104. Network partition selection may be performed as described above for step 604 in Fig. 6.

[0094] Step 1106. 3GPP RAN transmits an attach request to the mobility management node.

[0095] Step 1108. Security and location update procedures are performed.

[0096] Step 1110. Mobility management node transmits an update location request to the HLR/HSS.

[0097] Step 1112. The mobility management node receives an update location acknowledgement from the HLR/HSS. In some embodiments, the update location acknowledgement Ack includes UE subscription data that includes the partition ID.

[0098] Step 1114. Network partition selection may be performed as described in step 610 in Fig. 6.

[0099] Step 1116. The mobility management node transmits a Create Session Request to the PGW via the SGW.

[00100] Step 1118. IP-CAN session establishment is performed.

[00101] Step 1120. The mobility management node receives a create session response from the PGW via the SGW.

[00102] Step 1122. RRC setup is performed.

[00103] Step 1124. Modify bearer request/response sent between mobility management node and SGW.

[00104] In some embodiments, the network partition selection is performed before authentication and subscription data retrieval (Alt A in step 604). Thus, in this embodiment the subscription data cannot be used for the initial partition selection in

step 1104. Instead a network partition is selected based on UE-provided information. In this situation, it may be needed in step 1114 to make a redirect to the already assigned network partition (according to the network partition information provided with the subscription data from HSS) if that differs from the network partition selected in step 1104. This, however, does not cause any problems since the initial network partition selected in step 1104 (Alt A) is able to handle the particular UE type (e.g. can handle the corresponding UE identities and credentials) and a later redirection as in step 1114 (Alt B) redirects the UE to the proper network partition instance.

[00105] Fig. 12 illustrates an embodiment of a process in a network control entity that manages network connections for a network. The process may start at step 1200 where the network control entity receives a network attachment request from a network access entity or user equipment for connecting the user equipment to the network. In step 1202, the network control entity obtains a network partition ID associated with the UE, the network partition ID identifying a network partition that includes a predetermined group of network entities included in the network. In step 1204, the network control entity transmits, to a network storage entity, a notification containing the network partition ID, where the network storage entity stores the network partition ID.

[00106] In some embodiments, the network partition ID is included in the received attachment request, and the network partition ID is obtained by extracting the network partition ID from the received attachment request. In some embodiments, the network partition ID is determined by the network access entity, and the network partition ID is obtained by extracting the network partition ID from a message transmitted form the network access entity. In some embodiments, the network partition ID is determined by

the network control entity, determined based on information received in the network attachment request and/or information received in a message transmitted form the network access entity.

[00107] In some embodiments, the network storage entity is a home subscriber server. In some embodiments, the control entity is a mobility management entity (MME) entity. In some embodiments, the control entity is a Serving General Packet Radio Service (GPRS) Support Node (SGSN). In some embodiments, the network access entity is an Evolved Node B (eNB). In some embodiments the network access entity is an evolved Packet Data Gateway (ePDG). In some embodiments, the network access entity is a Trusted WLAN Access Gateway (TWAG) function.

[00108] Fig. 13 illustrates an embodiment of a process performed in a network access entity operating in a first network access technology. The process may start at step 1300 where the network access entity receives from a user equipment (UE), a request to connect to the network access entity, the request being part of a handover procedure from a second access technology to the first access technology. In step 1302, the network access entity transmits, to a network storage entity in response to receiving the request to connect to the network access entity, a request for a network partition ID that identifies a network partition including predetermined group of network entities, the request including at least an identity of the UE. In step 1304, the network access entity receives, from the network storage entity, a response message including the network partition ID. In step 1306, the network access entity selects the network partition in accordance with the network partition ID.

[00109] In some embodiments, the network access entity is a trusted wireless access gateway (TWAG). In some embodiments, the network access entity is an untrusted wireless access gateway. In some embodiments, the network access entity is an Evolved Node B (eNB). In some embodiments, the network access entity is a mobility management entity (MME).

[00110] In some embodiments, the first network access technology is a wireless local area network (WLAN) and the second network access technology is 3GPP. In some embodiments, the first network access technology is 3GPP and the second network access technology is a wireless local area network (WLAN). In some embodiments, the network storage entity is a home subscriber server.

[00111] Fig. 14 is a block diagram of an embodiment of network node such as a MME/SGW/PGW/HSS. As shown in Fig. 14, the network node may include or consist of: a computer system (CS) 1402, which may include one or more processors 1455 (e.g., a general purpose microprocessor) and/or one or more circuits, such as an application specific integrated circuit (ASIC), field-programmable gate arrays (FPGAs), a logic circuit, and the like; a network interface 1403 for use in connecting the network node to a network; and a data storage system 1406, which may include one or more non-volatile storage devices and/or one or more volatile storage devices (e.g., random access memory (RAM)). In embodiments where the network node includes a processor 1455, a computer program product (CPP) 1433 may be provided. CPP 1433 includes or is a computer readable medium (CRM) 1442 storing a computer program (CP) 1443 comprising computer readable instructions (CRI) 1444. CRM 1442 is a non-transitory computer readable medium, such as, but not limited, to magnetic media (e.g., a hard

disk), optical media (e.g., a DVD), solid state devices (e.g., random access memory (RAM), flash memory), and the like. In some embodiments, the CRI 1444 of computer program 1443 is configured such that when executed by computer system 1402, the CRI causes the network node to perform steps described above (e.g., steps described above with reference to the flow charts and message flows shown in the drawings). In other embodiments, the network node may be configured to perform steps described herein without the need for a computer program. That is, for example, computer system 1402 may consist merely of one or more ASICs. Hence, the features of the embodiments described herein may be implemented in hardware and/or software.

[00112] FIG. 15 illustrates a block diagram of an exemplary access node, such as node 404 shown in FIG. 4. As shown in FIG. 15, the access node 404 may include: a data processing system 1502, which may include one or more microprocessors and/or one or more circuits, such as an application specific integrated circuit (ASIC), field-programmable gate arrays (FPGAs), and the like; a network interface 1510; a transceiver 1504, and a data storage system 1506, which may include one or more non-volatile storage devices and/or one or more volatile storage devices (e.g., random access memory (RAM)). According to some embodiments, the data processing system 1502 may comprise a control unit used for selection of transmission parameters.

[00113] In embodiments where data processing system 1502 includes a microprocessor, computer readable program code (CRPC) 1508 may be stored in a computer readable medium, such as, but not limited, to magnetic media (e.g., a hard disk), optical media (e.g., a DVD), memory devices (e.g., random access memory), and the like. In some embodiments, computer readable program code is configured such

that when executed by a processor, the code causes the data processing system 1502 to perform steps described above (e.g., steps described above with reference to the flow charts shown above). In other embodiments, the access node 404 is configured to perform steps described herein without the need for code. That is, for example, data processing system 1502 may consist merely of one or more ASICs. Hence, the features of the embodiments described herein may be implemented in hardware and/or software. For example, in particular embodiments, the functional components of the base station described above may be implemented by data processing system 1502 executing computer instructions, by data processing system 1502 operating independent of any computer instructions, or by any suitable combination of hardware and/or software.

[00114] Fig. 16 is a block diagram of UE according to some embodiments. As shown in Fig. 16, UE may include or consist of: a computer system (CS) 1602, which may include one or more processors 1655 (e.g., a general purpose microprocessor) and/or one or more circuits, such as an application specific integrated circuit (ASIC), field-programmable gate arrays (FPGAs), a logic circuit, and the like; a transceiver 1605, coupled to an antenna, 1622 for transmitting and receiving data wireless; and a data storage system 1606, which may include one or more non-volatile storage devices and/or one or more volatile storage devices (e.g., random access memory (RAM)). In embodiments where UE includes a processor 1655, a computer program product (CPP) 1633 may be provided. CPP 1633 includes or is a computer readable medium (CRM) 1642 storing a computer program (CP) 1643 comprising computer readable instructions (CRI) 1644. CRM 1642 is a non-transitory computer readable medium, such as, but not