UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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Nokia of America Corp., Ericsson Inc., AT&T Services, Inc., Cellco Partnership d/b/a Verizon Wireless, and T-Mobile USA, Inc.,

Petitioners

v.

KT Corporation (Patent Owner) and Pegasus Wireless Innovation LLC (Exclusive Licensee)

Patent Owner

Case No. IPR2025-00036

U.S. Patent No. 11,627,631 B2

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DECLARATION OF DR. MICHAEL KOTZIN, IN SUPPORT OF PETITION FOR INTER PARTES REVIEW OF UNITED STATES PATENT NO. 11,627,631 B2

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Independent Claim 1 92

Claim 1, Element [1.pre]: A method for transmitting and receiving data, the method comprising: 92

Claim 1, Element [1.a]: deciding, by a source base station (BS), whether to perform a handover; 98

Claim 1, Element [1.b1]: transmitting, from the source BS to a target BS, a handover request message when it is decided to perform the handover, ... 102

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Claim 1, Element [1.b2]: wherein the handover request message includes network slice information; and..... 105

Claim 1, Element [1.c1]: receiving, by the source BS from the target BS, a handover request confirmation message in response to the handover request message, ... 109

Claim 1, Element [1.c2]: 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.115

Independent Claim 7 120

Claim 7, Element [7.pre]: A controller for transmitting and receiving data, the controller comprising: 120

Claim 7, Element [7.a]: a processor performs: to decide whether to perform a handover;..... 131

Claim 7, Element [7.b1]: to transmit a handover request message when it is decided to perform the handover, ... 137

Claim 7, Element [7.b2]: wherein the handover request message includes network slice information; and..... 140

Claim 7, Element [7.c1]: to receive a handover request confirmation message in response to the handover request message, ... 144

Claim 7, Element [7.c2]: wherein, if one or more protocol data unit (PDU) sessions are associated with one or more network slices that are not supported by a target BS, the handover request confirmation message includes information for indicating a rejection of the one or more PDU sessions by the target BS.149

Independent Claim 13 154

Claim 13, Element [13.pre]: An apparatus for transmitting and receiving data, the apparatus comprising: 154

Claim 13, Element [13.a]: a controller configured to decide whether to perform a handover; 160

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Claim 13, Element [13.b1]: a transmitter configured to transmit a handover request message when it is decided to perform the handover, ... 171

Claim 13, Element [13.b2]: wherein the handover request message includes network slice information; and..... 178

Claim 13, Element [13.c1]: a receiver configured to receive a handover request confirmation message in response to the handover request message, ... 182

Claim 13, Element [13.c2]: wherein, if one or more protocol data unit (PDU) sessions are associated with one or more network slices that are not supported by a target BS, the handover request confirmation message includes information for indicating a rejection of the one or more PDU sessions by the target BS.189

B. Ground 2: *R3-173152* and *TR 38.801* Render Obvious Claims 2-6, 8-12, and 14-18 of the ’631 patent..... 194

Motivation to Combine R3-173152 and TR 38.801..... 194

Dependent Claim 2: The method according to claim 1, further comprising: receiving, by the source BS and from a user equipment (UE), a non-access stratum (NAS) message including network slice request information. 200

Dependent Claim 3: The method according to claim 2, further comprising: receiving, by the source BS and from a core network entity, the network slice information, wherein the network slice information is configured by the network slice request information. 207

Dependent Claim 4: The method according to claim 2, wherein the NAS message including the network slice request information is included in a radio resource control (RRC) connection setup completion message..... 210

Dependent Claim 5: The method according to claim 3, wherein the network slice information is configured by the core network entity based on the network slice request information..... 215

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Dependent Claim 6: The method according to claim 5, wherein the transmission of the handover request message is performed through a direct interface associated with the target base station. 219

Dependent Claim 8: The controller according to claim 7, wherein the processor further performs to receive a non-access stratum (NAS) message including network slice request information.220

Dependent Claim 9: The controller according to claim 8, wherein the processor further performs to receive the network slice information from a core network, wherein the network slice information is configured by the network slice request information. 227

Dependent Claim 10: The controller according to claim 8, wherein the NAS message including the network slice request information is included in a radio resource control (RRC) connection setup completion message. 230

Dependent Claim 11: The controller according to claim 9, wherein the network slice information is configured by the core network entity based on the network slice request information. 235

Dependent Claim 12: The controller according to claim 11, wherein the transmission of the handover request message is performed through a direct interface associated with the target base station. 239

Dependent Claim 14: The apparatus according to claim 13, wherein the processor further performs to receive a non-access stratum (NAS) message including network slice request information.240

Dependent Claim 15: The apparatus according to claim 14, wherein the processor further performs to receive the network slice information from a core network, wherein the network slice information is configured by the network slice request information. 247

Dependent Claim 16: The apparatus according to claim 14, wherein the NAS message including the network slice information is

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included in a radio resource control (RRC) connection setup completion message. 250

Dependent Claim 17: The apparatus according to claim 15, wherein the network slice information is configured by the core network entity based on the network slice request information. 255

Dependent Claim 18: The apparatus according to claim 17, wherein the transmission of the handover request message is performed through a direct interface associated with the target base station. 259

C. Ground 3: *Han and TS 36.300* Render Obvious Claims 1, 7, and 13 of the '631 patent. 260

Motivation to Combine Han and TS 36.300 260

Independent Claim 1 264

Claim 1, Element [1.pre]: A method for transmitting and receiving data, the method comprising: 264

Claim 1, Element [1.a]: deciding, by a source base station (BS), whether to perform a handover; 267

Claim 1, Element [1.b1]: transmitting, from the source BS to a target BS, a handover request message when it is decided to perform the handover, ... 274

Claim 1, Element [1.b2]: wherein the handover request message includes network slice information; and 277

Claim 1, Element [1.c1]: receiving, by the source BS from the target BS, a handover request confirmation message in response to the handover request message, ... 278

Claim 1, Element [1.c2]: 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. 282

Independent Claim 7 286

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Claim 7, Element [7.pre]: A controller for transmitting and receiving data, the controller comprising: 286

Claim 7, Element [7.a]: a processor performs: to decide whether to perform a handover;..... 289

Claim 7, Element [7.b1]: to transmit a handover request message when it is decided to perform the handover, ... 298

Claim 7, Element [7.b2]: wherein the handover request message includes network slice information; and..... 300

Claim 7, Element [7.c1]: to receive a handover request confirmation message in response to the handover request message, ... 301

Claim 7, Element [7.c2]: wherein, if one or more protocol data unit (PDU) sessions are associated with one or more network slices that are not supported by a target BS, the handover request confirmation message includes information for indicating a rejection of the one or more PDU sessions by the target BS.305

Independent Claim 13..... 309

Claim 13, Element [13.pre]: An apparatus for transmitting and receiving data, the apparatus comprising: 309

Claim 13, Element [13.a]: a controller configured to decide whether to perform a handover; 311

Claim 13, Element [13.b1]: a transmitter configured to transmit a handover request message when it is decided to perform the handover, ... 320

Claim 13, Element [13.b2]: wherein the handover request message includes network slice information; and..... 324

Claim 13, Element [13.c1]: a receiver configured to receive a handover request confirmation message in response to the handover request message, ... 325

Claim 13, Element [13.c2]: wherein, if one or more protocol data unit (PDU) sessions are associated with one or more network slices that are not supported by a target BS, the handover request

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D. Ground 4: *Han*, *TS 36.300*, and *TR 38.801* Render Obvious Claims 2-6, 8-12, and 14-18 of the '631 patent. 335

Motivation to Combine Han, TS 36.300, and TR 38.801 335

Dependent Claim 2: The method according to claim 1, further comprising: receiving, by the source BS and from a user equipment (UE), a non-access stratum (NAS) message including network slice request information. 341

Dependent Claim 3: The method according to claim 2, further comprising: receiving, by the source BS and from a core network entity, the network slice information, wherein the network slice information is configured by the network slice request information. 348

Dependent Claim 4: The method according to claim 2, wherein the NAS message including the network slice request information is included in a radio resource control (RRC) connection setup completion message. 352

Dependent Claim 5: The method according to claim 3, wherein the network slice information is configured by the core network entity based on the network slice request information. 355

Dependent Claim 6: The method according to claim 5, wherein the transmission of the handover request message is performed through a direct interface associated with the target base station. 359

Dependent Claim 8: The controller according to claim 7, wherein the processor further performs to receive a non-access stratum (NAS) message including network slice request information.360

Dependent Claim 9: The controller according to claim 8, wherein the processor further performs to receive the network slice information from a core network, wherein the network slice information is configured by the network slice request information. 367

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Dependent Claim 10: The controller according to claim 8, wherein the NAS message including the network slice request information is included in a radio resource control (RRC) connection setup completion message. 371

Dependent Claim 11: The controller according to claim 9, wherein the network slice information is configured by the core network entity based on the network slice request information. 375

Dependent Claim 12: The controller according to claim 11, wherein the transmission of the handover request message is performed through a direct interface associated with the target base station. 379

Dependent Claim 14: The apparatus according to claim 13, wherein the processor further performs to receive a non-access stratum (NAS) message including network slice request information.380

Dependent Claim 15: The apparatus according to claim 14, wherein the processor further performs to receive the network slice information from a core network, wherein the network slice information is configured by the network slice request information. 387

Dependent Claim 16: The apparatus according to claim 14, wherein the NAS message including the network slice request information is included in a radio resource control (RRC) connection setup completion message. 391

Dependent Claim 17: The apparatus according to claim 15, wherein the network slice information is configured by the core network entity based on the network slice request information. 395

Dependent Claim 18: The apparatus according to claim 17, wherein the transmission of the handover request message is performed through a direct interface associated with the target base station. 399

X. CONCLUSION 401

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CLAIM LISTING

1.pre.	A method for transmitting and receiving data, the method comprising:
1.a.	deciding, by a source base station (BS), whether to perform a handover;
1.b1.	transmitting, from the source BS to a target BS, a handover request message when it is decided to perform the handover,
1.b2.	wherein the handover request message includes network slice information; and
1.c1.	receiving, by the source BS from the target BS, a handover request confirmation message in response to the handover request message,
1.c2.	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.
2	The method according to claim 1, further comprising: receiving, by the source BS from a user equipment (UE), a non-access stratum (NAS) message including network slice request information.
3	The method according to claim 2, further comprising: receiving, by the source BS from a core network entity, the network slice information, wherein the network slice information is configured by the network slice request information.
4	The method according to claim 2, wherein the NAS message including the network slice request information is included in a radio resource control (RRC) connection setup completion message.
5	The method according to claim 3, wherein the network slice information is configured by the core network entity based on the network slice request information.
6	The method according to claim 5, wherein the transmission of the handover request message is performed through a direct interface associated with the target base station.
7.pre.	A controller for transmitting and receiving data, the controller comprising: a processor performs:
7.a.	to decide whether to perform a handover,
7.b1.	to transmit a handover request message when it is decided to perform the handover,

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7.b2.	wherein the handover request message includes network slice information; and
7.c1.	to receive a handover request confirmation message in response to the handover request message,
7.c2.	wherein, if one or more protocol data unit (PDU) sessions are associated with one or more network slices that are not supported by a target BS, the handover request confirmation message includes information for indicating a rejection of the one or more PDU sessions by the target BS.
8	The controller according to claim 7, wherein the processor further performs to receive a non-access stratum (NAS) message including network slice request information.
9	The controller according to claim 8, wherein the processor further performs to receive the network slice information from a core network, wherein the network slice information is configured by the network slice request information.
10	The controller according to claim 8, wherein the NAS message including the network slice request information is included in a radio resource control (RRC) connection setup completion message.
11	The controller according to claim 9, wherein the network slice information is configured by the core network entity based on the network slice request information.
12	The controller according to claim 11, wherein the transmission of the handover request message is performed through a direct interface associated with the target base station.
13.pre.	An apparatus for transmitting and receiving data, the apparatus comprising:
13.a.	a controller configured to decide whether to perform a handover,
13.b1.	a transmitter configured to transmit a handover request message when it is decided to perform the handover,
13.b2.	wherein the handover request message includes network slice information; and
13.c1.	a receiver configured to receive a handover request confirmation message in response to the handover request message,
13.c2.	wherein, if one or more protocol data unit (PDU) sessions are associated with one or more network slices that are not supported by a target BS, the handover request confirmation message includes information for indicating a rejection of the one or more PDU sessions by the target BS.

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14	The apparatus according to claim 13, wherein the processor further performs to receive a non-access stratum (NAS) message including network slice request information.
15	The apparatus according to claim 14, wherein the processor further performs to receive the network slice information from a core network, wherein the network slice information is configured by the network slice request information.
16	The apparatus according to claim 14, wherein the NAS message including the network slice request information is included in a radio resource control (RRC) connection setup completion message.
17	The apparatus according to claim 15, wherein the network slice information is configured by the core network entity based on the network slice request information.
18	The apparatus according to claim 17, wherein the transmission of the handover request message is performed through a direct interface associated with the target base station.

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I, Michael Kotzin, declare as follows:

I. INTRODUCTION

1. I have been retained by Nokia of America Corporation, Ericsson Inc., AT&T Services, Inc., Cellco Partnership d/b/a Verizon Wireless, and T-Mobile, USA, Inc., ("Petitioners") to serve as an independent expert consultant in this proceeding before the United States Patent and Trademark Office ("PTO") against KT Corporation ("Patent Owner") regarding U.S. Patent No. 11,627,631 B2 ("the '631 patent"). (Ex. 1001).[1] I have been asked to submit this Declaration on behalf of Petitioners.

2. I have been asked to consider whether certain references disclose or render obvious claims 1-18 ("the challenged claims") of the '631 patent. My opinions are set forth below. Based on my experience and expertise, it is my opinion that the prior art renders all limitations of the challenged claims unpatentable, as I discuss in detail below.

3. I am not, and never have been, an employee of Nokia of America Corporation, Ericsson Inc., AT&T Services, Inc., Cellco Partnership d/b/a Verizon

[1] Where appropriate, I refer to exhibits that I understand are to be attached to the petition for *Inter Partes* Review of the '631 patent.

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Wireless, or T-Mobile, USA, Inc. I am not receiving compensation for this declaration beyond my normal hourly fees of $300 based on my time actually spent analyzing and documenting my opinions herein on the ’631 patent, the intrinsic record, the asserted prior art references identified in the Petition, and the issues related thereto. My compensation is not related to the outcome of this proceeding, and I will not receive any additional compensation based on the outcome of any IPR or other proceeding involving the ’631 patent.

4. All of my opinions set forth below are based on my own personal knowledge and professional judgment. I am over 18 years of age and, if I am called upon to do so, I would be competent to testify as to the matters set forth in this Declaration.

II. BACKGROUND AND QUALIFICATIONS

5. My academic and professional background is in electrical engineering and computer science, and I have been working in those fields since the completion of my B.S. in electrical engineering almost 50 years ago. My qualifications can be found in my curriculum vitae (or “CV”), which includes a summary of my professional and educational background, and which can be found in Exhibit 1004. The following is a brief summary of my relevant qualifications and professional experience.

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6. I received a B.S. in chemistry and a B.S. in electrical engineering from the University of Illinois in 1975, an M.S. in electrical engineering from Northwestern University in 1977, and a Ph.D. in electrical engineering and computer science from Northwestern University in 1981. During my graduate study at Northwestern (1975-1981), I performed research on communications and signal processing. My research dissertation was titled "Short Range Communication Using Diffusely Scattered Infrared Radiation."

7. I worked at Motorola, Inc. in various professional roles between 1975 and 2009. From 1975 to 1989, I worked for several Motorola Research labs in Illinois, where I developed technology related to private and public radio communication systems.

8. Between 1989 and 1998, I was the Vice President of Technical Staff and Director of Research and Advanced Technology in Motorola's Cellular Infrastructure and Networks division. Between 1998 and 2007, I transitioned to the Office of the Chief Technology Officer for Motorola's Mobile Devices division. In these roles, I provided leadership and strategic directions for the adoption and creation of new technology for cellular base station and handheld devices.

9. Between 2006 and 2009, I was the Vice President of Technical Staff in the Corporate Law Department of Motorola's Patent Operations division. In this role, I created technology portfolio strategy across businesses including quantitative

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goals for new and retained intellectual property assets. I also managed processes and corporate-wide teams related to creating and maintaining patent portfolios.

10. In the late 1990s through about 2005, I directly supervised and worked with engineers in the United States and Europe in developing technology focused on radio layer and signaling protocols. As part of this work, we developed and provided technical contributions for the 3rd Generation Partnership Project ("3GPP") meetings.

11. Since 2009, I have been the President of MDK Consulting, Inc., where I regularly provide technical consulting services on all aspects of wireless systems, products, and technology.

12. Over the past several decades I have performed extensive research on various aspects of systems, devices, and networks that acquire, store, process, and transmit information. My research has addressed software, algorithms, hardware, networking, protocols and other aspects of these systems and devices, and has included work on wireless mobile devices and systems, protocols including radio resource control (RRC) processes, signal processing and communications, base stations, hardware design methodologies, and cybersecurity. For example, in the 1970s and 1980s, I worked on technologies—including cellular, public safety, and private mobile—that formed the basis and was essential to several new digital radio systems.

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13. This work transitioned in the early 1990s to digital cellular applied research and development on cellular infrastructure and mobile devices. As a senior technologist and leader, first in the cellular infrastructure division and subsequently the mobile device division at Motorola, I was a significant participant and contributor to the development of new and evolving digital systems. Some of these evolutions included the adoption of functional improvements, continuing quality improvements, system generation advancements (e.g., GSM, W-CDMA, LTE, etc.), etc.

14. I am an inventor on approximately 134 issued U.S. patents and over 500 issued patents worldwide in areas including signal processing, data compression, communications, and wireless systems. I have published approximately 20 technical articles in peer-reviewed engineering journals and conference proceedings.

15. In addition to my professional experience, I have previously taught courses in electrical engineering at Northwestern University as an Adjunct Professor. I have also served as Chairman and member of numerous Motorola patent committees.

16. My *Curriculum Vitae* (Ex. 1004) lists my publication record in archival journals, international conferences, and workshops and further includes a list of granted patents.

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17. Based on my experience and education, I consider myself to be an expert at least in the fields of telecommunications, cellular networking, and mobile devices. As of the earliest priority date of the ’631 patent, I was at least a person of ordinary skill in the art of the ’631 patent, and I had personal knowledge of the technologies involved in the ’631 patent.

III. MATERIALS REVIEWED

18. The opinions contained in this Declaration are based on the documents I reviewed, my professional judgment, as well as my education, knowledge and experience in the relevant art.

19. In forming my opinions, I reviewed and relied upon the following materials and information:

Exhibit	Description
Ex. 1001	U.S. Patent No. 11,627,631 B2 (“the ’631 patent”)
Ex. 1002	Prosecution History of U.S. Patent No. 11,627,631 B2
Ex. 1005	KR Provisional Application No. 10-2016-0146054
Ex. 1006	English Translation of KR Provisional Application No. 10-2016-0146054 (“the 2016 KR priority document”)
Ex. 1007	KR Provisional Application No. 10-2017-0142205
Ex. 1008	English Translation of KR Provisional Application No. 10-2017-0142205 (“the 2017 KR priority document”)
Ex. 1009	U.S. Patent No. 11,044,777 B2 (“the ’777 patent”)
Ex. 1010	Prosecution History of U.S. Patent No. 11,044,777 B2
Ex. 1011	Xn Based Mobility Across RA (“*R3-173152*”)
Ex. 1012	Declaration of Craig Bishop Regarding Certification of Publication of

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Exhibit	Description
	R3-173152, *TS 36.300, TR 38.801*, *TR 21.905, TS 38.300,* and *TR 23.799*
Ex. 1013	3GPP TR 38.801 V0.4.0 (2016-08) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Study on New Radio Access Technology; Radio Access Architecture and Interfaces (Release 14) ("*TR 38.801*")
Ex. 1014	PCT Application No. PCT/CN2017/105046
Ex. 1015	Certified English Translation of PCT Application No. PCT/CN2017/105046 ("*Han*")
Ex. 1016	CN Application 20160875317.9
Ex. 1017	English Translation of CN Application 20160875317.9 ("*Han* CN Priority Document" or "Han CN")
Ex. 1018	3GPP TR 21.905 V13.1.0 (2016-06) 3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Vocabulary for 3GPP Specifications (Release 13) ("*TR 21.905*")
Ex. 1019	3GPP TS 38.300 V0.6.0 (2017-08) 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; NR and NG-RAN Overall Description; Stage 2 (Release 15) ("*TS 38.300*")
Ex. 1020	3GPP TR 23.799 V1.1.0 (10-2016) 3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; Study on Architecture for Next Generation System (Release 14) ("*TR 23.799*")
Ex. 1021	Sassan Ahmadi, LTE-Advanced A Practical Systems Approach to Understanding the 3GPP LTE Releases 10 and 11 Radio Access Technologies (2014) ("LTE-Advanced")
Ex. 1022	United States Patent Publication No. 2016/0080992, "Method of Inter-RAT Bearer Change for 3GPP System," Published March 27, 2016 ("*Huang-Fu*")
Ex. 1023	United States Patent Publication No. 2015/0043422, "Communication Control Method," Published February 12, 2015 ("*Fujishiro*")
Ex. 1024	3GPP TS 36.300 V.13.4.0 (2016-06) 3rd Generation Partnership

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Exhibit	Description
	Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2 (Release 13) ("*TS 36.300*")

20. I also reviewed any other materials I refer to in this Declaration in support of my opinions.

21. In forming my opinions, I have considered the materials listed above and any other documents cited in this Declaration. My opinions are based on the documents I reviewed and my knowledge and professional judgment. My opinions have also been guided by my appreciation of how a person of ordinary skill in the art would have understood the state of the art, the prior art, and the claims and the specification of the '631 patent at the time of the alleged invention.

IV. LEGAL STANDARDS

22. I am not an attorney, and do not offer opinions on the law in this Declaration.

23. In forming my analyses and conclusions expressed here in this Declaration, I have applied the legal principles described in the following paragraphs, which were provided to me by counsel for the Petitioners.

24. I used my understanding of the following legal principles set forth in this section in reaching my opinions.

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25. I understand that, in this proceeding, Petitioners have the burden of proving that the challenged claims are invalid by a preponderance of the evidence.

A. Prior Art

26. It is my understanding that information which satisfies one of the categories of prior art set forth in 35 U.S.C. § 102 may be used in an invalidity analysis under §§ 102 or 103. If information is not properly classified as prior art under one of the subsections of § 102 of the Patent Code, then it may not form the basis of an anticipation or obviousness determination. It is also my understanding that, for *inter partes* review, applicable prior art is limited to patents and printed publications.

B. Obviousness

27. I have been informed that a claim is invalid as obvious under 35 U.S.C. § 103 (AIA) if the differences between the claimed subject matter and the prior art are such that the subject matter as a whole would have been obvious at the time of the invention to a person of ordinary skill in the art. I have been informed that the following matters are relevant to determining whether the claimed invention would have been obvious: (1) the scope and content of the prior art, (2) the difference or differences between the patent claim and the prior art, (3) the level of ordinary skill in the art at the time the invention of the patent, and (4) any secondary considerations or objective indicia of non-obviousness.

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28. I have been informed that the combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results. When a claim simply arranges prior art elements with each performing the same function it had been known to perform and yields no more than one would expect from such an arrangement, then such a combination is obvious. When a patent claims a structure already known in the prior art altered by the mere substitution of one element for another known in the field, the combination is likely to be obvious unless the combination yields an unpredictable result.

29. I have been informed that when a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. If a person of ordinary skill in the art can implement a predictable variation, such a variation is likely unpatentable. For the same reason, if a technique has been used to improve one device, and one of ordinary skill in the art would recognize that it would improve similar devices in the same way, using the technique is obvious unless its actual application is beyond his or her skill. One question to consider is whether the improvement is more than predictably using prior art elements according to their established functions.

30. I have been informed that it may often be necessary, in a validity analysis, to consider whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue. This can be accomplished by

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looking to interrelated teachings of multiple patents or other publications or pieces of prior art; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by one of ordinary skill in the art.

31. I have been informed that a validity analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim; it is appropriate to take account of the inferences and creative steps that a person of ordinary skill in the art would employ. I have been informed that a person of ordinary skill in the art is a person of ordinary creativity, not an automaton.

32. I have been informed that a claim composed of several elements is not proved obvious merely by demonstrating that each element was, independently, known in the prior art. I have been informed that it can be important to identify a reason that would have prompted a person of ordinary skill in the art in the relevant field to combine the elements in the way the claimed new invention does. I am told that one way that subject matter can be proved obvious is by noting there existed at the time of the invention a known problem for which there was an obvious solution encompassed by the patent's claims. I have been informed that any need or problem known in the field of endeavor at the time of the claimed invention and addressed by the patent can provide a reason for combining the elements in the manner claimed.

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33. I have been informed that one should not assume that a person of ordinary skill in the art attempting to solve a problem will be led only to those elements of prior art designed to solve the same problem. Instead, I have been informed that since familiar items may have obvious uses beyond their primary purposes, in many cases a person of ordinary skill in the art will be able to fit the teachings of multiple prior art references together like pieces of a puzzle.

34. I have been informed that, when there is a design need or market pressure to solve a problem and there are a finite number of identified, predictable solutions, persons of ordinary skill in the art have good reason to pursue the known options within their technical grasp. If this leads to the anticipated success, the product was likely not accomplished by innovation but by using ordinary skill and common sense. I have been informed that, in such an instance, the fact that the combination was obvious to try may show that the combination was obvious.

35. I have been informed that, when determining whether a claimed combination would have been obvious, the correct analysis is not whether a person of ordinary skill in the art, writing on a blank slate, would have chosen the particular combination of elements described in the claim. Instead, I have been informed that the correct analysis considers whether one of ordinary skill, facing the wide range of needs created by developments in the field of endeavor, would have seen a benefit to selecting the combination claimed.

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36. I have been informed that, when determining whether a claimed invention is obvious, any "secondary considerations" of non-obviousness identified by the patentee should also be considered. These secondary considerations can include:

- commercial success of the invention, causally related to the invention itself rather than to companion factors, such as advertising or attractive packaging;
- the invention taught away from the technical direction followed by those skilled in the art;
- a long-felt but unsatisfied need for the invention while the needed implementing arts and elements had long been available;
- the invention achieves results unexpected to those skilled in the art;
- copying of the invention by competitors as distinguished from their independent development;
- unsuccessful attempts by those skilled in the art to make the invention;
- acquiescence by the industry to the patent's validity by honoring the patent through taking licenses or not infringing the patent, or both; and
- skepticism, disbelief in or incredulity by those skilled in the art that the patentee's approach worked.

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37. I have been informed that, for the above information to impact the obviousness of a patent claim, there must be a nexus between the alleged secondary considerations and the claims. In addition, I have been informed that the burden of introducing evidence of secondary considerations generally is on the Patent Owner. If the Patent Owner or its expert should assert secondary considerations of non-obviousness, I reserve the right to provide a Declaration addressing assertions of non-obviousness due to secondary considerations.

C. Claim Construction

38. I have been informed that claim terms are typically given their plain and ordinary meanings, as would have been understood by a person of ordinary skill in the art at the time of the earliest alleged priority date. I have further been informed that when considering the meaning of any terms in the challenged claims of the ’631 patent, I should apply the plain and ordinary meaning of those terms. I have further been informed that in considering the meaning of the claims, one must consider the language of the claims, the specification, and the prosecution history of record.

39. I have been informed that, in general, a preamble limits the invention if it recites essential structure or steps, or if it is necessary to give life, meaning, and vitality to the claim. I have further been informed that a preamble is not limiting where a patentee defines a structurally complete invention in the claim body and uses the preamble only to state a purpose or intended use for the invention. I have

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further been informed that dependence on a particular disputed preamble phrase for antecedent basis may limit claim scope because it indicates a reliance on both the preamble and claim body to define the claimed invention. I have further been informed that clear reliance on the preamble during prosecution to distinguish the claimed invention from the prior art transforms the preamble into a claim limitation because such reliance indicates use of the preamble to define, in part, the claimed invention.

D. Priority Date

40. In order to determine whether a reference qualifies as prior art for a given patent claim, one must determine the applicable priority date for that patent claim. I understand that in many cases the priority date is the actual filing date of the patent application or patent at issue. In certain cases, however, patent claims may be entitled to "priority" based on one or more earlier applications referenced on the face of the patent.

41. In order for a claim of a patent to be entitled to claim priority to an earlier filed application, I understand that the earlier filed application needs to have sufficient "written description" to support that claim.

42. When determining whether a specification contains adequate written description of the claimed invention, I understand that one must make an objective

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inquiry into the four corners of the specification from the perspective of a person of ordinary skill in the art.

43. Further, I understand that the standard for written description is stricter than the standard for determining whether or not a patent claim would have been obvious based on the prior art.

44. In particular, the question for purposes of written description is not merely whether the claimed invention is an obvious variant of what the specification discloses. Instead, the application itself must describe the invention, and do so in sufficient detail that one skilled in the art can clearly conclude that the inventor invented the claimed invention as of the date when the specification was filed.

45. Similarly, I understand that the issue of written description is separate from the question of "enablement" (i.e., whether a specification allows a person of ordinary skill to practice the claimed invention without undue experimentation). A specification may adequately enable a claimed invention, yet fail to provide written description support.

46. Finally, I understand that the standard for whether or not a disclosure is sufficient to support a claim is different than the standard for whether a disclosure anticipates a claim. To support a claim, the description must be sufficient to convey to a person of ordinary skill in the art that the inventors were in possession of the full scope of the claimed subject matter. By contrast, a description anticipates a claim

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if it discloses even a single species within the scope of the claim. Thus, in the case of "genus" claims covering two or more different species, I understand that there can be situations in which a given disclosure is sufficient to anticipate the claim even though that same disclosure is not adequate to support the claim and entitle the inventors to an earlier priority date.

47. I understand that in order to claim priority to an application through a chain of applications, every single application in the chain (going back to the particular application on which the inventors want to rely) needs to support the claim as a matter of written description.

48. In other words, each application in the chain must allow a person of ordinary skill to discern that the inventors were in possession of the claimed invention at the time of the application. As previously discussed, I understand that it is not sufficient under this standard for the disclosure in the specification to render the claimed invention obvious.

V. PERSON OF ORDINARY SKILL IN THE ART AT THE TIME OF THE ALLEGED INVENTION

49. Assuming that the '631 patent is entitled to its earliest alleged priority date of November 3, 2016 (*see* Ex. 1001, 1 ("Related U.S. Application Data" section); *see also* § VII.D *infra*), I was at least a person of ordinary skill in the art as of November 3, 2016, and can provide opinions regarding the knowledge of a person

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of ordinary skill in the art as of that time. My opinions herein are, where appropriate, based on my understandings as to a person of ordinary skill in the art at that time.

50. I understand that factors that are pertinent to a determination of the level of ordinary skill in the art include: (1) the educational level of the inventor; (2) the type of problems encountered in the art; (3) the prior art solutions to those problems; (4) the rapidity with which innovations are made; (5) the sophistication of the technology; and (6) and the educational level of workers active in the field.

51. Based on the materials and information I have reviewed and based on my experience in the technical areas relevant to the ’631 patent, a person of ordinary skill in the art at the time of the alleged invention of the ’631 patent would have had a bachelor’s degree in electrical engineering, computer engineering, or a related discipline, knowledge of the relevant 3GPP standards as of that time, and at least two years of experience working in a field involving wireless communications. A person with a different degree but with additional relevant experience could still qualify if the additional experience compensates for the different educational background. A person with less than 2 years of experience working in a field involving wireless communications could still qualify if the person has additional education that compensates for their lesser experience.

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VI. TECHNICAL BACKGROUND

52. Below, I present a brief overview of certain technical concepts and features that would have been known to a person of ordinary skill in the art prior to and at the time of the earliest alleged priority date of the ’631 patent. The technical concepts and features that I describe in this Technical Background section reflect the state of the art that a person of ordinary skill in the art would have had knowledge of and would have understood prior to and at the time of the alleged invention of the ’631 patent. I rely on, and incorporate as applicable (even if not expressly mentioned below in Section IX), the following disclosures to support my opinions in this Declaration, including those opinions relating to how the prior art discloses and/or suggests the challenged claims of the ’631 patent and how (and why) a person of ordinary skill in the art would have been motivated to consider and combine the disclosures and suggestions from one or more prior art references. The following disclosures may not be part of the grounds, but may be referenced herein to demonstrate the knowledge of the person of ordinary skill in the art when reviewing the references that are part of the grounds.

A. Mobile Communication Networks

53. Prior to the ’631 patent’s earliest alleged priority date, a person of ordinary skill in the art would have been familiar with mobile communication networks and their architectures.

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1. LTE

54. Exhibit 1021 ("LTE-Advanced") is a true and accurate copy of an example textbook outlining Long-Term Evolution (LTE) terminology and architecture. (*See, generally,* Exhibit 1021). LTE-Advanced was published in 2014 and explains what a person of ordinary skill in the art would have known.

55. LTE-Advanced explains that the "network architecture of LTE" is a "packet-switched core network architecture to support the evolved terrestrial radio access network (E-UTRAM)." (Ex. 1021, Chapter 2 Network Architecture, p. 45). The overall network architecture has two components: an access network and a core network, where the access network is a E-UTRAN and the core network as known as an EPC (or evolved packet core). (Ex. 1021, Chapter 2 Network Architecture, p. 57).

56. LTE-Advanced explains that an E-UTRAN access network consists of a "network of eNBs [or base stations]." (Ex. 1021, Chapter 2 Network Architecture, p. 57). A base station includes one or more "network nodes." (Ex. 1021, Chapter 1 Introduction to LTE-Advanced, pp. 20-21). "The eNBs are typically interconnected with each other by means of a logical interface known as X2 and to the EPC [or evolved packet core] by means of the S1 interface." (Ex. 1021, Chapter 2 Network Architecture, p. 57).

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57. "The radio resource control (RRC) sublayer in E-UTRAN protocol stack performs control-plane functions such as broadcast of system information related to access stratum (AS) and non-access stratum (NAS)" including others. (Ex. 1021, Chapter 5 Radio Resource Control Functions, p. 227). After an RRC connection is established through the control plane, a user plane interface is used to transfer user plane data between the UE and the E-UTRAN using the PDCP layer, the RLC layer, the MAC layer, and the Physical layer. (*see* Ex. 1021, Chapter 5 Radio Resource Control Functions, pp. 240-241).

2. Next Generation (NextGen or NG)

58. *TR 23.799* (Ex. 1020) describes what a person of ordinary skill in the art would have known, including "scenarios of migration" to a "new architecture" for "next generation mobile networks," noting an "objective" "to design a system architecture for next generation mobile networks" that "can be based on an evolution of the current architecture or based on a 'clean slate' approach." (Ex. 1020, 19).

59. *TR 23.799* defines "NG RAN" or "NextGen RAN" as a next generation radio access network, "NextGen Core Network" or NG CN as a core network that connects to a NextGen access network, "NextGen Access Network (NG AN)" as a NextGen RAN or a Non-3GPP access network and interfaces with the next generation core, NextGen System (NG System) as a system including a NextGen Access Network and NextGen Core (NGC), NextGen UE (NG UE) as a UE

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connecting to a NextGen system, and a PDU Session as an association between the UE and a data network that provides a PDU connectivity service (which is a service that provides exchange of PDUs between a UE and a data network). (Ex. 1020, 21-22).

60. *TR 23.799* describes a "high level architecture that can be used as a reference model," and the architecture (shown in Figure 4.2.1-1) shows a NextGen UE, a NextGen (R)AN, a NextGen Core, and their reference points. (Ex. 1021, 24).

Ex. 1020, Figure 4.2.1-1

4.2.1 Initial High level architectural view

This clause shows the high level architecture that can be used as a reference model for this study. Figure 4.2.1-1 shows the NextGen UE, NextGen(R)AN, NextGen Core and their reference points.

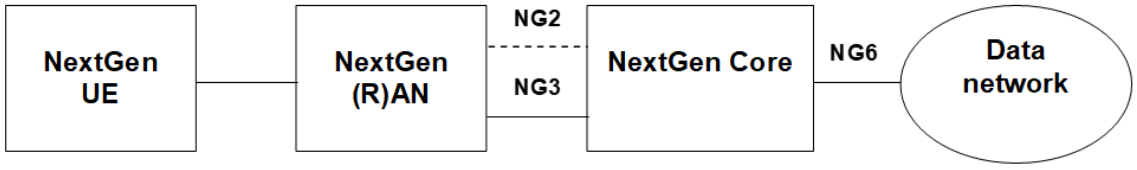


Figure 4.2.1-1: Initial High level architecture view for NextGen System

61. *TR 23.799* defines "NG2" as a "[r]eference point for the control plane between NextGen (R)AN and NextGen Core," "NG3" as a "[r]eference point for the user plane between NextGen (R)AN and NextGen Core," "NG1" as the "[r]eference point for the control plane between NextGen UE and NextGen Core," and "NG6" as the "reference point between the NextGen Core and the data network." (Ex. 1020, 25). A "radio access bearer" is a "service that the access stratum provides to the non-

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access stratum for transfer of user data between User Equipment and CN." (Ex. 1018, 24).

B. Base Stations

62. Prior to the '631 patent's earliest alleged priority date, a person of ordinary skill in the art would have been familiar with base stations (or eNBs, gNBs) and their components.

63. For example, *Huang-Fu* (Ex. 1022) depicts a block diagram of an evolved Node-B, eNB, or base station reproduced below. (Ex. 1022, ¶¶[0030-0031]; FIG. 1). *Huang-Fu* explains that a base unit may also be referred to as "an access point, an access terminal, a base station, a Node-B, an eNode-B, or by other terminology used in the art." (Ex. 1022, ¶[0026]).

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Ex. 1022, FIG. 1 (partial)

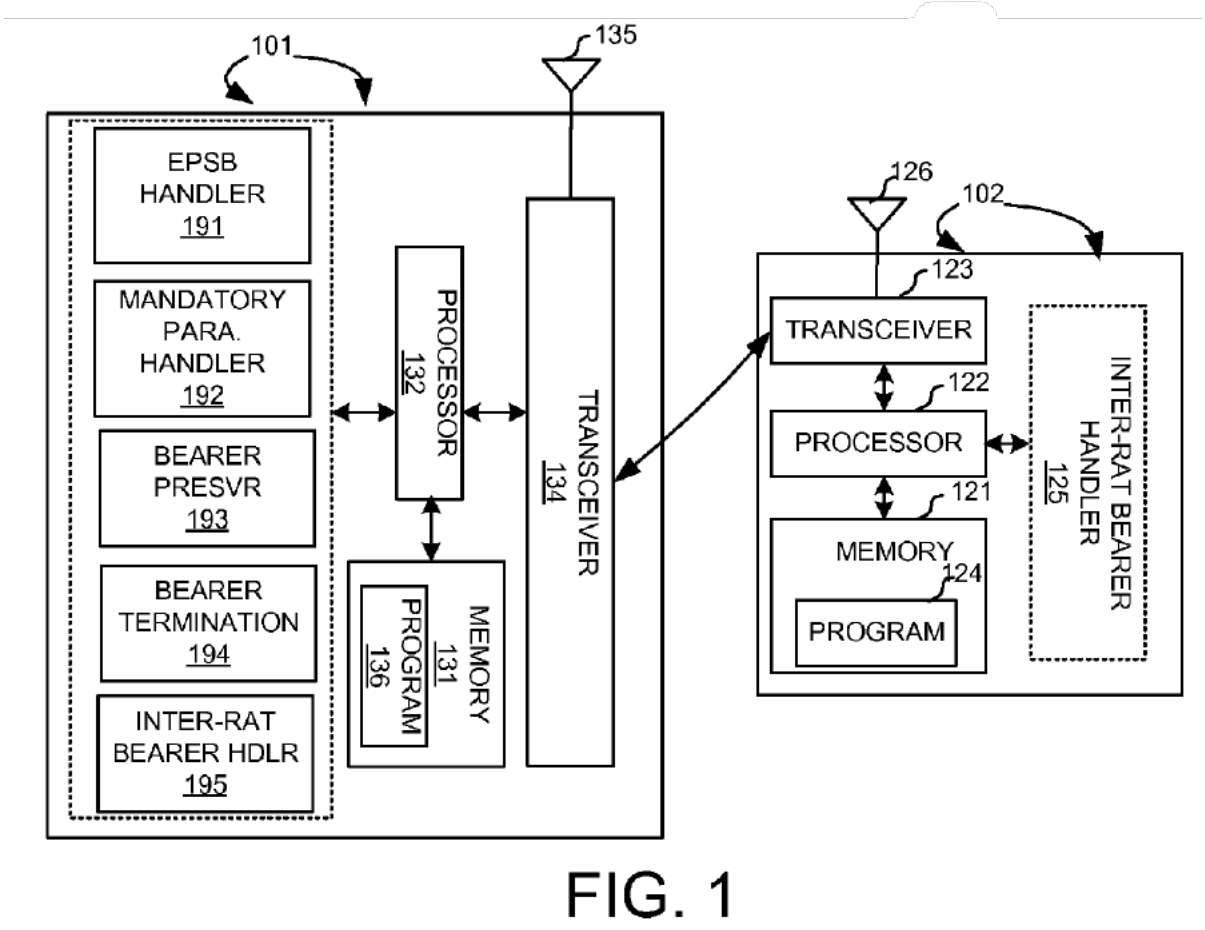


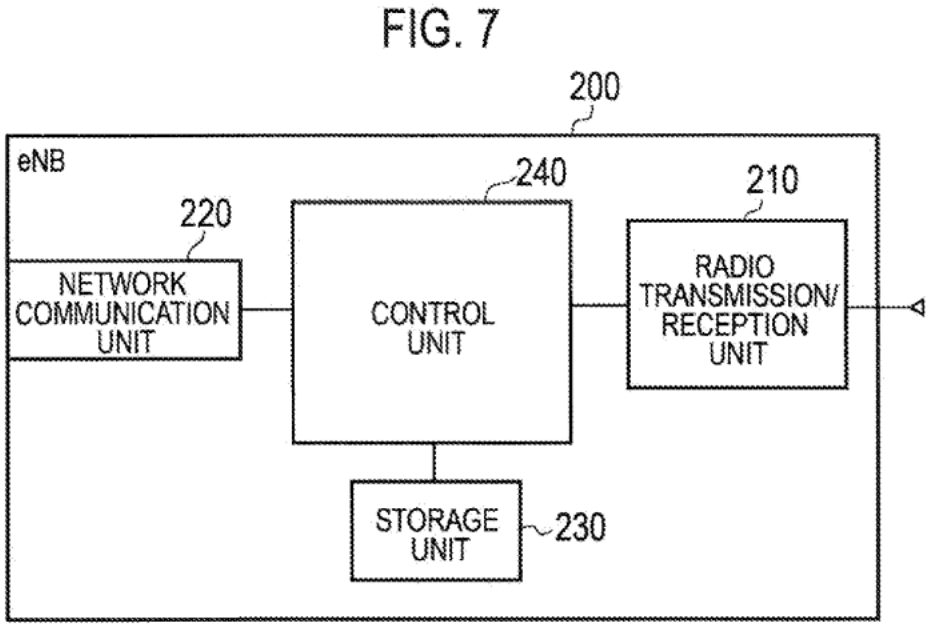
FIG. 1

64. *Huang-Fu* explains what a person of ordinary skill in the art would have understood, that an "eNB 102 has an antenna 126, which transmits and receives radio signals." (Ex. 1022, ¶[0031]). The eNB also includes a "processor 122." *Id.* The eNB also includes an "RF module 123, coupled with the antenna, [which] receives RF signals from antenna 126, converts them to baseband signals and sends them to processor 122." *Id.* The "RF transceiver 123 also converts received baseband signals from processor 122, converts them to RF signals, and sends out to antenna 126." *Id.* The "processor 122" of the eNB "processes the received baseband signals and

invokes different functional modules to perform features in base station 102." *Id.* The eNB also includes "memory 121" which "stores program instructions and data 124 to control operations of base station 102." *Id. Huang-Fu* explains that the "[b]ase station 102 also includes a set of control modules" "that carry out functional tasks." *Id.*

65. As another example, *Fujishiro* (Ex. 1023) depicts a block diagram of a base station, evolved Node-B, or eNB, reproduced below. (Ex. 1023, ¶¶[0056], [0098-0102]; FIG. 7).

Ex. 1023, FIG. 7



66. *Fujishiro* illustrates what a person of ordinary skill in the art would have understood, that an "eNB 200 includes a radio transmission/reception unit 210,

a network communication unit 220, a storage unit 230, and a control unit 240." (Ex. 1023, ¶0098]). *Fujishiro* explains that the "radio transmission/reception unit 210 transmits/receives a radio signal," the "network communication unit 220" "communications with [a] neighboring eNB" "through the X2 interface," and the "storage unit 230 stores various types of information that is used for the control by the control unit 240." (Ex. 1023, ¶¶0099-0101]). *Fujishiro* explains that the "control unit 240 controls various functions of the eNB 200." (Ex. 1023, ¶[0102]).

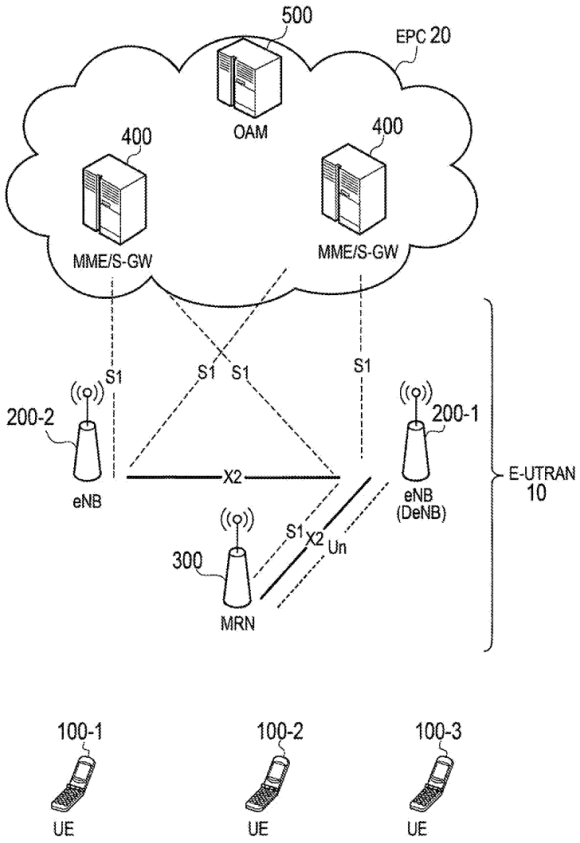
C. Terminal/UE Handover

67. Prior to the '631 patent's earliest alleged priority date, a person of ordinary skill in the art would have been familiar with handover of a UE or terminal from one base station to another base station.

68. For example, *Fujishiro*, with reference to FIG. 1 (reproduced below), explains that, when a UE "moves together with the movement of a user, a change in the serving cell of the UE 100 is necessary." (Ex. 1023, ¶[0060]).

Ex. 1023, FIG. 1

FIG. 1



69. *Fujishiro* explains what a person of ordinary skill in the art would have understood, that the operation "in which the UE 100 changes to serving cell in a connected state" "is called 'handover,'" a "series of procedures of the handover are called a 'handover procedure,'" and that the "handover procedure includes handover preparation step (Preparation), a handover execution step (Execution), and a handover completion step (Completion)." (Ex. 1023, ¶[0060]).

70. *Fujishiro* also explains that, in "the handover procedure, a cell of a handover source is called a 'source cell' and a cell of a handover destination is called

a 'target cell.'" (Ex. 1023, ¶[0061]). *Fujishiro* further explains that "in the handover procedure from a certain eNB" "to another eNB," an "eNB 200 of a handover source is called a 'source eNB' and an eNB 200 of a handover destination is called a 'target eNB.'" (Ex. 1023, ¶[0061]).

71. *Fujishiro* also explains that the "eNB 200 has a decision right of handover for the UE 100 subordinate to the eNB 200," and, more specifically, "the eNB 200 determines whether to perform handover from a serving cell to another cell on the basis of a measurement report from the UE." (Ex. 1023, ¶[0063]).

D. Network Slicing Support

72. Prior to the '631 patent's earliest alleged priority date, a person of ordinary skill in the art would have been familiar with network slicing.

73. As an example, *TR 38.801* defines a "network slice" as a network created by the operator customized to provide an optimized solution for a specific market scenario which demands specific requirements with end to end scope." (Ex. 1013, 7). *TR 38.801* goes on to explain that network slicing "is a new concept to allow differentiated treatment depending on each customer [sic] requirements." (Ex. 1013, 23). With slicing, according to *TR 38.801*, "it is now possible for Mobile Network Operators (MNO) to consider customers as belonging to different tenant types with each having different service requirements that govern in terms of what slice types each tenant is eligible to use based on Service Level Agreements (SLA)

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and subscriptions." (Ex. 1013, 23). That is, network slicing is the ability to deploy and use simultaneously different core networks, each one specialized in the provisioning of a given set of services and/or a given set of subscribers.

74. As yet another example, *TR 23.799* defines a network slice as a concept describing a system behavior which is implemented via network slice instances, a network slice instance as an instance created from a network slice template, and a network slice template as a logical representation of a network function and corresponding requirements necessary to provide the required telecommunication services and network capabilities. (Ex. 1020, 21).

E. NAS and RRC Messaging in Mobile Networks

75. Prior to the '631 patent's earliest alleged priority date, a person of ordinary skill in the art would have been familiar with NAS and RRC messaging.

76. A person of ordinary skill in the art would have been familiar with encapsulating NAS messages in RRC messages. For example, Figure 5.4 of LTE-Advanced depicts an example of encapsulation of "NAS signaling/messages in RRC messages." (Ex. 1021, 250).

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Ex. 1021, Figure 5.4

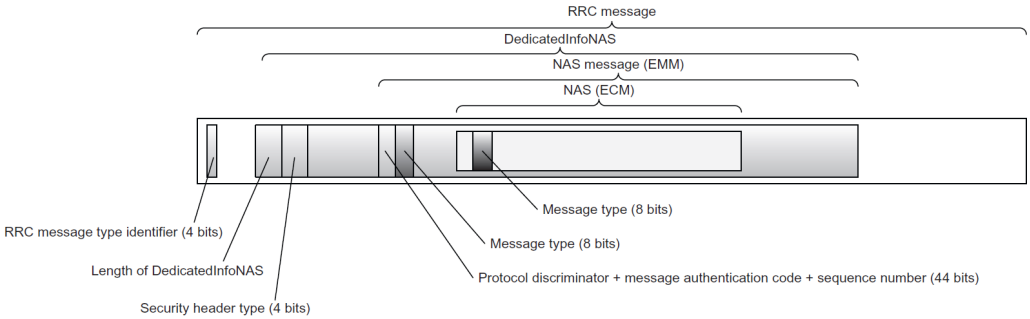


FIGURE 5.4

Encapsulation of NAS signaling/messages in RRC messages [27].

77. Figure 5.5 of LTE-Advanced depicts a "sequence of signaling for RRC connection setup, reconfiguration, and release." (Ex. 1021, 239).

Ex. 1021, Figure 5.5

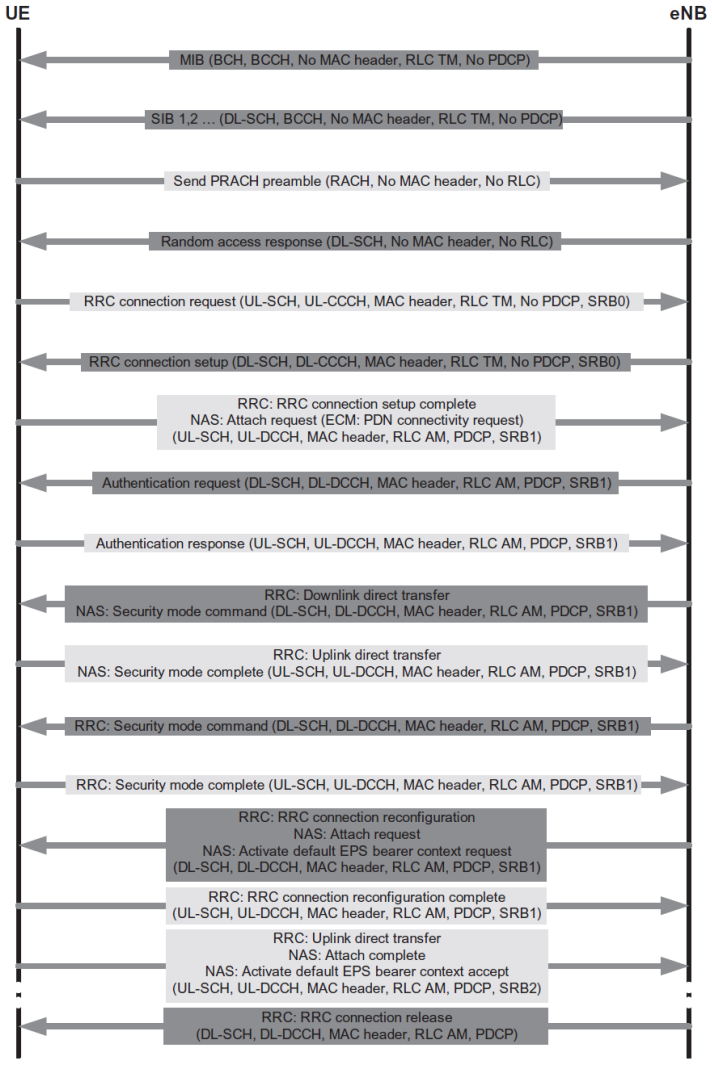


FIGURE 5.5

Sequence of signaling for RRC connection setup, reconfiguration, and release [27].

78. With reference to Figure 5.5, LTE-Advanced explains:

The NAS layer in the UE (see Figure 5.3) triggers connection establishment, which may be in response to a paging message. If the access is not barred, the lower layers in the UE perform a contention-based random access procedure. If the contention-based random access procedure is successful, the UE sends the RRC Connection

> Request message. This message includes an initial identity, which is typically the UE's system architecture evolution temporary mobile subscriber identity (S-TMSI) or a random number. If E-UTRAN accepts the connection request, it returns the RRC Connection Setup message that includes the initial radio resource configuration including SRB1. Instead of signaling each individual parameter, the E-UTRAN may order the UE to apply a default configuration, i.e., a configuration for which the parameter values are specified in the RRC specification. The UE responds with the RRC Connection Setup Complete message with an encapsulated NAS message, an identifier of the selected PLMN, and an identifier of the registered MME. Based on the last two parameters, the eNB decides with which MME it should establish the S1 connection. (Ex. 1021, 251).

79. A person of ordinary skill in the art would have further been familiar with the routing of NAS and RRC messages among UEs, base stations, and core network entities, and the discussions regarding the same in the context of network slicing support. For example, in a proposed architecture in *TR 23.799*, the "control plane of the NextGen Core is partitioned into two types of Network Functions (NFs)," the "Common Control Plane Network Functions (CCNFs)," and the "Slice-specific Control Plane Network Functions (SCNFs)." (Ex. 1020, 60). *Id.* The CCNFs "is a group of functions that are shared across the slices concurrently supported for a UE," and "Slice Specific Network Functions" (SSNFs) "is the set of functions of a Network Slice that are not shared with other Network slices concurrently supported

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for a UE." (Ex. 1020, 64). The SSNFs include control plane (CP) functions applicable to a SSNF and user plane (UP) functions applicable to a SSNF. *Id.*

80. *TR 23.799* details scenarios in which a UE accesses a network slice instance (NSI). (*See, generally,* Ex. 1020, 66-73). An example of such a scenario is depicted in Figure 6.1.2.2.3.2-1 below.

Ex. 1020, Figure 6.1.2.2.3.2-1

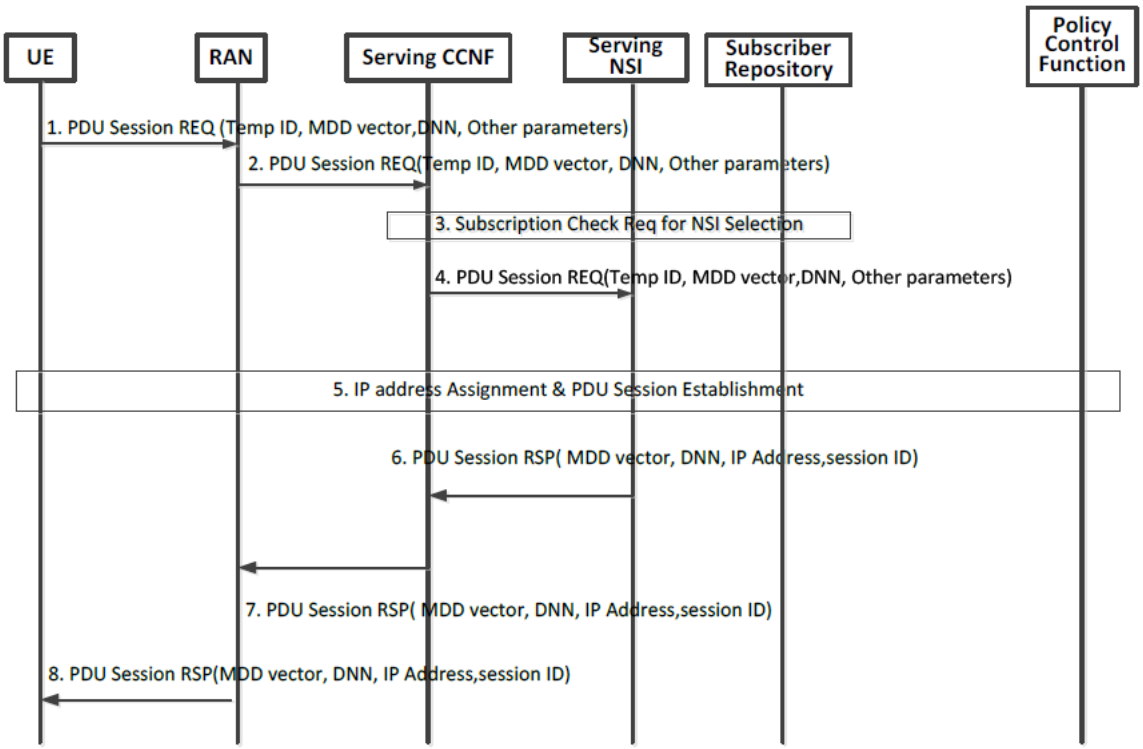


Figure 6.1.2.2.3.2-1: Subsequent PDU Session Request Slicing Procedures

81. Shown in Figure 6.1.2.2.3.2-1, a "UE initiates a Session Modification Request procedure after [a] PDU session was established in [a] target NSI, so it sends a Session Modification Request message including its Temporary ID, the MDD vector of the NSI and the Session ID and the related parameters (e.g QoS)." (Ex.

1020, 69). The "MDD vector is included since a specific NSI needs to be addressed by the NAS procedure." *Id.* The "UE includes at least the routing field of the Temporary ID in the RRC layer message for the RAN to route the NAS Message to the appropriate Serving CCNF." *Id.* That is, the UE sends information about the network slice instance in an NAS message encapsulated in an RRC layer message, and the RAN uses the Temporary ID in the RRC layer message to route the NAS Message to the appropriate control plane network function. *Id.*

VII. SUMMARY OF THE '631 PATENT

A. The '631 Patent's Specification

82. The '631 patent is titled "Method for Processing Data on Basis of Network Slice, and Apparatus Therefor" and discloses a "method of a base station for controlling transmission and reception of data through a network slice." (Ex. 1001, Abstract). The '631 patent discloses "a technology for network slicing in a next generation mobile communication network," and "a technology for providing services using network slicing to moving user equipments without interruption." (Ex. 1001, 1:20-24).

83. The '631 patent acknowledges that "[m]obile communication systems employing technologies related to 3rd generation partnership project (3GPP), such as Long Term Evolution (LTE), LTE-Advanced, fifth generation (5G), or the like, have been designed for transmitting and receiving a large amount of various data,

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sch as video data, radio data, or the like, at a high-speed." (Ex. 1001, 1:31-36). The '631 patent further acknowledges that "after LTE-Advanced, technologies for next generation radio access networks have been developed for enabling a user equipment to transmit and receive even more data at higher speed and providing higher quality of service (QoS)," including that "many development groups related to 3GPP have been introducing various 5G network technologies." (Ex. 1001, 1:37-43).

84. The '631 patent acknowledges that there were, at the time, "many researches and studies in progress for developing a service-oriented next generation mobile communication network employing network slicing technology in order to improve the efficiency of utilizing network resources, effectively accommodate a mobile service with various requirements, and guarantee quality of an end-to-end service to even user equipments." (Ex. 1001, 1:44-50). The '631 patent purports to identify problems relating to "mobility guarantee of the user equipment and transmission/reception procedures of data in case the network slicing technology is employed," alleging that "a specific procedure for service continuity and service stability" "is necessary to develop." (Ex. 1001, 1:51-55).

85. The '631 patent purports to solve these alleged problems by disclosing "a procedure of a user equipment and a base station for providing services based on network slicing, and a procedure for controlling the mobility of the user equipment using services based on the network slicing." (Ex. 1001, 1:62-66). The '631 patent

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purports to provide a solution including a "base station" "for controlling data transmission and reception through a network slice." (Ex. 1001, 2:29-39). The "base station" includes "a receiver receiving network slice request information from a user equipment configured with the network slice," and "a controller controlling the network slice request information to be transferred to a core network entity." *Id.* The "receiver further receives specific network slice information that is configured based on the network slice request information from the core network entity." *Id*.

86. The '631 patent purports to provide effects including that "services may be provided through network slicing with service interruption reduced or prevented," and "a user equipment and a base station may provide services through network slicing, resulting in the user equipment processing a large amount of data at an even higher speed." (Ex. 1001, 2:50-59).

87. The '631 patent describes "[t]ypical mobile communication networks," "such as 4G mobile communication network (e.g., LTE)," as including "a core network and an access network linked through physical network entities." (Ex. 1001, 7 :33-43). As a result, the '631 patent explains, "the efficiency of utilizing network resources reduces, and it is not easy to change configurations of the communication network." *Id.* The '631 patent recognized that "[r]ecently, discussions [had] been conducted on a service-oriented next generation mobile communication network employing a network slicing technology for effectively accommodating a mobile

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service with various requirements, and guaranteeing quality of an end-to-end service to even UEs." *Id.*

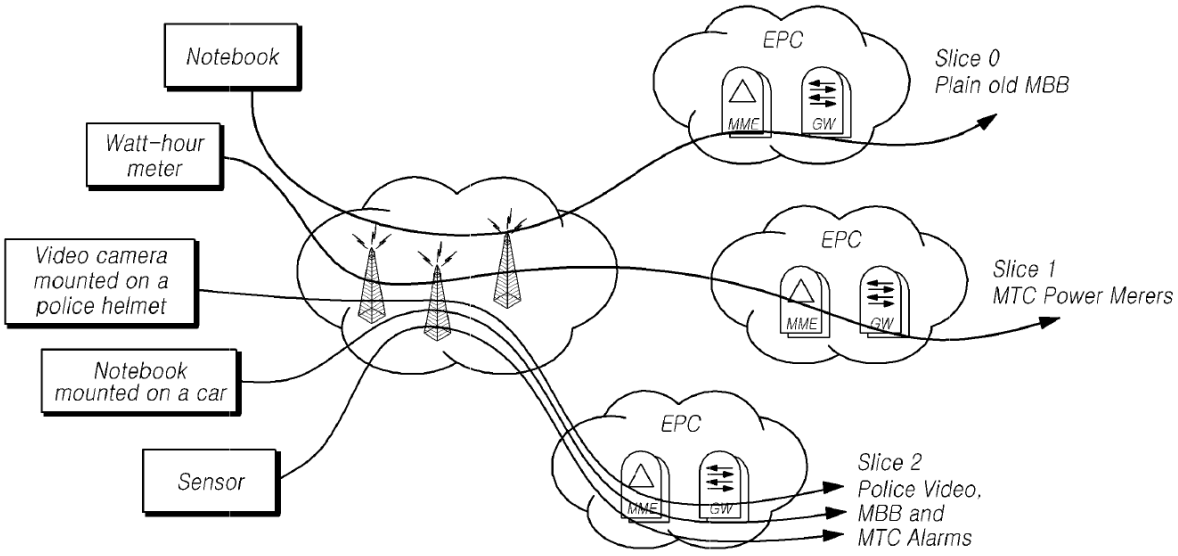
88. The '631 patent describes "network slicing" as "a technology for improving flexibility by dividing a network into multiple types of virtual networks using network virtualization technologies and configuring a separate logical network for each service or subscriber." (Ex. 1001, 7:44-57). The '631 patent goes on to explain that, "[w]ith network slicing, a needed resource may be allocated from a virtualized network resource pool according to a service type," and, therefore, "when a new service is introduced, it is possible to provide the service rapidly without a physical network established, and to use efficiently limited physical network resources." *Id.* Thus, "network slicing enables a logical network to be implemented in an infrastructure shared among multiple network slices, compared with establishing an independent network slicing infrastructure." *Id.*

89. With reference to FIG. 1 (reproduced below), the '631 patent describes "a plurality of slices configured in a network infrastructure." (Ex. 1001, 7:58-59; FIG. 1).

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Ex. 1001, FIG. 1

FIG. 1



90. Also referring to FIG. 1, the '631 patent describes a "service for connecting a notebook to the Internet through mobile broadband (MBB), a data service of watt-hour meter using machine type communications (MTC), a service for a video camera mounted on a police helmet and a notebook located on a police car, a data service of an MTC sensor, and the like," which "may be individually and dependently provided through a plurality of slices configured in a network infrastructure." (Ex. 1001, 7:60-67). Thus, "network resource utilization, etc. may be improved by slicing and providing the network resource for each individual service." (Ex. 1001, 7:67-8:2).

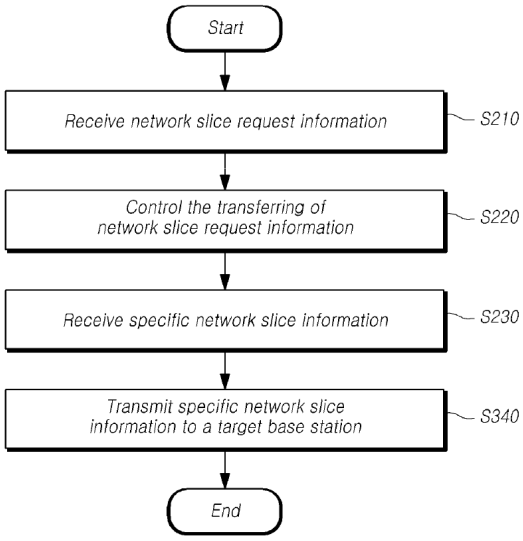
91. According to the ’631 patent, “network slicing allows differentiated treatment depending on each customer requirements,” and “or mobile network operators (MNO) to consider customers as belonging to different tenant types with each having different service requirements that govern in terms of what slice types each tenant is eligible to use based on service level agreement (SLA) and subscriptions.” (Ex. 1001, 8:3-9). However, according to the ’631 patent, a “specific procedure is needed for a UE to transmit and receive data through a specific network slice or one or more network slices provided over a shared infrastructure,” and one had allegedly “not been proposed or developed yet,” making it “impossible to guarantee the service continuity when a cell change is required as the UE moves.” (Ex. 1001, 8:10-21).

92. With reference to FIG. 3 (reproduced below), the ’631 patent illustrates “operations of a base station.” (Ex. 1001, 12:13-24).

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Ex. 1001, FIG. 3

FIG.3



93. In FIG. 3, "the base station may receive network slice request information from a UE configured with a network slice at step S210, control the network slice request information to be transferred to be a core network entity at step S220, receive specific network slice information that is configured based on the network slice request information from the core network entity at step S230, and transmit the specific network slice information to a target base station at step S340." (Ex. 1001, 12:16-24).

94. The '631 patent also describes that, "[a]fter the base station has received the specific network slice information from the core network entity, the base station may transmit the specific network slice information to the target base

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station." (Ex. 1001, 12:28-36). Then, "when the target base station receives the specific network slice information, the target base station may generate a handover command for the UE based on at least one of the specific network slice information and network slice information allowed by the target base station." (Ex. 1001, 12:38-45).

95. The '631 patent describes an embodiment in which slice information is transferred to a target base station during a handover. (Ex. 1001, 17:50-19:33). The '631 patent explains that, "[w]hile a UE in the RRC connected state transmits and receive [sic] data through a specific network slice, a handover may be performed as the UE moves," and "recognizing that a neighboring cell supports the corresponding slice may be helpful for a 5G cell/base station/network to allow the UE to be handed over." (Ex. 1001, 17:54-59).

96. In the embodiment in which slice information is transferred to a target base station during a handover, the '631 patent explains that "the network slice request information may be transmitted with being included in a handover request message," "in a handover preparation message," or "in AS-context information of the handover preparation message." (Ex. 1001, 18:27-41).

97. The '631 patent goes on to explain that, "when a target cell/base station does not support/allow a corresponding network slice, the target base station may include information for indicating this in a handover response inter-base station

interface (Xn) message or a handover command Inter-node RRC message." (Ex. 1001, 18:42-51). As another example, the '631 patent explains that "failed network slice information that is not supported/allowed by the target cell/base station may be included in the handover response inter-base station interface (Xn) message or the handover command inter-node RRC message." *Id.*

98. The '631 patent provides an additional example in which, "when a target cell/base station has received the configured network slice information through a source cell/base station, and when the target cell/base station does not support/allow network slicing or does not provide the corresponding configured network slice through the network slicing, or the source cell and the target cell are included in different network slice areas from each other, the target base station may transfer, to the source base station, the handover response inter-base station interface (Xn) message including information for indicating not supporting/allowing the network slice received through the source base station." (Ex. 1001, 18:52-62).

99. The '631 patent also states that, "when the target cell/base station has received the information through the source cell/base station, and when the target cell/base station does not support/allow network slicing or does not provide the corresponding configured network slice through the network slicing, the target base station may transfer a handover command inter-node RRC message including information for indicating this to a corresponding UE." (Ex. 1001, 18:62-19:3). As

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another example, "the source base station may not determine the handover to the target base station." (Ex. 1001, 19:3-5).

B. The '631 Patent's Prosecution History

100. Below is a brief summary of the '631 patent's prosecution history. This summary is not intended to address or summarize the '631 patent's entire prosecution history. Rather, it is intended to summarize the parts that may be relevant to my analysis below.

101. U.S. Patent Application No. 17/314,064 (the "'064 application") was filed May 7, 2021, and is a continuation of U.S. Patent Application No. 16/346,987 ("the '987 application") (which issued as U.S. Patent No. 11,044,777 ("the '777 patent")), which is a national stage entry of Application No. PCT/KR/2017/012319 ("the '319 PCT application"), which claims priority to KR Provisional Application No. 10-2017-0142205 ("the 2017 KR priority document"), filed October 30, 2017, and to KR Provisional Application No. 10-2016-0146054 ("the 2016 KR priority document"), filed November 3, 2016. (Ex. 1001, Cover).

102. On May 7, 2021, the Applicant filed the '064 application, including original claims 1-18. (Ex. 1002, 356-433). On October 14, 2022, the Examiner issued a Non-Final Office Action, in which claims 1-18 were rejected on the ground of nonstatutory double patenting over claims 1-16 of the '777 patent, and in which the Examiner indicated claims 1-18 were otherwise allowable over the prior art. (Ex.

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1002, 91-99). The Examiner specifically stated that 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 [sic] by the target BS." (Ex. 1002, 96). On November 10, 2022, the Applicant responded and filed a Terminal Disclaimer over the '777 patent. (Ex. 1002, 79-90). A Notice of Allowance was mailed December 5, 2022. (Ex. 1002, 68).

C. The '777 Patent's Prosecution History

103. As noted above, the patent at issue, the '631 patent, is a continuation of the '777 patent. Below is a brief summary of the '777 patent's prosecution history. This summary is not intended to address or summarize the '777 patent's entire prosecution history. Rather, it is intended to summarize the parts that may be relevant to my analysis below.

104. The '319 PCT application was filed November 2, 2017. (Ex. 1010, 1). The '987 application was filed May 2, 2019, as a national stage entry of the '319 PCT application. (Ex. 1010, 208, 214). The '319 PCT application claims priority to KR Provisional Application No. 10-2017-0142205 ("the 2017 KR priority document"), filed October 30, 2017, and to KR Provisional Application No. 10-2016-0146054 ("the 2016 KR priority document"), filed November 3, 2016. (Ex.

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1010, 214). The ’987 application ultimately issued as the ’777 patent. (Ex. 1009, Cover).

105. On May 2, 2019, the Applicant filed a preliminary amendment, amending the specification to include the priority claim, canceling originally filed claims 1-20, and presenting new claims 21-39. (Ex. 1010, 214-219).

106. On October 14, 2020, the Examiner issued a Non-Final Office Action rejecting claims 1, 3-7, 9-11, 13-17, 19, and 20 under 35 U.S.C. § 102 over U.S. Publication No. 2018/0007552 to Bae et al. (“Bae”), rejecting claims 1-20 under 35 U.S.C. § 102 over U.S. Publication No. 2018/0124854 to Myhre et al. (“Myhre”), and rejecting claims 2, 8, 12, and 18 under 35 U.S.C § 103 over Bae in view of U.S. Publication No. 2016/0353465 to Vrzic et al. (“Vrzic”). (Ex. 1010, 394-406).

107. On November 20, 2020, the Examiner replaced the October 14, 2020 Office Action with a new Office Action in which claims 21, 23-24, 27, 29-31, and 34 were rejected under 35 U.S.C. § 102 over Bae, claims 21-24, 27-31, and 33-34 were rejected under 35 U.S.C. § 102 over Myhre, and claims 22, 28, 32, and 25-26 were rejected under 35 U.S.C § 103 over Bae in view of Vrzic. (Ex. 1010, 414-424). The Examiner also indicated claims 37 and 38 were directed to allowable subject matter. (Ex. 1010, 424).

108. On January 11, 2021, the Applicant responded and amended independent claim 21 to include identified allowable subject matter from claim 37,

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including "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." (Ex. 1010, 430). Independent claims 27 and 31 were similarly amended, dependent claims 25, 35, and 37 were canceled, and dependent claims 26, 36, and 38 were amended to update dependencies. (Ex. 1010, 427-435).

109. A Notice of Allowance was mailed February 24, 2021. (Ex. 1010, 459-468).

D. Priority Date of the '631 Patent

110. My opinions set forth herein demonstrate that the claims of the '631 patent are obvious over the prior art whether the '631 patent is determined to have (1) a priority date of no earlier than October 30, 2017, or (2) a priority date of November 3, 2016.

111. I have reviewed the 2016 Korean Provisional application to which the '631 patent claims priority (Ex. 1006, the "2016 KR priority document") and confirm the 2016 KR priority document does not describe at least one limitation recited in the independent claims of the '631 patent in a manner that would have

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reasonably conveyed to a person of ordinary skill in the art that the inventor had possession of the claimed subject matter. Accordingly, I understand that the '631 patent is not entitled to a priority date as early as November 3, 2016. My analysis of the 2016 KR priority document with respect to certain limitations recited in the claims of the '631 patent is set forth below.

1. Independent Claims

112. Independent claims 1, 7, and 13 of the '631 patent recite, *inter alia*, "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." The 2016 KR priority document does not disclose such a feature, nor does the 2016 KR priority document reasonably convey to a person of ordinary skill in the art that the inventor had possession of such a feature.

113. At best, the 2016 KR priority document describes the concept of network slicing but not explicitly in connection with PDU sessions, and certainly does not disclose any concept of a rejection of PDU sessions based on a network slice associated therewith not being supported. Specifically, the 2016 KR Priority document merely describes "a data transmission-reception method based on network slicing in a (next-generation) mobile communication network," and "transmitting

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and received [sic] data based on network slicing while minimizing service disruption due to the movement of a terminal between cells," (Ex. 1006, ¶[0031]), and such description would not have reasonably conveyed to the person of ordinary skill in the art that a PDU session associated with an unsupported network slice would have been rejected by a target base station.

114. At best, the 2016 KR priority document describes a "Scenario 1," where a terminal "[m]oves from a network slicing transmission cell to a cell that does not support network slicing." (Ex. 1006, ¶¶[0044-0046]). In "Scenario 1," the 2016 KR priority document describes, "[w]hile in the source cell," "the terminal can allow the neighboring cells to which the terminal intends to move to know whether network slicing is supported based on the system information associated with the network slicing of the neighboring cell," "or the instruction information from which it can be confirmed whether network slicing is supported by the neighboring cell." *Id.* The 2016 KR priority document does not provide further definition or explanation of what "instruction information" includes. The 2016 KR priority document concludes "Scenario 1" with, "[i]f the neighboring cell to which the terminal intends to move does not support network slicing, the terminal may request network slicing services." *Id.* That is, in "Scenario 1," the 2016 KR priority document, at best, describes a terminal receiving an indication as to whether network slicing is supported or is not supported by a neighboring cell. To be clear, the 2016 KR priority document

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describes a cell itself that either does or does not support network slicing, and does not reasonably covey support or lack thereof by the cell that is on a PDU session by PDU session basis.

115. The 2016 KR priority document describes a "Scenario 2," where a terminal "[m]oves from a network slicing transmission cell to a network slicing transmission cell." (Ex. 1006, ¶¶[0047-0048]). In "Scenario 2," the 2016 KR priority document describes, "[w]hile in the source cell," "the terminal can allow the neighboring cells to which the terminal intends to move to know whether network slicing is supported based on the system information associated with the network slicing of the neighboring cell," "or the instruction information from which it can be confirmed whether network slicing is supported by the neighboring cell." *Id.* The 2016 KR priority document does not provide further definition or explanation of what "instruction information" includes. As with "Scenario 1," in "Scenario 2," the 2016 KR priority document, at best, describes a terminal receiving an indication as to whether network slicing is supported or is not supported by a neighboring cell as a whole and does not reasonably convey support or specific rejection on a PDU session by PDU session basis to a person of ordinary skill in the art.

116. The 2016 KR priority document states that a "terminal can allow the slice information to be included in the interest information," or "the terminal can have one or more information from among the slice information received via system

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information, pre-configured in the terminal, or received via RRC connection reconfiguration message, information for identifying the service/session/bearer linked to the slice information, and priority information for the corresponding network slice included in the interest information." (Ex. 1006, ¶[0062]). In this passage, the 2016 KR priority document describes, at best, that "information for identifying the service/session/bearer linked to the slice information" is either included in interest information by a terminal, received by the terminal via system information, pre-configured in the terminal, or received by the terminal via a RRC connection reconfiguration message. That the terminal may receive or have pre-configured information for identifying a "service/session/bearer" linked to "slice information" does not convey to the person of ordinary skill in the art any sort of support or lack thereof by a target base station of network slicing on a PDU session by PDU session basis. Moreover, this portion of the disclosure says nothing about rejection nor does it reasonably convey anything about rejection.

117. The 2016 KR priority document states that, "[d]uring handover preparation, the source base station can forward the network slice information" "to the target base station." (Ex. 1006, ¶[0078]). The information can be sent as included in "a handover request message," "in a handover preparation message," or "in the AS-Context information of the Handover Preparation message." Ex. 1006, ¶¶[0081-0083]). This disclosure of the 2016 KR priority document merely conveys that

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network slice information was shared; and does not convey anything about support or lack thereof on a PDU session by PDU session basis, let alone anything about rejection.

118. The 2016 KR priority document states that, "if the target cell/base station does not support network slicing, the target base station may include information to give an instruction in the handover response X2 message or the handover command inter-node RRC message." (Ex. 1006, ¶[0085]). The 2016 KR priority document describes:

> [0086] As one example, if the target cell/base station receives the information described above via the source cell/base station, and when the target cell/base station does not support network slicing, or does not provide the network slice via network slicing, the target base station may transmit the information to the source base station as included in the handover response X2 message. As another example, when the target cell/base station receives the information described above via the source cell/base station, and when the target cell/base station does not support network slicing, or does not provide the corresponding interest group communication via network slicing, the information may be forwarded to the terminal to give an instruction in the handover command internode RRC message.

(Ex. 1006, ¶[0086]). That is, the 2016 KR priority document describes, at best, a target base station including "information to give an instruction" in a response message when the target base station does not support network slicing or does not provide a network slice via network slicing. To be clear, in the passage of ¶[0086], the 2016 KR priority document states that "the target base station may transmit the information to the source base station as included in the handover response X2

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message" "when the target cell/base station does not support network slicing, or does not provide the network slice via network slicing." (Ex. 1006, ¶[0086]). That the "target cell/base station" "does not support network slicing" is not a description of the "target cell/base station" not supporting network slicing specific to a PDU session, nor would it have reasonably conveyed to the person of ordinary skill in the art that a "target cell/basis station" did not support network slicing specific to a PDU session. That the "target cell/base station" "does not provide the network slice via network slicing" is not a description of, nor would it have reasonably conveyed to a person of ordinary skill in the art, the "target cell/base station" not supporting network slicing specific to a PDU session. Moreover, with respect to the mention in ¶[0086] of "when the target cell/base station does not provide the corresponding interest group communication via network slicing," the 2016 KR priority document provides no further description of "interest group communication," nor of "group communication," therefore "corresponding interest group communication" does not imply or convey to a person of ordinary skill in the art PDU session specific slice information.

119. The 2016 KR priority document, just the like the '631 patent itself, makes no mention of a rejection, let alone "information for indicating a rejection of one or more PDU sessions." To be clear, the 2016 KR priority document, at best, describes either supporting or not supporting network slicing and conveying that

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information, and says nothing about rejecting a cell let alone a specific PDU session. The 2016 KR priority document does not disclose or reasonably convey the concept of rejection, let alone specific rejection of a PDU session. Thus, the 2016 KR priority document is silent as to a "handover request confirmation message" that "includes information for indicating a rejection of the one or more PDU sessions by the target BS." Because the 2016 KR priority document does not disclose "protocol data unit (PDU) sessions" specifically being associated with "network slices," a person of ordinary skill in the art would not have thought that the inventors were in possession of "one or more PDU sessions" being rejected, nor a handover request confirmation message including information for indicating a rejection of one or more PDU sessions, as is required by the independent claims.

120. Indeed, in a scenario described in the 2016 KR priority document in which a terminal moves to a cell where network slicing is not supported, the 2016 KR priority document describes that "the terminal may request network slicing services using an application server for supporting network slicing via unicast while receiving the service via network slicing in the source cell." (Ex. 1006, ¶[0046]). Further, in the other scenario in the 2016 KR priority document where a "target cell/base station does not support network slicing, or does not provide the network slice via network slicing, the target base station may transmit the information to the source base station." (Ex. 1006, ¶[0086]). The 2016 KR priority document describes

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that, in such a scenario, "the information may be forwarded to the terminal to give an instruction in the handover command internode RRC message." *Id.* The 2016 KR priority document makes no mention of a rejection in either scenario. Moreover, the 2016 KR priority document, at best, describes information about supporting network slicing at the cell level and not at the session level. These passages do not reasonably convey to a person of ordinary skill in the art that a PDU session associated with an unsupported network slice would be rejected.

121. Independent claims 1, 7, and 13 of the '631 patent recite, *inter alia*, "deciding, by a source base station (BS), whether to perform a handover," and "transmitting, from the source BS to a target BS, a handover request message when it is decided to perform the handover." The 2016 KR priority document does not disclose or reasonably convey such a feature – specifically, the 2016 KR priority document does not disclose a decision regarding whether to perform a handover that occurs prior to a handover request message being transmitted from the source BS to the target BS.

122. The terms "decide," "deciding," and "whether to perform a handover" only appear in the independent claims of the '631 patent and do not appear anywhere in the specification nor the figures of the '631 patent, and the term "decide" appears once in the 2016 KR priority document. The 2016 KR priority document, like the '631 patent, only makes mention of a situation where the "source base station may

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not decide to handover to the target base station," and the situation arises after the "target cell/base station receives [] information" via a "handover request message" or "handover preparation message," and responds to the source base station with a "handover response X2 message." (Ex. 1006, ¶¶[0081-0087]) (*see also* Ex. 1001, 18:52-19:5 ("the source base station may not determine the [sic] handover to the target base station," where the situation arises in "when the target cell/base station does not support/allow network slicing or does not provide the corresponding configured network slice through the network slicing.")). That is, the 2016 KR priority document, at best, describes a source base station "not decid[ing] to handover to the target base station" ***after*** the source base station has transmitted a handover request message to the target base station and received a handover response message from the target base station. Because the 2016 KR Priority document only describes a source base station "not decid[ing] to handover to the target base station" after the source base station has transmitted a hdnvoer request to the target base station and received a handover response message from the target base station, the disclosure of the 2016 KR priority document would not have reasonably conveyed to a person of ordinary skill in the art at the time that the inventors were in possession of a source base station deciding whether to perform a handover prior to sending a handover request message to a target base station. The 2016 KR priority document does not disclose or reasonably convey "deciding, by a

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source base station (BS), whether to perform a handover," and then "transmitting, from the source BS to a target BS, a handover request message when it is decided to perform the handover."

123. Accordingly, because it is my conclusion that the 2016 KR priority document does not provide support for at least one limitation recited in the independent claims of the '631 patent (i.e., the 2016 KR priority document does not reasonably convey to the person of ordinary skill in the art that the inventors had possession of the invention), I've been asked to assume that at least the independent claims of the '631 patent are entitled to a priority date no earlier than October 30, 2017.

2. Dependent Claims

124. Dependent claims 2, 8, and 14 require that a "non-access stratum (NAS) message including network slice request information" be received. Dependent claim 2 requires that the "non-access stratum (NAS) message including network slice request information" be received "by the source BS from a user equipment (UE)." Dependent claims 8 and 14 require that the "processor" "performs to" receive the "non-access stratum (NAS) message including network slice request information." Dependent claims 4, 10, and 16 require that the "NAS message including the network slice request information" of dependent claims 2, 8, and 14, respectively, be "included in a radio resource control (RRC) connection setup completion

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message." The 2016 KR priority document does not disclose or reasonably convey such features.

125. At best, the 2016 KR priority document describes providing "interest information" by "incorporating new fields into one or more RRC messages from among the UE assistance messages, RRC connection setup request messages, RRC connection setup completion messages, or provided via new RRC messages." Ex. 1006, ¶[0063]. The 2016 KR priority document describes that "slice information" can be "included in the interest information." Ex. 1006, ¶[0062]. However, the 2016 KR priority document makes no mention of a "non-access stratum (NAS) message" nor a "radio resource control (RRC) connection setup message" in which a "non-access stratum (NAS) message" is included. Indeed, the "non-access stratum (NAS) message" does not appear until the 2017 KR priority document. *See* Ex. 1008, ¶[0073], [0086], [0106], [0130], [0151], Claims 3, 9, 13, 19.

126. Accordingly, because it is my opinion that the 2016 KR priority document does not provide support for at least one limitation recited in dependent claims 2, 4, 8, 10, 14, and 16 of the '631 patent (i.e., the 2016 KR priority document does not reasonably convey to the person of ordinary skill in the art that the inventors had possession of the invention), I've been asked to assume that dependent claims 2, 4, 8, 10, 14, and 16 of the '631 patent are entitled to a priority date no earlier than October 30, 2017.

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E. Claim Construction of the ’631 Patent

127. I have been informed that claim terms are typically given their plain and ordinary meanings, as would have been understood by a person of ordinary skill in the art at the time of the earliest alleged priority date. I have further been informed that when considering the meaning of any terms in the challenged claims of the ‘631 Patent, I should apply the plain and ordinary meaning of those terms. I have further been informed that in considering the meaning of the claims, one must consider the language of the claims, the specification, and the prosecution history of record.

128. I have been informed that in general, a preamble limits the invention if it recites essential structure or steps, or if it is necessary to give life, meaning, and vitality to the claim. I have further been informed that a preamble is not limiting where a patentee defines a structurally complete invention in the claim body and uses the preamble only to state a purpose or intended use for the invention. I have further been informed that dependence on a particular disputed preamble phrase for antecedent basis may limit claim scope because it indicates a reliance on both the preamble and claim body to define the claimed invention. I have further been informed that clear reliance on the preamble during prosecution to distinguish the claimed invention from the prior art transforms the preamble into a claim limitation because such reliance indicates use of the preamble to define, in part, the claimed invention.

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VIII. SUMMARY OF THE PRIOR ART

A. *R3-173152* (Ex. 1011)

129. "Xn based mobility across RA," ("*R3-173152*", Ex. 1011) is a contribution by Huawei for the 3GPP TSG-RAN WG3 Meeting #97 in Berlin, Germany, held August 21-25, 2017. (Ex. 1011, 1).

130. *R3-173152* was published August 11, 2017. (Ex. 1011, 1; Ex. 1012, ¶¶52-57). Thus, based on my finding that the '631 patent is entitled to a priority date of no earlier than October 30, 2017 (*see* § VII.D *supra*), I understand *R3-173152* is prior art under at least 35 U.S.C. § 102(a) (AIA).

131. *R3-173152* is directed to "the Xn based handover procedure by taking the slice availability into account." (Ex. 1011, 1 "1 Introduction"). *R3-173152* contemplates that, "[g]iven that NW slice could be deployed in only part of the whole network, it is likely that target node cannot support the same NW slice(s) the UE is in question at the source node." (Ex. 1011, 1 "Introduction"). *R3-173152* explains that an assumption at the time was that "slice configuration does not change within the UE's registration area." (Ex. 1011, 1 "Discussion). *R3-173152* goes on to say that, following such an assumption, when a "UE is moving to the boundary of registration areas that support different slices, the effect of slice availability for handover needs to be considered." (Ex. 1011, 1 "2 Discussion"). That is, *R3-173152* recognized that the current assumption only provided for a scenario where a UE

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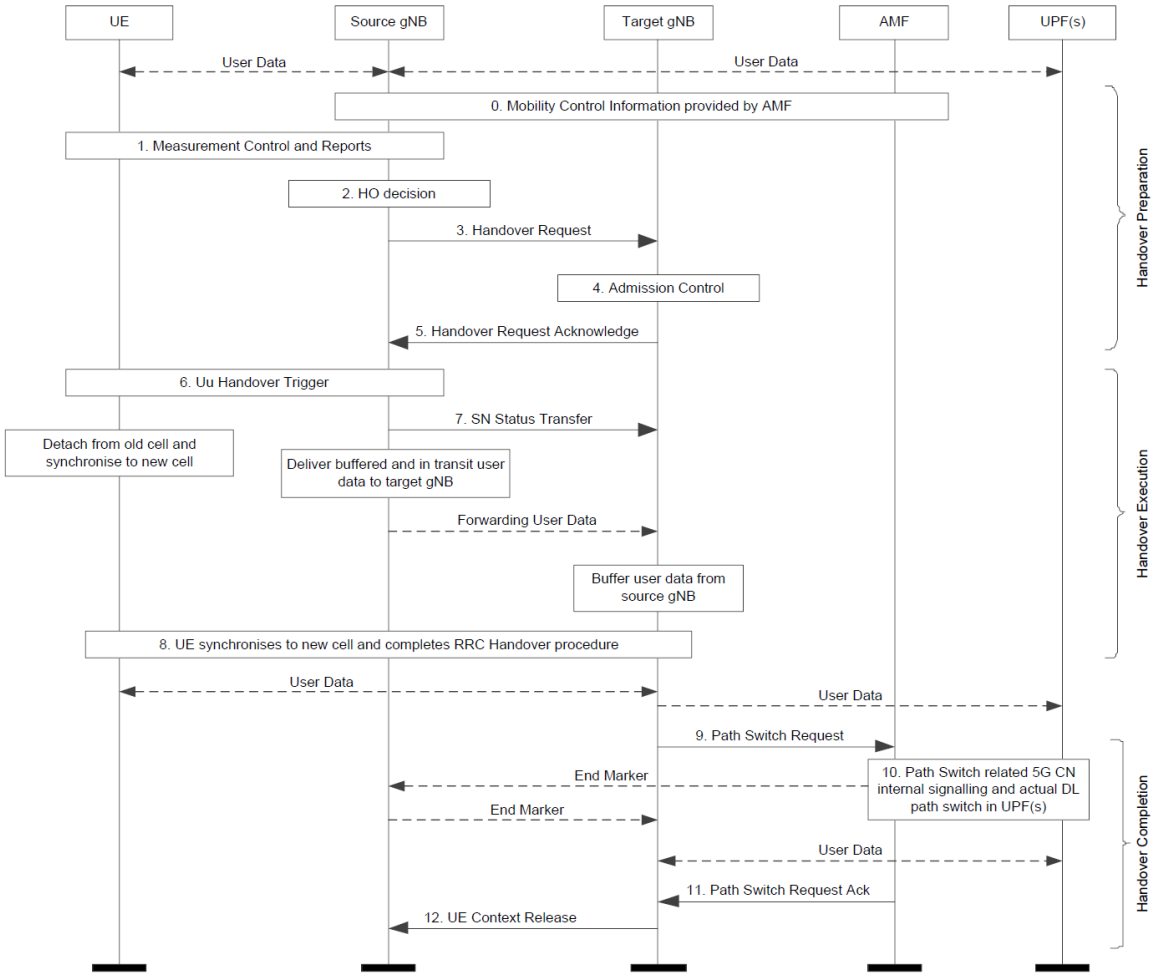
remained within the same registration area and therefore slice configuration did not change (and may not have been considered during handover).

132. *R3-173152* references *TS 38.300*, stating that the "Xn based handover as in figure 1" "has been captured in the TS38.300." (Ex. 1011, 2). *R3-173152* proposes text to add to TS 38.800, focusing on the "Xn based handover procedure" "by taking the slice availability into account." (Ex. 1011, 1). 3GPP TS 38.300 V0.6.0 ("*TS 38.300*", Ex. 1019), titled "3rd Generation Partnership Project" "Technical Specification Group Radio Access Network; NR; NR and NG-RAN Overall Description; Stage 2 (Release 15)," published in August 2017, was the latest published version of the Technical Specification 38.300 at the time *R3-173152* was published.

133. With reference to Figure 1, *R3-173152* "[c]onsider[s] the Xn based handover as in figure 1 which has been captured in the TS38.300." (Ex. 1011 2).

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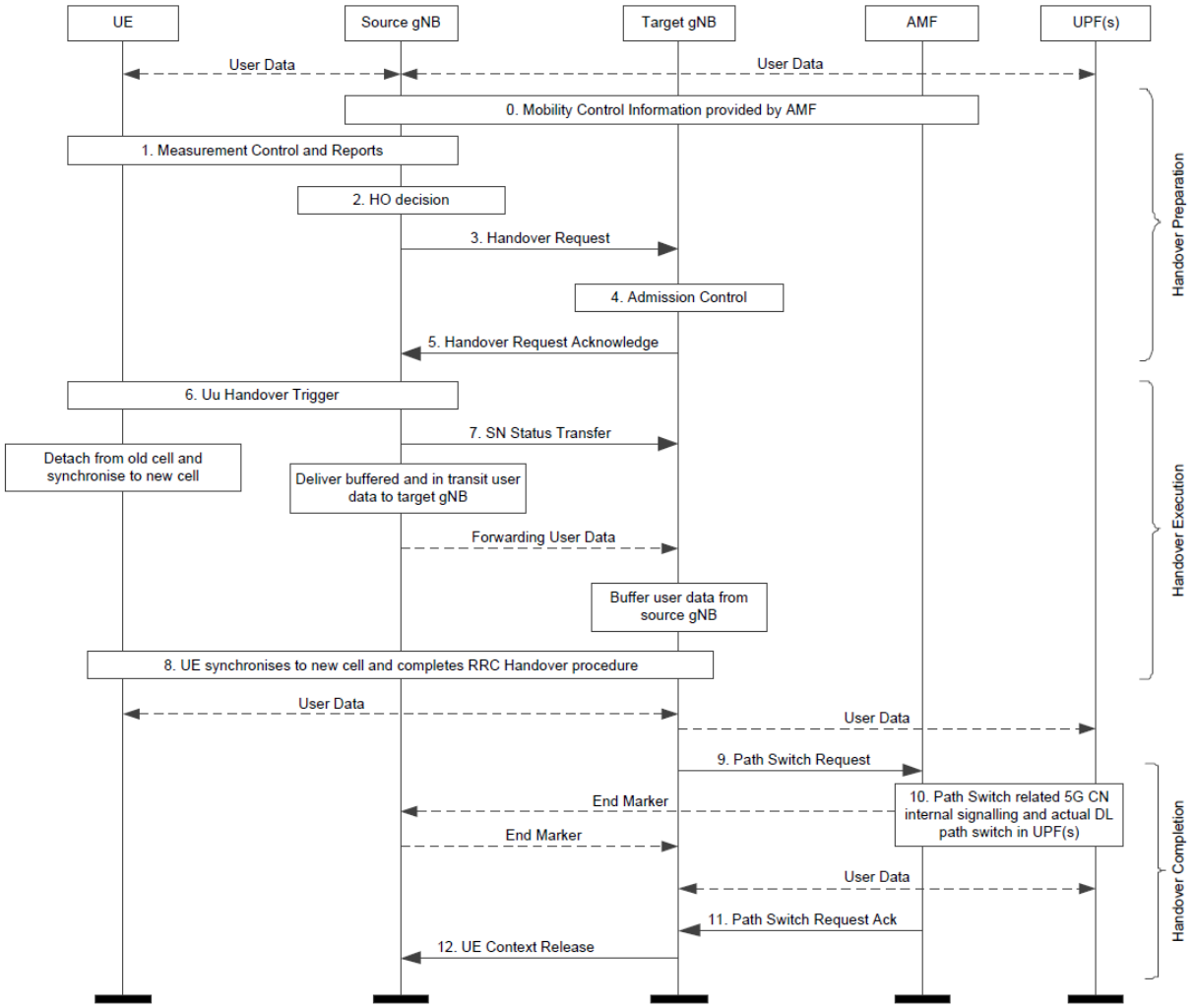
Ex. 1011, Figure 1



134. *TS 38.300* is specifically referenced by *R3-173152* as including the details of the process depicted in Figure 1 above of *R3-173152* and "provides an overview and overall description of the NG-RAN and focuses on the radio interface protocol architecture of NR connected to 5GC." (Ex. 1019, 7). *TS 38.300* describes the handover process depicted in Figure 9.2.3.2.1-1 (which is the same as Figure 1 of *R3-173152* above), in which a "source gNB decides to handover the UE," "issues a HANDOVER REQUEST message to the target gNB passing necessary

information to prepare the HO at the target side," "Admission Control may be performed by the target gNB," and the "target gNB" "sends the HANDOVER REQUEST ACKNOWLEDGE to the source gNB." (Ex. 1019, 33).

Ex. 1019, Figure 9.2.3.2.1-1



135. In Figure 1, *R3-173152* discloses a "Handover Request" message (shown as "3. Handover Request" being sent from "Source gNB" to "Target gNB" in Figure 1). Further in Figure 1, *R3-173152* discloses a "Handover Request ACK"

message (shown as "5. Handover Request Acknowledge" being sent from "Target gNB" to "Source gNB" in Figure 1). The same operations are disclosed by *TS 38.300* in Figure 9.2.3.2.1-1 shown above.

136. *R3-173152,* after presenting Figure 1, goes on to "discuss whether the Xn based handover can be used for mobility across Registration Area (RA), regardless of slice availability." (Ex. 1011, 2).

137. *R3-173152* explains that, in order to "make the discussion clearly," "a case that the source gNB and the target gNB are in the *same* RA" is discussed. (Ex. 1011, 2). That is, *R3-173152* intends to present slice-aware handover in a situation where the source gNB and the target gNBs are in different registration areas (*see* Ex. 1011, 2-3), and first describes how a slice-aware handover might work in the situation where the source gNB and target gNB are in the same registration area to ease understanding.

1. Slice-Aware Handover When Source gNB and Target gNB are in Same RA

138. In the "case that the source gNB and the target gNB are in the *same* RA," *R3-173152* discloses that, "[f]or the Handover Request message, it includes (all) PDU sessions with active UP connections handled by the source gNB, to indicate the target gNB which PDU session should handover to the target." (Ex. 1011, 2). That is, *R3-173152* provides additional detail to "3. Handover Request" of Figure 1 in order to support slice-aware handover in the scenario where the source

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gNB and the target gNB are in the same registration area. The additional details include that the "Handover Request message" "includes (all) PDU sessions with active UP connections handled by the source gNB," "to indicate [to] the target gNB which PD session should handover to the target." (Ex. 1011, 2).

139. In the case that the source gNB and the target gNB are in the *same* RA," *R3-173152* discloses that, for "Admission Control, the target gNB may admit all/part of PDU sessions included in the Handover Request message," and "[i]t is undoubted that the target gNB may reject some PDU sessions, e.g., due to resource limitation." (Ex. 1011, 2). That is, *R3-172152* provides additional detail to "4. Admission Control" of Figure 1 in order to support slice-aware handover in the scenario where the source gNB and the target gNB are in the same registration area. The additional details include that "the target gNB may admit all/part of PDU sessions included in the Handover Request message," and *R3-173152* notes that "[i]t is undoubted that the target gNB may reject some PDU sessions, e.g., due to resource limitation." (Ex. 1011, 2).

140. In the case that the source gNB and the target gNB are in the *same* RA," *R3-173152* discloses that, "[f]or the Handover Request ACK message, it includes the admitted PDU session list and not admitted PDU session list, to indicate which PDU session can handover to the target." (Ex. 1011, 2).

141. *R3-173152* further discloses:

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> Handover Request ACK message also includes the *RRC Context* IE, which will send to UE via the source gNB transparently (i.e., via Handover Command message). In the *RRC Context* IE, the target gNB presents how to configure the RBs for UE, and if some PDU sessions are rejected, the target gNB will put the DRBs associated to the rejected PDU sessions in the *DRB-ToReleaseList* (which is included in the *RRC Context* IE), and thus UE is notified which PDU sessions are not admitted in the target gNB.

(Ex. 1011, 2). That is, *R3-173152* provides additional detail to "5. Handover Request Acknowledge" of Figure 1 in order to support slice-aware handover in the scenario where the source gNB and the target gNB are in the same registration area. The additional details include that the "Handover Request ACK message" "includes the admitted PDU session list and not admitted PDU session list, to indicate which PDU session can handover to the target." (Ex. 1011, 2).

142. In the case that the source gNB and the target gNB are in the *same* RA," *R3-173152* discloses that, "[f]or the Path Switch message, the target gNB informs a list of PDU sessions to be switched to the AMF." (Ex. 1011, 2)[2]. To "inform the

[2] *TR 23.799* defines "AMF" to be "Access and Mobility Management Function," which "Handles the UE level access and mobility management including UE network access control, UE Location management and UE reachability

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AMF which PDU sessions are rejected in the target gNB, there are two options: option one is the target gNB also sends a list of non-admitted PDU sessions in the Path Switch message; option two is the AMF considers the non-included PDU session as implicitly rejected by the target gNB." *Id.* That is, *R3-173152* provides additional detail to "9. Path Switch Request" in Figure 1 in order to support slice-aware handover in the scenario where the source gNB and the target gNB are in the same registration area.

2. Slice-Aware Handover Across RAs

143. *R3-173152* then discloses a scenario where handover occurs "across RA" or Registered Area, "and the target gNB cannot supports [sic] all the UE's slices." (Ex. 1011, 2-3).

144. In the scenario where handover occurs across RA's and the target gNB cannot support all of the UE's slices, *R3-173152* discloses:

> As the target gNB cannot support all the slices, the PDU sessions with active UP connections handled by the source gNB can be divided to two part: one part is the PDU sessions which associated slice(s) is supported by the target gNB, another part is the PDU sessions which associated slice(s) is *not* supported by the target gNB. One option is

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management." Ex. 1020, 481. The AMF "supports the UE access the network via multiple access types including 3GPP access and non-3GPP access." *Id.*

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only including the latter part of PDU sessions, however, for this option, the source gNB always check the slice availability before handover. Another option is ***including all parts of PDU sessions in the Handover Request message***. In this option, check the slice availability is not mandatory, but the source gNB may also check the slice availability for selecting the suitable target gNBs (in step 2 as in figure 1), e.g., the source gNB will not request handover UE to a gNB cannot support any slice.

(Ex. 1011, 3) (emphasis added).

145. That is, *R3-173152* provides additional detail to "1. Handover Request" in Figure 1 in order to support slice-aware handover in the scenario where the source gNB and the target gNB are in different registration areas and the target gNB cannot support all of the UE's slices. The additional details include that the "Handover Request message" "includ[es] all parts of PDU sessions" so that the source gNB is not required to "check the slice availability." (Ex. 1011, 3).

146. In the scenario where handover occurs across RA's and the target gNB cannot support all of the UE's slices, *R3-173152* discloses, for "the Admission Control, the target gNB will check whether the slice of requested PDU sessions are supported, and the target gNB will reject the PDU sessions associated [with] non-supported slice." (Ex. 1011, 3). That is, *R3-173152* provides additional detail to "4. Admission Control" in Figure 1 in order to support slice-aware handover in the scenario where the source gNB and the target gNB are in different registration areas

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and the target gNB will check whether the slice of requested PDU sessions are supported, and the target gNB will reject the PDU sessions associated [with] non-supported slice." (Ex. 1011, 3).

147. In the scenario where handover occurs across RA's and the target gNB cannot support all of the UE's slices, *R3-173152* discloses, "[f]or the Handover Request ACK message, the target gNB informs non-admitted PDU sessions (e.g., including due to slice availability) list to the source gNB. The non-admitted PDU session is also indicated in the RRC Context IE through DRB-ToReleaseList, and thus UE can be informed." (Ex. 1011, 3). That is, *R3-173152* provides additional detail to "5. Handover Request Acknowledge" in Figure 1 in order to support slice-aware handover in the scenario where the source gNB and the target gNB are in different registration areas and the target gNB cannot support all of the UE's slices. The additional details include that the "Handover Request ACK message" includes a list of "non-admitted PDU sessions (e.g., including due to slice availability." (Ex. 1011, 3).

148. In the scenario where handover occurs across RA's and the target gNB cannot support all of the UE's slices, *R3-173152* discloses, for the "path switch procedure," "[t]he target gNB informs AMF [of] the admitted/non-admitted PDU sessions." (Ex. 1011, 3). That is, *R3-173152* provides additional detail to "9. Path Switch Request" in Figure 1 in order to support slice-aware handover in the scenario

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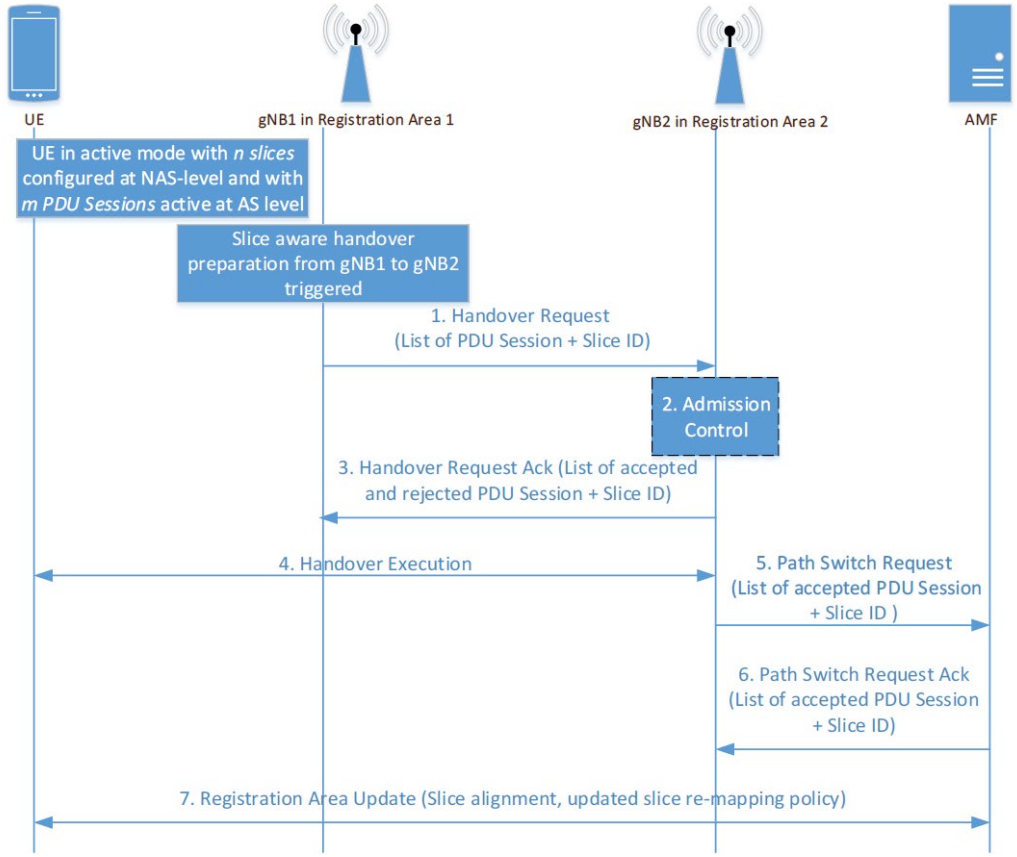
where the source gNB and the target gNB are in different registration areas and the target gNB cannot support all of the UE's slices.

149. *R3-173152* discloses three proposals, "Proposal 1" in which "Xn based handover shall be supported for active mode mobility across different Registration Areas (i.e., regardless of slice availability)," "Proposal 2" in which the "Source gNB may check the availability for handover decision," and "Proposal 3" in which the "Target gNB shall check the slice availability of each PDU session for admission control." (Ex. 1011, 3).

150. In a section titled "Text Proposal" *R3-173152* discloses a "Text Proposal to TS 38.300," *R3-173152* in which Figure 17.3.4.5-1 provides an "example for the case of active mode mobility across different Registration areas" "for the case of 5GC involved handover," and Figure 17.3.4.5-x (reproduced below) provides an "example for the case of active mode mobility across different Registration areas" "for the case of Xn based handover." (Ex. 1011, 4-5). That is, *R3-173152* proposes to add Figure 17.3.4.5-x and accompanying text to *TS 38.300* in order to support the above-described scenario of slice-aware handover.

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Ex. 1011, 4 (Figure 17.3.4.5-x)



151. Shown in Figure 17.3.4.5-x, *R3-173152* discloses "1. Handover Request" message including a "(List of PDU Session + Slice ID)" being transmitted by a first or source "gNB1" to a second or target "gNB2." (Ex. 1011, 5). To be clear, including "(List of PDU Session + Slice ID)" in the "1. Handover Request" message is intended to cover the above-described additional detail of "including all parts of PDU sessions" in the Handover Request message so that the source gNB is not required to "check the slice availability." (Ex. 1011, 3). Accordingly, a person of ordinary skill in the art would have understood that "1. Handover Request" of Figure 17.3.4.5-x corresponds to "3. Handover Request" of Figure 1, with additional detail

included in the message, including "(List of PDU Session + Slice ID)" to enable slice-aware handover.

152. Also shown in Figure 17.3.4.5-x, *R3-173152* discloses "2. Admission Control." (Ex. 1011, 5). A person of ordinary skill in the art would have understood that "2. Admission Control" of Figure 17.3.4.5-x corresponds to "4. Admission Control" of Figure 1.

153. Also shown in Figure 17.3.4.5-x, *R3-173152* discloses a "3. Handover Request Ack" message including a "(List of accepted and rejected PDU Session + Slice ID)" being received from the second or target "gNB2" by the first or source "gNB1" in response to the "Handover Request" message. (Ex. 1011, 5). To be clear, including "(List of accepted and rejected PDU Session + Slice ID)" in the "Handover Request Ack" message is intended to cover the above-described additional detail of the "Handover Request ACK message" including a list of "non-admitted PDU sessions (e.g., including due to slice availability." (Ex. 1011, 3). Accordingly, a person of ordinary skill in the art would have understood that "3. Handover Request Ack" of Figure 17.3.4.5-x corresponds to "5. Handover Request Acknowledge" of Figure 1, with additional detail included in the message, including "(List of accepted and rejected PDU Session + Slice ID)" to enable slice-aware handover.

154. Also shown in Figure 17.3.4.5-x, *R3-173152* discloses a "5. Path Switch Request" message, including "(List of accepted PDU Session + Slice ID)."

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(Ex. 1011, 5). To be clear, including "(List of accepted PDU Session + Slice ID)" in the "Path Switch Request" message is intended to cover the above-described detail of the "Path Switch Request" message such that the "[t]he target gNB informs AMF [of] the admitted/non-admitted PDU sessions." (Ex. 1011, 3). Accordingly, a person of ordinary skill in the art would have understood that "5. Path Switch Request" of Figure 17.3.4.5-x corresponds to "9. Path Switch Request" of Figure 1 with additional detail included in the message to enable slice-aware handover. *TS 38.300*[3], which is referenced by *R3-173152,* provides additional disclosure regarding the underlying documentation associated with *R3-173152*, including that the "main services and functions of the RRC" (or radio resource control) "sublayer," which include "Broadcast of System Information related to AS" (access stratum) "and NAS" (non-access stratum), "[e]stablishment, maintenance, and release of an RRC connection between the UE and NG-RAN" (next generation radio access network). (Ex. 1019, 23). *TS 38.300* explains that an "NG-RAN node" can be "a gNB, providing NR user plane and control plane protocol terminations towards [a] UE,"

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[3] While *TS 38.300* is not part of the grounds herein, it is referenced by *R3-173152* (and is a document for which *R3-173152* provides proposed additions), therefore it is referenced herein to demonstrate the knowledge of the person of ordinary skill in the art when reviewing *R3-173152*.

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or "an ng-eNB, providing E-UTRA user plane and control plane protocol terminations towards the UE." (Ex. 1019, 9).

155. *TS 38.300* explains that "RRC" is "terminated in gNB on the network side," and the "NAS control protocol" is "terminated in AMF on the network side." (Ex. 1019, 15). In Figure 4.4.2-1 (reproduced below), *TS 38.300* illustrates that an "NAS" message originating from a UE is transparently passed to an AMF by way of a gNB (i.e., the NAS message is sent to the gNB and the gNB passes the NAS message to the AMF such that the NAS message does not terminate in the gNB and, instead, terminates in the AMF). (*Id.; see also* § VI *supra*).

Ex. 1019, Figure 4.4.2-1

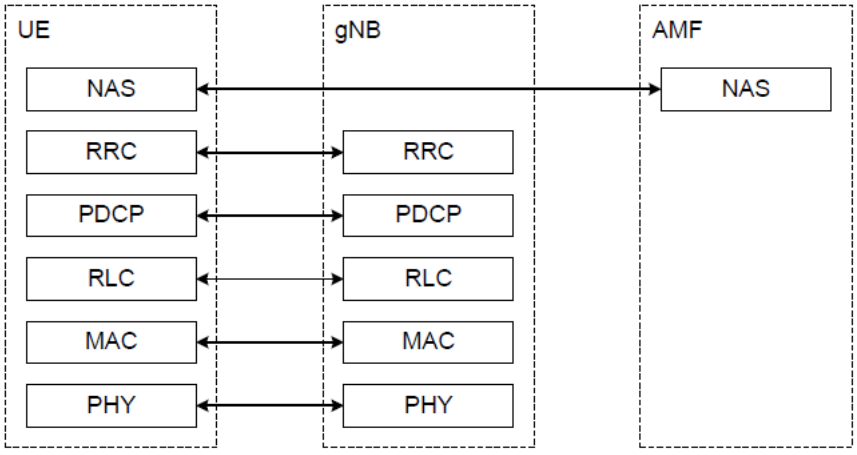


Figure 4.4.2-1: Control Plane Protocol Stack

B. *TR 38.801* (Ex. 1013)

156. 3GPP TR 38.801 V0.4.0 (2016-08) ("*TR 38.801*", Ex. 1013), is a Technical Report produced by the 3rd Generation Partnership Project (3GPP). (Ex. 1013, 1, 5).

157. *TR 38.801* was published September 13, 2016 (Ex. 1013, 1; Ex. 1012, ¶¶52-66). Consequently, even if the '631 patent is entitled to an earliest priority date of November 3, 2016, I have been informed that *TR 38.801* is prior art under at least 35 U.S.C. § 102(a) (AIA).

158. *TR 38.801* is generally directed to the "Radio Access Architecture and Interface aspects of the study item 'New Radio Access Technology'" and was intended "to record the discussion and agreements that arise in the specification of the 'New Radio Access Technology' from an Access Architecture and Interface specification point of view." (Ex. 1013, 6).

159. *TR 38.801* references 3GPP TR 21.905, "Vocabulary for 3GPP Specifications," ("*TR 21.905*", Ex. 1018), published June 2016. (Ex. 1013, 6). *TR 38.801* states that "the terms and definitions given in 3GPP TR 21.905" apply to *TR 38.801*, unless a term was defined in *TR 38.801*. (Ex. 1013, 7).

160. *TR 38.801* defines "Network Slice" as "a network created by the operator customized to provide an optimized solution for a specific market scenario which demands specific requirements with end to end scope." (Ex. 1016, 7). *TR*

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38.801 defines the acronym "NR" to be "New Radio" and the acronym "NGC" to be "Next Generation Core." *Id.*

161. *TR 38.801* discloses "Network Slicing" as "a new concept to allow differentiated treatment depending on each customer [sic] requirements." (Ex. 1016, 23). *TR 38.801* explains that, "[w]ith slicing, it is now possible for Mobile Network Operators (MNO) to consider customers as belonging to different tenant types with each having different service requirements that govern in terms of what slice types each tenant is eligible to use based on Service Level Agreements (SLA) and subscriptions." *Id.*

162. *TR 38.801* discloses a terminal (UE) sending network slice information to a source base station (eNB). (Ex. 1013, 26-27). *TR 38.801* defines the "Xn interface" to be the "interface allowing to interconnect two gNBs or one gNB and one eLTE eNB with each other." (Ex. 1013, 19).

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Ex. 1013, 27 (Figure 9.2.1-1)

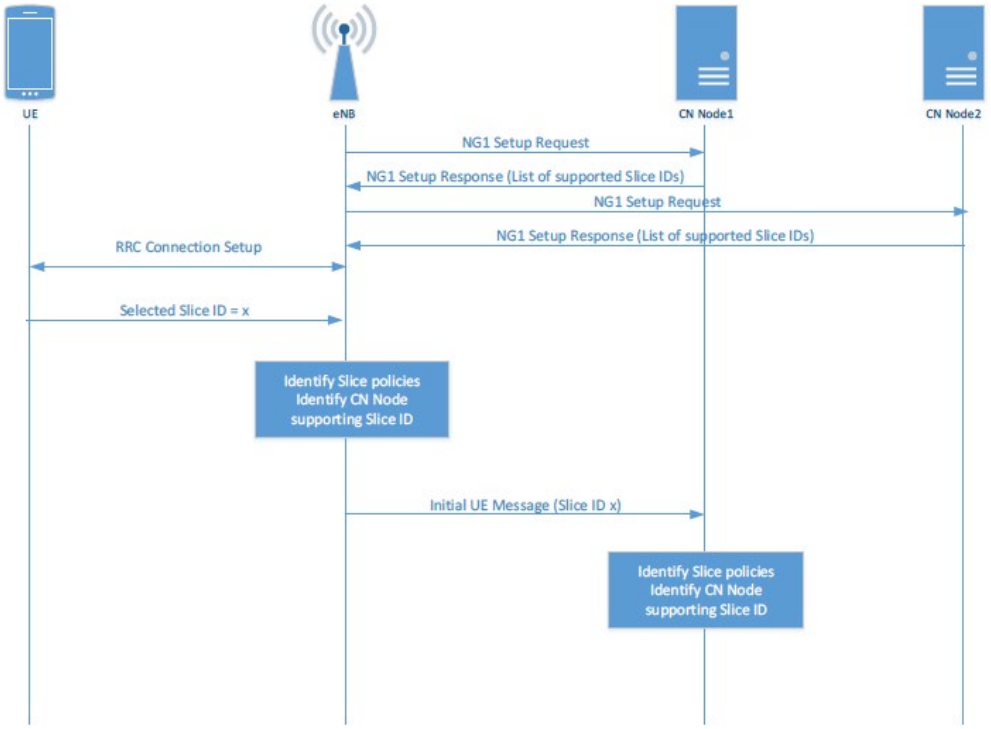


Figure 9.2.1-1: Slice selection when Slice ID is provided by the UE to RAN

163. *TR 38.801* discloses realizing "Network Slice selection" by either "configur[ing] the UE with a list of slice IDs to which it is allowed to access," or "let[ting] the CN notify the UE of the Slice IDs it can access and let the UE rely on such information onwards." (Ex. 1013, 26).

164. *TR 21.905*,[4] referenced by *TR 38.801*, defines "Access Stratum" as "functional grouping consisting of the parts in the infrastructure and in the user equipment and the protocols between these parts being specific to the access technique (i.e. the way the specific physical media between the User Equipment and the Infrastructure is used to carry information)" (*see* Ex. 1018, 7), and "Non-Access Stratum" as "[p]rotocols between UE and the core network that are not terminated in the UTRAN" (*see* Ex. 1018, 21) or "Universal Terrestrial Radio Access Network." (Ex. 1018, 6). *TR 21.905* defines a "[r]adio access bearer" as a "service that the access stratum provides to the non-access stratum for transfer of user data between User Equipment and CN" (*see* Ex. 1018, 24) or "Core Network." (Ex. 1018, 38).

C. *Han* (Ex. 1015)

165. PCT Application No. PCT/CN2017/105046 ("*Han*," Ex. 1015) is titled "Communication Method, Apparatus, System, Terminal, and Access Network Device." (Ex. 1015, Cover).

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[4] While *TR 21.905* is not part of the grounds herein, it is referenced by *TR 38.801* for defining terms used in *TR 38.801*, therefore it is referenced herein to demonstrate the knowledge of the person of ordinary skill in the art when reviewing *TR 38.801*.

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166. PCT Application No. PCT/CN2017/105046 was filed September 30, 2017, which claims priority to CN Application No. 201610875317.9 (Ex. 1016, Ex. 1017), filed September 30, 2016. (Ex. 1015, Cover). It is my opinion that PCT/CN2017/105046 and CN Application No. 201610875317.9 are substantially similar if not the same. Consequently, even if the '631 patent is entitled to an earliest priority date of November 3, 2016, I have been informed that *Han* is prior art under at least 35 U.S.C. § 102(a) (AIA).

167. *Han* is directed to "a communication method, an apparatus, a system, a terminal, and an access network device." (Ex. 1015, 3; Ex. 1017, 10). *Han* discloses the use of "quality of service" or "QoS" mechanisms in "existing long term evolution" or "LTE" systems to "ensure quality of service." (Ex. 1015, 3; Ex. 1017, 10). *Han* explains that, in the QoS mechanism, "when a terminal initiates a traffic whose the [sic] QoS needs to be ensured, a dedicated bearer needs to be established for the terminal" "to transmit data of the traffic." (Ex. 1015, 3; Ex. 1017, 10). *Han* explains that a "dedicated bearer is composed of a radio bearer between the terminal and an evolved NodeB" or "eNB for short" and a "ground side channel between the eNB and a network side device." (Ex. 1015, 3; Ex. 1017, 10).

168. *Han* discloses drawbacks associated with existing methodologies in which a "terminal needs to wait for completion of a process of allocating the QoS parameter," and "can send the traffic data only after the dedicated bearer is

established based on the QoS parameter." (Ex. 1015, 3-4; Ex. 1017, 10). Drawbacks of such a methodology, according to *Han*, include that "a data transmission start speed of an uplink traffic is relatively low," and a "requirement for reducing a traffic latency cannot be met." (Ex. 1015, 4; Ex. 1017, 10). *Han* presents technical solutions to the problem that "the data transmission start speed of the uplink traffic is relatively low." (Ex. 1015, 4; Ex. 1017, 10).

169. With reference to FIG. 1 (reproduced below), *Han* discloses a "schematic structural diagram of a communication system 100," which "may be an LTE system, a 5G system, or a subsequent evolved system of the 5G system" and includes "at least one terminal 120, at least one access network device 140, at least one core network control plane device 160, and at least one core network user plane device 180." (Ex. 1015, 24; Ex. 1017, 29).

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Ex. 1015, FIG. 1 (Ex. 1017, FIG. 1)

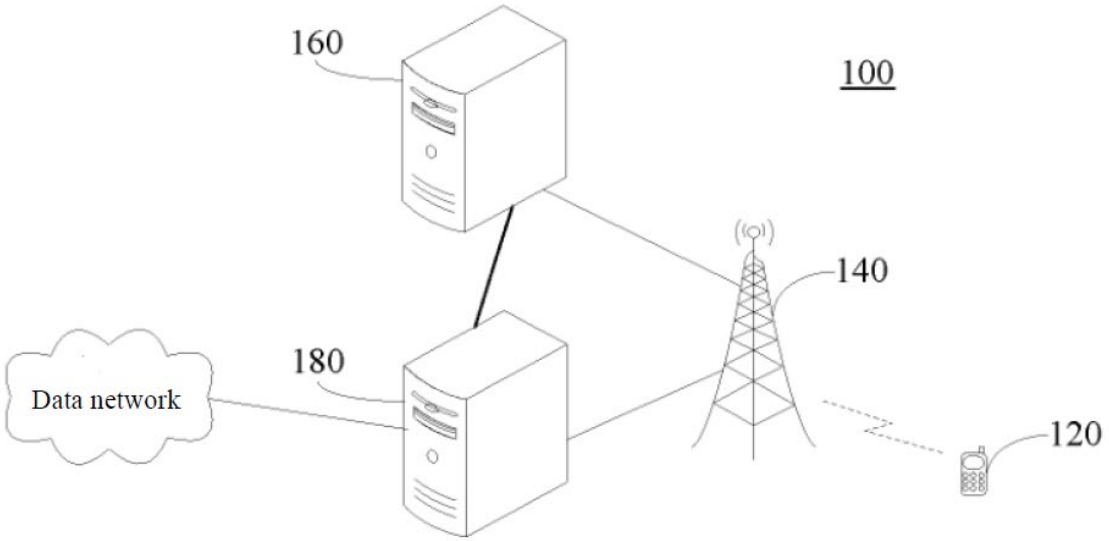


FIG. 1

170. *Han* describes that the "terminal 120" "may be a device such as a personal communication service (PCS for short) phone, a cordless telephone set, a session initiation protocol (SIP for short) phone, a wireless local loop (WLL for short) station, or a personal digital assistant (PDA for short)," or "referred to as a system, a subscriber unit, a subscriber station, a mobile station, a mobile console (Mobile), a remote station, an access point, a remote terminal, an access terminal, a user terminal, a user agent, a user device, or user equipment." (Ex. 1015, 24; Ex. 1017, 29). The "terminal 120 communicates with one or more network access devices 140 via a radio access network (RAN for short)." *Id.*

171. *Han* describes that the "access network device 140" "may be a base transceiver station (BTS for short)," "a base station (NodeB)," or "an eNB." (Ex. 1015, 24; Ex. 1017, 29).

172. *Han* explains that "uplink data is data that is sent from the terminal to the access network device through a radio interface, then from the access network device to the core network user plane device under control of the core network control plane device, and is finally sent to an external data network." (Ex. 1015, 25; Ex. 1017, 31). *Han* also explains that "downlink data is data that is sent to the terminal by the core network user plane device through the access network device, is successively submitted upward through a data channel in the terminal, and is finally submitted to an upper layer APP." *Id.*

173. With reference to FIG. 3 (reproduced below), *Han* discloses "a hardware structure in which an access network device 140 . . . is implemented." (Ex. 1015, 27; Ex. 1017, 33).

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Ex. 1015, FIG. 3 (Ex. 1017, FIG. 3)

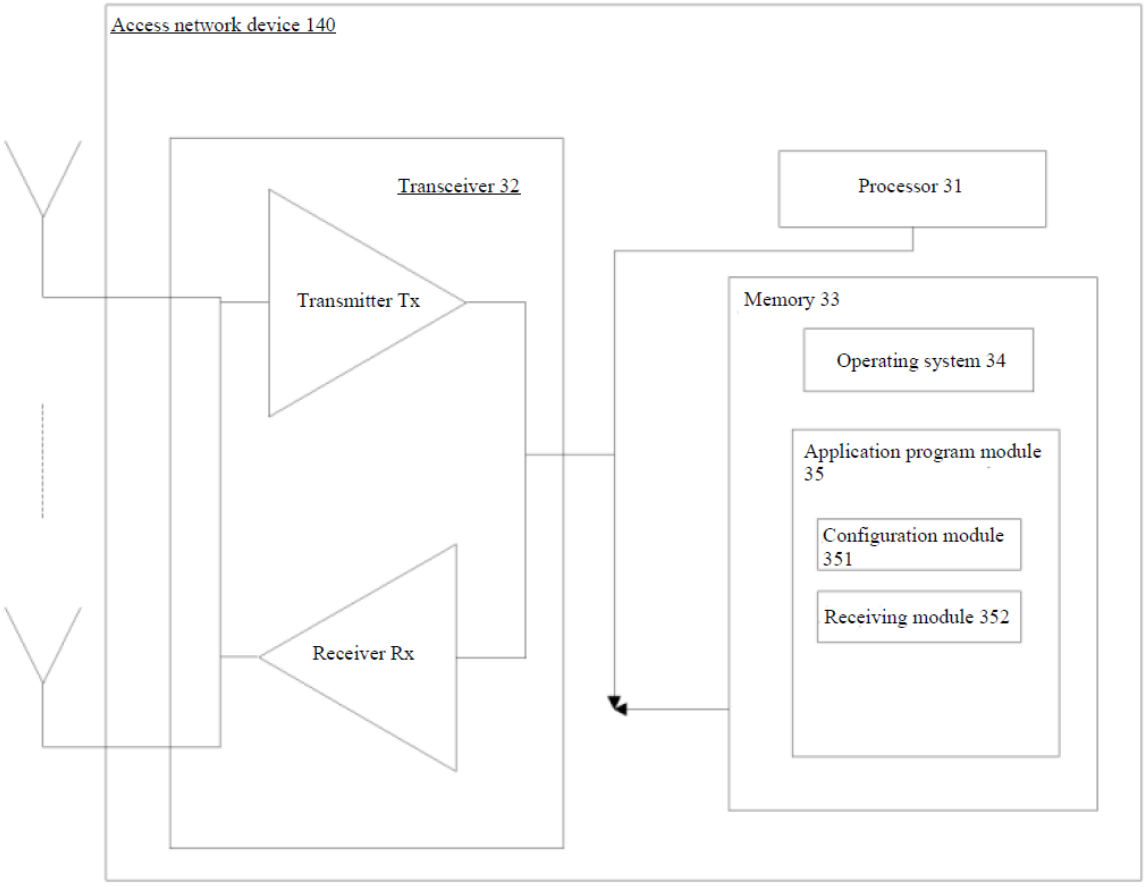


FIG. 3

174. *Han* discloses that the "access network device 140 includes a processor 31, a transceiver 32, and a memory 33," where "processor 31 includes one or more processing cores," and "transceiver 32 includes a receiver Rx and a transmitter Tx." (Ex. 1015, 27; Ex. 1017, 33). *Han* discloses that the "transceiver 32 may be further implemented as a communication chip" that "may include a receiving module," and "a transmitting module." *Id.*

175. With reference to FIG. 6 (reproduced below), *Han* discloses a "communication method" in which a "radio resource is configured based on pre-authorized QoS information in a handover process." (Ex. 1015, 44; Ex. 1017, 50). *Han* describes "QoS information" as including "PDU session information of the traffic." (Ex. 1015, 6; Ex. 1017, 4). *Han* clarifies that "PDU" stands for "protocol data unit." (Ex. 1015, 30; Ex. 1017, 4).

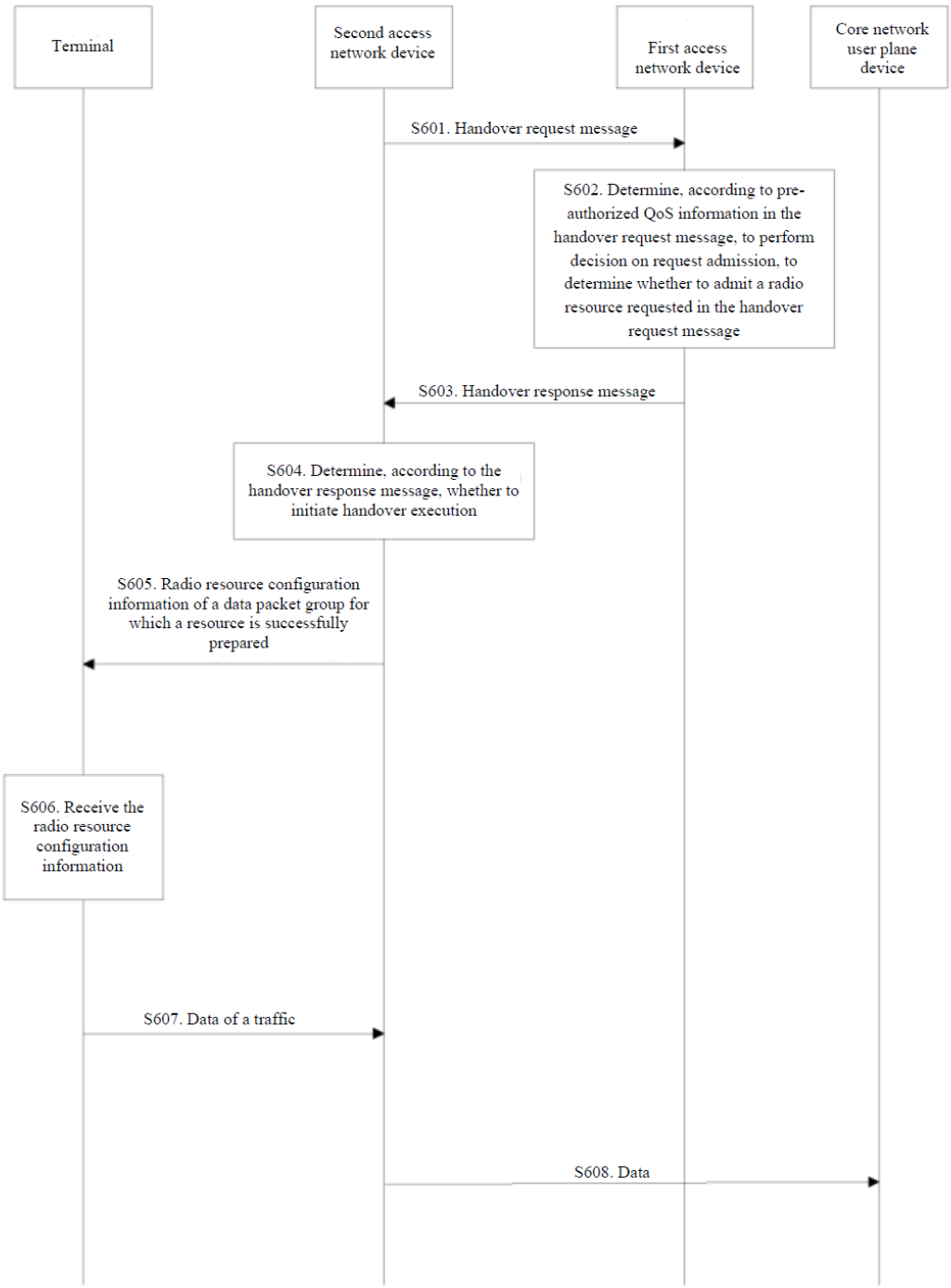


FIG. 6

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176. *Han* discloses, with reference to step "S601" in FIG. 6, a "second access network device send[ing] a handover request message to a first access network device." (Ex. 1015, 44; Ex. 1017, 50). *Han* discloses that "[t]he second access network device may also be referred to as a source-side access network device," and "the first access network device may also be referred to as a target-side access network device." *Id*.

177. *Han* discloses that the "handover request message includes pre-authorized QoS information." (Ex. 1015, 44; Ex. 1017, 50). *Han* further discloses that the "pre-authorized QoS information in the handover request message may include a part or all of [] second pre-authorized QoS information," where "the second pre-authorized QoS information" "may explicitly or implicitly include the PDU session information." (Ex. 1015, 42; Ex. 1017, 49). *Han* discloses that "the quality of service information further comprises at least one of PDU session information and identification information of network slice of the traffic." (Ex. 1015, 20; Ex. 1017, 7). *Han* discloses that "identification information of the slice includes at least one of the following: a slice ID, a slice type, a tenant type, a tenant identifier, a network function identifier, and the like." (Ex. 1015, 31; Ex. 1017, 37).

178. *Han* further discloses, with reference to step "S602" of FIG. 6, that "[t]he first [target-side] access network device receives the handover request message, and determines, according to pre-authorized QoS information in the

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handover request message, to perform judgment on request admission, to determine whether to admit a radio resource requested in the handover request message." (Ex. 1015, 46; Ex. 1017, 52). *Han* explains that "[a]dmitting the radio resource requested in the handover request message refers to configuring the radio resource for the terminal according to the radio resource requested in the handover request message." (Ex. 1015, 46; Ex. 1017, 52).

179. *Han* further discloses, with reference to step "S603" of FIG. 6, that "[t]he first [target-side] access network device sends a handover response message to the second [source-side] access network device," where "the handover response message may be a handover preparation failure message or a handover preparation success message." (Ex. 1015, 47; Ex. 1017, 53-54).

180. *Han* discloses that, "when determining that none of resources requested in the handover request message is admitted, the first [target-side] access network device sends the handover preparation failure message," where "the handover preparation failure message is used to indicate that none of the resources requested in the handover request message is admitted," or, "when determining that all or some resources requested in the handover request message are admitted, the first [target-side] access network device sends a handover preparation success message." (Ex. 1015, 47; Ex. 1017, 53-54). That "some of the resources requested in the handover request message are not admitted may include that some data packet groups in the

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pre-authorized QoS information for which radio bearers need to be pre-established are not admitted by the first [target-side] access network device." *Id.*

181. The "handover preparation failure message may further carry a handover failure cause," where a "failure cause may be provided for each data packet group of the handover request." (Ex. 1015, 47; Ex. 1017, 54). A "failure cause" may include: "there is no available radio resource, pre-establishment of a radio bearer with pre-authorized QoS is not supported, a QoS parameter is not supported, a geographic area is not supported, and the like." *Id.*

182. *Han* summarizes an "example in which a terminal is handed over between access network devices in [a] radio access network:"

> The example in which the terminal is handed over between access network devices in the radio access network has been described in the present embodiment. When the terminal is handed over between radio access networks, a handover request message sent by the source-side access network device may carry only QoS information for requiring the access network device to establish a radio resource. After receiving the handover request message, the target-side performs admission decision on the QoS information included in the handover request message, and if the target-side succeeds or partially succeeds in admission, the target-side returns a handover preparation success message, or otherwise, returns a handover preparation failure message.

(Ex. 1015, 49; Ex. 1017, 55).

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1. *Han*'s 2016 CN Priority Document Supports *Han*'s Disclosure

183. I provide as Appendix A to this document a table that includes the references to *Han* (Ex. 1015) that are relied upon in my analyses in section IX along with support from Han's 2016 CN priority document (Ex. 1017) to demonstrate that *Han*'s 2016 CN Priority document supports the disclosure of *Han*. Where I reference *Han* (Ex. 1015) in my analyses in section IX, I also provide reference to Han's 2016 CN priority document (Ex. 1017) to demonstrate that the citation to *Han* is supported by Han's 2016 CN priority document. Therefore, I am informed that Han is indeed entitled to the priority date of the Han 2016 CN priority document.

D. *TS 36.300* (Ex. 1024)

184. 3GPP TS 36.300 V13.4.0 (2016-06) ("*TS 36.300*", Ex. 1024), is a Technical Specification produced by the 3rd Generation Partnership Project (3GPP). (Ex. 1024, 1, 15).

185. *TS 36.300* was published July 7, 2016. (Ex. 1024, 1; Ex. 1012, ¶¶52, 68-73). Consequently, even if the '631 patent is entitled to an earliest priority date of November 3, 2016, I have been informed that *TS 36.300* is prior art under at least 35 U.S.C. § 102(a) (AIA).

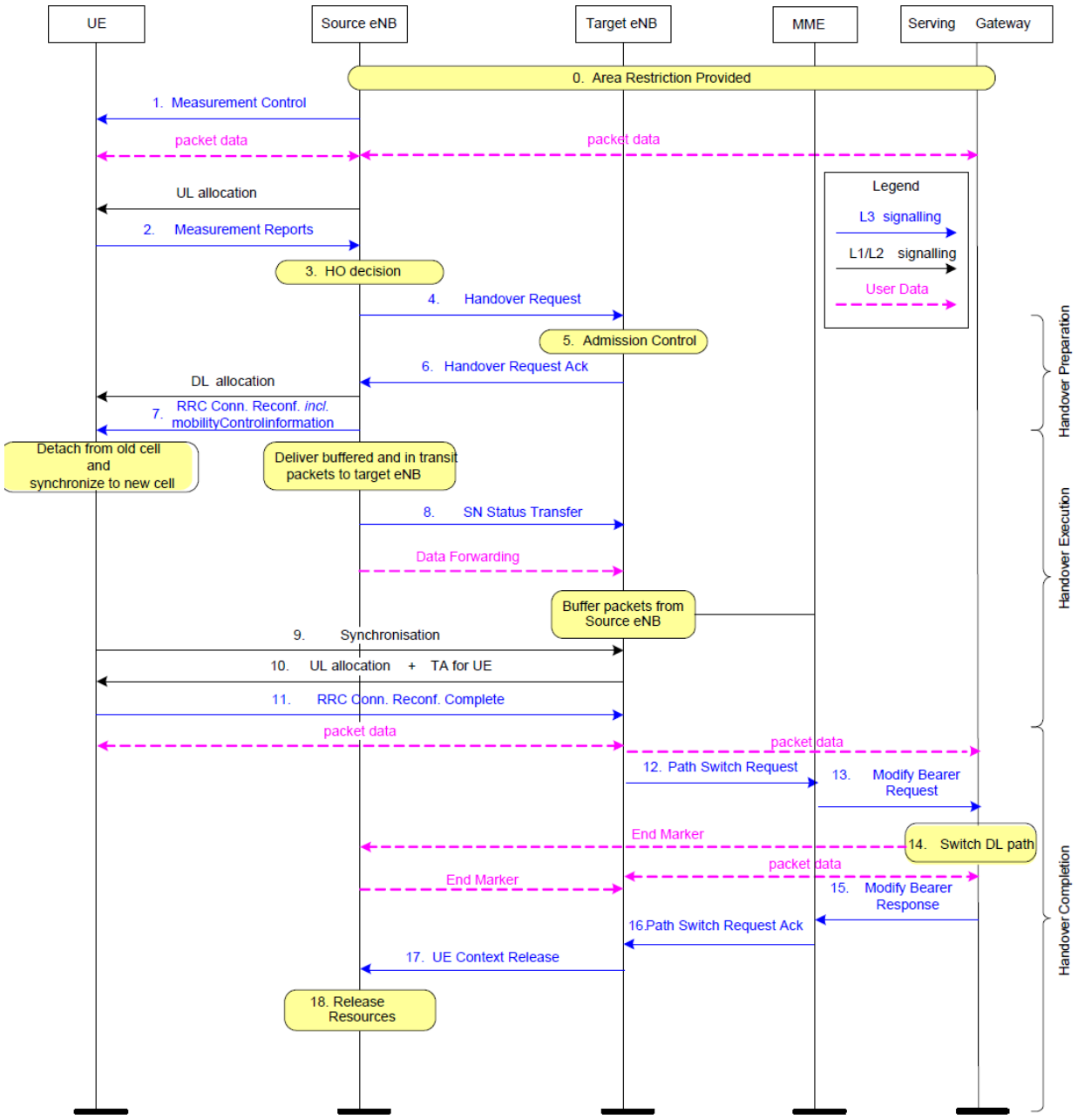
186. *TS 36.300* provides "an overview and overall description of the E-UTRAN radio interface protocol architecture." (Ex. 1024, 16).

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187. *TS 36.300* provides an overview of "Mobility Management" procedures, including "Mobility Support for UEs" and "necessary steps" for "[h]andover procedures." (Ex. 1024, 90). *TS 36.300* depicts a "basic handover scenario" in Figure 10.1.2.1.1-1, and provides details regarding the scenario. (Ex. 1024, 91-92; Figure 10.1.2.1.1-1).

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Ex. 1024, Figure 10.1.2.1.1-1



188. *TS 36.300* provides a "more detailed description" of the above scenario, including that, in step 2 ("2. Measurement Reports" in Figure 10.1.2.1.1-1), a "MEASUREMENT REPORT is triggered and sent to the eNB, and then, in step 3

("3. HO Decision" in Figure 10.1.2.1.1-1), "[t]he source eNB makes [a] decision based on MEASUREMENT REPORT and RRM information to hand off the UE." (Ex. 1024, 92-93; Figure 10.1.2.1.1-1). *TS 36.300* defines "HO" to be "handover." (Ex. 1024, 22).

189. In a step 4, a "HANDOVER REQUEST message" is sent by the source eNB to the target eNB "passing necessary information to prepare the HO at the target side." (Ex. 1024, 93 ("4. Handover Request" in Figure 10.1.2.1.1-1)). In a step 5, "Admission Control" ("5. Admission Control" in Figure 10.1.2.1.1-1) "may be performed by the target eNB dependent on the received E_RAB QoS information to increase the likelihood of a successfully HO, if the resource can be granted by target eNB." (Ex. 1024, 93). *TS 36.300* further states, with reference to step 5, that "[t]he target eNB configures the required resources according to the received E-RAB QoS information and reserves a C-RNTI and optionally a RACH preamble." *Id.*

190. In a step 6, the "target eNB prepares HO" and "sends the HANDOVER REQUEST ACKNOWLEDGE" ("6. Handover Request Ack" in Figure 10.1.2.1.1-1) "to the source eNB," and the "HANDOVER REQUEST ACKNOWLEDGE message includes a transparent container to be sent to the UE as an RRC message to perform the handover." (Ex. 1024, 93). In a step 12, the "target eNB sends a PATH SWITCH REQUEST message" ("12. Path Switch Request" in Figure 10.1.2.1.1-1) "to [the] MME to inform that the UE has changed cell." (Ex. 1024, 93).

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IX. THE PRIOR ART RENDERS OBVIOUS CLAIMS 1-18 OF THE '631 PATENT

A. Ground 1: *R3-173152* Renders Obvious Claims 1, 7, and 13 of the '631 patent.

191. *R3-173152* renders obvious claims 1, 7, and 13 of the '631 patent.

Independent Claim 1

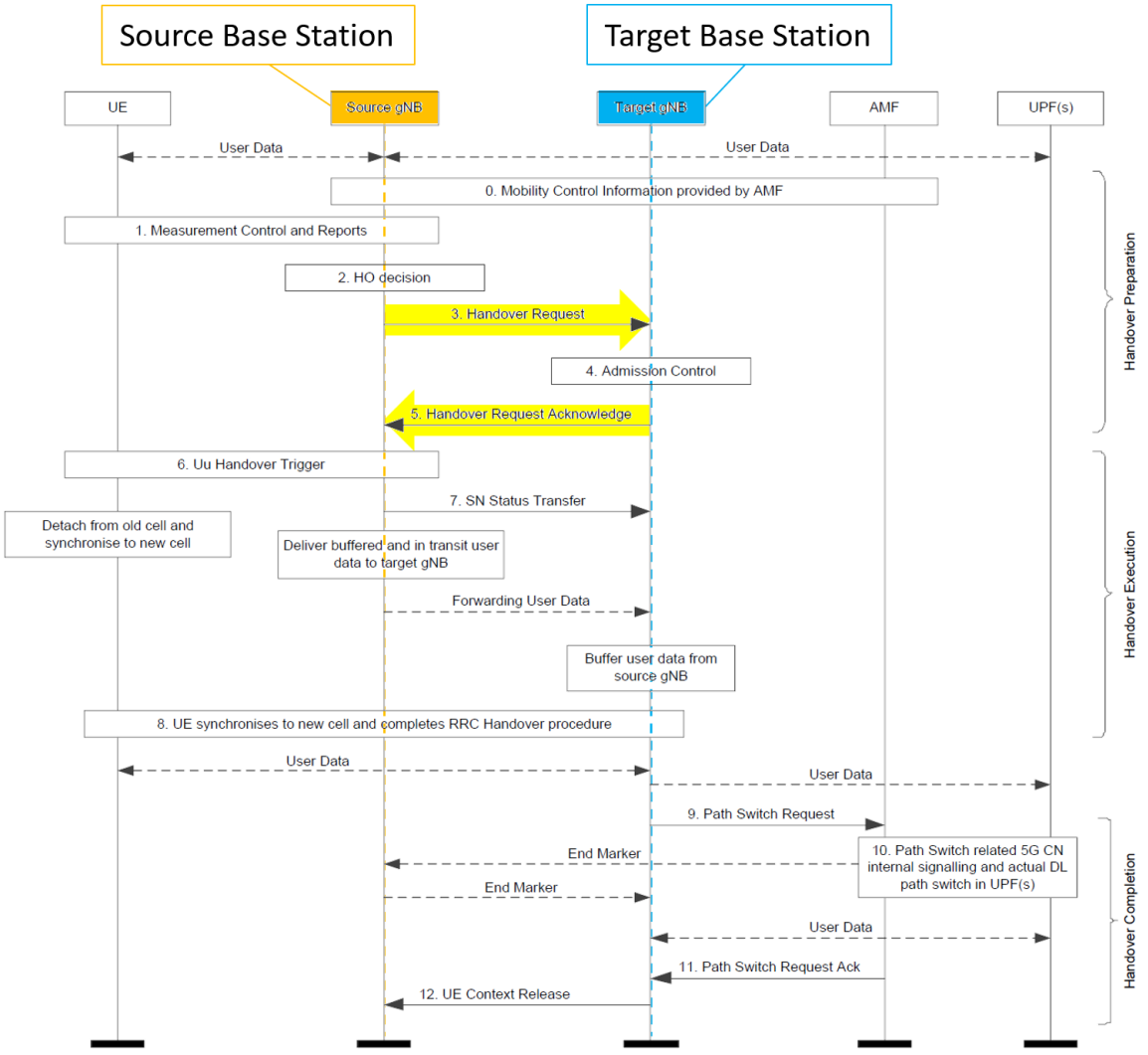
Claim 1, Element [1.pre]: A method for transmitting and receiving data, the method comprising:

192. To the extent that element [1.pre] is found to be limiting, *R3-173152* renders obvious claim element [1.pre].

193. With reference to Figure 1, *R3-173152* discloses an "Xn based handover." (Ex. 1011, 2).

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Ex. 1011, Figure 1 (annotated)



194. In Figure 1, *R3-173152* discloses a "Handover Request" message (shown as "3. Handover Request" being sent from "Source gNB" to "Target gNB" in Figure 1). Further in Figure 1, *R3-173152* discloses a "Handover Request ACK" message (shown as "5. Handover Request Acknowledge" being sent from "Target gNB" to "Source gNB" in Figure 1). *R3-173152,* after presenting Figure 1, goes on

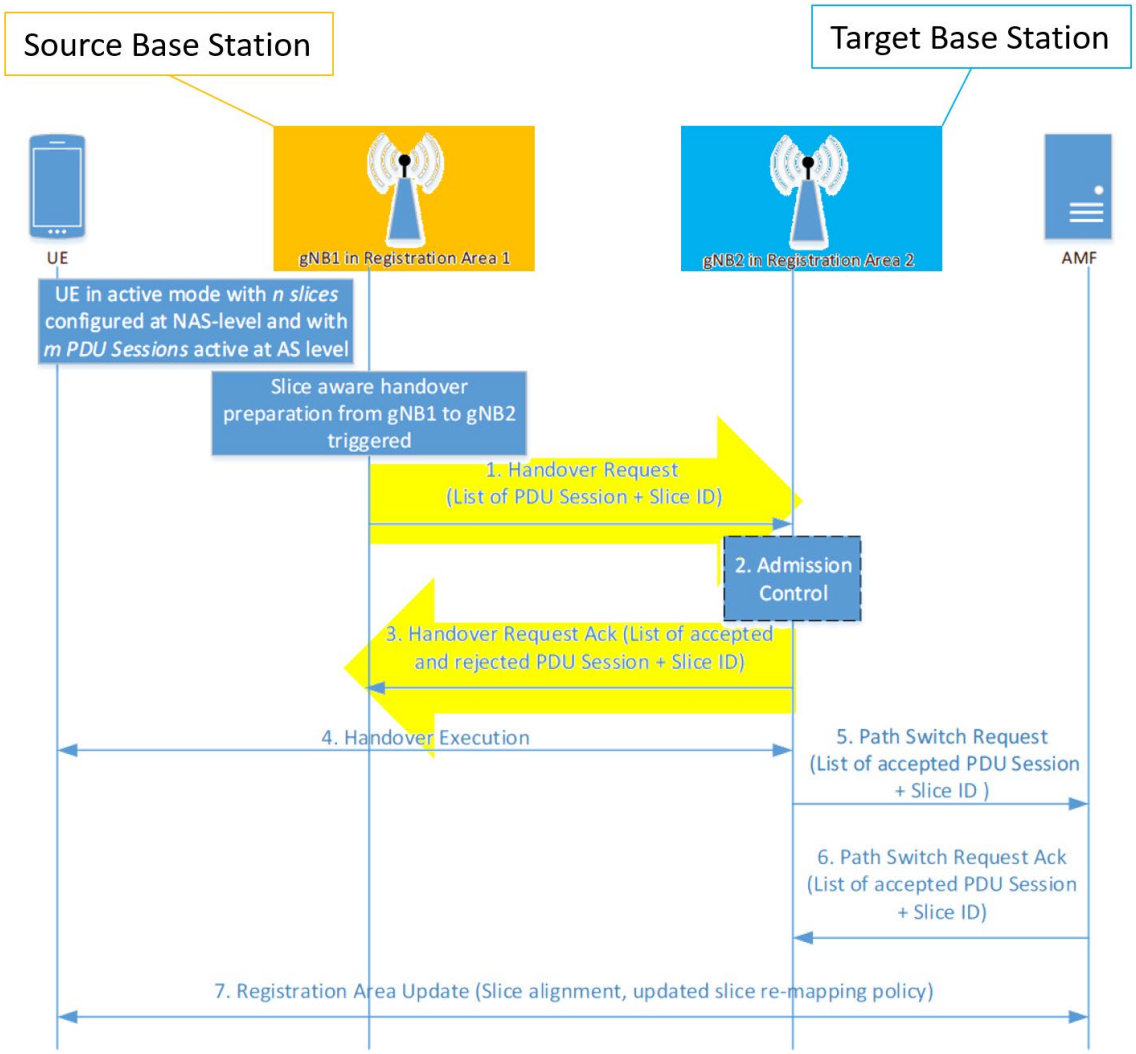
to "discuss whether the Xn based handover can be used for mobility across Registration Area (RA), regardless of slice availability." (Ex. 1011, 2).

195. *R3-173152* explains that, in order to "make the discussion clearly," "a case that the source gNB and the target gNB are in the *same* RA" is discussed. (Ex. 1011, 2). That is, *R3-173152* intends to present slice-aware handover in a situation where the source gNB and the target gNBs are in different registration areas (*see* Ex. 1011, 2-3), and first describes how a slice-aware handover might work in the situation where the source gNB and target gNB are in the same registration area to ease understanding. (*see, generally,* § VIII.A *supra*).

196. That is, *R3-173152* proposes to add Figure 17.3.4.5-x and accompanying text to *TS 38.300* in order to provide additional detail to various steps of Figure 1 to include transmitting and receiving data to support slice-aware handover. (*see, generally,* § VIII.A *supra*).

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Ex. 1011, Figure 17.3.4.5-x (annotated)



197. Shown in Figure 17.3.4.5-x, *R3-173152* discloses "1. Handover Request" message including a "(List of PDU Session + Slice ID)" being transmitted by a first or source "gNB1" to a second or target "gNB2." (Ex. 1011, 5). To be clear, including "(List of PDU Session + Slice ID)" in the "1. Handover Request" message is intended to cover the above-described additional detail of "including all parts of

PDU sessions" in the Handover Request message so that the source gNB is not required to "check the slice availability." (Ex. 1011, 3). Accordingly, a person of ordinary skill in the art would have understood that "1. Handover Request" of Figure 17.3.4.5-x corresponds to "3. Handover Request" of Figure 1, with additional detail included in the message, including "(List of PDU Session + Slice ID)" to include transmitting and receiving data to enable slice-aware handover.

198. Also shown in Figure 17.3.4.5-x, *R3-173152* discloses "2. Admission Control." (Ex. 1011, 5). A person of ordinary skill in the art would have understood that "2. Admission Control" of Figure 17.3.4.5-x corresponds to "4. Admission Control" of Figure 1.

199. Also shown in Figure 17.3.4.5-x, *R3-173152* discloses a "3. Handover Request Ack" message including a "(List of accepted and rejected PDU Session + Slice ID)" being received from the second or target "gNB2" by the first or source "gNB1" in response to the "Handover Request" message. (Ex. 1011, 5). To be clear, including "(List of accepted and rejected PDU Session + Slice ID)" in the "Handover Request Ack" message is intended to cover the above-described additional detail of the "Handover Request ACK message" including a list of "non-admitted PDU sessions (e.g., including due to slice availability." (Ex. 1011, 3). Accordingly, a person of ordinary skill in the art would have understood that "3. Handover Request Ack" of Figure 17.3.4.5-x corresponds to "5. Handover Request Acknowledge" of

Figure 1, with additional detail included in the message, including "(List of accepted and rejected PDU Session + Slice ID)" to include transmitting and receiving data to enable slice-aware handover.

200. Also shown in Figure 17.3.4.5-x, *R3-173152* discloses a "5. Path Switch Request" message, including "(List of accepted PDU Session + Slice ID)." (Ex. 1011, 5). To be clear, including "(List of accepted PDU Session + Slice ID)" in the "Path Switch Request" message is intended to cover the above-described detail of the "Path Switch Request" message such that the "[t]he target gNB informs AMF [of] the admitted/non-admitted PDU sessions." (Ex. 1011, 3). Accordingly, a person of ordinary skill in the art would have understood that "5. Path Switch Request" of Figure 17.3.4.5-x corresponds to "9. Path Switch Request" of Figure 1 with additional detail included in the message to include transmitting and receiving data to enable slice-aware handover.

201. To the extent it is argued that *R3-173152* does not explicitly state that its procedures are for "transmitting and receiving data," a person of ordinary skill in the art would have understood or found it obvious that data is transmitted and received in *R3-173152* because *R3-173152* depicts transmitting and receiving messages. Thus, a person of ordinary skill would have understood or found it obvious that "data" was "transmitted and received" in the handover method disclosed in *R3-173152*.

202. Thus, *R3-173152* renders obvious claim element [1.pre].

Claim 1, Element [1.a]: deciding, by a source base station (BS), whether to perform a handover;

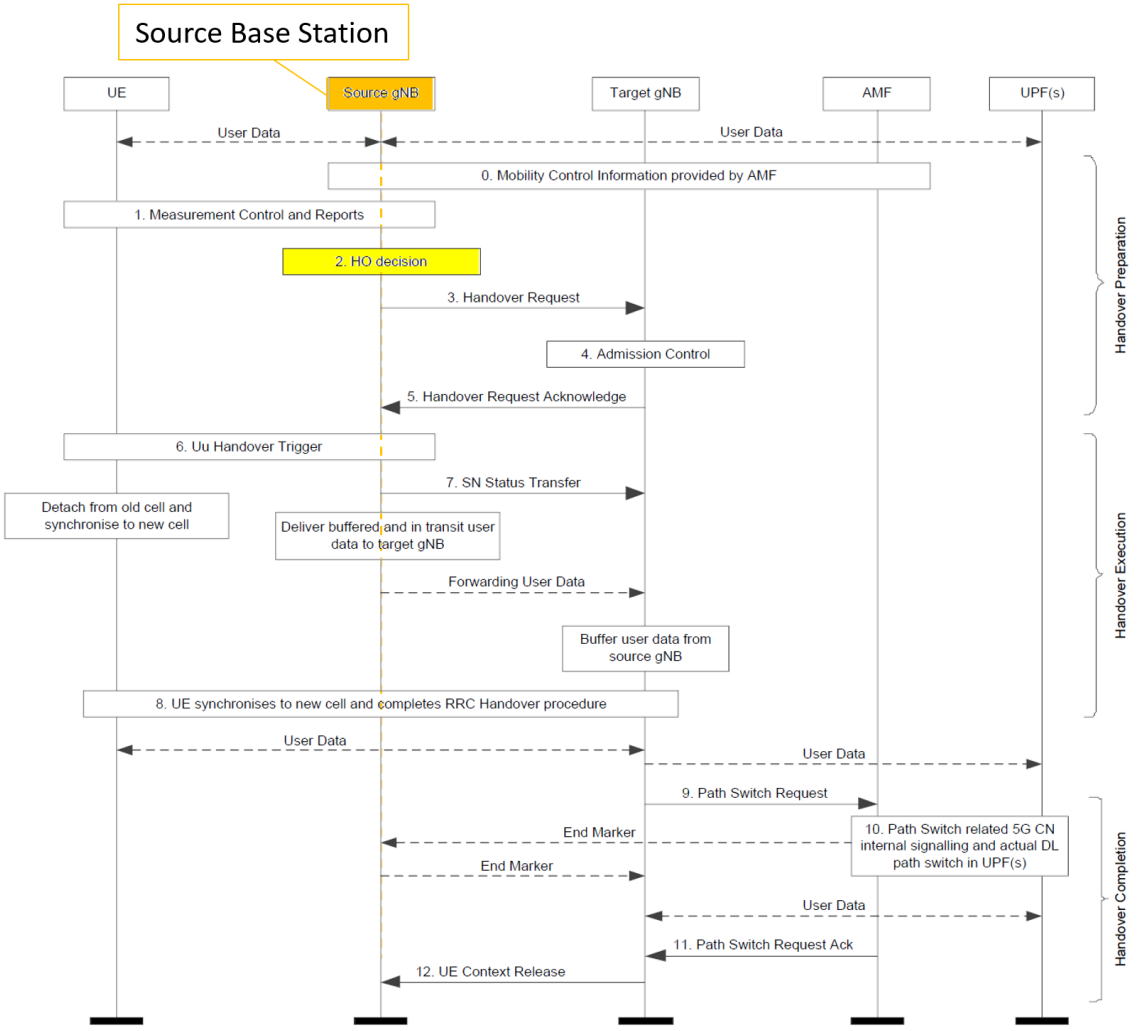
203. *R3-173152* renders obvious claim element [1.a].

204. The ’631 patent defines a “base station” as “generally refer[ring] to a station communicating with the UE.” (Ex. 1001, 3:61-62). The ’631 patent provides examples of base stations, including “all of various communication service areas and devices, such as a Node-B, an evolved Node-B (eNB), a gNode-B (gNB), a low power node (LPN), a sector, a site, various types of antennas, a base transceiver system (BTS), an access point, a point (e.g., a transmitting point, a receiving point, or a transceiving point), a relay node, a megacell, a macrocell, a microcell, a picocell, a femtocell, a remote radio head (RRH), a radio unit (RU), and a small cell.” (Ex. 1001, 3:62-4:4). Because the ’631 patent provides for a “base station” that is a “gNB,” a person of ordinary skill in the art would have understood that the gNB of *R3-173152* satisfies the claimed “base station.”

205. With reference to Figure 1 (reproduced and annotated below), *R3-173152* discloses a “Xn based handover,” where a “Source gNB” performs a step “2. HO decision.” (Ex. 1011, 2). *R3-173152* further discloses that the “Source gNB may check the slice availability for handover decision.” (Ex. 1011, 3).

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Ex. 1011, Figure 1 (annotated)



206. To the extent it is argued that *R3-173152* does not explicitly disclose the details of the "HO decision," the person of ordinary skill in the art would have found it obvious that the "Source gNB" decides whether to handover. For example, Figure 17.3.4.5-x depicts a step in which "Slice aware handover" is "triggered." Ex. 1011, 5. Moreover, a person of ordinary skill in the art would have found it obvious,

in view of *R3-173152*, that the "Source gNB" decides whether to handover prior to transmitting a handover request message because the person of ordinary skill in the art would have understood that a base station would not transmit handover request messages at random. That is, a person of ordinary skill in the art would have found it obvious that the "Source gNB" decides whether to handover prior to transmitting a handover request message because the person of ordinary skill in the art would have known that it would have been unnecessary, and inefficient, to transmit handover request messages to other base stations when it had not been determined that a handover was to be performed. Moreover, a person of ordinary skill in the art would have understood that transmitting handover request messages unprompted (e.g., without the use of a handover decision) would have increased network traffic and decreased bandwidth. Indeed, *R3-173152* discloses, in Figure 17.3.4.5-x (which supplements the handover messages of Figure 1), deciding to handover because it discloses "Slice aware handover . . . [is] triggered" at the source base station. (Ex. 1011, 5; Figure 17.3.4.5-x).

207. Indeed, *TS 38.300*[5], which was known to the person of ordinary skill in the art and specifically referenced by *R3-173152* as having "captured" "the Xn based

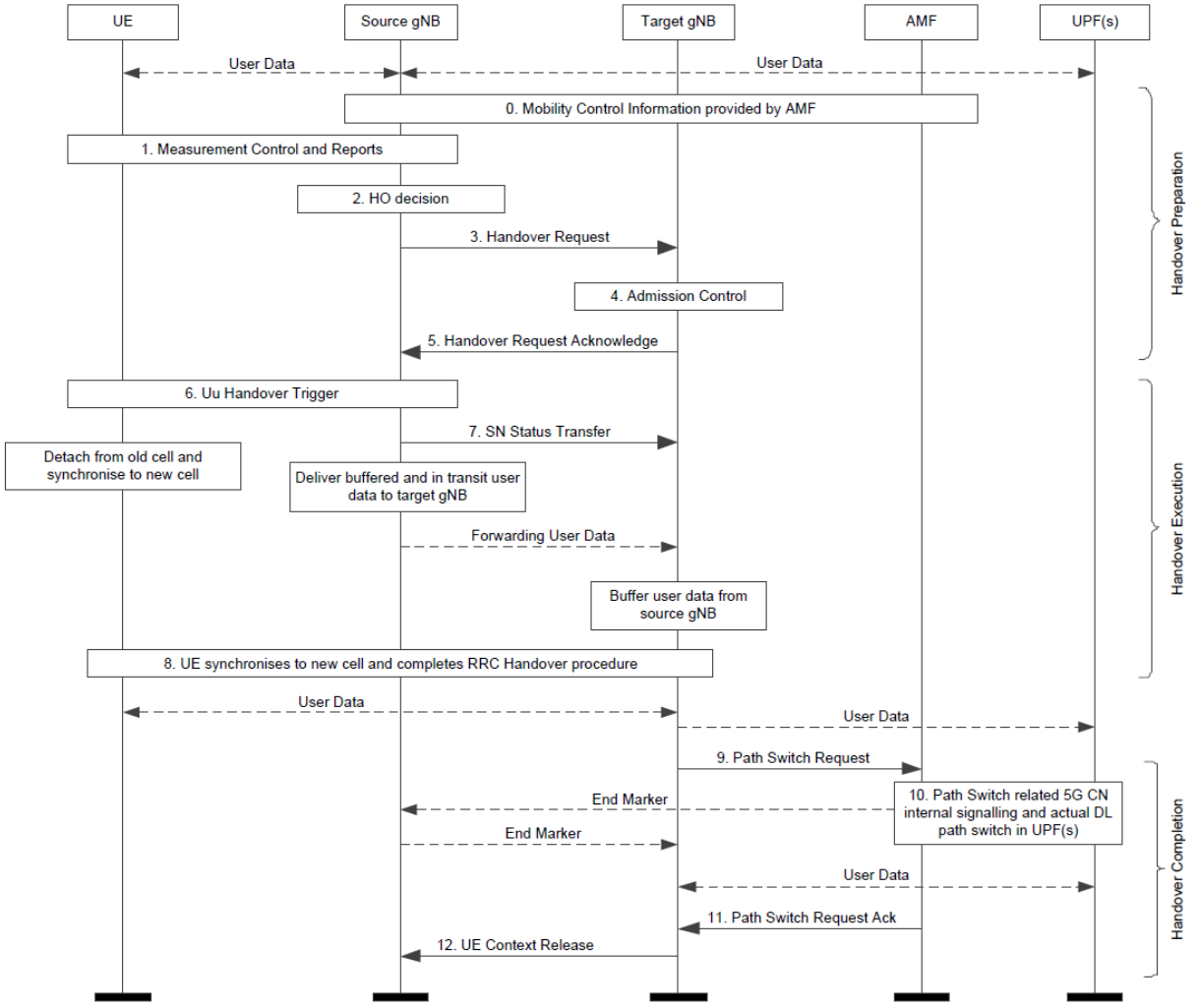
[5] While *TS 38.300* is not part of the grounds, it is referenced here to demonstrate the knowledge of the person of ordinary skill in the art when reviewing *R3-173152*.

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handover as in figure 1" (*see* Ex. 1011, 2) (in other words, as being the source of Figure 1 of *R3-173152*), corroborates what that a person of ordinary skill in the art would have known or found obvious - that the "Source gNB" decides whether to handover because *TS 38.300*, with reference to Figure 9.2.3.2.1-1 (reproduced below), discloses that the "***source gNB decides to handover the UE***." (Ex. 1019, 33) (emphasis added). That is, a person of ordinary skill in the art would have found it obvious that a handover decision occurred before any handover request message in Figure 17.3.4.5-x of *R3-173152*.

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Ex. 1019, Figure 9.2.3.2.1-1



208. Thus, *R3-173152* renders obvious claim element [1.a].

Claim 1, Element [1.b1]: transmitting, from the source BS to a target BS, a handover request message when it is decided to perform the handover,

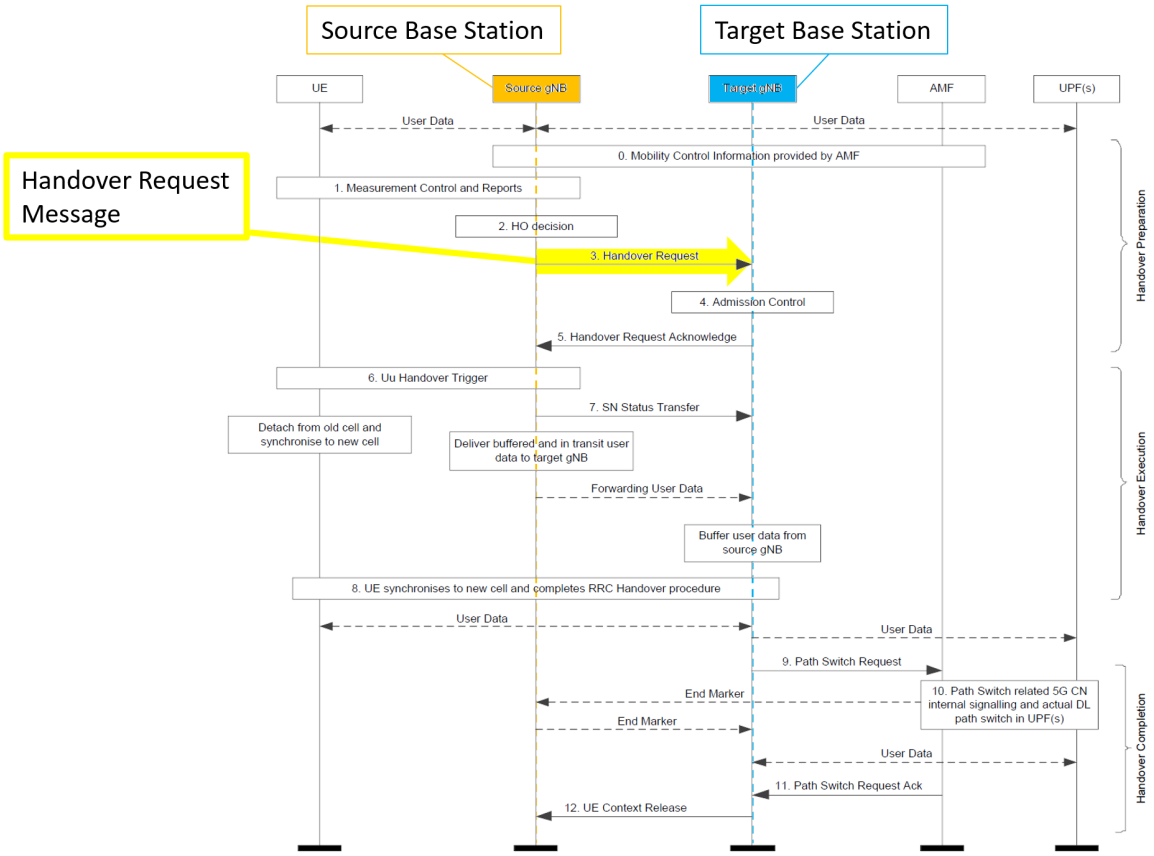
209. *R3-173152* renders obvious claim element [1.b1].

210. *R3-173152* renders obvious deciding whether to perform the handover.

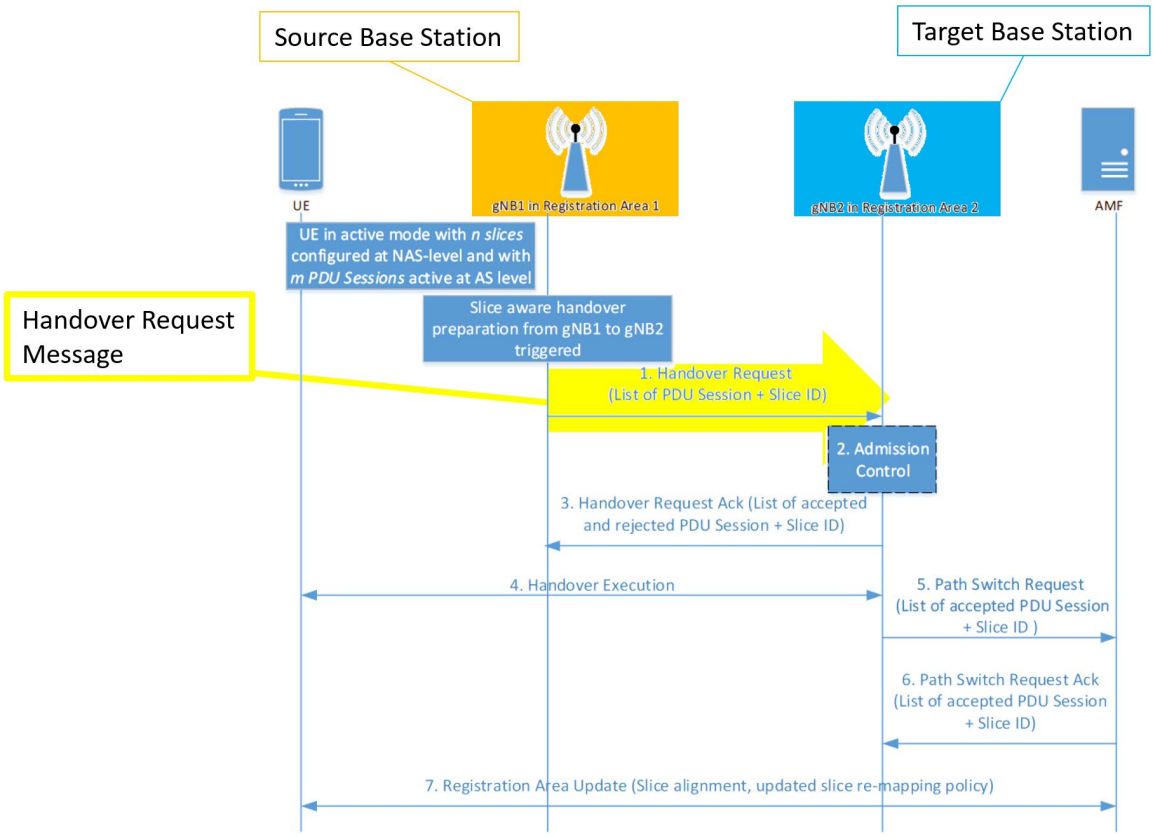
See § IX.A.[1.a] *supra*.

211. As I describe above, *R3-173152* provides additional detail regarding the "3. Handover Request" of the then-current standard for performing handover in Figure 1, so as to enable slice-aware handover. *R3-173152* also proposes to add Figure 17.3.4.5-x and accompanying text to *TS 38.300* in order to support slice-aware handover.

Ex. 1011, Figure 1 (annotated)



Ex. 1011, Figure 17.3.4.5-x (annotated)



212. Shown in Figure 17.3.4.5-x, *R3-173152* discloses a handover request message transmitted by the source base station ("gNB1") to the target base station ("gNB2") in the form of a "1. Handover Request" which includes, as part of the additional detail provided as a supplement to Figure 1, a "(List of PDU Session + Slice ID)." (Ex. 1011, 5). To be clear, including "(List of PDU Session + Slice ID)" in the "1. Handover Request" message provides the above-described additional detail of "including all parts of PDU sessions" in the Handover Request message so that the source gNB is not required to "check the slice availability." (Ex. 1011, 3).

Accordingly, a person of ordinary skill in the art would have understood that "1. Handover Request" of Figure 17.3.4.5-x corresponds to "3. Handover Request" of Figure 1, with additional detail included in the message, including "(List of PDU Session + Slice ID)" to enable slice-aware handover. Thus, *R3-173152*, through the teachings of Figure 1 and Figure 17.3.4.5-x, render obvious a handover request message being transmitted by the source base station to the target base station once it is decided to perform a handover.

213. Thus, *R3-173152* renders obvious claim element [1.b1].

Claim 1, Element [1.b2]: wherein the handover request message includes network slice information; and

214. *R3-173152* renders obvious claim element [1.b2].

215. *R3-173152* discloses handover procedures that take network slicing into account. (Ex. 1011, 1). *R3-173152* disclosed additional detail in the form of a Slice ID and PDU sessions (i.e., network slice information) in its handover request message, and the inclusion of these additional details enables slice-aware handover. *See* § IX.A.[1.b1] *supra. R3-173152,* after presenting Figure 1, goes on to discuss two scenarios in which details may be added to various messages or steps in Figure 1 to enable slice-aware handover. (Ex. 1011, 2-3). In all of the additional scenarios disclosed by *R3-173152*, the handover request message includes network slice information.

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216. In the "case that the source gNB and the target gNB are in the *same* RA," *R3-173152* discloses that, "[f]or the Handover Request message, it includes (all) PDU sessions with active UP connections handled by the source gNB, to indicate the target gNB which PDU session should handover to the target." (Ex. 1011, 2). That is, *R3-173152* provides additional detail to "3. Handover Request" of Figure 1 in order to support slice-aware handover in the scenario where the source gNB and the target gNB are in the same registration area. The additional details include that the "Handover Request message" "includes (all) PDU sessions with active UP connections handled by the source gNB," "to indicate [to] the target gNB which PDU session should handover to the target." (Ex. 1011, 2). To be clear, the handover request message includes network slice information.

217. In the scenario where handover occurs across RA's and the target gNB cannot support all of the UE's slices, *R3-173152* discloses:

> As the target gNB cannot support all the ***slices***, the PDU sessions with active UP connections handled by the source gNB can be divided to two part: one part is the PDU sessions which ***associated slice(s)*** is supported by the target gNB, another part is the PDU sessions which ***associated slice(s)*** is *not* supported by the target gNB. One option is only including the latter part of PDU sessions, however, for this option, the source gNB always check the slice availability before handover. Another option is ***including all parts of PDU sessions in the Handover Request message***. In this option, check the slice availability is not

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> mandatory, but the source gNB may also check the slice availability for selecting the suitable target gNBs (in step 2 as in figure 1), e.g., the source gNB will not request handover UE to a gNB cannot support any slice.

(Ex. 1011, 3) (emphasis added).

218. That is, *R3-173152* provides additional detail to "1. Handover Request" in Figure 1 in order to support slice-aware handover in the scenario where the source gNB and the target gNB are in different registration areas and the target gNB cannot support all of the UE's slices. The additional details include that the "Handover Request message" "includ[es] all parts of PDU sessions" so that the source gNB is not required to "check the slice availability." (Ex. 1011, 3). To be clear, the handover request message includes network slice information.

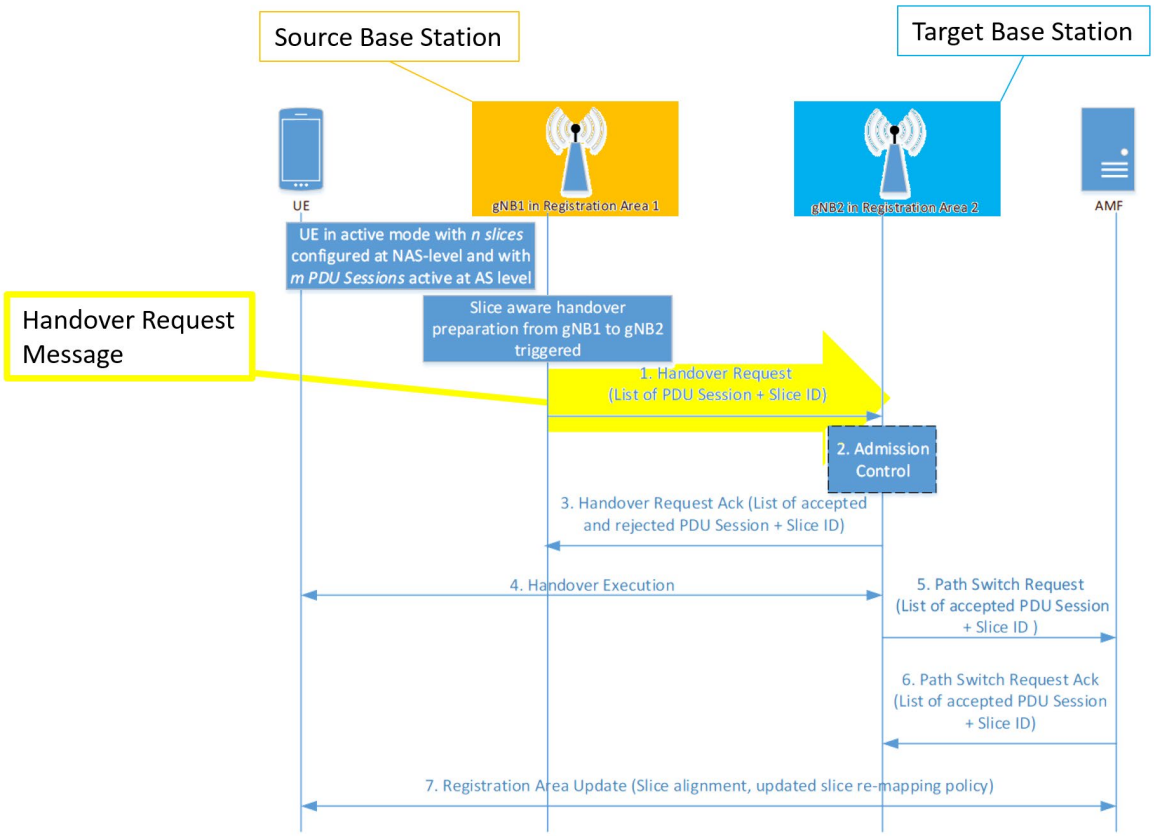
219. *R3-173152* also proposes to add Figure 17.3.4.5-x and accompanying text to *TS 38.300* in order to support slice-aware handover.

220. Shown in Figure 17.3.4.5-x, *R3-173152* discloses "1. Handover Request" message including a "(List of PDU Session + Slice ID)" being transmitted by a first or source "gNB1" to a second or target "gNB2." (Ex. 1011, 5). To be clear, including "(List of PDU Session + Slice ID)" in the "1. Handover Request" message is intended to cover the above-described additional detail of "including all parts of PDU sessions" in the Handover Request message so that the source gNB is not required to "check the slice availability." (Ex. 1011, 3). Accordingly, a person of

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ordinary skill in the art would have understood that "1. Handover Request" of Figure 17.3.4.5-x corresponds to "3. Handover Request" of Figure 1, with additional detail included in the message, including "(List of PDU Session + Slice ID)" to enable slice-aware handover.

Ex. 1011, Figure 17.3.4.5-x (annotated)



221. The '631 Patent explains that "network slice request information may include specific network slice information configured for [a] UE," and that the "network slice information may include information on at least one of network slice configured for the UE, information for identifying a network slice service/PDU

session/bearer associated with the corresponding network slice information, and information on a priority of the corresponding network slice." (Ex. 1001, 11:26-37). At least in view of the explicit disclosure of *R3-173152* that "PDU sessions" and Slice ID (i.e., information for identifying a corresponding network slice) are included in the handover request message so that a source gNB may check slice availability, a person of ordinary skill in the art would have understood or found it obvious that the handover request message of *R3-173152* included network slice information.

222. Thus, *R3-173152* renders obvious claim element [1.b2].

Claim 1, Element [1.c1]: receiving, by the source BS from the target BS, a handover request confirmation message in response to the handover request message,

223. *R3-173152* renders obvious claim element [1.c1].

224. As I describe above, *R3-173152* provides additional detail regarding the "5. Handover Request Acknowledge" of Figure 1 so as to enable slice-aware handover. The Handover Request Acknowledge message is a message that is received by the source base station from the target base station in response to the handover request message. The additional detail regarding the Handover Request Message does not impact whether a Handover Request Acknowledge message is sent, the additional detail merely supplements the contents of the Handover Request Acknowledge message.

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225. *R3-173152,* after presenting Figure 1, goes on to discuss two scenarios in which details may be added to various messages or steps in Figure 1 to enable slice-aware handover. (Ex. 1011, 2-3).

226. In the case that the source gNB and the target gNB are in the *same* RA," *R3-173152* discloses that, "[f]or the Handover Request ACK message, it includes the admitted PDU session list and not admitted PDU session list, to indicate which PDU session can handover to the target." (Ex. 1011, 2).

227. *R3-173152* further discloses:

> Handover Request ACK message also includes the *RRC Context* IE, which will send to UE via the source gNB transparently (i.e., via Handover Command message). In the *RRC Context* IE, the target gNB presents how to configure the RBs for UE, and if some PDU sessions are rejected, the target gNB will put the DRBs associated to the rejected PDU sessions in the *DRB-ToReleaseList* (which is included in the *RRC Context* IE), and thus UE is notified which PDU sessions are not admitted in the target gNB.

(Ex. 1011, 2). That is, *R3-173152* provides additional detail to "5. Handover Request Acknowledge" of Figure 1 in order to support slice-aware handover in the scenario where the source gNB and the target gNB are in the same registration area. The additional details include that the "Handover Request ACK message" "includes the admitted PDU session list and not admitted PDU session list, to indicate which PDU session can handover to the target." (Ex. 1011, 2).

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228. In the scenario where handover occurs across RA's and the target gNB cannot support all of the UE's slices, *R3-173152* discloses, "[f]or the Handover Request ACK message, the target gNB informs non-admitted PDU sessions (e.g., including due to slice availability) list to the source gNB. The non-admitted PDU session is also indicated in the RRC Context IE through DRB-ToReleaseList, and thus UE can be informed." (Ex. 1011, 3). That is, *R3-173152* provides additional detail to "5. Handover Request Acknowledge" in Figure 1 in order to support slice-aware handover in the scenario where the source gNB and the target gNB are in different registration areas and the target gNB cannot support all of the UE's slices. The additional details include that the "Handover Request ACK message" includes a list of "non-admitted PDU sessions (e.g., including due to slice availability." (Ex. 1011, 3).

229. *R3-173152* also proposes to add Figure 17.3.4.5-x and accompanying text to *TS 38.300* in order to support the above-described scenario of slice-aware handover.

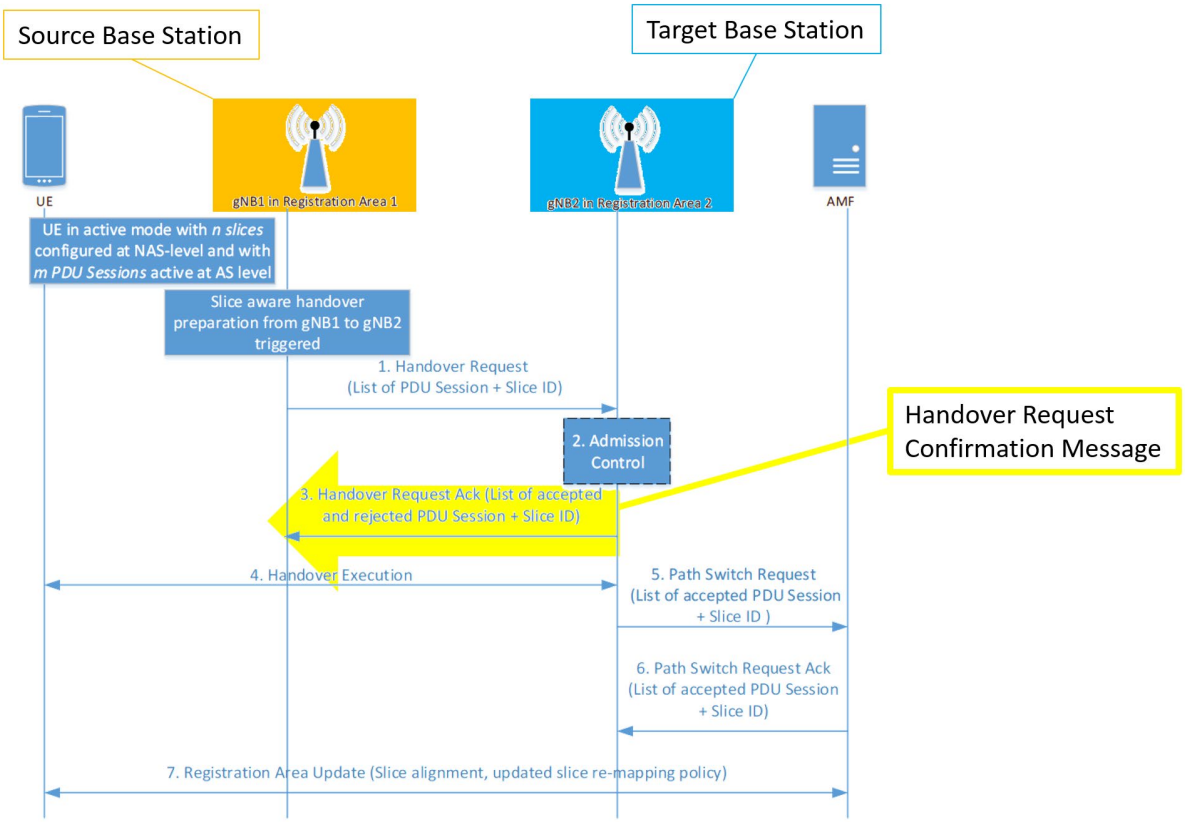
230. Shown in Figure 17.3.4.5-x, *R3-173152* discloses a "3. Handover Request Ack" message including a "(List of accepted and rejected PDU Session + Slice ID)" being received from the second or target "gNB2" by the first or source "gNB1" in response to the "Handover Request" message. (Ex. 1011, 5). The "Handover Request Ack" message is received by the source base station from the

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target base station in response to the handover request message. To be clear, including "(List of accepted and rejected PDU Session + Slice ID)" in the "Handover Request Ack" message is intended to cover the above-described additional detail of the "Handover Request ACK message" including a list of "non-admitted PDU sessions (e.g., including due to slice availability." (Ex. 1011, 3). Accordingly, a person of ordinary skill in the art would have understood that "3. Handover Request Ack" of Figure 17.3.4.5-x corresponds to "5. Handover Request Acknowledge" of Figure 1, with additional detail included in the message, including "(List of accepted and rejected PDU Session + Slice ID)" to enable slice-aware handover.

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Ex. 1011, Figure 17.3.4.5-x (annotated)



231. To the extent it is argued that the "Handover Request Ack" messages of *R3-173152* do not explicitly state that they contain a "confirmation," a person of ordinary skill in the art would have understood that the "Handover Request Ack" message of *R3-173152* satisfies the claimed the "handover request confirmation message" at least in view of the disclosure of the '631 patent.

232. The '631 patent does not use the term "handover request confirmation message" anywhere in the specification or figures, and only uses the term in independent claims 1, 7, and 13. The language of the claims indicates the "handover

request confirmation message" is received "in response to the handover request message," and "includes information for indicating rejection of the one or more PDU sessions by the target BS" "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." (*See, e.g.,* Ex. 1001, Claims 1, 7, 13). The examples in the '631 specification of when "information for indicating" "when a target cell/base station does not support/allow a corresponding network slice," or when "failed network slice information that is not supported/allowed by the target cell/base station" is included in a message, include "a handover response inter-base station interface (Xn) message" and "a handover command Inter-node RRC message," (Ex. 1001, 18:42-19:5). The '631 patent does not elaborate on what "a handover response inter-base station interface (Xn) message" is or contains, nor what "a handover command Inter-node RRC message" is or contains.

233. In view of the disclosure of the '631 patent, a person of ordinary skill in the art would have understood that the claimed "handover request confirmation message" was received "in response to the handover request message," and "include[d] information for indicating rejection of the one or more PDU sessions by the target BS" "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." Additional

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information regarding the contents of the "Handover Request ACK" is described *infra* in [1.c2] and I incorporate it in my analysis herein.

234. Accordingly, a person of ordinary skill in the art would have understood that the "Handover Request Ack" message of *R3-173152* - which is disclosed by *R3-173152* as being received in response to the handover request message, and which is also disclosed by *R3-173152* as including "the admitted PDU session list and not admitted PDU session list, to indicate which PDU session can handover to the target" (*see* Ex. 1011, 2), or "List of accepted and rejected PDU Session + Slice ID" (*see* Ex. 1011, 5) - satisfies the claimed "handover request confirmation message." *See also* [1.c2] *infra*.

235. Thus, *R3-173152* renders obvious claim element [1.c1].

Claim 1, Element [1.c2]: 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.

236. *R3-173152* renders obvious claim element [1.c2].

237. The '631 patent does not use the term "rejection" nor "reject" outside of the independent claims. Therefore, the '631 patent is unclear regarding what "information for indicating a rejection of the one or more PDU sessions by the target BS" entails. Notwithstanding the lack of disclosure by the '631 patent of such a limitation, *R3-173152* renders obvious such a limitation because it, in fact, clearly

discloses the claimed limitation - including information for indicating the rejection of some PDU sessions, e.g., due to resource limitation, by a target BS in its handover response message).

238. As I describe above, *R3-173152* provides additional detail regarding the "5. Handover Request Acknowledge" of Figure 1 so as to enable slice-aware handover. (*see generally* § VIII.A *supra*).

239. *R3-173152,* after presenting Figure 1, goes on to discuss two scenarios in which details may be added to various messages or steps in Figure 1 to enable slice-aware handover. (Ex. 1011, 2-3).

240. In the case that the source gNB and the target gNB are in the *same* RA," *R3-173152* discloses that, "[f]or the Handover Request ACK message, it includes the admitted PDU session list and not admitted PDU session list, to indicate which PDU session can handover to the target." (Ex. 1011, 2).

241. *R3-173152* further discloses:

> Handover Request ACK message also includes the *RRC Context* IE, which will send to UE via the source gNB transparently (i.e., via Handover Command message). In the *RRC Context* IE, the target gNB presents how to configure the RBs for UE, and ***if some PDU sessions are rejected, the target gNB will put the DRBs associated to the rejected PDU sessions in the DRB-ToReleaseList (which is included in the RRC Context IE)***, and thus UE is notified which PDU sessions are not admitted in the target gNB.

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(Ex. 1011, 2) (emphasis added). That is, *R3-173152* provides additional detail to "5. Handover Request Acknowledge" of Figure 1 in order to support slice-aware handover in the scenario where the source gNB and the target gNB are in the same registration area. The additional details include that the "Handover Request ACK message" "includes the admitted PDU session list and not admitted PDU session list, to indicate which PDU session can handover to the target." (Ex. 1011, 2). To be clear, the "Handover Request ACK message" includes information about "***rejected PDU sessions***" from the target gNB. (Ex. 1011, 2).

242. In the scenario where handover occurs across RA's and the target gNB cannot support all of the UE's slices, *R3-173152* discloses, "[f]or the Handover Request ACK message, the target gNB informs ***non-admitted PDU sessions (e.g., including due to slice availability) list to the source gNB***. The non-admitted PDU session is also indicated in the RRC Context IE through DRB-ToReleaseList, and thus UE can be informed." (Ex. 1011, 3). That is, *R3-173152* provides additional detail to "5. Handover Request Acknowledge" in Figure 1 in order to support slice-aware handover in the scenario where the source gNB and the target gNB are in different registration areas and the target gNB cannot support all of the UE's slices. The additional details include that the "Handover Request ACK message" includes a list of "non-admitted PDU sessions (e.g., including due to slice availability." (Ex. 1011, 3). To be clear, the "Handover Request ACK message" includes information

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about "***non-admitted PDU sessions***" in a list from the target gNB to the source gNB. *Id.* That is, the "Handover Request Ack" message of *R3-173152* includes information for indicating a rejection of one or more PDU sessions by the target BS when one or more PDU sessions are associated with one or more network slices that are not supported by the target BS.

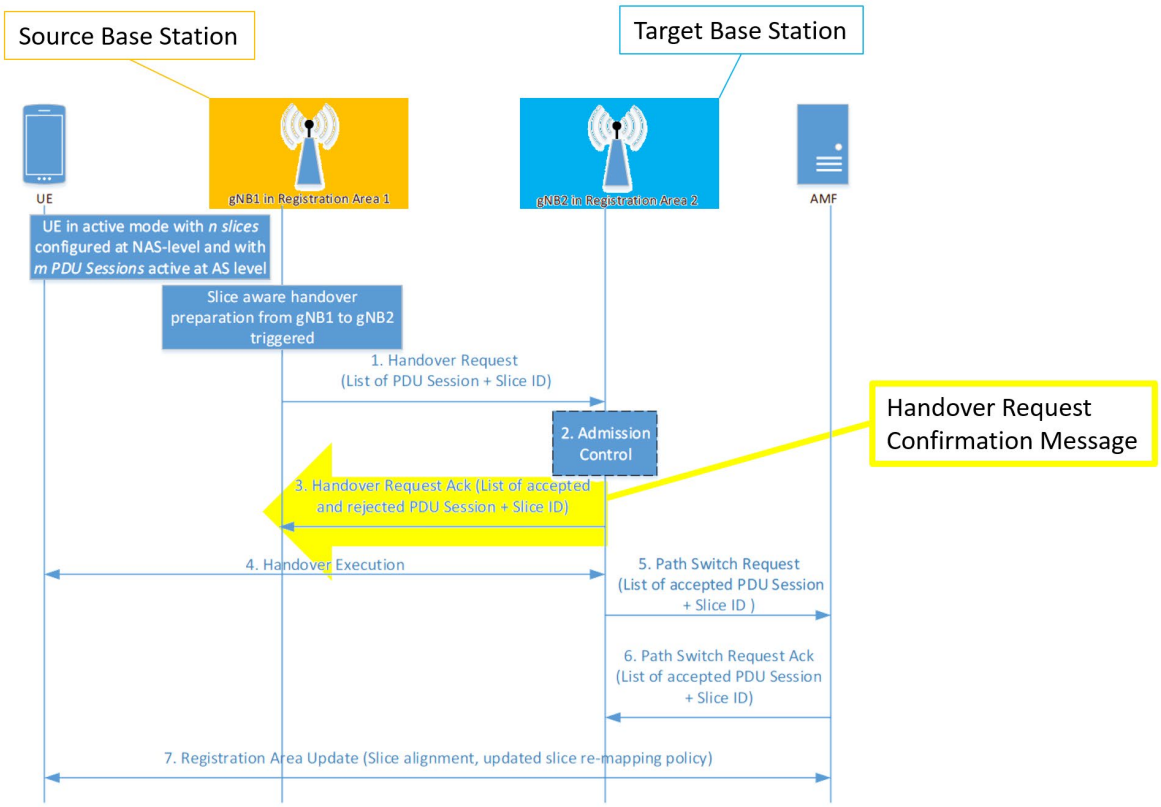
243. *R3-173152* also proposes to add Figure 17.3.4.5-x and accompanying text to *TS 38.300* in order to support the above-described scenario of slice-aware handover.

244. Shown in Figure 17.3.4.5-x, *R3-173152* discloses a "3. Handover Request Ack" message including a "(List of accepted and ***rejected PDU Session*** + Slice ID)" being received from the second or target "gNB2" by the first or source "gNB1" in response to the "Handover Request" message. (Ex. 1011, 5). To be clear, including "(List of accepted and ***rejected PDU Session*** + Slice ID)" in the "Handover Request Ack" message is intended to cover the above-described additional detail of the "Handover Request ACK message" including a list of "non-admitted PDU sessions (e.g., including due to slice availability." (Ex. 1011, 3). Accordingly, a person of ordinary skill in the art would have understood that "3. Handover Request Ack" of Figure 17.3.4.5-x corresponds to "5. Handover Request Acknowledge" of Figure 1, with additional detail included in the message, including "(List of accepted and rejected PDU Session + Slice ID)" to enable slice-aware

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handover. That is, *R3-173152* discloses a list of "***rejected PDU Session***" and "Slice ID" being included in a "Handover Request Ack" message.

Ex. 1011, Figure 17.3.4.5-x (annotated)



245. In view of the explicit disclosure in *R3-173152* of "rejected PDU Session" and "Slice ID" being included in a "Handover Request Ack" message, a person of ordinary skill in the art would have understood or found it obvious that the "Handover Request Ack" message provided information for indicating a rejection of one or more PDU sessions.

246. Thus, *R3-173152* renders obvious claim element [1.c2].

Independent Claim 7

Claim 7, Element [7.pre]: A controller for transmitting and receiving data, the controller comprising:

247. To the extent that element [7.pre] is found to be limiting, *R3-173152* renders obvious claim element [7.pre].

248. The '631 patent describes a "controller 510" as being part of a "base station 500." (Ex. 1001, 21:62-22:35). The "controller 510" "may control the overall operations of the base station 500." (Ex. 1001, 22:27-31). The "base station 500 may include a receiver 530 receiving network slice request information" and a "transmitter 520 transmitting the network slice request information." (Ex. 1001, 21:65-66, 22:20-21).

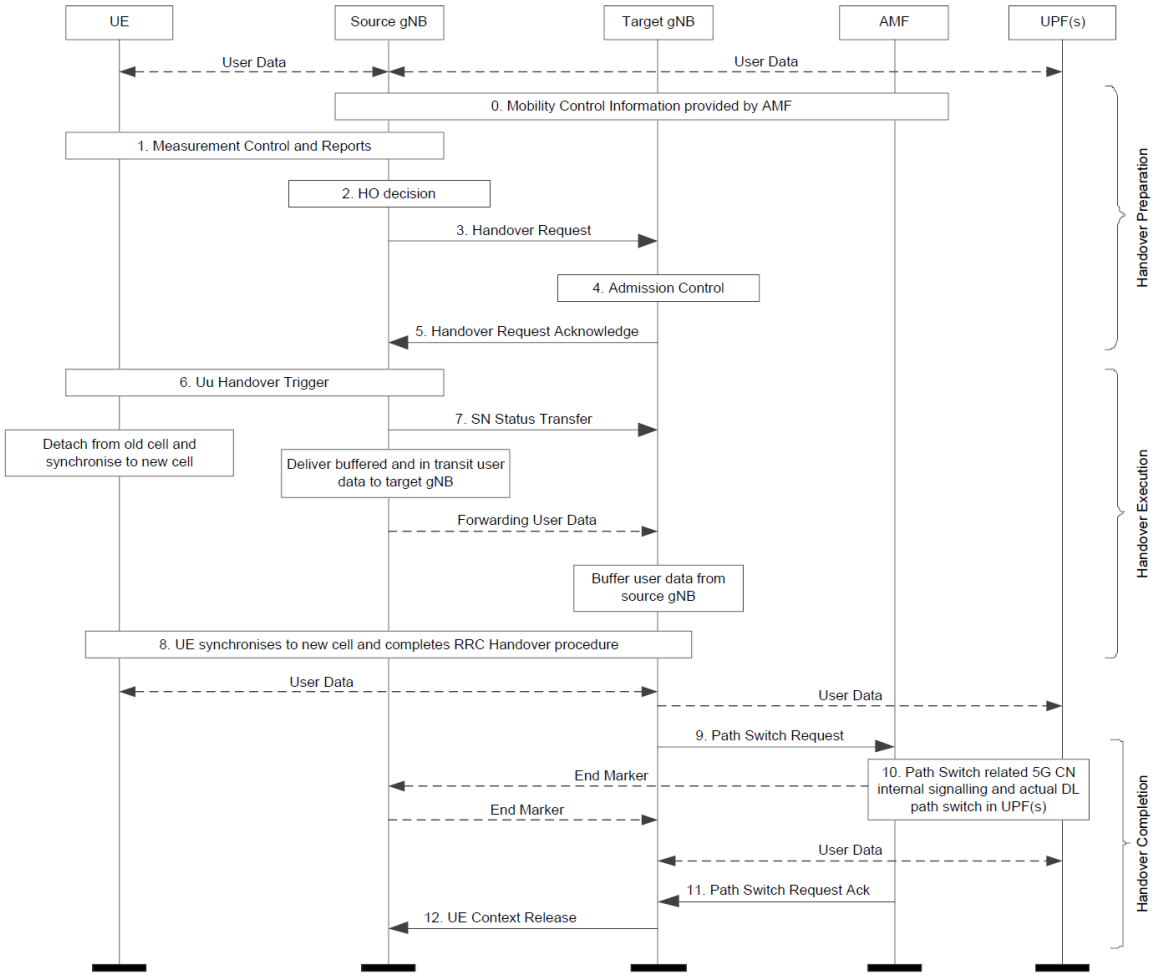
249. The '631 patent discloses in a generic manner that the controller controls the operation of the base station, including receiving network slice information, controlling network slice information, and controlling mobility of a terminal or UE. (Ex. 1001, 22:27-31). Accordingly, a person of ordinary skill in the art would have understood that the claim term "controller" refers to components (e.g., hardware and software) included in the base station or gNB for controlling the operations of the base station or gNB. And the person of ordinary skill in the art would have understood that the base station or gNB of *R3-173152* includes components (e.g., hardware and software) for controlling the operations of the base station or gNB.

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250. The ’631 patent defines a “base station” as “generally refer[ring] to a station communicating with the UE.” (Ex. 1001, 3:61-62). The ’631 patent provides examples of base stations, including “all of various communication service areas and devices, such as a Node-B, an evolved Node-B (eNB), a gNode-B (gNB), a low power node (LPN), a sector, a site, various types of antennas, a base transceiver system (BTS), an access point, a point (e.g., a transmitting point, a receiving point, or a transceiving point), a relay node, a megacell, a macrocell, a microcell, a picocell, a femtocell, a remote radio head (RRH), a radio unit (RU), and a small cell.” (Ex. 1001, 3:62-4:4).

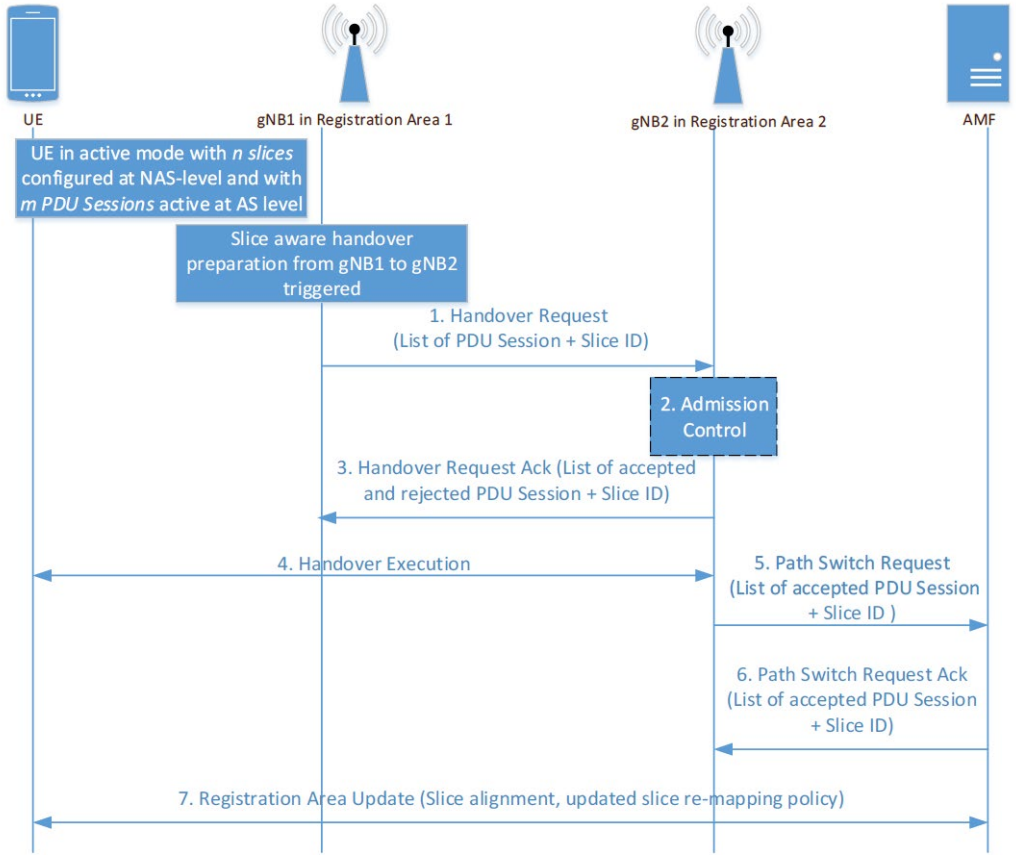
251. *R3-173152* discloses a gNB, or base station. (Ex. 1011, Figures 1, 17.3.4.5-x). Thus, *R3-173152* discloses the claimed controller, according to the understanding of the person of ordinary skill in the art at least in view of the knowledge of the person of ordinary skill in the art and consistent with the disclosure of the ’631 patent.

Ex. 1011, Figure 1



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Ex. 1011, 4 (Figure 17.3.4.5-x)



252. To the extent is it argued that *R3-173152* does not explicitly disclose that the base station or gNB includes a controller, a person of ordinary skill in the art would have been familiar with base stations and the components of base stations. *See* § VI.B *supra*. For example, *Huang-Fu*[6] (Ex. 1022) depicts a block diagram of an evolved Node-B, eNB, or base station reproduced below. *Huang-Fu* depicts a

[6] *Huang-Fu* is not part of the grounds, but is referenced here to demonstrate the knowledge of the person of ordinary skill in the art when reviewing *R3-173152*.

block diagram of an evolved node-B (eNB), reproduced below. (Ex. 1022, ¶¶[0030-0031]; FIG. 1). *Huang-Fu* explains that a base unit may also be referred to as "an access point, an access terminal, a base station, a Node-B, an eNode-B, or by other terminology used in the art." (Ex. 1022, ¶[0026]).

Ex. 1022, FIG. 1 (partial)

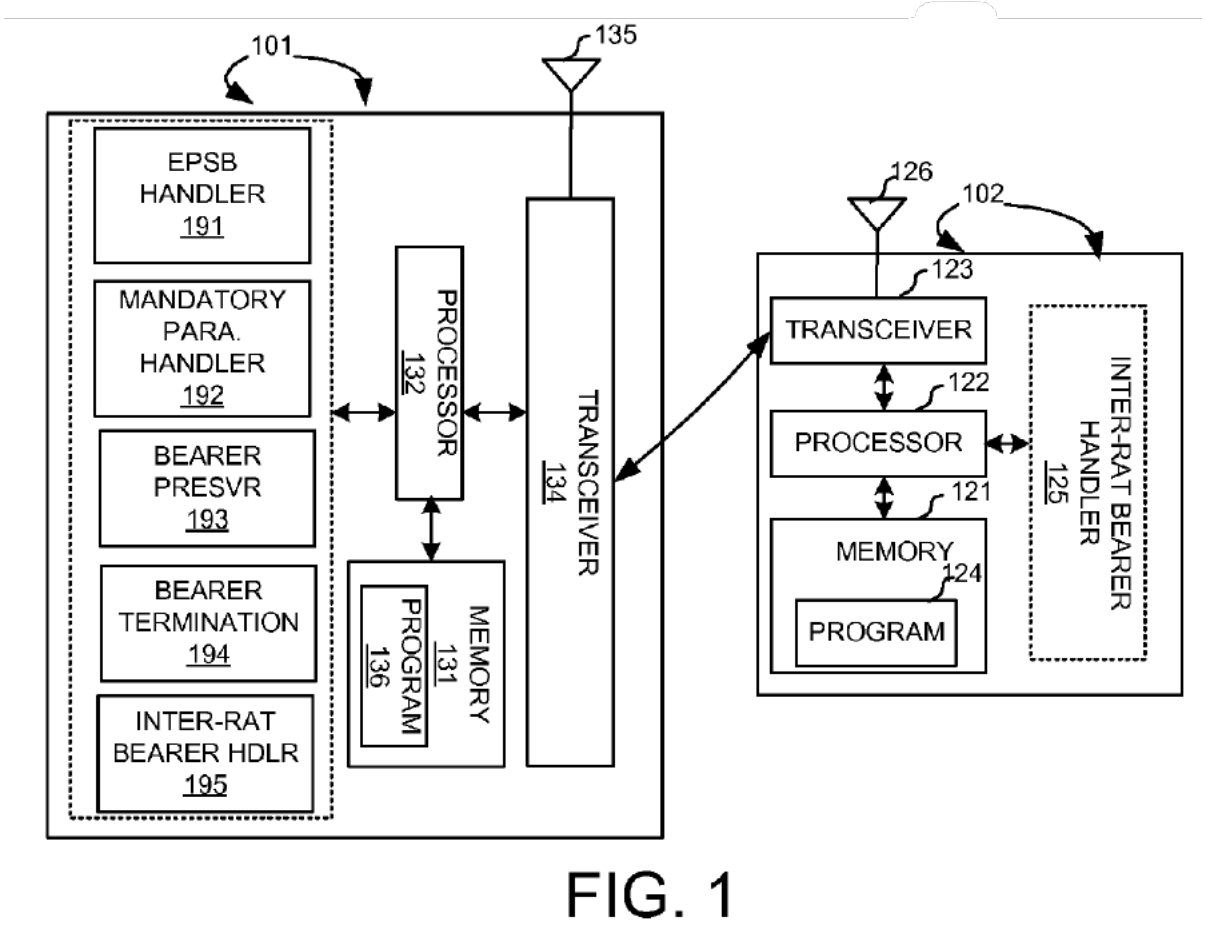


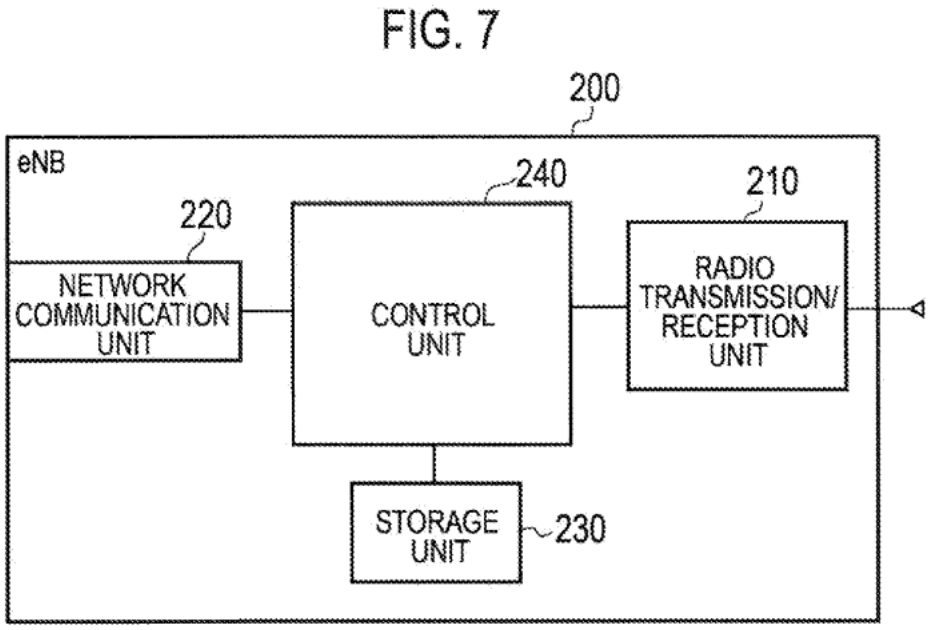
FIG. 1

253. *Huang-Fu* explains that an eNB includes a "processor 122." (Ex. 1022, ¶[0031]). The "processor 122" of the eNB "processes the received baseband signals and invokes different functional modules to perform features in base station 102." *Id.* The eNB also includes "memory 121" which "stores program instructions and

data 124 to control operations of base station 102." *Id. Huang-Fu* explains that the "[b]ase station 102 also includes a set of control modules" "that carry out functional tasks." *Id.*

254. As another example, *Fujishiro*[7] (Ex. 1023) depicts a block diagram of a base station, evolved Node-B, or eNB, reproduced below. (Ex. 1023, ¶¶[0056], [0098-0102]; FIG. 7).

Ex. 1023, FIG. 7



[7] *Fujishiro* is not part of the grounds, but is referenced here to demonstrate the knowledge of the person of ordinary skill in the art when reviewing *R3-173152*.

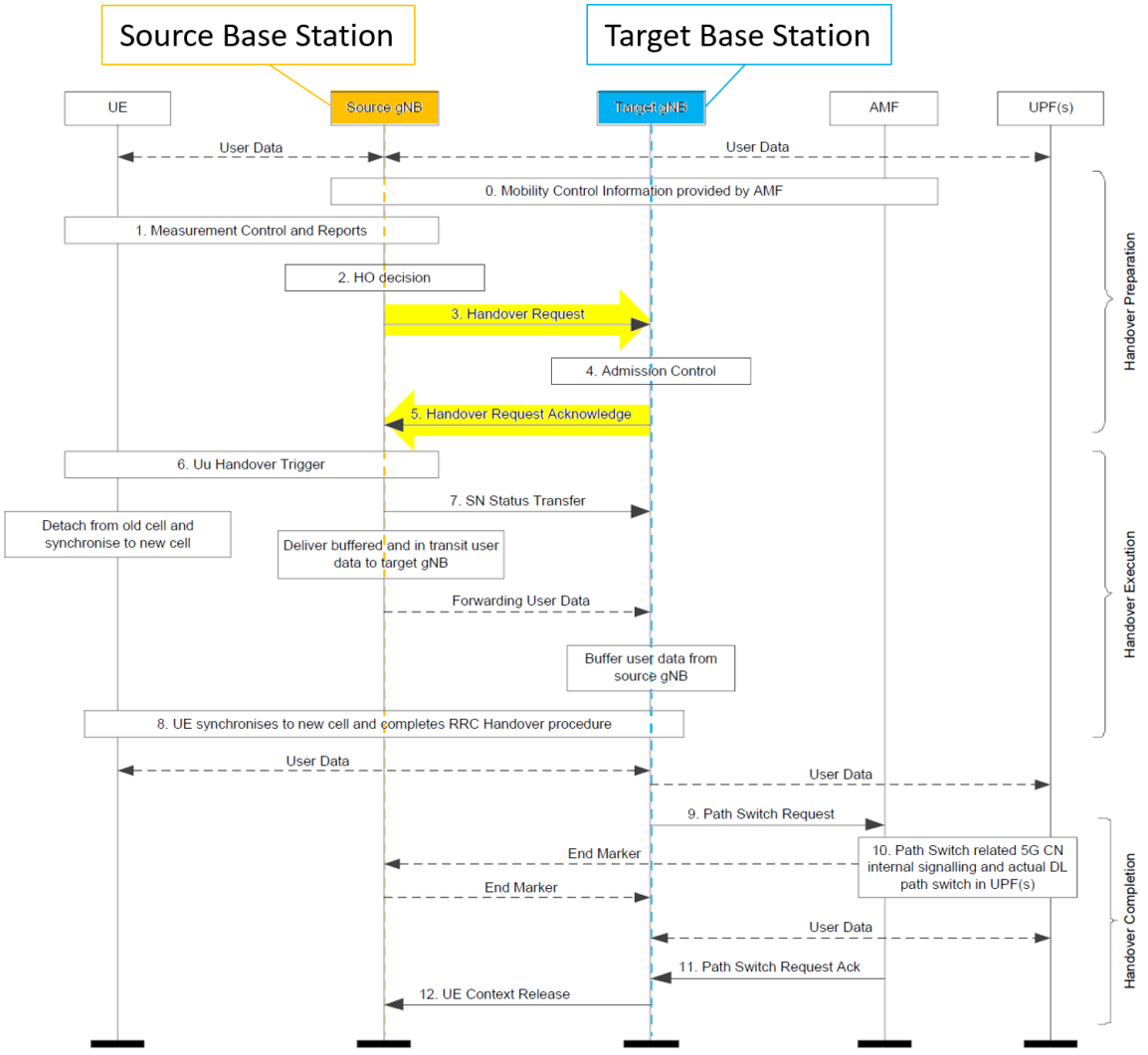
255. *Fujishiro* illustrates that an "eNB 200 includes a radio transmission/reception unit 210, a network communication unit 220, a storage unit 230, and a control unit 240." (Ex. 1023, ¶0098]). *Fujishiro* explains that the "control unit 240 controls various functions of the eNB 200." (Ex. 1023, ¶[0102]).

256. Accordingly, a person of ordinary skill in the art would have known that base stations included a controller or processor, as corroborated by *Huang-Fu* and *Fujishiro*, and therefore would have understood that a base station included the claimed "controller." Moreover, the person of ordinary skill in the art would have known that a base station could be a gNode-B (gNB), at least in view of the disclosure of the '631 patent. Thus, a person of ordinary skill in the art would have understood that a gNB satisfied the claimed "controller."

257. With reference to Figure 1, *R3-173152* discloses an "Xn based handover." (Ex. 1011, 2).

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Ex. 1011, Figure 1 (annotated)



258. In Figure 1, *R3-173152* discloses a "Handover Request" message (shown as "3. Handover Request" being sent from "Source gNB" to "Target gNB" in Figure 1). Further in Figure 1, *R3-173152* discloses a "Handover Request ACK" message (shown as "5. Handover Request Acknowledge" being sent from "Target gNB" to "Source gNB" in Figure 1). *R3-173152,* after presenting Figure 1, goes on

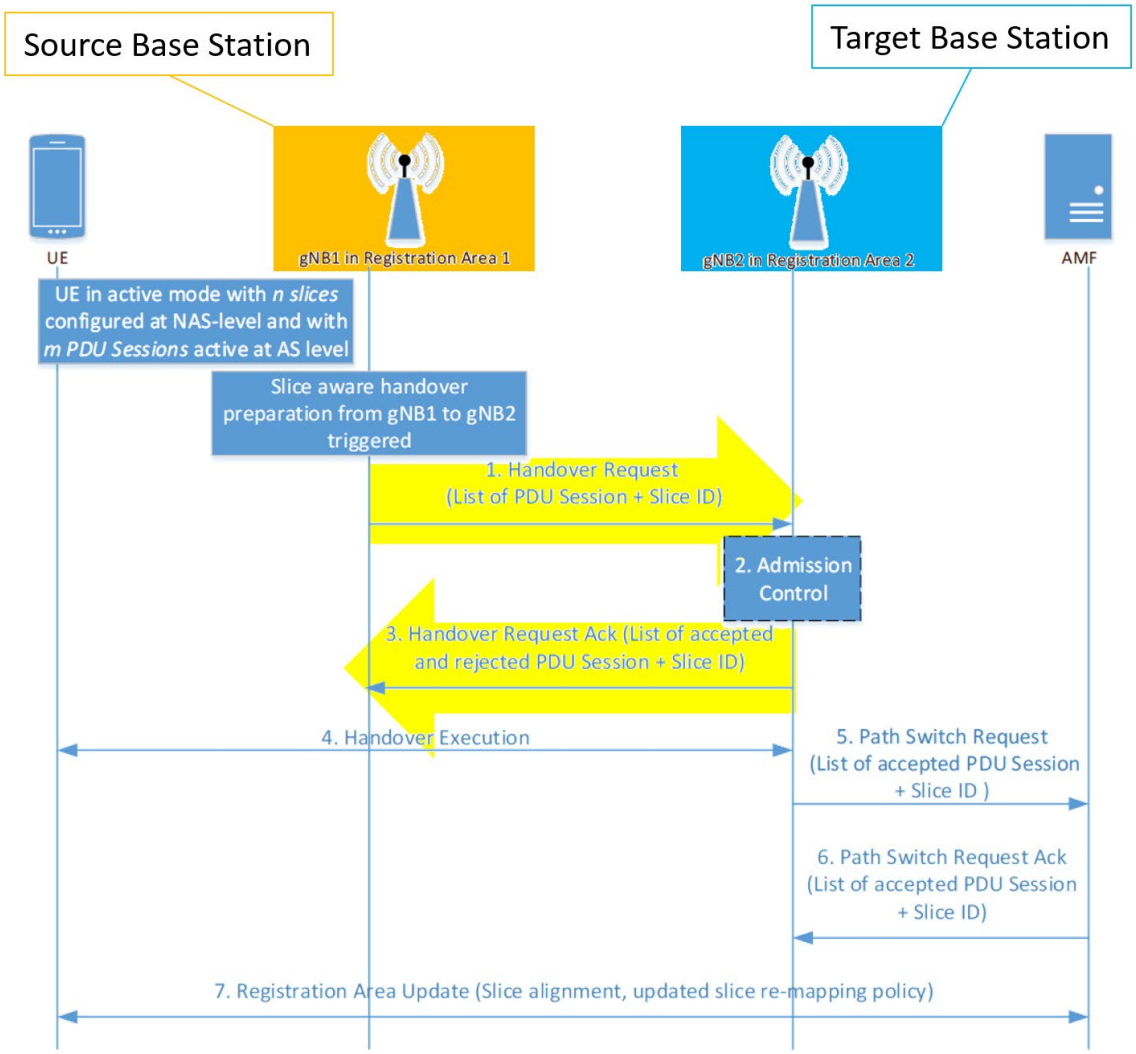
to "discuss whether the Xn based handover can be used for mobility across Registration Area (RA), regardless of slice availability." (Ex. 1011, 2).

259. *R3-173152* explains that, in order to "make the discussion clearly," "a case that the source gNB and the target gNB are in the *same* RA" is discussed. (Ex. 1011, 2). That is, *R3-173152* intends to present slice-aware handover in a situation where the source gNB and the target gNBs are in different registration areas (*see* Ex. 1011, 2-3), and first describes how a slice-aware handover might work in the situation where the source gNB and target gNB are in the same registration area to ease understanding. (*see, generally,* § VIII.A *supra*).

260. That is, *R3-173152* proposes to add Figure 17.3.4.5-x and accompanying text to *TS 38.300* in order to provide additional detail to various steps of Figure 1 to support slice-aware handover. (*see, generally,* § VIII.A *supra*).

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Ex. 1011, Figure 17.3.4.5-x (annotated)



261. Shown in Figure 17.3.4.5-x, *R3-173152* discloses "1. Handover Request" message including a "(List of PDU Session + Slice ID)" being transmitted by a first or source "gNB1" to a second or target "gNB2." (Ex. 1011, 5). To be clear, including "(List of PDU Session + Slice ID)" in the "1. Handover Request" message is intended to cover the above-described additional detail of "including all parts of

PDU sessions" in the Handover Request message so that the source gNB is not required to "check the slice availability." (Ex. 1011, 3). Accordingly, a person of ordinary skill in the art would have understood that "1. Handover Request" of Figure 17.3.4.5-x corresponds to "3. Handover Request" of Figure 1, with additional detail included in the message, including "(List of PDU Session + Slice ID)" to enable slice-aware handover.

262. Also shown in Figure 17.3.4.5-x, *R3-173152* discloses a "3. Handover Request Ack" message including a "(List of accepted and rejected PDU Session + Slice ID)" being received from the second or target "gNB2" by the first or source "gNB1" in response to the "Handover Request" message. (Ex. 1011, 5). To be clear, including "(List of accepted and rejected PDU Session + Slice ID)" in the "Handover Request Ack" message is intended to cover the above-described additional detail of the "Handover Request ACK message" including a list of "non-admitted PDU sessions (e.g., including due to slice availability." (Ex. 1011, 3). Accordingly, a person of ordinary skill in the art would have understood that "3. Handover Request Ack" of Figure 17.3.4.5-x corresponds to "5. Handover Request Acknowledge" of Figure 1, with additional detail included in the message, including "(List of accepted and rejected PDU Session + Slice ID)" to enable slice-aware handover.

263. To the extent it is argued that *R3-173152* does not explicitly state that its procedures are for "transmitting and receiving data," a person of ordinary skill in

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the art would have understood or found it obvious that data is transmitted and received in *R3-173152* because *R3-173152* depicts "Handover Request" and "Handover Request Ack" messages, which contain network slicing information, being transmitted to and received by gNBs. Thus, a person of ordinary skill would have understood that "data" was "transmitted and received" in the handover method disclosed in *R3-173152*.

264. Thus, *R3-173152* renders obvious claim element [7.pre].

Claim 7, Element [7.a]: a processor performs: to decide whether to perform a handover;

265. *R3-173152* renders obvious claim element [7.a].

266. *R3-173152* discloses a gNB or base station, and a person of ordinary skill in the art would have understood or found it obvious that a base station included a processor. *See* §§ VI.B, IX.A.[7.pre] *supra.* In any case, *R3-173152* discloses base stations and thus a processor.

267. To the extent is it argued that *R3-173152* does not explicitly disclose that the base station or gNB includes a processor, as discussed above, a person of ordinary skill in the art would have been familiar with base stations and the components of base stations, including that base stations included processors and it would have been obvious to include a processor in the base station so as to process the one or more handover commands disclosed herein. *See* § VI.B *supra*.

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268. The ’631 patent does not use the term “processor” in the specification. Instead, the term “controller” is used in a way that the person of skill in the art would have understood that the terms “controller” and “processor” are being used interchangeably. In claim 7, the term “controller” and the term “processor” are both used. As is shown below, the references render the claim obvious whether the term “controller” is used broadly to define a base station or narrowly to refer to a “processor.”

269. The inclusion of a processor in a base station was well known to the person of ordinary skill in the art. For example, *Huang-Fu*[8] (Ex. 1022) depicts a block diagram of an evolved Node-B, eNB, or base station reproduced below. *Huang-Fu* depicts a block diagram of an evolved node-B (eNB), reproduced below. (Ex. 1022, ¶¶[0030-0031]; FIG. 1). *Huang-Fu* explains that a base unit may also be referred to as “an access point, an access terminal, a base station, a Node-B, an eNode-B, or by other terminology used in the art.” (Ex. 1022, ¶[0026]).

[8] *Huang-Fu* is not part of the grounds, but is referenced here to demonstrate the knowledge of the person of ordinary skill in the art when reviewing *R3-173152*.

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Ex. 1022, FIG. 1 (partial)

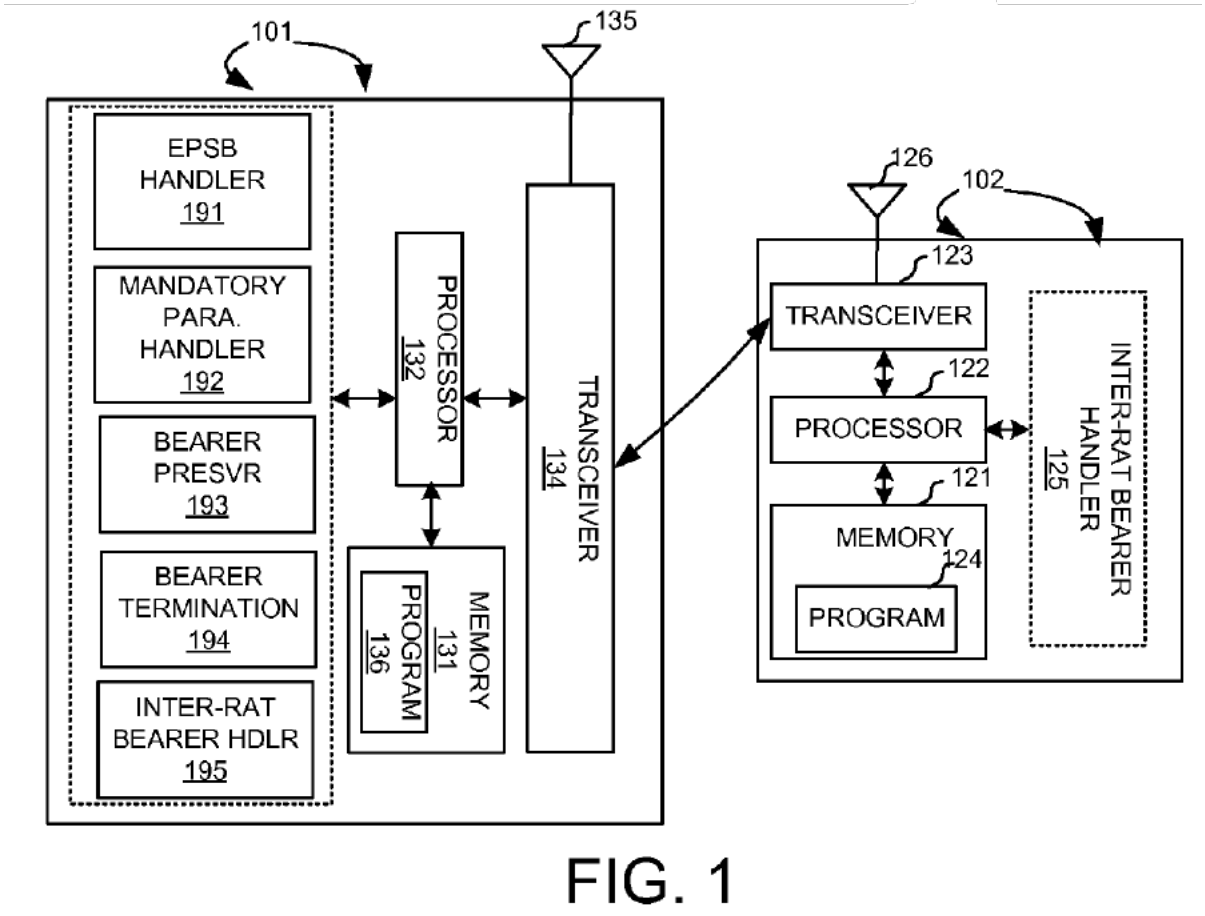
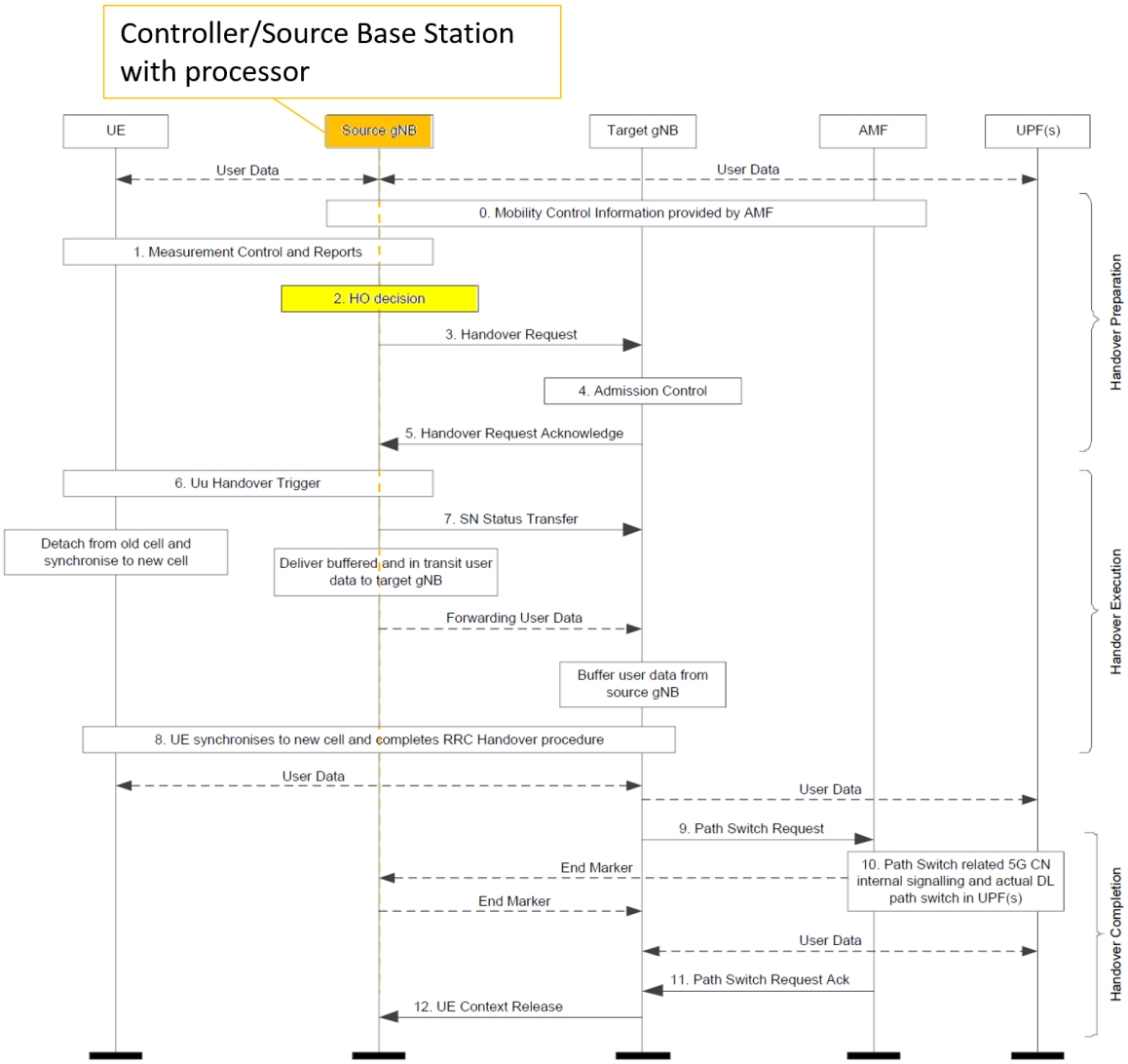


FIG. 1

270. *Huang-Fu* explains that an eNB includes a "processor 122." (Ex. 1022, ¶[0031]). The "processor 122" of the eNB "processes the received baseband signals and invokes different functional modules to perform features in base station 102." *Id.* The eNB also includes "memory 121" which "stores program instructions and data 124 to control operations of base station 102." *Id. Huang-Fu* explains that the "[b]ase station 102 also includes a set of control modules" "that carry out functional tasks." *Id.* Accordingly, a person of ordinary skill in the art would have known or found it obvious that a base station included a processor.

271. With reference to Figure 1 (reproduced and annotated below), *R3-173152* discloses a "Xn based handover," where a "Source gNB" performs a step "2. HO decision." (Ex. 1011, 2). *R3-173152* further discloses that the "Source gNB may check the slice availability for handover decision." (Ex. 1011, 3).

Ex. 1011, Figure 1 (annotated)



272. To the extent it is argued that *R3-173152* does not explicitly disclose the details of the "HO decision," the person of ordinary skill in the art would have known or found it obvious that the "Source gNB" decides whether to handover. For example, Figure 17.3.4.5-x depicts a step in which "Slice aware handover" is "triggered." Ex. 1011, 5. Moreover, a person of ordinary skill in the art would have found it obvious, in view of *R3-173152*, that the "Source gNB" decides whether to handover prior to transmitting a handover request message because the person of ordinary skill in the art would have understood that a base station would not transmit handover request messages at random. That is, a person of ordinary skill in the art would have found it obvious that the "Source gNB" decides whether to handover prior to transmitting a handover request message because the person of ordinary skill in the art would have known that it would have been unnecessary, and inefficient, to transmit handover request messages to other base stations when it had not been determined that a handover was to be performed. Moreover, a person of ordinary skill in the art would have understood that transmitting handover request messages unprompted (e.g., without the use of a handover decision) would have increased network traffic and decreased bandwidth. Indeed, *R3-173152* discloses, in Figure 17.3.4.5-x (which supplements the handover messages of Figure 1), deciding to handover because it discloses "Slice aware handover . . . [is] triggered" at the source

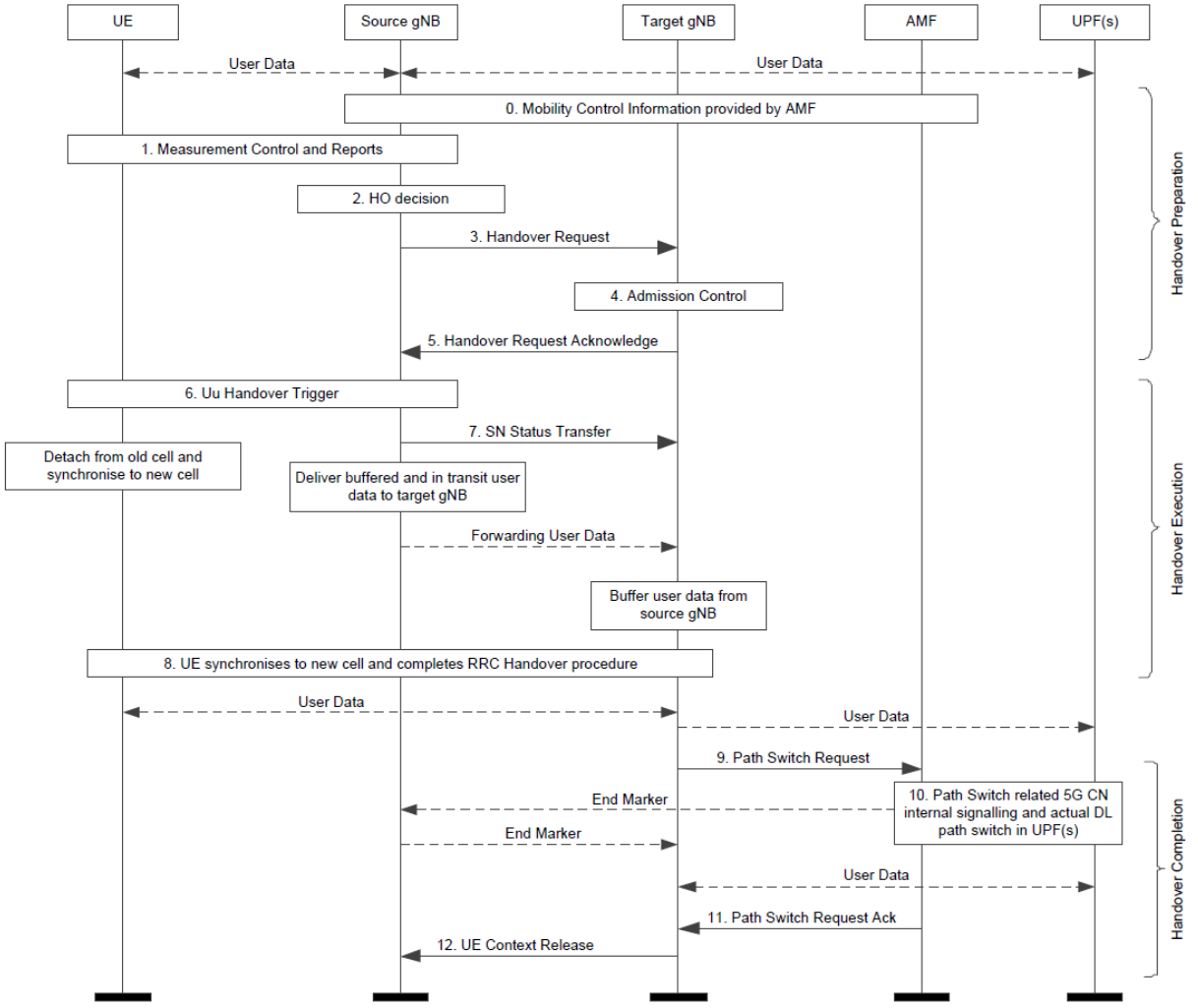
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base station. (Ex. 1011, 5; Figure 17.3.4.5-x). Indeed, *TS 38.300*[9], which is specifically referenced by *R3-173152* as having "captured" "the Xn based handover as in figure 1" (*see* Ex. 1011, 2) (in other words, as being the source of Figure 1 of *R3-173152*), corroborates what that a person of ordinary skill in the art would have known - that the "Source gNB" decides whether to handover because *TS 38.300*, with reference to Figure 9.2.3.2.1-1 (reproduced below), discloses that the "***source gNB decides to handover the UE***." (Ex. 1019, 33) (emphasis added). That is, a person of ordinary skill in the art would have found it obvious that a handover decision occurred before any handover request message in Figure 17.3.4.5-x of *R3-173152*.

[9] While *TS 38.300* is not part of the grounds, it is referenced here to demonstrate the knowledge of the person of ordinary skill in the art when reviewing *R3-173152*.

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Ex. 1019, Figure 9.2.3.2.1-1



273. Thus, *R3-173152* renders obvious claim element [7.a].

Claim 7, Element [7.b1]: to transmit a handover request message when it is decided to perform the handover,

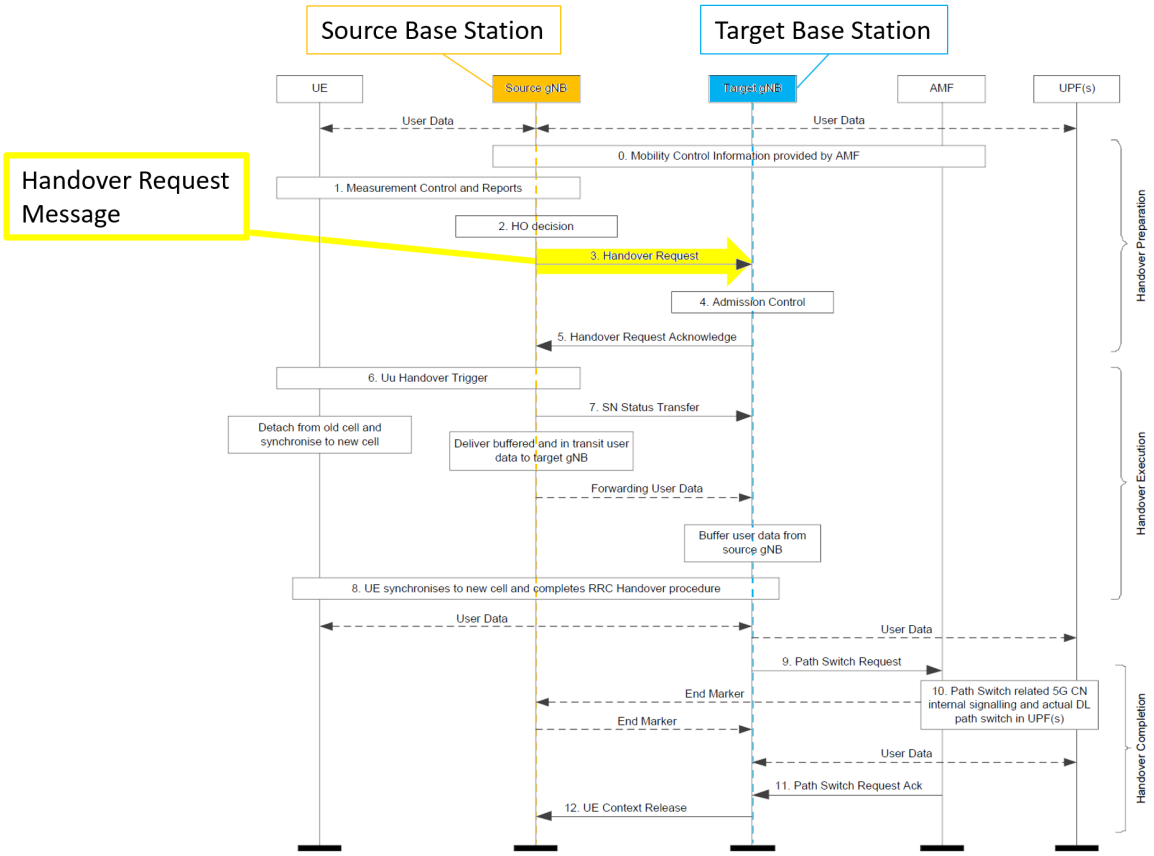
274. *R3-173152* renders obvious claim element [7.b1].

275. *R3-173152* renders obvious deciding whether to perform the handover.

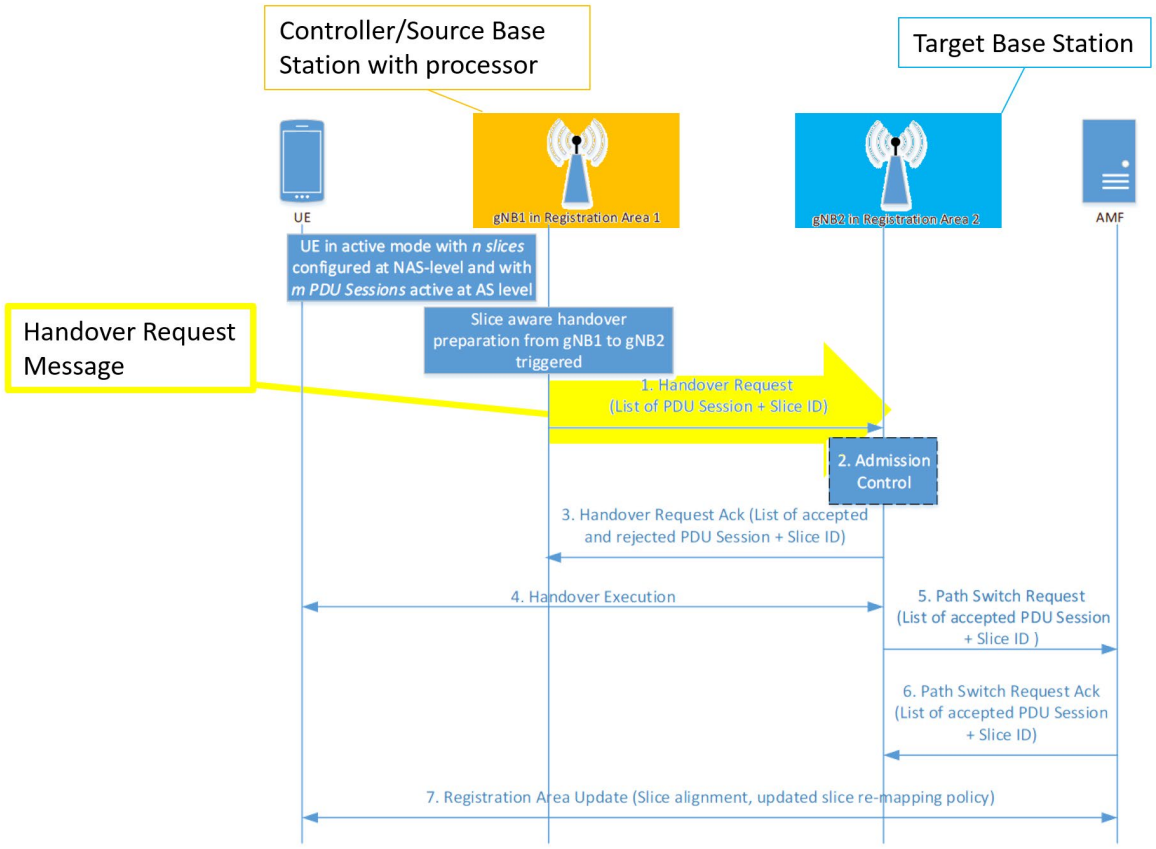
See § IX.A.[7.a] *supra*.

276. As I describe above, *R3-173152* provides additional detail regarding the "3. Handover Request" of Figure 1 (the then-current standard for handover) so as to enable slice-aware handover. *R3-173152* also proposes to add Figure 17.3.4.5-x and accompanying text to *TS 38.300* in order to support the above-described scenario of slice-aware handover.

Ex. 1011, Figure 1 (annotated)



Ex. 1011, Figure 17.3.4.5-x (annotated)



277. Shown in Figure 17.3.4.5-x, *R3-173152* discloses a "1. Handover Request" message including a "(List of PDU Session + Slice ID)" being transmitted by a first or source "gNB1" to a second or target "gNB2." (Ex. 1011, 5). To be clear, including "(List of PDU Session + Slice ID)" in the "1. Handover Request" message is intended to cover the above-described additional detail of "including all parts of PDU sessions" in the Handover Request message so that the source gNB is not required to "check the slice availability." (Ex. 1011, 3). Accordingly, a person of ordinary skill in the art would have understood that "1. Handover Request" of Figure

17.3.4.5-x corresponds to "3. Handover Request" of Figure 1, with additional detail included in the message, including "(List of PDU Session + Slice ID)" to enable slice-aware handover. Thus, *R3-173152*, through the teachings of Figure 1 and Figure 17.3.4.5-x, render obvious a handover request message being transmitted by the source base station to the target base station once it is decided to perform a handover.

278. Thus, *R3-173152* renders obvious claim element [7.b1].

Claim 7, Element [7.b2]: wherein the handover request message includes network slice information; and

279. *R3-173152* renders obvious claim element [7.b2].

280. *R3-173152* discloses handover procedures that take network slicing into account. (Ex. 1011, 1). *R3-173152* disclosed additional detail in the form of a Slice ID and PDU sessions (i.e., network slice information) in its handover request message, and the inclusion of these additional details enables slice-aware handover. *See* § IX.A.[7.b1] *supra. R3-173152,* after presenting Figure 1, goes on to discuss two scenarios in which details may be added to various messages or steps in Figure 1 to enable slice-aware handover. (Ex. 1011, 2-3).

281. In the "case that the source gNB and the target gNB are in the *same* RA," *R3-173152* discloses that, "[f]or the Handover Request message, it includes (all) PDU sessions with active UP connections handled by the source gNB, to indicate the target gNB which PDU session should handover to the target." (Ex.

1011, 2). That is, *R3-173152* provides additional detail to "3. Handover Request" of Figure 1 in order to support slice-aware handover in the scenario where the source gNB and the target gNB are in the same registration area. The additional details include that the "Handover Request message" "includes (all) PDU sessions with active UP connections handled by the source gNB," "to indicate [to] the target gNB which PD session should handover to the target." (Ex. 1011, 2).

282. In the scenario where handover occurs across RA's and the target gNB cannot support all of the UE's slices, *R3-173152* discloses:

> As the target gNB cannot support all the slices, the PDU sessions with active UP connections handled by the source gNB can be divided to two part: one part is the PDU sessions which associated slice(s) is supported by the target gNB, another part is the PDU sessions which associated slice(s) is *not* supported by the target gNB. One option is only including the latter part of PDU sessions, however, for this option, the source gNB always check the slice availability before handover. Another option is ***including all parts of PDU sessions in the Handover Request message***. In this option, check the slice availability is not mandatory, but the source gNB may also check the slice availability for selecting the suitable target gNBs (in step 2 as in figure 1), e.g., the source gNB will not request handover UE to a gNB cannot support any slice.

(Ex. 1011, 3) (emphasis added).

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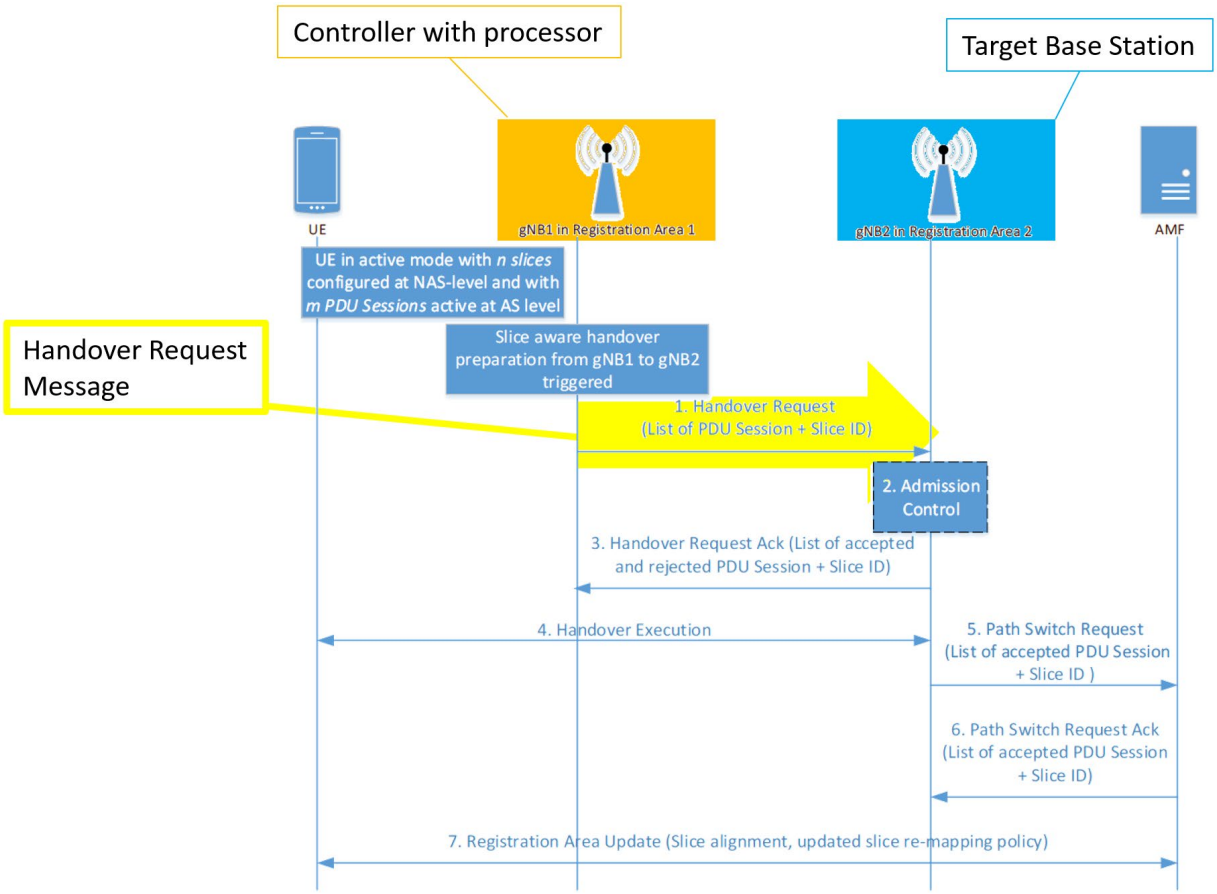
283. That is, *R3-173152* provides additional detail to "1. Handover Request" in Figure 1 in order to support slice-aware handover in the scenario where the source gNB and the target gNB are in different registration areas and the target gNB cannot support all of the UE's slices. The additional details include that the "Handover Request message" "includ[es] all parts of PDU sessions" so that the source gNB is not required to "check the slice availability." (Ex. 1011, 3).

284. *R3-173152* also proposes to add Figure 17.3.4.5-x and accompanying text to *TS 38.300* in order to support slice-aware handover.

285. Shown in Figure 17.3.4.5-x, *R3-173152* discloses "1. Handover Request" message including a "(List of PDU Session + Slice ID)" being transmitted by a first or source "gNB1" to a second or target "gNB2." (Ex. 1011, 5). To be clear, including "(List of PDU Session + Slice ID)" in the "1. Handover Request" message is intended to cover the above-described additional detail of "including all parts of PDU sessions" in the Handover Request message so that the source gNB is not required to "check the slice availability." (Ex. 1011, 3). Accordingly, a person of ordinary skill in the art would have understood that "1. Handover Request" of Figure 17.3.4.5-x corresponds to "3. Handover Request" of Figure 1, with additional detail included in the message, including "(List of PDU Session + Slice ID)" to enable slice-aware handover.

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Ex. 1011, Figure 17.3.4.5-x (annotated)



286. At least in view of the explicit disclosure of *R3-173152* that "PDU sessions" and Slice ID (i.e., information for identifying a corresponding network slice) are included in the handover request message so that a source gNB may check slice availability, a person of ordinary skill in the art would have understood or found it obvious that the handover request message of *R3-173152* included network slice information.

287. Thus, *R3-173152* renders obvious claim element [7.b2].

Claim 7, Element [7.c1]: to receive a handover request confirmation message in response to the handover request message,

288. *R3-173152* renders obvious claim element [7.c1].

289. As I describe above, *R3-173152* provides additional detail regarding the "5. Handover Request Acknowledge" of Figure 1 so as to enable slice-aware handover.

290. *R3-173152,* after presenting Figure 1, goes on to discuss two scenarios in which details may be added to various messages or steps in Figure 1 to enable slice-aware handover. (Ex. 1011, 2-3).

291. In the case that the source gNB and the target gNB are in the *same* RA," *R3-173152* discloses that, "[f]or the Handover Request ACK message, it includes the admitted PDU session list and not admitted PDU session list, to indicate which PDU session can handover to the target." (Ex. 1011, 2).

292. *R3-173152* further discloses:

> Handover Request ACK message also includes the *RRC Context* IE, which will send to UE via the source gNB transparently (i.e., via Handover Command message). In the *RRC Context* IE, the target gNB presents how to configure the RBs for UE, and if some PDU sessions are rejected, the target gNB will put the DRBs associated to the rejected PDU sessions in the *DRB-ToReleaseList* (which is included in the *RRC Context* IE), and thus UE is notified which PDU sessions are not admitted in the target gNB.

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(Ex. 1011, 2). That is, *R3-173152* provides additional detail to "5. Handover Request Acknowledge" of Figure 1 in order to support slice-aware handover in the scenario where the source gNB and the target gNB are in the same registration area. The additional details include that the "Handover Request ACK message" "includes the admitted PDU session list and not admitted PDU session list, to indicate which PDU session can handover to the target." (Ex. 1011, 2).

293. In the scenario where handover occurs across RA's and the target gNB cannot support all of the UE's slices, R3-173152 discloses, "[f]or the Handover Request ACK message, the target gNB informs non-admitted PDU sessions (e.g., including due to slice availability) list to the source gNB. The non-admitted PDU session is also indicated in the RRC Context IE through DRB-ToReleaseList, and thus UE can be informed." (Ex. 1011, 3). That is, R3-173152 provides additional detail to "5. Handover Request Acknowledge" in Figure 1 in order to support slice-aware handover in the scenario where the source gNB and the target gNB are in different registration areas and the target gNB cannot support all of the UE's slices. The additional details include that the "Handover Request ACK message" includes a list of "non-admitted PDU sessions (e.g., including due to slice availability." (Ex. 1011, 3).

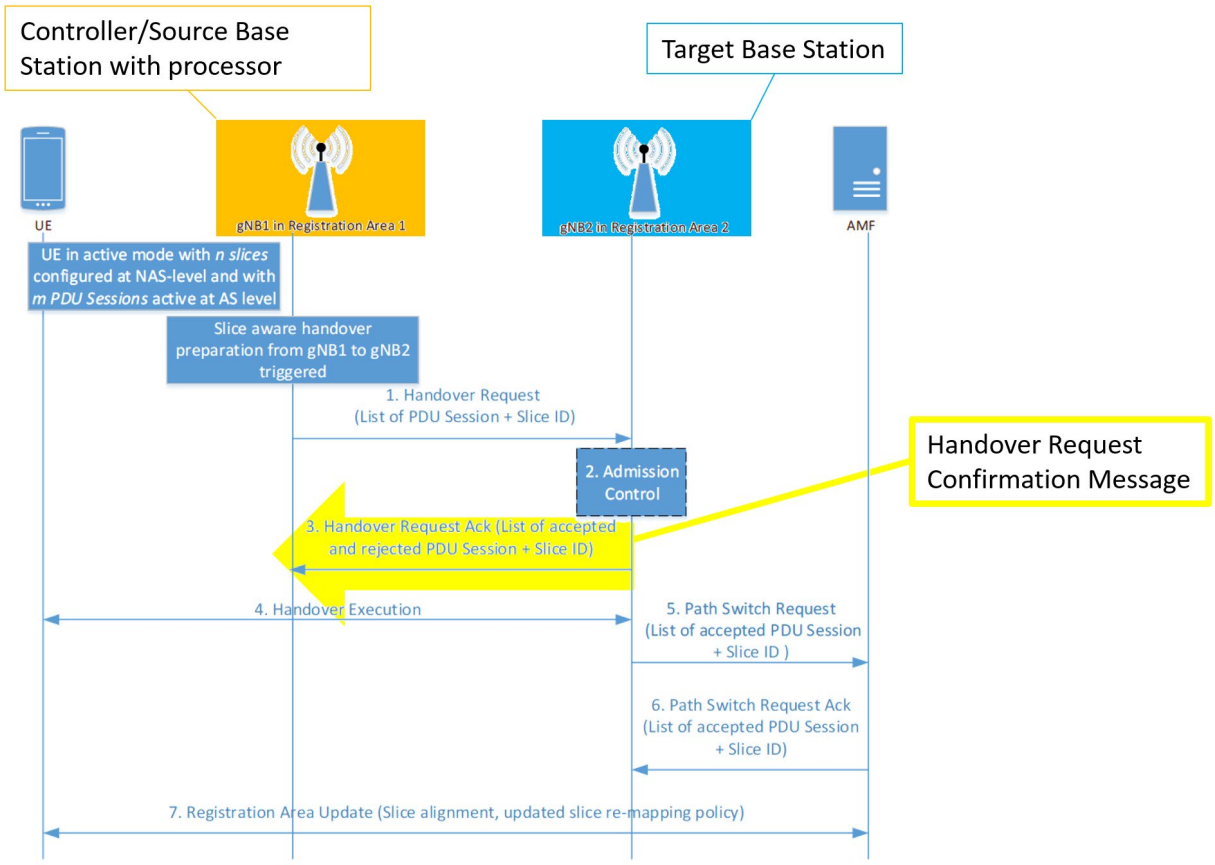
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294. R3-173152 also proposes to add Figure 17.3.4.5-x and accompanying text to TS 38.300 in order to support the above-described scenario of slice-aware handover.

295. Shown in Figure 17.3.4.5-x, R3-173152 discloses a "3. Handover Request Ack" message including a "(List of accepted and rejected PDU Session + Slice ID)" being received from the second or target "gNB2" by the first or source "gNB1" in response to the "Handover Request" message. (Ex. 1011, 5). To be clear, including "(List of accepted and rejected PDU Session + Slice ID)" in the "Handover Request Ack" message is intended to cover the above-described additional detail of the "Handover Request ACK message" including a list of "non-admitted PDU sessions (e.g., including due to slice availability." (Ex. 1011, 3). Accordingly, a person of ordinary skill in the art would have understood that "3. Handover Request Ack" of Figure 17.3.4.5-x corresponds to "5. Handover Request Acknowledge" of Figure 1, with additional detail included in the message, including "(List of accepted and rejected PDU Session + Slice ID)" to enable slice-aware handover.

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Ex. 1011, Figure 17.3.4.5-x (annotated)



296. To the extent it is argued that the "Handover Request Ack" messages of *R3-173152* do not explicitly state that they contain a "confirmation," a person of ordinary skill in the art would have understood that the "Handover Request Ack" message of *R3-173152* satisfies the claimed the "handover request confirmation message" at least in view of the disclosure of the '631 patent.

297. The '631 patent does not use the term "handover request confirmation message" anywhere in the specification or figures, and only uses the term in independent claims 1, 7, and 13. The language of the claims indicates the "handover

request confirmation message" is received "in response to the handover request message," and "includes information for indicating rejection of the one or more PDU sessions by the target BS" "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." (*See, e.g.,* Ex. 1001, Claims 1, 7, 13). The examples in the '631 specification of when "information for indicating" "when a target cell/base station does not support/allow a corresponding network slice," or when "failed network slice information that is not supported/allowed by the target cell/base station" is included in a message, include "a handover response inter-base station interface (Xn) message" and "a handover command Inter-node RRC message," (Ex. 1001, 18:42-19:5). The '631 patent does not elaborate on what "a handover response inter-base station interface (Xn) message" is or contains, nor what "a handover command Inter-node RRC message" is or contains.

298. In view of the disclosure of the '631 patent, a person of ordinary skill in the art would have understood that the claimed "handover request confirmation message" was received "in response to the handover request message," and "include[d] information for indicating rejection of the one or more PDU sessions by the target BS" "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." Additional

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information regarding the contents of the "Handover Request ACK" is described *infra* in [7.c2] and I incorporate it in my analysis herein.

299. Accordingly, a person of ordinary skill in the art would have understood that the "Handover Request Ack" message of *R3-173152* - which is disclosed by *R3-173152* as being received in response to the handover request message, and which is also disclosed by *R3-173152* as including "the admitted PDU session list and not admitted PDU session list, to indicate which PDU session can handover to the target" (*see* Ex. 1011, 2), or "List of accepted and rejected PDU Session + Slice ID" (*see* Ex. 1011, 5) - satisfies the claimed "handover request confirmation message." *See also* [7.c2] *infra*.

300. Thus, *R3-173152* renders obvious claim element [7.c1].

Claim 7, Element [7.c2]: wherein, if one or more protocol data unit (PDU) sessions are associated with one or more network slices that are not supported by a target BS, the handover request confirmation message includes information for indicating a rejection of the one or more PDU sessions by the target BS.

301. *R3-173152* renders obvious claim element [7.c2].

302. The '631 patent does not use the term "rejection" nor "reject" outside of the independent claims. Therefore, it is unclear what "information for indicating a rejection of the one or more PDU sessions by the target BS" entails. Notwithstanding this lack of disclosure by the '631 patent, *R3-173152* renders obvious such a limitation because it in fact clearly discloses the claimed limitation -

information for indicating the rejection of some PDU sessions, e.g., due to resource limitation, by a target base station in its handover response message.

303. As I describe above, *R3-173152* provides additional detail regarding the "5. Handover Request Acknowledge" of Figure 1 so as to enable slice-aware handover. (*see generally* § VIII.A *supra*).

304. *R3-173152,* after presenting Figure 1, goes on to discuss two scenarios in which details may be added to various messages or steps in Figure 1 to enable slice-aware handover. (Ex. 1011, 2-3).

305. In the case that the source gNB and the target gNB are in the *same* RA," *R3-173152* discloses that, "[f]or the Handover Request ACK message, it includes the admitted PDU session list and not admitted PDU session list, to indicate which PDU session can handover to the target." (Ex. 1011, 2).

306. *R3-173152* further discloses:

> Handover Request ACK message also includes the *RRC Context* IE, which will send to UE via the source gNB transparently (i.e., via Handover Command message). In the *RRC Context* IE, the target gNB presents how to configure the RBs for UE, and ***if some PDU sessions are rejected, the target gNB will put the DRBs associated to the rejected PDU sessions in the DRB-ToReleaseList (which is included in the RRC Context IE)***, and thus UE is notified which PDU sessions are not admitted in the target gNB.

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(Ex. 1011, 2) (emphasis added). That is, *R3-173152* provides additional detail to "5. Handover Request Acknowledge" of Figure 1 in order to support slice-aware handover in the scenario where the source gNB and the target gNB are in the same registration area. The additional details include that the "Handover Request ACK message" "includes the admitted PDU session list and not admitted PDU session list, to indicate which PDU session can handover to the target." (Ex. 1011, 2). To be clear, the "Handover Request ACK message" includes information about "***rejected PDU sessions***" from the target gNB. (Ex. 1011, 2).

307. In the scenario where handover occurs across RA's and the target gNB cannot support all of the UE's slices, *R3-173152* discloses, "[f]or the Handover Request ACK message, the target gNB informs ***non-admitted PDU sessions (e.g., including due to slice availability) list to the source gNB***. The non-admitted PDU session is also indicated in the RRC Context IE through DRB-ToReleaseList, and thus UE can be informed." (Ex. 1011, 3). That is, *R3-173152* provides additional detail to "5. Handover Request Acknowledge" in Figure 1 in order to support slice-aware handover in the scenario where the source gNB and the target gNB are in different registration areas and the target gNB cannot support all of the UE's slices. The additional details include that the "Handover Request ACK message" includes a list of "non-admitted PDU sessions (e.g., including due to slice availability." (Ex. 1011, 3). To be clear, the "Handover Request ACK message" includes information

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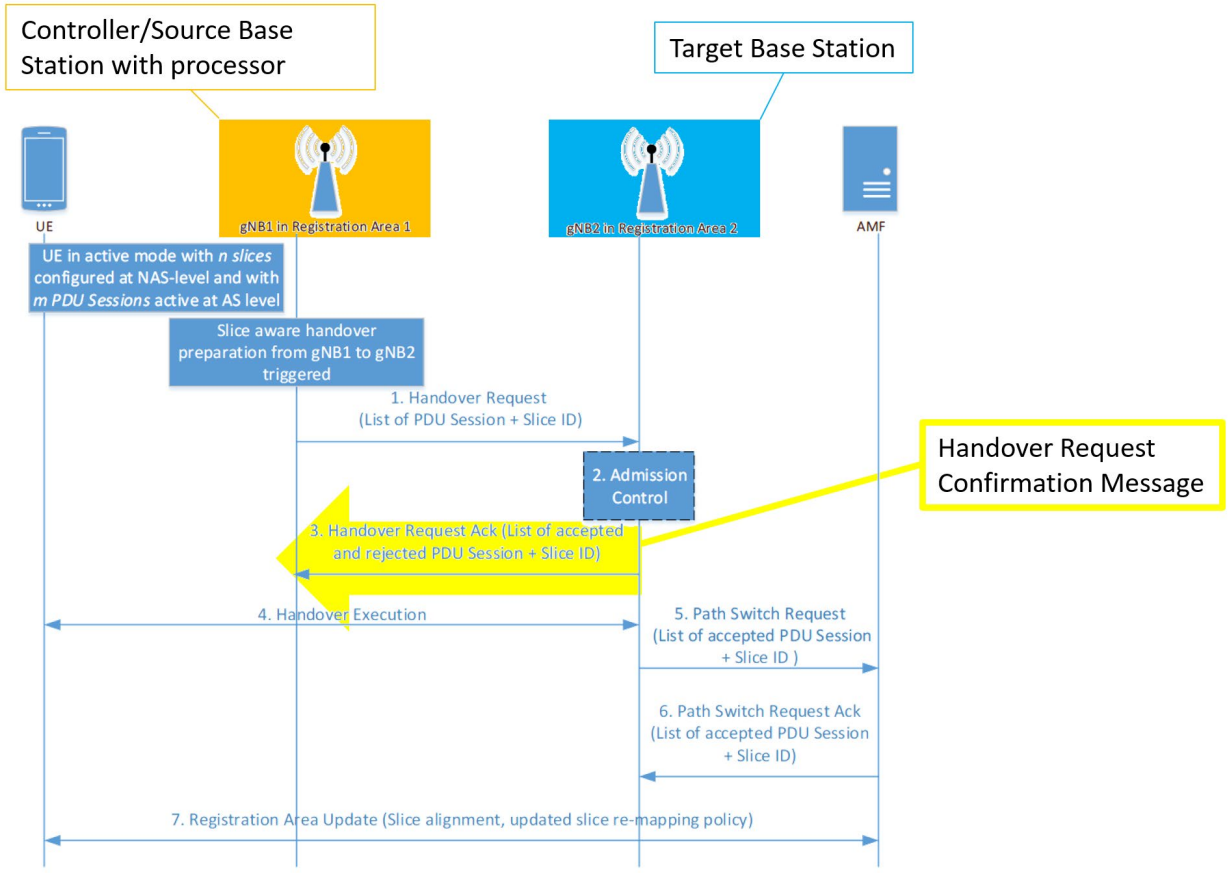
about "***non-admitted PDU sessions***" in a list from the target gNB to the source gNB. *Id.*

308. *R3-173152* also proposes to add Figure 17.3.4.5-x and accompanying text to *TS 38.300* in order to support the above-described scenario of slice-aware handover.

309. Shown in Figure 17.3.4.5-x, *R3-173152* discloses a "3. Handover Request Ack" message including a "(List of accepted and ***rejected PDU Session*** + Slice ID)" being received from the second or target "gNB2" by the first or source "gNB1" in response to the "Handover Request" message. (Ex. 1011, 5). To be clear, including "(List of accepted and ***rejected PDU Session*** + Slice ID)" in the "Handover Request Ack" message is intended to cover the above-described additional detail of the "Handover Request ACK message" including a list of "non-admitted PDU sessions (e.g., including due to slice availability." (Ex. 1011, 3). Accordingly, a person of ordinary skill in the art would have understood that "3. Handover Request Ack" of Figure 17.3.4.5-x corresponds to "5. Handover Request Acknowledge" of Figure 1, with additional detail included in the message, including "(List of accepted and rejected PDU Session + Slice ID)" to enable slice-aware handover. That is, *R3-173152* discloses a list of "***rejected PDU Session***" and "Slice ID" being included in a "Handover Request Ack" message.

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Ex. 1011, Figure 17.3.4.5-x (annotated)



310. In view of the explicit disclosure in *R3-173152* of "rejected PDU Session" and "Slice ID" being included in a "Handover Request Ack" message, a person of ordinary skill in the art would have understood or found it obvious that the "Handover Request Ack" message provided information for indicating a rejection of one or more PDU sessions.

311. Thus, *R3-173152* renders obvious claim element [7.c2].

Independent Claim 13

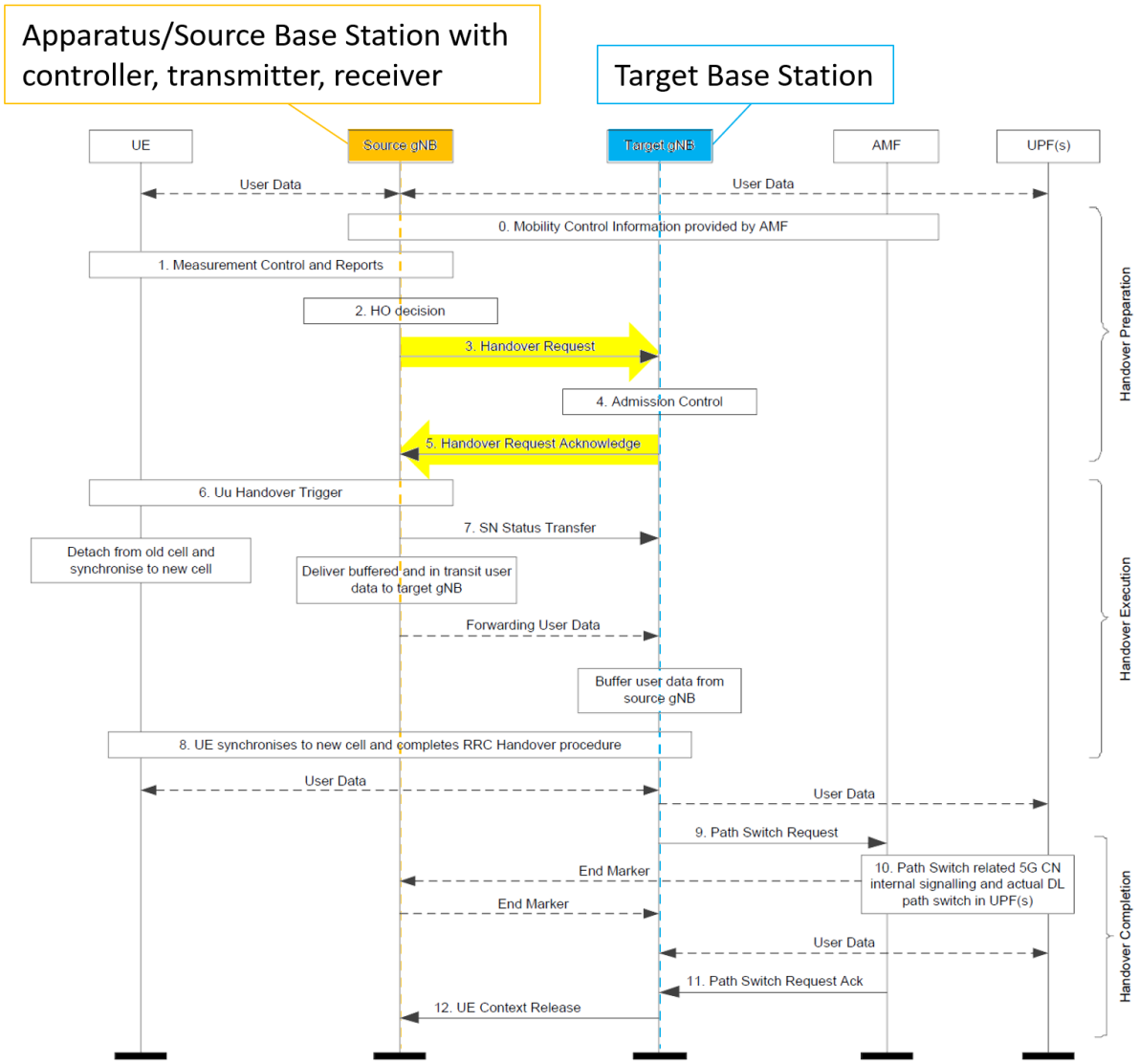
Claim 13, Element [13.pre]: An apparatus for transmitting and receiving data, the apparatus comprising:

312. To the extent that element [13.pre] is found to be limiting, *R3-173152* renders obvious claim element [13.pre].

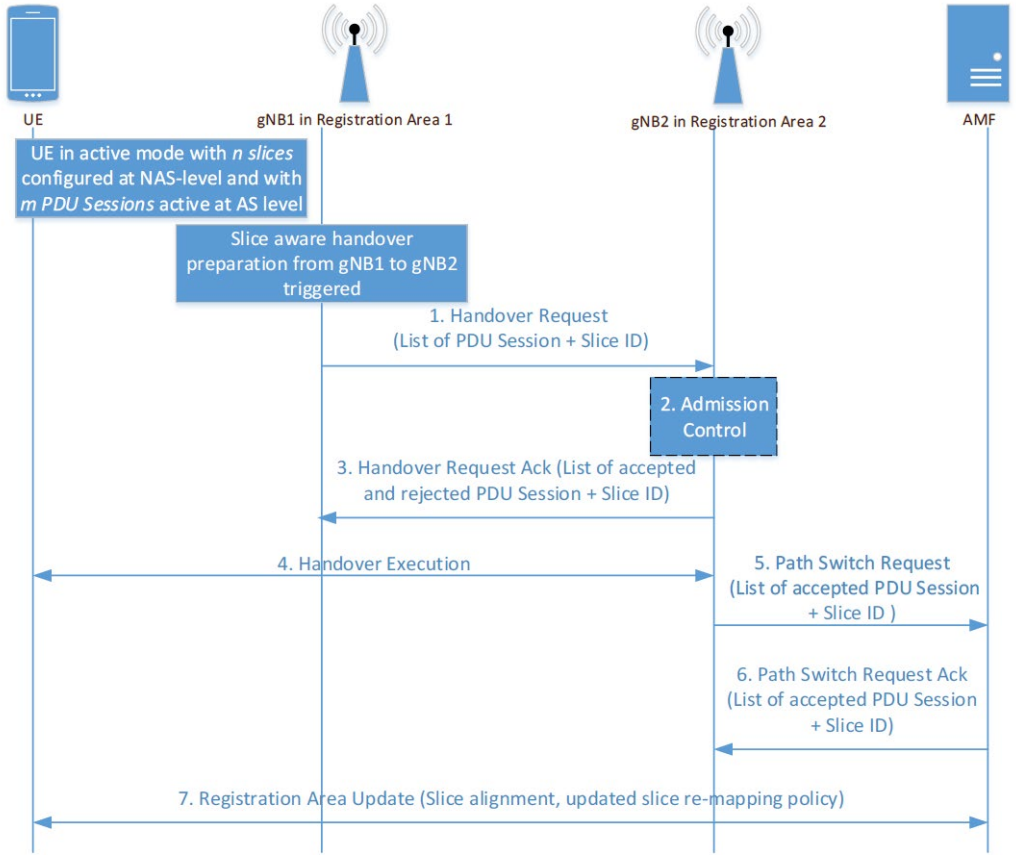
313. The '631 patent defines a "base station" as "generally refer[ring] to a station communicating with the UE." (Ex. 1001, 3:61-62). The '631 patent provides examples of base stations, including "all of various communication service areas and devices, such as a Node-B, an evolved Node-B (eNB), a gNode-B (gNB), a low power node (LPN), a sector, a site, various types of antennas, a base transceiver system (BTS), an access point, a point (e.g., a transmitting point, a receiving point, or a transceiving point), a relay node, a megacell, a macrocell, a microcell, a picocell, a femtocell, a remote radio head (RRH), a radio unit (RU), and a small cell." (Ex. 1001, 3:62-4:4). The '631 patent further states that a "base station may be referred to" as "an apparatus." (Ex. 1001, 4:13-21). Accordingly, a person of ordinary skill in the art would have understood that a base station, for example a gNB, satisfied the claimed "apparatus."

314. With reference to Figure 1, *R3-173152* discloses an "Xn based handover." (Ex. 1011, 2).

Ex. 1011, Figure 1 (annotated)



Ex. 1011, 4 (Figure 17.3.4.5-x)



315. In Figure 1, *R3-173152* discloses a "Handover Request" message (shown as "3. Handover Request" being sent from "Source gNB" to "Target gNB" in Figure 1). Further in Figure 1, *R3-173152* discloses a "Handover Request ACK" message (shown as "5. Handover Request Acknowledge" being sent from "Target gNB" to "Source gNB" in Figure 1). *R3-173152,* after presenting Figure 1, goes on to "discuss whether the Xn based handover can be used for mobility across Registration Area (RA), regardless of slice availability." (Ex. 1011, 2).

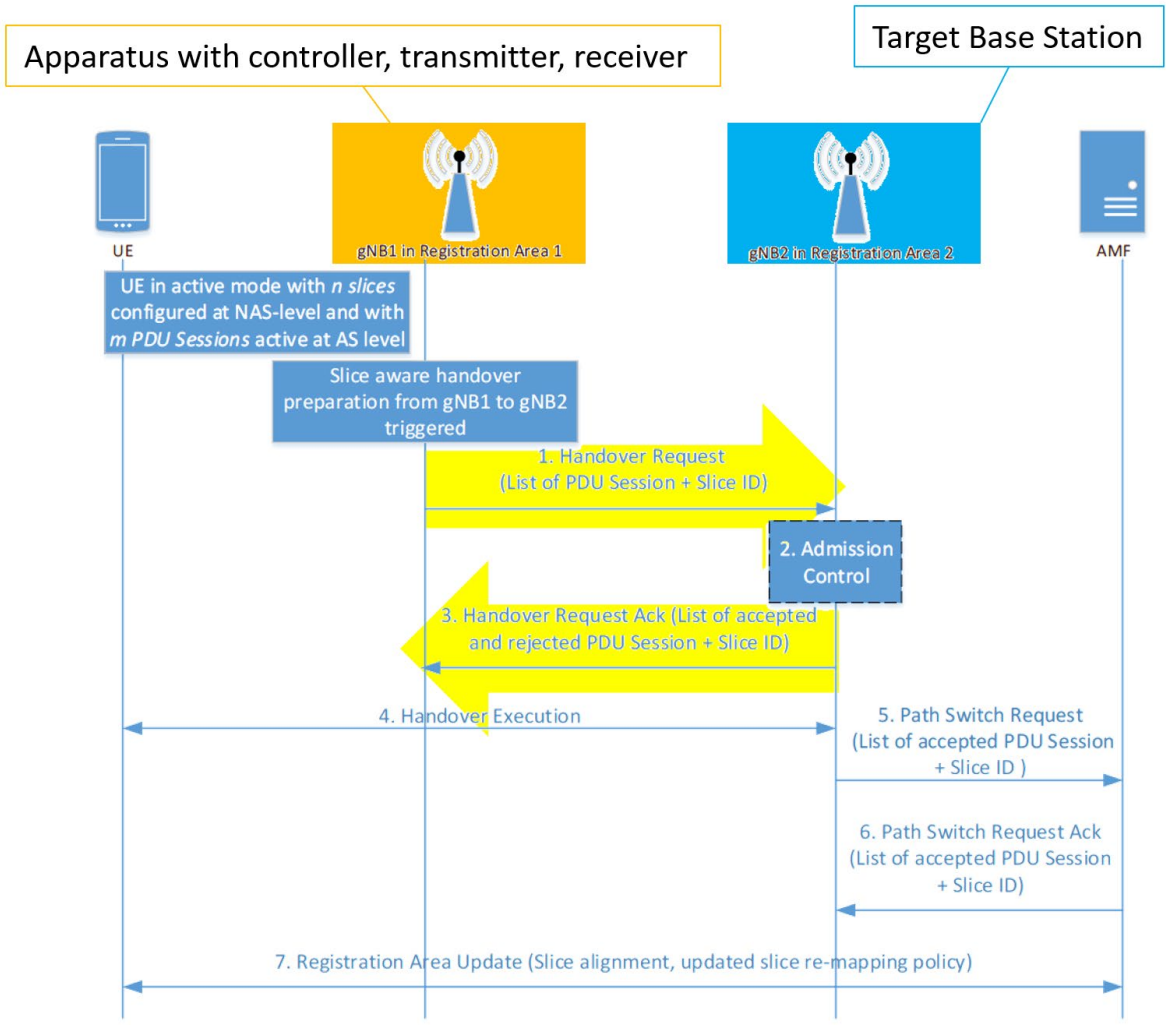
316. *R3-173152* explains that, in order to "make the discussion clearly," "a case that the source gNB and the target gNB are in the *same* RA" is discussed. (Ex.

1011, 2). That is, *R3-173152* intends to present slice-aware handover in a situation where the source gNB and the target gNBs are in different registration areas (*see* Ex. 1011, 2-3), and first describes how a slice-aware handover might work in the situation where the source gNB and target gNB are in the same registration area to ease understanding. (*see, generally,* § VIII.A *supra*).

317. That is, *R3-173152* proposes to add Figure 17.3.4.5-x and accompanying text to *TS 38.300* in order to provide additional detail to various steps of Figure 1 to support slice-aware handover. (*see, generally,* § VIII.A *supra*).

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Ex. 1011, Figure 17.3.4.5-x (annotated)



318. Shown in Figure 17.3.4.5-x, *R3-173152* discloses "1. Handover Request" message including a "(List of PDU Session + Slice ID)" being transmitted by a first or source "gNB1" to a second or target "gNB2." (Ex. 1011, 5). To be clear, including "(List of PDU Session + Slice ID)" in the "1. Handover Request" message is intended to cover the above-described additional detail of "including all parts of PDU sessions" in the Handover Request message so that the source gNB is not

required to "check the slice availability." (Ex. 1011, 3). Accordingly, a person of ordinary skill in the art would have understood that "1. Handover Request" of Figure 17.3.4.5-x corresponds to "3. Handover Request" of Figure 1, with additional detail included in the message, including "(List of PDU Session + Slice ID)" to enable slice-aware handover.

319. Also shown in Figure 17.3.4.5-x, *R3-173152* discloses a "3. Handover Request Ack" message including a "(List of accepted and rejected PDU Session + Slice ID)" being received from the second or target "gNB2" by the first or source "gNB1" in response to the "Handover Request" message. (Ex. 1011, 5). To be clear, including "(List of accepted and rejected PDU Session + Slice ID)" in the "Handover Request Ack" message is intended to cover the above-described additional detail of the "Handover Request ACK message" including a list of "non-admitted PDU sessions (e.g., including due to slice availability." (Ex. 1011, 3). Accordingly, a person of ordinary skill in the art would have understood that "3. Handover Request Ack" of Figure 17.3.4.5-x corresponds to "5. Handover Request Acknowledge" of Figure 1, with additional detail included in the message, including "(List of accepted and rejected PDU Session + Slice ID)" to enable slice-aware handover.

320. To the extent it is argued that *R3-173152* does not explicitly state that its procedures are for "transmitting and receiving data," a person of ordinary skill in the art would have understood that data is transmitted and received in *R3-173152*

because *R3-173152* depicts "Handover Request" and "Handover Request Ack" messages, which contain network slicing information, being transmitted to and received by gNBs. In view of the disclosure of the '631 patent, a person of ordinary skill would have understood that "data" was "transmitted and received" in the handover method disclosed in *R3-173152*.

321. Thus, *R3-173152* renders obvious claim element [13.pre].

Claim 13, Element [13.a]: a controller configured to decide whether to perform a handover;

322. *R3-173152* renders obvious claim element [13.a].

323. The '631 patent defines a "controller 510" as part of a "base station 500." (Ex. 1001, 21:62-22:35). The "controller 510" "may control the overall operations of the base station 500." (Ex. 1001, 22:27-31). The "base station 500 may include a receiver 530 receiving network slice request information" and a "transmitter 520 transmitting the network slice request information." (Ex. 1001, 21:65-66, 22:20-21). Accordingly, a person of ordinary skill in the art would have understood that the claimed "controller" was part of a base station.

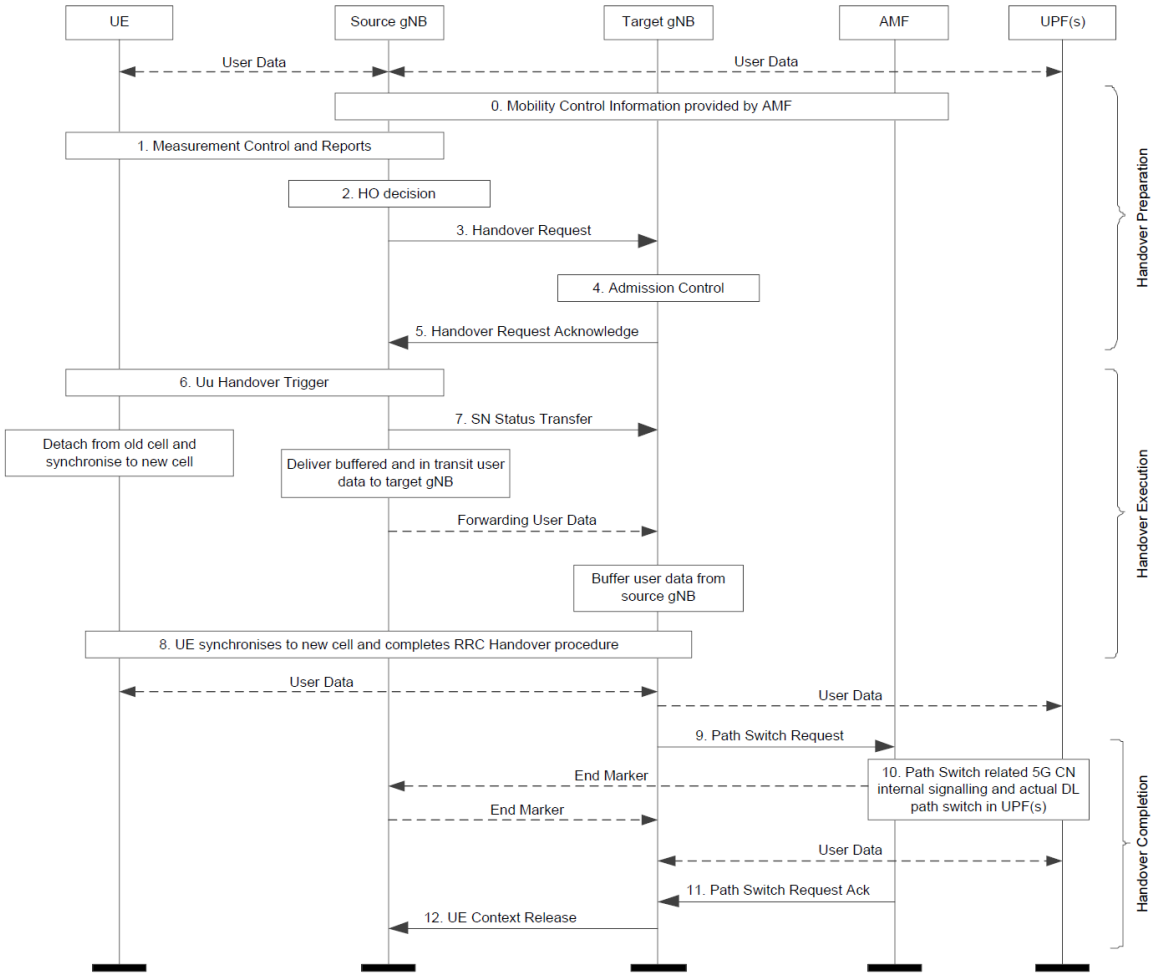
324. The '631 patent defines a "base station" as "generally refer[ring] to a station communicating with the UE." (Ex. 1001, 3:61-62). The '631 patent provides examples of base stations, including "all of various communication service areas and devices, such as a Node-B, an evolved Node-B (eNB), a gNode-B (gNB), a low power node (LPN), a sector, a site, various types of antennas, a base transceiver

system (BTS), an access point, a point (e.g., a transmitting point, a receiving point, or a transceiving point), a relay node, a megacell, a macrocell, a microcell, a picocell, a femtocell, a remote radio head (RRH), a radio unit (RU), and a small cell." (Ex. 1001, 3:62-4:4).

325. The '631 patent does not use the term "processor" in the specification. Instead, the term "controller" is used in a way that the person of skill in the art would have understood that the terms "controller" and "processor" are being used interchangeably.

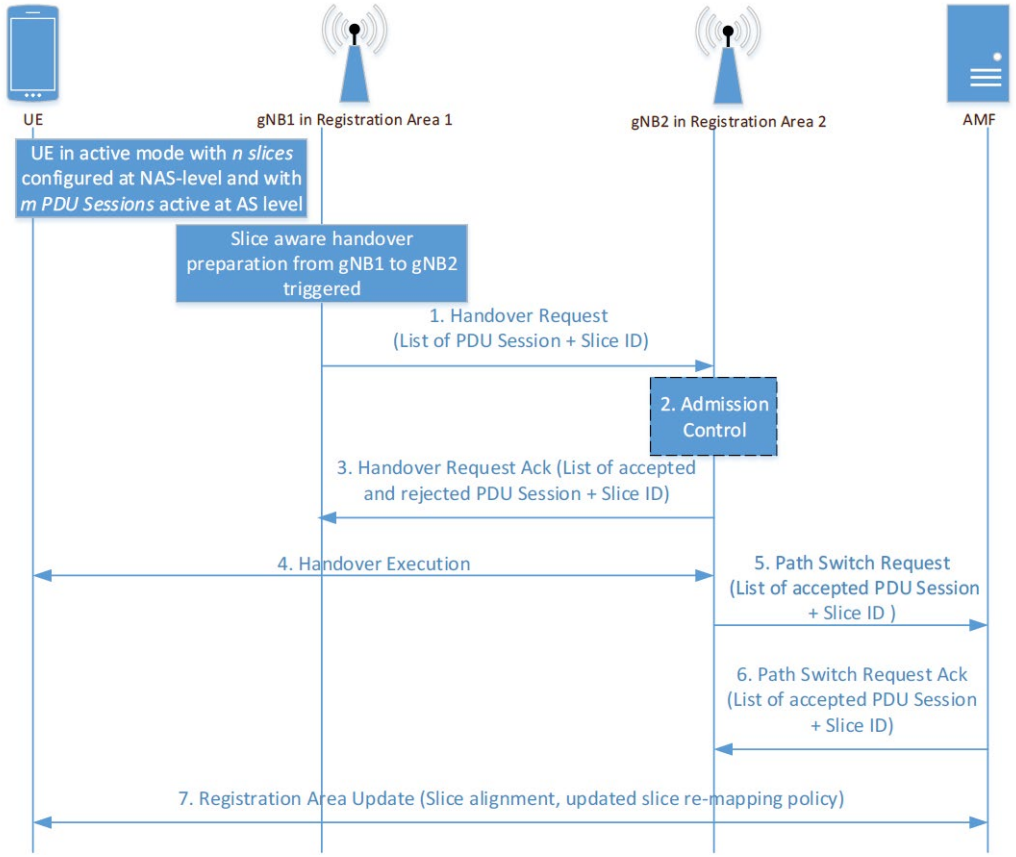
326. *R3-173152* discloses a gNB, or base station. (Ex. 1011, Figure 1, Figure 17.3.4.5-x). Thus, *R3-173152* discloses a controller, according to the understanding of the person of ordinary skill in the art in view of the knowledge of the person of ordinary skill in the art and consistent with the '631 patent.

Ex. 1011, Figure 1



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Ex. 1011, 4 (Figure 17.3.4.5-x)



327. To the extent is it argued that *R3-173152* does not explicitly disclose that the base station or gNB includes a controller, a person of ordinary skill in the art would have been familiar with base stations and the components of base stations. *See* § VI.B *supra*.

328. The inclusion of a processor or controller in a base station was well known to the person of ordinary skill in the art. For example, *Huang-Fu*[10] (Ex. 1022) depicts a block diagram of an evolved Node-B, eNB, or base station reproduced below. *Huang-Fu* depicts a block diagram of an evolved node-B (eNB), reproduced below. (Ex. 1022, ¶¶[0030-0031]; FIG. 1). *Huang-Fu* explains that a base unit may also be referred to as "an access point, an access terminal, a base station, a Node-B, an eNode-B, or by other terminology used in the art." (Ex. 1022, ¶[0026]).

[10] *Huang-Fu* is not part of the grounds, but is referenced here to demonstrate the knowledge of the person of ordinary skill in the art when reviewing *R3-173152*.

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Ex. 1022, FIG. 1 (partial)

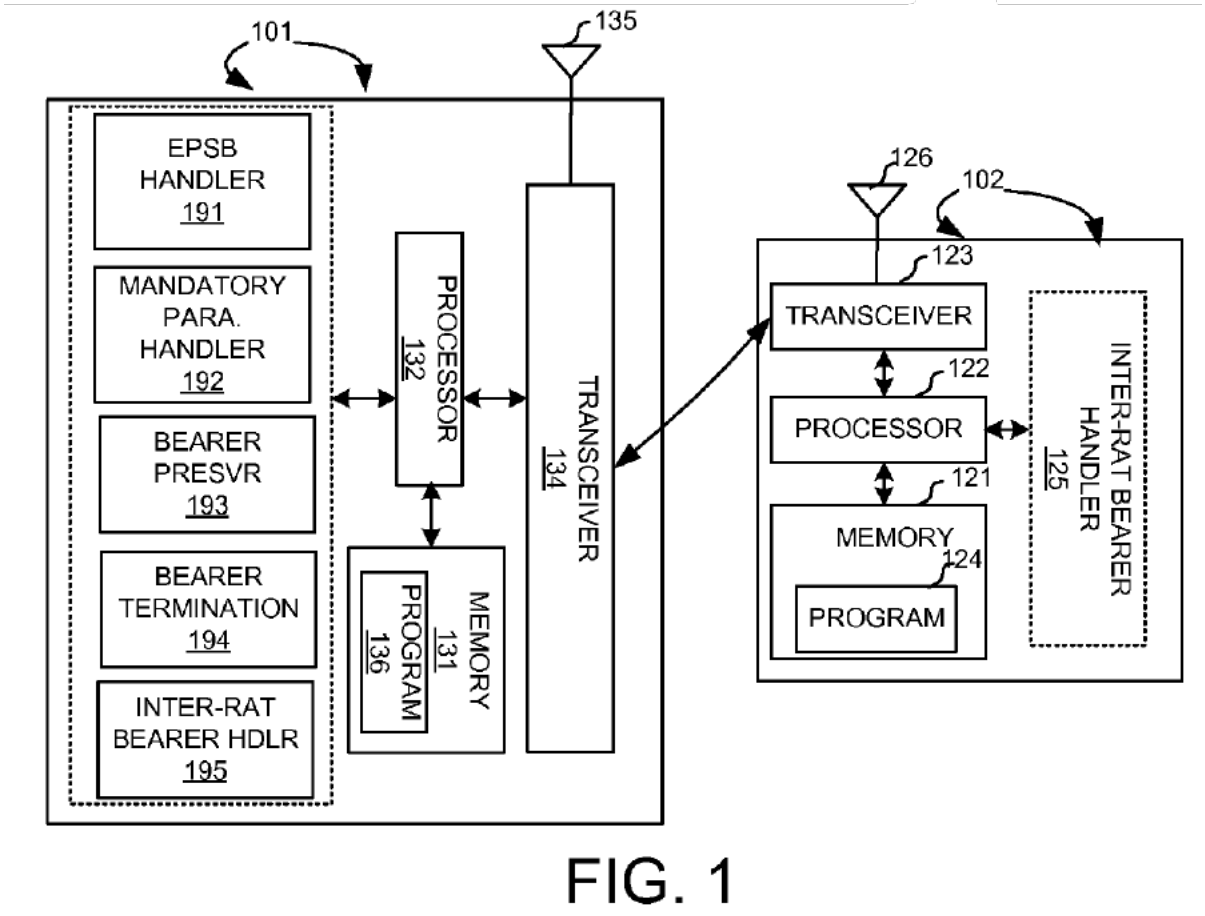
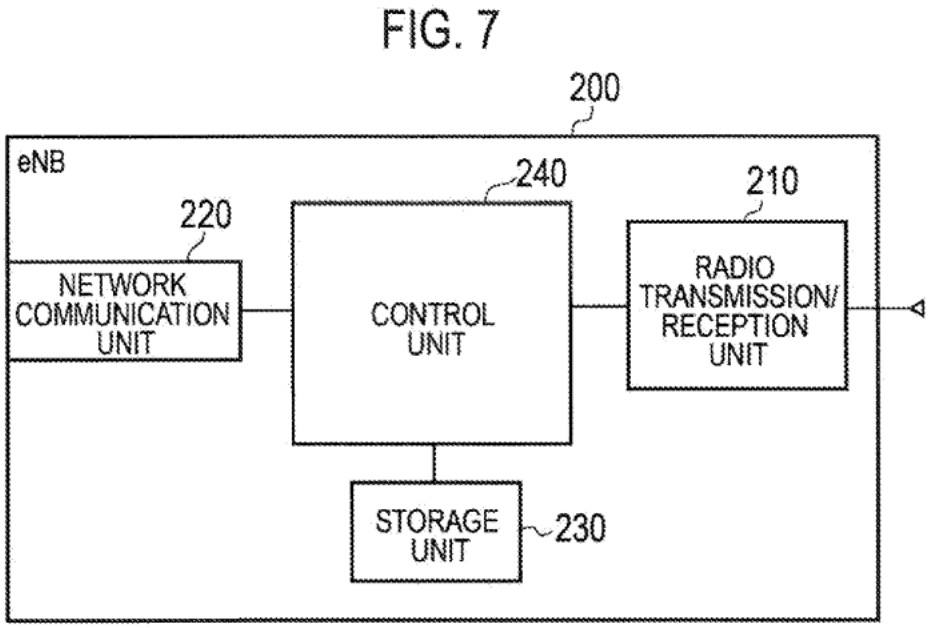


FIG. 1

329. *Huang-Fu* explains that an eNB includes a "processor 122." (Ex. 1022, ¶[0031]). The "processor 122" of the eNB "processes the received baseband signals and invokes different functional modules to perform features in base station 102." *Id.* The eNB also includes "memory 121" which "stores program instructions and data 124 to control operations of base station 102." *Id. Huang-Fu* explains that the "[b]ase station 102 also includes a set of control modules" "that carry out functional tasks." *Id.*

330. As another example, *Fujishiro*[11] (Ex. 1023) depicts a block diagram of a base station, evolved Node-B, or eNB, reproduced below. (Ex. 1023, ¶¶[0056], [0098-0102]; FIG. 7).

Ex. 1023, FIG. 7



331. *Fujishiro* illustrates that an "eNB 200 includes a radio transmission/reception unit 210, a network communication unit 220, a storage unit 230, and a control unit 240." (Ex. 1023, ¶0098]). *Fujishiro* explains that the "control unit 240 controls various functions of the eNB 200." (Ex. 1023, ¶[0102]).

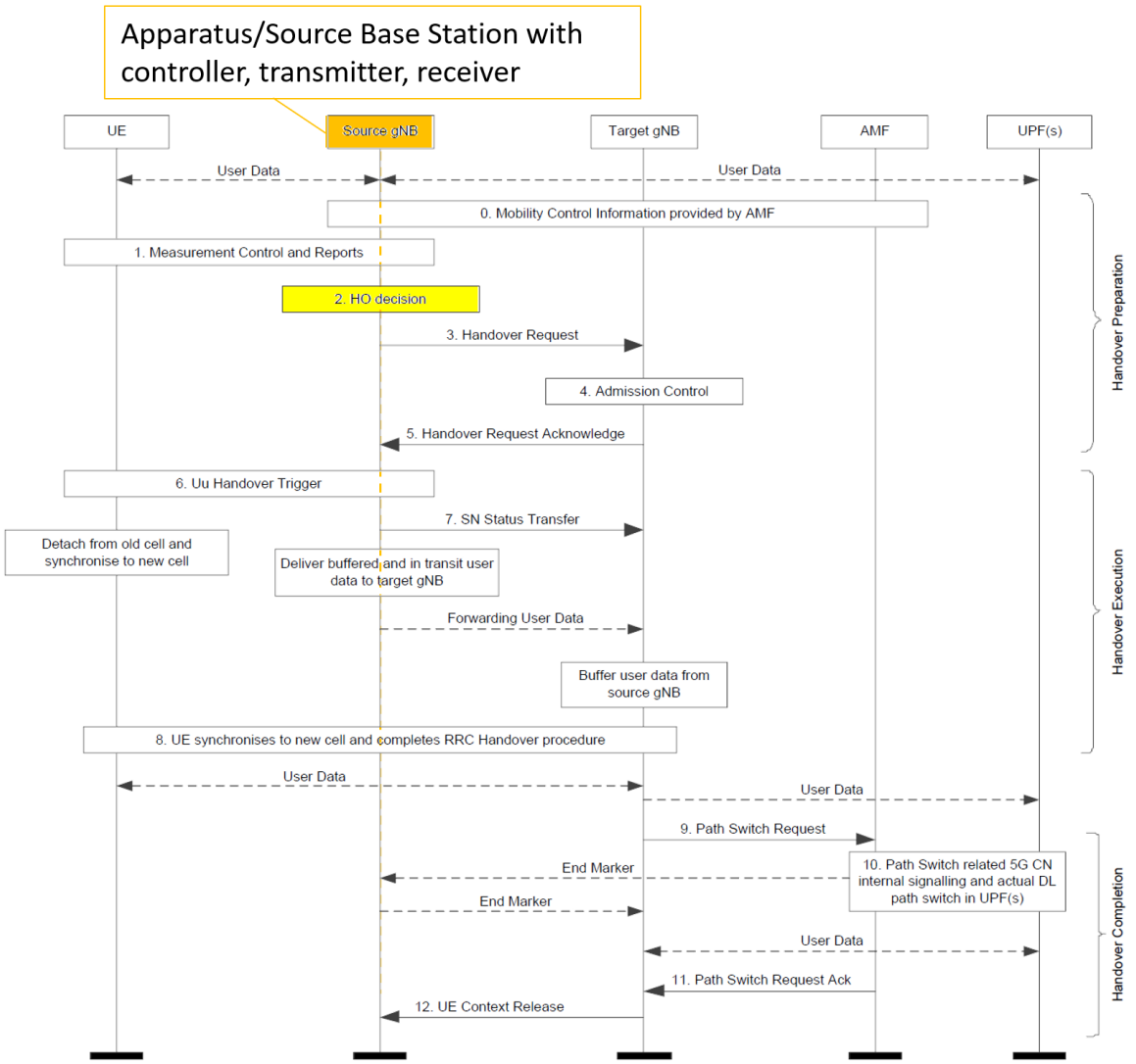
[11] *Fujishiro* is not part of the grounds, but is referenced here to demonstrate the knowledge of the person of ordinary skill in the art when reviewing *R3-173152*.

332. Accordingly, a person of ordinary skill in the art would have known that base stations included a controller or processor, as corroborated by *Huang-Fu* and *Fujishiro*, and therefore would have understood or found it obvious that a base station included the claimed "controller." Moreover, the person of ordinary skill in the art would have known that the claimed base station could be a gNode-B (gNB), at least in view of the disclosure of the '631 patent. Thus, a person of ordinary skill in the art would have understood or found it obvious that a gNB included the claimed "controller."

333. With reference to Figure 1 (reproduced and annotated below), *R3-173152* discloses a "Xn based handover," where a "Source gNB" performs a step "2. HO decision." (Ex. 1011, 2). *R3-173152* further discloses that the "Source gNB may check the slice availability for handover decision." (Ex. 1011, 3).

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Ex. 1011, Figure 1 (annotated)



334. To the extent *R3-173152* does not explicitly disclose the details of the "HO decision," the person of ordinary skill in the art would have known or found it obvious that the "Source gNB" decides whether to handover. For example, Figure 17.3.4.5-x depicts a step in which "Slice aware handover" is "triggered." Ex. 1011, 5. Moreover, a person of ordinary skill in the art would have found it obvious, in

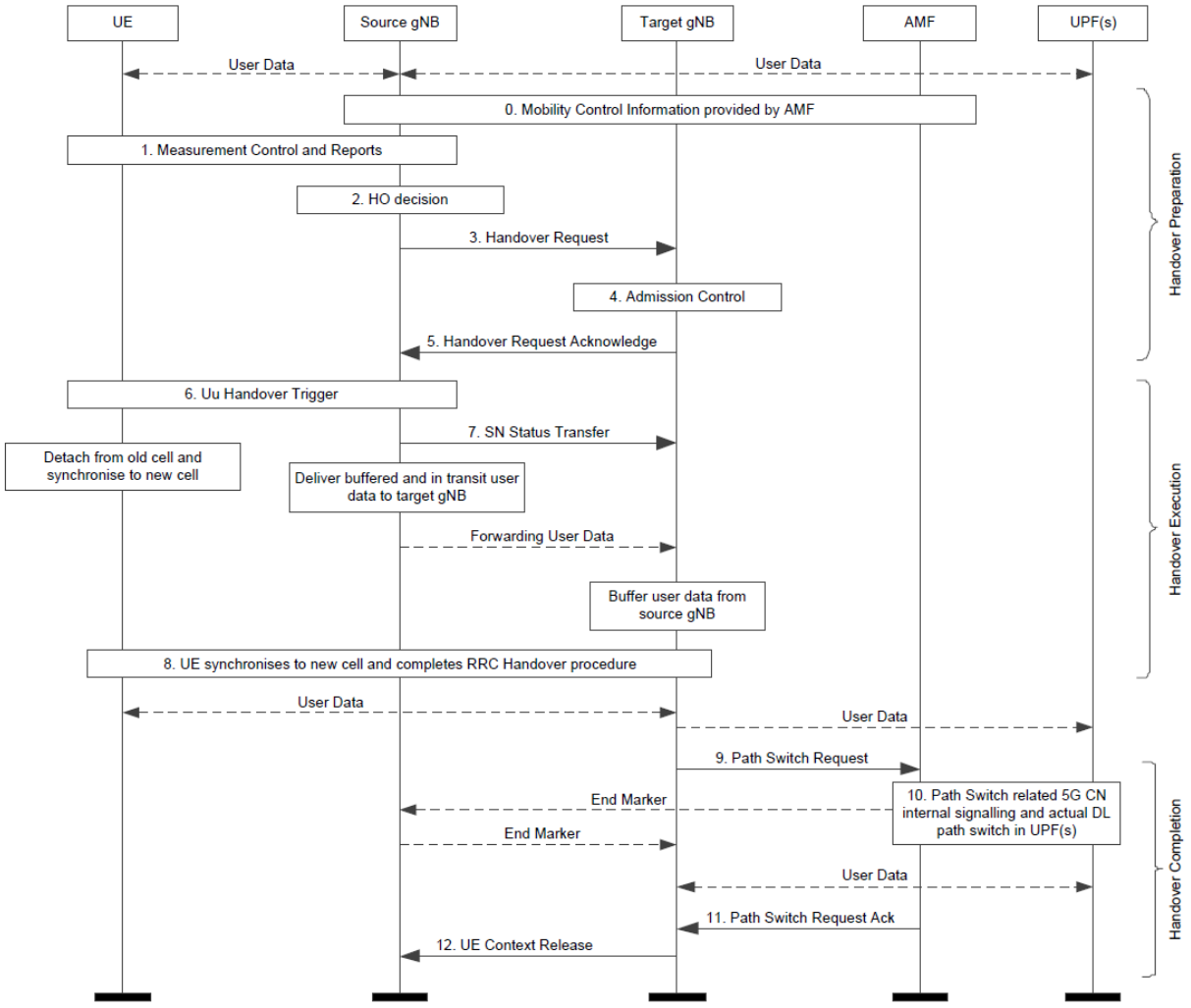
view of *R3-173152*, that the "Source gNB" decides whether to handover prior to transmitting a handover request message because the person of ordinary skill in the art would have understood that a base station would not transmit handover request messages at random. That is, a person of ordinary skill in the art would have found it obvious that the "Source gNB" decides whether to handover prior to transmitting a handover request message because the person of ordinary skill in the art would have known that it would have been unnecessary, and inefficient, to transmit handover request messages to other base stations when it had not been determined that a handover was to be performed. Moreover, a person of ordinary skill in the art would have understood that transmitting handover request messages unprompted (e.g., without the use of a handover decision) would have increased network traffic and decreased bandwidth. Indeed, *R3-173152* discloses, in Figure 17.3.4.5-x (which supplements the handover messages of Figure 1), deciding to handover because it discloses "Slice aware handover . . . [is] triggered" at the source base station. (Ex. 1011, 5; Figure 17.3.4.5-x). Indeed, *TS 38.300*[12], which is specifically referenced by *R3-173152* as having "captured" "the Xn based handover as in figure 1" (*see* Ex. 1011, 2) (in other words, as being the source of Figure 1 of *R3-173152*), corroborates

[12] While *TS 38.300* is not part of the grounds, it is referenced here to demonstrate the knowledge of the person of ordinary skill in the art when reviewing *R3-173152*.

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what that a person of ordinary skill in the art would have known - that the "Source gNB" decides whether to handover because *TS 38.300*, with reference to Figure 9.2.3.2.1-1 (reproduced below), discloses that the "***source gNB decides to handover the UE***." (Ex. 1019, 33) (emphasis added). That is, a person of ordinary skill in the art would have found it obvious that a handover decision occurred before any handover request message in Figure 17.3.4.5-x of *R3-173152*.

Ex. 1019, Figure 9.2.3.2.1-1



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335. Thus, *R3-173152* renders obvious claim element [13.a].

Claim 13, Element [13.b1]: a transmitter configured to transmit a handover request message when it is decided to perform the handover,

336. *R3-173152* renders obvious claim element [13.b1].

337. The '631 patent states that a "base station 500 may include a receiver 530 receiving network slice request information" and a "transmitter 520 transmitting the network slice request information." (Ex. 1001, 21:65-66, 22:20-21).

338. *R3-173152* discloses a gNB or base station. (*see* Ex. 1011, Figure 17.3.4.5-x). Because a person of ordinary skill in the art would have been familiar with base stations and their functionalities, which included transmitting and receiving signals, a person of ordinary skill in the art would have known or found it obvious that the base station of *R3-173152* included a transmitter.

339. To the extent is it argued that *R3-173152* does not explicitly disclose that the base station or gNB includes a transmitter, a person of ordinary skill in the art would have been familiar with base stations and the components of base stations. *See* § VI.B *supra*. The inclusion of a transmitter in a base station was well known to

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a person of ordinary skill in the art. For example, *Huang-Fu*[13] (Ex. 1022) depicts a block diagram of an evolved Node-B, eNB, or base station reproduced below. *Huang-Fu* depicts a block diagram of an evolved node-B (eNB), reproduced below. (Ex. 1022, ¶¶[0030-0031]; FIG. 1). *Huang-Fu* explains that a base unit may also be referred to as "an access point, an access terminal, a base station, a Node-B, an eNode-B, or by other terminology used in the art." (Ex. 1022, ¶[0026]).

[13] *Huang-Fu* is not part of the grounds, but is referenced here to demonstrate the knowledge of the person of ordinary skill in the art when reviewing *R3-173152*.

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Ex. 1022, FIG. 1 (partial)

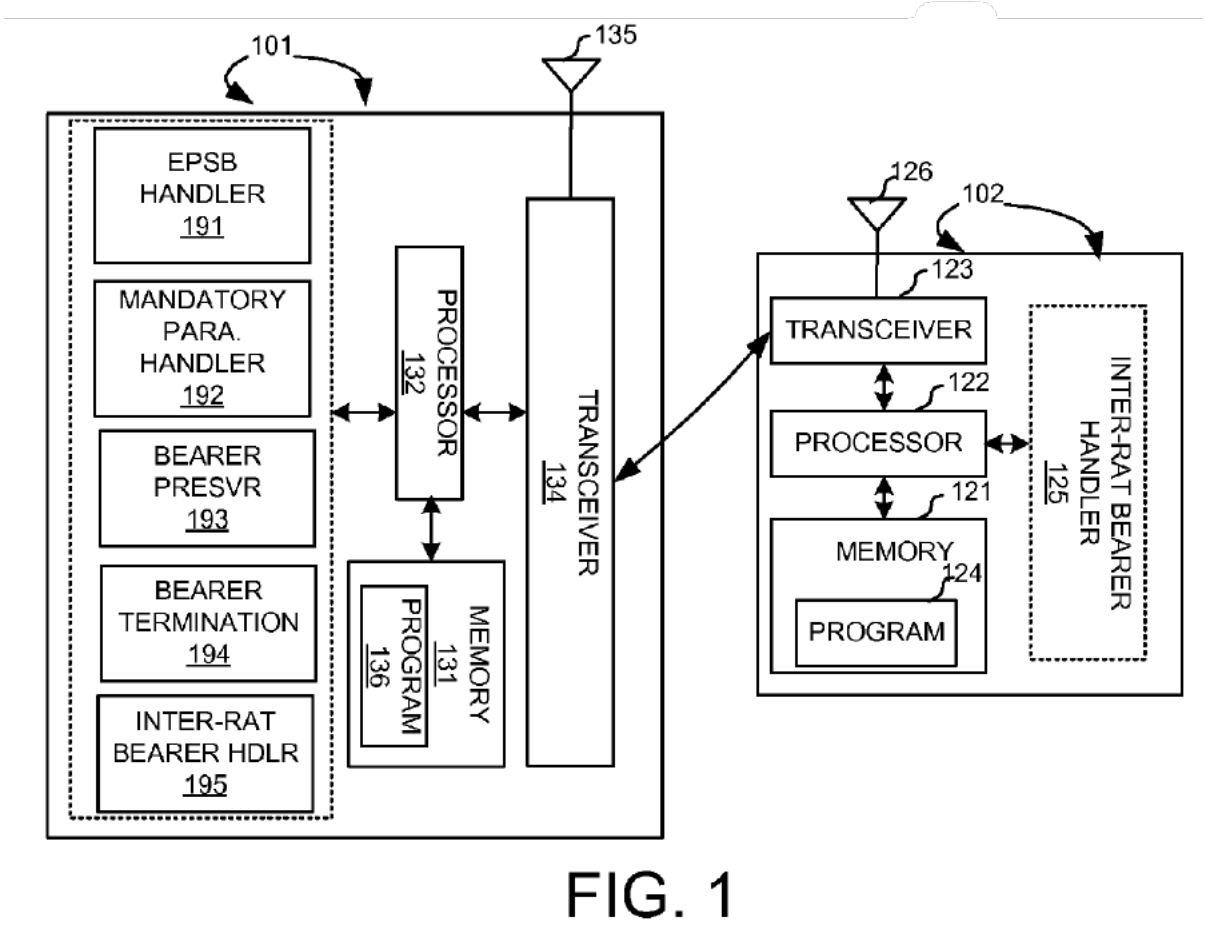
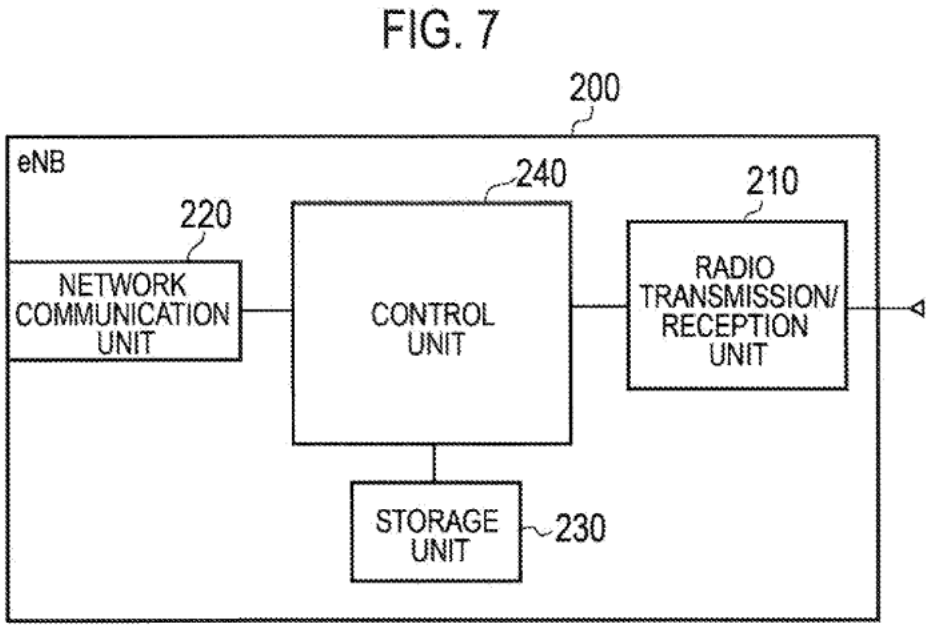


FIG. 1

340. *Huang-Fu* explains that an "eNB 102 has an antenna 126, which transmits and receives radio signals." (Ex. 1022, ¶[0031]). The eNB also includes an "RF module 123, coupled with the antenna, [which] receives RF signals from antenna 126, converts them to baseband signals and sends them to processor 122." *Id.* The "RF transceiver 123 also converts received baseband signals from processor 122, converts them to RF signals, and sends out to antenna 126." *Id.*

341. As another example, *Fujishiro*[14] (Ex. 1023) depicts a block diagram of a base station, evolved Node-B, or eNB, reproduced below. Ex. 1023, ¶¶[0056], [0098-0102]; FIG. 7).

Ex. 1023, FIG. 7



342. *Fujishiro* illustrates that an "eNB 200 includes a radio transmission/reception unit 210, a network communication unit 220, a storage unit 230, and a control unit 240." (Ex. 1023, ¶0098]). *Fujishiro* explains that the "radio transmission/reception unit 210 transmits/receives a radio signal," and the "network

[14] *Fujishiro* is not part of the grounds, but is referenced here to demonstrate the knowledge of the person of ordinary skill in the art when reviewing *R3-173152*.

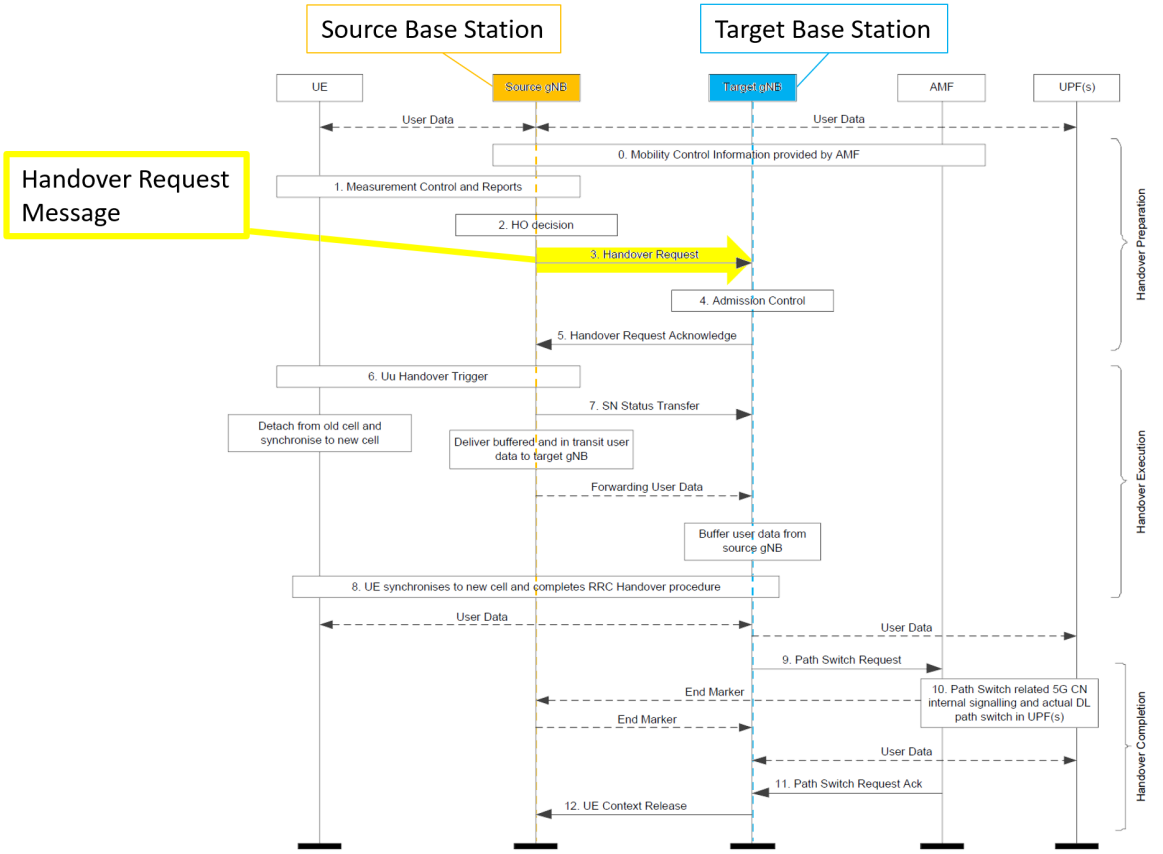
communication unit 220" "communications with [a] neighboring eNB" "through the X2 interface." (Ex. 1023, ¶¶0099-0101]).

343. Accordingly, a person of ordinary skill in the art would have known that a base station included a transmitter, as corroborated by *Huang-Fu* and *Fujishiro*. Thus, a person of ordinary skill in the art would have understood that the gNB of *R3-173152* included a "transmitter." *See also* [13.pre] *supra*.

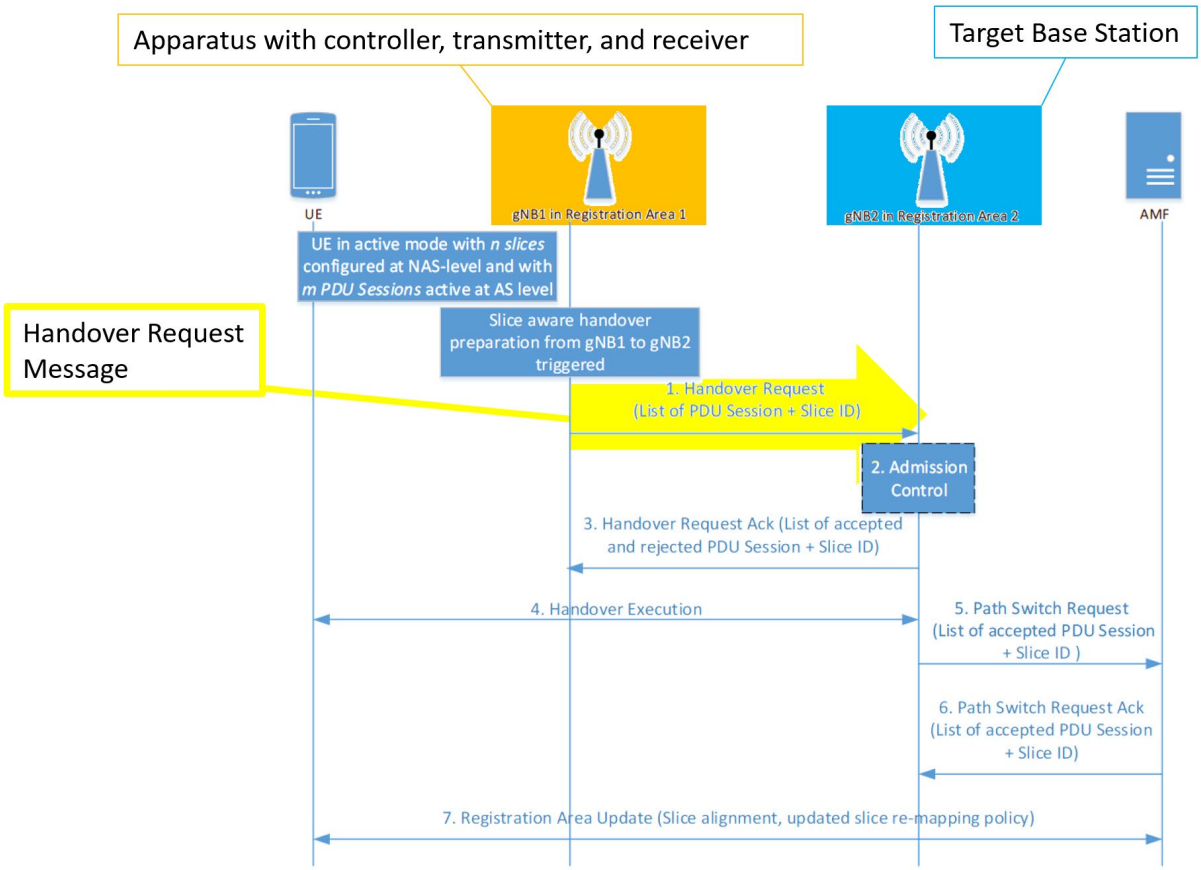
344. As I describe above, *R3-173152* provides additional detail regarding the "3. Handover Request" of Figure 1 (the then-current standard for handover) so as to enable slice aware handover. *R3-173152* discloses, with reference to Figure 17.3.4.5-x, a "gNB1 in Registration Area 1" transmitting a "Handover Request" message including a "[l]ist of PDU Session + Slice ID" to a "gNB2 in Registration Area 2." (Ex. 1011, 5).

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Ex. 1011, Figure 1 (annotated)



Ex. 1011, Figure 17.3.4.5-x (annotated)



345. Shown in Figure 17.3.4.5-x, *R3-173152* discloses a "1. Handover Request" message including a "(List of PDU Session + Slice ID)" being transmitted by a first or source "gNB1" to a second or target "gNB2." (Ex. 1011, 5). To be clear, including "(List of PDU Session + Slice ID)" in the "1. Handover Request" message is intended to cover the above-described additional detail of "including all parts of PDU sessions" in the Handover Request message so that the source gNB is not required to "check the slice availability." (Ex. 1011, 3). Accordingly, a person of ordinary skill in the art would have understood that "1. Handover Request" of Figure

17.3.4.5-x corresponds to "3. Handover Request" of Figure 1, with additional detail included in the message, including "(List of PDU Session + Slice ID)" to enable slice-aware handover. Thus, *R3-173152*, through the teachings of Figure 1 and Figure 17.3.4.5-x, render obvious a handover request message being transmitted by the source base station to the target base station once it is decided to perform a handover.

346. Thus, *R3-173152* renders obvious claim element [13.b1].

Claim 13, Element [13.b2]: wherein the handover request message includes network slice information; and

347. *R3-173152* renders obvious claim element [13.b2].

348. *R3-173152* discloses handover procedures that take network slicing into account. (Ex. 1011, 1). *R3-173152* disclosed additional detail in the form of a Slice ID and PDU sessions (i.e., network slice information) in its handover request message, and the inclusion of these additional details enables slice-aware handover. *See* § IX.A.[13.b1] *supra. R3-173152,* after presenting Figure 1, goes on to discuss two scenarios in which details may be added to various messages or steps in Figure 1 to enable slice-aware handover. (Ex. 1011, 2-3).

349. In the "case that the source gNB and the target gNB are in the *same* RA," *R3-173152* discloses that, "[f]or the Handover Request message, it includes (all) PDU sessions with active UP connections handled by the source gNB, to indicate the target gNB which PDU session should handover to the target." (Ex.

1011, 2). That is, *R3-173152* provides additional detail to "3. Handover Request" of Figure 1 in order to support slice-aware handover in the scenario where the source gNB and the target gNB are in the same registration area. The additional details include that the "Handover Request message" "includes (all) PDU sessions with active UP connections handled by the source gNB," "to indicate [to] the target gNB which PD session should handover to the target." (Ex. 1011, 2).

350. In the scenario where handover occurs across RA's and the target gNB cannot support all of the UE's slices, *R3-173152* discloses:

> As the target gNB cannot support all the slices, the PDU sessions with active UP connections handled by the source gNB can be divided to two part: one part is the PDU sessions which associated slice(s) is supported by the target gNB, another part is the PDU sessions which associated slice(s) is *not* supported by the target gNB. One option is only including the latter part of PDU sessions, however, for this option, the source gNB always check the slice availability before handover. Another option is ***including all parts of PDU sessions in the Handover Request message***. In this option, check the slice availability is not mandatory, but the source gNB may also check the slice availability for selecting the suitable target gNBs (in step 2 as in figure 1), e.g., the source gNB will not request handover UE to a gNB cannot support any slice.

(Ex. 1011, 3) (emphasis added).

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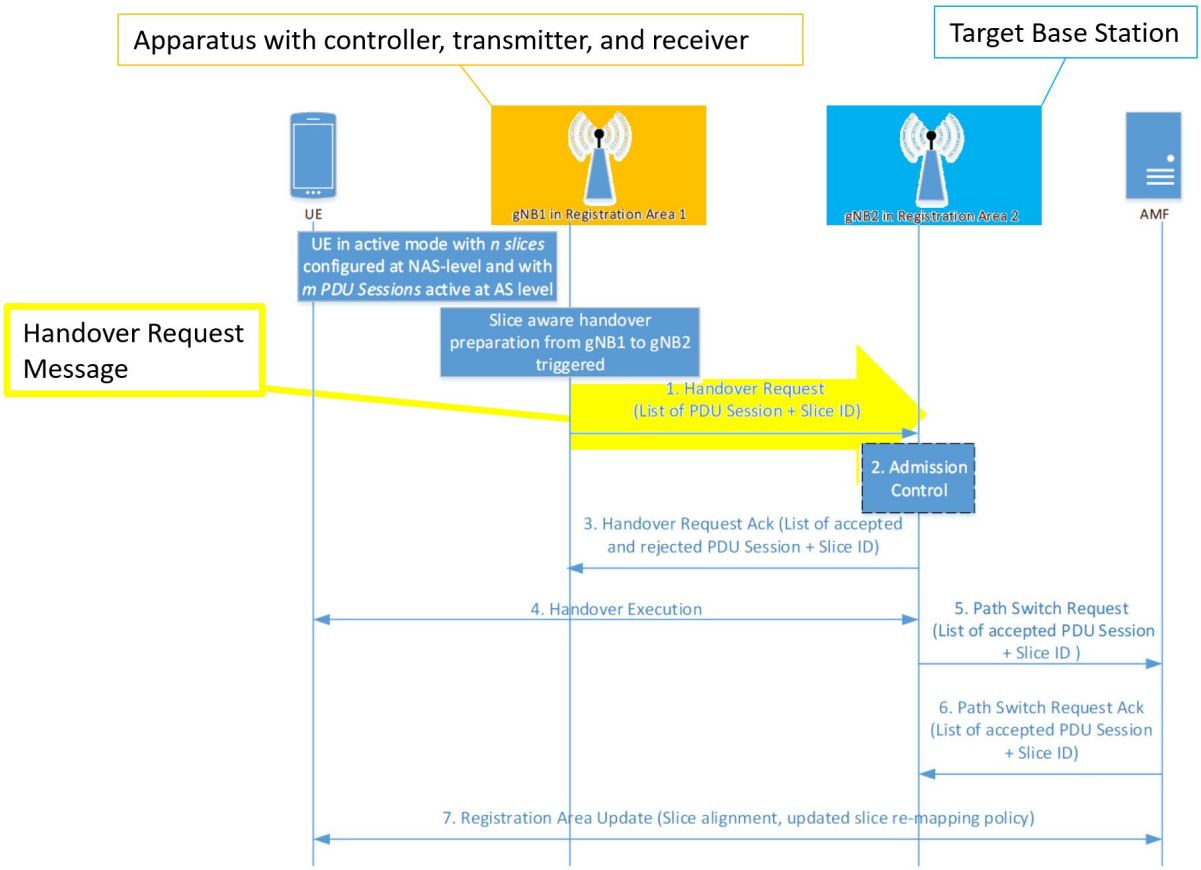
351. That is, *R3-173152* provides additional detail to "1. Handover Request" in Figure 1 in order to support slice-aware handover in the scenario where the source gNB and the target gNB are in different registration areas and the target gNB cannot support all of the UE's slices. The additional details include that the "Handover Request message" "includ[es] all parts of PDU sessions" so that the source gNB is not required to "check the slice availability." (Ex. 1011, 3).

352. *R3-173152* also proposes to add Figure 17.3.4.5-x and accompanying text to *TS 38.300* in order to support slice-aware handover.

353. Shown in Figure 17.3.4.5-x, *R3-173152* discloses "1. Handover Request" message including a "(List of PDU Session + Slice ID)" being transmitted by a first or source "gNB1" to a second or target "gNB2." (Ex. 1011, 5). To be clear, including "(List of PDU Session + Slice ID)" in the "1. Handover Request" message is intended to cover the above-described additional detail of "including all parts of PDU sessions" in the Handover Request message so that the source gNB is not required to "check the slice availability." (Ex. 1011, 3). Accordingly, a person of ordinary skill in the art would have understood that "1. Handover Request" of Figure 17.3.4.5-x corresponds to "3. Handover Request" of Figure 1, with additional detail included in the message, including "(List of PDU Session + Slice ID)" to enable slice-aware handover.

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Ex. 1011, Figure 17.3.4.5-x (annotated)



354. At least in view of the explicit disclosure of *R3-173152* that "PDU sessions" and Slice ID (i.e., information for identifying a corresponding network slice) are included in the handover request message so that a source gNB may check slice availability, a person of ordinary skill in the art would have understood or found it obvious that the handover request message of *R3-173152* included network slice information.

355. Thus, *R3-173152* renders obvious claim element [13.b2].

Claim 13, Element [13.c1]: a receiver configured to receive a handover request confirmation message in response to the handover request message,

356. *R3-173152* renders obvious claim element [13.c1].

357. The '631 patent states that a "base station 500 may include a receiver 530 receiving network slice request information" and a "transmitter 520 transmitting the network slice request information." (Ex. 1001, 21:65-66, 22:20-21).

358. *R3-173152* discloses a gNB or base station. (Ex. 1011, Figure 17.3.4.5-x). Because a person of ordinary skill in the art would have been familiar with base stations and their functionalities, which included transmitting and receiving signals, a person of ordinary skill in the art would have found it obvious that the base station of *R3-173152* included a receiver.

359. To the extent is it argued that *R3-173152* does not explicitly disclose that the base station or gNB includes a receiver, a person of ordinary skill in the art would have been familiar with base stations and the components of base stations. *See* § VI.B *supra*. For example, *Huang-Fu*[15] (Ex. 1022) depicts a block diagram of an evolved Node-B, eNB, or base station reproduced below. *Huang-Fu* depicts a block diagram of an evolved node-B (eNB), reproduced below. (Ex. 1022, ¶¶[0030-

[15] *Huang-Fu* is not part of the grounds, but is referenced here to demonstrate the knowledge of the person of ordinary skill in the art when reviewing *R3-173152*.

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0031]; FIG. 1). *Huang-Fu* explains that a base unit may also be referred to as "an access point, an access terminal, a base station, a Node-B, an eNode-B, or by other terminology used in the art." (Ex. 1022, ¶[0026]).

Ex. 1022, FIG. 1 (partial)

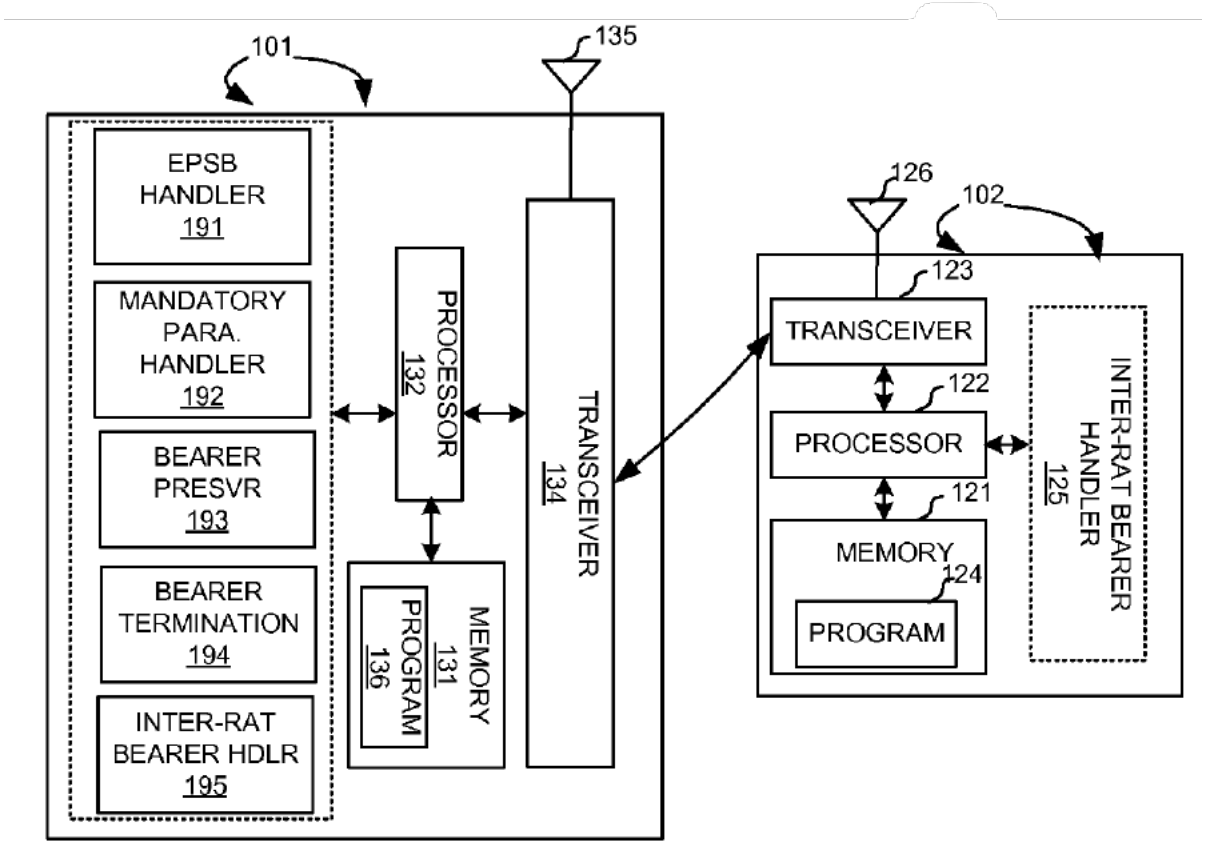


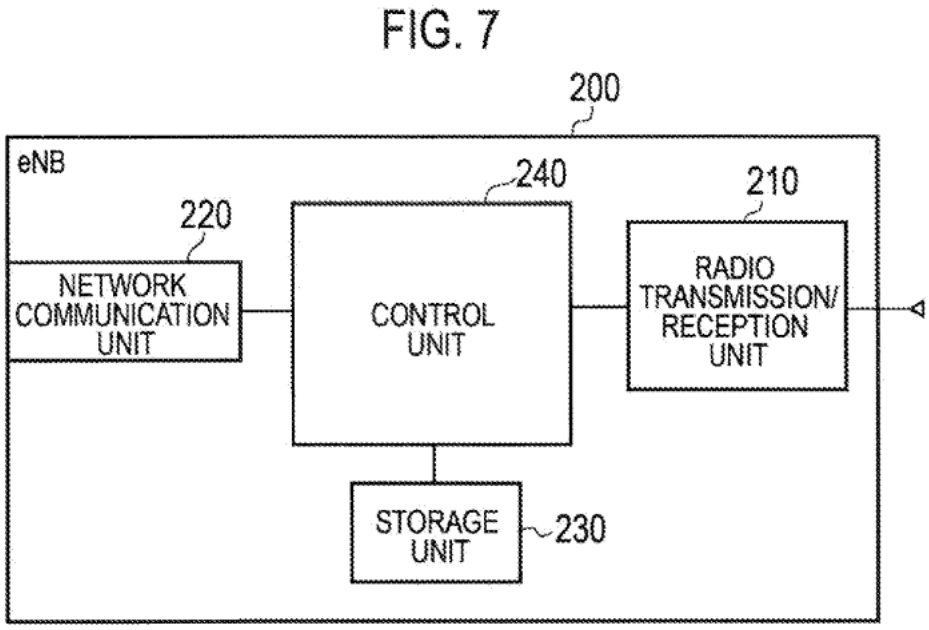
FIG. 1

360. *Huang-Fu* explains that an "eNB 102 has an antenna 126, which transmits and receives radio signals." (Ex. 1022, ¶[0031]). The eNB also includes an "RF module 123, coupled with the antenna, [which] receives RF signals from antenna 126, converts them to baseband signals and sends them to processor 122."

Id. The "RF transceiver 123 also converts received baseband signals from processor 122, converts them to RF signals, and sends out to antenna 126." *Id.*

361. As another example, *Fujishiro*[16] (Ex. 1023) depicts a block diagram of a base station, evolved Node-B, or eNB, reproduced below. (Ex. 1023, ¶¶[0056], [0098-0102]; FIG. 7).

Ex. 1023, FIG. 7



362. *Fujishiro* illustrates that an "eNB 200 includes a radio transmission/reception unit 210, a network communication unit 220, a storage unit

[16] *Fujishiro* is not part of the grounds, but is referenced here to demonstrate the knowledge of the person of ordinary skill in the art when reviewing *R3-173152*.

230, and a control unit 240." (Ex. 1023, ¶0098]). *Fujishiro* explains that the "radio transmission/reception unit 210 transmits/receives a radio signal," and the "network communication unit 220" "communications with [a] neighboring eNB" "through the X2 interface." (Ex. 1023, ¶¶[0099-0101]).

363. Accordingly, a person of ordinary skill in the art would have known that a base station included a receiver, as corroborated by *Huang-Fu* and *Fujishiro*. Thus, a person of ordinary skill in the art would have understood that gNB of *R3-173152* included a "receiver." *See also* [13.pre] *supra*.

364. *R3-173152* discloses a "Handover Request ACK" message that "includes the admitted PDU session list and not admitted PDU session list, to indicate which PDU session can handover to the target." (Ex. 1011, 2). *R3-173152* further discloses:

> Handover Request ACK message also includes the *RRC Context* IE, which will send to UE via the source gNB transparently (i.e., via Handover Command message). In the *RRC Context* IE, ***the target gNB presents how to configure the RBs for UE, and if some PDU sessions are rejected, the target gNB will put the DRBs associated to the rejected PDU sessions in the DRB-ToReleaseList (which is included in the RRC Context IE)***, and thus UE is notified which PDU sessions are not admitted in the target gNB.

(Ex. 1011, 2) (emphasis added).

365. *R3-173152* discloses, "[f]or the Handover Request ACK message, the target gNB informs non-admitted PDU sessions (e.g., including due to slice

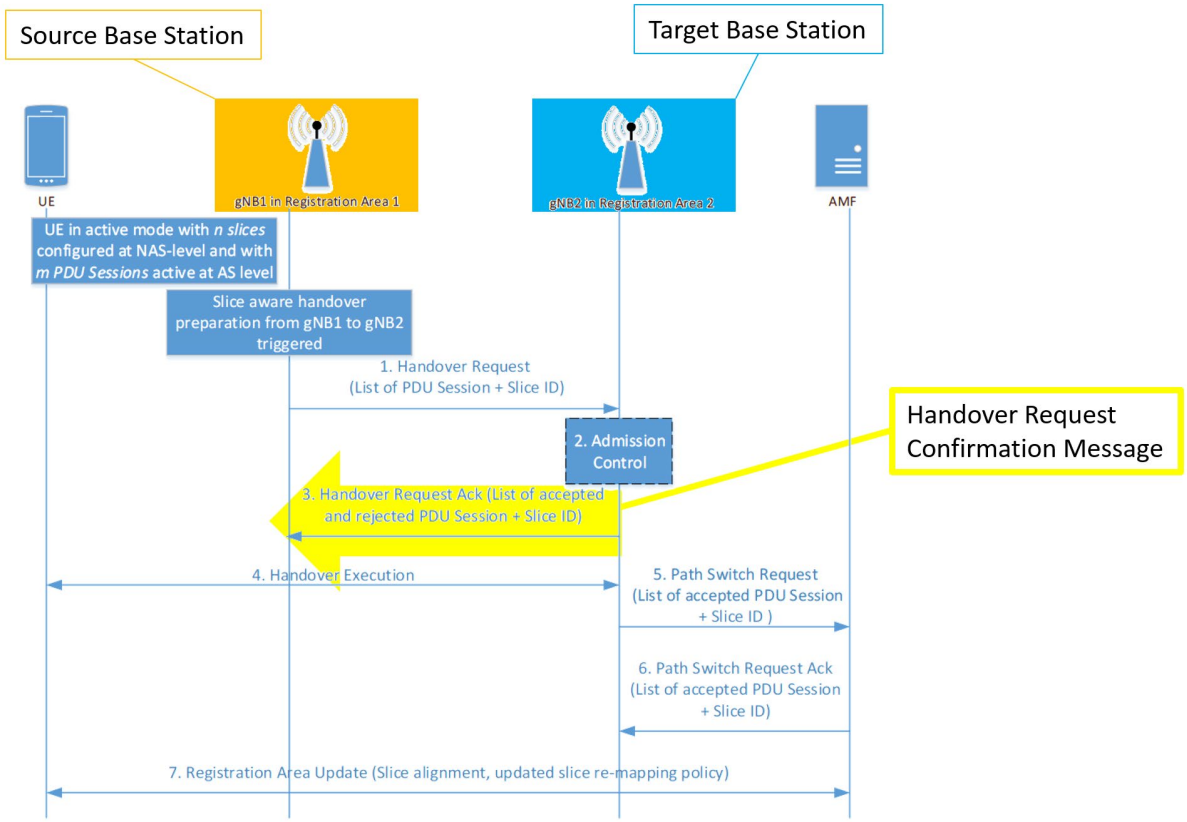
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availability) list to the source gNB. The non-admitted PDU session is also indicated in the RRC Context IE through DRB-ToReleaseList, and thus UE can be informed." (Ex. 1011, 3).

366. As I describe above, *R3-173152* provides additional detail regarding the "5. Handover Request Acknowledge" of Figure 1 so as to enable slice-aware handover. (Ex. 1011, 4). *R3-173152* also discloses a proposed Figure 17.3.4.5-x (reproduced below) that is a proposal for supplementing the "Xn Handover" procedure depicted in Figure 1 (reproduced above). With reference to Figure 17.3.4.5-x (reproduced below), a *R3-173152* discloses a "3. Handover Request Ack" message including a "(List of accepted and rejected PDU Session + Slice ID)" being received from the second or target "gNB2" or base station by the first or source "gNB1" or base station in response to the "Handover Request" message. (Ex. 1011, 4-5).

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Ex. 1011, Figure 17.3.4.5-x (annotated)



367. To the extent it is argued that the "Handover Request Ack" messages of *R3-173152* do not explicitly state that they contain a "confirmation," a person of ordinary skill in the art would have understood that the "Handover Request Ack" message of *R3-173152* satisfies the claimed the "handover request confirmation message" at least in view of the disclosure of the '631 patent.

368. The '631 patent does not use the term "handover request confirmation message" anywhere in the specification or figures, and only uses the term in independent claims 1, 7, and 13. The language of the claims indicates the "handover

request confirmation message" is received "in response to the handover request message," and "includes information for indicating rejection of the one or more PDU sessions by the target BS" "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." (*See, e.g.,* Ex. 1001, Claims 1, 7, 13). The examples in the '631 specification of when "information for indicating" "when a target cell/base station does not support/allow a corresponding network slice," or when "failed network slice information that is not supported/allowed by the target cell/base station" is included in a message, include "a handover response inter-base station interface (Xn) message" and "a handover command Inter-node RRC message," (Ex. 1001, 18:42-19:5). The '631 patent does not elaborate on what "a handover response inter-base station interface (Xn) message" is or contains, nor what "a handover command Inter-node RRC message" is or contains.

369. In view of the disclosure of the '631 patent, a person of ordinary skill in the art would have understood that the claimed "handover request confirmation message" was received "in response to the handover request message," and "include[d] information for indicating rejection of the one or more PDU sessions by the target BS" "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." Additional

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information regarding the contents of the "Handover Request ACK" is described *infra* in [13.c2] and I incorporate it in my analysis herein.

370. Accordingly, a person of ordinary skill in the art would have understood that the "Handover Request Ack" message of *R3-173152* - which is disclosed by *R3-173152* as being received in response to the handover request message, and which is also disclosed by *R3-173152* as including "the admitted PDU session list and not admitted PDU session list, to indicate which PDU session can handover to the target" (*see* Ex. 1011, 2), or "List of accepted and rejected PDU Session + Slice ID" (*see* Ex. 1011, 5) - satisfies the claimed "handover request confirmation message." *See also* [13.c2] *infra*.

371. Thus, *R3-173152* renders obvious claim element [13.c1].

Claim 13, Element [13.c2]: wherein, if one or more protocol data unit (PDU) sessions are associated with one or more network slices that are not supported by a target BS, the handover request confirmation message includes information for indicating a rejection of the one or more PDU sessions by the target BS.

372. *R3-173152* renders obvious claim element [13.c2].

373. The '631 patent does not use the term "rejection" nor "reject" outside of the independent claims. Therefore, it is unclear what "information for indicating a rejection of the one or more PDU sessions by the target BS" entails. Notwithstanding the lack of disclosure of the '631 patent, *R3-173152* renders obvious such a limitation because it in fact clearly discloses the claimed limitation.

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374. As I describe above, *R3-173152* provides additional detail regarding the "5. Handover Request Acknowledge" of Figure 1 so as to enable slice-aware handover. (*see generally* § VIII.A *supra*).

375. *R3-173152,* after presenting Figure 1, goes on to discuss two scenarios in which details may be added to various messages or steps in Figure 1 to enable slice-aware handover. (Ex. 1011, 2-3).

376. In the case that the source gNB and the target gNB are in the *same* RA," *R3-173152* discloses that, "[f]or the Handover Request ACK message, it includes the admitted PDU session list and not admitted PDU session list, to indicate which PDU session can handover to the target." (Ex. 1011, 2).

377. *R3-173152* further discloses:

> Handover Request ACK message also includes the *RRC Context* IE, which will send to UE via the source gNB transparently (i.e., via Handover Command message). In the *RRC Context* IE, the target gNB presents how to configure the RBs for UE, and ***if some PDU sessions are rejected, the target gNB will put the DRBs associated to the rejected PDU sessions in the DRB-ToReleaseList (which is included in the RRC Context IE)***, and thus UE is notified which PDU sessions are not admitted in the target gNB.

(Ex. 1011, 2) (emphasis added). That is, *R3-173152* provides additional detail to "5. Handover Request Acknowledge" of Figure 1 in order to support slice-aware handover in the scenario where the source gNB and the target gNB are in the same

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registration area. The additional details include that the "Handover Request ACK message" "includes the admitted PDU session list and not admitted PDU session list, to indicate which PDU session can handover to the target." (Ex. 1011, 2). To be clear, the "Handover Request ACK message" includes information about "***rejected PDU sessions***" from the target gNB. (Ex. 1011, 2).

378. In the scenario where handover occurs across RA's and the target gNB cannot support all of the UE's slices, *R3-173152* discloses, "[f]or the Handover Request ACK message, the target gNB informs ***non-admitted PDU sessions (e.g., including due to slice availability) list to the source gNB***. The non-admitted PDU session is also indicated in the RRC Context IE through DRB-ToReleaseList, and thus UE can be informed." (Ex. 1011, 3). That is, *R3-173152* provides additional detail to "5. Handover Request Acknowledge" in Figure 1 in order to support slice-aware handover in the scenario where the source gNB and the target gNB are in different registration areas and the target gNB cannot support all of the UE's slices. The additional details include that the "Handover Request ACK message" includes a list of "non-admitted PDU sessions (e.g., including due to slice availability." (Ex. 1011, 3). To be clear, the "Handover Request ACK message" includes information about "***non-admitted PDU sessions***" in a list from the target gNB to the source gNB. *Id.*

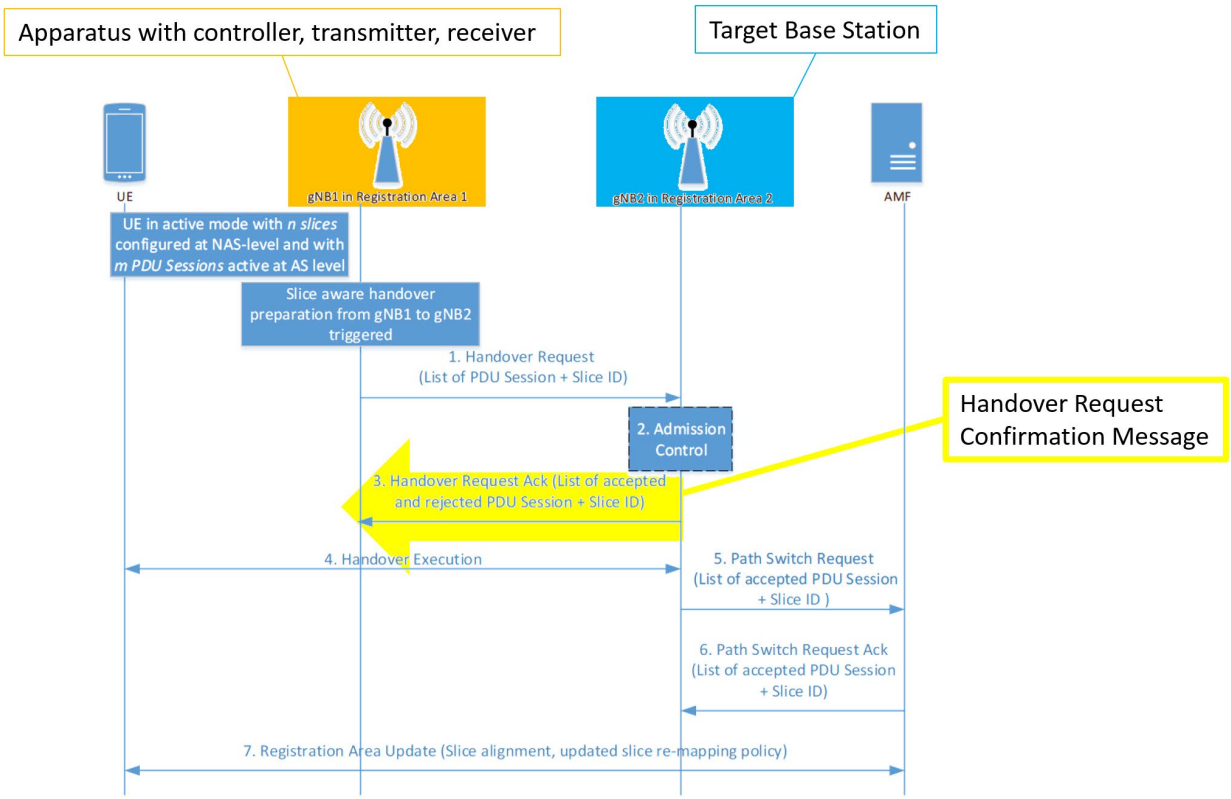
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379. *R3-173152* also proposes to add Figure 17.3.4.5-x and accompanying text to *TS 38.300* in order to support the above-described scenario of slice-aware handover.

380. Shown in Figure 17.3.4.5-x, *R3-173152* discloses a "3. Handover Request Ack" message including a "(List of accepted and ***rejected PDU Session*** + Slice ID)" being received from the second or target "gNB2" by the first or source "gNB1" in response to the "Handover Request" message. (Ex. 1011, 5). To be clear, including "(List of accepted and ***rejected PDU Session*** + Slice ID)" in the "Handover Request Ack" message is intended to cover the above-described additional detail of the "Handover Request ACK message" including a list of "non-admitted PDU sessions (e.g., including due to slice availability." (Ex. 1011, 3). Accordingly, a person of ordinary skill in the art would have understood that "3. Handover Request Ack" of Figure 17.3.4.5-x corresponds to "5. Handover Request Acknowledge" of Figure 1, with additional detail included in the message, including "(List of accepted and rejected PDU Session + Slice ID)" to enable slice-aware handover. That is, *R3-173152* discloses a list of "***rejected PDU Session***" and "Slice ID" being included in a "Handover Request Ack" message.

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Ex. 1011, Figure 17.3.4.5-x (annotated)



381. In view of the explicit disclosure in *R3-173152* of "rejected PDU Session" and "Slice ID" being included in a "Handover Request Ack" message, a person of ordinary skill in the art would have understood or found it obvious that the "Handover Request Ack" message provided information for indicating a rejection of one or more PDU sessions.

382. Thus, *R3-173152* renders obvious claim element [13.c2].

B. Ground 2: *R3-173152* and *TR 38.801* Render Obvious Claims 2-6, 8-12, and 14-18 of the '631 patent.

383. *R3-173152* and *TR 38.801* render obvious claims 2-6, 8-12, and 14-18 of the '631 patent.

Motivation to Combine *R3-173152* and *TR 38.801*

384. There are numerous reasons why a person of ordinary skill in the art would have been specifically motivated to combine *R3-173152* and *TR 38.801*.

385. *R3-173152* and *TR 38.801* are both generally directed to the field of radio access technology or network communications, (*see* Ex. 1011, 1; Ex. 1013, Cover), and are both publications associated with the 3rd Generation Partnership Project (3GPP). *Id.* These references, like the '631 patent, are directed to technology associated with "providing services using network slicing to moving user equipments without interruption." (Ex. 1001, 1:20-24).

386. *R3-173152* both identifies and provides a solution to the problem to be solved by the '631 patent (e.g., "mobility guarantee of the user equipment and transmission/reception procedures of data in case the network slicing technology is employed," and "a specific procedure for service continuity and service stability." (*see* Ex. 1001, 1:51-55)). *R3-173152* identifies the problem to be solved by the '631 patent by explaining that "it is likely that target node cannot support the same NW slice(s) the UE is in question at the source node," thus "when the UE is moving to the boundary of registration areas that support different slices, the effect of slice

availability for handover needs to be considered." (Ex. 1011, 1).

387. *R3-173152* identifies a solution to the problem to be solved by the '631 patent by providing a "Xn based handover procedure by taking the slice availability into account." (Ex. 1011, 1). *R3-173152* discloses an "Xn based handover" for "mobility across different Registration Areas," in which slice aware handovers of UEs are (1) prepared and executed by a source gNB and a target gNB when the source gNB and target gNB are in the same registration area, and (2) prepared and executed by a first gNB in a first registration area and a second gNB in a second registration area, for mobility across registration areas. (Ex. 1011, 2, 5).

388. Likewise, *TR 38.801* both identifies and provides a solution to the problem to be solved by the '631 patent (e.g., "mobility guarantee of the user equipment and transmission/reception procedures of data in case the network slicing technology is employed," and "a specific procedure for service continuity and service stability." (*see* Ex. 1001, 1:51-55)). *TR 38.801* identifies the problem to be solved by the '631 patent by explaining key principles for supporting network slicing. (Ex. 1013, 23).

389. *TR 38.801* provides a solution to the problem to be solved by the '631 patent by providing "support of Network Slicing in RAN" (a "Radio Access Network"). (Ex. 1013, 23). *TR 38.801* discloses realizing "Network Slice selection" by either "configur[ing] the UE with a list of slice IDs to which it is allowed to

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access," or "let[ting] the CN notify the UE of the Slice IDs it can access and let the UE rely on such information onwards." (Ex. 1013, 26).

390. In view of the explicit teaching in *R3-173152* of providing slice aware handovers of user equipment and the need for consideration of network slice availability during handovers, a person of ordinary skill in the art would have turned to *TR 38.801*, which expressly discloses multiple options for realizing and supporting network slicing, for additional mechanisms by which mobility of user equipments (UEs) can be effectuated across different registration areas.

391. A person of ordinary skill in the art would have combined these references to provide the system of *R3-173152* with the additional option of using a core network node to notify a UE of slice IDs it can access, as disclosed in *TR 38.801*, which enables differentiated handling of traffic for different network slices, selection of network slice by a slice ID provided by the UE, support for resource management, support for resource isolation between slices, and QoS differentiation within a slice. (Ex. 1013, 28).

392. Moreover, a person of ordinary skill in the art would have had a reasonable expectation of success in the combination of *R3-173152* and *TR 38.801* based on the explicit teachings of the references, the knowledge of the person of ordinary skill in the art, and recognizing that both *R3-173152* and *TR 38.801* relate to the 3rd Generation Partnership Project.

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393. *R3-173152* discloses that, for mobility across registration areas, where a target gNB cannot support all of the slices required by a UE, one option would be to have "the source gNB always check the slice availability before handover," or another option would be for "the source gNB [to] check the slice availability for selecting the suitable target gNBs" for requesting handover. (Ex. 1011, 3).

394. A person of ordinary skill in the art would have turned to *TR 38.801*, which discloses multiple implementations for providing slice information from the UE to the gNB (or base station), for details regarding how to convey required network slice information from a UE to a base station. The person of ordinary skill in the art would have been motivated to utilize an NAS message, or an NAS message encapsulated in an RRC message, to transmit the information about the "*n slices* configured at NAS-level" of *R3-173152's* "UE in active mode" to the gNB or base station, as taught by *TR 38.801*, in order to "enable[] support of multiple slices simultaneously supported by a UE." (Ex. 1013, 24). The person of ordinary skill in the art would have had a reasonable expectation of success in such a combination because the person of ordinary skill in the art would have been well aware of encapsulating an NAS message in an RRC message, and that the RRC sublayer was available for communication of NAS messages from a UE to a core network via a base station (*see* § VI *supra*), as also taught by *TR 38.801*.

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395. Moreover, the person of ordinary skill in the art would have understood that the UE of *R3-173152* and the UE of *TR 38.801* are similar devices with similar communication capabilities. The person of ordinary skill in the art would have further recognized that the ability to convey network slice information from a UE to an eNB via an NAS message, using the RRC sublayer, was an improvement to the UE of *TR 38.801* because such capability enabled the use of a single message to convey information to an eNB that the eNB needed for both (1) slice awareness and (2) for communicating to a selected core network node.

396. *R3-173152* discloses that, for mobility across registration areas, where a target gNB cannot support all of the slices required by a UE, one option would be to have "the source gNB always check the slice availability before handover," or another option would be for "the source gNB [to] check the slice availability for selecting the suitable target gNBs" for requesting handover. (Ex. 1011, 3). A person of ordinary skill in the art would have turned to *TR 38.801*, which discloses multiple implementations for providing slice information from the core network to the gNB (or base station), for details regarding how to convey required network slice information from a core network entity to a base station because the implementations in *TR 38.801* realize network slice selection in a manner that lets gNB "identify the CN node that supports the slice ID presented by [a] UE." (Ex. 1013, 26). That is, the person of ordinary skill in the art would have understood that *TR 38.801*'s teaching

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of enabling the RAN to "identify the CN node that supports the slice ID presented by [a] UE" would enable the source gNB of *R-173152* to be aware of slice availability in order to select suitable targets for handover.

397. A person of ordinary skill in the art would have had a reasonable expectation of success in attempting to transmit slice information from the core network entity to the gNB or base station because both *R3-173152* and *TR 38.801* disclose supporting network slicing among gNBs and eNBs interconnected with the Xn interface. (Ex. 1011, 1; Ex. 1013, 19, 29).

398. Moreover, the person of ordinary skill in the art would have understood that the networks and base stations of *R3-173152* and *TR 38.801* include similar devices with similar communication capabilities. The person of ordinary skill in the art would have further recognized that the ability to convey network slice information to an eNB by the core network, where the network slice information is configured based on network slice request information, was an improvement to the network and/or eNB of *TR 38.801* because such capability enabled the eNB to assist with determining which slices are supported.

399. For at least the reasons outlined above in this section entitled *Motivation to Combine R3-173152 and TR 38.801*, and those discussed further below, it is my opinion that a person of ordinary skill in the art would have been motivated to combine the teachings of *R3-173152* and *TR 38.801*.

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Dependent Claim 2: The method according to claim 1, further comprising: receiving, by the source BS and from a user equipment (UE), a non-access stratum (NAS) message including network slice request information.

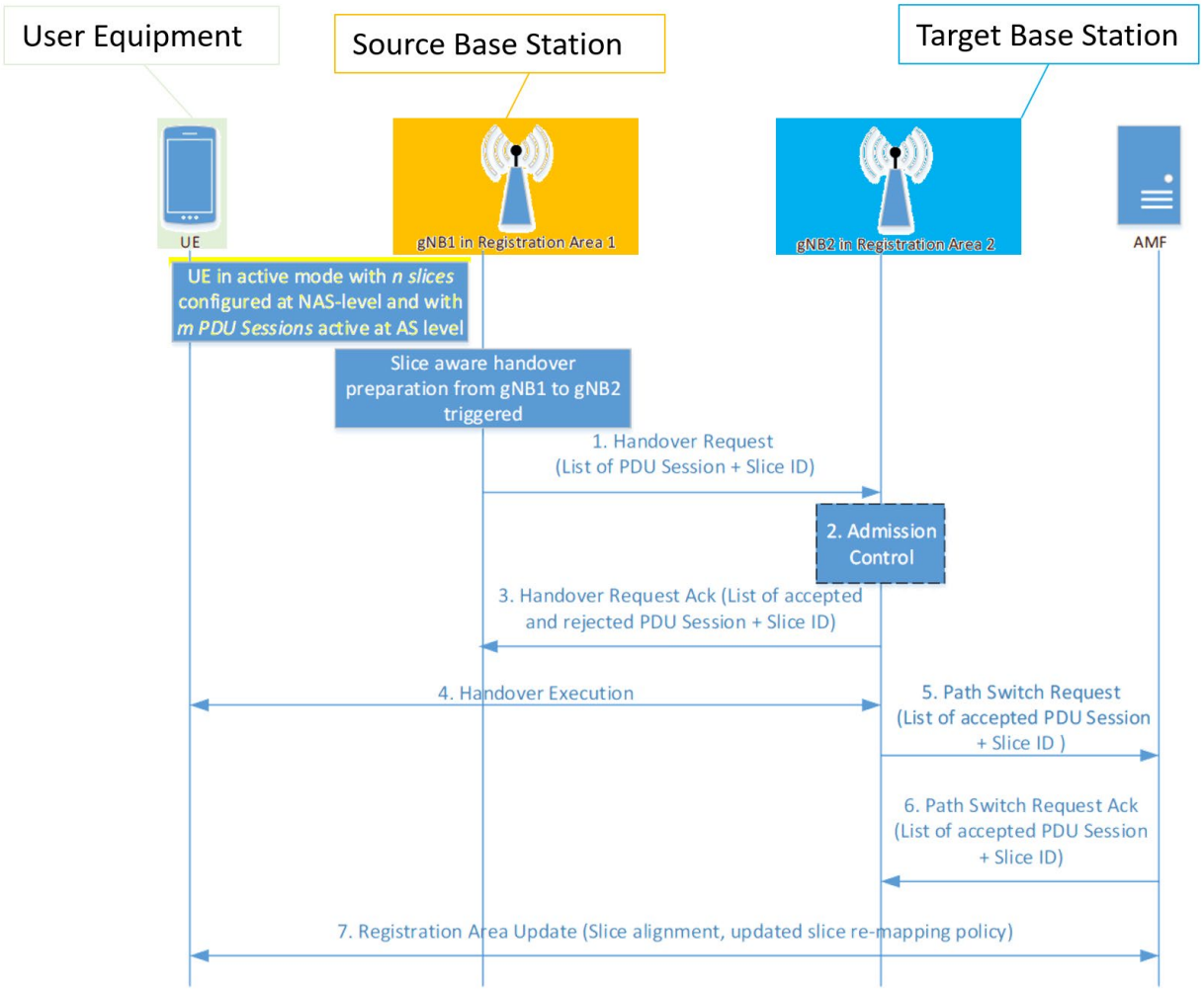
400. *R3-173152* and *TR 38.801* render obvious claim 2. As set forth above, *R3-173152* renders obvious all of the elements of claim 1. *See* § IX.A, *supra*.

401. *R3-173152* and *TR 38.801* render obvious the remaining limitations of claim 2.

402. *R3-173152* discloses a "UE" or user equipment "in active mode with *n slices* configured at NAS-level" or non-access stratum-level, "and with *m PDU Sessions* active at AS level." (Ex. 1011, 5).

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Ex. 1011, Figure 17.3.4.5-x (annotated)



403. *TR 21.905*[17], specifically referenced by *TR 38.801*, defines "Access

[17] *TR 21.905* is not part of the grounds, but it is referenced by *TR 38.801* and therefore is referenced here to demonstrate the knowledge of the person of ordinary skill in the art reviewing *TR 38.801*.

Stratum" as "functional grouping consisting of the parts in the infrastructure and in the user equipment and the protocols between these parts being specific to the access technique (i.e. the way the specific physical media between the User Equipment and the Infrastructure is used to carry information)" (*see* Ex. 1018, 7), and "Non-Access Stratum" as "[p]rotocols between UE and the core network that are not terminated in the UTRAN" (*see* Ex. 1018, 21) or "Universal Terrestrial Radio Access Network." (Ex. 1018, 6). *TR 21.905* defines a "[r]adio access bearer" as a "service that the access stratum provides to the non-access stratum for transfer of user data between User Equipment and CN" (*see* Ex. 1018, 24) or "Core Network." (Ex. 1018, 38).

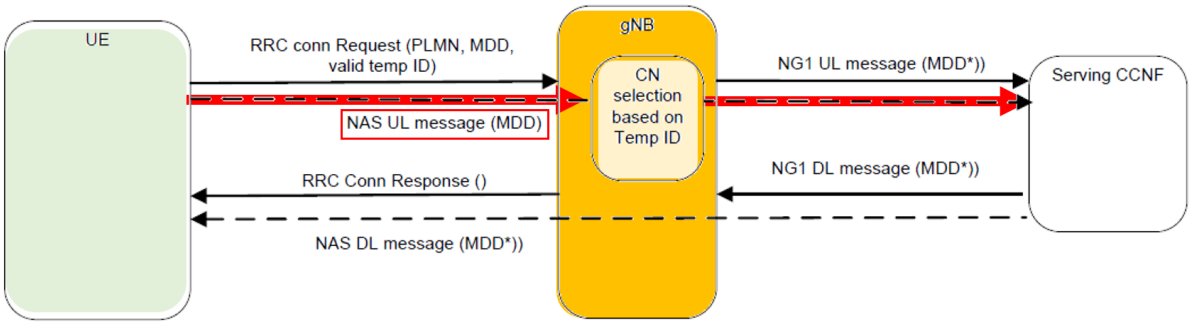
404. *TR 38.801* discloses a user equipment or UE sending an "RRC connection request" to a "gNB" or base station[18] (Ex. 1013, 24-26). *TR 38.801* also discloses a user equipment or UE sending a non-access stratum or NAS uplink or UL message. (Ex. 1013, 24-26). *TR 38.801* discloses a "Selection case 4" in which a "UE" transmits a "NAS UL" or non-access stratum uplink message containing "MDD," or a "Multi-Dimensional Descriptor." (Ex. 1013, 24-25). Selection case 4 is reproduced and annotated below.

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[18] The '631 patent provides examples of base stations, including "a gNode-B (gNB)." (Ex. 1001, 3:62-4:4).

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Ex. 1013, 25 (annotated)



405. *TR 38.801* discloses that the "MDD" is used "for RAN slice awareness (slice specific behavior, congestion control, resource isolation)." (Ex. 1013, 26). That is, *TR 38.801* discloses that the UE transmits an NAS message that includes network slice information (i.e., an MDD used for slice awareness) to the "Serving CCNF" by way of the "gNB" or base station. *Id.; see also* §§ VI, VIII.B *supra*. Even though the arrow associated with the "NAS UL message (MDD)" in the annotated figure above appears as though the "NAS UL message (MDD)" was sent from the UE to the Serving CCNF, a person of ordinary skill in the art would have understood or found it obvious that the UE transmitted the NAS message to the gNB or base station (and then from the gNB to the Serving CCNF), at least in view of the knowledge of the person of ordinary skill in the art - as discussed in the Technical Background herein (§VI *supra*) - as well as the depicted communication in the above drawing of *TR 38.801*. Therefore, *TR 38.801* discloses or renders obvious the source

base station (gNB, orange above), from a user equipment or UE (UE, green above), a non-access stratum (NAS) message ("NAS UL message (MDD)," red above), which includes network slice request information ("MDD").

406. *TR 38.801* also discloses a user equipment or UE sending network slice information to an eNB or base station.[19] (Ex. 1013, 26-27).

[19] The '631 patent provides examples of base stations, including "an evolved Node-B (eNB), a gNode-B (gNB)." (Ex. 1001, 3:62-4:4).

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Ex. 1013, Figure 9.2.1-1 (annotated)

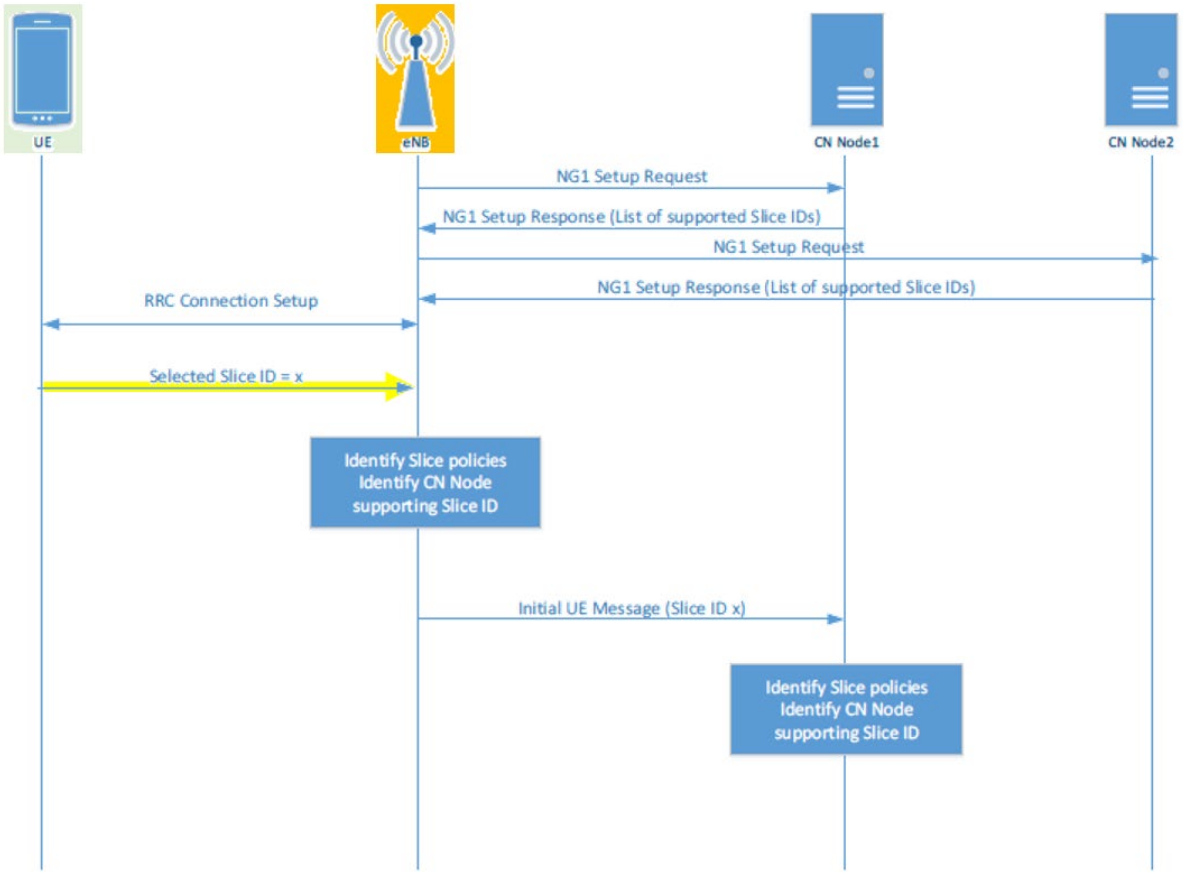


Figure 9.2.1-1: Slice selection when Slice ID is provided by the UE to RAN

407. *R3-173152* discloses that, for mobility across registration areas, where a target gNB cannot support all of the slices required by a UE, one option would be to have "the source gNB always check the slice availability before handover," or another option would be for "the source gNB [to] check the slice availability for selecting the suitable target gNBs" for requesting handover. (Ex. 1011, 3). A person of ordinary skill in the art would have turned to *TR 38.801*, which discloses multiple implementations for providing slice information from the UE to the gNB (or base

station), for details regarding how to convey required network slice information from a UE to a base station. The person of ordinary skill in the art would have been motivated to utilize an NAS message to transmit the information about the "*n slices* configured at NAS-level" of *R3-173152's* "UE in active mode" to the gNB or base station, as taught by *TR 38.801*, in order to "enable[] support of multiple slices simultaneously supported by a UE." (Ex. 1013, 24). The person of ordinary skill in the art would have had a reasonable expectation of success in such a combination because the person of ordinary skill in the art would have been well aware that the RRC sublayer was available for communication of NAS messages from a UE to a core network via a base station (*see* § VI *supra*), as also taught by *TR 38.801*.

408. Moreover, the person of ordinary skill in the art would have understood that the UE of *R3-173152* and the UE of *TR 38.801* are similar devices with similar communication capabilities. The person of ordinary skill in the art would have further recognized that the ability to convey network slice information from a UE to an eNB via an NAS message, using the RRC sublayer, was an improvement to the UE of *TR 38.801*, because such capability enabled the use of a single message to convey information to an eNB that the eNB needed for both (1) slice awareness and (2) for communicating to a selected core network node. The person of ordinary skill in the art would have further been motivated to combine *R3-173152* and *TR 38.801*

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for the reasons espoused in the section herein titled *Motivation to Combine R3-173152 and TR 38.801*.

409. Thus, *R3-173152* and *TR 38.801* render obvious claim 2.

Dependent Claim 3: The method according to claim 2, further comprising: receiving, by the source BS and from a core network entity, the network slice information, wherein the network slice information is configured by the network slice request information.

410. *R3-173152* and *TR 38.801* render obvious claim 3. As set forth above, *R3-173152* renders obvious all of the elements of claim 2. *See* § IX.B.2 *supra*.

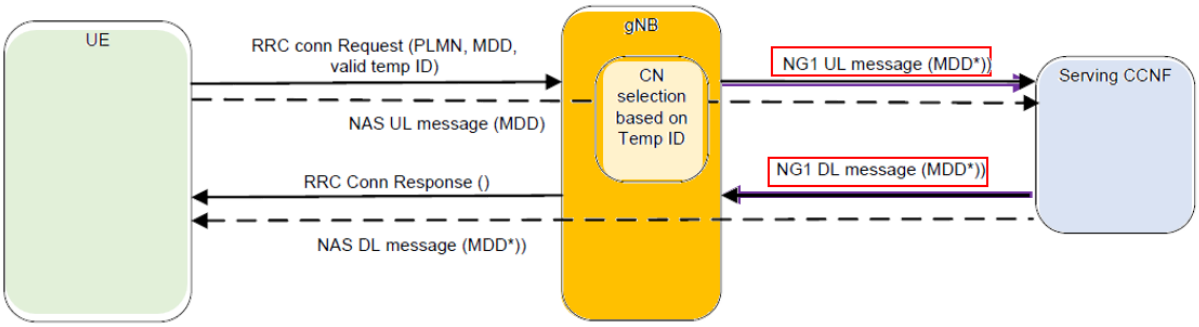
411. *R3-173152* and *TR 38.801* render obvious the remaining limitations of claim 3.

412. *R3-173152* renders obvious a source base station receiving network slice information. *See* § IX.A.[1.c1] *supra.*

413. *TR 38.801* discloses a Serving CCNF, or core network entity, receiving network slice request information in the form of an MDD in an uplink message. (Ex. 1013, 25-26). *TR 38.801* also states that "RAN uses the included MDD for RAN slice awareness (slice specific behavior, congestion control, resource isolation)." (Ex. 1013, 25-26. *TR 38.801* then states that the "MDD is sent back to the UE with the Temp ID at NAS level to either reconfirm the initially requested MDD or indicate a new one if policy has changed." *Id. TR 38.801* also states that the MDD is "also indicated in the NG1 DL message to gNB for confirmation." *Id*.

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Ex. 1013, 25 (annotated)



414. All of this is depicted in the image above from *TR 38.801*, in which source BS ("gNB," orange) receives from the core network entity ("Serving CCNF," light blue) network slice information ("MDD*"), where the network slice information is configured by the network slice request information ("MDD"). Because the Serving CCNF receives an MDD* (network slice request information) that is based on the MDD (network slice request information), and returns to the source BS an MDD* (network slice information) that is either a reconfirmation of the requested MDD or a modified MDD if a policy has changed (i.e., a requested MDD is unavailable), a person of ordinary skill in the art would have found it obvious or understood that *TR 38.801* disclosed that the network slice information is configured by the network slice request information.

415. *R3-173152* discloses that, for mobility across registration areas, where a target gNB cannot support all of the slices required by a UE, one option would be to have "the source gNB always check the slice availability before handover," or

another option would be for "the source gNB [to] check the slice availability for selecting the suitable target gNBs" for requesting handover. (Ex. 1011, 3). A person of ordinary skill in the art would have turned to *TR 38.801*, which discloses multiple implementations for providing slice information from the core network to the gNB (or base station), for details regarding how to convey required network slice information from a core network entity to a base station because the implementations in *TR 38.801* realize network slice selection in a manner that lets gNB "identify the CN node that supports the slice ID presented by [a] UE." (Ex. 1013, 26). That is, the person of ordinary skill in the art would have understood that *TR 38.801*'s teaching of enabling the RAN to "identify the CN node that supports the slice ID presented by [a] UE" would enable the source gNB of *R-173152* to be aware of slice availability in order to select suitable targets for handover.

416. A person of ordinary skill in the art would have had a reasonable expectation of success in attempting to transmit slice information from the core network entity to the gNB or base station because both *R3-173152* and *TR 38.801* disclose supporting network slicing among gNBs and eNBs interconnected with the Xn interface. (Ex. 1011, 1; Ex. 1013, 19, 29).

417. Moreover, the person of ordinary skill in the art would have understood that the networks and base stations of *R3-173152* and *TR 38.801* include similar devices with similar communication capabilities. The person of ordinary skill in the

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art would have further recognized that the ability to convey network slice information to an eNB by the core network, where the network slice information is configured based on network slice request information, was an improvement to the network and/or eNB of *TR 38.801* because such capability enabled the eNB to assist with determining which slices are supported. The person of ordinary skill in the art would have further been motivated to combine *R3-173152* and *TR 38.801* for the reasons espoused in the section herein titled *Motivation to Combine R3-173152 and TR 38.801*.

418. Thus, *R3-173152* and *TR 38.801* render obvious claim 3.

Dependent Claim 4: The method according to claim 2, wherein the NAS message including the network slice request information is included in a radio resource control (RRC) connection setup completion message.

419. *R3-173152* and *TR 38.801* render obvious claim 4. As set forth above, *R3-173152* and *TR 38.801* render obvious all of the elements of claim 2. *See* §§ IX.B.2 *supra*.

420. *R3-173152* and *TR 38.801* render obvious the remaining elements of claim 4.

421. As discussed above, *R3-173152* and *TR 38.801* render obvious "a non-access stratum (NAS) message including network slice request information." *See* § IX.B.2.

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422. The ’631 patent makes no mention of a “radio resource control (RRC) connection setup completion message” outside of the claims. The ’631 patent describes an “RRC connection setup complete message” that is used to “transmit[]” “network slice request information” from a UE “to a base station” by including the “network slice request information” in “a NAS message.” (Ex. 1001, 15:19-37). Accordingly, a person of ordinary skill in the art would have understood that the claimed “radio resource control (RRC) connection setup completion message” was an RRC message used to transmit network slice request information to a base station by including the network slice request information in an NAS message.

423. *R3-173152* discloses “indicat[ing]” a “non-admitted PDU session” “in the *RRC Context* IE,” so that a “UE can be informed.” (Ex. 1011, 3). *R3-173152* further discloses, “[a]fter receiving the Handover Command message including *RRC Context* IE,” a “UE releases the DRB associated to the non-admitted PDU sessions and informs the NAS level.” (Ex. 1011, 3).

424. *R3-173152* also discloses a UE “complet[ing] [an] RRC Handover procedure.” (Ex. 1011, 2; Figure 1). *TS 38.300*[20], specifically referenced by *R3-*

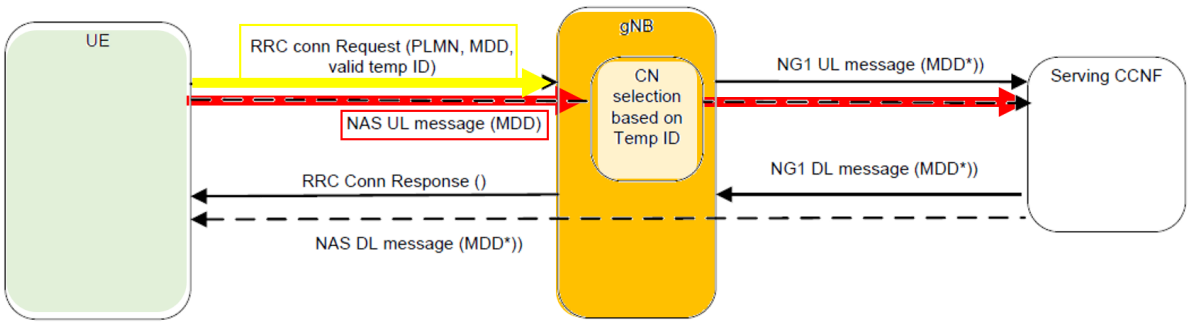
[20] *TS 38.300* is not part of the grounds, but it is specifically referenced by *R3-173152* and is referenced here to demonstrate the knowledge of a person of ordinary skill in the art reviewing *R3-173152*.

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173152, includes "general principles and requirements related to the realization of network slicing the NG-RAN," including that a "UE should be able to provide assistance information for network slice selection in RRC message." (Ex. 1019, 45).

425. *TR 38.801* discloses a UE sending an RRC message including an MDD (network slice request information) as well as an NAS message containing an MDD (network slice request information) to the gNB.[21] (Ex. 1013, 24-26).

Ex. 1013, 25 (annotated)



426. *TR 38.801* also discloses an "MDD [being] sent back to the UE with the Temp ID at NAS level" and an "RRC Conn Response" message being sent back to the UE. (Ex. 1013, 24-26).

[21] The '631 patent provides examples of base stations, including "a gNode-B (gNB)." (Ex. 1001, 3:62-4:4).

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427. *TR 38.801* discloses that the "MDD" is used "for RAN slice awareness (slice specific behavior, congestion control, resource isolation)." (Ex. 1013, 26). That is, *TR 38.801* discloses that the NAS message includes network slice request information. *See also* §§ VI, VIII.B *supra*..

428. A person of ordinary skill in the art would have known or found it obvious, at least in view of the knowledge of the person of ordinary skill in the art as discussed in the Technical Background herein (§ VI *supra*), that the NAS message was transmitted either on its own by the UE to the gNB, or as part of or encapsulated in an RRC by the UE to the gNB..

429. *R3-173152* discloses that, for mobility across registration areas, where a target gNB cannot support all of the slices required by a UE, one option would be to have "the source gNB always check the slice availability before handover," or another option would be for "the source gNB [to] check the slice availability for selecting the suitable target gNBs" for requesting handover. (Ex. 1011, 3). A person of ordinary skill in the art would have turned to *TR 38.801*, which discloses multiple implementations for providing slice information from the UE to the gNB (or base station), for details regarding how to convey required network slice information from a UE to a base station. The person of ordinary skill in the art would have been motivated to utilize an NAS message encapsulated in an RRC message to transmit the information about the "*n slices* configured at NAS-level" of *R3-173152's* "UE

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in active mode" to the gNB or base station, as taught by *TR 38.801*, in order to "enable[] support of multiple slices simultaneously supported by a UE." (Ex. 1013, 24). The person of ordinary skill in the art would have had a reasonable expectation of success in such a combination because the person of ordinary skill in the art would have been well aware of encapsulating NAS messages in RRC messages and that the RRC sublayer was available for communication of NAS messages from a UE to a core network via a base station (*see* § VI *supra*), as also taught by *TR 38.801*.

430. Moreover, the person of ordinary skill in the art would have understood that the UE of *R3-173152* and the UE of *TR 38.801* are similar devices with similar communication capabilities. The person of ordinary skill in the art would have further recognized that the ability to convey network slice information from a UE to an eNB via an NAS message encapsulated in an RRC message, using the RRC sublayer, was an improvement to the UE of *TR 38.801* because such capability enabled the use of a single message to convey information to an eNB that the eNB needed for both (1) slice awareness and (2) for communicating to a selected core network node. The person of ordinary skill in the art would have further been motivated to combine *R3-173152* and *TR 38.801* for the reasons espoused in the section herein titled *Motivation to Combine R3-173152 and TR 38.801*.

431. Thus, *R3-173152* and *TR 38.801* render obvious claim 4.

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Dependent Claim 5: The method according to claim 3, wherein the network slice information is configured by the core network entity based on the network slice request information.

432. *R3-173152* and *TR 38.801* render obvious claim 5. As set forth above, *R3-173152* and *TR 38.801* render obvious all of the elements of claim 3. *See* § IX.B.3 *supra*.

433. *R3-173152* and *TR 38.801* render obvious the remaining elements of claim 5.

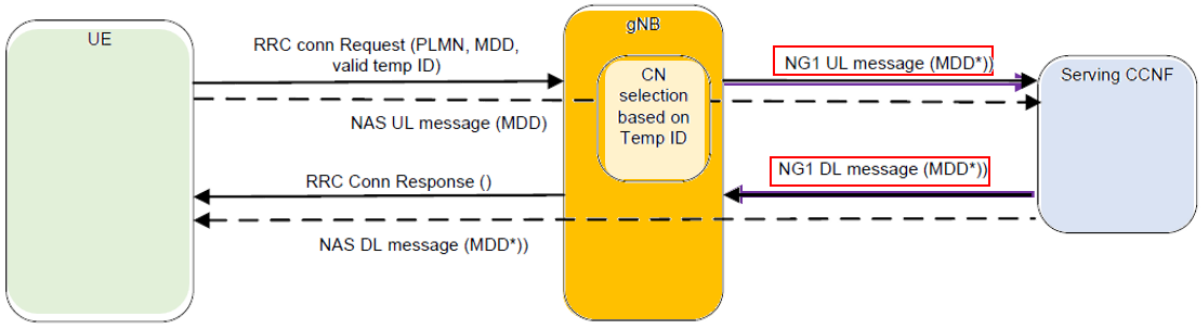
434. *R3-173152* discloses a source base station receiving network slice information. *See* § IX.A.[1.c1] *supra.*

435. *TR 38.801* defines a "slice ID" as "unambiguously identif[ying] one of the pre-configured network slices…" (Ex. 1013, 23). *TR 38.801* also discloses several scenarios involving network slice selection, and those scenarios are disclosed by *TR 38.801* as being based on a solution described in "section 6.1.2 of TR 23.799." (Ex. 1013, 24; Ex. 1020, 61). *TR 38.801* discloses, with reference to the image annotated below, that the core network entity ("Serving CCNF," light blue) receives the network slice request information (MDD*) in an uplink or "UL message." (Ex. 1013, 25-26). According to *TR 38.801,* "RAN uses the included MDD for RAN slice awareness (slice specific behavior, congestion control, resource isolation)." *Id.* The "MDD is sent back to the UE with the Temp ID at NAS level to either reconfirm the initially requested MDD or indicates a new one if policy has changed." *Id.* The

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MDD* is "also indicated in the NG1 DL message to gNB for confirmation." *Id.* In the solution referenced by *TR 38.801* and described in section 6.1.2 of *TR 23.799*, the "CCNF decides the initial set of [network slice instances] for the UE based on an evaluation of the Requested MDD, Subscribed MDD (if available), …," and the "Accepted MDD" "is passed to the UE in [an] Attach Accept message." (Ex. 1020, p. 67).

Ex. 1013, 25 (annotated)



436. Therefore, and with reference to the image annotated above, *TR 38.801* discloses receiving by the source BS ("gNB," orange), from the core network entity ("Serving CCNF," light blue), network slice information ("MDD*" as part of "NG1 DL message (MDD*)"), where the network slice information ("MDD*") is configured by the core network entity based on the network slice request information ("MDD"). That is, while it appears in the image that the Serving CCNF receives from the gNB and sends to the gNB the same MDD*, a person of ordinary skill in the art would have understood or found it obvious that the Serving CCNF modified

the MDD* prior to sending it back in view of the explicit disclosure in *TR 38.801* that the "MDD is sent back to the UE with the Temp ID at NAS level to either reconfirm the initially requested MDD or indicate a new one if policy has changed," and the MDD is "also indicated in the NG1 DL message to gNB for confirmation." (Ex. 1013, 25-26).

437. *R3-173152* discloses that, for mobility across registration areas, where a target gNB cannot support all of the slices required by a UE, one option would be to have "the source gNB always check the slice availability before handover," or another option would be for "the source gNB [to] check the slice availability for selecting the suitable target gNBs" for requesting handover. (Ex. 1011, 3). A person of ordinary skill in the art would have turned to *TR 38.801*, which discloses multiple implementations for providing slice information from the core network to the gNB (or base station), for details regarding how to convey required network slice information from a core network entity to a base station because the implementations in *TR 38.801* realize network slice selection in a manner that lets the gNB "identify the CN node that supports the slice ID presented by [a] UE." (Ex. 1013, 26). That is, the person of ordinary skill in the art would have understood that *TR 38.801*'s teaching of enabling the RAN to "identify the CN node that supports the slice ID presented by [a] UE" would provide the source gNB of *R-173152* with the ability to be aware of slice availability in order to select suitable targets for handover.

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438. A person of ordinary skill in the art would have had a reasonable expectation of success in attempting to transmit slice information from the core network entity to the gNB or base station because both *R3-173152* and *TR 38.801* disclose supporting network slicing among gNBs and eNBs interconnected with the Xn interface. (Ex. 1011, 1; Ex. 1013, 19, 29).

439. Moreover, the person of ordinary skill in the art would have understood that the networks and base stations of *R3-173152* and *TR 38.801* include similar devices with similar communication capabilities. The person of ordinary skill in the art would have further recognized that the ability to convey network slice information to an eNB by the core network, where the network slice information is configured based on network slice request information, was an improvement to the network and/or eNB of *TR 38.801* because such capability enabled the eNB to assist with determining which slices are supported. The person of ordinary skill in the art would have further been motivated to combine *R3-173152* and *TR 38.801* for the reasons espoused in the section herein titled *Motivation to Combine R3-173152 and TR 38.801*.

440. Thus, *R3-173152* and *TR 38.801* render obvious claim 5.

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Dependent Claim 6: The method according to claim 5, wherein the transmission of the handover request message is performed through a direct interface associated with the target base station.

441. *R3-173152* and *TR 38.801* render obvious claim 6. As set forth above, *R3-173152* and *TR 38.801* render obvious all of the elements of claim 5. *See* § IX.B. 5 *supra*.

442. *R3-173152* and *TR 38.801* render obvious the remaining elements of claim 6.

443. The '631 patent refers to "X2" as an "inter-base station interface." (Ex. 1001, 19:13-18). The '631 patent states that a "handover based on an interface between a core network entity and a base station may be used only when a handover based on an inter-base station interface cannot be used." (Ex. 1001, 19:6-34). A person of ordinary skill in the art would have understood that the claimed "direct interface" meant that the handover request message was performed between the source and target base stations without the core network in between them, or using an "Xn" interface. *R3-173152* discloses that "the Xn based handover is proceeded between the source gNB and the target gNB directly." (Ex. 1011, 3). *TS 38.300*, specifically referenced by *R3-173152*, depicts the procedure of Figure 1 of *R3-173152*, stating that "preparation messages are directly exchanged between the gNBs" "without involvement of the 5GC." (Ex. 1019, 32). Thus, a person of ordinary skill in the art would have found it obvious that a "handover" "proceed[ing]"

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"directly" between a "source gNB and [a] target gNB" meant that the transmission of messages between the source gNB and target gNB was performed through a direct interface between the two.

444. A person of ordinary skill in the art would have been motivated to implement the teachings of *R3-173152* and *TR 38.801* for at least the reasons espoused in the section herein titled *Motivation to Combine R3-173152 and TR 38.801*.

445. Thus, *R3-173152* and *TR 38.801* render obvious claim 6.

Dependent Claim 8: The controller according to claim 7, wherein the processor further performs to receive a non-access stratum (NAS) message including network slice request information.

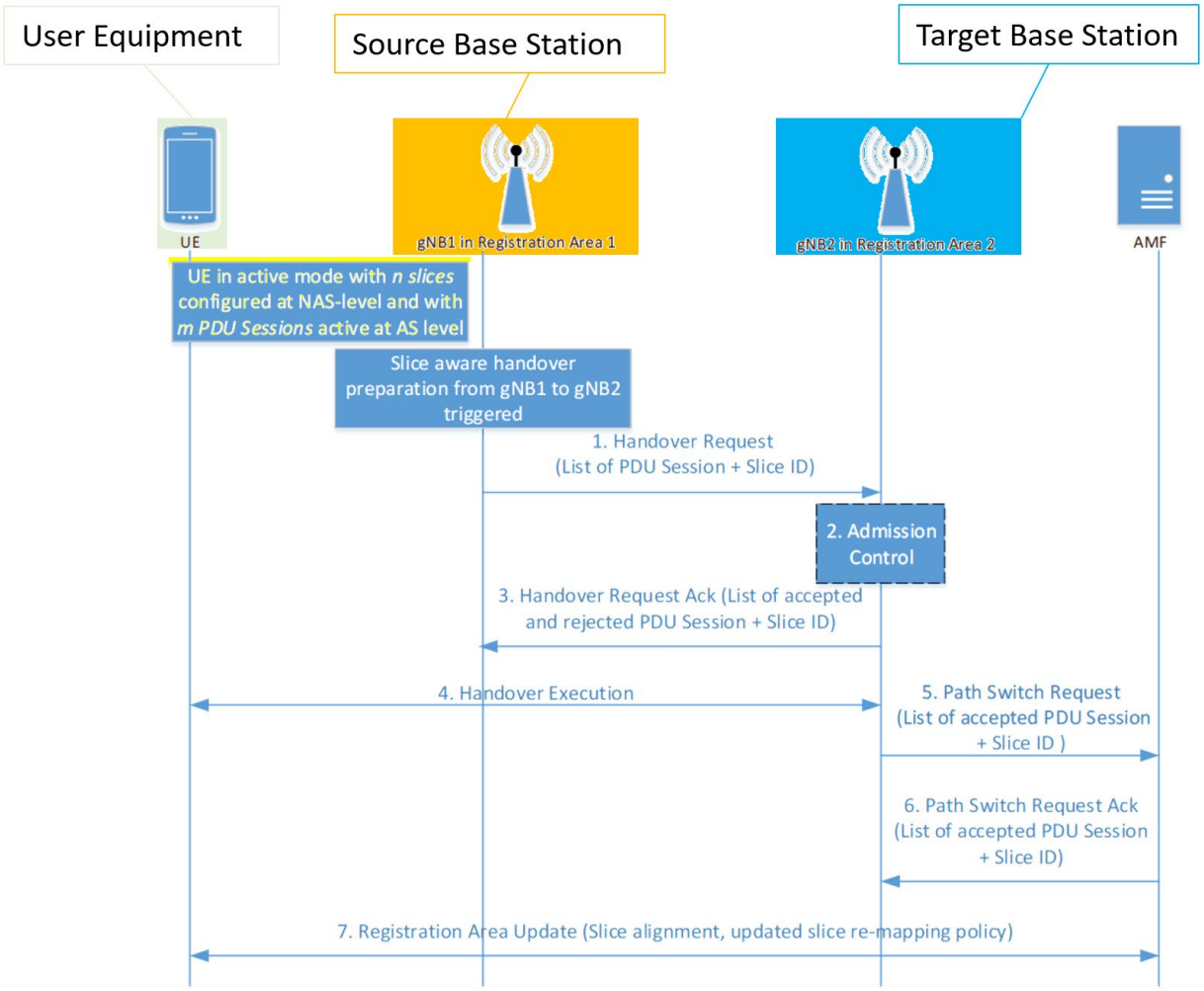
446. *R3-173152* and *TR 38.801* render obvious claim 8. As set forth above, *R3-173152* and *TR 38.801* render obvious all of the elements of claim 7. *See* § IX.A *supra*.

447. *R3-173152* and *TR 38.801* render obvious the remaining elements of claim 8.

448. *R3-173152* discloses a "UE" or user equipment "in active mode with *n slices* configured at NAS-level" or non-access stratum-level, "and with *m PDU Sessions* active at AS level." (Ex. 1011, 5).

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Ex. 1011, Figure 17.3.4.5-x (annotated)



449. *TR 21.905*[22], specifically referenced by *TR 38.801*, defines "Access Stratum" as "functional grouping consisting of the parts in the infrastructure and in the user equipment and the protocols between these parts being specific to the access technique (i.e. the way the specific physical media between the User Equipment and the Infrastructure is used to carry information)" (*see* Ex. 1018, 7), and "Non-Access Stratum" as "[p]rotocols between UE and the core network that are not terminated in the UTRAN" (*see* Ex. 1018, 21) or "Universal Terrestrial Radio Access Network." (Ex. 1018, 6). *TR 21.905* defines a "[r]adio access bearer" as a "service that the access stratum provides to the non-access stratum for transfer of user data between User Equipment and CN" (*see* Ex. 1018, 24) or "Core Network." (Ex. 1018, 38).

450. *TR 38.801* discloses a user equipment or UE sending an "RRC connection request" to a "gNB" or base station.[23] (Ex. 1013, 24-26). *TR 38.801* also

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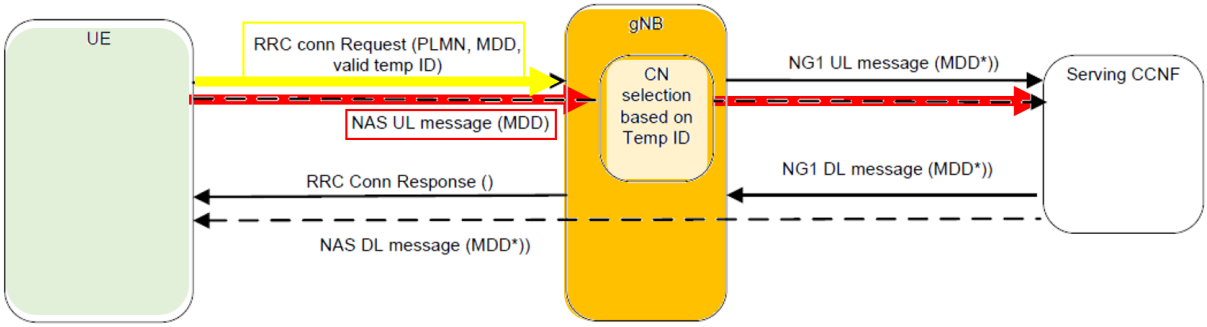
[22] *TR 21.905* is not part of the grounds, but it is referenced by *TR 38.801* and therefore is referenced here to demonstrate the knowledge of the person of ordinary skill in the art reviewing *TR 38.801*.

[23] The '631 patent provides examples of base stations, including "a gNode-B (gNB)." (Ex. 1001, 3:62-4:4).

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discloses a user equipment or UE sending a non-access stratum or NAS uplink or UL message. (Ex. 1013, 24-26). *TR 38.801* discloses a "Selection case 4" in which a "UE" transmits a "NAS UL" or non-access stratum uplink message containing "MDD," or a "Multi-Dimensional Descriptor." (Ex. 1013, 24-25). Selection case 4 is reproduced and annotated below.

Ex. 1013, 25 (annotated)



451. *TR 38.801* discloses that the "MDD" is used "for RAN slice awareness (slice specific behavior, congestion control, resource isolation)." (Ex. 1013, 26). That is, *TR 38.801* discloses that the NAS message includes network slice information. *see also* §§ VI, VIII.B *supra*. A person of ordinary skill in the art would have understood that the NAS message could have been encapsulated in the "RRC Conn Response" message at least in view of the knowledge of the person of ordinary skill in the art as discussed in the Technical Background herein (§VI *supra*). Even though the arrow associated with the "NAS UL message (MDD)" in the annotated figure above appears as though the "NAS UL message (MDD)" was sent from the

UE to the Serving CCNF, a person of ordinary skill in the art would have understood or found it obvious that the UE transmitted the NAS message to the gNB or base station (and then from the gNB to the Serving CCNF), at least in view of the knowledge of the person of ordinary skill in the art - as discussed in the Technical Background herein (§VI *supra*) - as well as the depicted communication in the above drawing of *TR 38.801*. Therefore, *TR 38.801* discloses or renders obvious the source base station (gNB, orange above), from a user equipment or UE (UE, green above), a non-access stratum (NAS) message ("NAS UL message (MDD)," red above), which includes network slice request information ("MDD").

452. *TR 38.801* also discloses a user equipment or UE sending network slice information to an eNB or base station.[24] (Ex. 1013, 26-27).

[24] The '631 patent provides examples of base stations, including "an evolved Node-B (eNB), a gNode-B (gNB)." (Ex. 1001, 3:62-4:4).

Ex. 1013, Figure 9.2.1-1 (annotated)

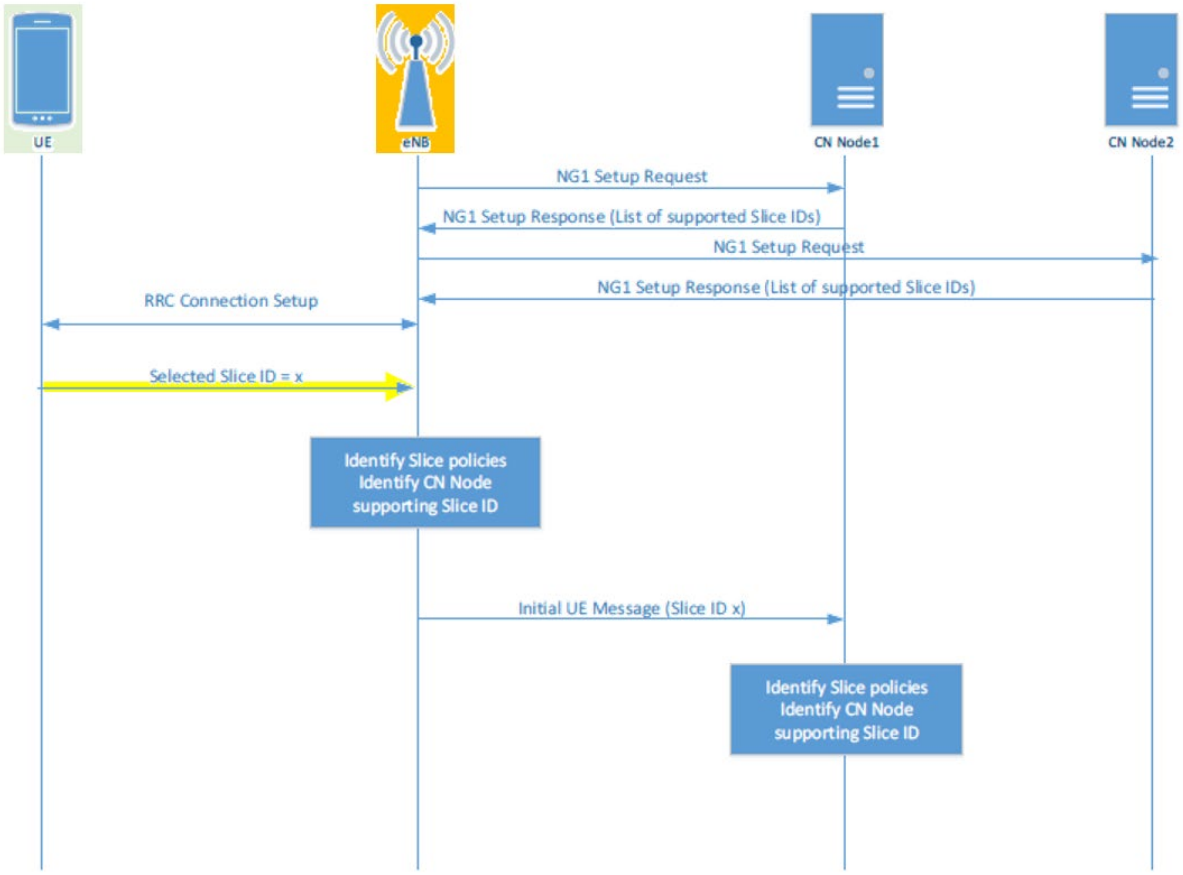


Figure 9.2.1-1: Slice selection when Slice ID is provided by the UE to RAN

453. *R3-173152* discloses that, for mobility across registration areas, where a target gNB cannot support all of the slices required by a UE, one option would be to have "the source gNB always check the slice availability before handover," or another option would be for "the source gNB [to] check the slice availability for selecting the suitable target gNBs" for requesting handover. (Ex. 1011, 3). A person of ordinary skill in the art would have turned to *TR 38.801*, which discloses multiple implementations for providing slice information from the UE to the gNB (or base

station), for details regarding how to convey required network slice information from a UE to a base station. The person of ordinary skill in the art would have been motivated to utilize an NAS message to transmit the information about the "*n slices* configured at NAS-level" of *R3-173152's* "UE in active mode" to the gNB or base station, as taught by *TR 38.801*, in order to "enable[] support of multiple slices simultaneously supported by a UE." (Ex. 1013, 24). The person of ordinary skill in the art would have had a reasonable expectation of success in such a combination because the person of ordinary skill in the art would have been well aware that the RRC sublayer was available for communication of NAS messages from a UE to a core network via a base station (*see* § VI *supra*), as also taught by *TR 38.801*.

454. Moreover, the person of ordinary skill in the art would have understood that the UE of *R3-173152* and the UE of *TR 38.801* are similar devices with similar communication capabilities. The person of ordinary skill in the art would have further recognized that the ability to convey network slice information from a UE to an eNB via an NAS message, using the RRC sublayer, was an improvement to the UE of *TR 38.801* because such capability enabled the use of a single message to convey information to an eNB that the eNB needed for both (1) slice awareness and (2) for communicating to a selected core network node. A person of ordinary skill in the art would have been motivated to implement the teachings of *R3-173152* and

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TR 38.801 for at least the reasons espoused in the section herein titled *Motivation to Combine R3-173152 and TR 38.801*.

455. Thus, *R3-173152* and *TR 38.801* render obvious claim 8.

Dependent Claim 9: The controller according to claim 8, wherein the processor further performs to receive the network slice information from a core network, wherein the network slice information is configured by the network slice request information.

456. *R3-173152* and *TR 38.801* render obvious claim 9. As set forth above, *R3-173152* and *TR 38.801* render obvious all of the elements of claim 8. *See* § IX.B.8 *supra*.

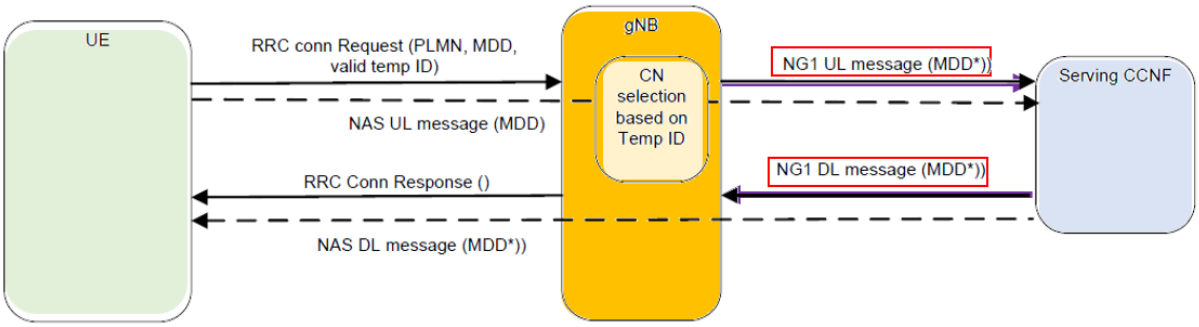
457. *R3-173152* and *TR 38.801* render obvious the remaining elements of claim 9.

458. *R3-173152* discloses a source base station receiving network slice information. *See* § IX.A.[7.c1] *supra.*

459. *TR 38.801* discloses a Serving CCNF, or core network entity, receiving network slice request information in the form of an MDD in an uplink message. (Ex. 1013, 25-26). *TR 38.801* also states that "RAN uses the included MDD for RAN slice awareness (slice specific behavior, congestion control, resource isolation)." (Ex. 1013, 25-26. *TR 38.801* then states that the "MDD is sent back to the UE with the Temp ID at NAS level to either reconfirm the initially requested MDD or indicate a new one if policy has changed." *Id. TR 38.801* also states that the MDD is "also indicated in the NG1 DL message to gNB for confirmation." *Id*.

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Ex. 1013, 25 (annotated)



460. All of this is depicted in the image above from *TR 38.801*, in which source BS ("gNB," orange) receives from the core network entity ("Serving CCNF," light blue) network slice information ("MDD*"), where the network slice information is configured by the network slice request information ("MDD"). Because the Serving CCNF receives an MDD* (network slice request information) that is based on the MDD (network slice request information), and returns to the source BS an MDD* (network slice information) that is either a reconfirmation of the requested MDD or a modified MDD if a policy has changed (i.e., a requested MDD is unavailable), a person of ordinary skill in the art would have found it obvious or understood that *TR 38.801* disclosed that the network slice information is configured by the network slice request information.

461. *R3-173152* discloses that, for mobility across registration areas, where a target gNB cannot support all of the slices required by a UE, one option would be to have "the source gNB always check the slice availability before handover," or

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another option would be for "the source gNB [to] check the slice availability for selecting the suitable target gNBs" for requesting handover. (Ex. 1011, 3). A person of ordinary skill in the art would have turned to *TR 38.801*, which discloses multiple implementations for providing slice information from the core network to the gNB (or base station), for details regarding how to convey required network slice information from a core network entity to a base station because the implementations in *TR 38.801* realize network slice selection in a manner that lets gNB "identify the CN node that supports the slice ID presented by [a] UE." (Ex. 1013, 26). That is, the person of ordinary skill in the art would have understood that *TR 38.801*'s teaching of enabling the RAN to "identify the CN node that supports the slice ID presented by [a] UE" would enable the source gNB of *R-173152* to be aware of slice availability in order to select suitable targets for handover.

462. A person of ordinary skill in the art would have had a reasonable expectation of success in attempting to transmit slice information from the core network entity to the gNB or base station because both *R3-173152* and *TR 38.801* disclose supporting network slicing among gNBs and eNBs interconnected with the Xn interface. (Ex. 1011, 1; Ex. 1013, 19, 29).

463. Moreover, the person of ordinary skill in the art would have understood that the networks and base stations of *R3-173152* and *TR 38.801* include similar devices with similar communication capabilities. The person of ordinary skill in the

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art would have further recognized that the ability to convey network slice information to an eNB by the core network, where the network slice information is configured based on network slice request information, was an improvement to the network and/or eNB of *TR 38.801* because such capability enabled the eNB to assist with determining which slices are supported. A person of ordinary skill in the art would have been motivated to implement the teachings of *R3-173152* and *TR 38.801* for at least the reasons espoused in the section herein titled *Motivation to Combine R3-173152 and TR 38.801*.

464. Thus, *R3-173152* and *TR 38.801* render obvious claim 9.

Dependent Claim 10: The controller according to claim 8, wherein the NAS message including the network slice request information is included in a radio resource control (RRC) connection setup completion message.

465. *R3-173152* and *TR 38.801* render obvious claim 10. As set forth above, *R3-173152* and *TR 38.801* render obvious all of the elements of claim 8. *See* § IX.B.8 *supra*.

466. *R3-173152* and *TR 38.801* render obvious the remaining elements of claim 10.

467. As discussed above, *R3-173152* and *TR 38.801* render obvious "a non-access stratum (NAS) message including network slice request information." *See* § IX.B.9.

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468. The ’631 patent makes no mention of a “radio resource control (RRC) connection setup completion message” outside of the claims. The ’631 patent describes an “RRC connection setup complete message” that is used to “transmit[]” “network slice request information” from a UE “to a base station” by including the “network slice request information” in “a NAS message.” (Ex. 1001, 15:19-37). Accordingly, a person of ordinary skill in the art would have understood that the claimed “radio resource control (RRC) connection setup completion message” was an RRC message used to transmit network slice request information to a base station by including the network slice request information in an NAS message.

469. *R3-173152* discloses “indicat[ing]” a “non-admitted PDU session” “in the *RRC Context* IE,” so that a “UE can be informed.” (Ex. 1011, 3). *R3-173152* further discloses, “[a]fter receiving the Handover Command message including *RRC Context* IE,” a “UE releases the DRB associated to the non-admitted PDU sessions and informs the NAS level.” (Ex. 1011, 3).

470. *R3-173152* also discloses a UE “complet[ing] [an] RRC Handover procedure.” (Ex. 1011, 2; Figure 1). *TS 38.300*[25], specifically referenced by *R3-*

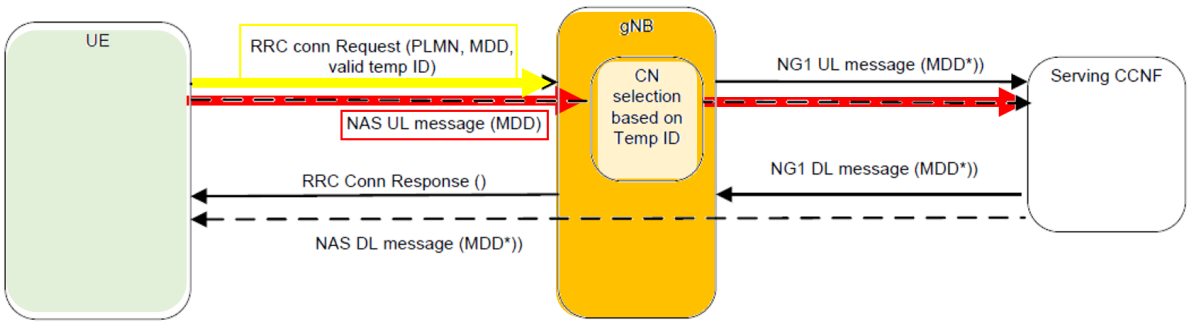
[25] *TS 38.300* is not part of the grounds, but it is specifically referenced by *R3-173152* and is referenced here to demonstrate the knowledge of a person of ordinary skill in the art reviewing *R3-173152*.

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173152, includes "general principles and requirements related to the realization of network slicing the NG-RAN," including that a "UE should be able to provide assistance information for network slice selection in RRC message." (Ex. 1019, 45).

471. *TR 38.801* discloses a UE sending an RRC message including an MDD (network slice request information) as well as an NAS message containing an MDD (network slice request information) to the gNB.[26] (Ex. 1013, 24-26).

Ex. 1013, 25 (annotated)



472. *TR 38.801* also discloses an "MDD [being] sent back to the UE with the Temp ID at NAS level" and an "RRC Conn Response" message being sent back to the UE. (Ex. 1013, 24-26).

[26] The '631 patent provides examples of base stations, including "a gNode-B (gNB)." (Ex. 1001, 3:62-4:4).

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473. *TR 38.801* discloses that the "MDD" is used "for RAN slice awareness (slice specific behavior, congestion control, resource isolation)." (Ex. 1013, 26). That is, *TR 38.801* discloses that the NAS message includes network slice request information. *See also* §§ VI, VIII.B *supra*.

474. A person of ordinary skill in the art would have known or found it obvious, at least in view of the knowledge of the person of ordinary skill in the art as discussed in the Technical Background herein (§ VI *supra*), that the NAS message was transmitted either on its own by the UE to the gNB, or as part of or encapsulated in an RRC by the UE to the gNB.

475. *R3-173152* discloses that, for mobility across registration areas, where a target gNB cannot support all of the slices required by a UE, one option would be to have "the source gNB always check the slice availability before handover," or another option would be for "the source gNB [to] check the slice availability for selecting the suitable target gNBs" for requesting handover. (Ex. 1011, 3). A person of ordinary skill in the art would have turned to *TR 38.801*, which discloses multiple implementations for providing slice information from the UE to the gNB (or base station), for details regarding how to convey required network slice information from a UE to a base station. The person of ordinary skill in the art would have been motivated to utilize an NAS message encapsulated in an RRC message to transmit

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the information about the "*n slices* configured at NAS-level" of *R3-173152's* "UE in active mode" to the gNB or base station, as taught by *TR 38.801*, in order to "enable[] support of multiple slices simultaneously supported by a UE." (Ex. 1013, 24). The person of ordinary skill in the art would have had a reasonable expectation of success in such a combination because the person of ordinary skill in the art would have been well aware of encapsulating NAS messages in RRC messages and that the RRC sublayer was available for communication of NAS messages from a UE to a core network via a base station (*see* § VI *supra*), as also taught by *TR 38.801*.

476. Moreover, the person of ordinary skill in the art would have understood that the UE of *R3-173152* and the UE of *TR 38.801* are similar devices with similar communication capabilities. The person of ordinary skill in the art would have further recognized that the ability to convey network slice information from a UE to an eNB via an NAS message encapsulated in an RRC message, using the RRC sublayer, was an improvement to the UE of *TR 38.801* because such capability enabled the use of a single message to convey information to an eNB that the eNB needed for both (1) slice awareness and (2) for communicating to a selected core network node. A person of ordinary skill in the art would have been motivated to implement the teachings of *R3-173152* and *TR 38.801* for at least the reasons espoused in the section herein titled *Motivation to Combine R3-173152 and TR 38.801*.

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477. Thus, *R3-173152* and *TR 38.801* render obvious claim 10.

Dependent Claim 11: The controller according to claim 9, wherein the network slice information is configured by the core network entity based on the network slice request information.

478. *R3-173152* and *TR 38.801* render obvious claim 11. As set forth above, *R3-173152* and *TR 38.801* render obvious all of the elements of claim 9. *See* § IX.B.9 *supra*.

479. *R3-173152* and *TR 38.801* render obvious the remaining elements of claim 11.

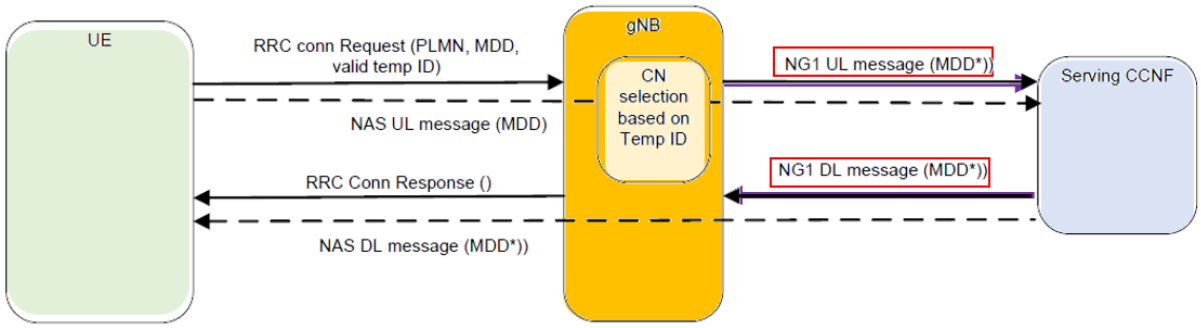
480. *R3-173152* discloses a source base station receiving network slice information. *See* §IX.A.[7.c1] *supra.*

481. *TR 38.801* defines a "slice ID" as "unambiguously identif[ying] one of the pre-configured network slices…" (Ex. 1013, 23). *TR 38.801* also discloses several scenarios involving network slice selection, and those scenarios are disclosed by *TR 38.801* as being based on a solution described in "section 6.1.2 of TR 23.799." (Ex. 1013, 24; Ex. 1020, 61). *TR 38.801* discloses, with reference to the image annotated below, that the core network entity ("Serving CCNF," light blue) receives the network slice request information (MDD*) in an uplink or "UL message." (Ex. 1013, 25-26). According to *TR 38.801,* "RAN uses the included MDD for RAN slice awareness (slice specific behavior, congestion control, resource isolation)." *Id.* The "MDD is sent back to the UE with the Temp ID at NAS level to either reconfirm the

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initially requested MDD or indicates a new one if policy has changed." *Id.* The MDD* is "also indicated in the NG1 DL message to gNB for confirmation." *Id.* In the solution referenced by *TR 38.801* and described in section 6.1.2 of *TR 23.799*, the "CCNF decides the initial set of [network slice instances] for the UE based on an evaluation of the Requested MDD, Subscribed MDD (if available), …," and the "Accepted MDD" "is passed to the UE in [an] Attach Accept message." (Ex. 1020, p. 67)..

Ex. 1013, 25 (annotated)



482. Therefore, and with reference to the image annotated above, *TR 38.801* discloses receiving by the source BS ("gNB," orange), from the core network entity ("Serving CCNF," light blue), network slice information ("MDD*" as part of "NG1 DL message (MDD*)"), where the network slice information ("MDD*") is configured by the core network entity based on the network slice request information ("MDD"). That is, while it appears in the image that the Serving CCNF receives from the gNB and sends to the gNB the same MDD*, a person of ordinary skill in

the art would have understood or found it obvious that the Serving CCNF modified the MDD* prior to sending it back in view of the explicit disclosure in *TR 38.801* that the "MDD is sent back to the UE with the Temp ID at NAS level to either reconfirm the initially requested MDD or indicate a new one if policy has changed," and the MDD is "also indicated in the NG1 DL message to gNB for confirmation." (Ex. 1013, 25-26).

483. *R3-173152* discloses that, for mobility across registration areas, where a target gNB cannot support all of the slices required by a UE, one option would be to have "the source gNB always check the slice availability before handover," or another option would be for "the source gNB [to] check the slice availability for selecting the suitable target gNBs" for requesting handover. (Ex. 1011, 3). A person of ordinary skill in the art would have turned to *TR 38.801*, which discloses multiple implementations for providing slice information from the core network to the gNB (or base station), for details regarding how to convey required network slice information from a core network entity to a base station because the implementations in *TR 38.801* realize network slice selection in a manner that lets gNB "identify the CN node that supports the slice ID presented by [a] UE." (Ex. 1013, 26). That is, the person of ordinary skill in the art would have understood that *TR 38.801*'s teaching of enabling the RAN to "identify the CN node that supports the slice ID presented

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by [a] UE" would enable the source gNB of *R-173152* to be aware of slice availability in order to select suitable targets for handover.

484. A person of ordinary skill in the art would have had a reasonable expectation of success in attempting to transmit slice information from the core network entity to the gNB or base station because both *R3-173152* and *TR 38.801* disclose supporting network slicing among gNBs and eNBs interconnected with the Xn interface. (Ex. 1011, 1; Ex. 1013, 19, 29).

485. Moreover, the person of ordinary skill in the art would have understood that the networks and base stations of *R3-173152* and *TR 38.801* include similar devices with similar communication capabilities. The person of ordinary skill in the art would have further recognized that the ability to convey network slice information to an eNB by the core network, where the network slice information is configured based on network slice request information, was an improvement to the network and/or eNB of *TR 38.801* because such capability enabled the eNB to assist with determining which slices are supported. A person of ordinary skill in the art would have been motivated to implement the teachings of *R3-173152* and *TR 38.801* for at least the reasons espoused in the section herein titled *Motivation to Combine R3-173152 and TR 38.801*.

486. Thus, *R3-173152* and *TR 38.801* render obvious claim 11.

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Dependent Claim 12: The controller according to claim 11, wherein the transmission of the handover request message is performed through a direct interface associated with the target base station.

487. *R3-173152* and *TR 38.801* render obvious claim 12. As set forth above, *R3-173152* and *TR 38.801* render obvious all of the elements of claim 11. *See* § IX.B. 11 *supra*.

488. *R3-173152* and *TR 38.801* render obvious the remaining elements of claim 12.

489. The '631 patent refers to "X2" as an "inter-base station interface." (Ex. 1001, 19:13-18). The '631 patent states that a "handover based on an interface between a core network entity and a base station may be used only when a handover based on an inter-base station interface cannot be used." (Ex. 1001, 19:6-34). A person of ordinary skill in the art would have understood that the claimed "direct interface" meant that the handover request message was performed between the source and target base stations without the core network in between them, or using an "Xn" interface. *R3-173152* discloses that "the Xn based handover is proceeded between the source gNB and the target gNB directly." (Ex. 1011, 3). *TS 38.300*, specifically referenced by *R3-173152*, depicts the procedure of Figure 1 of *R3-173152*, stating that "preparation messages are directly exchanged between the gNBs" "without involvement of the 5GC." (Ex. 1019, 32). Thus, a person of ordinary skill in the art would have understood or found it obvious that a "handover"

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"proceed[ing]" "directly" between a "source gNB and [a] target gNB" meant that the transmission of messages between the source gNB and target gNB was performed through a direct interface between the two.

490. A person of ordinary skill in the art would have been motivated to implement the teachings of *R3-173152* and *TR 38.801* for at least the reasons espoused in the section herein titled *Motivation to Combine R3-173152 and TR 38.801*.

491. Thus, *R3-173152* and *TR 38.801* render obvious claim 12.

Dependent Claim 14: The apparatus according to claim 13, wherein the processor further performs to receive a non-access stratum (NAS) message including network slice request information.

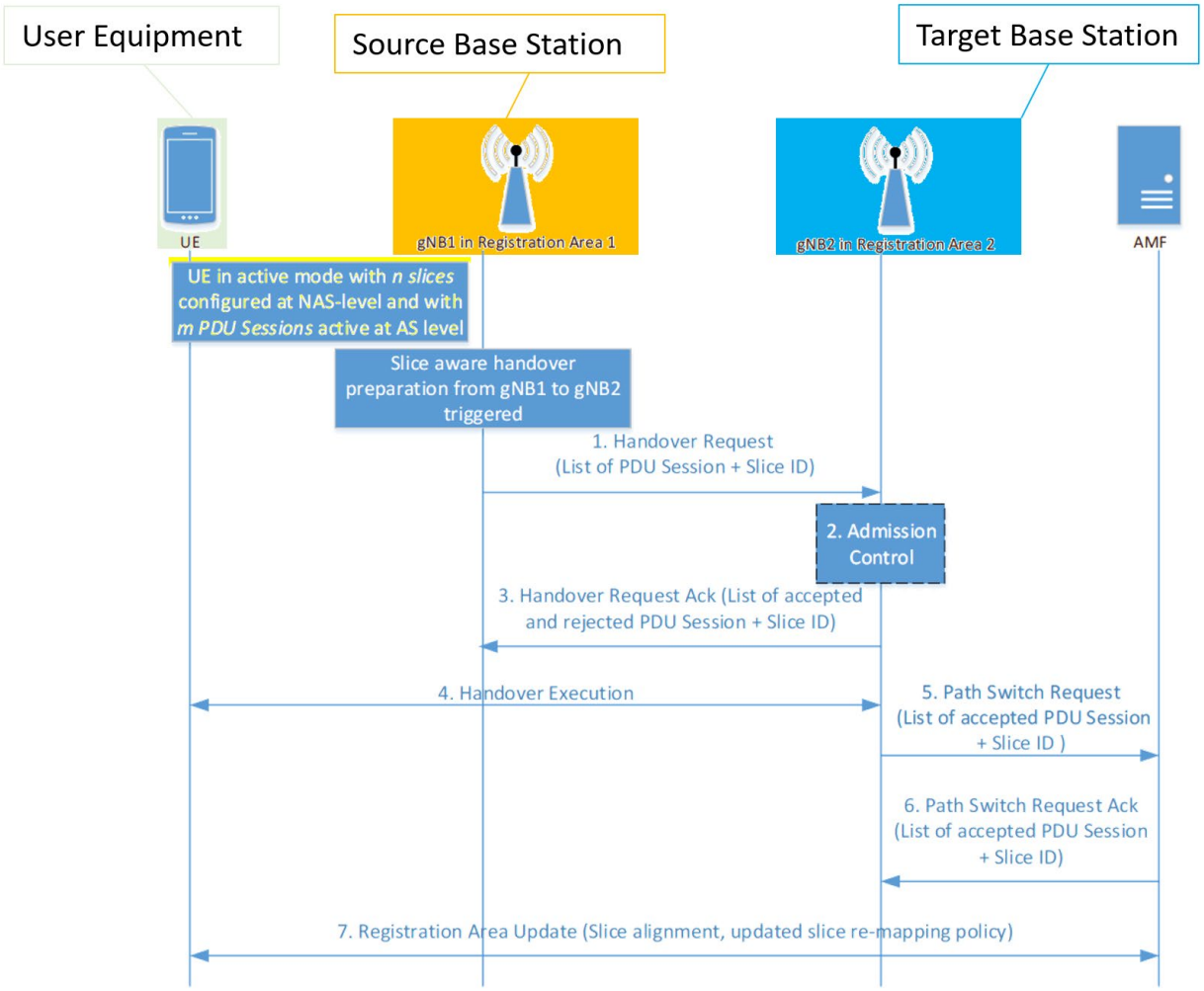
492. *R3-173152* and *TR 38.801* render obvious claim 14. As set forth above, *R3-173152* and *TR 38.801* render obvious all of the elements of claim 13. *See* § IX.A *supra*.

493. *R3-173152* and *TR 38.801* render obvious the remaining elements of claim 14.

494. *R3-173152* discloses a "UE" or user equipment "in active mode with *n slices* configured at NAS-level" or non-access stratum-level, "and with *m PDU Sessions* active at AS level." (Ex. 1011, 5).

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Ex. 1011, Figure 17.3.4.5-x (annotated)



495. *TR 21.905*[27], specifically referenced by *TR 38.801*, defines "Access Stratum" as "functional grouping consisting of the parts in the infrastructure and in the user equipment and the protocols between these parts being specific to the access technique (i.e. the way the specific physical media between the User Equipment and the Infrastructure is used to carry information)" (*see* Ex. 1018, 7), and "Non-Access Stratum" as "[p]rotocols between UE and the core network that are not terminated in the UTRAN" (*see* Ex. 1018, 21) or "Universal Terrestrial Radio Access Network." (Ex. 1018, 6). *TR 21.905* defines a "[r]adio access bearer" as a "service that the access stratum provides to the non-access stratum for transfer of user data between User Equipment and CN" (*see* Ex. 1018, 24) or "Core Network." (Ex. 1018, 38).

496. *TR 38.801* discloses a user equipment or UE sending an "RRC connection request" to a "gNB" or base station.[28] (Ex. 1013, 24-26). *TR 38.801* also

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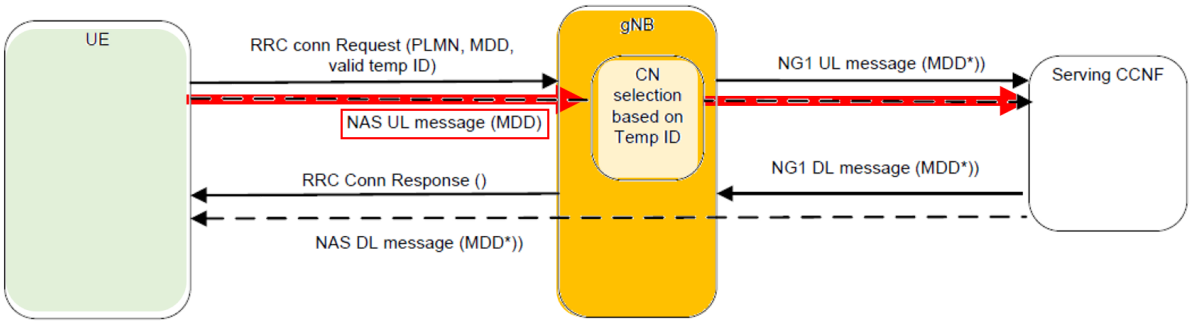
[27] *TR 21.905* is not part of the grounds, but it is referenced by *TR 38.801* and therefore is referenced here to demonstrate the knowledge of the person of ordinary skill in the art reviewing *TR 38.801*.

[28] The '631 patent provides examples of base stations, including "a gNode-B (gNB)." (Ex. 1001, 3:62-4:4).

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discloses a user equipment or UE sending a non-access stratum or NAS uplink or UL message. (Ex. 1013, 24-26). *TR 38.801* discloses a "Selection case 4" in which a "UE" transmits a "NAS UL" or non-access stratum uplink message containing "MDD," or a "Multi-Dimensional Descriptor." (Ex. 1013, 24-25). Selection case 4 is reproduced and annotated below.

Ex. 1013, 25 (annotated)



497. *TR 38.801* discloses that the "MDD" is used "for RAN slice awareness (slice specific behavior, congestion control, resource isolation)." (Ex. 1013, 26). That is, *TR 38.801* discloses that the UE transmits an NAS message that includes network slice information (i.e., an MDD used for slice awareness) to the "Serving CCNF" by way of the "gNB" or base station. *Id.; see also* §VIII.B *supra*.Even though the arrow associated with the "NAS UL message (MDD)" in the annotated figure above appears as though the "NAS UL message (MDD)" was sent from the UE to the Serving CCNF, a person of ordinary skill in the art would have understood

or found it obvious that the UE transmitted the NAS message to the gNB or base station (and then from the gNB to the Serving CCNF), at least in view of the knowledge of the person of ordinary skill in the art - as discussed in the Technical Background herein (§VI *supra*) - as well as the depicted communication in the above drawing of *TR 38.801*. Therefore, *TR 38.801* discloses or renders obvious the source base station (gNB, orange above), from a user equipment or UE (UE, green above), a non-access stratum (NAS) message ("NAS UL message (MDD)," red above), which includes network slice request information ("MDD").

498. *TR 38.801* also discloses a user equipment or UE sending network slice information to an eNB or base station.[29] (Ex. 1013, 26-27).

[29] The '631 patent provides examples of base stations, including "an evolved Node-B (eNB), a gNode-B (gNB)." (Ex. 1001, 3:62-4:4).

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Ex. 1013, Figure 9.2.1-1 (annotated)

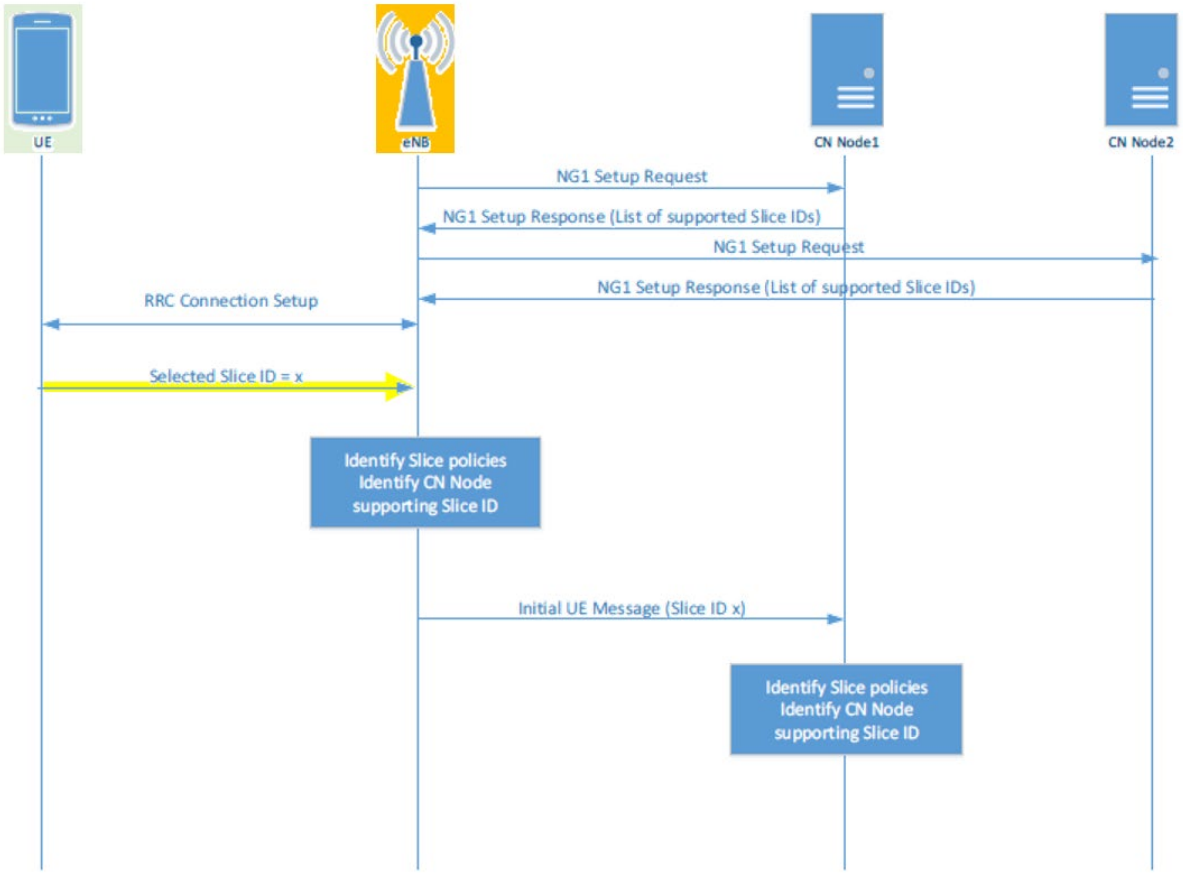


Figure 9.2.1-1: Slice selection when Slice ID is provided by the UE to RAN

499. *R3-173152* discloses that, for mobility across registration areas, where a target gNB cannot support all of the slices required by a UE, one option would be to have "the source gNB always check the slice availability before handover," or another option would be for "the source gNB [to] check the slice availability for selecting the suitable target gNBs" for requesting handover. (Ex. 1011, 3). A person of ordinary skill in the art would have turned to *TR 38.801*, which discloses multiple implementations for providing slice information from the UE to the gNB (or base

station), for details regarding how to convey required network slice information from a UE to a base station. The person of ordinary skill in the art would have been motivated to utilize an NAS message to transmit the information about the "*n slices* configured at NAS-level" of *R3-173152's* "UE in active mode" to the gNB or base station, as taught by *TR 38.801*, in order to "enable[] support of multiple slices simultaneously supported by a UE." (Ex. 1013, 24). The person of ordinary skill in the art would have had a reasonable expectation of success in such a combination because the person of ordinary skill in the art would have been well aware that the RRC sublayer was available for communication of NAS messages from a UE to a core network via a base station (*see* § VI *supra*), as also taught by *TR 38.801*.

500. Moreover, the person of ordinary skill in the art would have understood that the UE of *R3-173152* and the UE of *TR 38.801* are similar devices with similar communication capabilities. The person of ordinary skill in the art would have further recognized that the ability to convey network slice information from a UE to an eNB via an NAS message, using the RRC sublayer, was an improvement to the UE of *TR 38.801* because such capability enabled the use of a single message to convey information to an eNB that the eNB needed for both (1) slice awareness and (2) for communicating to a selected core network node. A person of ordinary skill in the art would have been motivated to implement the teachings of *R3-173152* and

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TR 38.801 for at least the reasons espoused in the section herein titled *Motivation to Combine R3-173152 and TR 38.801*.

501. Thus, *R3-173152* and *TR 38.801* render obvious claim 14.

Dependent Claim 15: The apparatus according to claim 14, wherein the processor further performs to receive the network slice information from a core network, wherein the network slice information is configured by the network slice request information.

502. *R3-173152* and *TR 38.801* render obvious claim 15. As set forth above, *R3-173152* and *TR 38.801* render obvious all of the elements of claim 14. *See* § IX.B. 14 *supra*.

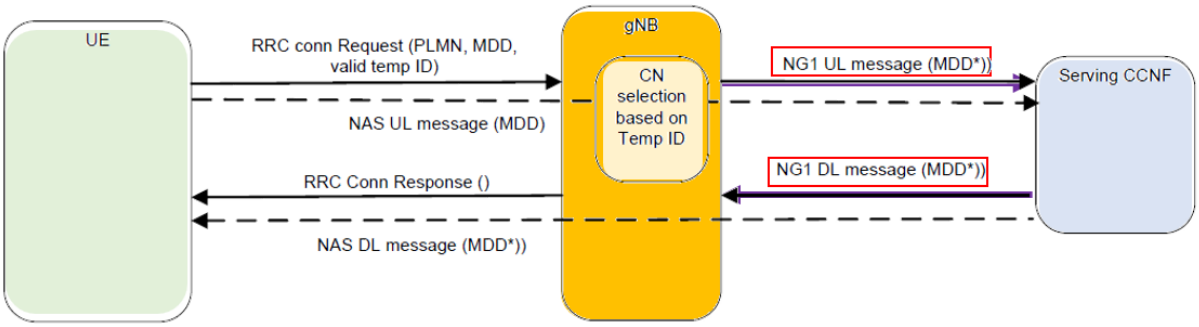
503. *R3-173152* and *TR 38.801* render obvious the remaining elements of claim 15.

504. *R3-173152* discloses a source base station receiving network slice information. *See* §IX.A.[13.c1] *supra.*

505. *TR 38.801* discloses a Serving CCNF, or core network entity, receiving network slice request information in the form of an MDD in an uplink message. (Ex. 1013, 25-26). *TR 38.801* also states that "RAN uses the included MDD for RAN slice awareness (slice specific behavior, congestion control, resource isolation)." (Ex. 1013, 25-26. *TR 38.801* then states that the "MDD is sent back to the UE with the Temp ID at NAS level to either reconfirm the initially requested MDD or indicate a new one if policy has changed." *Id. TR 38.801* also states that the MDD is "also indicated in the NG1 DL message to gNB for confirmation." *Id*.

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Ex. 1013, 25 (annotated)



506. All of this is depicted in the image above from *TR 38.801*, in which source BS ("gNB," orange) receives from the core network entity ("Serving CCNF," light blue) network slice information ("MDD*"), where the network slice information is configured by the network slice request information ("MDD"). Because the Serving CCNF receives an MDD* (network slice request information) that is based on the MDD (network slice request information), and returns to the source BS an MDD* (network slice information) that is either a reconfirmation of the requested MDD or a modified MDD if a policy has changed (i.e., a requested MDD is unavailable), a person of ordinary skill in the art would have found it obvious or understood that *TR 38.801* disclosed that the network slice information is configured by the network slice request information.

507. *R3-173152* discloses that, for mobility across registration areas, where a target gNB cannot support all of the slices required by a UE, one option would be to have "the source gNB always check the slice availability before handover," or

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another option would be for "the source gNB [to] check the slice availability for selecting the suitable target gNBs" for requesting handover. (Ex. 1011, 3). A person of ordinary skill in the art would have turned to *TR 38.801*, which discloses multiple implementations for providing slice information from the core network to the gNB (or base station), for details regarding how to convey required network slice information from a core network entity to a base station because the implementations in *TR 38.801* realize network slice selection in a manner that lets gNB "identify the CN node that supports the slice ID presented by [a] UE." (Ex. 1013, 26). That is, the person of ordinary skill in the art would have understood that *TR 38.801*'s teaching of enabling the RAN to "identify the CN node that supports the slice ID presented by [a] UE" would enable the source gNB of *R-173152* to be aware of slice availability in order to select suitable targets for handover.

508. A person of ordinary skill in the art would have had a reasonable expectation of success in attempting to transmit slice information from the core network entity to the gNB or base station because both *R3-173152* and *TR 38.801* disclose supporting network slicing among gNBs and eNBs interconnected with the Xn interface. (Ex. 1011, 1; Ex. 1013, 19, 29).

509. Moreover, the person of ordinary skill in the art would have understood that the networks and base stations of *R3-173152* and *TR 38.801* include similar devices with similar communication capabilities. The person of ordinary skill in the

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art would have further recognized that the ability to convey network slice information to an eNB by the core network, where the network slice information is configured based on network slice request information, was an improvement to the network and/or eNB of *TR 38.801* because such capability enabled the eNB to assist with determining which slices are supported. A person of ordinary skill in the art would have been motivated to implement the teachings of *R3-173152* and *TR 38.801* for at least the reasons espoused in the section herein titled *Motivation to Combine R3-173152 and TR 38.801*.

510. Thus, *R3-173152* and *TR 38.801* render obvious claim 15.

Dependent Claim 16: The apparatus according to claim 14, wherein the NAS message including the network slice information is included in a radio resource control (RRC) connection setup completion message.

511. *R3-173152* and *TR 38.801* render obvious claim 16. As set forth above, *R3-173152* and *TR 38.801* render obvious all of the elements of claim 14. *See* § IX.B.14 *supra*.

512. *R3-173152* and *TR 38.801* render obvious the remaining elements of claim 16.

513. As discussed above, *R3-173152* and *TR 38.801* render obvious "a non-access stratum (NAS) message including network slice request information." *See* § IX.B.14.

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514. The ’631 patent makes no mention of a “radio resource control (RRC) connection setup completion message” outside of the claims. The ’631 patent describes an “RRC connection setup complete message” that is used to “transmit[]” “network slice request information” from a UE “to a base station” by including the “network slice request information” in “a NAS message.” (Ex. 1001, 15:19-37). Accordingly, a person of ordinary skill in the art would have understood that the claimed “radio resource control (RRC) connection setup completion message” was an RRC message used to transmit network slice request information to a base station by including the network slice request information in an NAS message.

515. *R3-173152* discloses “indicat[ing]” a “non-admitted PDU session” “in the *RRC Context* IE,” so that a “UE can be informed.” (Ex. 1011, 3). *R3-173152* further discloses, “[a]fter receiving the Handover Command message including *RRC Context* IE,” a “UE releases the DRB associated to the non-admitted PDU sessions and informs the NAS level.” (Ex. 1011, 3).

516. *R3-173152* also discloses a UE “complet[ing] [an] RRC Handover procedure.” (Ex. 1011, 2; Figure 1). *TS 38.300*[30], specifically referenced by *R3-*

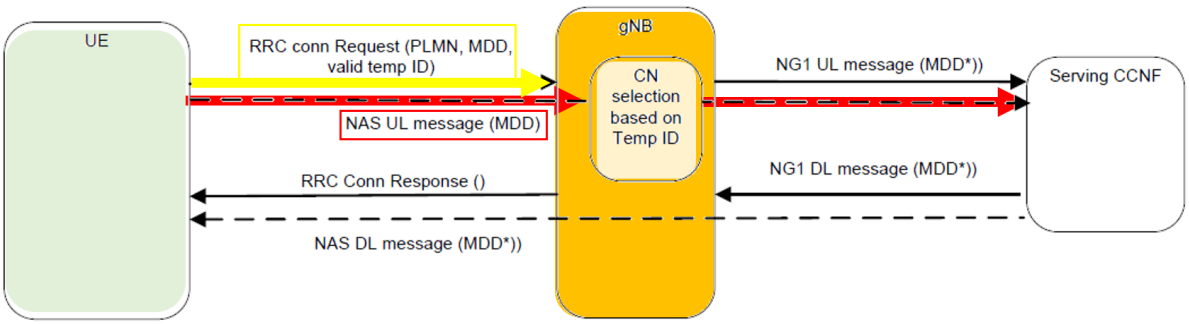
[30] *TS 38.300* is not part of the grounds, but it is specifically referenced by *R3-173152* and is referenced here to demonstrate the knowledge of a person of ordinary skill in the art reviewing *R3-173152*.

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173152, includes "general principles and requirements related to the realization of network slicing the NG-RAN," including that a "UE should be able to provide assistance information for network slice selection in RRC message." (Ex. 1019, 45).

517. *TR 38.801* discloses a UE sending an RRC message including an MDD (network slice request information) as well as an NAS message containing an MDD (network slice request information) to the gNB or base station.[31] (Ex. 1013, 24-26).

Ex. 1013, 25 (annotated)



518. *TR 38.801* also discloses an "MDD [being] sent back to the UE with the Temp ID at NAS level" and an "RRC Conn Response" message being sent back to the UE. (Ex. 1013, 24-26).

[31] The '631 patent provides examples of base stations, including "a gNode-B (gNB)." (Ex. 1001, 3:62-4:4).

519. *TR 38.801* discloses that the "MDD" is used "for RAN slice awareness (slice specific behavior, congestion control, resource isolation)." (Ex. 1013, 26). That is, *TR 38.801* discloses that the NAS message includes network slice request information. *see also* §§ VI, VIII.B *supra*.

520. A person of ordinary skill in the art would have known or found it obvious, at least in view of the knowledge of the person of ordinary skill in the art as discussed in the Technical Background herein (§ VI *supra*), that the NAS message was transmitted either on its own by the UE to the gNB, or as part of or encapsulated in an RRC by the UE to the gNB.

521. *R3-173152* discloses that, for mobility across registration areas, where a target gNB cannot support all of the slices required by a UE, one option would be to have "the source gNB always check the slice availability before handover," or another option would be for "the source gNB [to] check the slice availability for selecting the suitable target gNBs" for requesting handover. (Ex. 1011, 3). A person of ordinary skill in the art would have turned to *TR 38.801*, which discloses multiple implementations for providing slice information from the UE to the gNB (or base station), for details regarding how to convey required network slice information from a UE to a base station. The person of ordinary skill in the art would have been motivated to utilize an NAS message encapsulated in an RRC message to transmit the information about the "*n slices* configured at NAS-level" of *R3-173152's* "UE

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in active mode" to the gNB or base station, as taught by *TR 38.801*, in order to "enable[] support of multiple slices simultaneously supported by a UE." (Ex. 1013, 24). The person of ordinary skill in the art would have had a reasonable expectation of success in such a combination because the person of ordinary skill in the art would have been well aware of encapsulating NAS messages in RRC messages and that the RRC sublayer was available for communication of NAS messages from a UE to a core network via a base station (*see* § VI *supra*), as also taught by *TR 38.801*.

522. Moreover, the person of ordinary skill in the art would have understood that the UE of *R3-173152* and the UE of *TR 38.801* are similar devices with similar communication capabilities. The person of ordinary skill in the art would have further recognized that the ability to convey network slice information from a UE to an eNB via an NAS message encapsulated in an RRC message, using the RRC sublayer, was an improvement to the UE of *TR 38.801* because such capability enabled the use of a single message to convey information to an eNB that the eNB needed for both (1) slice awareness and (2) for communicating to a selected core network node. A person of ordinary skill in the art would have been motivated to implement the teachings of *R3-173152* and *TR 38.801* for at least the reasons espoused in the section herein titled *Motivation to Combine R3-173152 and TR 38.801*.

523. Thus, *R3-173152* and *TR 38.801* render obvious claim 16.

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Dependent Claim 17: The apparatus according to claim 15, wherein the network slice information is configured by the core network entity based on the network slice request information.

524. *R3-173152* and *TR 38.801* render obvious claim 17. As set forth above, *R3-173152* and *TR 38.801* render obvious all of the elements of claim 15. *See* § IX.B.15 *supra*.

525. *R3-173152* and *TR 38.801* render obvious the remaining elements of claim 17.

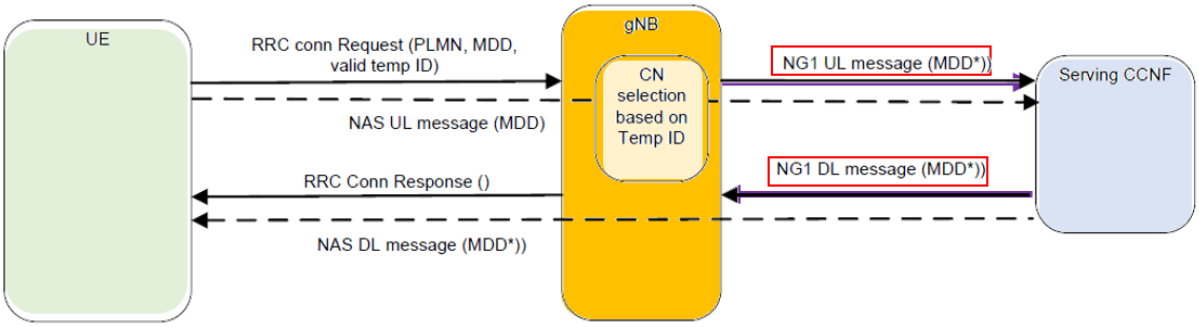
526. *R3-173152* discloses a source base station receiving network slice information. *See* § IX.A.[13.c1] *supra.*

527. *TR 38.801* defines a "slice ID" as "unambiguously identif[ying] one of the pre-configured network slices…" (Ex. 1013, 23). *TR 38.801* also discloses several scenarios involving network slice selection, and those scenarios are disclosed by *TR 38.801* as being based on a solution described in "section 6.1.2 of TR 23.799." (Ex. 1013, 24; Ex. 1020, 61). *TR 38.801* discloses, with reference to the image annotated below, that the core network entity ("Serving CCNF," light blue) receives the network slice request information (MDD*) in an uplink or "UL message." (Ex. 1013, 25-26). According to *TR 38.801,* "RAN uses the included MDD for RAN slice awareness (slice specific behavior, congestion control, resource isolation)." *Id.* The "MDD is sent back to the UE with the Temp ID at NAS level to either reconfirm the initially requested MDD or indicates a new one if policy has changed." *Id.* The

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MDD* is "also indicated in the NG1 DL message to gNB for confirmation." *Id.* In the solution referenced by *TR 38.801* and described in section 6.1.2 of *TR 23.799*, the "CCNF decides the initial set of [network slice instances] for the UE based on an evaluation of the Requested MDD, Subscribed MDD (if available), …," and the "Accepted MDD" "is passed to the UE in [an] Attach Accept message." (Ex. 1020, p. 67).

Ex. 1013, 25 (annotated)



528. Therefore, and with reference to the image annotated above, *TR 38.801* discloses receiving by the source BS ("gNB," orange), from the core network entity ("Serving CCNF," light blue), network slice information ("MDD*" as part of "NG1 DL message (MDD*)"), where the network slice information ("MDD*") is configured by the core network entity based on the network slice request information ("MDD"). That is, while it appears in the image that the Serving CCNF receives from the gNB and sends to the gNB the same MDD*, a person of ordinary skill in the art would have understood or found it obvious that the Serving CCNF modified

the MDD* prior to sending it back in view of the explicit disclosure in *TR 38.801* that the "MDD is sent back to the UE with the Temp ID at NAS level to either reconfirm the initially requested MDD or indicate a new one if policy has changed," and the MDD is "also indicated in the NG1 DL message to gNB for confirmation." (Ex. 1013, 25-26).

529. *R3-173152* discloses that, for mobility across registration areas, where a target gNB cannot support all of the slices required by a UE, one option would be to have "the source gNB always check the slice availability before handover," or another option would be for "the source gNB [to] check the slice availability for selecting the suitable target gNBs" for requesting handover. (Ex. 1011, 3). A person of ordinary skill in the art would have turned to *TR 38.801*, which discloses multiple implementations for providing slice information from the core network to the gNB (or base station), for details regarding how to convey required network slice information from a core network entity to a base station because the implementations in *TR 38.801* realize network slice selection in a manner that lets gNB "identify the CN node that supports the slice ID presented by [a] UE." (Ex. 1013, 26). That is, the person of ordinary skill in the art would have understood that *TR 38.801*'s teaching of enabling the RAN to "identify the CN node that supports the slice ID presented by [a] UE" would enable the source gNB of *R-173152* to be aware of slice availability in order to select suitable targets for handover.

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530. A person of ordinary skill in the art would have had a reasonable expectation of success in attempting to transmit slice information from the core network entity to the gNB or base station because both *R3-173152* and *TR 38.801* disclose supporting network slicing among gNBs and eNBs interconnected with the Xn interface. (Ex. 1011, 1; Ex. 1013, 19, 29).

531. Moreover, the person of ordinary skill in the art would have understood that the networks and base stations of *R3-173152* and *TR 38.801* include similar devices with similar communication capabilities. The person of ordinary skill in the art would have further recognized that the ability to convey network slice information to an eNB by the core network, where the network slice information is configured based on network slice request information, was an improvement to the network and/or eNB of *TR 38.801* because such capability enabled the eNB to assist with determining which slices are supported. A person of ordinary skill in the art would have been motivated to implement the teachings of *R3-173152* and *TR 38.801* for at least the reasons espoused in the section herein titled *Motivation to Combine R3-173152 and TR 38.801*.

532. Thus, *R3-173152* and *TR 38.801* render obvious claim 17.

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Dependent Claim 18: The apparatus according to claim 17, wherein the transmission of the handover request message is performed through a direct interface associated with the target base station.

533. *R3-173152* and *TR 38.801* render obvious claim 18. As set forth above, *R3-173152* and *TR 38.801* render obvious all of the elements of claim 17. *See* § IX.B.17 *supra*.

534. *R3-173152* and *TR 38.801* render obvious the remaining elements of claim 18.

535. The '631 patent refers to "X2" as an "inter-base station interface." (Ex. 1001, 19:13-18). The '631 patent states that a "handover based on an interface between a core network entity and a base station may be used only when a handover based on an inter-base station interface cannot be used." (Ex. 1001, 19:6-34). A person of ordinary skill in the art would have understood that the claimed "direct interface" meant that the handover request message was performed between the source and target base stations without the core network in between them, or using an "Xn" interface. *R3-173152* discloses that "the Xn based handover is proceeded between the source gNB and the target gNB directly." (Ex. 1011, 3). *TS 38.300*, specifically referenced by *R3-173152*, depicts the procedure of Figure 1 of *R3-173152*, stating that "preparation messages are directly exchanged between the gNBs" "without involvement of the 5GC." (Ex. 1019, 32). Thus, a person of ordinary skill in the art would have understood or found it obvious that a "handover"

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"proceed[ing]" "directly" between a "source gNB and [a] target gNB" meant that the transmission of messages between the source gNB and target gNB was performed through a direct interface between the two.

536. A person of ordinary skill in the art would have been motivated to implement the teachings of *R3-173152* and *TR 38.801* for at least the reasons espoused in the section herein titled *Motivation to Combine R3-173152 and TR 38.801*.

537. Thus, *R3-173152* and *TR 38.801* render obvious claim 18.

C. Ground 3: *Han and TS 36.300* Render Obvious Claims 1, 7, and 13 of the '631 patent.

538. *Han* and *TS 36.300* render obvious claims 1, 7, and 13 of the '631 patent.

Motivation to Combine *Han* and *TS 36.300*

539. There are numerous reasons why a person of ordinary skill in the art would have been motivated to combine *Han* and *TS 36.300*.

540. First, both *Han* and *TS 36.300* generally relate to the field of radio access technology or network communications. (*see* Ex. 1015, 3, 24; Ex. 1017, 10, 29; Ex. 1024, 1, 16). These references, like the '631 patent, are directed to technology for "providing services using network slicing to moving user equipments without interruption." (Ex. 1001, 1:20-24). *Han* is directed to "a communication method, an apparatus, a system, a terminal, and an access network device." (Ex.

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1015, 3; Ex. 1017, 10). *Han* discloses the use of "quality of service" or "QoS" mechanisms in "existing long term evolution" or "LTE" systems to "ensure quality of service." (Ex. 1015, 3; Ex. 1017, 10). *Han* explains that, in the QoS mechanism, "when a terminal initiates a traffic whose the [sic] QoS needs to be ensured, a dedicated bearer needs to be established for the terminal" "to transmit data of the traffic." (Ex. 1015, 3; Ex. 1017, 10). *TS 36.300* provides the standard details for supporting terminal or UE handover in order to maintain UE mobility (i.e., providing services to moving UEs without interruption), including an overview of "Mobility Management" procedures, including "Mobility Support for UEs" and "necessary steps" for "[h]andover procedures." (Ex. 1024, 90).

541. *Han* both identifies and provides a solution to the problem to be solved by the '631 patent (e.g., "mobility guarantee of the user equipment and transmission/reception procedures of data in case the network slicing technology is employed," and "a specific procedure for service continuity and service stability." (*see* Ex. 1001, 1:51-55)), by providing a "handover process" in which a "radio resource is configured based on pre-authorized QoS information." (Ex. 1015, 44; Ex. 1017, 50). *Han*'s process ensures "mobility performance of [a] terminal" when the terminal "is handed over between access network devices in a radio access network." (Ex. 1015, 49; Ex. 1017, 55).

542. Similarly, *TS 36.300* both identifies and provides a solution to the

problem to be solved by the '631 patent (i.e., mobility guarantee of moving UEs), by providing an overview of "Mobility Management" procedures, including "Mobility Support for UEs" and "necessary steps" for "[h]andover procedures." (Ex. 1024, 90).

543. In view of the explicit teaching in *Han* of configuring a radio resource during a handover process based on pre-authorized QoS information, and a desire to ensure "mobility performance of [a] terminal" during handover, a person of ordinary skill in the art would have turned to *TS 36.*300, which expressly discloses implementation details for configuring required resources according to received QoS information during handover, to understand how the standard described such processes and to allow for backwards compatibility with network entities (e.g., devices, base stations, etc.) that were reliant on a previous standard or generation of network. (*see* Ex. 1024, 93). A person of ordinary skill in the art would have looked to *TS 36.300* for details regarding a more efficient handover process, that is, one that included a handover decision, so that the system of *Han* would not transmit QoS information without a handover decision.

544. A person of ordinary skill in the art would have combined these references to provide the system of *Han* with details regarding standard handover procedures, as disclosed in *TS 36.300*, in order to maintain "[l]oad balancing" with handover. (*see* Ex. 1024, 89).

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545. Moreover, a person of ordinary skill in the art would have had a reasonable expectation of success in the combination of *Han* and *TS 36.300* based on the explicit teachings of the references, the knowledge of the person of ordinary skill in the art (*see* § VI *supra*), and recognizing that both *Han* and *TS 36.300* relate to LTE systems. (Ex. 1015, 24; Ex. 1017, 29; Ex. 1024, 83, 121).

546. The person of ordinary skill in the art would have had a reasonable expectation of success in the combination because the handover-related messages disclosed in *Han* and *TS 36.300* were similar messages directed to similar goals, with different details.

547. Moreover, the person of ordinary skill in the art would have understood that the terminal or user equipment of *Han* and the UE of *TS 36.300* are similar devices with similar communication capabilities.

548. For at least the reasons outlined above in this section entitled *Motivation to Combine Han and TS 36.300,* and those discussed further below, it is my opinion that a person of ordinary skill in the art would have been motivated to combine the teachings of *Han,* and *TS 36.300*.

549. As I've noted above, where I reference a teaching in *Han* (Ex. 1015), I also reference the same teaching in Han's 2016 CN priority document (Ex. 1017) to demonstrate that the teachings of *Han* are the same as those in Han's 2016 CN priority document and therefore that I have been told I can assume *Han* is prior art

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to the ’631 patent irrespective of the priority date to which the ’631 patent is deemed to be entitled.

Independent Claim 1

Claim 1, Element [1.pre]: A method for transmitting and receiving data, the method comprising:

550. To the extent that element [1.pre] is found to be limiting, *Han* renders obvious claim element [1.pre].

551. *Han* discloses “a communication method, an apparatus, a system, a terminal, and an access network device.” (Ex. 1015, 1, 3; Ex. 1017, 10).

552. With reference to FIG. 1 (reproduced below), *Han* discloses a “schematic structural diagram of a communication system 100,” which “may be an LTE system, a 5G system, or a subsequent evolved system of the 5G system” and includes “at least one terminal 120, at least one access network device 140, at least one core network control plane device 160, and at least one core network user plane device 180.” (Ex. 1015, 22-24; Ex. 1017, 27-30).

Ex. 1015, FIG. 1 (Ex. 1017, FIG. 1)

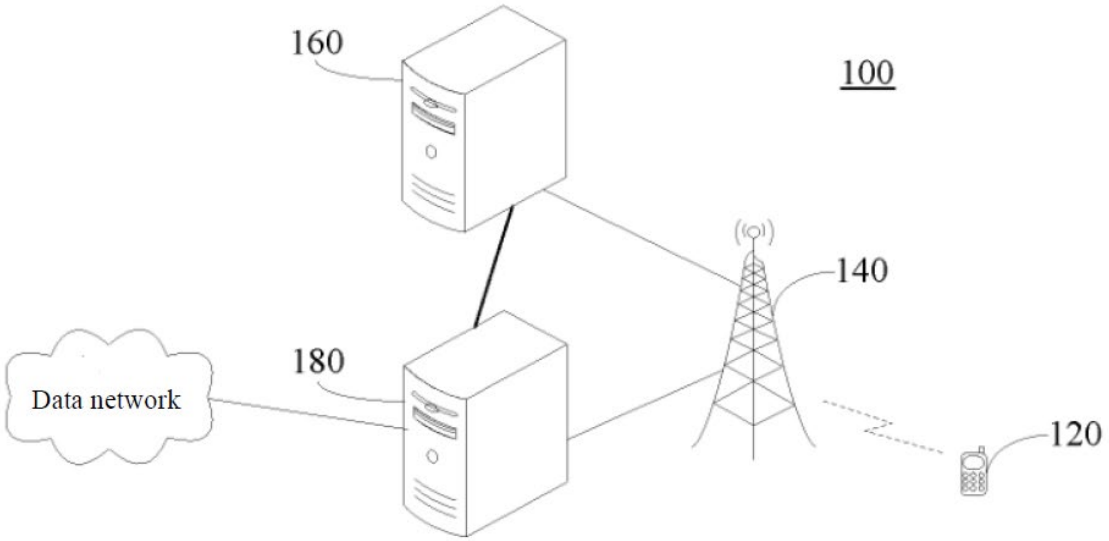


FIG. 1

553. *Han* discloses that the "terminal 120" "may be a device such as a personal communication service (PCS for short) phone, a cordless telephone set, a session initiation protocol (SIP for short) phone, a wireless local loop (WLL for short) station, or a personal digital assistant (PDA for short)," or "referred to as a system, a subscriber unit, a subscriber station, a mobile station, a mobile console (Mobile), a remote station, an access point, a remote terminal, an access terminal, a user terminal, a user agent, a user device, or user equipment." (Ex. 1015, 24; Ex. 1017, 29-30). The "terminal 120 communicates with one or more network access devices 140 via a radio access network (RAN for short)." *Id.*

554. *Han* discloses that the "access network device 140" "may be a base transceiver station (BTS for short)," "a base station (NodeB)," "an eNB," though it

"is not limited in the present invention." (Ex. 1015, 24; Ex. 1017, 30). With reference to FIG. 3 (reproduced below), *Han* discloses "a hardware structure in which an access network device 140 . . . is implemented." (Ex. 1015, 27; Ex. 1017, 33).

Ex. 1015, FIG. 3 (Ex. 1017, FIG. 3)

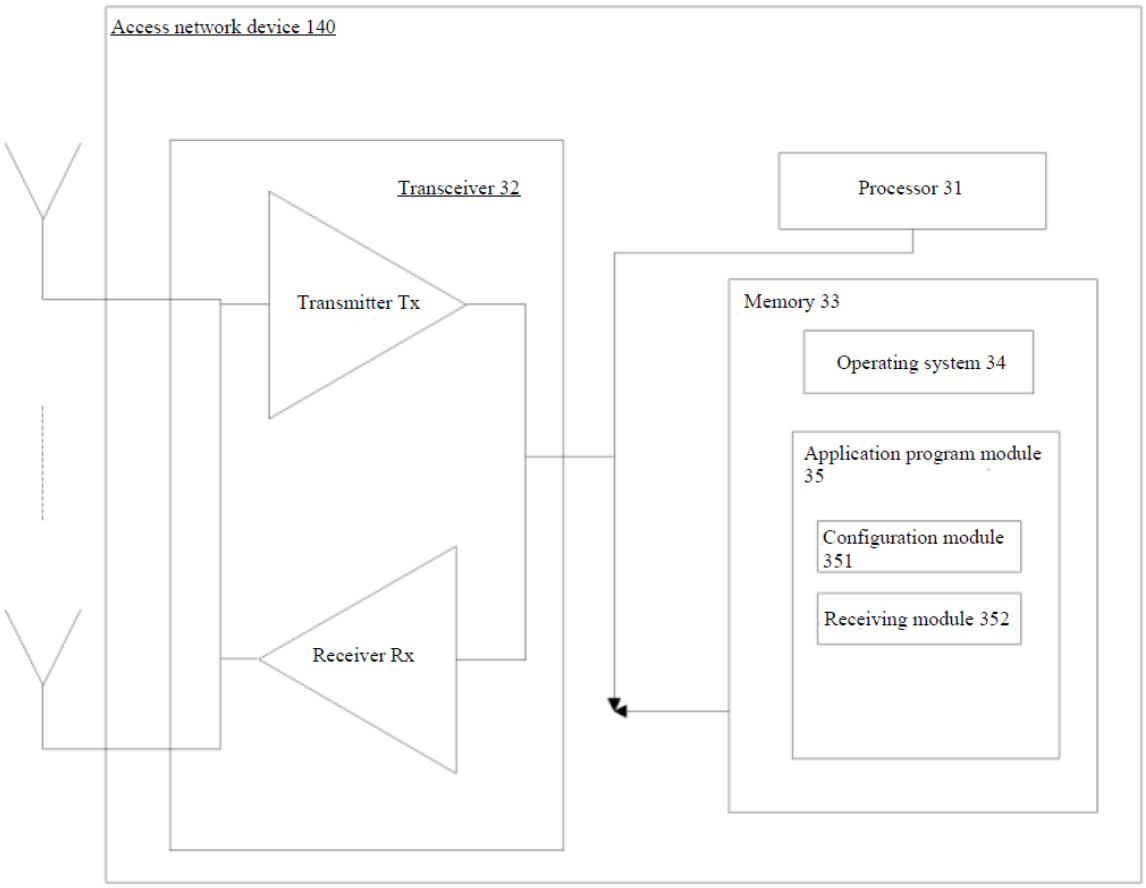


FIG. 3

555. *Han* discloses that the "access network device 140 includes a processor 31, a transceiver 32, and a memory 33," where "processor 31 includes one or more processing cores," and "transceiver 32 includes a receiver Rx and a transmitter Tx." (Ex. 1015, 27; Ex. 1017, 33). *Han* discloses that the "transceiver 32 may be further

implemented as a communication chip" that "may include a receiving module," and "a transmitting module." *Id.*

556. To the extent it is argued that *Han* does not explicitly state that its procedures are for "transmitting and receiving data," a person of ordinary skill in the art would have understood that data is transmitted and received in *Han* because *Han* explicitly discloses a "communication method," and depicts an "access network device" or base station that includes a "receiving module" and a "transmitting module." A person of ordinary skill would have understood that "data" was "transmitted and received" in the methods disclosed in *Han*.

557. Thus, *Han* renders obvious claim element [1.pre].

Claim 1, Element [1.a]: deciding, by a source base station (BS), whether to perform a handover;

558. *Han* renders obvious claim element [1.a].

559. With reference to step "S604" of FIG. 6 (reproduced and annotated below), *Han* discloses that a "second [source-side] access network device,"[32] or

[32] *Han* discloses that "[t]he second access network device may also be referred to as a source-side access network device," and "the first access network device may also be referred to as a target-side access network device." (Ex. 1015, 44; Ex. 1017, 50).

"base station"[33] "determines" "whether to initiate handover execution." (Ex. 1015, 48; Ex. 1017, 54). *Han* discloses that the "second [source-side] access network device," or "base station," makes such a determination after receiving and "according to [a] handover response message." (Ex. 1015, 48; Ex. 1017, 54).

I use this nomenclature throughout the analyses herein with respect to *Han* for the purposes of ease of understanding.

[33] *Han* discloses that the "access network device" may be "a base station." (Ex. 1015, 24; Ex. 1017, 30). I use this nomenclature throughout the analyses herein with respect to *Han* for the purposes of ease of understanding.

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Ex. 1015, FIG. 6 (annotated) (Ex. 1017, FIG. 6)

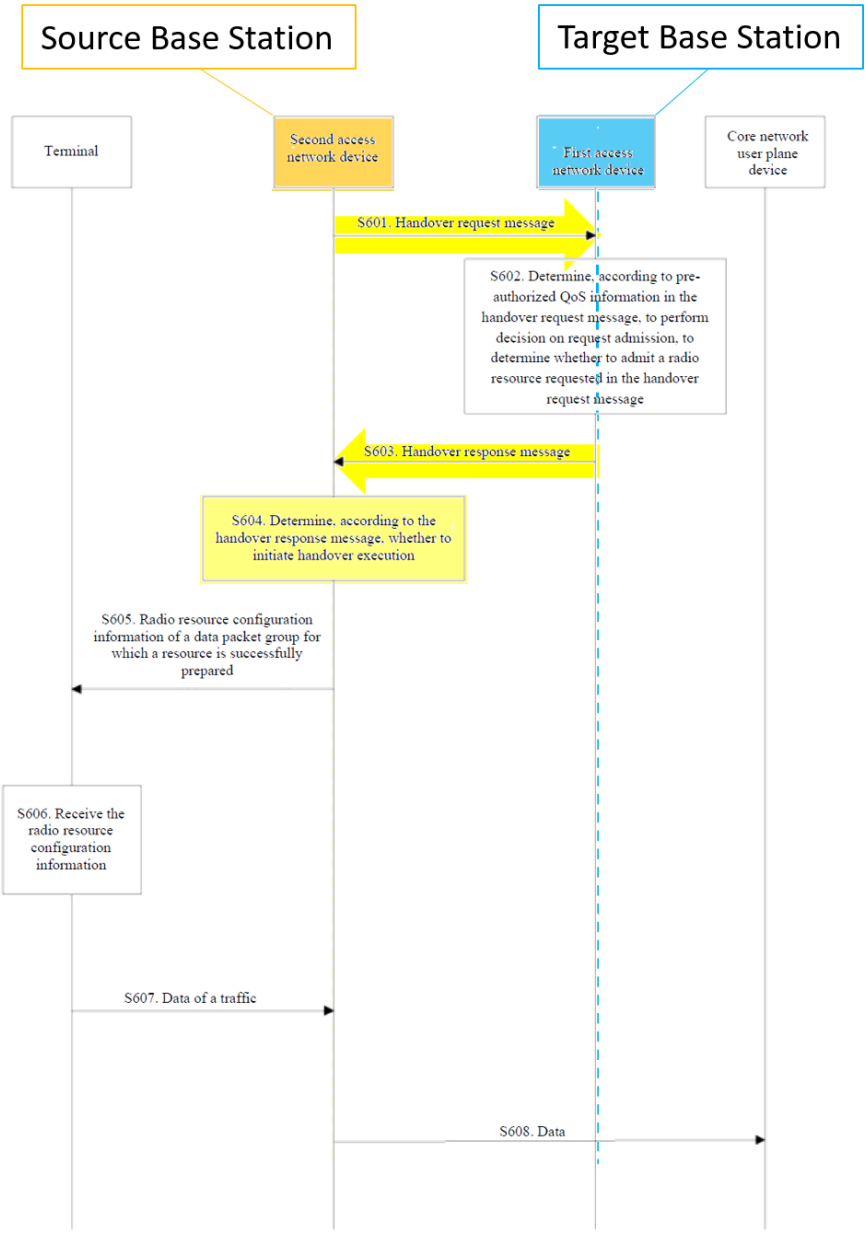


FIG. 6

560. It would have been obvious to a person of ordinary skill in the art that *Han's* "second [source-side] access network device" or "base station" decided to perform a handover prior to sending the handover request message to the "first

[target-side] access network device" or "base station" because it would have been unnecessary and inefficient for the "second [source-side] access network device" or "base station" to send the handover request message to the "first [target-side] access network device" or "base station" when it had not been determined to perform a handover. That is, a person of ordinary skill in the art would have understood that, if the "second [source-side] access network device" sent messages without having first decided to perform a handover, network traffic would have increased and bandwidth would have decreased. The person of ordinary skill in the art would have found it obvious to improve the "second [source-side] access network device" of *Han* by including a handover decision prior to sending a handover request message because such improvement would have given the second device a reason to send the handover request message. Indeed, the '631 Patent fails to provide any detail regarding a source base station deciding whether to perform a handover prior to transmitting a handover request message to a target base station, underscoring that even the inventors of the '631 Patent found such a feature to be obvious.

561. To the extent it is argued that such a feature is not obvious in view of *Han*, it would have been obvious to a person of ordinary skill in the art to combine the teachings of *Han* with *TS 36.300*, which explicitly discloses a source base station deciding whether to perform a handover prior to transmitting a handover request message to a target base station. As explained in the section herein titled *Motivation*

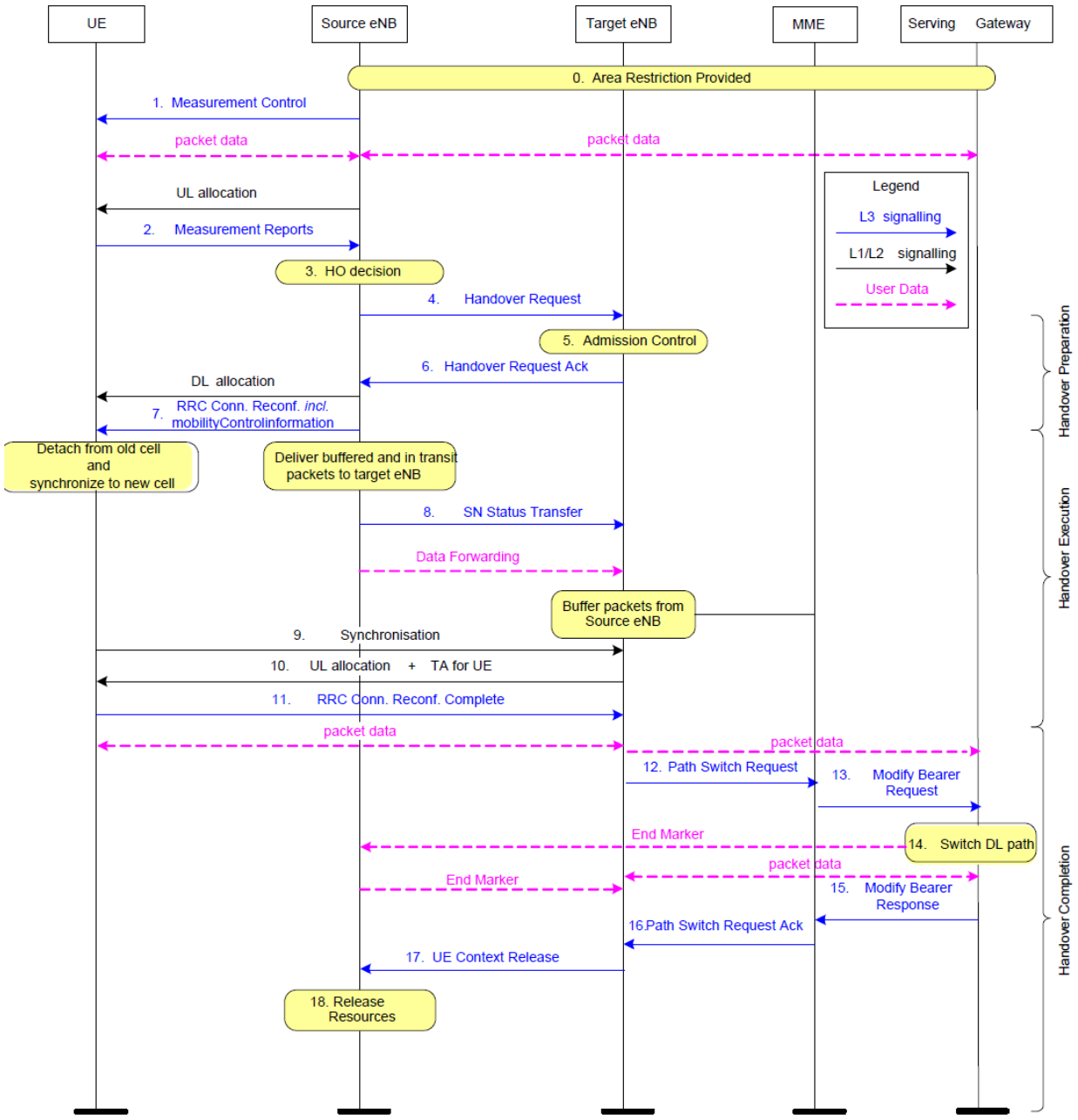
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to Combine Han and TS 36.300, a person of ordinary skill in the art would have made such an improvement or modification in order to ensure backwards compatibility (and would also lead to the efficiency-related benefits explained above).

562. *TS 36.300* provides an overview of "Mobility Management" procedures, including "Mobility Support for UEs" and "necessary steps" for "[h]andover procedures." (Ex. 1024, 90). *TS 36.300* depicts a "basic handover scenario" in Figure 10.1.2.1.1-1, and provides details regarding the scenario. (Ex. 1024, 91-92; Figure 10.1.2.1.1-1).

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Ex. 1024, Figure 10.1.2.1.1-1



563. *TS 36.300* provides a "more detailed description" of the above scenario, including that, in step 2 ("2. Measurement Reports" in Figure 10.1.2.1.1-1), a "MEASUREMENT REPORT is triggered and sent to the eNB," and then, in step 3

("***3. HO Decision***" in Figure 10.1.2.1.1-1), "[t]he source eNB makes ***[a] decision based on MEASUREMENT REPORT and RRM information to hand off the UE***." (Ex. 1024, 92-93; Figure 10.1.2.1.1-1) (emphasis added). *TS 36.300* defines "HO" to be "handover." (Ex. 1024, 22).

564. It would have been obvious to a person of ordinary skill in the art to combine the teachings of *Han* and *TS 36.300* to provide the system of *Han* with details regarding standard handover procedures, as disclosed in *TS 36.300*, in order to maintain "[l]oad balancing" with handover. (*see* Ex. 1024, 89). That is, the person of ordinary skill in the art would have known to consult standard documentation to understand the basics of handover procedures. A person of ordinary skill in the art would have had a reasonable expectation of success in the combination of *Han* and *TS 36.300* based on the explicit teachings of the references, the knowledge of the person of ordinary skill in the art (*see* § VI *supra*), and recognizing that both *Han* and *TS 36.300* relate to LTE systems. (Ex. 1015, 24; Ex. 1017, 29; Ex. 1024, 83, 121).

565. The person of ordinary skill in the art would have had a reasonable expectation of success in the combination because the handover-related messages disclosed in *Han* and *TS 36.300* were similar messages directed to similar goals, with different details.

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566. It would have further been obvious to the person of ordinary skill in the art to combine *Han* and *TS 36.300* for at least the reasons espoused in the section herein titled *Motivation to Combine Han and TS 36.300*.

567. Thus, *Han* renders obvious claim element [1.a]. Further, *Han* and *TS 36.300* render obvious claim element [1.a].

Claim 1, Element [1.b1]: transmitting, from the source BS to a target BS, a handover request message when it is decided to perform the handover,

568. *Han* discloses or renders obvious claim element [1.b1].

569. As established with respect to claim element [1.a], *Han* renders obvious deciding to perform a handover. *See* § IX.C.[1.a] *supra.*

570. Also established above, *Han* discloses that a "base station" is an example of an "access network device," (*see* Ex. 1015, 24; Ex. 1017, 30), that "[t]he second access network device may also be referred to as a source-side access network device," and "the first access network device may also be referred to as a target-side access network device." (Ex. 1015, 44; Ex. 1017, 50). Accordingly, *Han* a person of ordinary skill in the art would have understood that *Han* discloses a "source-side" "base station" and a "target-side" "base station."

571. *Han* discloses a "communication method" in which a "radio resource is configured based on pre-authorized QoS information in a handover process." (Ex. 1015, 44; Ex. 1017, 50).

572. *Han* discloses, with reference to step "S601" in FIG. 6 (reproduced below), a "second access network device" or "source-side" "base station" "send[ing] a handover request message to a first access network device" or "target-side" "base station." (Ex. 1015, 44; Ex. 1017, 50). That is, *Han* discloses step "S601" is part of a "handover process." *Id.*

Ex. 1015, FIG. 6 (annotated) (Ex. 1017, FIG. 6)

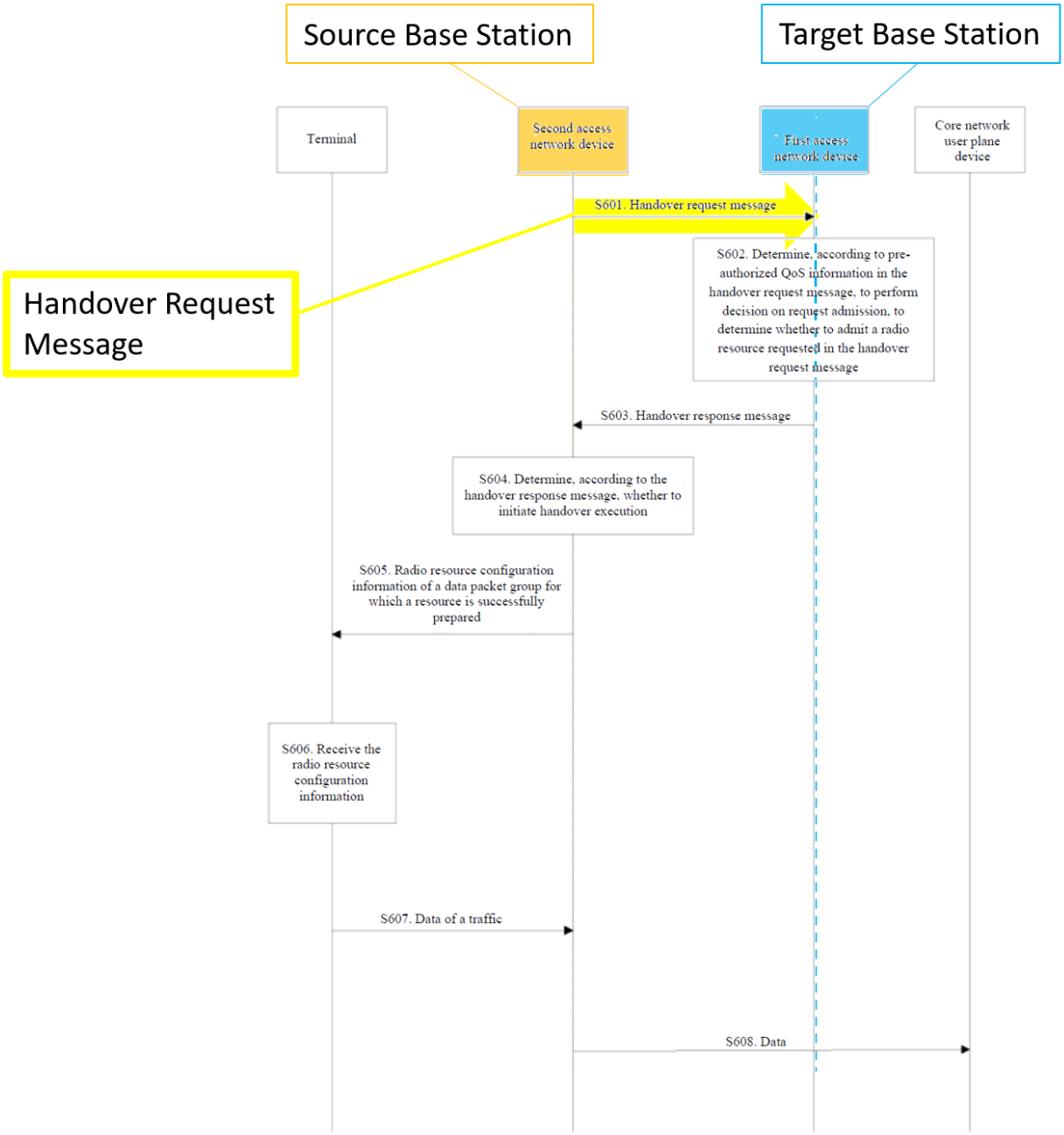


FIG. 6

573. Thus, *Han* renders obvious claim element [1.b1].

Claim 1, Element [1.b2]: wherein the handover request message includes network slice information; and

574. *Han* renders obvious claim element [1.b2].

575. *Han* discloses that the "handover request message includes pre-authorized QoS information." (Ex. 1015, 44; Ex. 1017, 51). *Han* further discloses that the "pre-authorized QoS information in the handover request message may include a part or all of [] second pre-authorized QoS information," where "the second pre-authorized QoS information" "may explicitly or implicitly include the PDU session information." (Ex. 1015, 42; Ex. 1017, 49). *Han* discloses that "the quality of service information further comprises at least one of PDU session information and identification information of network slice of the traffic." (Ex. 1015, 20; Ex. 1017, 7). *Han* discloses that "identification information of the slice includes at least one of the following: a slice ID, a slice type, a tenant type, a tenant identifier, a network function identifier, and the like." (Ex. 1015, 31; Ex. 1017, 57). That is, *Han* discloses that the "handover request message" includes "QoS [quality of service] information," that "quality of service information" comprises "PDU session information," and "identification information of network slice of the traffic," where "identification information of the slice includes at least one of the following: a slice ID, a slice type, a tenant type, a tenant identifier, a network function identifier, and the like." (Ex. 1015, 31; Ex. 1017, 57).

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576. The ’631 patent discloses that “network slice request information may include specific network slice information configured for [a] UE.” (Ex. 1001, 11:26-37). The “network slice information may include information on at least one of network slice configured for the UE, ***information for identifying a network slice service/PDU session/bearer associated with the corresponding network slice information***, and information on a priority of the corresponding network slice.” *Id.* In view of the explicit disclosure of “identification information of the slice includes at least one of the following: a slice ID, a slice type, a tenant type, a tenant identifier, a network function identifier, and the like” being included in the handover request message of *Han*, a person of ordinary skill in the art would have understood or found it obvious, consistent with the disclosure of the ’631 patent, that the handover request message of *Han* included network slice information. Thus, *Han* renders obvious claim element [1.b2].

Claim 1, Element [1.c1]: receiving, by the source BS from the target BS, a handover request confirmation message in response to the handover request message,

577. *Han* renders obvious claim element [1.c1].

578. Established above, *Han* discloses that a “access network device” may be “a base station,” (*see* Ex. 1015, 24; Ex. 1017, 30), that “[t]he second access network device may also be referred to as a source-side access network device,” and “the first access network device may also be referred to as a target-side access

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network device." (Ex. 1015, 44; Ex. 1017, 50). Accordingly, a person of ordinary skill in the art would have understood that *Han* discloses a "source-side" "base station" and a "target-side" "base station."

579. *Han* discloses, with reference to step "S602" of FIG. 6, that "[t]he first [target-side] access network device receives the handover request message, and determines, according to pre-authorized QoS information in the handover request message, to perform judgment on request admission, to determine whether to admit a radio resource requested in the handover request message." (Ex. 1015, 46; Ex. 1017, 52-53). *Han* explains that "[a]dmitting the radio resource requested in the handover request message refers to configuring the radio resource for the terminal according to the radio resource requested in the handover request message." (Ex. 1015, 46; Ex. 1017, 52).

580. *Han* discloses, with reference to step "S603" of FIG. 6, that "[t]he first [target-side] access network device" or "target-side" "base station" "sends a handover response message to the second [source-side] access network device" or "source-side" "base station," where "the handover response message may be a handover preparation failure message or a handover preparation success message." (Ex. 1015, 47; Ex. 1017, 53).

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Ex. 1015, FIG. 6 (annotated) (Ex. 1017, FIG. 6)

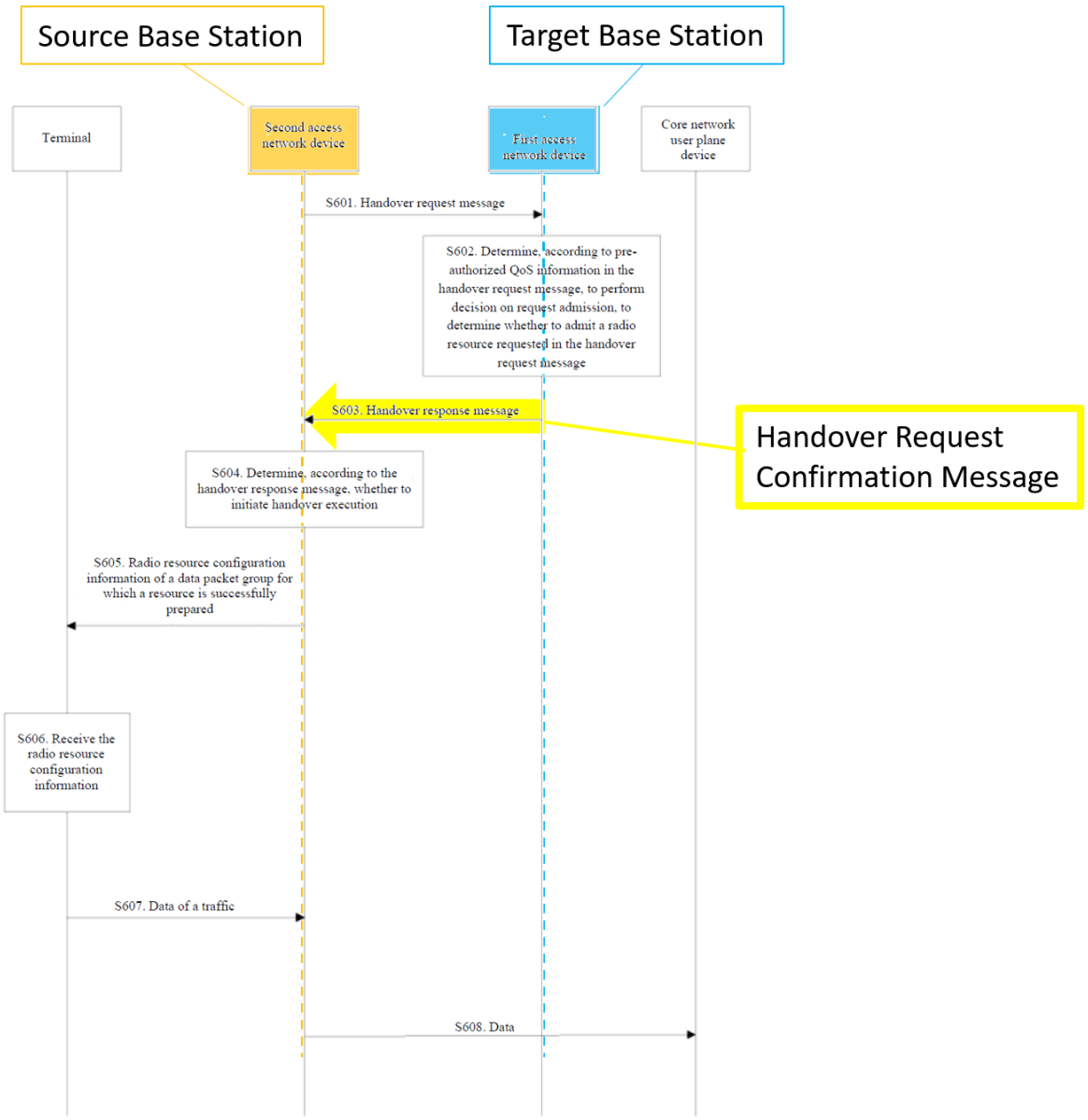


FIG. 6

581. That is, *Han* discloses a "target-side" "base station" "send[ing] a handover response message to the second [source-side] access network device" or "source-side" "base station," after or in response to "[t]he first [target-side] access

network device" or "target-side" "base station" having "receive[d] the handover request message, and determin[ing], according to pre-authorized QoS information in the handover request message, to perform judgment on request admission, to determine whether to admit a radio resource requested in the handover request message." (Ex. 1015, 46; Ex. 1017, 52).

582. The '631 patent does not provide an explicit definition nor explanation of a "handover request confirmation message." Indeed, the phrase "handover request confirmation message" only appears in the independent claims of the '631 patent and not in the specification nor the figures.

583. To the extent it is argued that *Han* does not explicitly refer to the "handover response message" as a "handover request confirmation message," a person of ordinary skill in the art would have understood that *Han's* handover response message included a "request confirmation" in view of *Han's* explicit disclosure that "the handover response message may be a handover preparation failure message or a handover preparation success message." (Ex. 1015, 47; Ex. 1017, 53). The person of ordinary skill in the art would have had such an understanding because the person of ordinary skill in the art would have understood that a "handover preparation" "failure message" or a "success message" would have provided "confirmation" of "handover preparation," whether (1) successful or (2) a failure, to the "source-side" "base station." Moreover, the person of ordinary skill in

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the art would have understood or found it obvious that the "handover response message" of *Han* included a "request confirmation" in view of the explicit disclosure in *Han* that the "handover response message" may be a "handover preparation success message." (Ex. 1015, 47; Ex. 1017, 53).

584. Thus, *Han* renders obvious claim element [1.c1].

Claim 1, Element [1.c2]: 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.

585. *Han* renders obvious claim element [1.c2].

586. Established above, *Han* discloses that a "access network device" may be "a base station," (*see* Ex. 1015, 24; Ex. 1017, 30), and that "the first access network device may also be referred to as a target-side access network device." (Ex. 1015, 44; Ex. 1017, 50). Accordingly, a person of ordinary skill in the art would have understood that *Han* discloses a "target-side" "base station."

587. *Han* discloses, with reference to step "S601" in FIG. 6, that a "second access network device" or "source-side" "base station" "sends a handover request message to a first access network device" or "target-side" "base station." (Ex. 1015, 44; Ex. 1017, 50-51).

588. *Han* discloses that the "handover request message includes pre-authorized QoS information." (Ex. 1015, 44) (Ex. 1017, 50-51). *Han* further

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discloses that the "pre-authorized QoS information in the handover request message may include a part or all of [] second pre-authorized QoS information," where "the second pre-authorized QoS information" "may explicitly or implicitly include the PDU session information." (Ex. 1015, 42; Ex. 1017, 49). *Han* discloses that "the quality of service information further comprises at least one of PDU session information and identification information of network slice of the traffic." (Ex. 1015, 20; Ex. 1017, 7). *Han* discloses that "identification information of the slice includes at least one of the following: a slice ID, a slice type, a tenant type, a tenant identifier, a network function identifier, and the like." (Ex. 1015, 31; Ex. 1017, 57). That is, *Han* discloses that the "handover request message" includes "QoS [quality of service] information," that "quality of service information" comprises "PDU session information," and "identification information of network slice of the traffic," where "identification information of the slice includes at least one of the following: a slice ID, a slice type, a tenant type, a tenant identifier, a network function identifier, and the like." (Ex. 1015, 31; Ex. 1017, 57). That is, a person of ordinary skill in the art would have understood that *Han* discloses that the "handover request message" includes quality of service information, and that the quality of service information includes network slice information associated with PDU sessions.

589. *Han* discloses, with reference to step "S603" of FIG. 6, that "[t]he first [target-side] access network device" or "target-side" "base station" "sends a

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handover response message," where "the handover response message may be a handover preparation failure message or a handover preparation success message." (Ex. 1015, 47; Ex. 1017, 53).

590. *Han* discloses that, "when determining that none of resources requested in the handover request message is admitted, the first [target-side] access network device sends the handover preparation failure message," where "the handover preparation failure message is used to indicate that none of the resources requested in the handover request message is admitted," or, "when determining that all or some resources requested in the handover request message are admitted, the first [target-side] access network device sends a handover preparation success message." (Ex. 1015, 47; Ex. 1017, 53). That "some of the resources requested in the handover request message are not admitted may include that some data packet groups in the pre-authorized QoS information for which radio bearers need to be pre-established are not admitted by the first [target-side] access network device." *Id. Han* explains that "[a]dmitting the radio resource requested in the handover request message refers to configuring the radio resource for the terminal according to the radio resource requested in the handover request message." (Ex. 1015, 46; Ex. 1017, 50-53).

591. *Han* discloses that the "handover preparation failure message may further carry a handover failure cause," where a "***failure cause may be provided for each data packet group of the handover request***." (Ex. 1015, 47; Ex. 1017, 53-54).

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A "failure cause" may include: "there is no available radio resource, pre-establishment of a radio bearer with pre-authorized QoS is not supported, a QoS parameter is not supported, a geographic area is not supported, and the like." *Id.* That is, *Han* discloses that the "handover preparation failure message" includes a "handover failure cause" "for each data packet group of the handover request," where a "failure cause" for a "data packet group" (i.e., part of a PDU session) may include that a "radio bearer with [the] pre-authorized QoS," or ***network slice information associated with a PDU session, "is not supported."*** *Id.*

592. A person of ordinary skill in the art would have understood or found it obvious that *Han* discloses that the target-side access network device does not admit a requested resource that was part of the quality of service information sent by the source-side access network device and, because *Han* explicitly discloses that the quality of service information includes network slice information associated with PDU sessions, *Han* discloses that the target-side access network device does not admit and thus rejects one or more PDU sessions. As such, the person of ordinary skill in the art would have understood or found it obvious that rejected PDU sessions would be signaled as part of "handover failure cause" message. To be clear, the person of ordinary skill in the art would have understood or found it obvious that Han's "handover preparation failure message" (or handover request confirmation message) included a "handover failure cause" (or information) for indicating

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rejection of one or more PDU data sessions (i.e., a data packet group of *Han* which is part of a PDU session in *Han*), when the one or more PDU data sessions (PDU sessions are part of the QoS information) are not supported by a target base station.

593. Thus, *Han* renders obvious claim element [1.c2].

Independent Claim 7

Claim 7, Element [7.pre]: A controller for transmitting and receiving data, the controller comprising:

594. To the extent that element [7.pre] is found to be limiting, *Han* renders obvious claim element [7.pre].

595. The ’631 patent defines a “controller 510” as part of a “base station 500.” (Ex. 1001, 21:62-22:35). The “controller 510” “may control the overall operations of the base station 500.” (Ex. 1001, 22:27-31). The “base station 500 may include a receiver 530 receiving network slice request information” and a “transmitter 520 transmitting the network slice request information.” (Ex. 1001, 21:65-66, 22:20-21). The specification and figures of the ’631 patent also do not use the term “processor” anywhere but the claims, and use the term “controller” in a manner that a person of ordinary skill in the art would have understood to be interchangeable with the term “processor.” That is, the ’631 patent does not define a controller, in the context of a base station, to be distinct or separate from a base station.

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596. The ’631 patent defines a “base station” as “generally refer[ring] to a station communicating with the UE.” (Ex. 1001, 3:61-62). The ’631 patent provides examples of base stations, including “all of various communication service areas and devices, such as a Node-B, an evolved Node-B (eNB), a gNode-B (gNB), a low power node (LPN), a sector, a site, various types of antennas, a base transceiver system (BTS), an access point, a point (e.g., a transmitting point, a receiving point, or a transceiving point), a relay node, a megacell, a macrocell, a microcell, a picocell, a femtocell, a remote radio head (RRH), a radio unit (RU), and a small cell.” (Ex. 1001, 3:62-4:4).

597. With reference to FIG. 1 (reproduced below), *Han* discloses a “schematic structural diagram of a communication system 100,” which “may be an LTE system, a 5G system, or a subsequent evolved system of the 5G system” and includes “at least one terminal 120, at least one access network device 140, at least one core network control plane device 160, and at least one core network user plane device 180.” (Ex. 1015, 22-24; Ex. 1017, 27-30).

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Ex. 1015, FIG. 1 (Ex. 1017, FIG. 1)

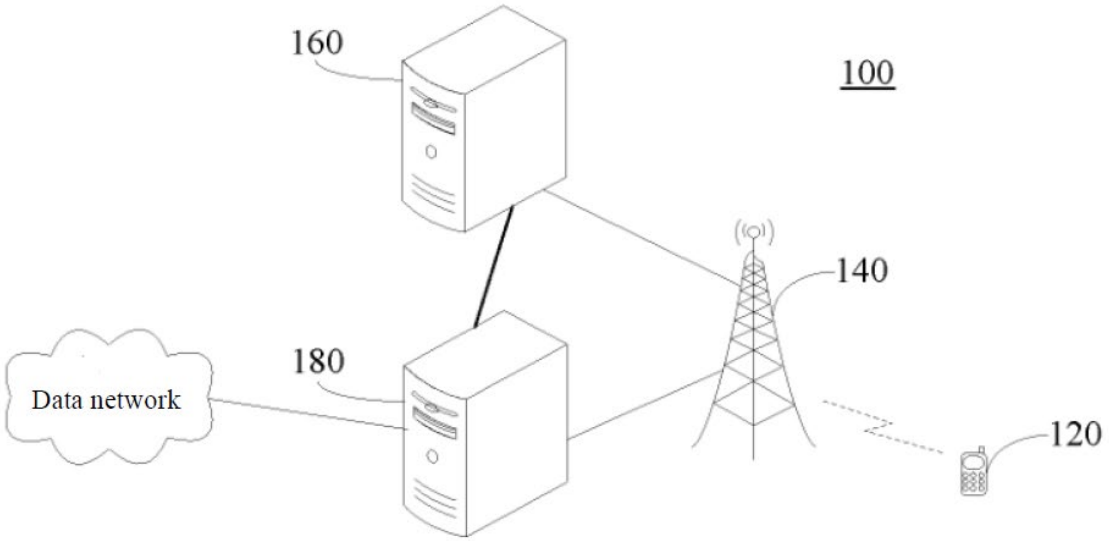


FIG. 1

598. *Han* describes that the "access network device 140" "may be a base transceiver station (BTS for short)," "a base station (NodeB)," or "an eNB." (Ex. 1015, 24; Ex. 1017, 30).

599. To the extent the preamble of claim 7 is limiting, a person of ordinary skill in the art would have understood that, in view of the use of the term "controller" in the '631 patent in the context of a base station, that the claimed "controller" is a base station, which *Han* discloses.

600. To the extent it is argued that *Han* does not explicitly state that its procedures are for "transmitting and receiving data," a person of ordinary skill in the art would have understood that data is transmitted and received in *Han* because *Han* explicitly discloses an "access network device" or base station that includes a

"receiving module" and a "transmitting module." A person of ordinary skill would have understood that "data" was "transmitted and received" using the access network device disclosed in *Han*.

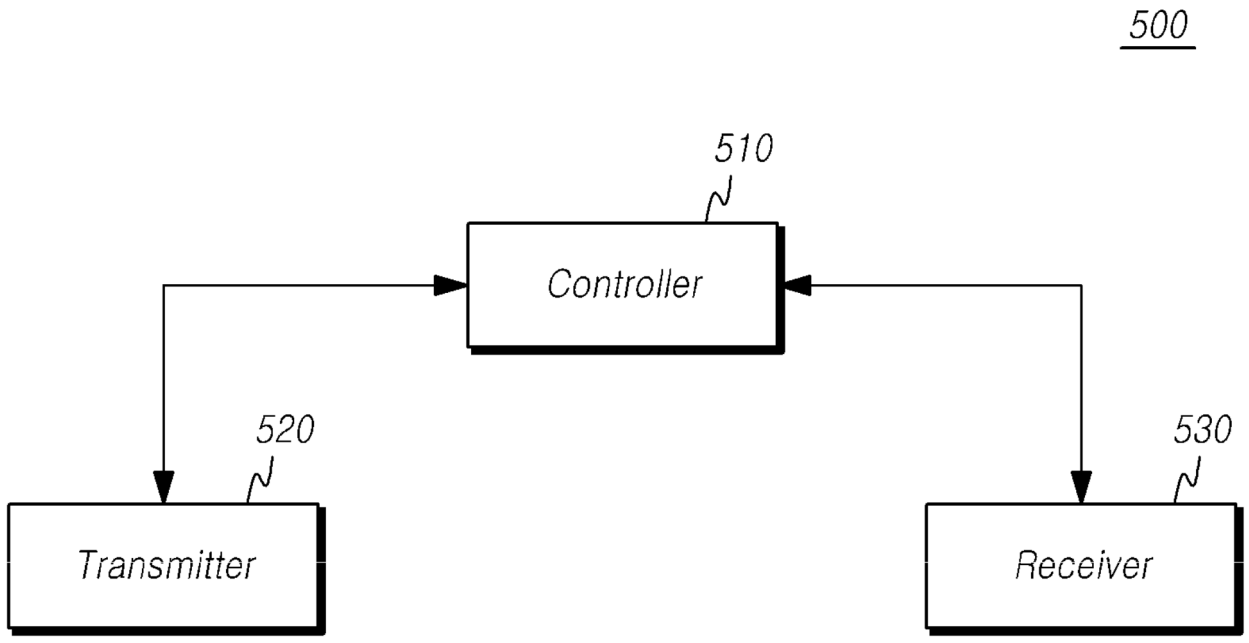
601. Thus, *Han* renders obvious claim element [7.pre].

Claim 7, Element [7.a]: a processor performs: to decide whether to perform a handover;

602. *Han* renders obvious claim element [7.a].

603. The specification and figures of the '631 patent make no mention of a processor. The '631 patent defines a "controller 510" as part of a "base station 500," and depicts the same in FIG. 5 (reproduced below). (Ex. 1001, 21:62-22:35).

Ex. 1001, FIG. 5



604. The '631 patent discloses that the "controller 510" "may control the overall operations of the base station 500." (Ex. 1001, 22:27-31). The "base station

500 may include a receiver 530 receiving network slice request information" and a "transmitter 520 transmitting the network slice request information." (Ex. 1001, 21:65-66, 22:20-21).

605. Given the person of ordinary skill in the art would have understood the claimed "controller" of [7.pre] to be a base station, the person of ordinary skill in the art would have understood that the claimed "processor" was the "controller" of FIG. 5. Because the "controller" of FIG. 5 "control[s] the overall operations of the base station," the person of ordinary skill in the art would have understood that the "controller" of FIG. 5 is satisfied by a processor of a base station, which *Han* discloses. In any case, *Han* discloses base stations and a control unit (or processor).

606. With reference to FIG. 3, *Han* discloses that the "access network device 140" or base station "includes a processor 31." (Ex. 1015, 25; Ex. 1017, 30).

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Ex. 1015, FIG. 3 (annotated) (Ex. 1017, FIG. 3)

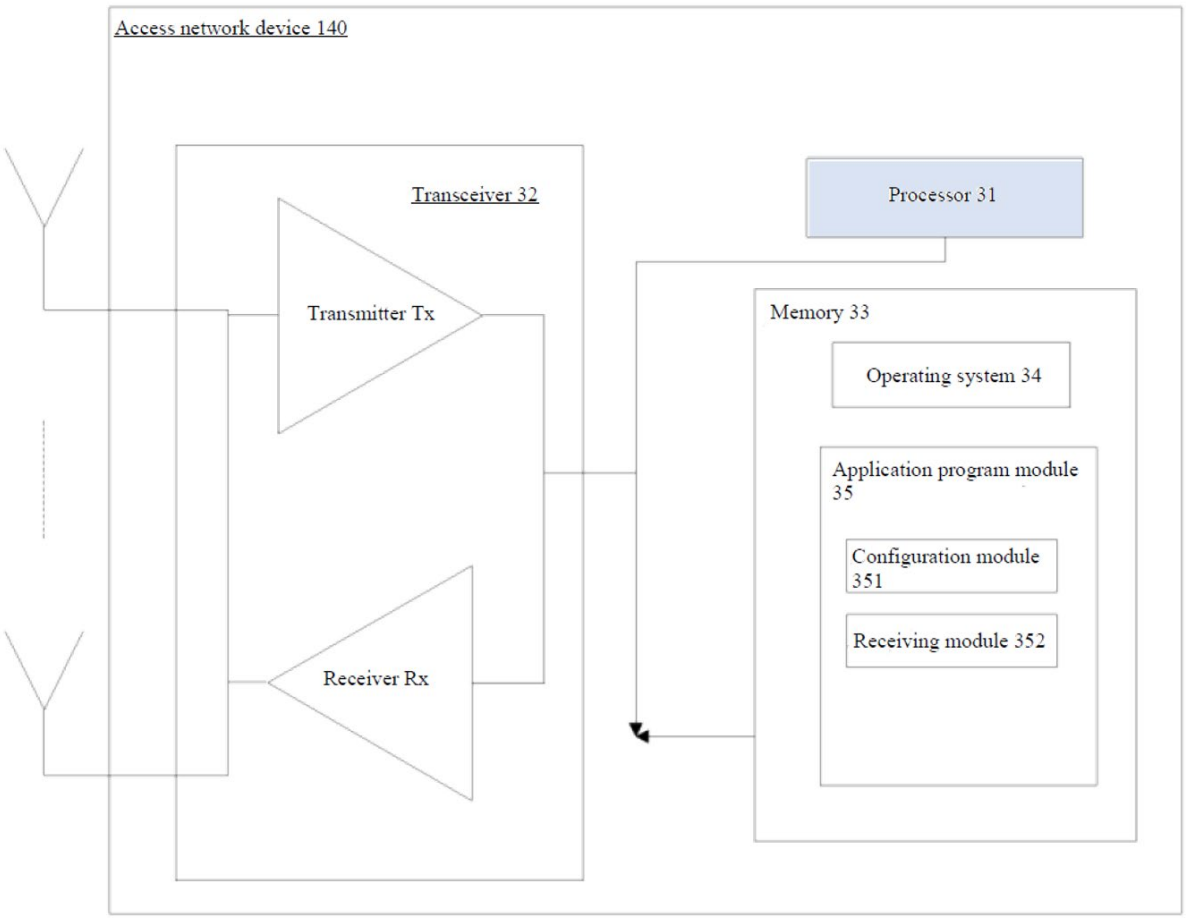


FIG. 3

607. With reference to step "S604" of FIG. 6 (reproduced and annotated below), *Han* discloses that a "second [source-side] access network device,"[34] or

[34] *Han* discloses that "[t]he second access network device may also be referred to as a source-side access network device," and "the first access network device may also be referred to as a target-side access network device." (Ex. 1015, 44; Ex. 1017, 50).

"base station"[35] "determines" "whether to initiate handover execution." (Ex. 1015, 48; Ex. 1017, 54). *Han* discloses that the "second [source-side] access network device," or "base station," makes such a determination after receiving and "according to [a] handover response message." (Ex. 1015, 48; Ex. 1017, 54).

I use this nomenclature throughout the analyses herein with respect to *Han* for the purposes of ease of understanding.

[35] *Han* discloses that the "access network device" may be "a base station." (Ex. 1015, 24; Ex. 1017, 30). I use this nomenclature throughout the analyses herein with respect to *Han* for the purposes of ease of understanding.

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Ex. 1015, FIG. 6 (annotated) (Ex. 1017, FIG. 6)

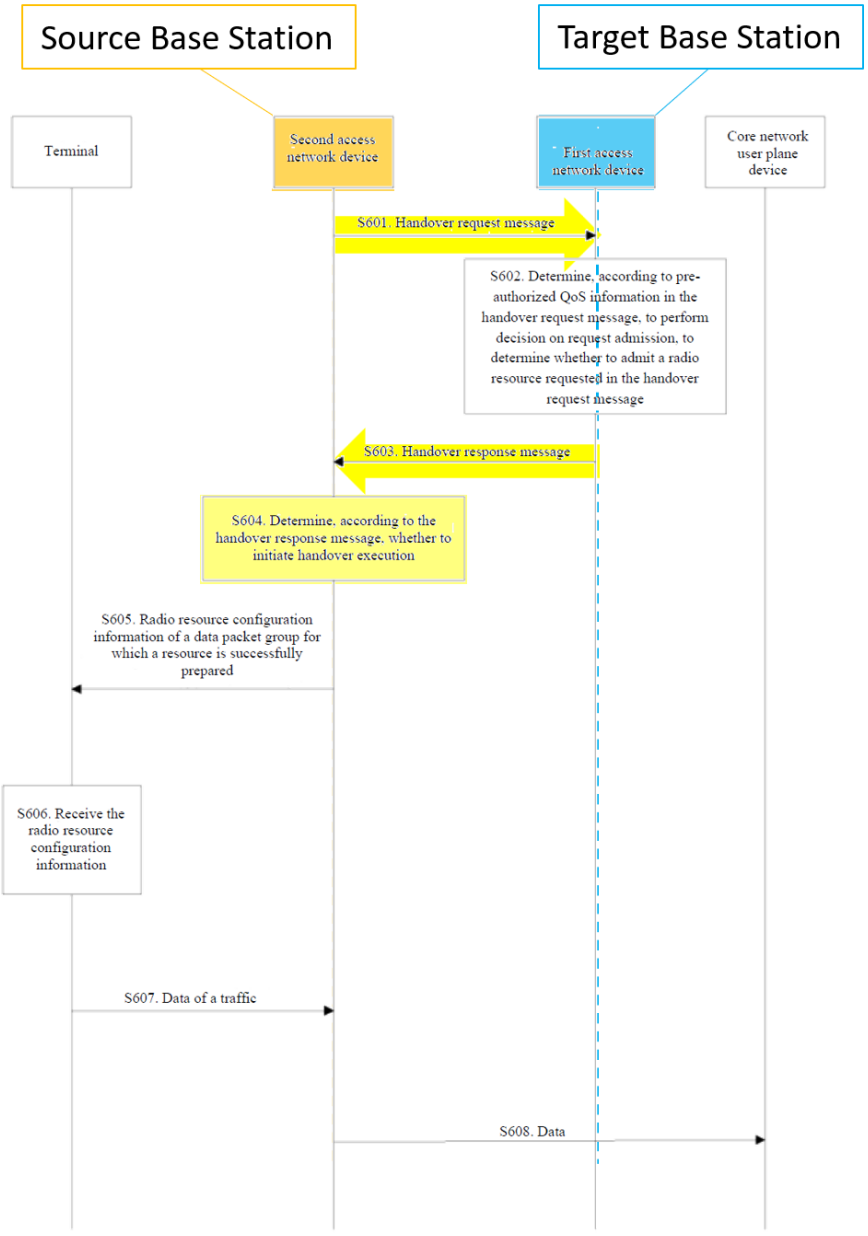


FIG. 6

608. It would have been obvious to a person of ordinary skill in the art that *Han's* "second [source-side] access network device" or "base station" decided to perform a handover prior to sending the handover request message to the "first

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[target-side] access network device" or "base station" because it would have been unnecessary and inefficient for the "second [source-side] access network device" or "base station" to send the handover request message to the "first [target-side] access network device" or "base station" when it had not been determined to perform a handover. That is, a person of ordinary skill in the art would have understood that, if the "second [source-side] access network device" sent messages without having first decided to perform a handover, network traffic would have increased and bandwidth would have decreased. The person of ordinary skill in the art would have found it obvious to improve the "second [source-side] access network device" of *Han* by including a handover decision prior to sending a handover request message because such improvement would have given the second device a reason to send the handover request message. Indeed, the '631 Patent fails to provide any detail regarding a source base station deciding whether to perform a handover prior to transmitting a handover request message to a target base station, underscoring that even the inventors of the '631 Patent found such a feature to be obvious.

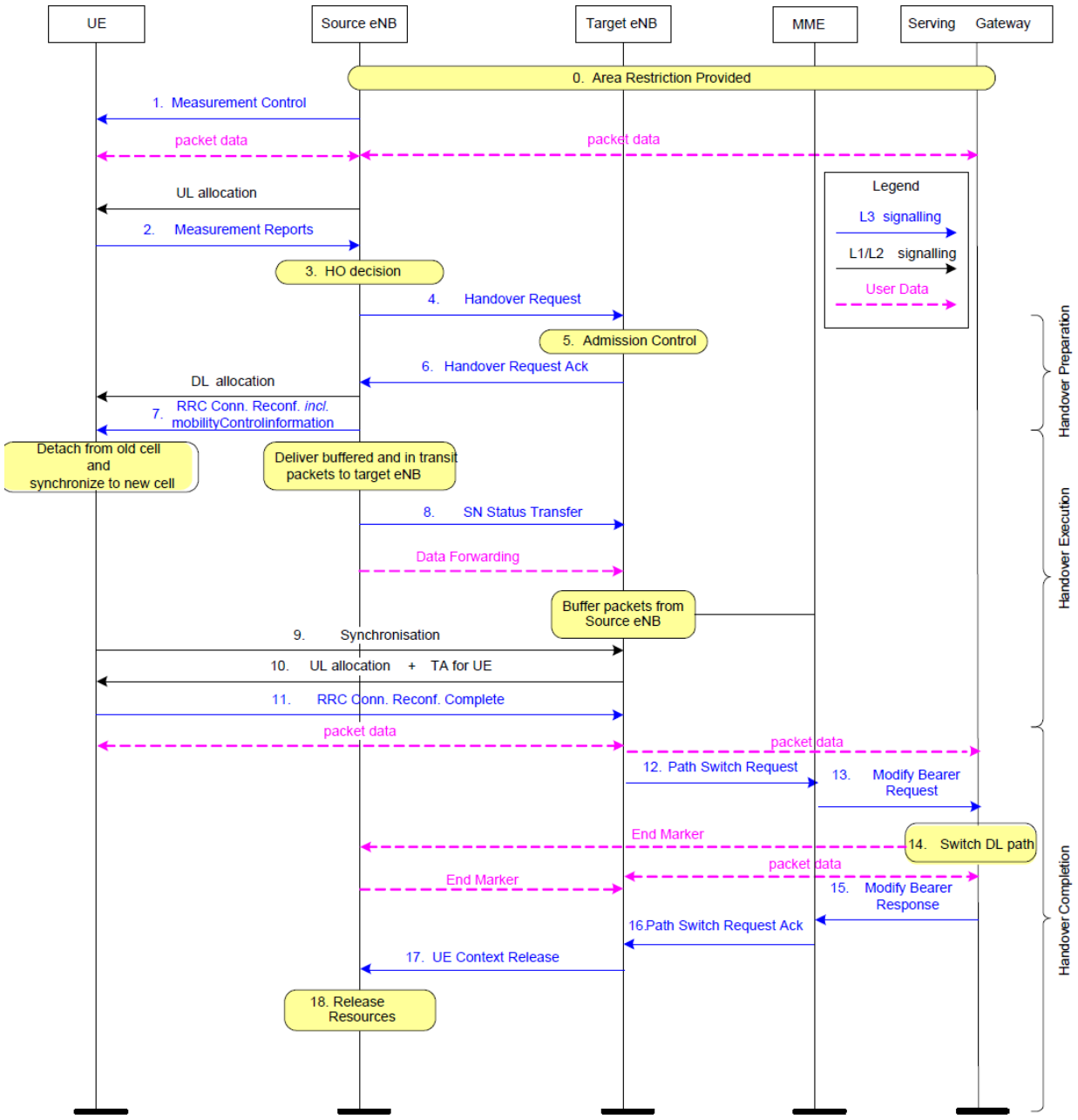
609. To the extent it is argued that such a feature is not obvious in view of *Han*, it would have been obvious to a person of ordinary skill in the art to combine the teachings of *Han* with *TS 36.300*, which explicitly discloses a source base station deciding whether to perform a handover prior to transmitting a handover request message to a target base station.

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610. *TS 36.300* provides an overview of "Mobility Management" procedures, including "Mobility Support for UEs" and "necessary steps" for "[h]andover procedures." (Ex. 1024, 90). *TS 36.300* depicts a "basic handover scenario" in Figure 10.1.2.1.1-1, and provides details regarding the scenario. (Ex. 1024, 91-92; Figure 10.1.2.1.1-1).

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Ex. 1024, Figure 10.1.2.1.1-1



611. *TS 36.300* provides a "more detailed description" of the above scenario, including that, in step 2 ("2. Measurement Reports" in Figure 10.1.2.1.1-1), a "MEASUREMENT REPORT is triggered and sent to the eNB, and then, in step 3

("***3. HO Decision***" in Figure 10.1.2.1.1-1), "[t]he source eNB makes ***[a] decision based on MEASUREMENT REPORT and RRM information to hand off the UE***." (Ex. 1024, 92-93; Figure 10.1.2.1.1-1) (emphasis added). *TS 36.300* defines "HO" to be "handover." (Ex. 1024, 22).

612. It would have been obvious to a person of ordinary skill in the art to combine the teachings of *Han* and *TS 36.300* to provide the system of *Han* with details regarding standard handover procedures, as disclosed in *TS 36.300*, in order to maintain "[l]oad balancing" with handover. (*see* Ex. 1024, 89). That is, the person of ordinary skill in the art would have known to consult standard documentation to understand the basics of handover procedures. A person of ordinary skill in the art would have had a reasonable expectation of success in the combination of *Han* and *TS 36.300* based on the explicit teachings of the references, the knowledge of the person of ordinary skill in the art (*see* § VI *supra*), and recognizing that both *Han* and *TS 36.300* relate to LTE systems. (Ex. 1015, 24; Ex. 1017, 29; Ex. 1024, 83, 121).

613. The person of ordinary skill in the art would have had a reasonable expectation of success in the combination because the handover-related messages disclosed in *Han* and *TS 36.300* were similar messages directed to similar goals, with different details. As explained in the section herein titled *Motivation to Combine Han and TS 36.300*, a person of ordinary skill in the art would have made such an

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improvement or modification in order to ensure backwards compatibility (and would also lead to the efficiency-related benefits explained above).

614. It would have further been obvious to the person of ordinary skill in the art to combine *Han* and *TS 36.300* for at least the reasons espoused in the section herein titled *Motivation to Combine Han and TS 36.300*.

615. Thus, *Han* renders obvious claim element [7.a]. Further, *Han* and *TS 36.300* render obvious claim element [7.a].

Claim 7, Element [7.b1]: to transmit a handover request message when it is decided to perform the handover,

616. *Han* renders obvious claim element [7.b1].

617. *Han* discloses that the "access network device" includes a processor. *See* § IX.C.[7.a] *supra*. *Han* renders obvious a processor deciding whether to perform a handover. *Id*. Also established above, a person of ordinary skill in the art would have understood that the claimed "controller" and "processor" were part of a base station. *Id.*

618. *Han* discloses a "communication method" in which a "radio resource is configured based on pre-authorized QoS information in a handover process." (Ex. 1015, 44; Ex. 1017, 50).

619. *Han* discloses, with reference to step "S601" in FIG. 6 (reproduced below), a "second access network device" or "source-side" "base station" "send[ing] a handover request message to a first access network device" or "target-side" "base

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station." (Ex. 1015, 44; Ex. 1017, 50). That is, *Han* discloses step "S601" is part of a "handover process." *Id.*

Ex. 1015, FIG. 6 (annotated) (Ex. 1017, FIG. 6)

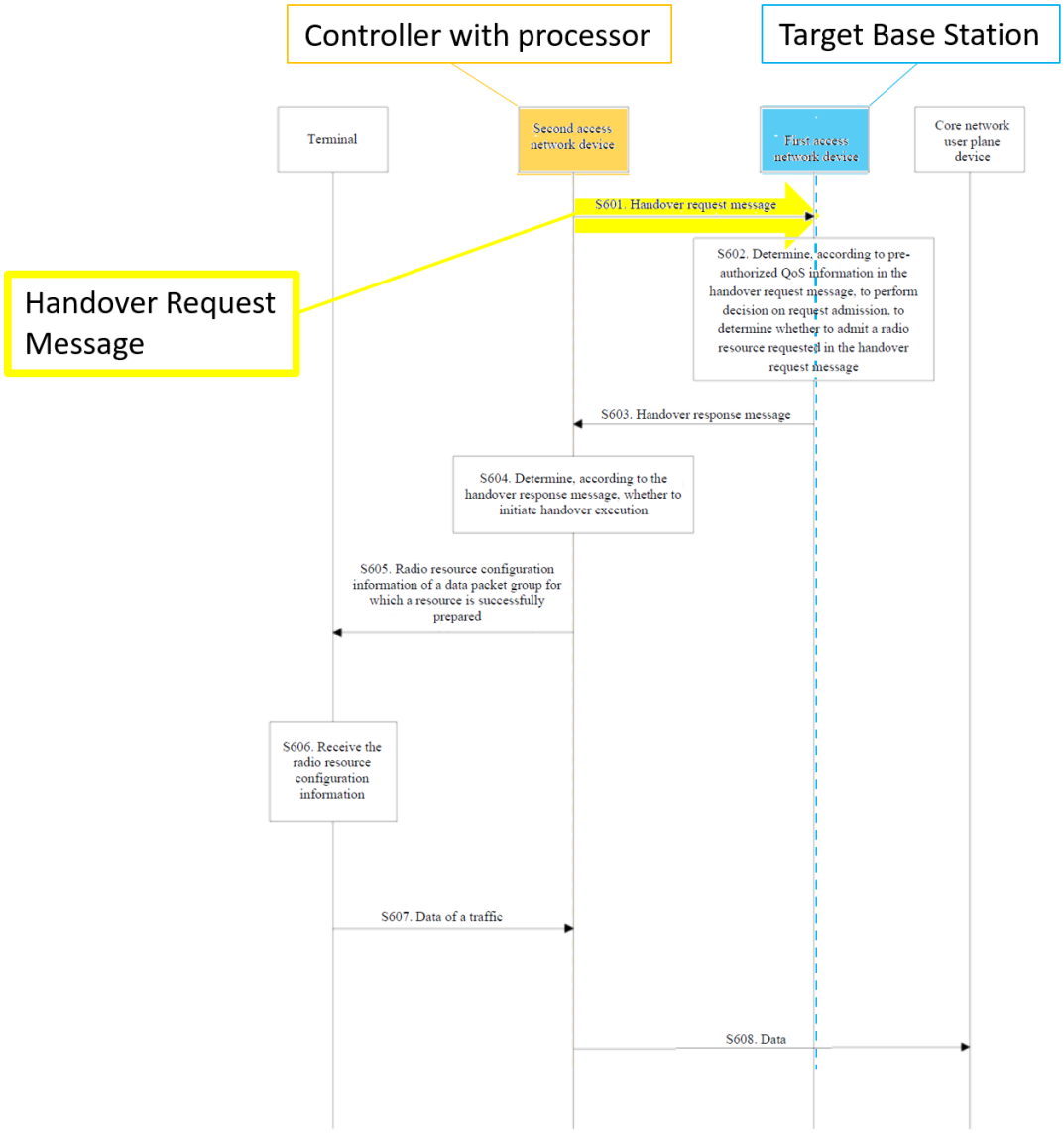


FIG. 6

620. Thus, *Han* renders obvious claim element [7.b1].

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Claim 7, Element [7.b2]: wherein the handover request message includes network slice information; and

621. *Han* renders obvious claim element [7.b2].

622. *Han* discloses that the "handover request message includes pre-authorized QoS information." (Ex. 1015, 44; Ex. 1017, 51). *Han* further discloses that the "pre-authorized QoS information in the handover request message may include a part or all of [] second pre-authorized QoS information," where "the second pre-authorized QoS information" "may explicitly or implicitly include the PDU session information." (Ex. 1015, 42; Ex. 1017, 49). *Han* discloses that "the quality of service information further comprises at least one of PDU session information and identification information of network slice of the traffic." (Ex. 1015, 20; Ex. 1017, 7). *Han* discloses that "identification information of the slice includes at least one of the following: a slice ID, a slice type, a tenant type, a tenant identifier, a network function identifier, and the like." (Ex. 1015, 31; Ex. 1017, 57). That is, *Han* discloses that the "handover request message" includes "QoS [quality of service] information," that "quality of service information" comprises "PDU session information," and "identification information of network slice of the traffic," where "identification information of the slice includes at least one of the following: a slice ID, a slice type, a tenant type, a tenant identifier, a network function identifier, and the like." (Ex. 1015, 31; Ex. 1017, 57).

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623. The ’631 patent discloses that “network slice request information may include specific network slice information configured for [a] UE.” (Ex. 1001, 11:26-37). The “network slice information may include information on at least one of network slice configured for the UE, ***information for identifying a network slice service/PDU session/bearer associated with the corresponding network slice information***, and information on a priority of the corresponding network slice.” *Id.* In view of the explicit disclosure of “identification information of the slice includes at least one of the following: a slice ID, a slice type, a tenant type, a tenant identifier, a network function identifier, and the like” being included in the handover request message of *Han*, a person of ordinary skill in the art would have understood or found it obvious, consistent with the disclosure of the ’631 patent, that the handover request message of *Han* included network slice information. Thus, *Han* renders obvious claim element [7.b2].

Claim 7, Element [7.c1]: to receive a handover request confirmation message in response to the handover request message,

624. *Han* renders obvious claim element [7.c1].

625. *Han* discloses that the “access network device” includes a processor. *See* §§ IX.C.[1.pre] [1.a], [7.pre], [7.a] *supra*. Also established above, a person of ordinary skill in the art would have understood that the claimed “controller” and “processor” were part of a base station. *Id.*

626. *Han* discloses, with reference to step "S602" of FIG. 6, that "[t]he first [target-side] access network device receives the handover request message, and determines, according to pre-authorized QoS information in the handover request message, to perform judgment on request admission, to determine whether to admit a radio resource requested in the handover request message." (Ex. 1015, 46; Ex. 1017, 52-53). *Han* explains that "[a]dmitting the radio resource requested in the handover request message refers to configuring the radio resource for the terminal according to the radio resource requested in the handover request message." (Ex. 1015, 46; Ex. 1017, 52).

627. *Han* discloses, with reference to step "S603" of FIG. 6, that "[t]he first [target-side] access network device" or "target-side" "base station" "sends a handover response message to the second [source-side] access network device" or "source-side" "base station," where "the handover response message may be a handover preparation failure message or a handover preparation success message." (Ex. 1015, 47; Ex. 1017, 53).

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Ex. 1015, FIG. 6 (annotated) (Ex. 1017, FIG. 6)

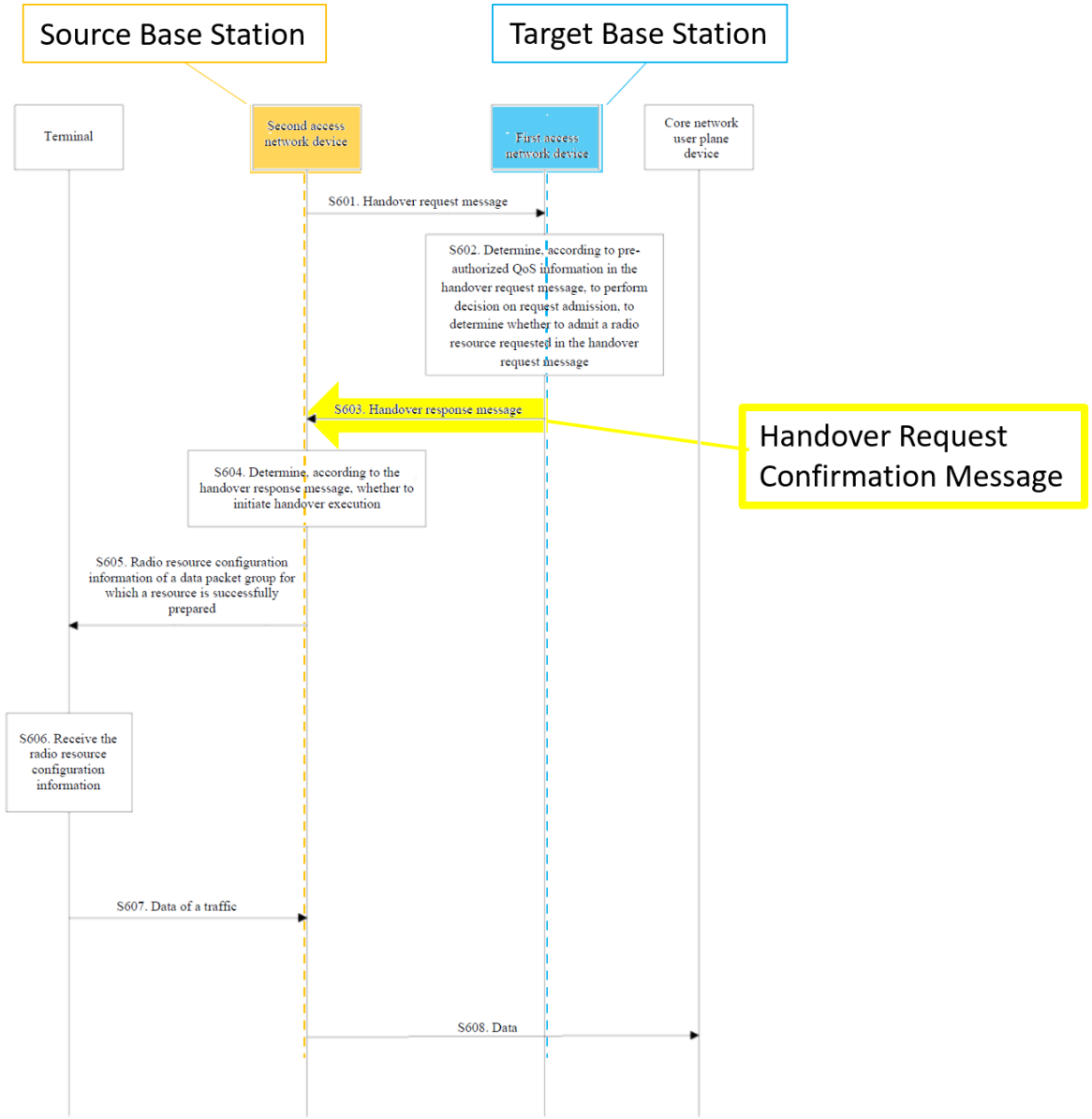


FIG. 6

628. That is, *Han* discloses a "target-side" "base station" "send[ing] a handover response message to the second [source-side] access network device" or

"source-side" "base station," after or in response to "[t]he first [target-side] access network device" or "target-side" "base station" having "receive[d] the handover request message, and determin[ing], according to pre-authorized QoS information in the handover request message, to perform judgment on request admission, to determine whether to admit a radio resource requested in the handover request message." (Ex. 1015, 46; Ex. 1017, 52).

629. The '631 patent does not provide an explicit definition nor explanation of a "handover request confirmation message." Indeed, the phrase "handover request confirmation message" only appears in the independent claims of the '631 patent and not in the specification nor the figures.

630. To the extent it is argued that *Han* does not explicitly refer to the "handover response message" as a "handover request confirmation message," a person of ordinary skill in the art would have understood that *Han's* handover response message included a "request confirmation" in view of *Han's* explicit disclosure that "the handover response message may be a handover preparation failure message or a handover preparation success message." (Ex. 1015, 47; Ex. 1017, 53). The person of ordinary skill in the art would have had such an understanding because the person of ordinary skill in the art would have understood that a "handover preparation" "failure message" or a "success message" would have provided "confirmation" of "handover preparation," whether (1) successful or (2) a

failure, to the "source-side" "base station." Moreover, the person of ordinary skill in the art would have understood or found it obvious that the "handover response message" of *Han* included a "request confirmation" in view of the explicit disclosure in *Han* that the "handover response message" may be a "handover preparation success message." (Ex. 1015, 47; Ex. 1017, 53).

631. Thus, *Han* renders obvious claim element [7.c1].

Claim 7, Element [7.c2]: wherein, if one or more protocol data unit (PDU) sessions are associated with one or more network slices that are not supported by a target BS, the handover request confirmation message includes information for indicating a rejection of the one or more PDU sessions by the target BS.

632. *Han* renders obvious claim element [7.c2].

633. Established above, *Han* discloses that a "access network device" may be "a base station," (*see* Ex. 1015, 24; Ex. 1017, 30), and that "the first access network device may also be referred to as a target-side access network device." (Ex. 1015, 44; Ex. 1017, 50). Accordingly, a person of ordinary skill in the art would have understood that *Han* discloses a "target-side" "base station."

634. *Han* discloses, with reference to step "S601" in FIG. 6, that a "second access network device" or "source-side" "base station" "sends a handover request message to a first access network device" or "target-side" "base station." (Ex. 1015, 44; Ex. 1017, 50-51).

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635. *Han* discloses that the "handover request message includes pre-authorized QoS information." (Ex. 1015, 44) (*see* Ex. 1017, 50-51). *Han* further discloses that the "pre-authorized QoS information in the handover request message may include a part or all of [] second pre-authorized QoS information," where "the second pre-authorized QoS information" "may explicitly or implicitly include the PDU session information." (Ex. 1015, 42; Ex. 1017, 49). *Han* discloses that "the quality of service information further comprises at least one of PDU session information and identification information of network slice of the traffic." (Ex. 1015, 20; Ex. 1017, 7). *Han* discloses that "identification information of the slice includes at least one of the following: a slice ID, a slice type, a tenant type, a tenant identifier, a network function identifier, and the like." (Ex. 1015, 31; Ex. 1017, 57). That is, *Han* discloses that the "handover request message" includes "QoS [quality of service] information," that "quality of service information" comprises "PDU session information," and "identification information of network slice of the traffic," where "identification information of the slice includes at least one of the following: a slice ID, a slice type, a tenant type, a tenant identifier, a network function identifier, and the like." (Ex. 1015, 31; Ex. 1017, 57). That is, a person of ordinary skill in the art would have understood that *Han* discloses that the "handover request message" includes quality of service information, and that the quality of service information includes network slice information associated with PDU sessions.

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636. *Han* discloses, with reference to step "S603" of FIG. 6, that "[t]he first [target-side] access network device" or "target-side" "base station" "sends a handover response message," where "the handover response message may be a handover preparation failure message or a handover preparation success message." (Ex. 1015, 47; Ex. 1017, 53).

637. *Han* discloses that, "when determining that none of resources requested in the handover request message is admitted, the first [target-side] access network device sends the handover preparation failure message," where "the handover preparation failure message is used to indicate that none of the resources requested in the handover request message is admitted," or, "when determining that all or some resources requested in the handover request message are admitted, the first [target-side] access network device sends a handover preparation success message." (Ex. 1015, 47; Ex. 1017, 53). That "some of the resources requested in the handover request message are not admitted may include that some data packet groups in the pre-authorized QoS information for which radio bearers need to be pre-established are not admitted by the first [target-side] access network device." *Id. Han* explains that "[a]dmitting the radio resource requested in the handover request message refers to configuring the radio resource for the terminal according to the radio resource requested in the handover request message." (Ex. 1015, 46; Ex. 1017, 50-53).

638. *Han* discloses that the "handover preparation failure message may further carry a handover failure cause," where a "failure cause may be provided for each data packet group of the handover request." (Ex. 1015, 47; Ex. 1017, 53-54). A "failure cause" may include: "there is no available radio resource, pre-establishment of a radio bearer with pre-authorized QoS is not supported, a QoS parameter is not supported, a geographic area is not supported, and the like." *Id.* That is, *Han* discloses that the "handover preparation failure message" includes a "handover failure cause" "for each data packet group of the handover request," where a "failure cause" for a "data packet group" (i.e., part of a PDU session) may include that a "radio bearer with [the] pre-authorized QoS," or network slice information associated with a PDU session, "is not supported." *Id.*

639. A person of ordinary skill in the art would have understood that *Han* discloses that the target-side access network device does not admit a requested resource that was part of the quality of service information sent by the source-side access network device and, because *Han* explicitly discloses that the quality of service information includes network slice information associated with PDU sessions, *Han* discloses that the target-side access network device does not admit one or more PDU sessions. To be clear, the person of ordinary skill in the art would have understood or found it obvious that Han's "handover preparation failure message" (or handover request confirmation message) included a "handover failure

cause" (or information) for indicating rejection of one or more PDU data sessions (i.e., a data packet group of *Han* which is part of a PDU session in *Han*), when the one or more PDU data sessions (PDU sessions are part of the QoS information) are not supported by a target base station.

640. Thus, *Han* discloses or renders obvious claim element [7.c2].

Independent Claim 13

Claim 13, Element [13.pre]: An apparatus for transmitting and receiving data, the apparatus comprising:

641. To the extent that element [13.pre] is found to be limiting, *Han* renders obvious claim element [13.pre].

642. The '631 patent defines a "base station" as "generally refer[ring] to a station communicating with the UE." (Ex. 1001, 3:61-62). The '631 patent provides examples of base stations, including "all of various communication service areas and devices, such as a Node-B, an evolved Node-B (eNB), a gNode-B (gNB), a low power node (LPN), a sector, a site, various types of antennas, a base transceiver system (BTS), an access point, a point (e.g., a transmitting point, a receiving point, or a transceiving point), a relay node, a megacell, a macrocell, a microcell, a picocell, a femtocell, a remote radio head (RRH), a radio unit (RU), and a small cell." (Ex. 1001, 3:62-4:4). The '631 patent also refers to a "base station" as "an apparatus." (Ex. 1001, 4:13-36). Accordingly, a person of ordinary skill in the art would have understood that the claimed "apparatus" was a base station, and that an example of

a base station was an evolved Node-B (eNB), which *Han* discloses. Therefore, a person of ordinary skill in the art would have understood or found it obvious that *Han* disclosed the claimed apparatus.

643. With reference to FIG. 1 (reproduced below), *Han* discloses a "schematic structural diagram of a communication system 100," which "may be an LTE system, a 5G system, or a subsequent evolved system of the 5G system" and includes "at least one terminal 120, at least one access network device 140, at least one core network control plane device 160, and at least one core network user plane device 180." (Ex. 1015, 22-24; Ex. 1017, 27-30).

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Ex. 1015, FIG. 1 (Ex. 1017, FIG. 1)

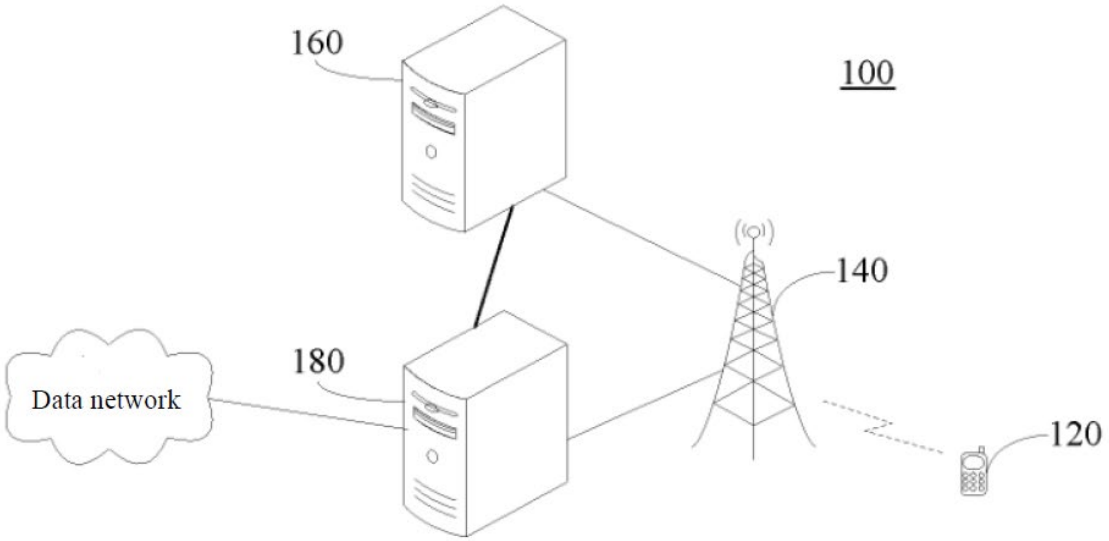


FIG. 1

644. *Han* describes that the "access network device 140" "may be a base transceiver station (BTS for short)," "a base station (NodeB)," or "an eNB." (Ex. 1015, 24; Ex. 1017, 30).

645. Thus, *Han* renders obvious claim element [13.pre].

Claim 13, Element [13.a]: a controller configured to decide whether to perform a handover;

646. *Han* renders obvious claim element [13.a].

647. The '631 patent defines a "controller 510" as part of a "base station 500." (Ex. 1001, 21:62-22:35). The "controller 510" "may control the overall operations of the base station 500." (Ex. 1001, 22:27-31). The "base station 500 may include a receiver 530 receiving network slice request information" and a

"transmitter 520 transmitting the network slice request information." (Ex. 1001, 21:65-66, 22:20-21).

648. The '631 patent defines a "base station" as "generally refer[ring] to a station communicating with the UE." (Ex. 1001, 3:61-62). The '631 patent provides examples of base stations, including "all of various communication service areas and devices, such as a Node-B, an evolved Node-B (eNB), a gNode-B (gNB), a low power node (LPN), a sector, a site, various types of antennas, a base transceiver system (BTS), an access point, a point (e.g., a transmitting point, a receiving point, or a transceiving point), a relay node, a megacell, a macrocell, a microcell, a picocell, a femtocell, a remote radio head (RRH), a radio unit (RU), and a small cell." (Ex. 1001, 3:62-4:4).

649. The specification and figures of the '631 patent also do not use the term "processor" anywhere but the claims, and use the term "controller" in a manner that a person of ordinary skill in the art would have understood to be interchangeable with the term "processor." Because the "controller 510" of the '631 patent "control[s] the overall operations of the base station," the person of ordinary skill in the art would have understood that the "controller" of FIG. 5 is satisfied by a processor of a base station, which *Han* discloses.

650. With reference to FIG. 3, *Han* discloses that the "access network device 140" or base station "includes a processor 31." (Ex. 1015, 25; Ex. 1017, 30).

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Ex. 1015, FIG. 3 (annotated) (Ex. 1017, FIG. 3)

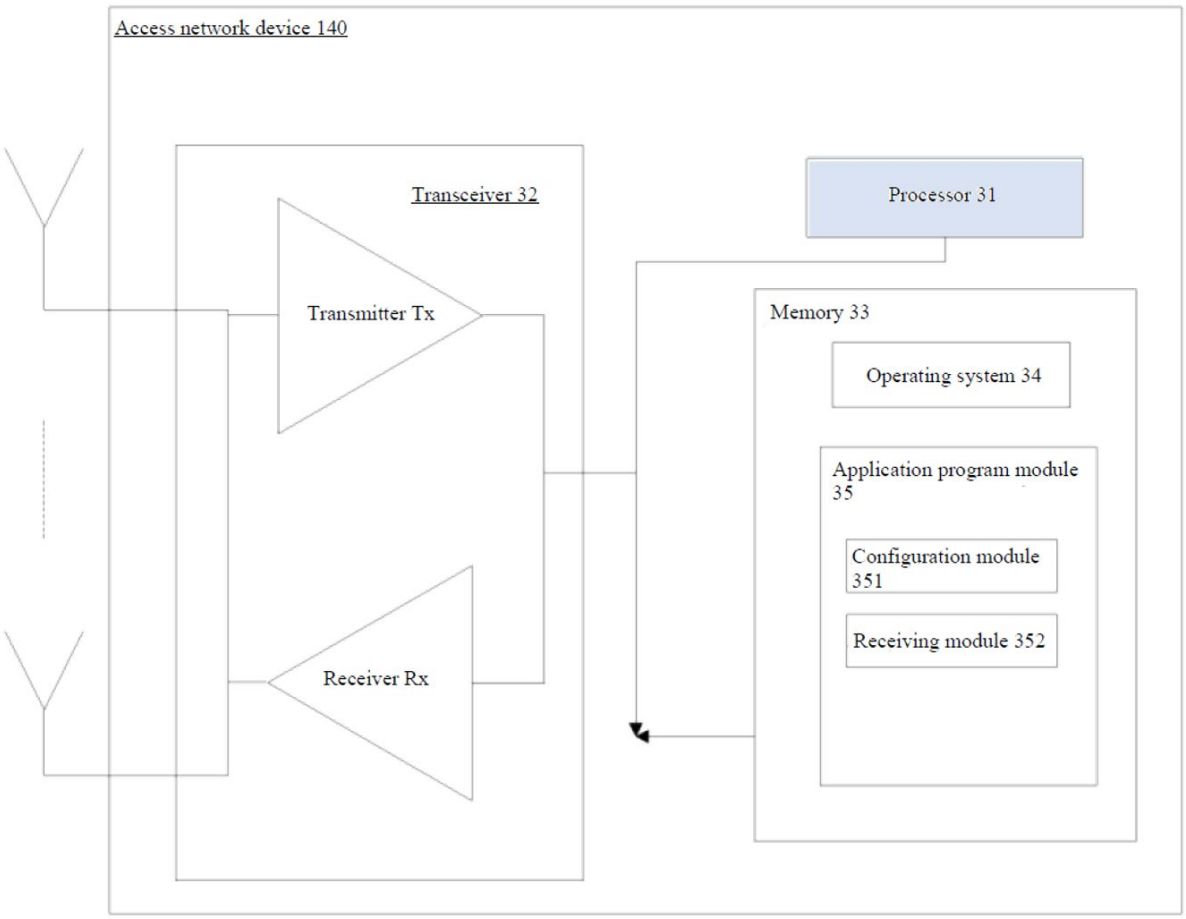


FIG. 3

651. With reference to step "S604" of FIG. 6 (reproduced and annotated below), *Han* discloses that a "second [source-side] access network device,"[36] or

[36] *Han* discloses that "[t]he second access network device may also be referred to as a source-side access network device," and "the first access network device may also

"base station"[37] "determines" "whether to initiate handover execution." (Ex. 1015, 48; Ex. 1017, 54). *Han* discloses that the "second [source-side] access network device," or "base station," makes such a determination after receiving and "according to [a] handover response message." (Ex. 1015, 48; Ex. 1017, 54).

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be referred to as a target-side access network device." (Ex. 1015, 44; Ex. 1017, 50). I use this nomenclature throughout the analyses herein with respect to *Han* for the purposes of ease of understanding.

[37] *Han* discloses that the "access network device" may be "a base station." (Ex. 1015, 24; Ex. 1017, 30). I use this nomenclature throughout the analyses herein with respect to *Han* for the purposes of ease of understanding.

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Ex. 1015, FIG. 6 (annotated) (Ex. 1017, FIG. 6)

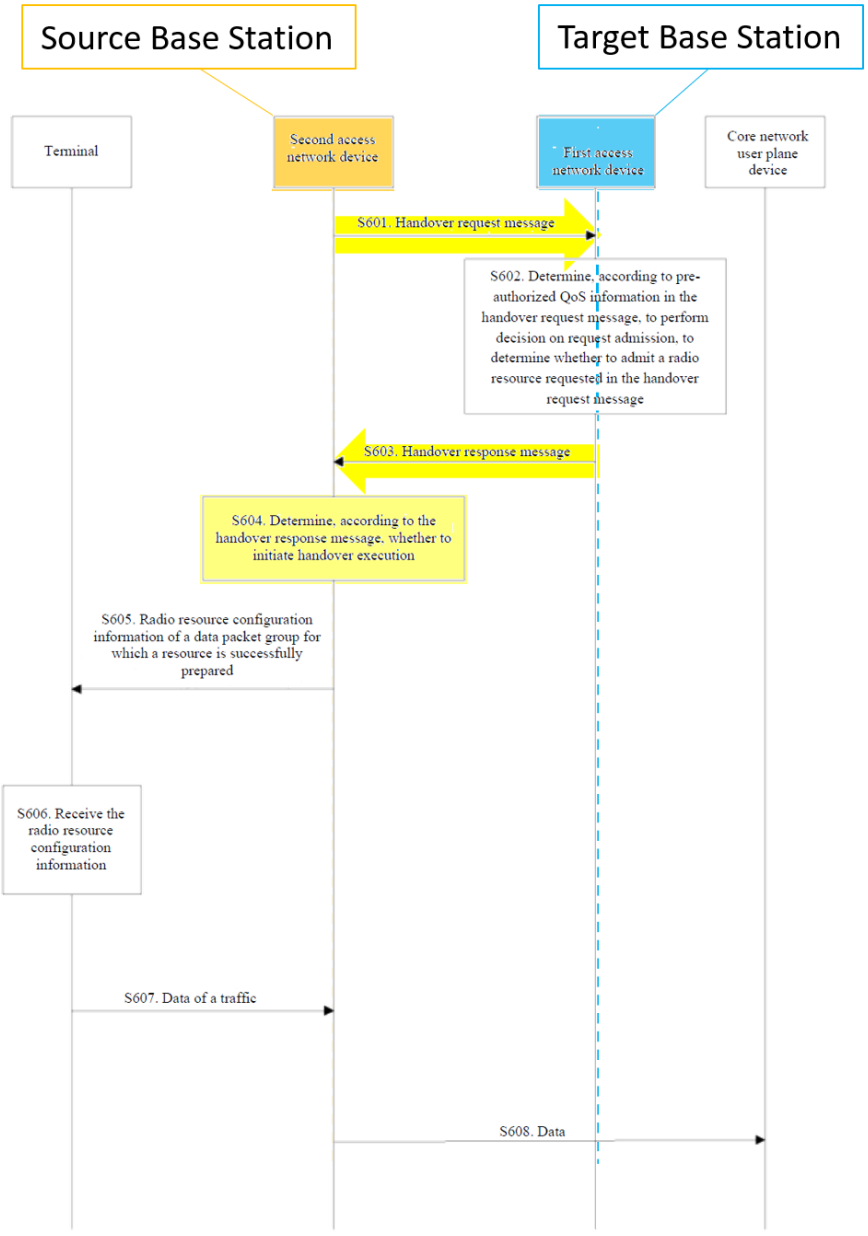


FIG. 6

652. It would have been obvious to a person of ordinary skill in the art that *Han's* "second [source-side] access network device" or "base station" decided to perform a handover prior to sending the handover request message to the "first

[target-side] access network device" or "base station" because it would have been unnecessary and inefficient for the "second [source-side] access network device" or "base station" to send the handover request message to the "first [target-side] access network device" or "base station" when it had not been determined to perform a handover. That is, a person of ordinary skill in the art would have understood that, if the "second [source-side] access network device" sent messages without having first decided to perform a handover, network traffic would have increased and bandwidth would have decreased. The person of ordinary skill in the art would have found it obvious to improve the "second [source-side] access network device" of *Han* by including a handover decision prior to sending a handover request message because such improvement would have given the second device a reason to send the handover request message.Indeed, the '631 Patent fails to provide any detail regarding a source base station deciding whether to perform a handover prior to transmitting a handover request message to a target base station, underscoring that even the inventors of the '631 Patent found such a feature to be obvious.

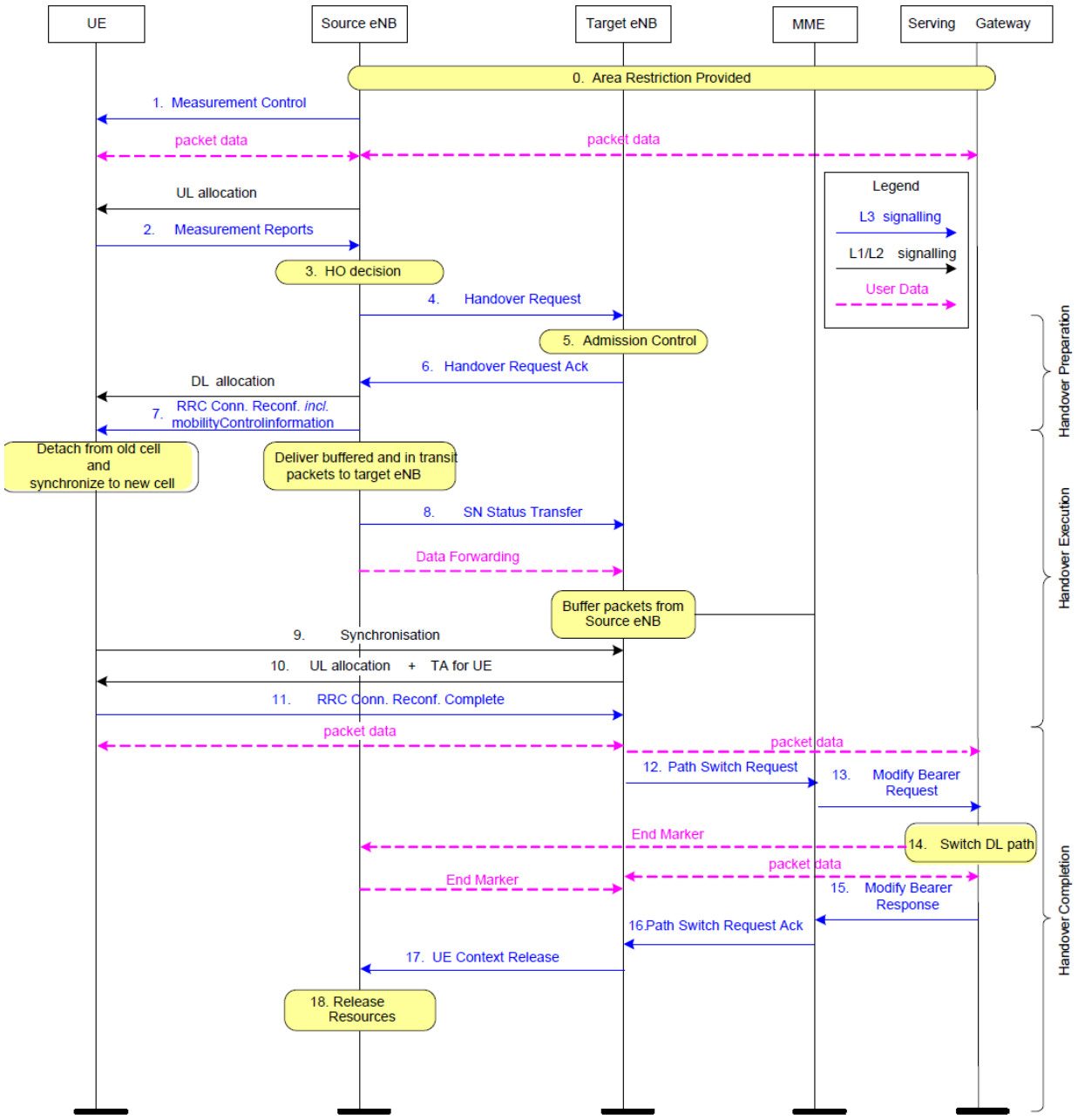
653. To the extent it is argued that such a feature is not obvious in view of *Han*, it would have been obvious to a person of ordinary skill in the art to combine the teachings of *Han* with *TS 36.300*, which explicitly discloses a source base station deciding whether to perform a handover prior to transmitting a handover request message to a target base station.

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654. *TS 36.300* provides an overview of "Mobility Management" procedures, including "Mobility Support for UEs" and "necessary steps" for "[h]andover procedures." (Ex. 1024, 90). *TS 36.300* depicts a "basic handover scenario" in Figure 10.1.2.1.1-1, and provides details regarding the scenario. (Ex. 1024, 91-92; Figure 10.1.2.1.1-1).

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Ex. 1024, Figure 10.1.2.1.1-1



655. *TS 36.300* provides a "more detailed description" of the above scenario, including that, in step 2 ("2. Measurement Reports" in Figure 10.1.2.1.1-1), a "MEASUREMENT REPORT is triggered and sent to the eNB, and then, in step 3

("***3. HO Decision***" in Figure 10.1.2.1.1-1), "[t]he source eNB makes ***[a] decision based on MEASUREMENT REPORT and RRM information to hand off the UE***." (Ex. 1024, 92-93; Figure 10.1.2.1.1-1) (emphasis added). *TS 36.300* defines "HO" to be "handover." (Ex. 1024, 22).

656. It would have been obvious to a person of ordinary skill in the art to combine the teachings of *Han* and *TS 36.300* to provide the system of *Han* with details regarding standard handover procedures, as disclosed in *TS 36.300*, in order to maintain "[l]oad balancing" with handover. (*see* Ex. 1024, 89). That is, the person of ordinary skill in the art would have known to consult standard documentation to understand the basics of handover procedures. A person of ordinary skill in the art would have had a reasonable expectation of success in the combination of *Han* and *TS 36.300* based on the explicit teachings of the references, the knowledge of the person of ordinary skill in the art (*see* § VI *supra*), and recognizing that both *Han* and *TS 36.300* relate to LTE systems. (Ex. 1015, 24; Ex. 1017, 29; Ex. 1024, 83, 121).

657. The person of ordinary skill in the art would have had a reasonable expectation of success in the combination because the handover-related messages disclosed in *Han* and *TS 36.300* were similar messages directed to similar goals, with different details. As explained in the section herein titled *Motivation to Combine Han and TS 36.300*, a person of ordinary skill in the art would have made such an

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improvement or modification in order to ensure backwards compatibility (and would also lead to the efficiency-related benefits explained above).

658. It would have further been obvious to the person of ordinary skill in the art to combine *Han* and *TS 36.300* for at least the reasons espoused in the section herein titled *Motivation to Combine Han and TS 36.300*.

659. Thus, *Han* renders obvious claim element [13.a]. Further, *Han* and *TS 36.300* render obvious claim element [13.a].

Claim 13, Element [13.b1]: a transmitter configured to transmit a handover request message when it is decided to perform the handover,

660. *Han* renders obvious claim element [13.b1].

661. The ’631 patent describes that a “base station 500 may include a receiver 530 receiving network slice request information” and a “transmitter 520 transmitting the network slice request information.” (Ex. 1001, 21:65-66, 22:20-21). Accordingly, a person of ordinary skill in the art would have understood that the claimed “transmitter” was part of a base station.

662. The ’631 patent defines a “base station” as “generally refer[ring] to a station communicating with the UE.” (Ex. 1001, 3:61-62). The ’631 patent provides examples of base stations, including “all of various communication service areas and devices, such as a Node-B, an evolved Node-B (eNB), a gNode-B (gNB), a low power node (LPN), a sector, a site, various types of antennas, a base transceiver system (BTS), an access point, a point (e.g., a transmitting point, a receiving point,

or a transceiving point), a relay node, a megacell, a macrocell, a microcell, a picocell, a femtocell, a remote radio head (RRH), a radio unit (RU), and a small cell." (Ex. 1001, 3:62-4:4). Accordingly, a person of ordinary skill in the art would have understood that the claimed "transmitter" was part of a base station, and an example of the base station was an evolved Node-B (eNB), which *Han* discloses.

663. With reference to FIG. 3, *Han* discloses that a "access network device 140" or base station "includes a processor 31, a transceiver 32, and a memory 33," where "transceiver 32 includes a receiver Rx and a transmitter Tx." (Ex. 1015, 27; Ex. 1017, 33). *Han* discloses that the "transceiver 32 may be further implemented as a communication chip" that "may include a receiving module," and "a transmitting module." *Id.*

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Ex. 1015, FIG. 3 (annotated) (Ex. 1017, FIG. 3)

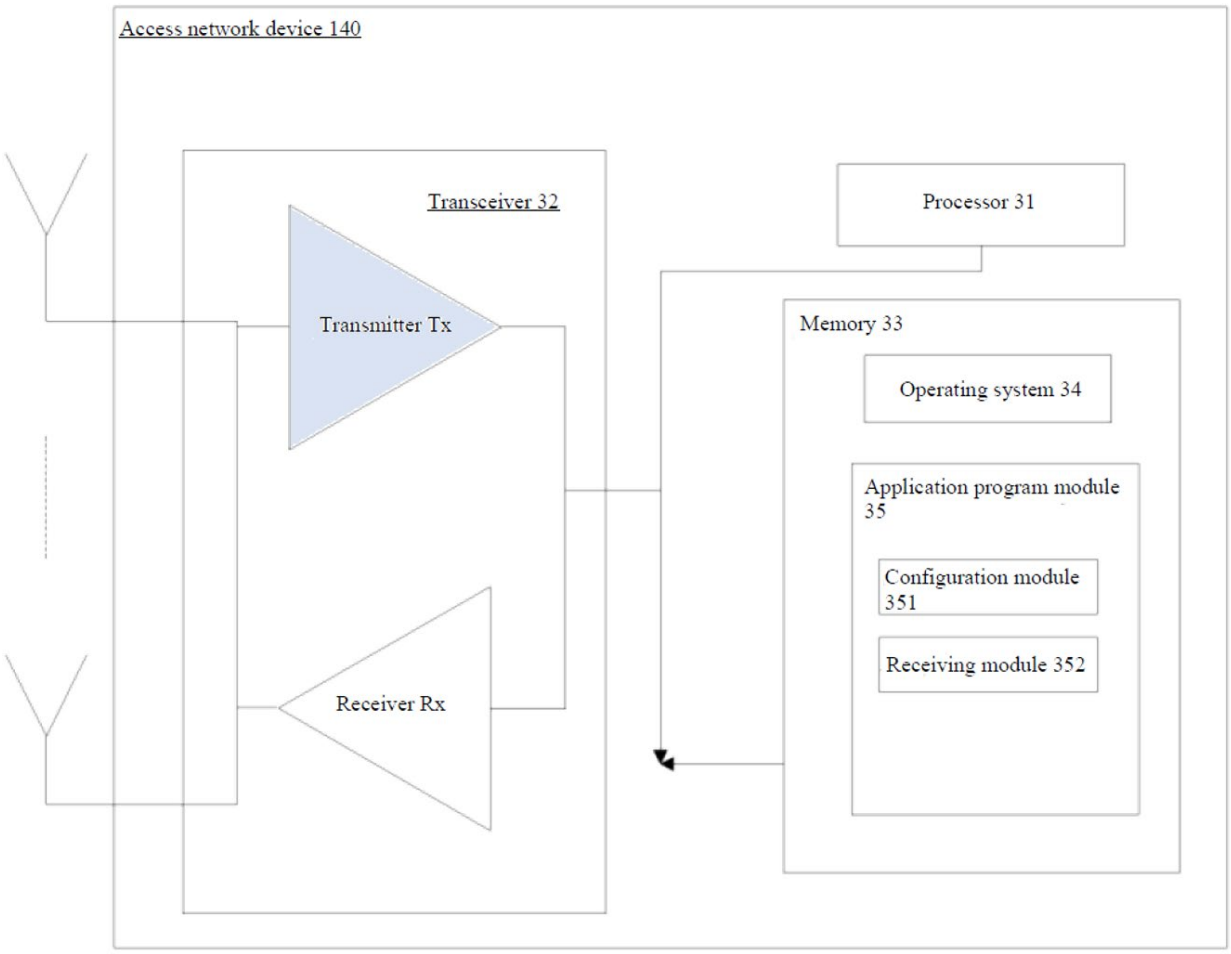


FIG. 3

664. *Han* discloses a "communication method" in which a "radio resource is configured based on pre-authorized QoS information in a handover process." (Ex. 1015, 44; Ex. 1017, 50).

665. *Han* discloses, with reference to step "S601" in FIG. 6 (reproduced below), a "second access network device" or "source-side" "base station" "send[ing] a handover request message to a first access network device" or "target-side" "base

station." (Ex. 1015, 44; Ex. 1017, 50). That is, *Han* discloses step "S601" is part of a "handover process." *Id.*

Ex. 1015, FIG. 6 (annotated) (Ex. 1017, FIG. 6)

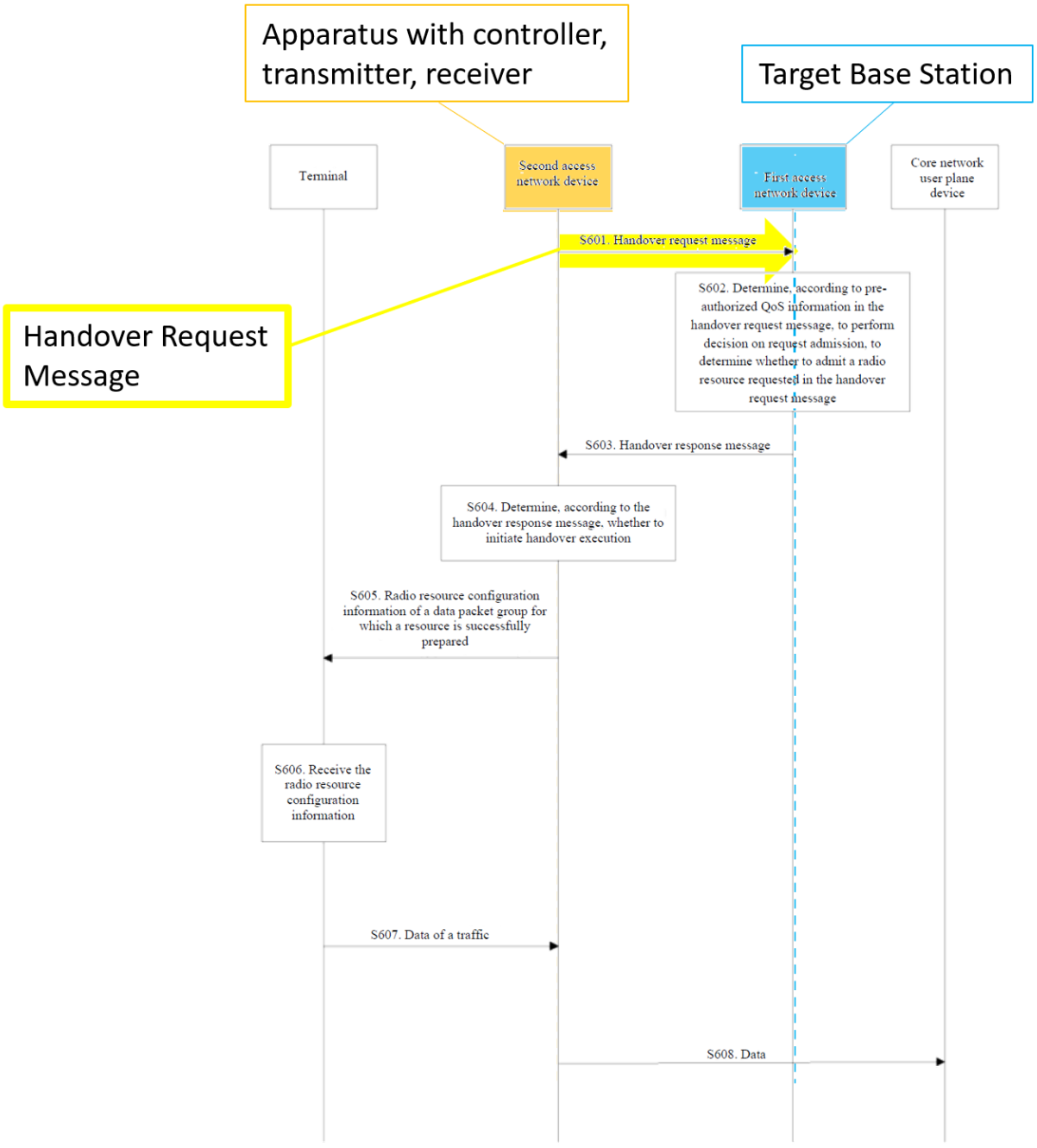


FIG. 6

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666. Thus, *Han* renders obvious claim element [13.b1].

Claim 13, Element [13.b2]: wherein the handover request message includes network slice information; and

667. *Han* renders obvious claim element [13.b2].

668. *Han* discloses that the "handover request message includes pre-authorized QoS information." (Ex. 1015, 44; Ex. 1017, 51). *Han* further discloses that the "pre-authorized QoS information in the handover request message may include a part or all of [] second pre-authorized QoS information," where "the second pre-authorized QoS information" "may explicitly or implicitly include the PDU session information." (Ex. 1015, 42; Ex. 1017, 49). *Han* discloses that "the quality of service information further comprises at least one of PDU session information and identification information of network slice of the traffic." (Ex. 1015, 20; Ex. 1017, 7). *Han* discloses that "identification information of the slice includes at least one of the following: a slice ID, a slice type, a tenant type, a tenant identifier, a network function identifier, and the like." (Ex. 1015, 31; Ex. 1017, 57). That is, *Han* discloses that the "handover request message" includes "QoS [quality of service] information," that "quality of service information" comprises "PDU session information," and "identification information of network slice of the traffic," where "identification information of the slice includes at least one of the following: a slice ID, a slice type, a tenant type, a tenant identifier, a network function identifier, and the like." (Ex. 1015, 31; Ex. 1017, 57).

669. The ’631 patent discloses that “network slice request information may include specific network slice information configured for [a] UE.” (Ex. 1001, 11:26-37). The “network slice information may include information on at least one of network slice configured for the UE, ***information for identifying a network slice service/PDU session/bearer associated with the corresponding network slice information***, and information on a priority of the corresponding network slice.” *Id.* In view of the explicit disclosure of “identification information of the slice includes at least one of the following: a slice ID, a slice type, a tenant type, a tenant identifier, a network function identifier, and the like” being included in the handover request message of *Han*, a person of ordinary skill in the art would have understood or found it obvious, consistent with the disclosure of the ’631 patent, that the handover request message of *Han* included network slice information. Thus, *Han* renders obvious claim element [13.b2].

Claim 13, Element [13.c1]: a receiver configured to receive a handover request confirmation message in response to the handover request message,

670. *Han* renders obvious claim element [13.c1].

671. The ’631 patent describes that a “base station 500 may include a receiver 530 receiving network slice request information” and a “transmitter 520 transmitting the network slice request information.” (Ex. 1001, 21:65-66, 22:20-21).

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Accordingly, a person of ordinary skill in the art would have understood that the claimed "receiver" was part of a base station.

672. The '631 patent defines a "base station" as "generally refer[ring] to a station communicating with the UE." (Ex. 1001, 3:61-62). The '631 patent provides examples of base stations, including "all of various communication service areas and devices, such as a Node-B, an evolved Node-B (eNB), a gNode-B (gNB), a low power node (LPN), a sector, a site, various types of antennas, a base transceiver system (BTS), an access point, a point (e.g., a transmitting point, a receiving point, or a transceiving point), a relay node, a megacell, a macrocell, a microcell, a picocell, a femtocell, a remote radio head (RRH), a radio unit (RU), and a small cell." (Ex. 1001, 3:62-4:4). Accordingly, a person of ordinary skill in the art would have understood that the claimed "receiver" was part of a base station, and that an example of a base station was an evolved Node-B (eNB), which *Han* discloses.

673. With reference to FIG. 3, *Han* discloses that a "access network device 140" or base station "includes a processor 31, a transceiver 32, and a memory 33," where "transceiver 32 includes a receiver Rx and a transmitter Tx." (Ex. 1015, 27; Ex. 1017, 33). *Han* discloses that the "transceiver 32 may be further implemented as a communication chip" that "may include a receiving module," and "a transmitting module." *Id.*

Ex. 1015, FIG. 3 (annotated) (Ex. 1017, FIG. 3)

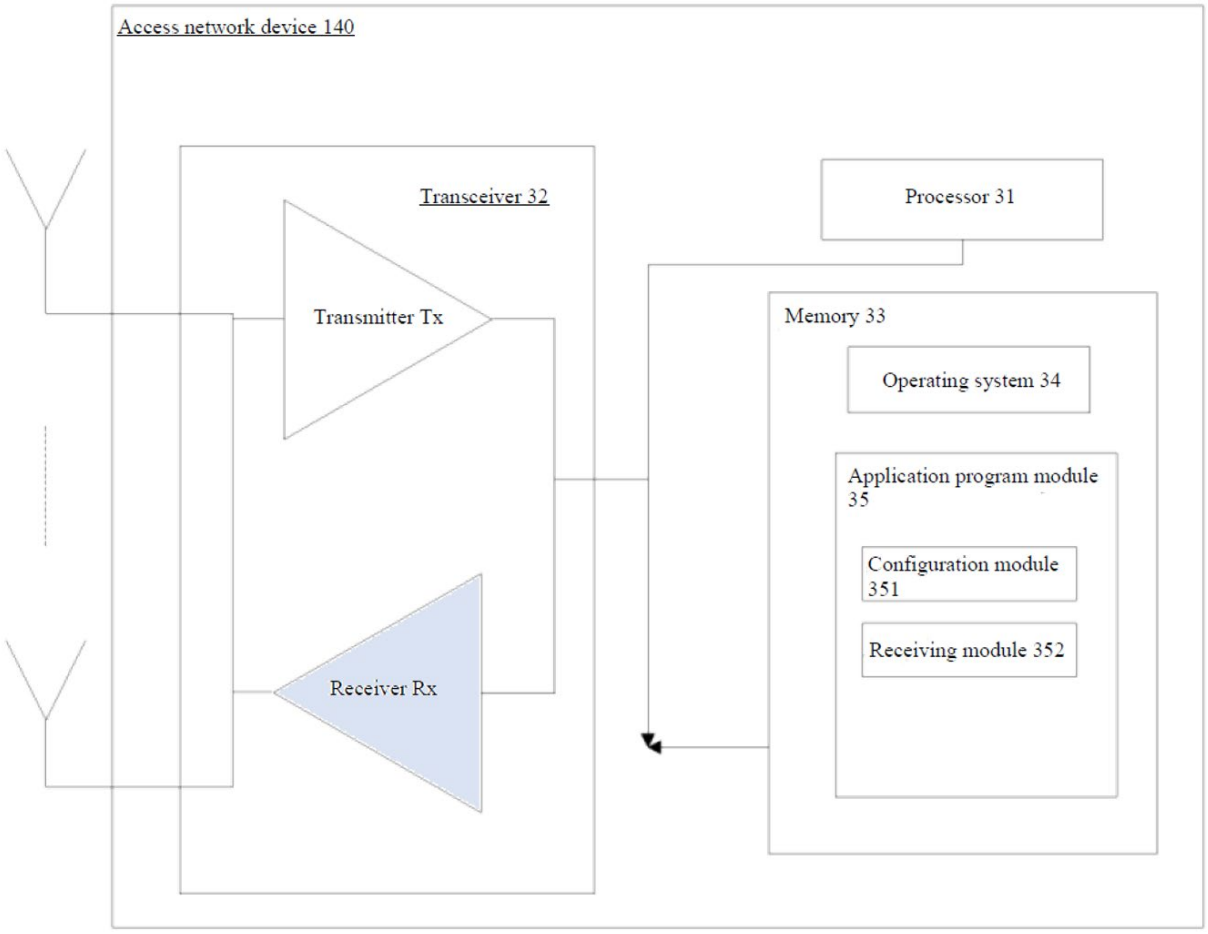


FIG. 3

674. *Han* discloses, with reference to step "S602" of FIG. 6, that "[t]he first [target-side] access network device receives the handover request message, and determines, according to pre-authorized QoS information in the handover request message, to perform judgment on request admission, to determine whether to admit a radio resource requested in the handover request message." (Ex. 1015, 46; Ex. 1017, 52-53). *Han* explains that "[a]dmitting the radio resource requested in the handover request message refers to configuring the radio resource for the terminal

according to the radio resource requested in the handover request message." (Ex. 1015, 46; Ex. 1017, 52).

675. *Han* discloses, with reference to step "S603" of FIG. 6, that "[t]he first [target-side] access network device" or "target-side" "base station" "sends a handover response message to the second [source-side] access network device" or "source-side" "base station," where "the handover response message may be a handover preparation failure message or a handover preparation success message." (Ex. 1015, 47; Ex. 1017, 53).

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Ex. 1015, FIG. 6 (annotated; Ex. 1017, FIG. 6)

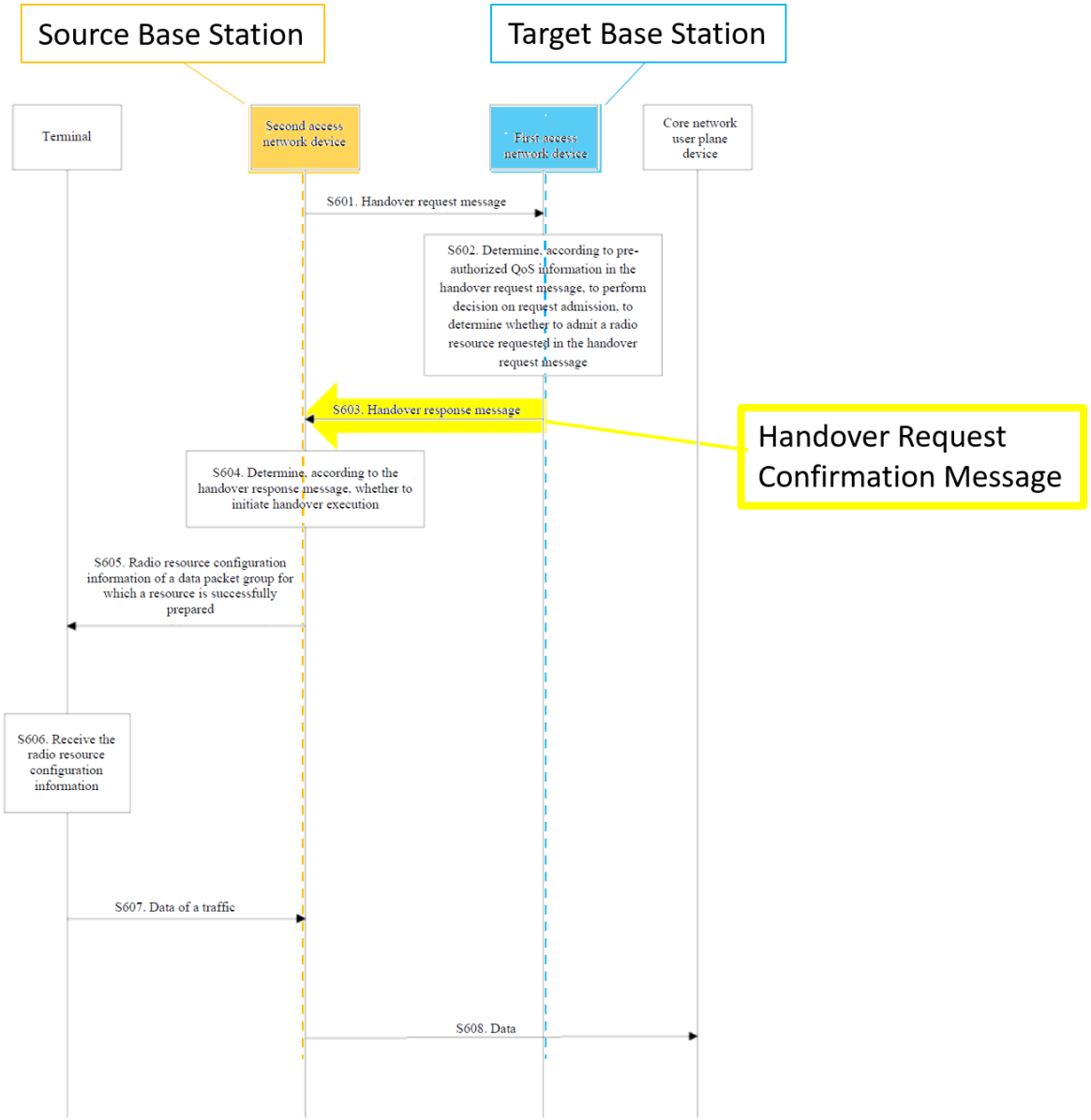


FIG. 6

676. That is, *Han* discloses a "target-side" "base station" "send[ing] a handover response message to the second [source-side] access network device" or

"source-side" "base station," after or in response to "[t]he first [target-side] access network device" or "target-side" "base station" having "receive[d] the handover request message, and determin[ing], according to pre-authorized QoS information in the handover request message, to perform judgment on request admission, to determine whether to admit a radio resource requested in the handover request message." (Ex. 1015, 46; Ex. 1017, 52).

677. The '631 patent does not provide an explicit definition nor explanation of a "handover request confirmation message." Indeed, the phrase "handover request confirmation message" only appears in the independent claims of the '631 patent and not in the specification nor the figures.

678. To the extent it is argued that *Han* does not explicitly refer to the "handover response message" as a "handover request confirmation message," a person of ordinary skill in the art would have understood that *Han's* handover response message included a "request confirmation" in view of *Han's* explicit disclosure that "the handover response message may be a handover preparation failure message or a handover preparation success message." (Ex. 1015, 47; Ex. 1017, 53). The person of ordinary skill in the art would have had such an understanding because the person of ordinary skill in the art would have understood that a "handover preparation" "failure message" or a "success message" would have provided "confirmation" of "handover preparation," whether (1) successful or (2) a

failure, to the "source-side" "base station." Moreover, the person of ordinary skill in the art would have understood or found it obvious that the "handover response message" of *Han* included a "request confirmation" in view of the explicit disclosure in *Han* that the "handover response message" may be a "handover preparation success message." (Ex. 1015, 47; Ex. 1017, 53).

679. Thus, *Han* renders obvious claim element [13.c1].

Claim 13, Element [13.c2]: wherein, if one or more protocol data unit (PDU) sessions are associated with one or more network slices that are not supported by a target BS, the handover request confirmation message includes information for indicating a rejection of the one or more PDU sessions by the target BS.

680. *Han* renders obvious claim element [13.c2].

681. Established above, *Han* discloses that a "access network device" may be "a base station," (*see* Ex. 1015, 24; Ex. 1017, 30), and that "the first access network device may also be referred to as a target-side access network device." (Ex. 1015, 44; Ex. 1017, 50). Accordingly, a person of ordinary skill in the art would have understood that *Han* discloses a "target-side" "base station."

682. *Han* discloses, with reference to step "S601" in FIG. 6, that a "second access network device" or "source-side" "base station" "sends a handover request message to a first access network device" or "target-side" "base station." (Ex. 1015, 44; Ex. 1017, 50-51).

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683. *Han* discloses that the "handover request message includes pre-authorized QoS information." (Ex. 1015, 44) (*see* Ex. 1017, 50-51). *Han* further discloses that the "pre-authorized QoS information in the handover request message may include a part or all of [] second pre-authorized QoS information," where "the second pre-authorized QoS information" "may explicitly or implicitly include the PDU session information." (Ex. 1015, 42; Ex. 1017, 49). *Han* discloses that "the quality of service information further comprises at least one of PDU session information and identification information of network slice of the traffic." (Ex. 1015, 20; Ex. 1017, 7). *Han* discloses that "identification information of the slice includes at least one of the following: a slice ID, a slice type, a tenant type, a tenant identifier, a network function identifier, and the like." (Ex. 1015, 31; Ex. 1017, 57). That is, *Han* discloses that the "handover request message" includes "QoS [quality of service] information," that "quality of service information" comprises "PDU session information," and "identification information of network slice of the traffic," where "identification information of the slice includes at least one of the following: a slice ID, a slice type, a tenant type, a tenant identifier, a network function identifier, and the like." (Ex. 1015, 31; Ex. 1017, 57). That is, a person of ordinary skill in the art would have understood that *Han* discloses that the "handover request message" includes quality of service information, and that the quality of service information includes network slice information associated with PDU sessions.

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684. *Han* discloses, with reference to step "S603" of FIG. 6, that "[t]he first [target-side] access network device" or "target-side" "base station" "sends a handover response message," where "the handover response message may be a handover preparation failure message or a handover preparation success message." (Ex. 1015, 47; Ex. 1017, 53).

685. *Han* discloses that, "when determining that none of resources requested in the handover request message is admitted, the first [target-side] access network device sends the handover preparation failure message," where "the handover preparation failure message is used to indicate that none of the resources requested in the handover request message is admitted," or, "when determining that all or some resources requested in the handover request message are admitted, the first [target-side] access network device sends a handover preparation success message." (Ex. 1015, 47; Ex. 1017, 53). That "some of the resources requested in the handover request message are not admitted may include that some data packet groups in the pre-authorized QoS information for which radio bearers need to be pre-established are not admitted by the first [target-side] access network device." *Id. Han* explains that "[a]dmitting the radio resource requested in the handover request message refers to configuring the radio resource for the terminal according to the radio resource requested in the handover request message." (Ex. 1015, 46; Ex. 1017, 50-53).

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686. *Han* discloses that the "handover preparation failure message may further carry a handover failure cause," where a "failure cause may be provided for each data packet group of the handover request." (Ex. 1015, 47; Ex. 1017, 53-54). A "failure cause" may include: "there is no available radio resource, pre-establishment of a radio bearer with pre-authorized QoS is not supported, a QoS parameter is not supported, a geographic area is not supported, and the like." *Id.* That is, *Han* discloses that the "handover preparation failure message" includes a "handover failure cause" "for each data packet group of the handover request," where a "failure cause" for a "data packet group" (i.e., part of a PDU session) may include that a "radio bearer with [the] pre-authorized QoS," or network slice information associated with a PDU session, "is not supported." *Id.*

687. A person of ordinary skill in the art would have understood that *Han* discloses that the target-side access network device does not admit a requested resource that was part of the quality of service information sent by the source-side access network device and, because *Han* explicitly discloses that the quality of service information includes network slice information associated with PDU sessions, *Han* discloses that the target-side access network device does not admit one or more PDU sessions. To be clear, the person of ordinary skill in the art would have understood or found it obvious that Han's "handover preparation failure message" (or handover request confirmation message) included a "handover failure

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cause" (or information) for indicating rejection of one or more PDU data sessions (i.e., a data packet group of *Han* which is part of a PDU session in *Han*), when the one or more PDU data sessions (PDU sessions are part of the QoS information) are not supported by a target base station.

688. Thus, *Han* renders obvious claim element [13.c2].

D. Ground 4: *Han*, *TS 36.300*, and *TR 38.801* Render Obvious Claims 2-6, 8-12, and 14-18 of the '631 patent.

689. *Han*, *TS 36.300*, and *TR 38.801* render obvious claims 2-6, 8-12, and 14-18 of the '631 patent.

Motivation to Combine *Han*, *TS 36.300*, and *TR 38.801*

690. There are numerous reasons why a person of ordinary skill in the art would have been specifically motivated to combine *Han*, *TS 36.300*, and *TR 38.801*.

691. First, each of *Han*, *TS 36.300*, and *TR 38.801* generally relates to the field of radio access technology or network communications. (*see* Ex. 1015, 3, 24; Ex. 1017, 10, 29; Ex. 1024, 1, 16; Ex. 1013, Cover, 6). These references, like the '631 patent, are directed to technology for "providing services using network slicing to moving user equipments without interruption." (Ex. 1001, 1:20-24). *Han* is directed to "a communication method, an apparatus, a system, a terminal, and an access network device." (Ex. 1015, 3; Ex. 1017, 10). *Han* discloses the use of "quality of service" or "QoS" mechanisms in "existing long term evolution" or "LTE" systems to "ensure quality of service." (Ex. 1015, 3; Ex. 1017, 10). *Han*

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explains that, in the QoS mechanism, "when a terminal initiates a traffic whose the [sic] QoS needs to be ensured, a dedicated bearer needs to be established for the terminal" "to transmit data of the traffic." (Ex. 1015, 3; Ex. 1017, 10). *TS 36.300* provides the standard details for supporting terminal or UE handover in order to maintain UE mobility (i.e., providing services to moving UEs without interruption), including an overview of "Mobility Management" procedures, including "Mobility Support for UEs" and "necessary steps" for "[h]andover procedures." (Ex. 1024, 90). *TR 38.801* discloses "Network Slicing" as "a new concept to allow differentiated treatment depending on each customer [sic] requirements." (Ex. 1016, 23). *TR 38.801* explains that, "[w]ith slicing, it is now possible for Mobile Network Operators (MNO) to consider customers as belonging to different tenant types with each having different service requirements that govern in terms of what slice types each tenant is eligible to use based on Service Level Agreements (SLA) and subscriptions." *Id.*

692. *Han* both identifies and provides a solution to the problem to be solved by the '631 patent (e.g., "mobility guarantee of the user equipment and transmission/reception procedures of data in case the network slicing technology is employed," and "a specific procedure for service continuity and service stability." (*see* Ex. 1001, 1:51-55)), by providing a "handover process" in which a "radio resource is configured based on pre-authorized QoS information." (Ex. 1015, 44;

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Ex. 1017, 50). *Han*'s process ensures "mobility performance of [a] terminal" when the terminal "is handed over between access network devices in a radio access network." (Ex. 1015, 49; Ex. 1017, 55).

693. Similarly, *TS 36.300* both identifies and provides a solution to the problem to be solved by the '631 patent (i.e., mobility guarantee of moving UEs), by providing an overview of "Mobility Management" procedures, including "Mobility Support for UEs" and "necessary steps" for "[h]andover procedures." (Ex. 1024, 90).

694. Likewise, *TR 38.801* both identifies and provides a solution to the problem to be solved by the '631 patent (e.g., "mobility guarantee of the user equipment and transmission/reception procedures of data in case the network slicing technology is employed," and "a specific procedure for service continuity and service stability." (*see* Ex. 1001, 1:51-55)). *TR 38.801* identifies the problem to be solved by the '631 patent by explaining key principles for supporting network slicing. (Ex. 1013, 23).

695. *TR 38.801* provides a solution to the problem to be solved by the '631 patent by providing "support of Network Slicing in RAN" (a "Radio Access Network"). (Ex. 1013, 23). *TR 38.801* discloses realizing "Network Slice selection" by either "configur[ing] the UE with a list of slice IDs to which it is allowed to

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access," or "let[ting] the CN notify the UE of the Slice IDs it can access and let the UE rely on such information onwards." (Ex. 1013, 26).

696. In view of the explicit teaching in *Han* of configuring a radio resource during a handover process based on pre-authorized QoS information, and a desire to ensure "mobility performance of [a] terminal" during handover, a person of ordinary skill in the art would have turned to *TS 36.*300, which expressly discloses implementation details for configuring required resources according to received QoS information during handover to understand how the standard described such processes. (*see* Ex. 1024, 93). A person of ordinary skill in the art would have further looked to *TR 38.801*, which expressly discloses multiple options for realizing network slice selection, for additional mechanisms by which mobility performance of terminals can be ensured during handovers across different registration areas.

697. A person of ordinary skill in the art would have combined these references to provide the system of *Han* with details regarding standard handover procedures, as disclosed in *TS 36.300*, in order to maintain "[l]oad balancing" with handover (*see* Ex. 1024, 89), and to provide the system of *Han* with the additional option of using a core network node to notify a terminal of slice IDs it can access, as disclosed in *TR 38.801*, to enable differentiated handling of traffic for different network slices, selection of network slice by a slice ID provided by the UE, support for resource management and resource isolation between slices, and QoS

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differentiation within a slice (Ex. 1013, 28).

698. Moreover, a person of ordinary skill in the art would have had a reasonable expectation of success in the combination of *Han*, *TS 36.300*, and *TR 38.801* based on the explicit teachings of the references, the knowledge of the person of ordinary skill in the art (*see* § VI *supra*), and recognizing that all three of *Han*, *TS 36.300*, and *TR 38.801* relate to LTE systems. (Ex. 1015, 24; Ex. 1017, 29; Ex. 1024, 83, 121; Ex. 1013, 7-11).

699. A person of ordinary skill in the art would have been motivated to utilize the handover procedure-related disclosure of *TS 36.300* for details regarding how to implement UE handover such that configuring required resources are configured according to received QoS information during handover, and to utilize one of the multiple implementations of *TR 38.801* for details regarding how to convey required network slice information from a UE to a base station in *Han* to "enable[] support of multiple slices simultaneously supported by a UE" (*see* Ex. 1013, 24), and/or to enable differentiated handling of traffic for different network slices, selection of network slice by a slice ID provided by the UE, support for resource management and resource isolation between slices, and QoS differentiation within a slice, as is taught by *TR 38.801* (Ex. 1013, 28).

700. The person of ordinary skill in the art would have had a reasonable expectation of success in the combination because the handover-related messages

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disclosed in *Han*, *TS 36.300*, and *TR 38.801* were similar messages directed to similar goals, with different details. The person of ordinary skill in the art would have also had a reasonable expectation of success in the combination because the person of ordinary skill in the art would have been well aware that the RRC sublayer was available for communication of NAS messages from a UE to a core network via a base station (*see* § VI *supra*), as also taught by *TR 38.801*.

701. Moreover, the person of ordinary skill in the art would have understood that the terminal or user equipment of *Han*, the UE of *TS 36.300*, and the UE of *TR 38.801* are similar devices with similar communication capabilities. The person of ordinary skill in the art would have further recognized that the ability to convey network slice information from a UE to an eNB via an NAS message, using the RRC sublayer, was an improvement to the UE of *TR 38.801* because such capability enabled the use of a single message to convey information to an eNB that the eNB needed for both (1) slice awareness and (2) for communicating to a selected core network node.

702. It would have been obvious to a person of ordinary skill in the art that *Han*'s NAS message could have been encapsulated in an RRC message at least in view of the teachings of *TR 38.801* and the knowledge of the person of ordinary skill in the art that the RRC sublayer was available for communication of NAS messages (*see* § VI *supra*), as also taught by *TR 38.801*. This knowledge of the person of

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ordinary skill in the art that the RRC sublayer was available for communication of NAS messages, also during handover, would also have provided the person of ordinary skill in the art with a reasonable expectation of success in combining *Han*, *TS 36.300*, and *TR 38.801*.

703. For at least the reasons outlined above in this section entitled *Motivation to Combine Han, TS 36.300, and TR 38.801*, and those discussed further below, it is my opinion that a person of ordinary skill in the art would have been motivated to combine the teachings of *Han, TS 36.300,* and *TR 38.801*.

Dependent Claim 2: The method according to claim 1, further comprising: receiving, by the source BS and from a user equipment (UE), a non-access stratum (NAS) message including network slice request information.

704. *Han*, *TS 36.300*, and *TR 38.801* render obvious claim 2. As set forth above, *Han* and *TS 36.300* render obvious all of the elements of claim 1. *See* § IX.C, *supra*.

705. *Han*, *TS 36.300*, and *TR 38.801* render obvious the remaining elements of claim 2.

706. The ’631 patent states that the “UE may transmit the network slice request information to the base station,” where “the network slice request information may be included in a radio resource control (RRC) connection setup message,” or, “[a]lternatively, the network slice request information may be

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included in a non-access stratum (NAS) message included in the RRC connection setup message." (Ex. 1001, 12:59-67; *see also* 11:19-25, 22:48-51).

707. *Han* discloses "receiving, by [an] access network device, an access stratum AS message sent by [a] terminal," or "user equipment,"[38] "where the AS message includes a non-access stratum protocol data unit" or "NAS PDU," and the data packet for which no QoS parameter has been configured is carried in the NAS PDU." (Ex. 1015, 15; Ex. 1017, 23). That is, *Han* discloses the terminal (a user equipment (UE)) sending a message to the access network device (the source BS), where the message includes a non-access stratum protocol data unit. *Id.*

708. *Han* further discloses a non-access stratum (NAS) message that includes network slice request information. (*see, e.g.,* Ex. 1015, 28-31; Ex. 1017, 36-38). For example, *Han* discloses "the core network control plane device sends the first [pre-]authorized QoS information to the terminal by means of a non-access stratum (NAS for short) message" (*see* Ex. 1015, 28; Ex. 1017, 36), where "the first pre-authorized QoS information may further include" "identification information of a network slice of a data packet group," and "data packet groups" are part of a "PDU session." (Ex. 1015, 29-31; Ex. 1017, 37).

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[38] *Han* describes that the "terminal" may be referred to as a "user equipment." (Ex. 1015, 24; Ex. 1017, 29-30).

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709. *TR 21.905*[39], referenced by *TR 38.801*, defines "Access Stratum" as "functional grouping consisting of the parts in the infrastructure and in the user equipment and the protocols between these parts being specific to the access technique (i.e. the way the specific physical media between the User Equipment and the Infrastructure is used to carry information)" (*see* Ex. 1018, 7), and "Non-Access Stratum" as "[p]rotocols between UE and the core network that are not terminated in the UTRAN" (*see* Ex. 1018, 21) or "Universal Terrestrial Radio Access Network." (Ex. 1018, 6). *TR 21.905* defines a "[r]adio access bearer" as a "service that the access stratum provides to the non-access stratum for transfer of user data between User Equipment and CN" (*see* Ex. 1018, 24) or "Core Network." (Ex. 1018, 38).

710. *TR 38.801* discloses a user equipment or UE sending an "RRC connection request" to a "gNB" or base station[40] (Ex. 1013, 24-26). *TR 38.801* also

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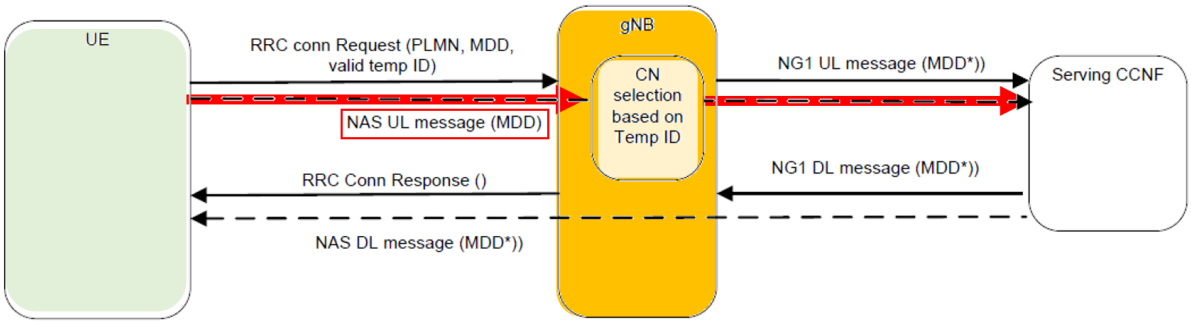
[39] *TR 21.905* is not part the grounds, but it is specifically referenced by *TR 38.801* and referenced here to demonstrate the knowledge of the person of ordinary skill in the art reviewing *TR 38.801*.

[40] The '631 patent provides examples of base stations, including "a gNode-B (gNB)." (Ex. 1001, 3:62-4:4).

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discloses a user equipment or UE sending a non-access stratum or NAS uplink or UL message. (Ex. 1013, 24-26). *TR 38.801* discloses a "Selection case 4" in which a "UE" transmits a "NAS UL" or non-access stratum uplink message containing "MDD," or a "Multi-Dimensional Descriptor." (Ex. 1013, 24-25). Selection case 4 is reproduced and annotated below.

Ex. 1013, 25 (annotated)



711. *TR 38.801* discloses that the "MDD" is used "for RAN slice awareness (slice specific behavior, congestion control, resource isolation)." (Ex. 1013, 26). That is, *TR 38.801* discloses that the UE transmits an NAS message that includes network slice information (i.e., an MDD used for slice awareness) to the "Serving CCNF" by way of the "gNB" or base station. *Id.; see also* §§ VI, VIII.B *supra*. Even though the arrow associated with the "NAS UL message (MDD)" in the annotated figure above appears as though the "NAS UL message (MDD)" was sent from the UE to the Serving CCNF, a person of ordinary skill in the art would have understood

or found it obvious that the UE transmitted the NAS message to the gNB or base station (and then from the gNB to the Serving CCNF), at least in view of the knowledge of the person of ordinary skill in the art - as discussed in the Technical Background herein (§VI supra) - as well as the depicted communication in the above drawing of TR 38.801. Therefore, TR 38.801 discloses or renders obvious the source base station (gNB, orange above), from a user equipment or UE (UE, green above), a non-access stratum (NAS) message ("NAS UL message (MDD)," red above), which includes network slice request information ("MDD").

712. *TR 38.801* also discloses a user equipment or UE sending network slice information to an eNB or base station.[41] (Ex. 1013, 26-27).

[41] The '631 patent provides examples of base stations, including "an evolved Node-B (eNB), a gNode-B (gNB)." (Ex. 1001, 3:62-4:4).

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Ex. 1013, Figure 9.2.1-1 (annotated)

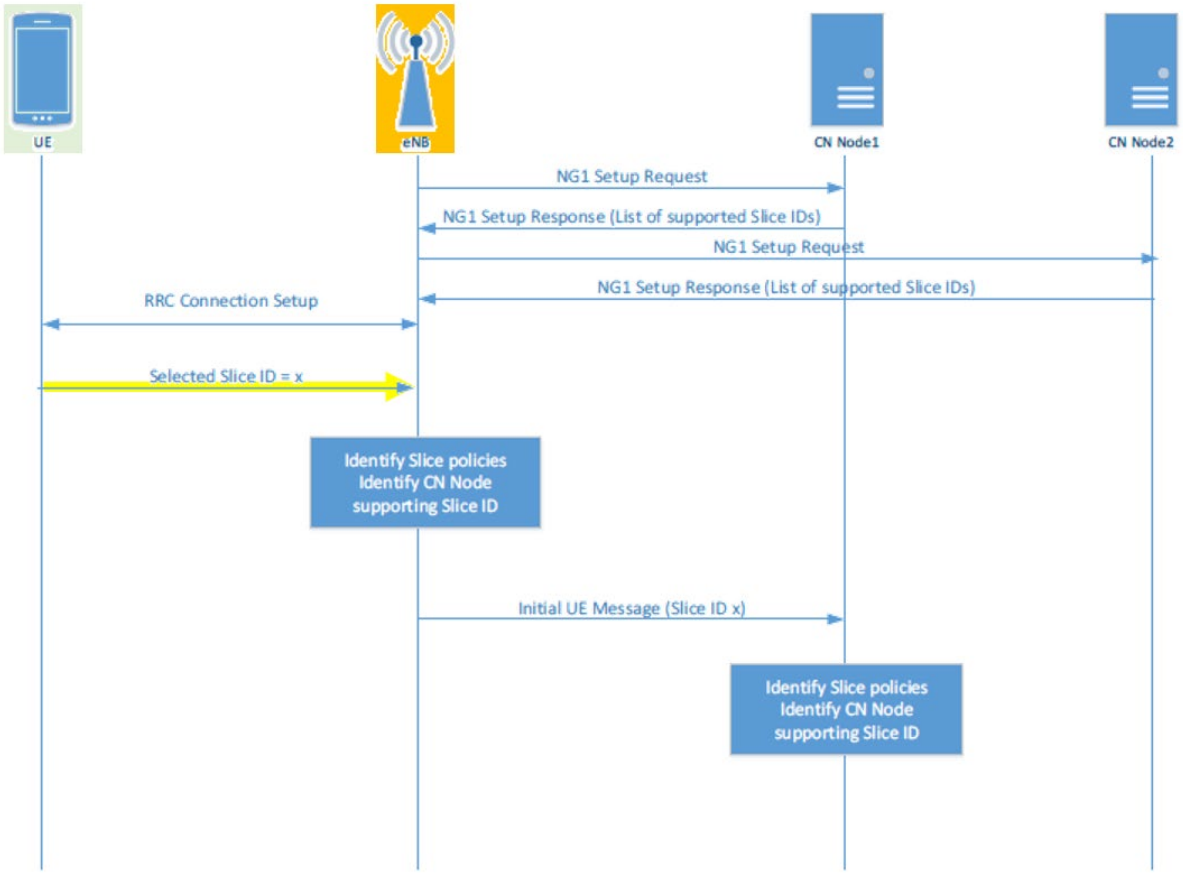


Figure 9.2.1-1: Slice selection when Slice ID is provided by the UE to RAN

713. It would have been obvious to a person of ordinary skill in the art that *Han*'s message sent by the terminal to the access network device could have been a non-access stratum message at least because *Han* explicitly describes the "message sent by the terminal" as including "a non-access stratum protocol data unit NAS PDU." (Ex. 1015, 15; Ex. 1017, 23).

714. A person of ordinary skill in the art would have been motivated to utilize one of the multiple implementations of *TR 38.801* for details regarding how

to convey required network slice information from a UE to a base station to "enable[] support of multiple slices simultaneously supported by a UE" (*see* Ex. 1013, 24), and/or to ensure "resource isolation," which *TR 38.801* describes as "enabl[ing] specialized customization" and which "avoids one slice affecting another slice." (Ex. 1013, 28).

715. The person of ordinary skill in the art would have had a reasonable expectation of success in such a combination because the person of ordinary skill in the art would have been well aware that the RRC sublayer was available for communication of NAS messages from a UE to a core network via a base station (*see* § VI *supra*), as also taught by *TR 38.801*.

716. Moreover, the person of ordinary skill in the art would have understood that the terminal or user equipment of *Han* and the UE of *TR 38.801* are similar devices with similar communication capabilities. The person of ordinary skill in the art would have further recognized that the ability to convey network slice information from a UE to an eNB via an NAS message, using the RRC sublayer, was an improvement to the UE of *TR 38.801* because such capability enabled the use of a single message to convey information to an eNB that the eNB needed for both (1) slice awareness and (2) for communicating to a selected core network node.

717. Thus, *Han*, *TS 36.300*, and *TR 38.801* render obvious claim 2.

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Dependent Claim 3: The method according to claim 2, further comprising: receiving, by the source BS and from a core network entity, the network slice information, wherein the network slice information is configured by the network slice request information.

718. *Han*, *TS 36.300*, and *TR 38.801* render obvious claim 3. As set forth above, *Han*, *TS 36.300*, and *TR 38.801* render obvious all of the elements of claim 2. *See* § IX.D.2 *supra*.

719. *Han*, *TS 36.300*, and *TR 38.801* render obvious the remaining elements of claim 3.

720. The "network slice request information" of [3.a] appears to refer back to the "network slice request information" of [2.a] that was received by the base station from the user equipment.

721. The '631 patent describes a "base station" "receiv[ing] the specific network slice information that is configured based on the network slice information from the core network entity" "[a]fter the base station has transmitted the network slice request information to the core network entity." (Ex. 1001, 11:49-60).

722. *Han* discloses that a "core network control plane device sends first pre-authorized QoS information to a terminal, and sends second pre-authorized QoS information to a first access network device." (Ex. 1015, 28; FIG. 5; Ex. 1017, 36, FIG. 5). *Han* discloses that the "second pre-authorized QoS information may include content of [] first pre-authorized QoS information," where "the first pre-authorized

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QoS information may further include" "identification information of a network slice of a data packet group." (Ex. 1015, 31-33; Ex. 1017, 37).

Ex. 1015, FIG. 5 (annotated) (Ex. 1017, FIG. 5)

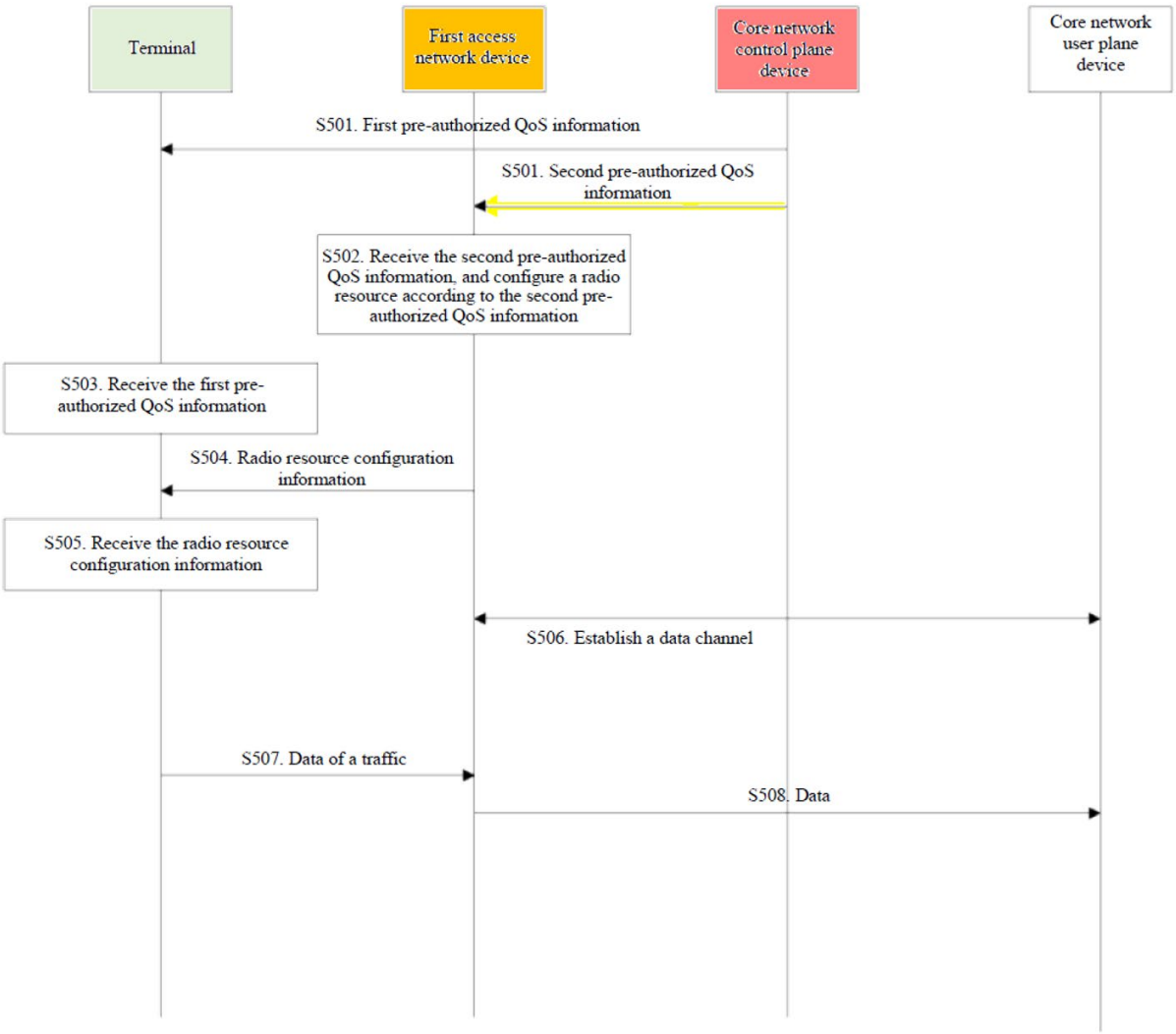


FIG. 5

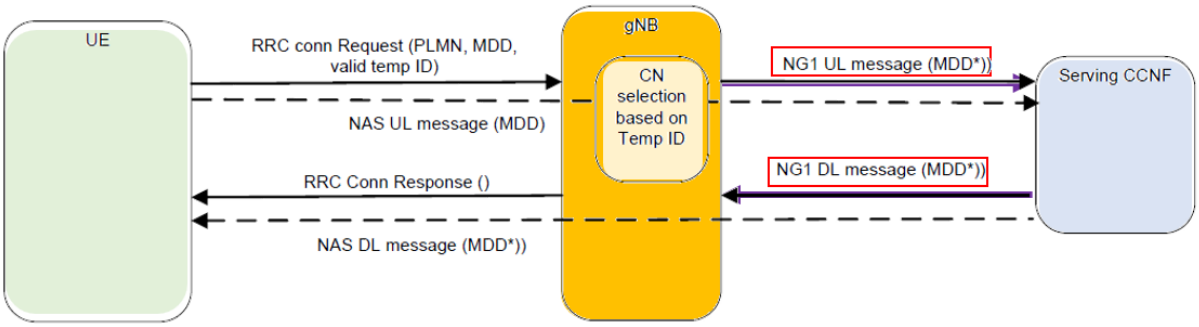
723. *Han* discloses "[t]he first QoS information includes at least one of first pre-authorized QoS information and reflective characteristic information, and the

reflective characteristic information includes a downlink QoS parameter of the traffic and indication information that is used to indicate a capability of obtaining an uplink QoS parameter based on the downlink QoS parameter of the traffic," and "the pre-authorized QoS information (including the first pre-authorized QoS information and second pre-authorized QoS information in the following specification) is proactively ***configured by the core network control plane device*** for the terminal based on subscription information of the terminal or according to a common traffic (such as email or Taobao)." (Ex. 1015, 5 (emphasis added); Ex. 1017, 12).

724. *TR 38.801* also discloses a Serving CCNF, or core network entity, receiving network slice request information in the form of an MDD in an uplink message. (Ex. 1013, 25-26). *TR 38.801* also states that "RAN uses the included MDD for RAN slice awareness (slice specific behavior, congestion control, resource isolation)." (Ex. 1013, 25-26. *TR 38.801* then states that the "MDD is sent back to the UE with the Temp ID at NAS level to either reconfirm the initially requested MDD or indicate a new one if policy has changed." *Id. TR 38.801* also states that the MDD is "also indicated in the NG1 DL message to gNB for confirmation." *Id*.

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Ex. 1013, 25 (annotated)



725. All of this is depicted in the image above from *TR 38.801*, in which source BS ("gNB," orange) receives from the core network entity ("Serving CCNF," light blue) network slice information ("MDD*"), where the network slice information is configured by the network slice request information ("MDD"). Because the Serving CCNF receives an MDD* (network slice request information) that is based on the MDD (network slice request information), and returns to the source BS an MDD* (network slice information) that is either a reconfirmation of the requested MDD or a modified MDD if a policy has changed (i.e., a requested MDD is unavailable), a person of ordinary skill in the art would have found it obvious or understood that *TR 38.801* disclosed that the network slice information is configured by the network slice request information.

726. A person of ordinary skill in the art would have been motivated to implement and combine the teachings of *Han*, *TS 36.300*, and *TR 38.801* for at least

the reasons espoused in the section herein titled *Motivation to Combine Han, TS 36.300, and TR 38.801*.

727. Thus, *Han*, *TS 36.300*, and *TR 38.801* render obvious claim 3.

Dependent Claim 4: The method according to claim 2, wherein the NAS message including the network slice request information is included in a radio resource control (RRC) connection setup completion message.

728. *Han*, *TS 36.300*, and *TR 38.801* render obvious claim 4. As set forth above, *Han*, *TS 36.300*, and *TR 38.801* render obvious all of the elements of claim 2. *See* § IX.D.2 *supra*.

729. *Han*, *TS 36.300*, and *TR 38.801* render obvious the remaining elements of claim 4.

730. As discussed above, *Han*, *TS 36.300*, and *TR 38.801* render obvious a "NAS message including the network slice information." *See* §IX.D.2 *supra*.

731. The '631 patent makes no mention of a "radio resource control (RRC) connection setup completion message" outside of the claims. The '631 patent describes an "RRC connection setup complete message" that is used to "transmit[]" "network slice request information" from a UE "to a base station" by including the "network slice request information" in "a NAS message." (Ex. 1001, 15:19-37). Accordingly, a person of ordinary skill in the art would have understood that the claimed "radio resource control (RRC) connection setup completion message" was

an RRC message used to transmit network slice request information to a base station by including the network slice request information in an NAS message.

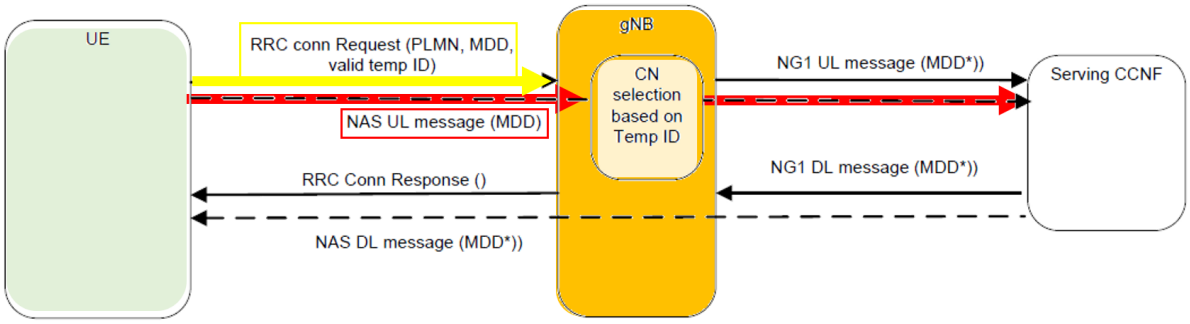
732. *Han* discloses a "terminal send[ing] an AS message" (or access stratum message) "to an access network device," where the "AS message carries a NAS PDU" (or non-access stratum PDU) (Ex. 1015, 60; Ex. 1017, 67-68). *Han* discloses that the "AS message may be an RRC message," and the "RRC message includes one of an RRC connection request, an RRC connection reestablishment request, a UE information response message, and the like." *Id.* That is, *Han* discloses an "RRC message" that carries a non-access stratum PDU. *Id.*

733. *TR 38.801* discloses a UE sending an RRC message including an MDD (network slice request information) as well as an NAS message containing an MDD (network slice request information) to the gNB or base station.[42] (Ex. 1013, 24-26).

[42] The '631 patent provides examples of base stations, including "a gNode-B (gNB)." (Ex. 1001, 3:62-4:4).

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Ex. 1013, 25 (annotated)



734. *TR 38.801* also discloses an "MDD [being] sent back to the UE with the Temp ID at NAS level" and an "RRC Conn Response" message being sent back to the UE. (Ex. 1013, 24-26).

735. *TR 38.801* discloses that the "MDD" is used "for RAN slice awareness (slice specific behavior, congestion control, resource isolation)." (Ex. 1013, 26). That is, *TR 38.801* discloses that the NAS message includes network slice request information. *see also* §§ VI, VIII.B *supra.*

736. A person of ordinary skill in the art would have known or found it obvious, at least in view of the knowledge of the person of ordinary skill in the art as discussed in the Technical Background herein (§ VI *supra*), that the NAS message was transmitted either on its own by the UE to the gNB, or as part of or encapsulated in an RRC by the UE to the gNB.

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737. This knowledge of the person of ordinary skill in the art that the RRC sublayer was available for communication of NAS messages would also have provided the person of ordinary skill in the art with a reasonable expectation of success in combining *Han* and *TR 38.801*.

738. Thus, *Han*, *TS 36.300*, and *TR 38.801* render obvious claim 4.

Dependent Claim 5: The method according to claim 3, wherein the network slice information is configured by the core network entity based on the network slice request information.

739. *Han*, *TS 36.300*, and *TR 38.801* render obvious claim 5. As set forth above, *Han*, *TS 36.300*, and *TR 38.801* render obvious all of the elements of claim 3. *See* § IX.D.3 *supra*.

740. *Han*, *TS 36.300*, and *TR 38.801* render obvious the remaining elements of claim element 5.

741. *Han* discloses that a "core network control plane device sends first pre-authorized QoS information to a terminal, and sends second pre-authorized QoS information to a first access network device." (Ex. 1015, 30, FIG. 5; Ex. 1017, 35, FIG. 5). *Han* discloses that the "second pre-authorized QoS information may include content of [] first pre-authorized QoS information," where "the first pre-authorized QoS information may further include" "identification information of a network slice of a data packet group." (Ex. 1015, 29-31; Ex. 1017, 37).

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Ex. 1015, FIG. 5 (annotated) (Ex. 1017, FIG. 5)

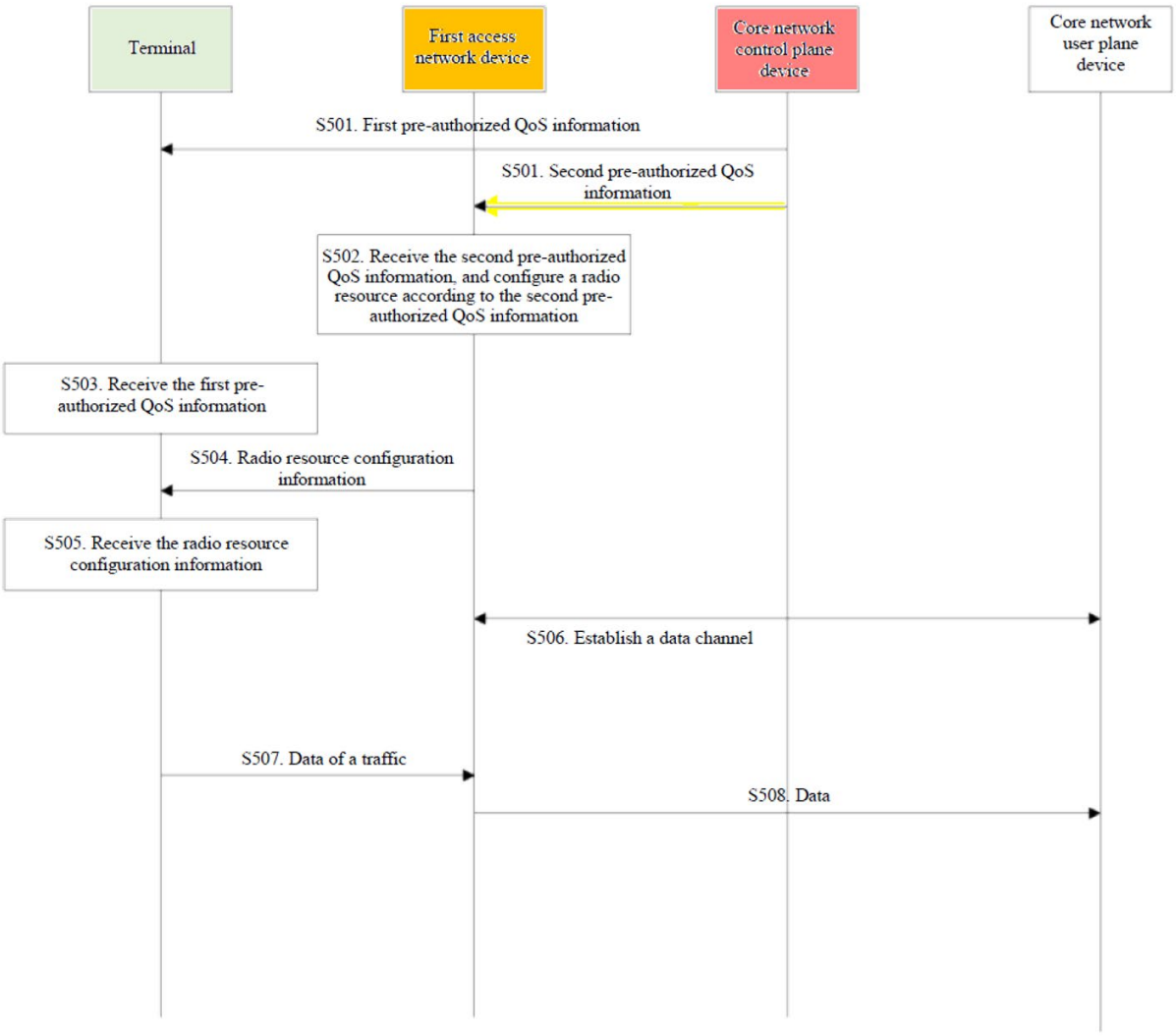


FIG. 5

742. *Han* discloses "[t]he first QoS information includes at least one of first pre-authorized QoS information and reflective characteristic information, and the reflective characteristic information includes a downlink QoS parameter of the traffic and indication information that is used to indicate a capability of obtaining an uplink QoS parameter based on the downlink QoS parameter of the traffic," and "the

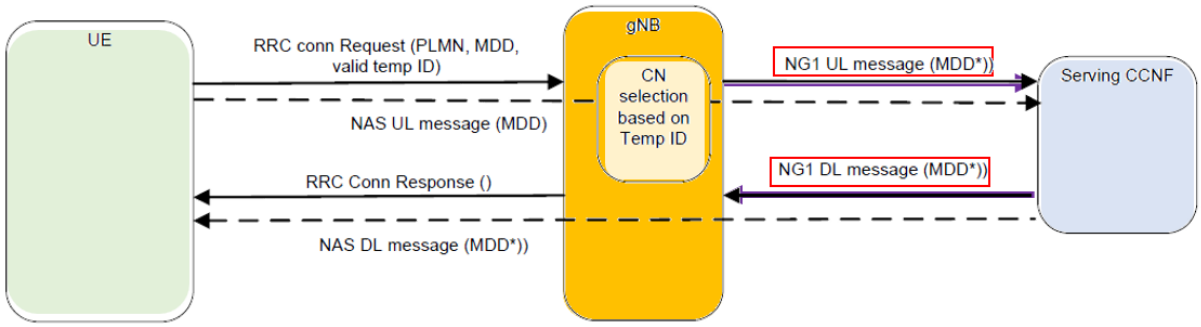
pre-authorized QoS information (including the first pre-authorized QoS information and second pre-authorized QoS information in the following specification) is proactively ***configured by the core network control plane device*** for the terminal based on subscription information of the terminal or according to a common traffic (such as email or Taobao)." (Ex. 1015, 5 (emphasis added); Ex. 1017, 12).

743. *TR 38.801* defines a "slice ID" as "unambiguously identif[ying] one of the pre-configured network slices…" (Ex. 1013, 23). *TR 38.801* also discloses several scenarios involving network slice selection, and those scenarios are disclosed by *TR 38.801* as being based on a solution described in "section 6.1.2 of TR 23.799." (Ex. 1013, 24; Ex. 1020, 61). *TR 38.801* discloses, with reference to the image annotated below, that the core network entity ("Serving CCNF," light blue) receives the network slice request information (MDD*) in an uplink or "UL message." (Ex. 1013, 25-26). According to *TR 38.801,* "RAN uses the included MDD for RAN slice awareness (slice specific behavior, congestion control, resource isolation)." *Id.* The "MDD is sent back to the UE with the Temp ID at NAS level to either reconfirm the initially requested MDD or indicates a new one if policy has changed." *Id.* The MDD* is "also indicated in the NG1 DL message to gNB for confirmation." *Id.* In the solution referenced by *TR 38.801* and described in section 6.1.2 of *TR 23.799*, the "CCNF decides the initial set of [network slice instances] for the UE based on an evaluation of the Requested MDD, Subscribed MDD (if available), …," and the

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"Accepted MDD" "is passed to the UE in [an] Attach Accept message." (Ex. 1020, p. 67).

Ex. 1013, 24 (annotated)



744. Therefore, and with reference to the image annotated above, *TR 38.801* discloses receiving by the source BS ("gNB," orange), from the core network entity ("Serving CCNF," light blue), network slice information ("MDD*" as part of "NG1 DL message (MDD*)"), where the network slice information ("MDD*") is configured by the core network entity based on the network slice request information ("MDD"). That is, while it appears in the image that the Serving CCNF receives from the gNB and sends to the gNB the same MDD*, a person of ordinary skill in the art would have understood or found it obvious that the Serving CCNF modified the MDD* prior to sending it back in view of the explicit disclosure in *TR 38.801* that the "MDD is sent back to the UE with the Temp ID at NAS level to either reconfirm the initially requested MDD or indicate a new one if policy has changed,"

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and the MDD is "also indicated in the NG1 DL message to gNB for confirmation." (Ex. 1013, 25-26).

745. A person of ordinary skill in the art would have been motivated to implement and combine the teachings of *Han*, *TS 36.300*, and *TR 38.801* for at least the reasons espoused in the section herein titled *Motivation to Combine Han, TS 36.300, and TR 38.801*.

746. Thus, *Han*, *TS 36.300*, and *TR 38.801* render obvious claim 5.

Dependent Claim 6: The method according to claim 5, wherein the transmission of the handover request message is performed through a direct interface associated with the target base station.

747. *Han*, *TS 36.300*, and *TR 38.801* render obvious claim 6. As set forth above, *Han*, *TS 36.300*, and *TR 38.801* render obvious all of the elements of claim 5. *See* § IX.D.5 *supra*.

748. *Han*, *TS 36.300*, and *TR 38.801* render obvious the remaining elements of claim 6. The '631 patent refers to "X2" as an "inter-base station interface," and states that a "handover based on an interface between a core network entity and a base station may be used only when a handover based on an inter-base station interface cannot be used." Ex. 1001, 19:6-34. Accordingly, a person of ordinary skill in the art would have understood that the claimed "direct interface" meant that the handover request message was performed between the source and target base stations without the core network.

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749. *Han* discloses that "[a] handover process message between the first access network device and the second access network device may be sent and received through a direct interface between the first access network device and the second access network device (a handover process between peer entities)." (Ex. 1015, 44; Ex. 1017, 50).

750. A person of ordinary skill in the art would have been motivated to implement the teachings of *Han*, *TS 36.300*, and *TR 38.801* for at least the reasons espoused in the section herein titled *Motivation to Combine Han*, *TS 36.300*, *and TR 38.801*.

751. Thus, *Han*, *TS 36.300*, and *TR 38.801* render obvious claim 6.

Dependent Claim 8: The controller according to claim 7, wherein the processor further performs to receive a non-access stratum (NAS) message including network slice request information.

752. *Han*, *TS 36.300*, and *TR 38.801* render obvious claim 8. *Han* and *TS 36.300* render obvious all of the elements of claim 7. *See* § IX.C *supra*.

753. *Han*, *TS 36.300*, and *TR 38.801* render obvious the remaining elements of claim 8.

754. The '631 patent states that the "UE may transmit the network slice request information to the base station," where "the network slice request information may be included in a radio resource control (RRC) connection setup message," or, "[a]lternatively, the network slice request information may be

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included in a non-access stratum (NAS) message included in the RRC connection setup message." (Ex. 1001, 12:59-67; *see also* 11:19-25, 22:48-51).

755. *Han* discloses "receiving, by [an] access network device, an access stratum AS message sent by [a] terminal," or "user equipment,"[43] "where the AS message includes a non-access stratum protocol data unit" or "NAS PDU," and the data packet for which no QoS parameter has been configured is carried in the NAS PDU." (Ex. 1015, 15; Ex. 1017, 23). That is, *Han* discloses the terminal (a user equipment (UE)) sending a message to the access network device (the source BS), where the message includes a non-access stratum protocol data unit. *Id.*

756. *Han* further discloses a non-access stratum (NAS) message that includes network slice request information. (*see, e.g.,* Ex. 1015, 28-31; Ex. 1017, 36-38). For example, *Han* discloses "the core network control plane device sends the first [pre-]authorized QoS information to the terminal by means of a non-access stratum (NAS for short) message" (*see* Ex. 1015, 28; Ex. 1017, 36), where "the first pre-authorized QoS information may further include" "identification information of a network slice of a data packet group," and "data packet groups" are part of a "PDU session." (Ex. 1015, 29-31; Ex. 1017, 37).

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[43] *Han* describes that the "terminal" may be referred to as a "user equipment." (Ex. 1015, 24; Ex. 1017, 29-30).

757. *TR 21.905*[44], specifically referenced by *TR 38.801*, defines "Access Stratum" as "functional grouping consisting of the parts in the infrastructure and in the user equipment and the protocols between these parts being specific to the access technique (i.e. the way the specific physical media between the User Equipment and the Infrastructure is used to carry information)" (*see* Ex. 1018, 7), and "Non-Access Stratum" as "[p]rotocols between UE and the core network that are not terminated in the UTRAN" (*see* Ex. 1018, 21) or "Universal Terrestrial Radio Access Network." (Ex. 1018, 6). *TR 21.905* defines a "[r]adio access bearer" as a "service that the access stratum provides to the non-access stratum for transfer of user data between User Equipment and CN" (*see* Ex. 1018, 24) or "Core Network." (Ex. 1018, 38).

758. *TR 38.801* discloses a user equipment or UE sending an "RRC connection request" to a "gNB" or base station[45] (Ex. 1013, 24-26). *TR 38.801* also

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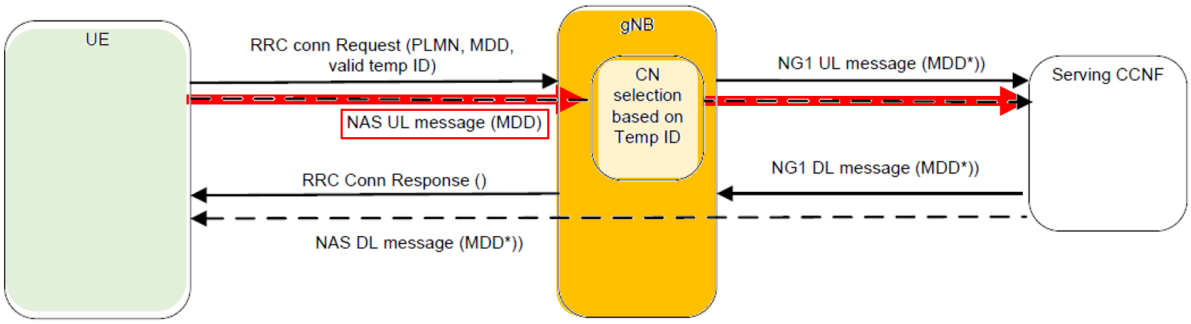
[44] *TR 21.905* is not part the grounds, but it is specifically referenced by *TR 38.801* and referenced here to demonstrate the knowledge of the person of ordinary skill in the art reviewing *TR 38.801*.

[45] The '631 patent provides examples of base stations, including "a gNode-B (gNB)." (Ex. 1001, 3:62-4:4).

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discloses a user equipment or UE sending a non-access stratum or NAS uplink or UL message. (Ex. 1013, 24-26). *TR 38.801* discloses a "Selection case 4" in which a "UE" transmits a "NAS UL" or non-access stratum uplink message containing "MDD," or a "Multi-Dimensional Descriptor." (Ex. 1013, 24-25). Selection case 4 is reproduced and annotated below.

Ex. 1013, 25 (annotated)



759. *TR 38.801* discloses that the "MDD" is used "for RAN slice awareness (slice specific behavior, congestion control, resource isolation)." (Ex. 1013, 26). That is, *TR 38.801* discloses that the UE transmits an NAS message that includes network slice information (i.e., an MDD used for slice awareness) to the "Serving CCNF" by way of the "gNB" or base station. *Id.; see also* §§ VI, VIII.B *supra*. Even though the arrow associated with the "NAS UL message (MDD)" in the annotated figure above appears as though the "NAS UL message (MDD)" was sent from the UE to the Serving CCNF, a person of ordinary skill in the art would have understood

or found it obvious that the UE transmitted the NAS message to the gNB or base station (and then from the gNB to the Serving CCNF), at least in view of the knowledge of the person of ordinary skill in the art - as discussed in the Technical Background herein (§VI supra) - as well as the depicted communication in the above drawing of TR 38.801. Therefore, TR 38.801 discloses or renders obvious the source base station (gNB, orange above), from a user equipment or UE (UE, green above), a non-access stratum (NAS) message ("NAS UL message (MDD)," red above), which includes network slice request information ("MDD").

760. *TR 38.801* also discloses a user equipment or UE sending network slice information to an eNB or base station.[46] (Ex. 1013, 26-27).

[46] The '631 patent provides examples of base stations, including "an evolved Node-B (eNB), a gNode-B (gNB)." (Ex. 1001, 3:62-4:4).

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Ex. 1013, Figure 9.2.1-1 (annotated)

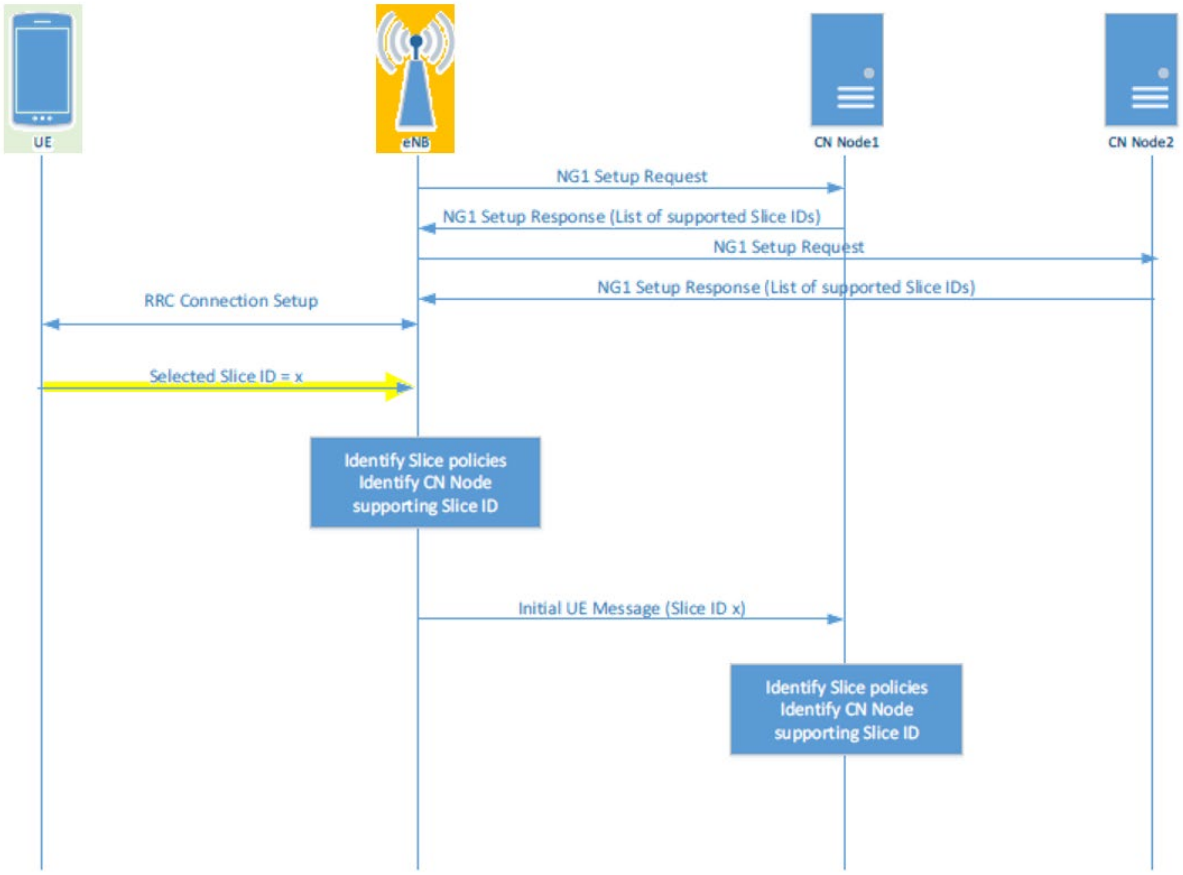


Figure 9.2.1-1: Slice selection when Slice ID is provided by the UE to RAN

761. It would have been obvious to a person of ordinary skill in the art that *Han*'s message sent by the terminal to the access network device could have been a non-access stratum message at least because *Han* explicitly describes the "message sent by the terminal" including "a non-access stratum protocol data unit NAS PDU." (Ex. 1015, 15; Ex. 1017, 23).

762. A person of ordinary skill in the art would have been motivated to utilize one of the multiple implementations of *TR 38.801* for details regarding how

to convey required network slice information from a UE to a base station to "enable[] support of multiple slices simultaneously supported by a UE" (*see* Ex. 1013, 24), and/or to ensure "resource isolation," which *TR 38.801* describes as "enabl[ing] specialized customization" and which "avoids one slice affecting another slice." (Ex. 1013, 28).

763. The person of ordinary skill in the art would have had a reasonable expectation of success in such a combination because the person of ordinary skill in the art would have been well aware that the RRC sublayer was available for communication of NAS messages from a UE to a core network via a base station (*see* § VI *supra*), as also taught by *TR 38.801*.

764. Moreover, the person of ordinary skill in the art would have understood that the terminal or user equipment of *Han* and the UE of *TR 38.801* are similar devices with similar communication capabilities. The person of ordinary skill in the art would have further recognized that the ability to convey network slice information from a UE to an eNB via an NAS message, using the RRC sublayer, was an improvement to the UE of *TR 38.801* because such capability enabled the use of a single message to convey information to an eNB that the eNB needed for both (1) slice awareness and (2) for communicating to a selected core network node.

765. A person of ordinary skill in the art would have been motivated to implement and combine the teachings of *Han*, *TS 36.300*, and *TR 38.801* for at least

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the reasons espoused in the section herein titled *Motivation to Combine Han, TS 36.300, and TR 38.801.*

766. Thus, *Han*, *TS 36.300*, and *TR 38.801* render obvious claim 8.

Dependent Claim 9: The controller according to claim 8, wherein the processor further performs to receive the network slice information from a core network, wherein the network slice information is configured by the network slice request information.

767. *Han*, *TS 36.300*, and *TR 38.801* render obvious claim 9. As set forth above, *Han*, *TS 36.300*, and *TR 38.801* render obvious all of the elements of claim 8. *See* § IX.D.8 *supra*.

768. *Han*, *TS 36.300*, and *TR 38.801* render obvious the remaining elements of claim 9.

769. The ’631 patent describes a “base station” “receiv[ing] the specific network slice information that is configured based on the network slice information from the core network entity” “[a]fter the base station has transmitted the network slice request information to the core network entity.” (Ex. 1001, 11:49-60).

770. *Han* discloses that a “core network control plane device sends first pre-authorized QoS information to a terminal, and sends second pre-authorized QoS information to a first access network device.” (Ex. 1015, 28; FIG. 5; Ex. 1017, 36, FIG. 5). *Han* discloses that the “second pre-authorized QoS information may include content of [] first pre-authorized QoS information,” where “the first pre-authorized

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QoS information may further include" "identification information of a network slice of a data packet group." (Ex. 1015, 31-33; Ex. 1017, 37).

Ex. 1015, FIG. 5 (annotated) (Ex. 1017, FIG. 5)

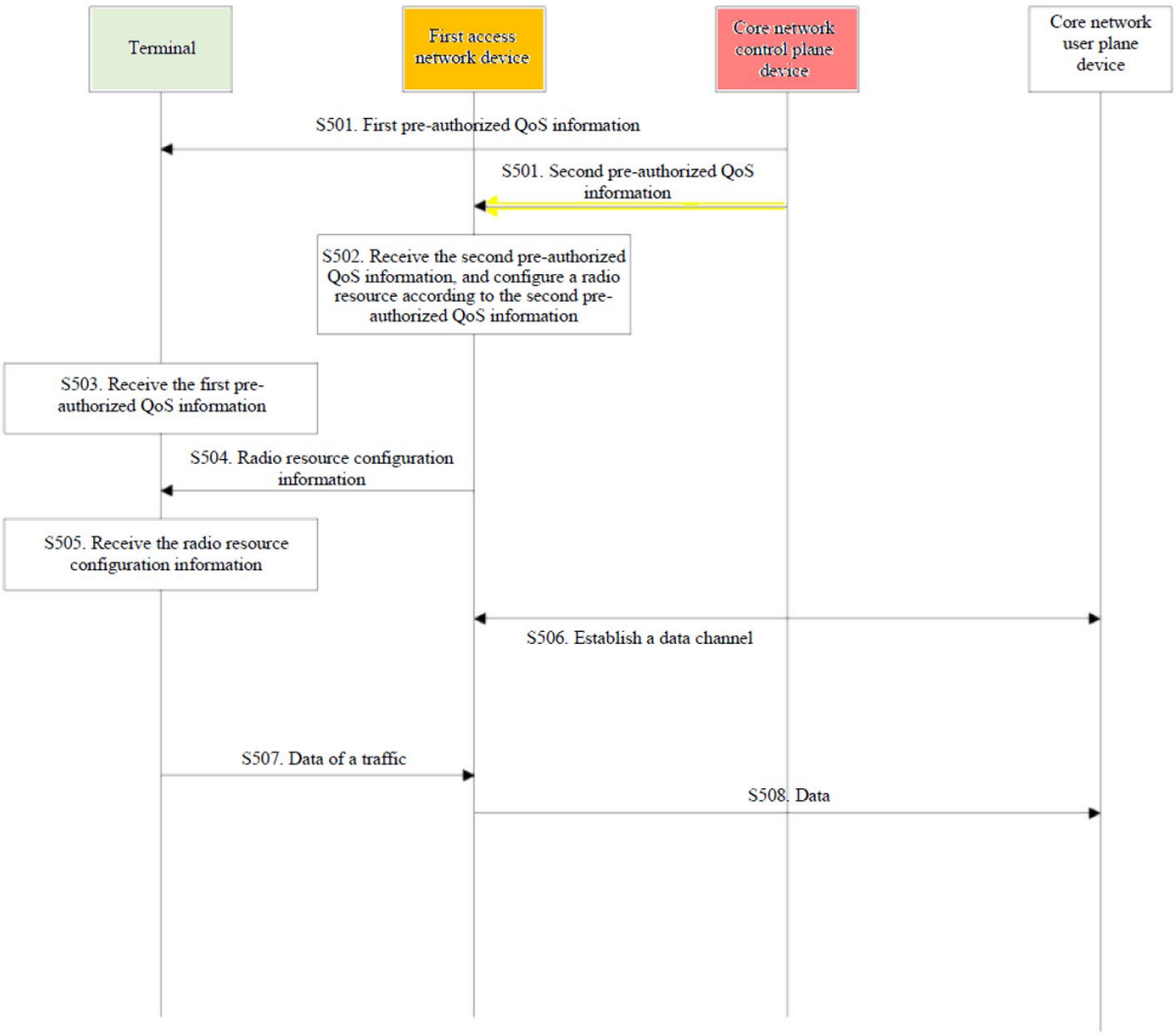


FIG. 5

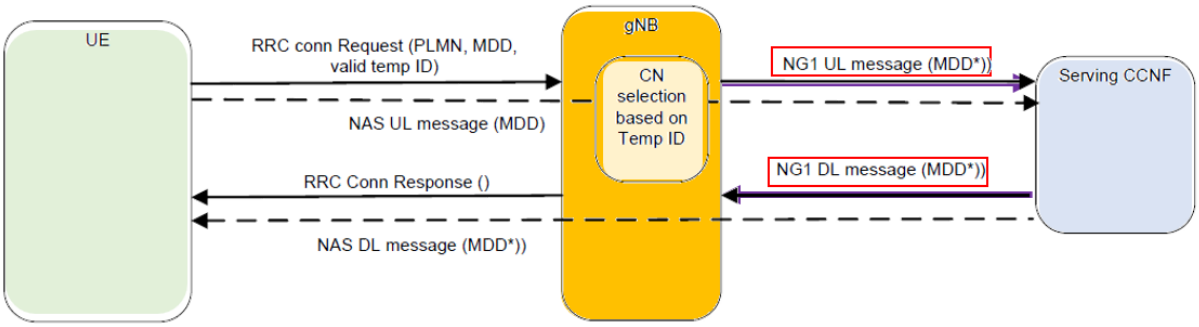
771. *Han* discloses "[t]he first QoS information includes at least one of first pre-authorized QoS information and reflective characteristic information, and the

reflective characteristic information includes a downlink QoS parameter of the traffic and indication information that is used to indicate a capability of obtaining an uplink QoS parameter based on the downlink QoS parameter of the traffic," and "the pre-authorized QoS information (including the first pre-authorized QoS information and second pre-authorized QoS information in the following specification) is proactively ***configured by the core network control plane device*** for the terminal based on subscription information of the terminal or according to a common traffic (such as email or Taobao)." (Ex. 1015, 5) (emphasis added; Ex. 1017, 12).

772. *TR 38.801* also discloses a Serving CCNF, or core network entity, receiving network slice request information in the form of an MDD in an uplink message. (Ex. 1013, 25-26). *TR 38.801* also states that "RAN uses the included MDD for RAN slice awareness (slice specific behavior, congestion control, resource isolation)." (Ex. 1013, 25-26. *TR 38.801* then states that the "MDD is sent back to the UE with the Temp ID at NAS level to either reconfirm the initially requested MDD or indicate a new one if policy has changed." *Id. TR 38.801* also states that the MDD is "also indicated in the NG1 DL message to gNB for confirmation." *Id*.

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Ex. 1013, 25 (annotated)



773. All of this is depicted in the image above from *TR 38.801*, in which source BS ("gNB," orange) receives from the core network entity ("Serving CCNF," light blue) network slice information ("MDD*"), where the network slice information is configured by the network slice request information ("MDD"). Because the Serving CCNF receives an MDD* (network slice request information) that is based on the MDD (network slice request information), and returns to the source BS an MDD* (network slice information) that is either a reconfirmation of the requested MDD or a modified MDD if a policy has changed (i.e., a requested MDD is unavailable), a person of ordinary skill in the art would have found it obvious or understood that *TR 38.801* disclosed that the network slice information is configured by the network slice request information.

774. A person of ordinary skill in the art would have been motivated to implement and combine the teachings of *Han*, *TS 36.300*, and *TR 38.801* for at least

the reasons espoused in the section herein titled *Motivation to Combine Han*, *TS 36.300*, and *TR 38.801*.

775. Thus, *Han*, *TS 36.300*, and *TR 38.801* render obvious claim 9.

Dependent Claim 10: The controller according to claim 8, wherein the NAS message including the network slice request information is included in a radio resource control (RRC) connection setup completion message.

776. *Han*, *TS 36.300*, and *TR 38.801* render obvious claim 10. As set forth above, *Han*, *TS 36.300*, and *TR 38.801* render obvious all of the elements of claim 8. *See* § IX.D.8 *supra*.

777. *Han*, *TS 36.300*, and *TR 38.801* render obvious the remaining elements of claim 10.

778. As discussed above, *Han*, *TS 36.300*, and *TR 38.801* render obvious a "NAS message including the network slice information." *See* § IX.D.8 *supra*.

779. The '631 patent makes no mention of a "radio resource control (RRC) connection setup completion message" outside of the claims. The '631 patent describes an "RRC connection setup complete message" that is used to "transmit[]" "network slice request information" from a UE "to a base station" by including the "network slice request information" in "a NAS message." (Ex. 1001, 15:19-37). Accordingly, a person of ordinary skill in the art would have understood that the claimed "radio resource control (RRC) connection setup completion message" was

an RRC message used to transmit network slice request information to a base station by including the network slice request information in an NAS message.

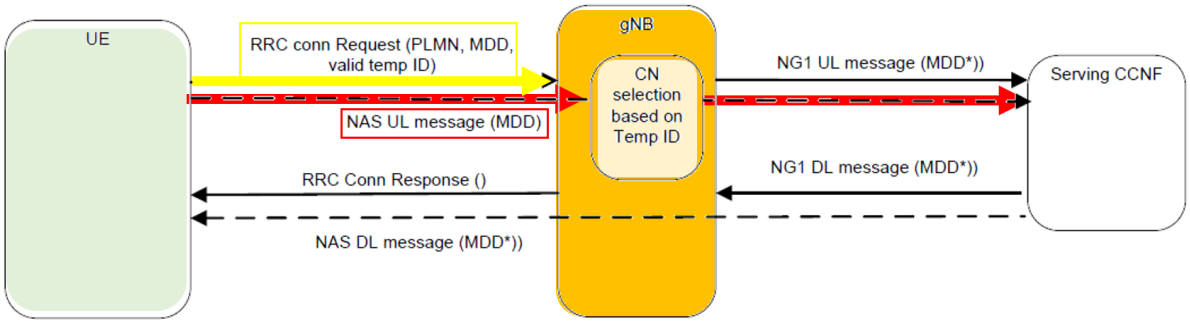
780. *Han* discloses a "terminal send[ing] an AS message" (or access stratum message) "to an access network device," where the "AS message carries a NAS PDU" (or non-access stratum PDU) (Ex. 1015, 60; Ex. 1017, 67-68). *Han* discloses that the "AS message may be an RRC message," and the "RRC message includes one of an RRC connection request, an RRC connection reestablishment request, a UE information response message, and the like." *Id.* That is, *Han* discloses an "RRC message" that carries a non-access stratum PDU. *Id.*

781. *TR 38.801* discloses a UE sending an RRC message including an MDD as well as an NAS message containing an MDD to the gNB or base station.[47] (Ex. 1013, 24-26).

[47] The '631 patent provides examples of base stations, including "a gNode-B (gNB)." (Ex. 1001, 3:62-4:4).

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Ex. 1013, 25 (annotated)

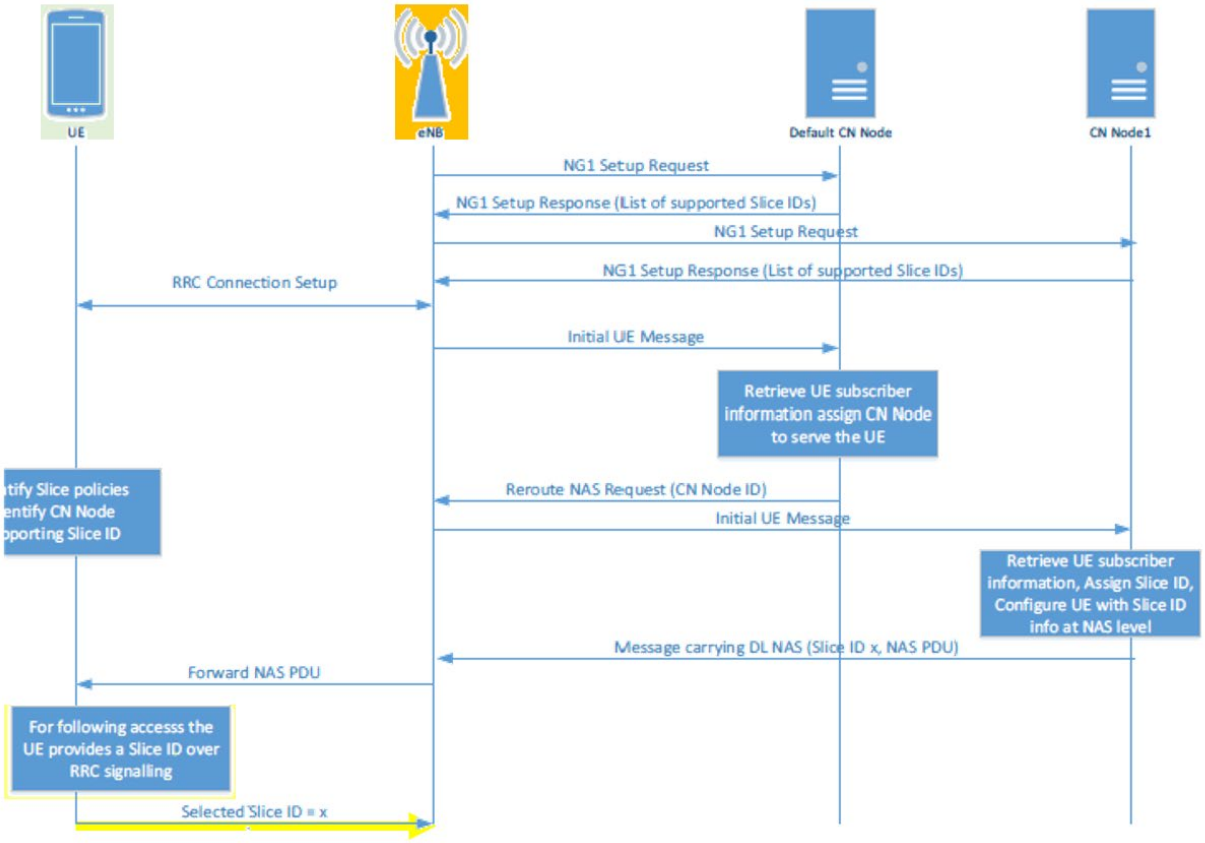


782. *TR 38.801* also discloses an "MDD [being] sent back to the UE with the Temp ID at NAS level" and an "RRC Conn Response" message being sent back to the UE. (Ex. 1013, 24-26).

783. *TR 38.801* discloses that the "MDD" is used "for RAN slice awareness (slice specific behavior, congestion control, resource isolation)." (Ex. 1013, 26). That is, *TR 38.801* discloses that the NAS message includes network slice information. *see also* §§ VI, VIII.B *supra*.

784. *TR 38.801* further discloses, as depicted in Figure 9.2.1-2, that a "UE will present to the RAN a slice ID that [it] intends to access at RRC connection establishment." (Ex. 1013, 27).

Ex. 1013, Figure 9.2.1-2 (annotated)



785. It would have been obvious to a person of ordinary skill in the art that *Han*'s NAS message could have been encapsulated in an RRC message at least in view of the teachings of *TR 38.801* and the knowledge of the person of ordinary skill in the art of encapsulating NAS messages in RRC messages - as discussed in the Technical Background herein (§VI *supra*) – as well as the knowledge of the person of ordinary skill in the art that the RRC sublayer was available for communication of NAS messages (*see* § VI *supra*), as also taught by *TR 38.801*. This knowledge of

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the person of ordinary skill in the art that the RRC sublayer was available for communication of NAS messages would also have provided the person of ordinary skill in the art with a reasonable expectation of success in combining *Han* and *TR 38.801*.

786. A person of ordinary skill in the art would have been motivated to implement and combine the teachings of *Han*, *TS 36.300*, and *TR 38.801* for at least the reasons espoused in the section herein titled *Motivation to Combine Han, TS 36.300, and TR 38.801.*

787. Thus, *Han*, *TS 36.300*, and *TR 38.801* render obvious claim 10.

Dependent Claim 11: The controller according to claim 9, wherein the network slice information is configured by the core network entity based on the network slice request information.

788. *Han*, *TS 36.300*, and *TR 38.801* render obvious claim 11. As set forth above, *Han*, *TS 36.300*, and *TR 38.801* render obvious all of the elements of claim 9. *See* § IX.D.9 *supra*.

789. *Han*, *TS 36.300*, and *TR 38.801* render obvious the remaining elements of claim 11.

790. *Han* discloses that a "core network control plane device sends first pre-authorized QoS information to a terminal, and sends second pre-authorized QoS information to a first access network device." (Ex. 1015, 30, FIG. 5; Ex. 1017, 35, FIG. 5). *Han* discloses that the "second pre-authorized QoS information may include

content of [] first pre-authorized QoS information," where "the first pre-authorized QoS information may further include" "identification information of a network slice of a data packet group." (Ex. 1015, 29-31; Ex. 1017, 37).

Ex. 1015, FIG. 5 (annotated) (Ex. 1017, FIG. 5)

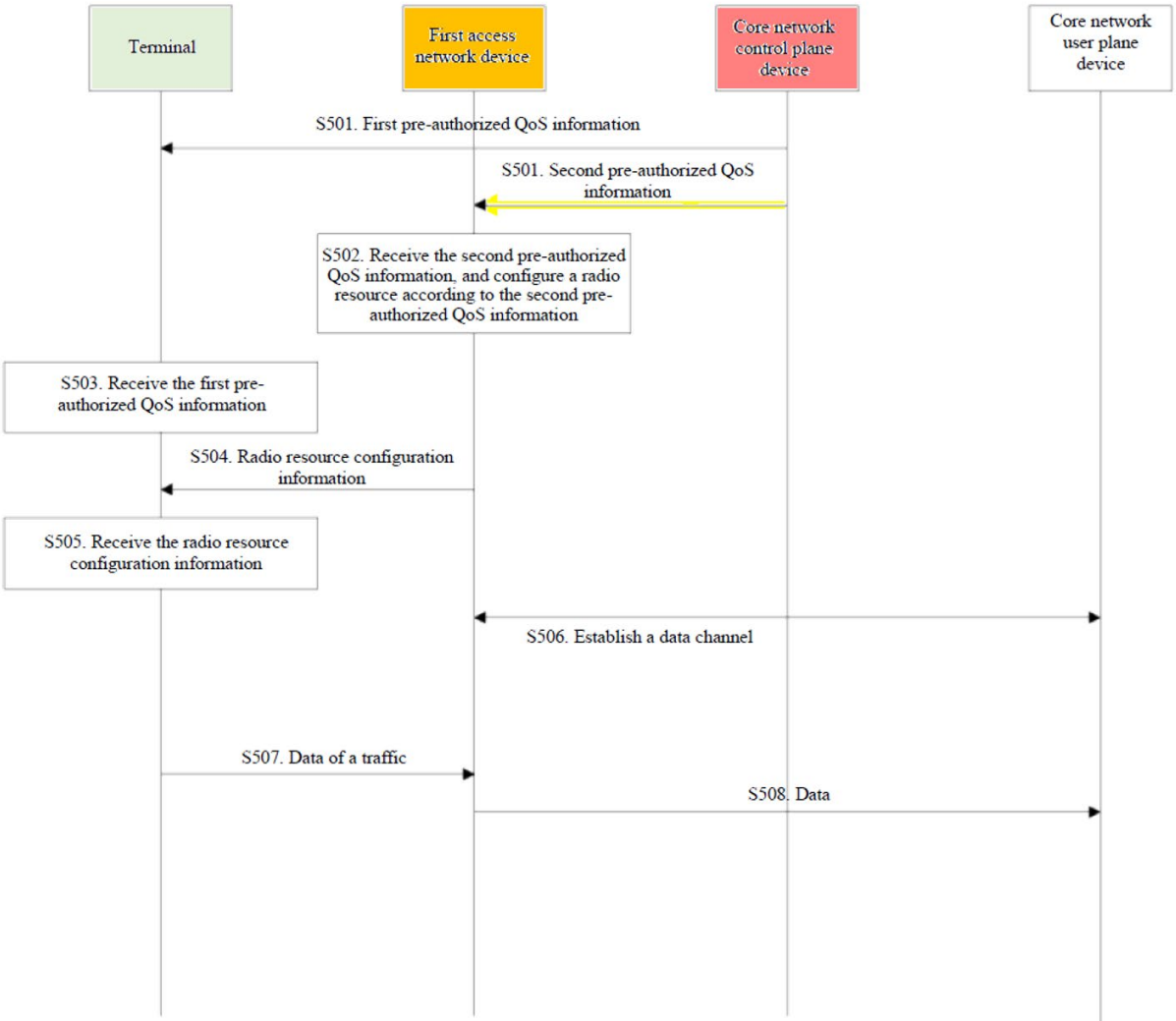


FIG. 5

791. *Han* discloses "[t]he first QoS information includes at least one of first pre-authorized QoS information and reflective characteristic information, and the

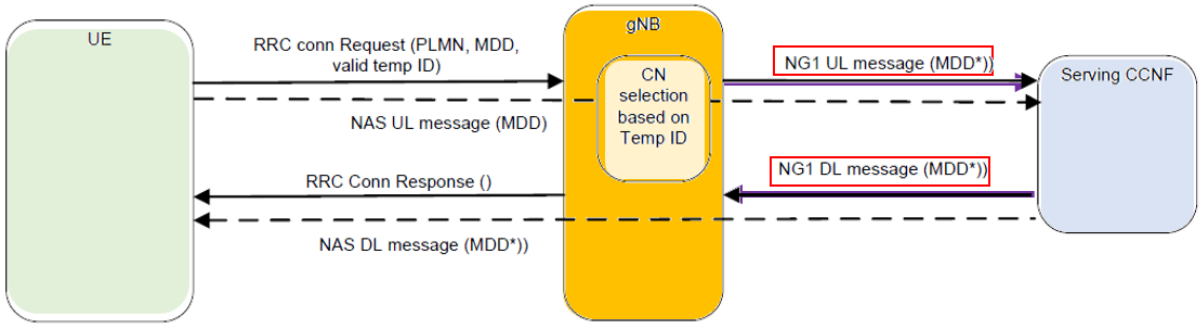
reflective characteristic information includes a downlink QoS parameter of the traffic and indication information that is used to indicate a capability of obtaining an uplink QoS parameter based on the downlink QoS parameter of the traffic," and "the pre-authorized QoS information (including the first pre-authorized QoS information and second pre-authorized QoS information in the following specification) is proactively ***configured by the core network control plane device*** for the terminal based on subscription information of the terminal or according to a common traffic (such as email or Taobao)." (Ex. 1015, 5) (emphasis added; Ex. 1017, 12).

792. *TR 38.801* defines a "slice ID" as "unambiguously identif[ying] one of the pre-configured network slices…" (Ex. 1013, 23). *TR 38.801* also discloses several scenarios involving network slice selection, and those scenarios are disclosed by *TR 38.801* as being based on a solution described in "section 6.1.2 of TR 23.799." (Ex. 1013, 24; Ex. 1020, 61). *TR 38.801* discloses, with reference to the image annotated below, that the core network entity ("Serving CCNF," light blue) receives the network slice request information (MDD*) in an uplink or "UL message." (Ex. 1013, 25-26). According to *TR 38.801,* "RAN uses the included MDD for RAN slice awareness (slice specific behavior, congestion control, resource isolation)." *Id.* The "MDD is sent back to the UE with the Temp ID at NAS level to either reconfirm the initially requested MDD or indicates a new one if policy has changed." *Id.* The MDD* is "also indicated in the NG1 DL message to gNB for confirmation." *Id.* In

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the solution referenced by *TR 38.801* and described in section 6.1.2 of *TR 23.799*, the "CCNF decides the initial set of [network slice instances] for the UE based on an evaluation of the Requested MDD, Subscribed MDD (if available), …," and the "Accepted MDD" "is passed to the UE in [an] Attach Accept message." (Ex. 1020, p. 67).

Ex. 1013, 24 (annotated)



793. Therefore, and with reference to the image annotated above, *TR 38.801* discloses receiving by the source BS ("gNB," orange), from the core network entity ("Serving CCNF," light blue), network slice information ("MDD*" as part of "NG1 DL message (MDD*)"), where the network slice information ("MDD*") is configured by the core network entity based on the network slice request information ("MDD"). That is, while it appears in the image that the Serving CCNF receives from the gNB and sends to the gNB the same MDD*, a person of ordinary skill in the art would have understood or found it obvious that the Serving CCNF modified the MDD* prior to sending it back in view of the explicit disclosure in *TR 38.801*

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that the "MDD is sent back to the UE with the Temp ID at NAS level to either reconfirm the initially requested MDD or indicate a new one if policy has changed," and the MDD is "also indicated in the NG1 DL message to gNB for confirmation." (Ex. 1013, 25-26).

794. A person of ordinary skill in the art would have been motivated to implement and combine the teachings of *Han*, *TS 36.300*, and *TR 38.801* for at least the reasons espoused in the section herein titled *Motivation to Combine Han, TS 36.300, and TR 38.801*.

795. Thus, *Han*, *TS 36.300*, and *TR 38.801* render obvious claim 11.

Dependent Claim 12: The controller according to claim 11, wherein the transmission of the handover request message is performed through a direct interface associated with the target base station.

796. *Han*, *TS 36.300*, and *TR 38.801* render obvious claim 12. As set forth above, *Han*, *TS 36.300*, and *TR 38.801* render obvious all of the elements of claim 11. *See* § IX.D.11 *supra*.

797. *Han*, *TS 36.300*, and *TR 38.801* render obvious the remaining elements of claim 12. The '631 patent refers to "X2" as an "inter-base station interface," and states that a "handover based on an interface between a core network entity and a base station may be used only when a handover based on an inter-base station interface cannot be used." Ex. 1001, 19:6-34. Accordingly, a person of ordinary skill in the art would have understood that the claimed "direct interface" meant that the

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handover request message was performed between the source and target base stations without the core network.

798. *Han* discloses that "[a] handover process message between the first access network device and the second access network device may be sent and received through a direct interface between the first access network device and the second access network device (a handover process between peer entities)." (Ex. 1015, 44; Ex. 1017, 50).

799. A person of ordinary skill in the art would have been motivated to implement and combine the teachings of *Han*, *TS 36.300*, and *TR 38.801* for at least the reasons espoused in the section herein titled *Motivation to Combine Han, TS 36.300, and TR 38.801*.

800. Thus, *Han*, *TS 36.300*, and *TR 38.801* render obvious claim 12.

Dependent Claim 14: The apparatus according to claim 13, wherein the processor further performs to receive a non-access stratum (NAS) message including network slice request information.

801. *Han*, *TS 36.300*, and *TR 38.801* render obvious claim 14. *Han* and *TS 36.300* render obvious all of the elements of claim 13. *See* § IX.C. *supra*.

802. *Han*, *TS 36.300*, and *TR 38.801* render obvious the remaining elements of claim 14.

803. The '631 patent states that the "UE may transmit the network slice request information to the base station," where "the network slice request

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information may be included in a radio resource control (RRC) connection setup message," or, "[a]lternatively, the network slice request information may be included in a non-access stratum (NAS) message included in the RRC connection setup message." (Ex. 1001, 12:59-67; *see also* 11:19-25, 22:48-51).

804. *Han* discloses "receiving, by [an] access network device, an access stratum AS message sent by [a] terminal," or "user equipment,"[48] "where the AS message includes a non-access stratum protocol data unit" or "NAS PDU," and the data packet for which no QoS parameter has been configured is carried in the NAS PDU." (Ex. 1015, 15; Ex. 1017, 23). That is, *Han* discloses the terminal (a user equipment (UE)) sending a message to the access network device (the source BS), where the message includes a non-access stratum protocol data unit. *Id.*

805. *Han* further discloses a non-access stratum (NAS) message that includes network slice request information. (*see, e.g.,* Ex. 1015, 28-31; Ex. 1017, 36-38). For example, *Han* discloses "the core network control plane device sends the first [pre-]authorized QoS information to the terminal by means of a non-access stratum (NAS for short) message" (*see* Ex. 1015, 28; Ex. 1017, 36), where "the first pre-authorized QoS information may further include" "identification information of

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[48] *Han* describes that the "terminal" may be referred to as a "user equipment." (Ex. 1015, 24; Ex. 1017, 29-30).

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a network slice of a data packet group," and "data packet groups" are part of a "PDU session." (Ex. 1015, 29-31; Ex. 1017, 37).

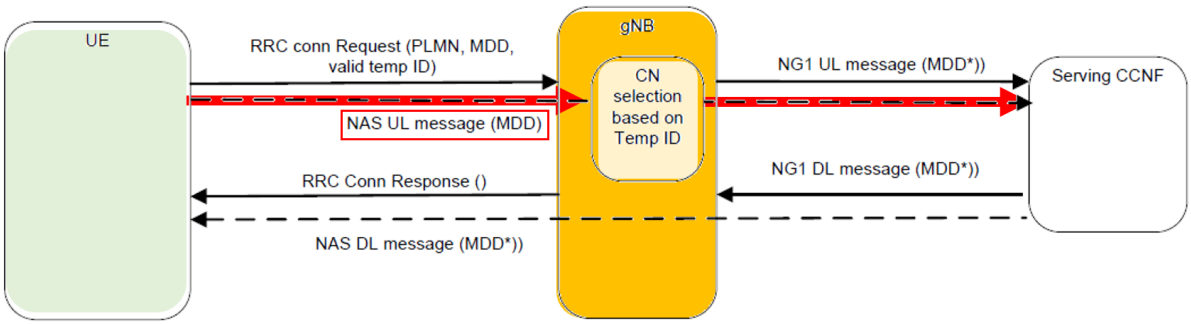
806. *TR 21.905*[49], referenced by *TR 38.801*, defines "Access Stratum" as "functional grouping consisting of the parts in the infrastructure and in the user equipment and the protocols between these parts being specific to the access technique (i.e. the way the specific physical media between the User Equipment and the Infrastructure is used to carry information)" (*see* Ex. 1018, 7), and "Non-Access Stratum" as "[p]rotocols between UE and the core network that are not terminated in the UTRAN" (*see* Ex. 1018, 21) or "Universal Terrestrial Radio Access Network." (Ex. 1018, 6). *TR 21.905* defines a "[r]adio access bearer" as a "service that the access stratum provides to the non-access stratum for transfer of user data between User Equipment and CN" (*see* Ex. 1018, 24) or "Core Network." (Ex. 1018, 38).

[49] *TR 21.905* is not part the grounds, but it is specifically referenced by *TR 38.801* and referenced here to demonstrate the knowledge of the person of ordinary skill in the art reviewing *TR 38.801*.

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807. *TR 38.801* discloses a user equipment or UE sending an "RRC connection request" to a "gNB" or base station[50] (Ex. 1013, 24-26). *TR 38.801* also discloses a user equipment or UE sending a non-access stratum or NAS uplink or UL message. (Ex. 1013, 24-26). *TR 38.801* discloses a "Selection case 4" in which a "UE" transmits a "NAS UL" or non-access stratum uplink message containing "MDD," or a "Multi-Dimensional Descriptor." (Ex. 1013, 24-25). Selection case 4 is reproduced and annotated below.

Ex. 1013, 25 (annotated)



808. *TR 38.801* discloses that the "MDD" is used "for RAN slice awareness (slice specific behavior, congestion control, resource isolation)." (Ex. 1013, 26). That is, *TR 38.801* discloses that the UE transmits an NAS message that includes

[50] The '631 patent provides examples of base stations, including "a gNode-B (gNB)." (Ex. 1001, 3:62-4:4).

network slice information (i.e., an MDD used for slice awareness) to the "Serving CCNF" by way of the "gNB" or base station. *Id.; see also* §§ VI, VIII.B *supra*. Even though the arrow associated with the "NAS UL message (MDD)" in the annotated figure above appears as though the "NAS UL message (MDD)" was sent from the UE to the Serving CCNF, a person of ordinary skill in the art would have understood or found it obvious that the UE transmitted the NAS message to the gNB or base station (and then from the gNB to the Serving CCNF), at least in view of the knowledge of the person of ordinary skill in the art - as discussed in the Technical Background herein (§VI supra) - as well as the depicted communication in the above drawing of TR 38.801. Therefore, TR 38.801 discloses or renders obvious the source base station (gNB, orange above), from a user equipment or UE (UE, green above), a non-access stratum (NAS) message ("NAS UL message (MDD)," red above), which includes network slice request information ("MDD").

809. *TR 38.801* also discloses a user equipment or UE sending network slice information to an eNB or base station.[51] (Ex. 1013, 26-27).

[51] The '631 patent provides examples of base stations, including "an evolved Node-B (eNB), a gNode-B (gNB)." (Ex. 1001, 3:62-4:4).

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Ex. 1013, Figure 9.2.1-1 (annotated)

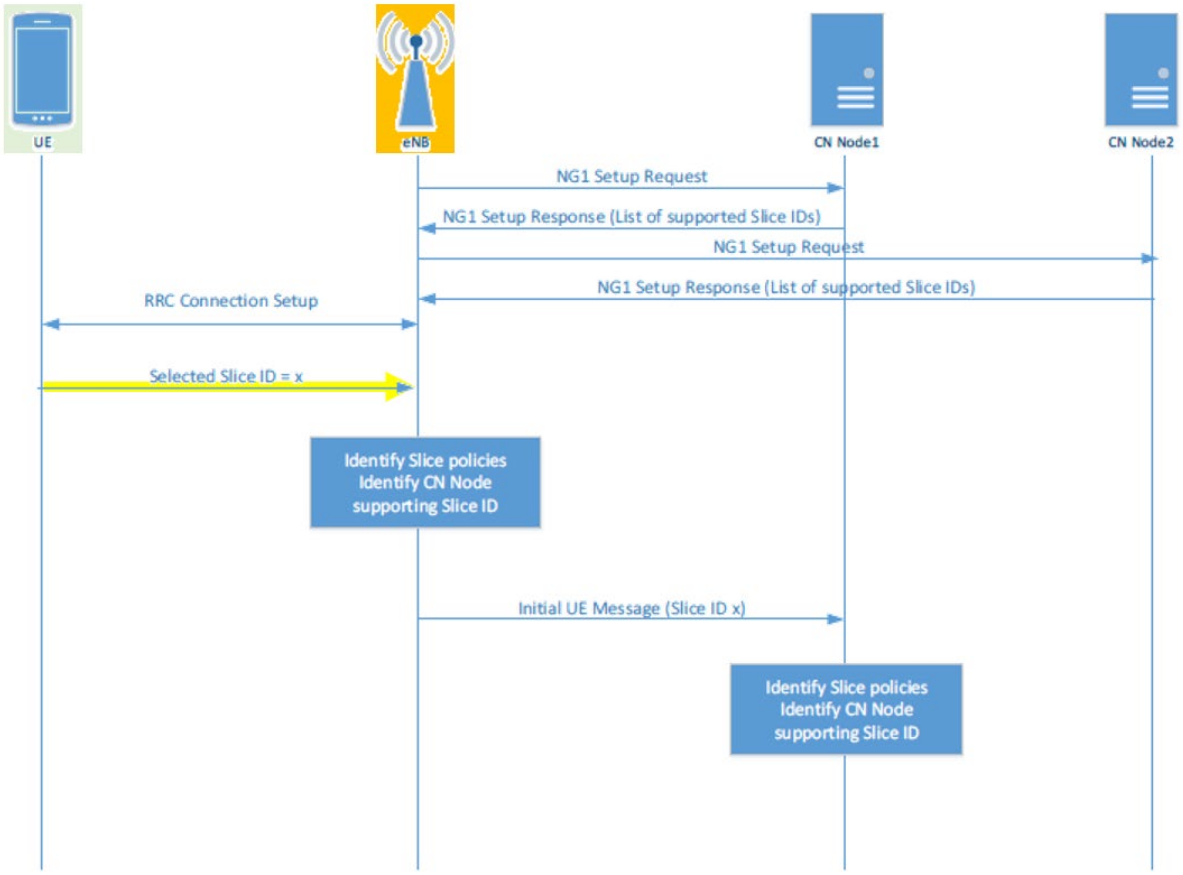


Figure 9.2.1-1: Slice selection when Slice ID is provided by the UE to RAN

810. It would have been obvious to a person of ordinary skill in the art that *Han*'s message sent by the terminal to the access network device could have been a non-access stratum message at least because *Han* explicitly describes the "message sent by the terminal" including "a non-access stratum protocol data unit NAS PDU." (Ex. 1015, 15; Ex. 1017, 23).

811. A person of ordinary skill in the art would have been motivated to utilize one of the multiple implementations of *TR 38.801* for details regarding how

to convey required network slice information from a UE to a base station to "enable[] support of multiple slices simultaneously supported by a UE" (*see* Ex. 1013, 24), and/or to ensure "resource isolation," which *TR 38.801* describes as "enabl[ing] specialized customization" and which "avoids one slice affecting another slice." (Ex. 1013, 28).

812. The person of ordinary skill in the art would have had a reasonable expectation of success in such a combination because the person of ordinary skill in the art would have been well aware that the RRC sublayer was available for communication of NAS messages from a UE to a core network via a base station (*see* § VI *supra*), as also taught by *TR 38.801*.

813. Moreover, the person of ordinary skill in the art would have understood that the terminal or user equipment of *Han* and the UE of *TR 38.801* are similar devices with similar communication capabilities. The person of ordinary skill in the art would have further recognized that the ability to convey network slice information from a UE to an eNB via an NAS message, using the RRC sublayer, was an improvement to the UE of *TR 38.801* because such capability enabled the use of a single message to convey information to an eNB that the eNB needed for both (1) slice awareness and (2) for communicating to a selected core network node.

814. A person of ordinary skill in the art would have been motivated to implement and combine the teachings of *Han*, *TS 36.300*, and *TR 38.801* for at least

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the reasons espoused in the section herein titled *Motivation to Combine Han, TS 36.300, and TR 38.801*.

815. Thus, *Han*, *TS 36.300*, and *TR 38.801* render obvious claim 14.

Dependent Claim 15: The apparatus according to claim 14, wherein the processor further performs to receive the network slice information from a core network, wherein the network slice information is configured by the network slice request information.

816. *Han*, *TS 36.300*, and *TR 38.801* render obvious claim 15. As set forth above, *Han*, *TS 36.300*, and *TR 38.801* render obvious all of the elements of claim 14. *See* § IX.D.14 *supra*.

817. *Han*, *TS 36.300*, and *TR 38.801* render obvious the remaining elements of claim 15.

818. The ’631 patent describes a “base station” “receiv[ing] the specific network slice information that is configured based on the network slice information from the core network entity” “[a]fter the base station has transmitted the network slice request information to the core network entity.” (Ex. 1001, 11:49-60).

819. *Han* discloses that a “core network control plane device sends first pre-authorized QoS information to a terminal, and sends second pre-authorized QoS information to a first access network device.” (Ex. 1015, 28; FIG. 5; Ex. 1017, 36, FIG. 5). *Han* discloses that the “second pre-authorized QoS information may include content of [] first pre-authorized QoS information,” where “the first pre-authorized

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QoS information may further include" "identification information of a network slice of a data packet group." (Ex. 1015, 31-33; Ex. 1017, 37).

Ex. 1015, FIG. 5 (annotated) (Ex. 1017, FIG. 5)

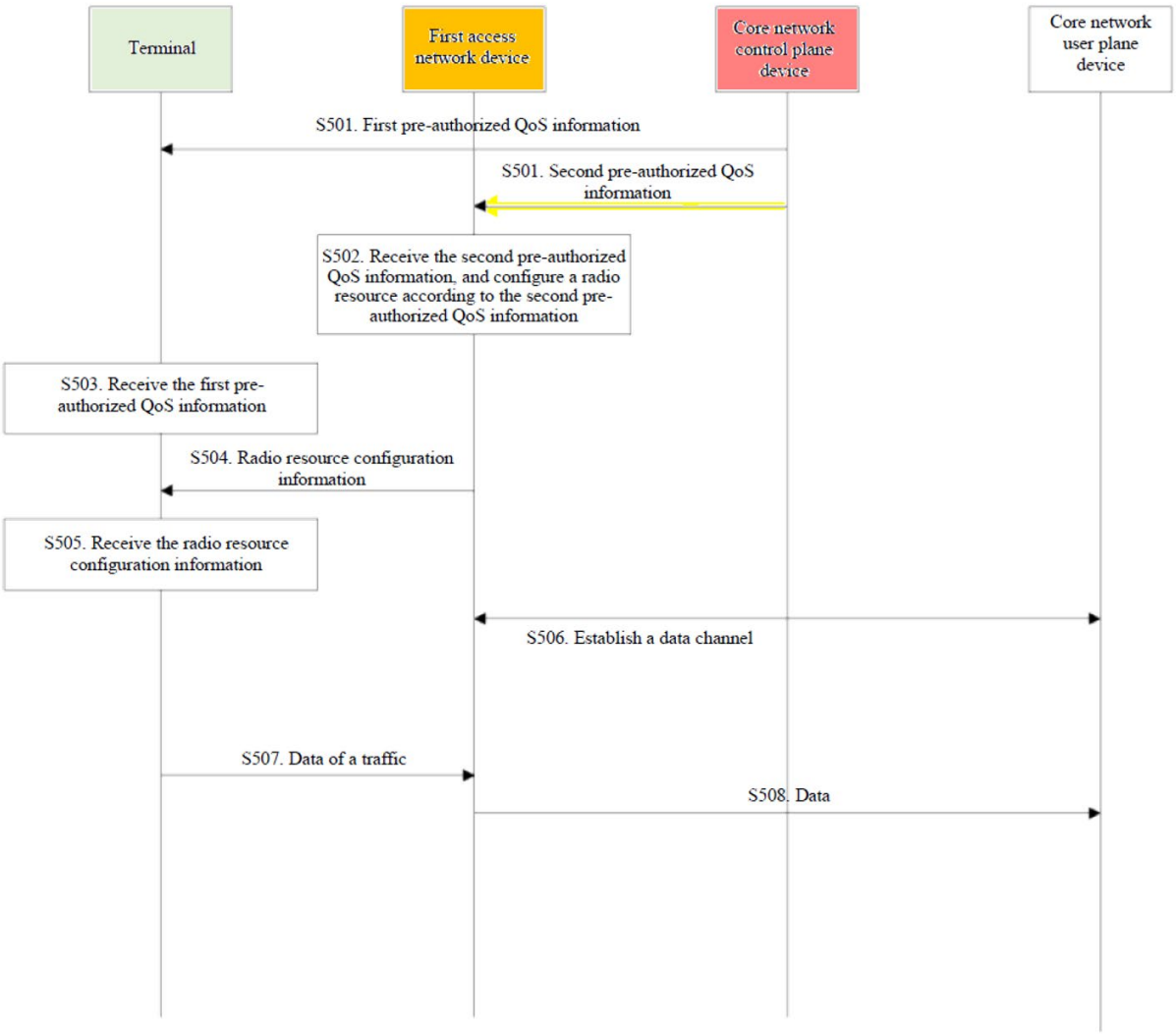


FIG. 5

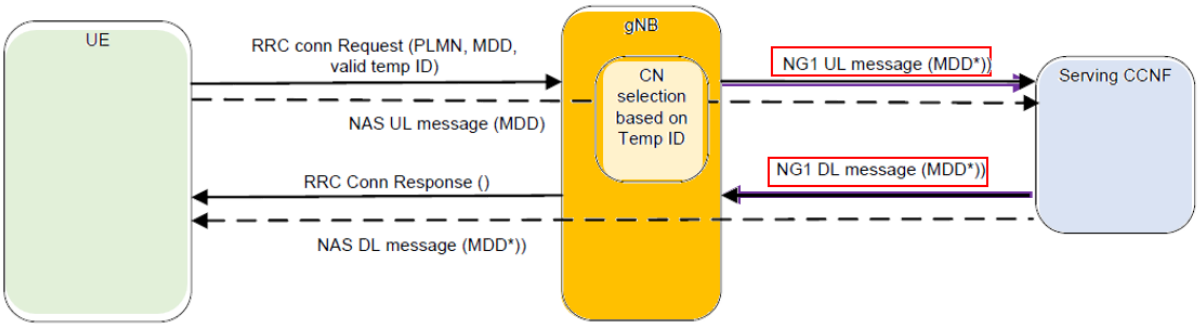
820. *Han* discloses "[t]he first QoS information includes at least one of first pre-authorized QoS information and reflective characteristic information, and the

reflective characteristic information includes a downlink QoS parameter of the traffic and indication information that is used to indicate a capability of obtaining an uplink QoS parameter based on the downlink QoS parameter of the traffic," and "the pre-authorized QoS information (including the first pre-authorized QoS information and second pre-authorized QoS information in the following specification) is proactively ***configured by the core network control plane device*** for the terminal based on subscription information of the terminal or according to a common traffic (such as email or Taobao)." (Ex. 1015, 5) (emphasis added; Ex. 1017, 12).

821. *TR 38.801* also discloses a Serving CCNF, or core network entity, receiving network slice request information in the form of an MDD in an uplink message. (Ex. 1013, 25-26). *TR 38.801* also states that "RAN uses the included MDD for RAN slice awareness (slice specific behavior, congestion control, resource isolation)." (Ex. 1013, 25-26. *TR 38.801* then states that the "MDD is sent back to the UE with the Temp ID at NAS level to either reconfirm the initially requested MDD or indicate a new one if policy has changed." *Id. TR 38.801* also states that the MDD is "also indicated in the NG1 DL message to gNB for confirmation." *Id*.

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Ex. 1013, 25 (annotated)



822. All of this is depicted in the image above from *TR 38.801*, in which source BS ("gNB," orange) receives from the core network entity ("Serving CCNF," light blue) network slice information ("MDD*"), where the network slice information is configured by the network slice request information ("MDD"). Because the Serving CCNF receives an MDD* (network slice request information) that is based on the MDD (network slice request information), and returns to the source BS an MDD* (network slice information) that is either a reconfirmation of the requested MDD or a modified MDD if a policy has changed (i.e., a requested MDD is unavailable), a person of ordinary skill in the art would have found it obvious or understood that *TR 38.801* disclosed that the network slice information is configured by the network slice request information.

823. A person of ordinary skill in the art would have been motivated to implement the teachings of *Han*, *TS 36.300*, and *TR 38.801* for at least the reasons

espoused in the section herein titled *Motivation to Combine Han, TS 36.300, and TR 38.801*.

824. Thus, *Han*, *TS 36.300*, and *TR 38.801* render obvious claim 15.

Dependent Claim 16: The apparatus according to claim 14, wherein the NAS message including the network slice request information is included in a radio resource control (RRC) connection setup completion message.

825. *Han*, *TS 36.300*, and *TR 38.801* render obvious claim 16. As set forth above, *Han*, *TS 36.300*, and *TR 38.801* render obvious all of the elements of claim 14. *See* § IX.D.14 *supra*.

826. *Han*, *TS 36.300*, and *TR 38.801* render obvious the remaining elements of claim 16.

827. As discussed above, *Han*, *TS 36.300*, and *TR 38.801* render obvious a "NAS message including the network slice information." *See* § IX.D.14 *supra*.

828. The '631 patent makes no mention of a "radio resource control (RRC) connection setup completion message" outside of the claims. The '631 patent describes an "RRC connection setup complete message" that is used to "transmit[]" "network slice request information" from a UE "to a base station" by including the "network slice request information" in "a NAS message." (Ex. 1001, 15:19-37). Accordingly, a person of ordinary skill in the art would have understood that the claimed "radio resource control (RRC) connection setup completion message" was

an RRC message used to transmit network slice request information to a base station by including the network slice request information in an NAS message.

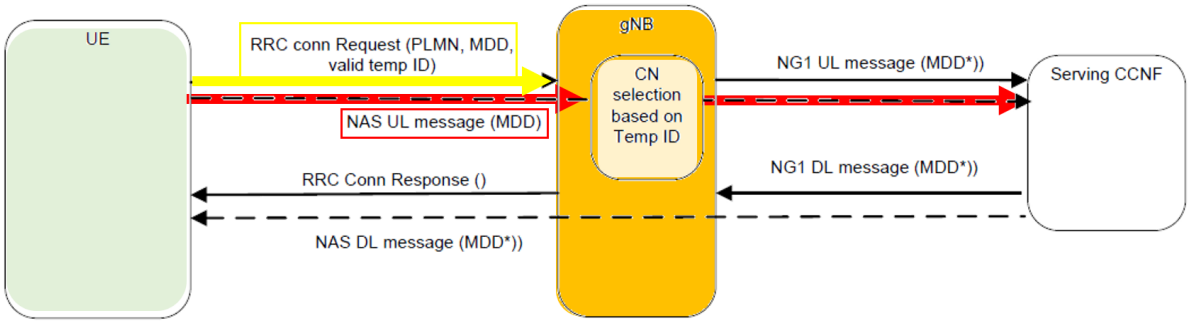
829. *Han* discloses a "terminal send[ing] an AS message" (or access stratum message) "to an access network device," where the "AS message carries a NAS PDU" (or non-access stratum PDU) (Ex. 1015, 58). *Han* discloses that the "AS message may be an RRC message," and the "RRC message includes one of an RRC connection request, an RRC connection reestablishment request, a UE information response message, and the like." *Id.* That is, *Han* discloses an "RRC message" that carries a non-access stratum PDU. *Id.*

830. *TR 38.801* discloses a UE sending an RRC message including an MDD as well as an NAS message containing an MDD to the.[52] (Ex. 1013, 24-26).

[52] The '631 patent provides examples of base stations, including "a gNode-B (gNB)." (Ex. 1001, 3:62-4:4).

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Ex. 1013, 25 (annotated)



831. *TR 38.801* also discloses an "MDD [being] sent back to the UE with the Temp ID at NAS level" and an "RRC Conn Response" message being sent back to the UE.[53] (Ex. 1013, 24-26).

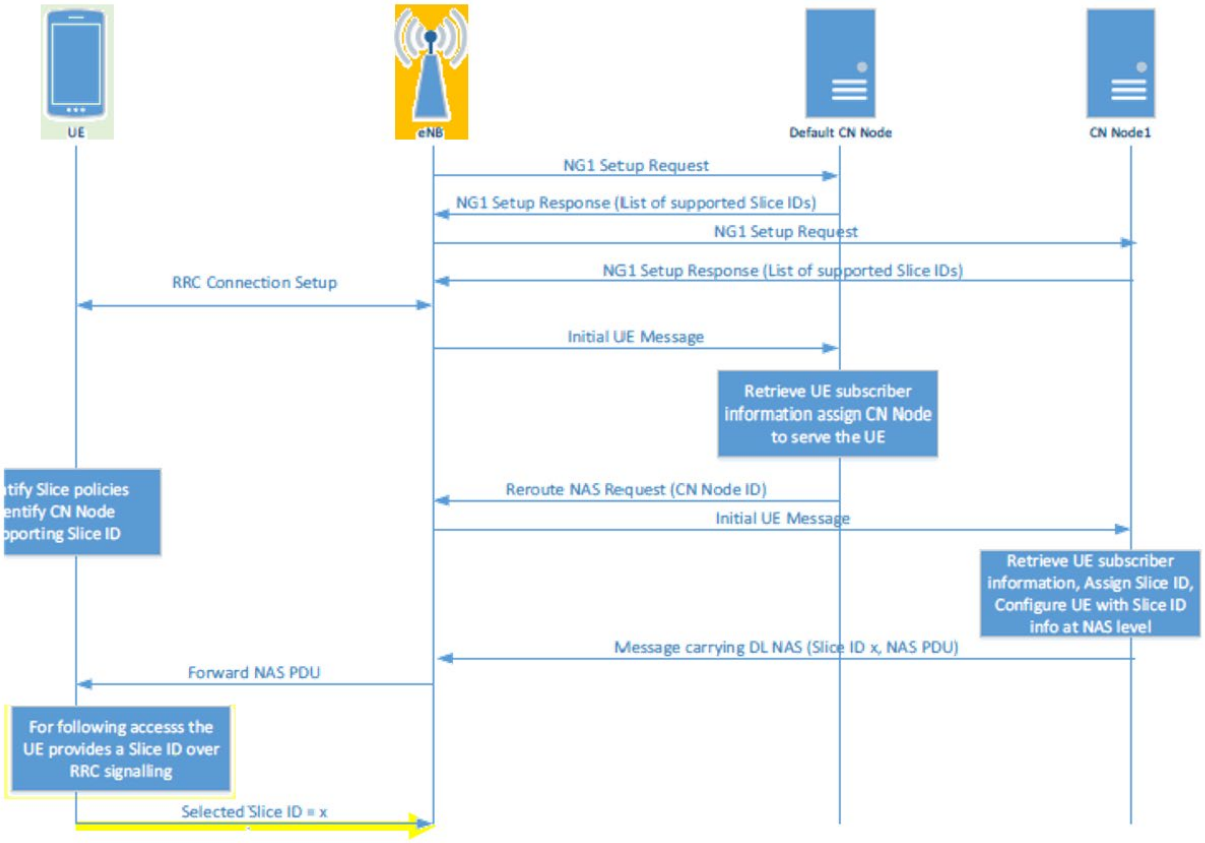
832. *TR 38.801* discloses that the "MDD" is used "for RAN slice awareness (slice specific behavior, congestion control, resource isolation)." (Ex. 1013, 26). That is, *TR 38.801* discloses that the NAS message includes network slice information. *see also* §§ VI, VII.B *supra*. A person of ordinary skill in the art would have understood that the NAS message could have been encapsulated in an RRC

[53] The '631 patent provides examples of base stations, including "a gNode-B (gNB)." (Ex. 1001, 3:62-4:4).

message at least in view of the knowledge of the person of ordinary skill in the art as discussed in the Technical Background herein (§VI *supra*).

833. *TR 38.801* further discloses, as depicted in Figure 9.2.1-2, that a "UE will present to the RAN a slice ID that [it] intends to access at RRC connection establishment." (Ex. 1013, 27).

Ex. 1013, Figure 9.2.1-2 (annotated)



834. It would have been obvious to a person of ordinary skill in the art that *Han*'s NAS message could have been encapsulated in an RRC message at least in

view of the teachings of *TR 38.801* and the knowledge of the person of ordinary skill in the art that the RRC sublayer was available for communication of NAS messages (*see* § VI *supra*), as also taught by *TR 38.801*. This knowledge of the person of ordinary skill in the art that the RRC sublayer was available for communication of NAS messages would also have provided the person of ordinary skill in the art with a reasonable expectation of success in combining *Han* and *TR 38.801*.

835. A person of ordinary skill in the art would have been motivated to implement and combine the teachings of *Han*, *TS 36.300*, and *TR 38.801* for at least the reasons espoused in the section herein titled *Motivation to Combine Han, TS 36.300, and TR 38.801*.

836. Thus, *Han*, *TS 36.300*, and *TR 38.801* render obvious claim 17.

Dependent Claim 17: The apparatus according to claim 15, wherein the network slice information is configured by the core network entity based on the network slice request information.

837. *Han*, *TS 36.300*, and *TR 38.801* render obvious claim 17. As set forth above, *Han*, *TS 36.300*, and *TR 38.801* render obvious all of the elements of claim 15. *See* § IX.D.15 *supra*.

838. *Han*, *TS 36.300*, and *TR 38.801* render obvious the remaining elements of claim 17.

839. *Han* discloses that a "core network control plane device sends first pre-authorized QoS information to a terminal, and sends second pre-authorized QoS

information to a first access network device." (Ex. 1015, 30, FIG. 5; Ex. 1017, 35, FIG. 5). *Han* discloses that the "second pre-authorized QoS information may include content of [] first pre-authorized QoS information," where "the first pre-authorized QoS information may further include" "identification information of a network slice of a data packet group." (Ex. 1015, 29-31; Ex. 1017, 37).

Ex. 1015, FIG. 5 (annotated) (Ex. 1017, FIG. 5)

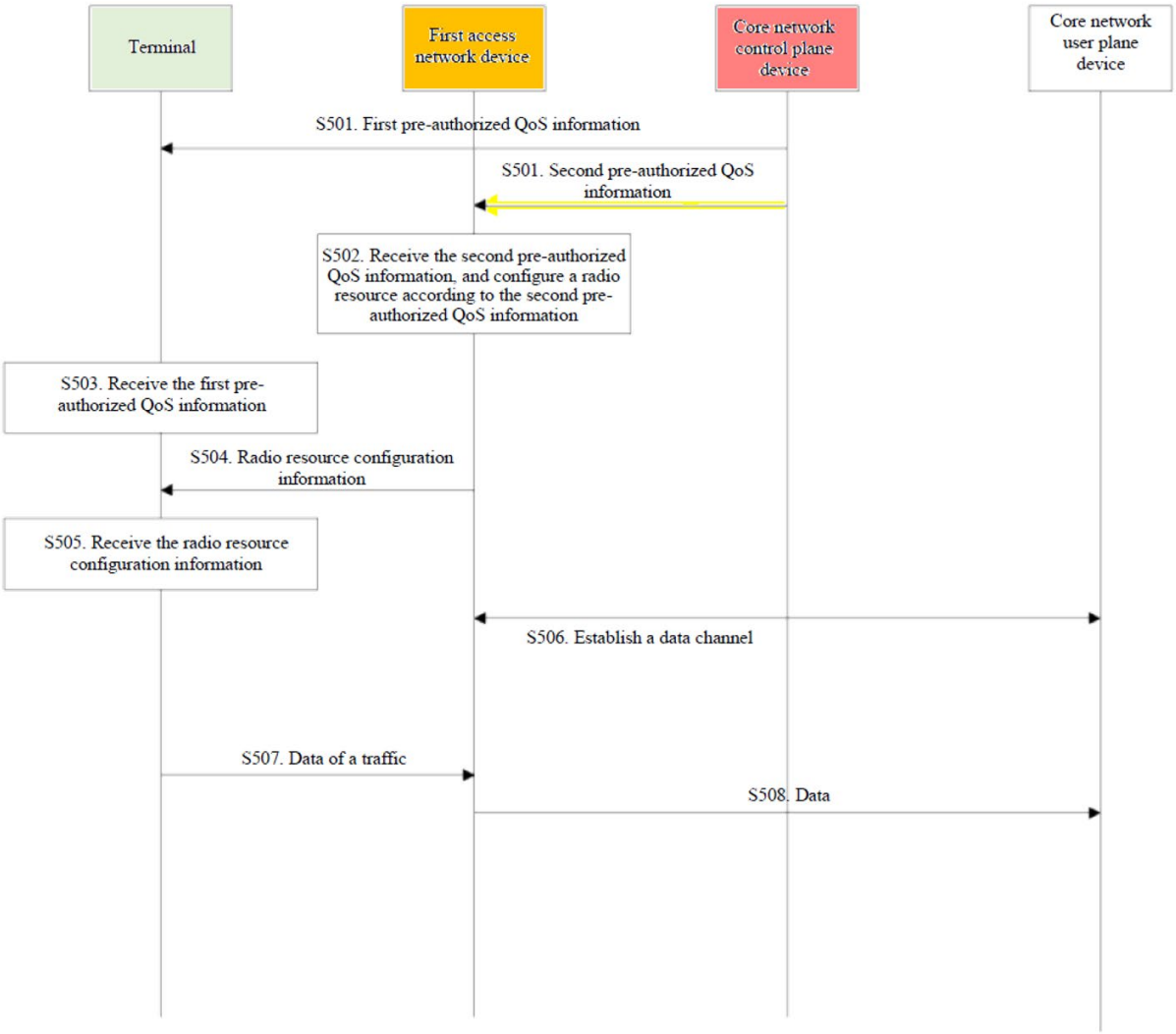


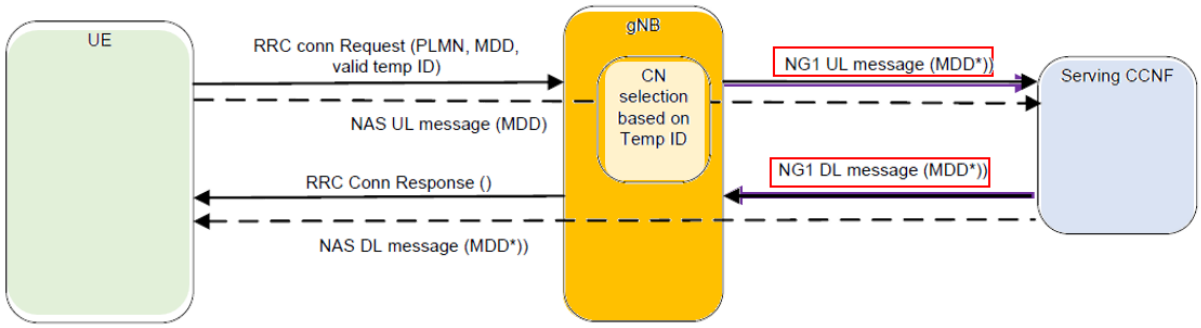
FIG. 5

840. *Han* discloses "[t]he first QoS information includes at least one of first pre-authorized QoS information and reflective characteristic information, and the reflective characteristic information includes a downlink QoS parameter of the traffic and indication information that is used to indicate a capability of obtaining an uplink QoS parameter based on the downlink QoS parameter of the traffic," and "the pre-authorized QoS information (including the first pre-authorized QoS information and second pre-authorized QoS information in the following specification) is proactively ***configured by the core network control plane device*** for the terminal based on subscription information of the terminal or according to a common traffic (such as email or Taobao)." (Ex. 1015, 5) (emphasis added; Ex. 1017, 12).

841. *TR 38.801* defines a "slice ID" as "unambiguously identif[ying] one of the pre-configured network slices…" (Ex. 1013, 23). *TR 38.801* also discloses several scenarios involving network slice selection, and those scenarios are disclosed by *TR 38.801* as being based on a solution described in "section 6.1.2 of TR 23.799." (Ex. 1013, 24; Ex. 1020, 61). *TR 38.801* discloses, with reference to the image annotated below, that the core network entity ("Serving CCNF," light blue) receives the network slice request information (MDD*) in an uplink or "UL message." (Ex. 1013, 25-26). According to *TR 38.801,* "RAN uses the included MDD for RAN slice awareness (slice specific behavior, congestion control, resource isolation)." *Id.* The "MDD is sent back to the UE with the Temp ID at NAS level to either reconfirm the

initially requested MDD or indicates a new one if policy has changed." *Id.* The MDD* is "also indicated in the NG1 DL message to gNB for confirmation." *Id.* In the solution referenced by *TR 38.801* and described in section 6.1.2 of *TR 23.799*, the "CCNF decides the initial set of [network slice instances] for the UE based on an evaluation of the Requested MDD, Subscribed MDD (if available), …," and the "Accepted MDD" "is passed to the UE in [an] Attach Accept message." (Ex. 1020, p. 67).

Ex. 1013, 24 (annotated)



842. Therefore, and with reference to the image annotated above, *TR 38.801* discloses receiving by the source BS ("gNB," orange), from the core network entity ("Serving CCNF," light blue), network slice information ("MDD*" as part of "NG1 DL message (MDD*)"), where the network slice information ("MDD*") is configured by the core network entity based on the network slice request information ("MDD"). That is, while it appears in the image that the Serving CCNF receives from the gNB and sends to the gNB the same MDD*, a person of ordinary skill in

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the art would have understood or found it obvious that the Serving CCNF modified the MDD* prior to sending it back in view of the explicit disclosure in *TR 38.801* that the "MDD is sent back to the UE with the Temp ID at NAS level to either reconfirm the initially requested MDD or indicate a new one if policy has changed," and the MDD is "also indicated in the NG1 DL message to gNB for confirmation." (Ex. 1013, 25-26).

843. A person of ordinary skill in the art would have been motivated to implement and combine the teachings of *Han*, *TS 36.300*, and *TR 38.801* for at least the reasons espoused in the section herein titled *Motivation to Combine Han, TS 36.300, and TR 38.801*.

844. Thus, *Han*, *TS 36.300*, and *TR 38.801* render obvious claim 17.

Dependent Claim 18: The apparatus according to claim 17, wherein the transmission of the handover request message is performed through a direct interface associated with the target base station.

845. *Han*, *TS 36.300*, and *TR 38.801* render obvious claim 18. As set forth above, *Han*, *TS 36.300*, and *TR 38.801* render obvious all of the elements of claim 17. *See* § IX.D.17 *supra*.

846. *Han*, *TS 36.300*, and *TR 38.801* render obvious the remaining elements of claim. The '631 patent refers to "X2" as an "inter-base station interface," and states that a "handover based on an interface between a core network entity and a base station may be used only when a handover based on an inter-base station

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interface cannot be used." Ex. 1001, 19:6-34. Accordingly, a person of ordinary skill in the art would have understood that the claimed "direct interface" meant that the handover request message was performed between the source and target base stations without the core network.

847. *Han* discloses that "[a] handover process message between the first access network device and the second access network device may be sent and received through a direct interface between the first access network device and the second access network device (a handover process between peer entities)." (Ex. 1015, 44; Ex. 1017, 50).

848. A person of ordinary skill in the art would have been motivated to implement and combine the teachings of *Han*, *TS 36.300*, and *TR 38.801* for at least the reasons espoused in the section herein titled *Motivation to Combine Han, TS 36.300, and TR 38.801*.

849. Thus, *Han*, *TS 36.300*, and *TR 38.801* render obvious claim 18.

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X. CONCLUSION

I 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 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.

Dated: Oct. 16, 2024

Michael D Kotzin

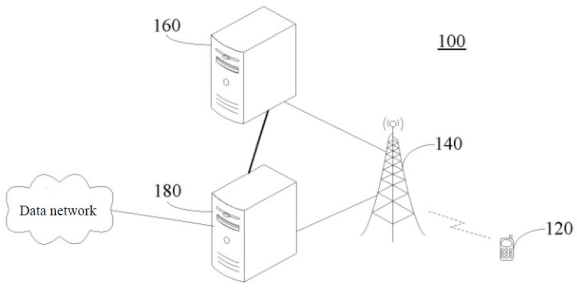
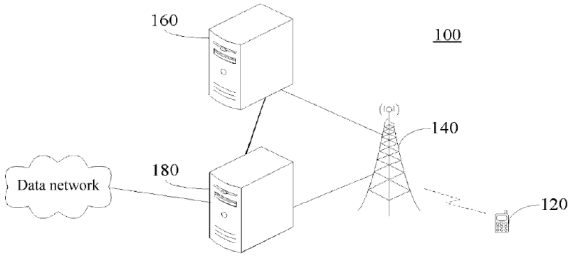
Michael Kotzin, Ph.D.

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Han (Ex. 1015)	2016 CN Priority Document (Ex. 1017)
"The present invention relates to the technical field of communications, and relates in particular to a communication method, an apparatus, a system, a terminal, and an access network device." (Ex. 1015, 3).	"The present invention relates to the technical field of communications, and in particular, to a method, apparatus, and system for communication, a terminal, and an access network device." (Ex. 1017, 10).
"To ensure quality of service, an end-to-end quality of service (QoS for short) mechanism is usually used in an existing long term evolution (LTE for short) system. In this mechanism, when a terminal initiates a traffic whose the QoS needs to be ensured, a dedicated bearer needs to be established for the terminal to transmit data of the traffic." (Ex. 1015, 3).	"To ensure the quality of services, an end-to-end Quality of Service (QoS) mechanism is usually adopted in existing Long Term Evolution (LTE) systems. In this mechanism, when a 10 terminal initiates traffic the QoS of which needs to be ensured, a dedicated bearer needs to be established for the terminal to transmit data of the traffic." (Ex. 1017, 10).
"The dedicated bearer is composed of a radio bearer between the terminal and an evolved NodeB (eNB for short) and a ground side channel between the eNB and a network side device. A process of establishing the dedicated bearer is as follows: When	"The dedicated bearer is comprised of a radio bearer between the terminal and an evolved NodeB (eNB) and a ground side channel between the eNB and a network side device. The process of establishing a dedicated bearer is as follows: when initiating the traffic, the terminal first

Han (Ex. 1015)	2016 CN Priority Document (Ex. 1017)
initiating a traffic, the terminal first interacts with an application server by means of a default bearer. The application server triggers a policy and charging rules function (PCRF for short) unit to generate a QoS parameter, and notifies a mobility management entity (MME for short) of the generated QoS parameter. Then the MME sends the QoS parameter to the eNB. After receiving the QoS parameter, the eNB may establish the dedicated bearer according to the received QoS parameter. Then, the terminal can send the data of the traffic on the established dedicated bearer." (Ex. 1015, 3).	interacts with an application server by means of a default bearer; the application server triggers a Policy and Charging Rules Function (PCRF) unit to generate a QoS parameter, and notifies a Mobility Management Entity (MME) of the generated QoS parameter; and then the MME sends the QoS parameter to the eNB. After receiving the QoS parameter, the eNB establishes a dedicated bearer according to the received QoS parameter, and then the terminal can send the traffic data on the established dedicated bearer." (Ex. 1017, 10).
"The terminal needs to wait for completion of a process of allocating the QoS parameter, and can send the traffic data only after the dedicated bearer is established according to the QoS parameter. Therefore, a data transmission start speed of an uplink traffic is relatively low, and the	"Since the terminal needs to wait for completion of a process of allocating the QoS parameter, and can send the traffic data only after the dedicated bearer is established according to the QoS parameter, the data sending start speed of uplink traffic is relatively slow, and a

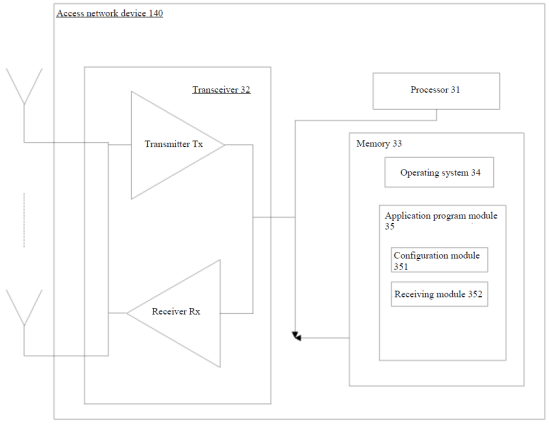
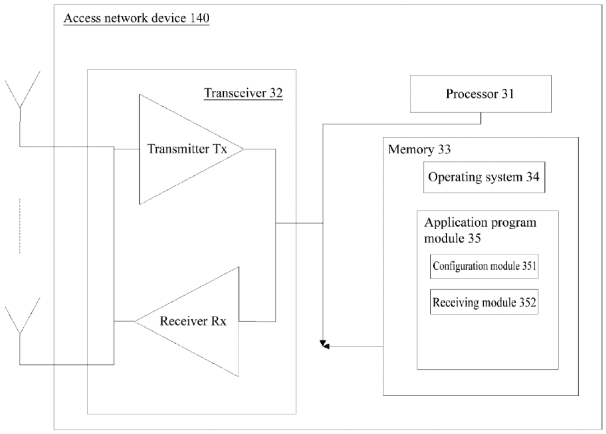
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Han (Ex. 1015)	2016 CN Priority Document (Ex. 1017)
requirement for reducing a traffic latency cannot be met." (Ex. 1015, 3-4).	requirement for reducing traffic latency cannot be met." (Ex. 1017, 10).
"To solve the problem in the prior art that the data transmission start speed of the uplink traffic is relatively low, embodiments of the present invention provide a communication method, an apparatus, a system, a terminal, and an access network device." (Ex. 1015, 4).	"To solve the problem in the prior art that the data sending start speed of uplink traffic is relatively slow, embodiments of the present invention provide a method, apparatus, and system for communication, a terminal, and an access network device." (Ex. 1017, 11)
Ex. 1015, FIG. 1  FIG. 1	Ex. 1017, FIG. 1  FIG. 1
"FIG. 1 is a schematic structural diagram of a communication system 100 according to an embodiment of the present invention. The communication system 100 may be an LTE system, a 5G system, or a subsequent evolved system of the 5G system. The communication system	"FIG. 1 shows a schematic structural diagram of a communication system 100 according to an embodiment of the present invention. The communication system 100 may be an LTE system, a 5G system, or a subsequent evolved system thereof. The communication system 100 includes: at least one terminal 120, at

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100 includes: at least one terminal 120, at least one access network device 140, at least one core network control plane device 160, and at least one core network user plane device 180." (Ex. 1015, 24).	least one access network device 140, at least one core network control plane device 160, and at least one core network user plane device 180." (Ex. 1017, 29).
"The terminal 120 may be a device such as a personal communication service (PCS for short) phone, a cordless telephone set, a session initiation protocol (SIP for short) phone, a wireless local loop (WLL for short) station, or a personal digital assistant (PDA for short). The terminal may also be referred to as a system, a subscriber unit, a subscriber station, a mobile station, a mobile console (Mobile), a remote station, an access point, a remote terminal, an access terminal, a user terminal, a user agent, a user device, or user equipment. The terminal 120 communicates with one or more access network devices 140 via a	"The terminal 120 may be a device such as a Personal Communication Service (PCS) phone, a cordless telephone set, a Session Initiation Protocol (SIP) phone, a Wireless Local Loop (WLL) station, or a Personal Digital Assistant (PDA). The terminal may also be referred to as a system, a subscriber unit, a subscriber station, a mobile station, a mobile console (Mobile), a remote station, an access point, a remote terminal, an access terminal, a user terminal, a user agent, a user device, or user equipment. The terminal 120 communicates with one or more access network devices 140 by means of a Radio Access Network (RAN)." (Ex. 1017, 29-30).

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radio access network (RAN for short).” (Ex. 1015, 24).	
“For example, the access network device 140 may be a base transceiver station (BTS for short) in a global system for mobile communications (GSM for short) or a code division multiple access (CDMA for short) system, or a base station (NodeB) in a wideband code division multiple access (WCDMA for short) system, or an eNB in LTE system, which is not limited in the present invention.” (Ex. 1015, 24).	“For example, the access network device 140 may be a Base Transceiver Station (BTS) in a Global System for Mobile Communications (GSM) or a Code Division Multiple Access (CDMA) system, or a base station (NodeB) in Wideband Code Division 10 Multiple Access (WCDMA) system, or an eNB in LTE system. This is not limited in the present invention.” (Ex. 1017, 29-30).
Ex. 1015, FIG. 3  FIG. 3	Ex. 1017, FIG. 3  FIG. 3

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"FIG. 3 shows a hardware structure in which an access network device 140 according to an embodiment of the present invention is implemented. Referring to FIG. 3, the access network device 140 includes a processor 31, a transceiver 32, and a memory 33. The processor 31 includes one or more processing cores. The processor 31 runs a software program and modules, thereby executing various function applications and information processing. The transceiver 32 includes a receiver Rx and a transmitter Tx. The transceiver 32 may be further implemented as a communication chip. The communication chip may include a receiving module, a transmitting module, a modulation/demodulation module, and the like, and is configured to modulate/demodulate information, and receive or send the	"FIG. 3 shows the hardware structure of an access network device 140 provided to implement an embodiment of the present invention. Referring to FIG. 3, the access network device 140 includes a processor 31, a transceiver 32, and a memory 33. The processor 31 includes one or more processing cores. The processor 31 runs a software program and modules, thereby executing various function applications and information processing. The transceiver 32 includes a receiver Rx and a transmitter Tx. The transceiver 32 may be further implemented as a communication chip. The communication chip may include a receiving module, a transmitting module, a modulation/demodulation module, and the like, and is configured to modulate/demodulate information, and receive or send the information by means of a radio signal." (Ex. 1017, 31-33).

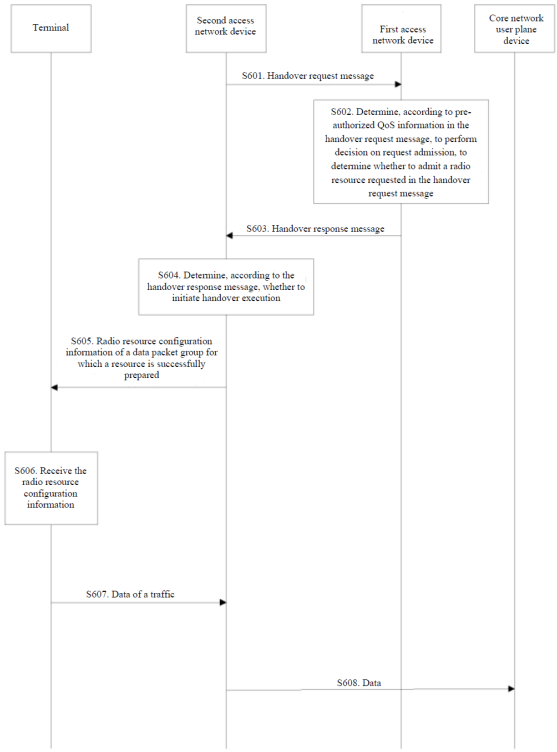
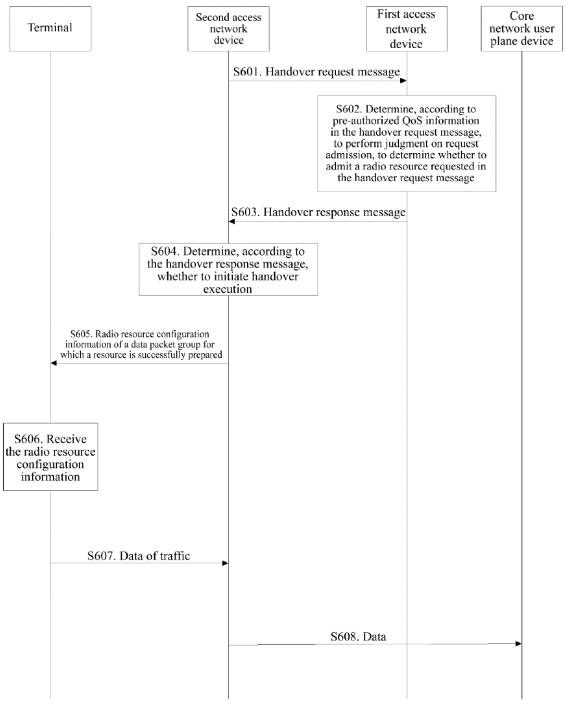
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information by means of a radio signal." (Ex. 1015, 27)	
"It should be noted that, in the embodiment of the present invention, uplink data is data that is sent from the terminal to the access network device through a radio interface, then from the access network device to the core network user plane device under control of the core network control plane device, and is finally sent to an external data network; and downlink data is data that is sent to the terminal by the core network user plane device through the access network device, is successively submitted upward through a data channel in the terminal, and is finally submitted to an upper layer APP." (Ex. 1015, 25).	"It should be noted that, in the embodiments of the present invention, uplink data refers to data that is sent from the terminal to the access network device by means of a radio interface, then from the access network device to the core network user plane device under control of the core 5 network control plane device, and is finally sent to an external data network, and downlink data refers to data that is sent to the terminal by the core network user plane device by means of the access network device, is successively submitted upward through a data channel in the terminal, and is finally submitted to an upper layer APP." (Ex. 1017, 31).
"In a feasible design, the quality of service information further comprises at least one of PDU session information and identification information of network slice of the traffic." (Ex. 1015, 6, 20).	"16. The method according to claim 15, characterized in that the quality of service information further comprises at least one of PDU session information of the traffic and identification information

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	of a network slice." (Ex. 1017, 4, 7, Cl. 16).
"Further, the second pre-authorized QoS information or the authorized QoS information may explicitly or implicitly include the PDU session information." (Ex. 1015, 40).	"Further, the second pre-authorized QoS information or the authorized QoS information may explicitly or implicitly include the PDU session information." (Ex. 1017, 49).
"Optionally, the first pre-authorized QoS information may further include: identification information of a network slice of a data packet group, wherein the identification information of the slice includes at least one of the following: a slice id, a slice type, a tenant type, a tenant identifier, a network function identifier, and the like." (Ex. 1015, 31).	"Optionally, the first pre-authorized QoS information may further include: identification information of a network slice of a data packet group, wherein the identification information of the slice includes at least one of the following: a slice ID, a slice type, a tenant type, a tenant identifier, a network function identifier, and the like." (Ex. 1017, 37, 57).
Ex. 1015, FIG. 6	Ex. 1017, FIG. 6

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 FIG. 6	 FIG. 6
"Referring to FIG. 6, FIG. 6 shows a communication method according to an embodiment of the present invention. The method is implemented by using the system shown in FIG. 1. In the embodiment shown in FIG. 6, present embodiment of the present invention is described in detail by using an example in which a radio resource is configured according to pre-authorized QoS information in a handover process." (Ex. 1015, 44)	"Referring to FIG. 6, FIG. 5 shows a communication method provided in an embodiment of the present invention. The method is implemented by using the system shown in FIG. 1. In the embodiment shown in FIG. 6, this embodiment of the present invention is described in detail by using an example in which a radio resource is configured according to pre-authorized QoS information in a handover process." (Ex. 1017, 50-51)

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"S601: A second access network device sends a handover request message to a first access network device. The second access network device may also be referred to as a source-side access network device, and the first access network device may also be referred to as a target-side access network device. A handover process message between the first access network device and the second access network device may be sent and received through a direct interface between the first access network device and the second access network device (a handover process between peer entities)." (Ex. 1015, 44).	"S601: A second access network device sends a handover request message to a first access network device. The second access network device may also be referred to as a source-side access network device, and the first access network device may also be referred to as a target-side access network device. A handover process message between the first access network device and the second access network device may be sent and received through a direct interface between the first access network device and the second access network device (a handover process between peer entities)." (Ex. 1017, 50).
"The handover request message includes pre-authorized QoS information. The pre-authorized QoS information in the handover request message may include a part or all of the second pre-authorized QoS information in the embodiment shown	"The handover request message includes pre-authorized QoS information. The pre-authorized QoS information in the handover request message may include a part or all of the second pre-authorized QoS information in the embodiment shown in FIG. 5, for example, may 5

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in FIG. 5, for example, may include only the QoS parameter identifier in step S501 and a QoS parameter corresponding to the QoS parameter identifier; or may include the QoS parameter identifier, the QoS parameter corresponding to the QoS parameter identifier, and the packet filter corresponding to the QoS parameter; or may further include the first indication information." (Ex. 1015, 44).	include only the QoS parameter identifier in step S501 and a QoS parameter corresponding to the QoS parameter identifier; or may include the QoS parameter identifier, the QoS parameter corresponding to the QoS parameter identifier, and the packet filter corresponding to the QoS parameter; or may further include the first indication information." (Ex. 1017, 50-51).
"Further, the second pre-authorized QoS information or the authorized QoS information may explicitly or implicitly include the PDU session information. For example, the second pre-authorized QoS information in the session establishment process may implicitly include the session information, and specific session information is associated according to different session establishment processes. When the core network control plane device notifies the	"Further, the second pre-authorized QoS information or the authorized QoS information may explicitly or implicitly include the PDU session information. For example, the second pre-authorized QoS information in the session establishment process may implicitly include the session information, and specific session information is associated according to different session establishment processes. In the process of the core network control plane device notifying the access network device of

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access network device of the authorized QoS, the session information may be explicitly carried in the QoS information." (Ex. 1015, 42).	the authorized QoS, the session information may be explicitly carried in the QoS information." (Ex. 1017, 49).
"S602: The first access network device receives the handover request message, and determines, according to pre-authorized QoS information in the handover request message, to perform judgment on request admission, to determine whether to admit a radio resource requested in the handover request message. Admitting the radio resource requested in the handover request message refers to configuring the radio resource for the terminal according to the radio resource requested in the handover request message. Refer to step 502 for specific implementation of configuring the radio resource, and detailed description is omitted herein." (Ex. 1015, 46).	"S602: The first access network device receives the handover request message, and determines, according to pre-authorized QoS information in the handover request message, to perform judgment on request admission, to determine whether to admit a radio resource requested in the handover request message. Admitting the radio resource requested in the handover request message is configuring the radio resource for the terminal according to the radio resource requested in the handover request message. Refer to step 502 for specific implementation of configuring the radio resource, and detailed description is omitted herein." (Ex. 1017, 52).

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"For example, when performing admission judgment, the first access network device may consider only the data packet group for which a radio resource has been configured, and determine, according to the QoS parameter of the data packet group and a resource status of the target side, whether to admit the data packet group for which a radio bearer has been established on the source side." (Ex. 1015, 46).	"For example, when performing admission judgment, the first access network device may consider only the data packet group for which a radio resource has been configured, and determine, 10 according to the QoS parameter of the data packet group and a resource status of the target side, whether to admit the data packet group for which a radio bearer has been established on the source side." (Ex. 1017, 53).
"S603: The first access network device sends a handover response message to the second access network device, wherein the handover response message may be a handover preparation failure message or a handover preparation success message. Specifically, when determining that none of resources requested in the handover request message is admitted, the first access network device sends the handover preparation failure message, wherein	"S603: The first access network device sends a handover response message to the second access network device, wherein the handover response message may be a handover preparation failure message or a handover preparation success message. Specifically, when determining that none of resources requested in the handover request message is admitted, the first access network device sends the handover preparation failure message, wherein the handover preparation failure message is

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the handover preparation failure message is used to indicate that none of the resources requested in the handover request message is admitted; or when determining that all or some resources requested in the handover request message are admitted, the first access network device sends a handover preparation success message. That some of the resources requested in the handover request message are not admitted may include that some data packet groups in the pre-authorized QoS information for which radio bearers need to be pre-established are not admitted by the first access network device." (Ex. 1015, 47).	used to indicate that none of the resources requested in the handover request message is admitted; or when determining that all or some resources requested in the handover request message are admitted, the first access network device sends a handover preparation success message. That some of the resources requested in the handover request message are not admitted may include that some data packet groups in the pre-authorized QoS information for which radio bearers need to be pre-established are not admitted by the first access network device." (Ex. 1017, 53-54).
"Specifically, the QoS parameter may include one or more of a priority, a packet loss rate, a latency, a guaranteed bit rate (GBR for short), a maximum rate, a requested rate, a drop precedence of a single data packet, a priority of a single data	"Specifically, the QoS parameter may include one or more of a priority, a packet loss rate, a latency, a Guaranteed Bit Rate (GBR), a maximum rate, a requested rate, a drop precedence of a single data packet, a priority of a single data packet, a session rate, and an

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packet, a session rate, and an allocation and retention priority (ARP for short). The guaranteed bit rate refers to a rate that the data packet group needs a network to guarantee. The maximum rate refers to a maximum transmission rate of the data packet group. The requested rate refers to a rate that a non-GBR traffic requests the network to provide, and refers generally to a rate required by the data packet group for meeting the traffic. The session rate refers to a maximum value of a sum of rates provided for all non-guaranteed bit rate data packet groups in a PDU session. The allocation and retention priority indicates a level of preempting and being preempted of a data packet group." (Ex. 1015, 31, 33). "Further, the access network device may configure a binding relationship between a data packet group and a radio bearer, and a same radio bearer	Allocation and Retention Priority (ARP). The guaranteed bit rate is a rate that the data packet group needs a network to guarantee. The maximum rate is a maximum transmission rate of the data packet group. The requested rate is a rate that a non-GBR traffic requests the network to provide, and is generally a rate required by the data packet group for meeting the traffic. The session rate is a maximum value of a sum of rates provided for all non-guaranteed bit rate data packet groups in a PDU session. The allocation and retention priority indicates a level of preempting and being preempted of a data packet group." (Ex. 1017, 30, 39) "Further, the access network device may configure a binding relationship between a data packet group and a radio bearer, and data packet groups of the same PDU session may be bound 5 in the same radio bearer." (Ex. 1017, 34, 43).

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may be bound to data packet groups of a same PDU session." (Ex. 1015, 35, 37).	
"Further, the handover preparation failure message may further carry a handover failure cause. A failure cause may be provided for each data packet group of the handover request. The failure cause includes but is not limited to: there is no available radio resource, pre-establishment of a radio bearer with pre-authorized QoS is not supported, a QoS parameter is not supported, a geographic area is not supported, and the like. That a geographic area is not supported is that the traffic is not supported in a target cell of the target access network device, for example, some traffics are effective only in a particular geographic area. That a QoS parameter is not supported is that a traffic corresponding to the QoS parameter cannot be supported in the	"Further, the handover preparation failure message may further carry a handover failure cause. A failure cause may be provided for each data packet group of the handover request. The failure cause includes but is not limited to: there is no available radio resource, pre-establishment of a radio bearer with pre-authorized QoS is not supported, a QoS parameter is not supported, a geographic area is not supported, and the like. That a geographic area is not supported is that the traffic is not supported in a target cell of the target access network device, for example, some traffic are effective only in a particular geographic area. That a QoS parameter is not supported is that traffic corresponding to the QoS parameter cannot be supported in the target access network device." (Ex. 1017, 54).

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target access network device." (Ex. 1015, 47).	
"S604: The second access network device receives the handover response message, and determines, according to the handover response message, whether to initiate handover execution. Specifically, if the second access network device receives the handover preparation success message, the second access network device may initiate handover execution, and hand the terminal over to a target cell, wherein the target cell is a cell provided by the first access network device. Further, the second access network device may determine, according to a status of an admitted resource that is requested by the source side, not to initiate handover execution. For example, the target side admits only resource requests of some traffics, and the source side determines not to initiate handover execution. Alternatively, the	"S604: The second access network device receives the handover response message, and determines, according to the handover response message, whether to initiate handover execution. Specifically, if the second access network device receives the handover preparation success message, the second access network device may initiate handover execution, and hand the terminal over to a target cell, wherein the target cell is a cell provided by the first access network device. Further, the second access network device may determine, according to a status of an admitted resource that is requested by the source side, not to initiate handover execution. For example, the target side admits only resource requests of some traffic, and the source side determines not to initiate handover execution. Alternatively, the source side may determine, according to

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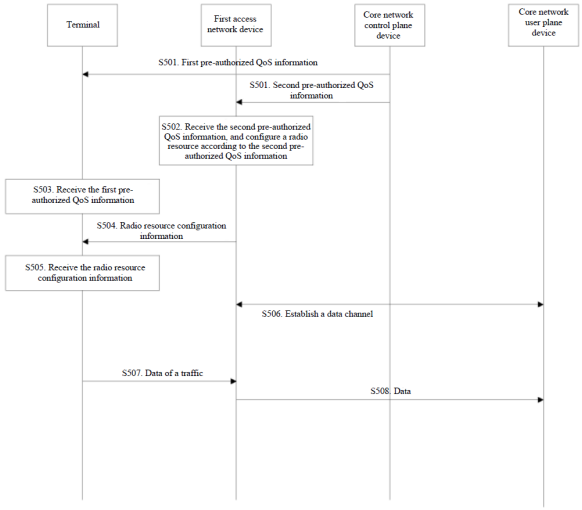
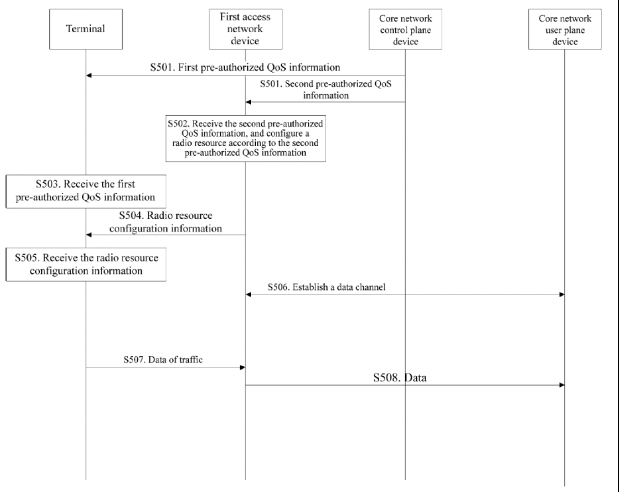
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source side may determine, according to a type of a traffic received by the target side, such as an authorized service or a pre-authorized service, whether to initiate a handover." (Ex. 1015, 48).	a type of traffic received by the target side, such as an authorized service or a pre-authorized service, whether to initiate a handover." (Ex. 1017, 54).
"The example in which the terminal is handed over between access network devices in the radio access network has been described in the present embodiment. When the terminal is handed over between radio access networks, a handover request message sent by the source-side access network device may carry only QoS information for requiring the access network device to establish a radio resource. After receiving the handover request message, the target-side performs admission decision on the QoS information included in the handover request message, and if the target-side succeeds or partially succeeds in admission, the target-side returns a handover preparation	"In this embodiment, the handover of the terminal between access network devices in a radio access network will be described as an example. When the terminal is handed over between radio access networks, a handover request message sent by the source-side access network device may carry only QoS information for requiring the access network device to establish a radio resource. After receiving the handover request message, the target-side performs admission decision on the QoS information included in the handover request message, and if the target-side succeeds or partially succeeds in admission, the target-side returns a handover preparation success message, or otherwise, returns a handover

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success message, or otherwise, returns a handover preparation failure message." (Ex. 1015, 49).	preparation failure message." (Ex. 1017, 55).
"In the present embodiment, the source-side access network device may determine, according to the handover preparation success message of the target-side access network device, whether to initiate a handover, and hand the terminal over to the target-side access network device, so that mobility performance of the terminal can be ensured. The target-side access network device configures a radio resource for the terminal in the handover process according to pre-authorized QoS. After the terminal is handed over to the target-side access network device, and when the data of the terminal arrives, the terminal may directly send the data on the configured radio resource, thereby increasing a data transmission start speed, and	"In this embodiment, the source-side access network device may determine, according to the handover preparation success message of the target-side access network device, whether to initiate a handover, and hand the terminal over to the target-side access network device, so that mobility performance of the terminal can be ensured. The target-side access network device configures a radio resource for the terminal in the handover process according to pre-authorized QoS. After the terminal is handed over to the target-side access network device, and when the data of the terminal arrives, the terminal may directly send the data on the configured radio resource, thereby increasing a data transmission start speed, and improving user experience." (Ex. 1017, 55-56).

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improving user experience." (Ex. 1015, 49).	
"[R]eceiving, by the access network device, an access stratum AS message sent by the terminal, wherein the AS message comprises a non-access stratum protocol data unit NAS PDU, and the data packet for which no QoS parameter has been configured is carried in the NAS PDU." (Ex. 1015, 15, 17).	"[R]eceiving, by the access network device, an access stratum (AS) message sent by the terminal, wherein the AS message comprises a non-access stratum protocol data unit (NAS PDU), 5 and the data packet for which no QoS parameter has been configured is carried in the NAS PDU." (Ex. 1017, 23).
"In an implementation, the core network control plane device sends the second pre-authorized QoS information to the first access network device by means of an access stratum (AS for short) message, and then the first access network device sends the first pre-authorized QoS information to the terminal by means of an AS message. In another implementation, the core network control plane device sends the second authorized QoS information to the first access network device by means	"In an implementation, the core network control plane device sends the second pre-authorized QoS information to the first access network device by means of an Access Stratum (AS) message, and then the first access network device sends the first pre-authorized QoS information to the terminal by means of an AS message. In another implementation, the core network control plane device sends the second authorized QoS information to the first access network device by means of an AS message, and the core network

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of an AS message, and the core network control plane device sends the first authorized QoS information to the terminal by means of a non-access stratum (NAS for short) message, as shown in FIG. 5." (Ex. 1015, 28-31).	control plane device sends the first authorized QoS information to the terminal by means of a Non-Access Stratum (NAS) message, as shown in FIG. 5." (Ex. 1017, 36-37).
Ex. 1015, FIG. 5  FIG. 5	Ex. 1017, FIG. 5  FIG. 5
"The first QoS information comprises at least one of first pre-authorized QoS information and reflective characteristic information, and the reflective characteristic information comprises a downlink QoS parameter of the traffic and indication	"The first QoS information comprises at least one of first pre-authorized QoS information and reflective characteristic information, and the reflective characteristic information comprises indication information for indicating that an uplink QoS parameter can be

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information that is used to indicate a capability of obtaining an uplink QoS parameter according to the downlink QoS parameter of the traffic. In the present embodiment of the present invention, the pre-authorized QoS information (comprising the first pre-authorized QoS information and second pre-authorized QoS information in the following specification) is proactively configured by the core network control plane device for the terminal according to subscription information of the terminal or according to a common traffic (such as email or Taobao).” (Ex. 1015, 5).	obtained according to a downlink QoS parameter of the traffic, and the downlink QoS parameter of the traffic. In this 10 embodiment of the present invention, the pre-authorized QoS information (comprising the first pre-authorized QoS information and second pre-authorized QoS information hereinafter) is proactively configured by the core network control plane device for the terminal according to subscription information of the terminal or according to common traffic (such as email or Taobao).”(Ex. 1017, 12)
“S1001: A terminal sends an AS message to an access network device. The AS message carries a NAS PDU, and the NAS PDU includes user data. The AS message may be an RRC message, and the RRC message includes one of an RRC connection request, an RRC connection	“S1001: A terminal sends an AS message to an access network device. The AS message carries a NAS PDU, and the NAS PDU includes user data. The AS message may be an RRC message, and the RRC message includes one of an RRC 25 connection request, an RRC connection reestablishment

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reestablishment request, a UE information response message, and the like." (Ex. 1015, 58, 60).	request, a UE information response message, and the like." (Ex. 1017, 67-68).

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