

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AT&T SERVICES INC., T-MOBILE USA, INC., CELLCO PARTNERSHIP
D/B/A VERIZON WIRELESS, ERICSSON, INC. AND NOKIA OF AMERICA
CORPORATION,
Petitioners,

v.

ASUS TECHNOLOGY LICENSING INC.,
Patent Owner.

Patent No. 10,798,754

DECLARATION OF DR. MARK P. MAHON

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f.	Claim 3: The method of claim 1, wherein a header in the SDAP PDU includes at least the QFI field.	56
g.	Claim 4: The method of claim 1, wherein the network node transmits an IP (Internet Protocol) packet included in the SDAP PDU to a core network.	57
h.	Claim 5: The method of claim 1, wherein the network node is a base station (or gNB).	57
i.	Element 6P: A network node, comprising:	58
j.	Element 6A: a control circuit; a processor installed in the control circuit; and a memory installed in the control circuit and operatively coupled to the processor; wherein the processor is configured to execute a program code stored in the memory to:	58
k.	Element 6B: transmit a first RRC (Radio Resource Control) message with a DRB (Data Radio Bearer) configuration to a UE (User Equipment) for establishing a default DRB for a PDU (Protocol Data Unit) session, wherein the DRB configuration includes a QFI (QoS Flow Id) configuration used to indicate whether a QFI field is present or not in uplink for the default DRB and the QFI configuration is always set to a value indicating the QFI field is present in uplink for the default DRB;	59
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m.	Element 6D: receive a SDAP (Service Data Adaptation Protocol) PDU with the QFI field via the default DRB from the UE.....	59
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I, Dr. Mark P. Mahon, declare as follows:

I. INTRODUCTION

1. I have been retained as an independent expert consultant on behalf of AT&T Services Inc., T-Mobile USA, Inc., Cellco Partnership D/B/A Verizon Wireless, Ericsson, Inc., and Nokia of America Corporation (collectively “Petitioners”) in this *Inter Partes* Review proceeding (“IPR”) before the Patent Trial and Appeal Board (“Board” or PTAB”) of the United States Patent and Trademark Office (“PTO”) regarding U.S. Patent No. 10,798,754 (“the ’754 Patent”) (Ex. 1001).¹ I am being compensated at my rate of \$550 per hour for the time that I spend on this matter, in addition to expenses. My compensation in this case is in no way contingent on the nature of my findings, the presentation of my findings in testimony, or the outcome of this or any other proceeding. I have no other interest in this proceeding.

2. This Declaration summarizes the opinions that I have formed to date and based on the material currently available to me. I reserve the right to modify my opinions, if necessary, based on further review and analysis of information that I receive subsequent to the filing of this Declaration, including in response to any

¹ In this Declaration, I reference documents by exhibit numbers that, as I understand, are attached as exhibits in this *Inter Partes* Review of the ’754 Patent.

positions taken by ASUS Technology Licensing Inc. (“Patent Owner”) or its experts that I have not been provided yet, including any secondary consideration evidence that Patent Owner or its expert may consider and present.

3. In my view, the prior art discloses or suggests the features recited in Claims 1-10 (what I understand are the “Challenged Claims”) of the ’754 Patent. The ’754 Patent is invalid based on the following grounds:

Ground	Claims	Basis for Unpatentability
1	1-10	§ 103 – R2-1704250 (Ex-1005) in view of R2-1706381 (Ex-1006)
2	1-10	§ 103 – 3GPP TS 38.300 (Ex-1007) in view of R2-1706381 (Ex-1006)

II. EDUCATIONAL BACKGROUND AND QUALIFICATIONS

4. I have summarized in this section my educational background, career history, publications, and other relevant qualifications. I understand my full *curriculum vitae* is being submitted as Ex. 1004 to this proceeding.

1. Overview

5. I am a Teaching Professor in the School of Electrical Engineering and Computer Science at Pennsylvania State University, University Park, PA (“Penn State” or “PSU”). I have worked on telecommunications networks, including AMPS, IS-95, CDMA2000, GSM, EDGE, UMTS/WCDMA, LTE, and 5G cellular systems since 1988.

6. I received my B.S. in Electronics Engineering from the University of Scranton in 1987. I received my M.S. in Electrical Engineering and Ph.D. in Acoustics from Penn State in 1991 and 2001, respectively.

7. In 1988, after I received my bachelor’s degree, I joined the Central Intelligence Agency (CIA) while pursuing my M.S. degree at Penn State part-time. My first job at the CIA involved designing and testing systems to automatically capture and characterize telecommunication signals and emissions from various computer networking devices.

8. I returned to Penn State in early 1990 to pursue graduate research full-time and complete my M.S. degree. My graduate research work focused on

wideband beamforming and adaptive signal processing. After completing my M.S. degree in EE in 1991, I accepted a full-time faculty research position at the Applied Research Lab at PSU, primarily working on classified programs, and began working on diverse radio frequency and acoustic sensor systems including wireless communications and small wireless networks for acoustic tracking, source localization, and feature extraction.

9. I began pursuing my Ph.D. part-time in 1993 while continuing my faculty research position. In 1997, as part of my faculty research position, I began working on classified programs focused on mathematical analytical modeling of cellular communication networks and the development of hardware and software systems to test against cellular networks. My role was to develop the algorithms and write the code running on a specially developed embedded system. For this work, I received a letter of recognition as the “genius behind the VELA software algorithms” from the Director of National Reconnaissance Office (NRO) Systems Engineering and Technology Office. As part of this same work, I was extensively involved in protocol and signaling analysis as well as researching model-specific performance and unique functional characteristics associated with individual mobile devices. The work involved testing dozens of handsets from many manufacturers in controlled and real-world environments against network simulators and live operational networks for each research project.

10. In 2000 my research extended into utilizing non-orthogonal wavelets for improving detection and localization of cellular handsets from high altitude sensor systems. In 2001, I completed my Ph.D. and my research focused on the utilization of advanced communication signals for wideband characterization and remote sensing of propagation channels.

11. Beginning in 1997 my cellular communications research work focused on CDMA, GSM, EDGE, UMTS, LTE, and 5G cellular systems primarily under grants sponsored primarily by the Department of Defense. This classified research work required 3GPP protocol analysis and development of real-time embedded hardware and software systems capable of interacting with cellular networks and cellular handsets. A large portion of my work was directed at architectures, protocols, software, and signaling.

12. I have been working on classified projects since 1988. Before 1998, because the work was not deemed highly classified, I was able to publish eight journal and conference papers prior to 2000. Between 1999 and 2015, however, I was allowed to publish only one article in an unclassified symposium and published and presented about a dozen articles in classified settings. This is because during this period, the vast majority of my research was highly classified. As a result, nearly all of my research results were summarized in classified reports and not available to the general public. Further, because the U.S. government owns any intellectual property

resulting from the sponsored research work, I did not pursue or file patent applications.

13. In 2015, I transferred to the School of Electrical Engineering and Computer Science at Penn State as a teaching faculty member. In that role, I have continued teaching graduate and undergraduate courses, guiding Ph.D. and M.S. students in communication and mobile networking (including LTE and 5G cellular networks), and pursuing research in this and related areas. Since 2015, I have been an author on nine refereed papers as listed in my curriculum vitae (CV).

14. Because of my decades of research and my continuing work at Penn State, I have intimate knowledge of telecommunication networks, including the technology involved in the patent in this case. I have been highly recognized as an expert in such systems within the research community. I was recognized twice by the National Reconnaissance Office with commendation letters for work dealing with detecting cellular signals in low signal to noise ratio environments. The U.S. government awarded me over \$12M in grants between 2003 and 2015 for projects focused on mobile communication devices and networks, in which I served as a Principal Investigator (PI), Co- PI, and/or technical lead.

15. Additionally, during my research career, I interacted extensively with computer scientists and engineers responsible for the design, development, and testing of telephony and data networking systems and testbeds. As a research faculty

member, I oversaw engineers and computer scientists that executed many joint projects with development organizations. These interactions exposed me to a wide range of computer scientists and engineers working on telecommunication network technologies. Since 2011, I have been teaching undergraduate and graduate classes in communication and mobile networking and am familiar with the curricula being taught to electrical engineers and computer scientists. The interactions with a wide range of computer scientists and engineers working on telecommunication network technologies and the familiarity with the classes taught to electrical engineers and computer scientists have allowed me to have a good understanding of the level of skills possessed by a person of ordinary skill in the field of cellular technology.

2. Experience with cellular networks

16. I have extensive experience with mobile networks in general and LTE and 5G specifically. While most of my research efforts between 1998 and 2015 are highly classified, I can state that they included detailed investigation of network architectures, signaling, and functional behavior. A typical research effort would involve studying 3GPP, 3GPP2, IEEE, and other protocol standards to fully comprehend all aspects of L1, L2, and L3 requirements including timing, bit-level construction of the control and user plane messages, and timing characteristics for a given standard as well as functional behavior of network components and user equipment.

17. From 2006 through 2015 my research focused specifically on LTE. My research continues to this day, although I am no longer operating in a classified environment. During this time, I investigated the performance and functional differences of many varied network and handset devices to see how differing signaling and environmental factors influenced the behavior of user equipment in a given network environment. This included how synchronization, timing, and signal to interference plus noise ratio (SINR) for a given device would affect specific functional aspects including elements of the receiver structure, decoding and demodulation performance, calculation of parameters used by the device for making decisions and deriving parameters reported to the network.

18. As part of my research work, I built several custom LTE platforms that implemented specific network-side and user equipment-side functionality including custom signal generation and processing structures, particularly the signal processing chains on both the transmit and receive sides. This equipment was developed using network simulation hardware in a laboratory environment and was later tested with LTE networks in both controlled and fully operational environments. Implementing the transmit and receive chains for custom built LTE-enabled equipment required me to gain an intimate understanding of the relevant 3GPP protocol specifications and the underlying OFDM and WCDMA structures. Since 2015, I have been primarily focused on guiding graduate students pursuing

research into multiple-input multiple-output (MIMO) techniques to improve throughput in dense-user environments, optimized distributed processing algorithms, and the implementation of block chain coding techniques to improve handover security in 4G (LTE)/5G (NR) networks.

19. My curriculum vitae provides additional information regarding my education, technical experience, and publications.

III. MATERIALS REVIEWED AND TIME OF INVENTION

20. The opinions contained in this Declaration are based on the documents that I reviewed, my professional judgment, as well as my education, experience, and knowledge regarding technologies related to the '754 Patent.

21. In forming my opinions expressed in this declaration, I reviewed:
- a. the '754 Patent (Ex. 1001);
 - b. the file history of the '754 Patent (Ex. 1002);
 - c. CATT, "Discussion on QoS Mapping," TSG-RAN Working Group 2 Meeting #98 (2017) ("R2-1704250") (Ex. 1005);
 - d. CATT, "NR SDAPP Header Format," TSG-RAN Working Group 2 Meeting #NR (2017) ("R2-1706381") (Ex. 1006);
 - e. "Technical Specification Group Radio Access Network; NR; NR and NG-RAN Overall Description," 3GPP TS 38.300 v0.4.1 (June 2017) ("3GPP TS 38.300") (Ex. 1007);
 - f. Any other materials that I refer to in this Declaration in support of my opinions, including Exhibits to the Petition.

22. For Grounds 1 and 2 of the Petition, I have been asked to consider the time of the invention to be around July 24, 2017, which I understand is the filing date of the application (U.S. Patent Application No. 62/536,163) to which the '754 Patent claims priority. Ex. 1001, Cover. My opinions reflect how a person of

ordinary skill in the art (as I define in Section V below) would have understood the claims and the specification of the '754 Patent, the prior art to the patent, and the state of the art, at the time of the alleged invention.

IV. LEGAL STANDARDS

1. Overview

23. I am not an attorney or a legal expert, and I do not opine on matters of law. All the legal standards, which are listed in this section and which I applied in reaching the conclusions expressed throughout this Declaration, were provided to me by counsel. In preparing this Declaration, I have endeavored to faithfully apply these legal standards. I do not intend to offer opinions on the law. Below, I describe the law that I applied in analyzing the claims of the '754 Patent.

24. I have been informed by counsel that an issued patent is presumed valid and that the challenger of a patent's validity bears the burden of proving invalidity of the patent.

2. Patent Claims

25. I have been informed by counsel that a patent's claims describe the invention made by the inventors and describe what the patent owner owns and what the owner may prevent others from doing.

26. I have been informed by counsel that claims may describe products, such as machines or chemical compounds, or processes for making or using a product. Claims are usually divided into parts or steps called limitations.

27. I have been informed by counsel that there are two types of claims: independent claims and dependent claims. An independent claim sets forth all the requirements that must be met in order to be covered by that claim. Thus, it is not

necessary to look at any other claim to determine what an independent claim covers. A dependent claim does not itself recite all of the requirements of the claim, but refers to another claim for some of its requirements. In this way, a dependent claim depends on another claim. The law considers a dependent claim to incorporate all of the requirements of the claims to which it refers.

28. I have been informed by counsel that that a dependent claim then adds its own additional requirements. To determine what a dependent claim covers, it is necessary to look at both the dependent claim and any other claims to which it refers.

29. I have been informed by counsel that in a case where dependent claims incorporate the limitations of an independent claim upon which they depend, if a reference fails to disclose any of the limitations of the independent claim, the claims which depend on that independent claim cannot be made invalid by such a reference. As a result, any of the references at issue in this proceeding that fail to disclose all of the limitations of an independent claim necessarily also fail to disclose all of the limitations of claims which depend on that independent claim.

3. Burden of Proof for Invalidity

30. I have been informed by counsel and I understand that the party challenging the validity of an issued U.S. patent in an IPR bears the burden of proving invalidity through facts supported by a preponderance of the evidence. I have been informed that a “preponderance of the evidence” means evidence

sufficient to prove that a fact is more likely true than it is not.

4. Claim Construction

31. I have been informed by counsel and I understand that the first step in determining validity is to properly construe the claims. I have further been informed by counsel that, in this proceeding, the Board must determine the scope of the claims by using the same claim construction standard that United States District Courts use. Under this standard, words of a claim are given their “ordinary” and “customary” meaning as would have been understood by a person of ordinary skill in the art at the time of the invention. I have been informed that such a person looks to the claims, specification, and file history in understanding the meaning of the claim terms. I have applied this understanding in this declaration.

5. Person of Ordinary Skill in the Art

32. I have been informed by counsel and I understand that a person having ordinary skill in the art may be defined by factors such as, when considered at the time of the alleged invention: (a) the levels of education and experience of the inventor and other persons actively involved in the field; (b) the types of problems encountered in the field; (c) prior art solutions to those problems; (d) rapidity with which innovations are made; and (e) the sophistication of the technology.

6. Anticipation

33. I have been informed by counsel and I understand that a patent claim can be found invalid as anticipated if each and every element of the claim, as

properly construed, is found either explicitly or inherently in a single prior art reference. If the single prior art reference does not disclose explicitly or inherently any one claim limitation, then that claim is not anticipated. I have further been informed that the single prior art reference cannot merely disclose each element; rather, it must disclose all of the elements as arranged in the claim. I have been informed that for a prior art reference to “inherently” disclose something, the reference must necessarily function in accordance with, or include the claimed limitations, to anticipate. The missing descriptive matter cannot merely probably or possibly include the claimed limitations. I have further been informed by counsel that, with respect to an anticipation analysis, it is improper to combine separate, distinct embodiments of a single prior art reference.

34. I have been informed that for a reference to be anticipatory, the reference must contain an enabling disclosure. I have been informed that merely naming or describing the subject matter is insufficient if it cannot be produced without undue experimentation.

7. Obviousness

35. I have been informed by counsel that a patent claim can be found invalid as obvious if the differences between the claim and the prior art references would have been obvious to a person of ordinary skill in the art at the time of the invention, taking into account (1) the scope and content of the prior art, (2) the

differences between the prior art and the claims, (3) the level of ordinary skill in the art, and (4) any objective indicia of non-obviousness. I have further been informed by counsel that a claim can be found to be obvious in light of either a single prior art reference or multiple prior art references. I have been informed that references qualify as prior art for an obviousness determination only when they are analogous to the claimed invention. Two separate tests define the scope of analogous prior art: (1) whether the art is from the same field of endeavor, regardless of the problem addressed; and (2) if the reference is not within the field of the inventor's endeavor, whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved.

36. I have been informed that to be obvious in light of a single prior art reference or multiple prior art references, there must be a reason either to modify the single prior art reference or to combine the two or more prior art references to achieve the claimed invention. I have been informed by counsel that this reason may come from a teaching, suggestion, or motivation to combine or may come from the reference or references themselves, the knowledge or "common sense" of one skilled in the art, or from the nature of the problem to be solved, and may be explicit or implicit from the prior art as a whole.

37. I have been informed by counsel that the combination of familiar elements according to known methods is likely to be obvious when it does no more

than yield predictable results.

38. I have further been informed by counsel that there is no suggestion to combine, however, if a reference teaches away from its combination with another source. A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant, or if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the applicant. If when combined, the references would produce a seemingly inoperative device, then they teach away from their combination. I have been informed that it is improper to combine references where the references teach away from their combination.

39. I have been informed by counsel that the degree of teaching away will depend on the particular facts; in general, a reference will teach away if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the applicant. I have been informed that a reference teaches away, for example, if (1) the combination would produce a seemingly inoperative device, or (2) the references leave the impression that the product would not have the property sought by the applicant.

40. I have been informed by counsel that if the teachings of a prior art

reference would lead one skilled in the art to make a modification that would render another prior art device inoperable, then such a modification would generally not be obvious. I have been informed that if a proposed modification would render the prior art device unsatisfactory for its intended purpose, then the proposed modification would generally not be obvious.

41. I have been informed by counsel that it is improper to use hindsight in making the obviousness determination.

42. I have been informed by counsel that some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness must be made. I have been informed that, for example, there may be no rational underpinning to support the legal conclusion of obviousness where systems are already complete and the party challenging validity seeks to mix and match components, which each exist in the separate systems, from these complete systems.

V. PERSON OF ORDINARY SKILL IN THE ART (POSITA)

43. Based on my review of the '754 Patent, the types of problems encountered in the art at and prior to the time of the invention, prior solutions to those problems, the pace with which innovations were made during the relevant time period, the sophistication of the technology, and the educational level of active professionals in the field, I believe that a person of ordinary skill in the art, at the time of the invention, would have had at least a Bachelor's degree in electrical engineering, computer science, or computer engineering; familiarity with the relevant 3GPP standards as of this time; and at least two years of work experience in design, development, and/or testing of cellular networks. More education could have substituted for work experience and vice versa.

44. All of my opinions in this Declaration are from the perspective of a person of ordinary skill in the art, as I have defined it above and during the relevant time frame (e.g., 2017). During that time frame, I possessed at least the qualifications of a POSITA, as defined above.

VI. CLAIM CONSTRUCTION

45. I understand that claim terms are typically given their ordinary and customary meaning, as would have been understood by a person of ordinary skill in the art at the time of the alleged invention. In considering the meaning of the claims, I also understand that one must consider the claim language, specification, prosecution history, and the knowledge of a person of ordinary skill in the art at the relevant time.

VII. BACKGROUND OF THE RELEVANT TECHNOLOGY

46. The '754 Patent is titled “Method And Apparatus For Serving Quality Of Service (QOS) Flow In A Wireless Communication System.” Ex-1001, Cover. The '754 Patent’s “Background” section explains that, at the time of the invention, an allegedly “new radio technology for the next generation (e.g., 5G) is currently being discussed by the 3GPP standards organization.” *Id.*, 1:34-38. The '754 Patent discloses a method and apparatus for a network node, including “the network node transmitting a first message with a DRB (Data Radio Bearer) configuration to a UE (User Equipment) for establishing a default DRB for a PDU (Packet Data Unit) session, wherein the DRB configuration includes a QFI (QoS Flow Id) configuration used to indicate whether a QFI field is present or not in uplink for the default DRB and the QFI configuration is always set to a value indicating the QFI field is present in uplink for the default DRB.” *Id.*, Abstract. The network node establishes “the default DRB with a presence of the QFI field in uplink. The method also includes the network node receiving a SDAP (Service Data Adaptation Protocol) PDU with the QFI field via the default DRB from the UE.” *Id.*

47. Figure 2 of the '754 Patent, which I have reproduced below, discloses a generic communications system that provides a basic overview of how information, for example a QFI, is transmitted and received. Figure 2 includes “a transmitter system 210 (also known as the access network) and a receiver system

250 (also known as access terminal (AT) or user equipment (UE)) in a MIMO system 200. At the transmitter system 210, traffic data for a number of data streams is provided from a data source 212 to a transmit (TX) data processor 214.” *Id.*, 3:34-40. At receiver system 250, the transmitted modulated signals are received from transmitter system 210 and processed. *Id.*, 4:5-43.

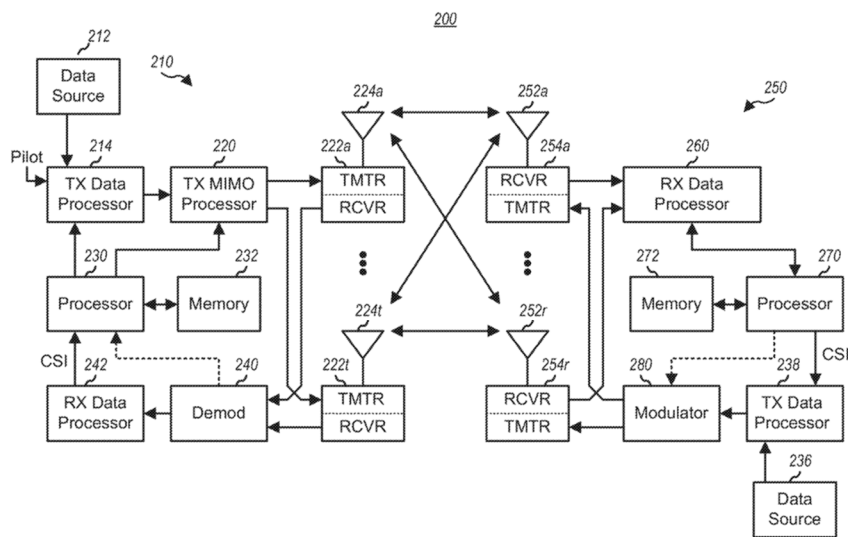


FIG. 2

Ex-1001, Fig. 2.

48. The communications system disclosed in Figure 2 enables communication between transmitter system 210 and receiver system 250. To enable communication, a processor 270 in receiver system 250 periodically determines which pre-coding matrix to use and formulates a reverse link message comprising a matrix index portion and a rank value portion. Ex-1001, 4:5-43. “The reverse link

message may comprise various types of information regarding the communication link and/or the received data stream.” *Id.*, 4:29-30. At transmitter system 210, the modulated signals from receiver system 250 are received and processed to extract the reserve link message transmitted by the receiver system 250. *Id.*, 4:30-43. Processor 230 then processes the extracted message. *Id.*

VIII. THE '754 PATENT

50. Figure 5 of the '754 Patent, which I have reproduced below, discloses the 5G standalone network architecture, which requires the deployment of a 5G core network ("5GC") connected to the next-generation radio access network ("NG-RAN"). Ex-1001, 5:21-43. For each User Equipment ("UE"), the 5G core network establishes at least one Packet Data Unit ("PDU") Session, and for each PDU Session, the network node or NB establishes at least one Data Radio Bearer ("DRB"). Ex-1001, 5:25-27. "The NG-RAN maps packets belonging to different PDU sessions to different DRBs. Hence, the NG-RAN establishes at least one default DRB for each PDU Session indicated by 5GC upon PDU Session establishment." Ex-1001, 5:27-31.

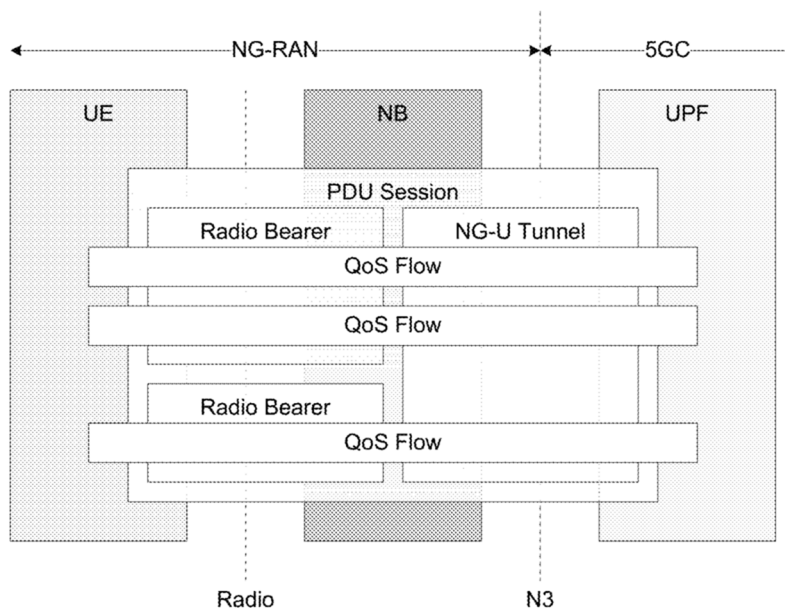


FIG. 5 (PRIOR ART)

Ex-1001, Fig. 5.

51. As shown in Figure 5, NG-RAN and 5GC ensure quality of service (e.g. reliability and target delay) by mapping packets to appropriate QoS Flows and DRBs. Ex-1001, 5:38-40. Quality of Service (QoS) is a method for optimizing service and traffic flow by controlling such factors as packet loss, bit rate, throughput, transmission delay, availability, jitter, etc. QoS Flows separate traffic into unique flows which receive differing treatment based on the nature of the traffic. Ex-1001, 7:4-20. For example, one QoS flow may handle video traffic, while another QoS flow may handle website-browsing traffic. A QoS Flow ID (“QFI”) is used to identify a QoS flow in the 5G system. *Id.* User Plane traffic with the same QFI within a PDU session receives the same traffic forwarding treatment (e.g. scheduling, admission threshold). *Id.* The QFI is carried in a packet header. *Id.*

52. SDAP (“Service Data Adaption Protocol”) is a 5G sublayer used for mapping QoS Flows to DRBs for both downlink and uplink packets. *Id.*, 5:10-20. QoS Flows may be mapped to a DRB either by explicit reconfiguration from the node or by what is called “Reflective Mapping,” in which a UE that receives a new QoS Flow in the downlink will reflectively map the new QoS Flow to the same DRB in the uplink. *Id.*, 5:52-67. SDAP headers for Data PDUs contain a QFI for that PDU, *id.*, 25:11-49, and uplink PDUs without QFI are assigned to the default DRB. *Id.*, 6:6-9, 44-51.

53. The '754 Patent discloses that packet loss can occur when a UE initiates a second QoS Flow and there is no pre-configured mapping of the second QoS Flow to a DRB. Ex-1001, 23:35-54. The new, second QoS Flow will be mapped to the default DRB. *Id.* If the default DRB does not require QFI in uplink, the node will not be aware of the second QoS Flow and its Data PDUs will be discarded. *Id.* The '754 Patent describes the situation as follows:

The UE initiates a new UL QoS flow (the second UL QoS flow) e.g. based on pre-configured QoS parameters. If there is no mapping of the QFI to a DRB in the AS [(“Access Stratum”)] mapping table for this PDU session, the second UL QoS flow will be mapped to a default DRB of the PDU session. In case there is already an ongoing UL QoS flow (the first UL QoS flow) mapped to this default DRB and the default DRB is not configured with presence of SDAP header for UL currently, the gNB would not be aware of the second UL QoS flow when receiving UL SDAP PDUs corresponding to the second UL QoS flow from the UE. In this situation, the target QoS of the second UL QoS flow would not be satisfied because gNB would not set up a new DRB for the second QoS flow or map the second QoS flow to an existing DRB according to QoS parameters of the second QoS flow. Besides, the IP packets included in those SDAP PDUs of the second UL QoS flow would not be distinguished by the core network (e.g. UPF) because the packet filter corresponds to the first UL QoS flow. As a result, the IP packets would be discarded, which causes data missing and resources waste.

Ex-1001, 23:35-54.

54. The '754 Patent purportedly addresses this issue by transmitting a

simple message that includes a QFI configuration indicating that the QFI field is always present in uplink for the default DRB. Ex-1001, 25:11-49, 27:1-22. Figure 12 of the '754 Patent, shown below, discloses that in step 1205, the network node “transmits a first message with a DRB configuration to a UE for establishing a default DRB for a PDU session, where the DRB configuration includes a QFI configuration used to indicate whether a QFI field is present or not in uplink for the default DRB and the QFI configuration is always set to a value indicating the QFI field is present in uplink for the default DRB.” *Id.*, 27:2-9. “In step 1210, the network node establishes the default DRB with a presence of the QFI field in uplink,” and in step 1215, “the network node receives a SDAP PDU with the QFI field via the default DRB from the UE.” *Id.*, 27:13-19.

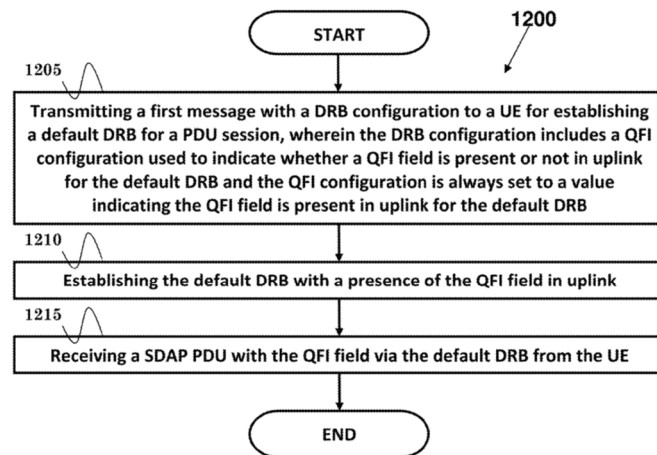


FIG. 12

Ex-1001, Fig. 12.

IX. PROSECUTION HISTORY OF THE '754 PATENT

55. I understand that the '754 Patent issued from an application that was filed on July 24, 2018. In the Notice of Allowance, the Examiner offered the following reason for allowing Claims 1 and 6 of the '754 Patent.

The prior art of record, considered individually or in combination, fails to fairly show or suggest the claimed network node (claim 6) and method (claim 1), comprising, among other limitations, the novel and unobvious limitations as “transmitting a first Radio Resource Control ‘RRC’ message with a Data Radio Bearer ‘DRB’ configuration to a User Equipment ‘UE’ for establishing a default DRB for a Packet Data Unit ‘PDU’ session, wherein the DRB configuration includes a QoS Flow Id ‘QFI’ configuration used to indicate whether a QFI field is present or not in uplink for the default DRB and the QFI configuration is always set to a value indicating the QFI field is present in uplink for the default DRB . . . via the default DRB from the UE.

Ex-1002, 38.

56. Importantly, I understand that there is no evidence that the Examiner was aware of the prior art identified in this petition.

X. THE PRIOR ART REFERENCES

1. R2-1704250 (Ex-1005)

57. R2-1704250 is a technical proposal published on May 6, 2017 regarding Quality of Service mapping that teaches a method for transmitting certain information related to a default setting for handling Quality of Service flows. Ex-1005. The proposal “discusses how to manage the mapping between QoS flow and DRB and how to carry QFI information in UL and DL” between a UE and a node. *Id.*, 1.² The proposal, like the claimed invention, specifically provides a method for a network node, where the node transmits a first RRC message with a DRB configuration to a UE. Ex-1005, 1-2.

58. The proposal also discloses establishing a default DRB for a PDU session. *Id.* Further, the proposal discloses establishing the default DRB with a presence of the QFI field in uplink and receiving SDAP PDU with the QFI field via the default DRB from the UE. *Id.*, 2 (“So the default DRB shall be configured to always include QFI in SDAP header at least in UL.”). Thus, it was a standard practice in the prior art to the ’754 Patent in my opinion to transmit specific default information discussed in the ’754 Patent between a node and a UE to enhance QoS.

2. R2-1706381 (Ex-1006)

² In wireless networks, “DL” or “downlink” refers to signals transmitted from a base station to a mobile device, while “UL” or “uplink” refers to signals transmitted from a mobile device to a base station.

59. R2-1706381 is a technical proposal published on June 17, 2017 disclosing a header containing the specific Quality of Service information in the claimed invention, including where the DRB configuration includes a QFI configuration used to indicate whether a QFI field is present or not in uplink for the default DRB and the QFI configuration is always set to a value indicating the QFI field is present in uplink for the default DRB. Ex-1006. The proposal discusses “the detailed formats of SDAP data PDU and QFI presence.” Ex-1006, 1.

60. The proposal specifically provides that the DRB configuration transmitted from the node to the UE includes a QFI configuration used to indicate whether a QFI field is present or not in uplink for the default DRB. *Id.*, 1 (“It is proposed to support explicit UL QFI presence indicator in RRC signaling and allow carrying UL QFI even in 1-to-1 mapping.”). In the proposal, a QFI presence indicator is included in an RRC message such that the QFI is included in uplink packets even when there is only a single QoS flow mapped to a single default DRB (“1-to-1 mapping”). *Id.* Further, the proposal confirms that the transmitted QFI configuration is always set to a value indicating the QFI field is present in uplink for the default DRB. *Id.*, 1 (“UL PDU should always carry QFI (QoS Flow Indicator) information either by explicit header field or by implicit configuration with 1-to-1 mapping.”). These concepts were well-known in the prior art before the claimed invention in my opinion.

3. 3GPP TS 38.300 (Ex-1007)

61. Before July 24, 2017, procedures for transmitting and receiving specific QoS information between a node and a UE for network communications were well known in my opinion. 3GPP TS 38.300 is a Technical Specification that was publicly available on June 12, 2017, and that provides an “overall description of the NG-RAN and focuses on the radio interface protocol architecture of NR connected to 5GC.” Ex-1007, 7. The specification discusses “QFI to DRB mapping with RRC signaling” between a UE and a node. *Id.*, 50-51. The specification, like the claimed invention, specifically provides a method for a network node, where the node transmits a first RRC message with a DRB configuration to a UE. Ex-1007, 38-40, 50-53. The specification also discloses establishing a default DRB for a PDU session. *Id.* Further, the specification discloses establishing the default DRB with a presence of the QFI field in uplink and receiving SDAP PDU with the QFI field via the default DRB from the UE. *Id.*

XI. THE CHALLENGED CLAIMS ARE INVALID

1. Ground 1: The Challenged Claims Are Obvious in View of R2-1704250 Combined with R2-1706831

63. In my opinion, R2-1704250 in view of R2-1706381 renders obvious Claims 1-10.

a. Element 1P: A method of a network node, comprising:

64. To the extent that the preamble is limiting, in my opinion R2-1704250 discloses a method of a network node. For example, R2-1704250 “discusses how to manage the mapping between QoS flow and DRB and how to carry QFI information in UL and DL” between a UE and a network node. Ex-1005, 1. R2-1704250 specifically states that the “gNB” or network node “should always be aware of UL QFI” and provides that the SDAP header can carry the QFI. Ex-1005, 1. “[T]he number of QoS flow(s) over default bearer is dynamically changed and out of the control of gNB. So the default DRB shall be configured to always include QFI in SDAP header at least in UL.” Ex-1005, 2. Thus, R2-1704250 discloses the preamble of Claim 1 of the ’754 Patent in my opinion.

- b. Element 1A: transmitting a first RRC (Radio Resource Control) message with a DRB (Data Radio Bearer) configuration to a UE (User Equipment) for establishing a default DRB for a PDU (Protocol Data Unit) session, wherein the DRB configuration includes a QFI (QoS Flow Id) configuration used to indicate whether a QFI field is present or not in uplink for the default DRB and the QFI configuration is always set to a value indicating the QFI field is present in uplink for the default DRB;**

65. The combination of R2-1704250 and R2-1706831 renders obvious claim element 1A of the '754 Patent in my opinion. R2-1704250 discloses “transmitting a first RRC (Radio Resource Control) message with a DRB (Data Radio Bearer) configuration to a UE (User Equipment) for establishing a default DRB for a PDU (Protocol Data Unit) session.” Specifically, R2-1704250 describes “Default DRB handling” and states that “the mapping association is configured to the UE by RRC,” where the node transmits an RRC message with a DRB configuration to the UE for establishing a default DRB for a PDU. Ex-1005, 2. The default DRB is established such that the “UE shall map the UL packet in the default bearer, which means that the number of QoS flow(s) over default bearer is dynamically changed and out of the control of gNB. So the default DRB shall be configured to always include QFI in SDAP header at least in UL.” *Id.* The default DRB is established for a PDU session. Ex-1005, 1-2 (“New AS layer PDU is PDCP SDU” and “all SDAP PDUs may carry QFI field no matter 1-to-1 mapping or m-to-1 mapping”). The mapping discussed in R2-1704250 means that either a single QoS

flow is mapped to a single default DRB (“1-to-1 mapping”) or multiple QoS flows are mapped to a single DRB (“m-to-1 mapping”). Ex-1005, 1.

66. To the extent that R2-1704250 fails to teach “wherein the DRB configuration includes a QFI (QoS Flow Id) configuration used to indicate whether a QFI field is present or not in uplink for the default DRB and the QFI configuration is always set to a value indicating the QFI field is present in uplink for the default DRB,” the combination of R2-1704250 with R2-1706381 nevertheless renders this limitation obvious to a POSITA in my opinion.

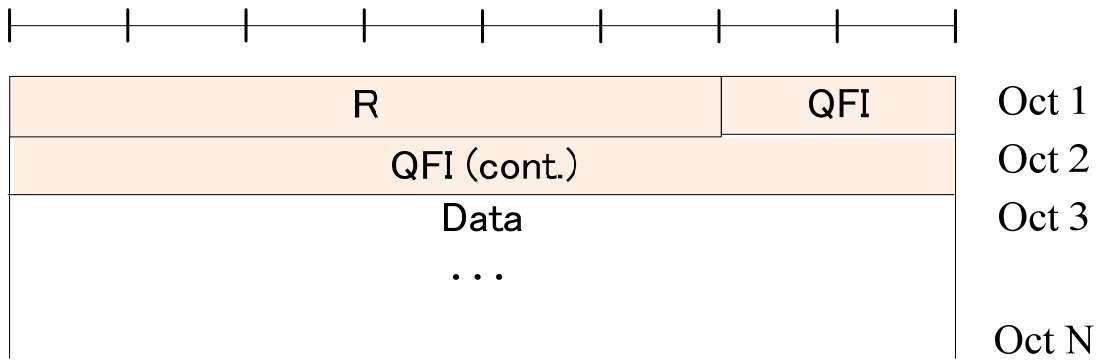
67. R2-1706381 teaches “the detailed formats of SDAP data PDU and QFI presence.” Ex-1006, 1. The proposal explains that using PDUs with and without the QFI field brings complexity and confusion for SDAP layer processing:

For UL SDAP, if there is 1-to-1 mapping between QoS flow and DRB, it can be not marked with QFI in principle. Network can derive the QFI from DRB tunnel. But the issue of mapping reconfiguration caused by QoS flow addition and deletion arises, where PDUs without QFI field and PDUs with QFI field may be mixed in buffers and in the air. It brings extra complexity and confusion for SDAP layer processing.

Ex-1006, 1. The proposal then describes a solution to this problem such that the “network configures UE always carrying QFI from the beginning of DRB establishment, even in 1-to-1 mapping period. This can avoid re-organization of PDUs and other re-establishment operation triggered by mapping relationship reconfiguration.” *Id.*

68. To effect this solution, the proposal specifically discloses that “the DRB configuration includes a QFI (QoS Flow Id) configuration used to indicate whether a QFI field is present or not in uplink for the default DRB,” as required by claim element 1A. Ex-1006, 1 (“It is proposed to support explicit UL QFI presence indicator in RRC signaling and allow carrying UL QFI even in 1-to-1 mapping.”). The QFI configuration is included in the DRB configuration in the RRC message, where the RRC message communicated from the node to the UE includes an “explicit UL QFI presence indicator in RRC signaling” that allows “carrying UL QFI even in 1-to-1 mapping.” Ex-1006, 1.

69. The proposal also discloses that “the QFI configuration is always set to a value indicating the QFI field is present in uplink for the default DRB,” as required by element 1A. *Id.*, 1 (“UL PDU should always carry QFI (QoS Flow Indicator) information either by explicit header field or by implicit configuration with 1-to-1 mapping.”). The proposal describes a situation where, “when PDU session establishes, there is only one QoS flow in a DRB. Later some other QoS flow(s) activation or arrival, mapping relationship between QoS flow(s) and that DRB can be changed from 1-to-1 to many-to-1 mapping. In this case, it is an easy way that network configures UE ***always*** carrying QFI from the beginning of DRB establishment, even in 1-to-1 mapping period.” Ex-1006, 1 (emphasis added). Figure 2 of the proposal, shown below, discloses the UL PDU with QFI:



Ex-1006, Figure 1.

70. In view of R2-1706381’s disclosure of a QFI configuration used to indicate whether a QFI field is present or not in uplink for the default DRB and that the QFI configuration is always set to a value indicating the QFI field is present, a POSITA would have found it obvious in to use this configuration in the proposal described by R2-1704250 in my opinion. R2-1704250 specifically contemplates the use of QFI configuration information when it states that, “[w]hether SDAP header includes QFI field or not is explicitly configured by network and even in 1-to-1 mapping case the QFI field may be also present to avoid complexity caused by reconfiguration between 1-to-1 and m-to-1 mapping.” Ex-1005, 2. Accordingly, to reduce complexity and confusion, a POSITA would have been motivated to combine the proposal regarding default DRB handling in R2-1704250 with the specific QFI configuration and setting described in R2-1706381. A skilled artisan would have found it obvious to practice the proposed combination by adding the claimed QFI configuration to the expressly disclosed method for default DRB handling in R2-

1704250.

71. A POSITA would have understood that a major benefit of R2-1706381's system is that the claimed QFI configuration permits mapping of multiple QoS flows to DRBs with no packet loss and less complexity. Ex-1006, 1-2. A POSITA would have understood that this same benefit could be realized in R2-1704250's system. As a result, to the extent R2-1704250 does not disclose the approach already, a POSITA would have been motivated to improve upon R2-1704250's method by including a QFI configuration used to map QoS flows to DRBs with no packet loss and less complexity. This would minimize packet loss and simplify the process for mapping QoS flows to DRBs in my opinion.

72. In addition to being motivated to pursue the proposed combination, a POSITA would have had a reasonable expectation of success in meeting the limitations of the claimed invention in my opinion. R2-1704250 itself teaches the need for simplification of QoS flow mapping. Ex-1005, 1-2. "[T]o avoid complexity caused by reconfiguration between 1-to-1 and m-to-1 mapping," R2-1704250 generally discloses using QFI information for QoS flow and DRB mapping. *Id.* Especially given R2-1706381's disclosures, a POSITA would have known that it was possible for R2-1704250 to employ a QFI configuration that was always set to a value indicating the QFI field is present in uplink for the default DRB.

73. Claim element 1A of the '754 Patent is therefore obvious in view of

R2-1704250 combined with R2-1706381 in my opinion.

c. Element 1B: establishing the default DRB with a presence of the QFI field in uplink; and

74. R2-1704250 discloses claim element 1B of the '754 Patent in my opinion. R2-1704250 discloses “establishing the default DRB with a presence of the QFI field in uplink.” The proposal states that “the default DRB shall be configured to always include QFI in SDAP header at least in UL.” Ex-1005, 2. Further, “the UE shall map the UL packet in the default bearer, which means that the number of QoS flow(s) over default bearer is dynamically changed and out of the control of gNB.” Ex-1005, 2. Thus, R2-1704250 teaches establishing the default DRB with a presence of the QFI field in uplink. *See also supra* § XI(1)(b).

d. Element 1C: receiving a SDAP (Service Data Adaptation Protocol) PDU with the QFI field via the default DRB from the UE.

75. R2-1704250 discloses claim element 1C of the '754 Patent in my opinion. R2-1704250 discloses “receiving a SDAP (Service Data Adaptation Protocol) PDU with the QFI field via the default DRB from the UE.” The proposal states that “the UE shall map the UL packet in the default bearer, which means that the number of QoS flow(s) over default bearer is dynamically changed and out of the control of gNB.” Ex-1005, 2. Further, “the default DRB shall be configured to always include QFI in SDAP header at least in UL.” *Id.* As a result, the node will receive a SDAP PDU with the QFI field present via the default DRB from the UE.

Thus, R2-1704250 teaches receiving a SDAP PDU with the QFI field via the default DRB from the UE. *See also supra* § XI(1)(c).

- e. **Claim 2: The method of claim 1, wherein the network node is not allowed to transmit a second RRC message to the UE for reconfiguring the QFI configuration for the default DRB to no presence of the QFI field.**

76. The combination of R2-1704250 and R2-1706831 renders obvious Claim 2 of the '754 Patent in my opinion. As I discussed above, Claim 1 of the '754 Patent is obvious in view of R2-1704250 combined with R2-1706381. Further, to the extent that R2-1704250 fails to teach “wherein the network node is not allowed to transmit a second RRC message to the UE for reconfiguring the QFI configuration for the default DRB to no presence of the QFI field,” as required by Claim 2, the combination of R2-1704250 with R2-1706381 nevertheless renders this limitation obvious to a POSITA.

77. R2-1706381 discloses that “the network node is not allowed to transmit a second RRC message to the UE for reconfiguring the QFI configuration for the default DRB to no presence of the QFI field,” as required by claim 2. The proposal teaches “the detailed formats of SDAP data PDU and QFI presence,” Ex-1006, 1, and the proposal explains that using PDUs with and without the QFI field brings complexity and confusion for SDAP layer processing. Ex-1006, 1. The proposal then describes a solution to this problem such that the “network configures UE *always* carrying QFI from the beginning of DRB establishment, even in 1-to-1

mapping period.” *Id.* (emphasis added). In addition, the proposal states that “UL PDU should *always* carry QFI (QoS Flow Indicator) information.” Ex-1006, 1 (emphasis added). Because R2-1706381 discloses that the network configures the UE to always carry QFI, a POSITA would understand from this disclosure that the network node is not allowed to transmit a second RRC message to the UE for reconfiguring the QFI configuration for the default DRB to no presence of the QFI field, as required by Claim 2.

78. In view of R2-1706381’s disclosure that the QFI configuration is *always* set to a value indicating the QFI field is present, a POSITA would have found it obvious to use this configuration in the proposal described by R2-1704250 to arrive at the claimed invention of Claim 2 in my opinion. R2-1704250 specifically contemplates the use of QFI configuration information when it states that, “[w]hether SDAP header includes QFI field or not is explicitly configured by network and even in 1-to-1 mapping case the QFI field may be also present to avoid complexity caused by reconfiguration between 1-to-1 and m-to-1 mapping.” Ex-1005, 2. Accordingly, to reduce complexity and confusion, a POSITA would have been motivated to combine the proposal regarding default DRB handling in R2-1704250 with the specific QFI configuration and setting described in R2-1706381 to arrive at the claimed invention of Claim 2. A skilled artisan would have found it obvious to practice the proposed combination by adding the claimed QFI

configuration to the expressly disclosed method for default DRB handling in R2-1704250.

79. In my opinion, a POSITA would have understood that a major benefit of R2-1706381's system is that the consistent use of the claimed QFI configuration permits mapping of multiple QoS flows to DRBs with no packet loss and less complexity because QFI is always present. Ex-1006 at 1-2. A POSITA would have understood that this same benefit could be realized in R2-1704250's system. As a result, to the extent R2-1704250 does not disclose the approach already, a POSITA would have been motivated to improve upon R2-1704250's method by including a QFI configuration used to map QoS flows to DRBs with no packet loss and less complexity.

80. In addition to being motivated to pursue the proposed combination, a POSITA would have had a reasonable expectation of success in combining the proposals to arrive at the claimed invention of Claim 2 in my opinion. R2-1704250 itself teaches the need for simplification of QoS flow mapping. Ex-1005, 1-2. Especially given R2-1706381's disclosures, a POSITA would have known that it was possible for R2-1704250 to employ a QFI configuration such that the network node is not allowed to transmit a second RRC message to the UE for reconfiguring the QFI configuration for the default DRB to no presence of the QFI field.

81. Claim 2 of the '754 Patent is therefore obvious in view of R2-1704250

combined with R2-1706381.

f. Claim 3: The method of claim 1, wherein a header in the SDAP PDU includes at least the QFI field.

82. The combination of R2-1704250 and R2-1706831 renders obvious Claim 3 of the '754 Patent. As I discussed above, Claim 1 of the '754 Patent is obvious in view of R2-1704250 combined with R2-1706381. Further, R2-1704250 discloses wherein a header in the SDAP PDU includes at least the QFI field, as required by Claim 3. R2-1704250 discloses that “all SDAP PDUs may carry QFI field no matter 1-to-1 mapping or m-to-1mapping.” Ex-1005, 2. The header in the SDAP PDU includes the QFI field: “[T]he number of QoS flow(s) over default bearer is dynamically changed and out of the control of gNB. So the default DRB shall be configured to always include QFI in SDAP header at least in UL.” Ex-1005, 2. Further, “[t]he default DRB shall be configured to always include QFI in SDAP header at least in UL.” *Id.* As a result, R2-1704250 discloses wherein a header in the SDAP PDU includes at least the QFI field, as required by Claim 3.

83. Claim 3 of the '754 Patent is therefore obvious in view of R2-1704250 combined with R2-1706381.

g. Claim 4: The method of claim 1, wherein the network node transmits an IP (Internet Protocol) packet included in the SDAP PDU to a core network.

84. The combination of R2-1704250 and R2-1706831 renders obvious Claim 4 of the '754 Patent. As I discussed above, Claim 1 of the '754 Patent is

obvious in view of R2-1704250 combined with R2-1706381. Further, R2-1704250 discloses that the network node transmits an IP (Internet Protocol) packet included in the SDAP PDU to a core network, as required by Claim 4. R2-1704250 discloses using VoIP, or Voice over Internet Protocol, as a service that uses IP packets included in SDAP PDUs to transmit information back and forth between a node and a core network. Ex-1005, 2. As a result, R2-1704250 discloses that the network node transmits an IP (Internet Protocol) packet included in the SDAP PDU to a core network, as required by Claim 4.

85. Claim 4 of the '754 Patent is therefore obvious in view of R2-1704250 combined with R2-1706381.

h. Claim 5: The method of claim 1, wherein the network node is a base station (or gNB).

86. The combination of R2-1704250 and R2-1706831 renders obvious Claim 5 of the '754 Patent in my opinion. As I discussed above, Claim 1 of the '754 Patent is obvious in view of R2-1704250 combined with R2-1706381. Further, R2-1704250 discloses wherein the network node is a base station (or gNB), as required by Claim 5. R2-1704250 discloses that the network node is a “gNB” and “should always be aware of UL QFI.” Ex-1005, 2. Further, the “default DRB shall be configured to always include QFI in SDAP header at least in UL” such that the number of “QoS flow(s) over default bearer is dynamically changed and out of the control of gNB.” Ex-1005, 2. As a result, R2-1704250 discloses wherein the network

node is a base station (or gNB), as required by Claim 5.

87. Claim 5 of the '754 Patent is therefore obvious in view of R2-1704250 combined with R2-1706381.

i. Element 6P: A network node, comprising:

88. See Element 1[P], *supra* § XI(1)(a).

j. Element 6A: a control circuit; a processor installed in the control circuit; and a memory installed in the control circuit and operatively coupled to the processor; wherein the processor is configured to execute a program code stored in the memory to:

89. R2-1704250 discloses that the network node comprises a control circuit; a processor installed in the control circuit; and a memory installed in the control circuit and operatively coupled to the processor; wherein the processor is configured to execute a program code stored in the memory to perform certain steps. For example, R2-1704250 “discusses how to manage the mapping between QoS flow and DRB and how to carry QFI information in UL and DL” between a UE and a network node. Ex-1005, 1. R2-1704250 specifically states that the network node is a “gNB” or gNodeB, Ex-1005, 2, which is a base station or node that a POSITA would understand includes a control circuit, a processor installed in the control circuit, and a memory installed in the control circuit and operatively coupled to the processor, wherein the processor is configured to execute a program code stored in the memory to perform certain steps. R2-1704250 also discloses that “the number of

QoS flow(s) over default bearer is dynamically changed and out of the control of gNB.” Ex-1005, 2. This indicates that the gNB includes a control circuit with a processor and memory in my opinion, where the processor can execute program code stored in memory. Thus, R2-1704250 discloses claim element 6A of the ’754 Patent.

- k. Element 6B: transmit a first RRC (Radio Resource Control) message with a DRB (Data Radio Bearer) configuration to a UE (User Equipment) for establishing a default DRB for a PDU (Protocol Data Unit) session, wherein the DRB configuration includes a QFI (QoS Flow Id) configuration used to indicate whether a QFI field is present or not in uplink for the default DRB and the QFI configuration is always set to a value indicating the QFI field is present in uplink for the default DRB;**

90. See Element 1A, *supra* § XI(1)(b).

- l. Element 6C: establish the default DRB with a presence of the QFI field in uplink; and**

91. See Element 1B, *supra* § XI(1)(c).

- m. Element 6D: receive a SDAP (Service Data Adaptation Protocol) PDU with the QFI field via the default DRB from the UE.**

92. See Element 1C, *supra* § XI(1)(d).

- n. Claim 7: The network node of claim 6, wherein the network node is not allowed to transmit a second RRC message to the UE for reconfiguring the QFI configuration for the default DRB to no presence of the QFI field.**

93. See Claim 2, *supra* § XI(1)(e).

- o. Claim 8: The network node of claim 6, wherein a header in the SDAP PDU includes at least the QFI field.**

94. See Claim 3, *supra* § XI(1)(f).

- p. Claim 9: The network node of claim 6, wherein the network node transmits an IP (Internet Protocol) packet included in the SDAP PDU to a core network.**

95. See Claim 4, *supra* § XI(1)(g).

- q. Claim 10: The network node of claim 6, wherein the network node is a base station (or gNB).**

96. See Claim 5, *supra* § XI(1)(h).

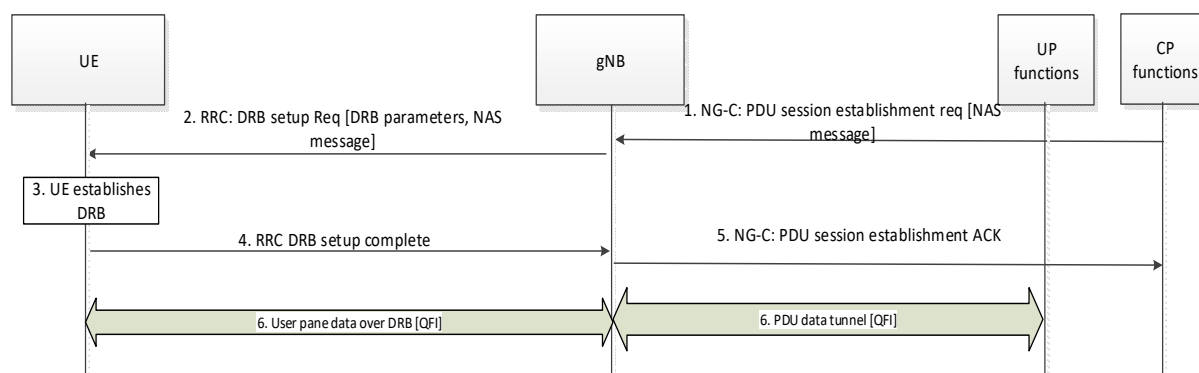
2. Ground 2: The Challenged Claims Are Obvious in View of 3GPP TS 38.300 Combined with R2-1706381

97. In my opinion, 3GPP TS 38.300 in view of R2-1706381 additionally renders obvious Claims 1-10.

a. Element 1P: A method of a network node, comprising:

98. To the extent that the preamble is limiting, in my opinion 3GPP TS 38.300 discloses a method of a network node. 3GPP TS 38.300 teaches a method of a network node, or gNB, where the network node transmits and receives messages to enable network communications. Ex-1007, 38-40, 49-53. For example, as shown in Figure A.1-1 reproduced below, the gNB “sends a DRB set up Request message to the UE including DRB parameters,” and “Data is sent over the PDU session to gNB and then over the DRB to the UE. The data packets may optionally include a QoS marking (same as or corresponding to QFI) in the SDAP header.” *Id.*, 49. Thus,

3GPP TS 38.300 discloses the preamble of Claim 1 of the '754 Patent.



Ex-1007, Fig. A.1-1; *see also id.*, Figs. A.2-6.1.

- b. Element 1A: transmitting a first RRC (Radio Resource Control) message with a DRB (Data Radio Bearer) configuration to a UE (User Equipment) for establishing a default DRB for a PDU (Protocol Data Unit) session, wherein the DRB configuration includes a QFI (QoS Flow Id) configuration used to indicate whether a QFI field is present or not in uplink for the default DRB and the QFI configuration is always set to a value indicating the QFI field is present in uplink for the default DRB;**

99. The combination of 3GPP TS 38.300 and R2-1706831 renders obvious claim element 1A of the '754 Patent in my opinion. 3GPP TS 38.300 discloses “transmitting a first RRC (Radio Resource Control) message with a DRB (Data Radio Bearer) configuration to a UE (User Equipment) for establishing a default DRB for a PDU (Protocol Data Unit) session.” Specifically, 3GPP TS 38.300 discloses that “the NG-RAN may configure by RRC an uplink ‘QoS Flow to DRB mapping,’” where the gNB transmits an RRC message with a DRB configuration to the UE for establishing a default DRB for a PDU. Ex-1007, 39, 49-53; Figs. A.1-

6.1. As shown in Figure A.1.1, the “gNB sends a DRB set up Request message,” which is the RRC message shown in the figure, “to the UE including DRB parameters and the NAS message.” *Id.*, 49. The “UE establishes at least default DRB associated with the new PDU session. It creates the QFI to DRB mapping.” *Id.*

100. To the extent that 3GPP TS 38.300 fails to teach “wherein the DRB configuration includes a QFI (QoS Flow Id) configuration used to indicate whether a QFI field is present or not in uplink for the default DRB and the QFI configuration is always set to a value indicating the QFI field is present in uplink for the default DRB,” the combination of 3GPP TS 38.300 with R2-1706381 nevertheless renders this limitation obvious to a POSITA in my opinion.

101. R2-1706381 teaches “the detailed formats of SDAP data PDU and QFI presence.” Ex-1006, 1. The proposal explains that using PDUs with and without the QFI field brings complexity and confusion for SDAP layer processing:

For UL SDAP, if there is 1-to-1 mapping between QoS flow and DRB, it can be not marked with QFI in principle. Network can derive the QFI from DRB tunnel. But the issue of mapping reconfiguration caused by QoS flow addition and deletion arises, where PDUs without QFI field and PDUs with QFI field may be mixed in buffers and in the air. It brings extra complexity and confusion for SDAP layer processing.

Ex-1006, 1. The proposal then describes a solution to this problem such that the “network configures UE always carrying QFI from the beginning of DRB establishment, even in 1-to-1 mapping period. This can avoid re-organization of

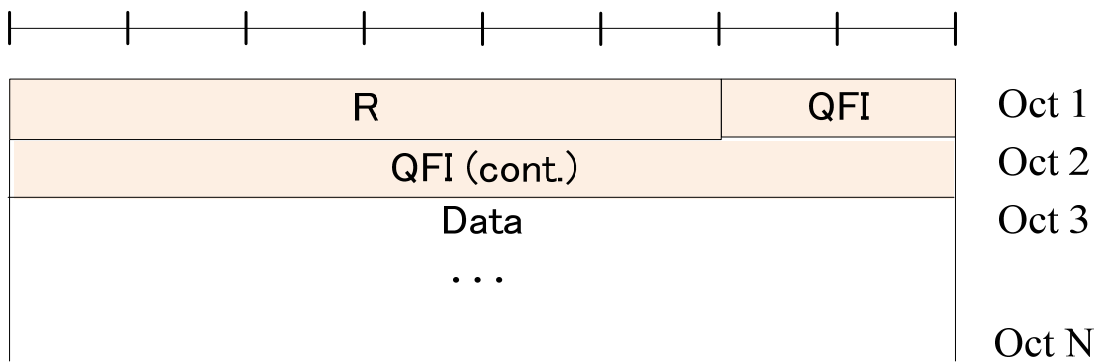
PDUs and other re-establishment operation triggered by mapping relationship reconfiguration.” *Id.*

102. To effect this solution, the proposal specifically discloses that “the DRB configuration includes a QFI (QoS Flow Id) configuration used to indicate whether a QFI field is present or not in uplink for the default DRB,” as required by claim element 1A. Ex-1006, 1 (“It is proposed to support explicit UL QFI presence indicator in RRC signaling and allow carrying UL QFI even in 1-to-1 mapping.”). The QFI configuration is included in the DRB configuration in the RRC message, where the RRC message communicated from the node to the UE includes an “explicit UL QFI presence indicator in RRC signaling” that allows “carrying UL QFI even in 1-to-1 mapping.” Ex-1006, 1.

103. The reference also discloses that “the QFI configuration is always set to a value indicating the QFI field is present in uplink for the default DRB,” as required by element 1A. *Id.*, 1 (“UL PDU should always carry QFI (QoS Flow Indicator) information either by explicit header field or by implicit configuration with 1-to-1 mapping.”). The reference describes a situation where, “when PDU session establishes, there is only one QoS flow in a DRB. Later some other QoS flow(s) activation or arrival, mapping relationship between QoS flow(s) and that DRB can be changed from 1-to-1 to many-to-1 mapping. In this case, it is an easy way that network configures UE *always* carrying QFI from the beginning of DRB

establishment, even in 1-to-1 mapping period.” Ex-1006, 1 (emphasis added).

Figure 2 of R2-1706381, shown below, discloses the UL PDU with QFI:



Id., Figure 2.

104. In view of R2-1706381’s disclosure of a QFI configuration used to indicate whether a QFI field is present or not in uplink for the default DRB and that the QFI configuration is always set to a value indicating the QFI field is present, a POSITA would have found it obvious in to use this configuration in the system described by 3GPP TS 38.300 in my opinion. 3GPP TS 38.300 specifically contemplates the use of QFI information when it states that, “[t]he data packets may optionally include a QoS marking (same as or corresponding to QFI) in the SDAP header.” Ex-1007, 49. Accordingly, to reduce complexity and confusion, a POSITA would have been motivated to combine the proposal regarding default DRB handling in 3GPP TS 38.300 with the specific QFI configuration and setting described in R2-1706381. A skilled artisan would have found it obvious to practice the proposed combination by adding the claimed QFI configuration to the expressly disclosed

method for default DRB handling in 3GPP TS 38.300.

105. A POSITA would have understood that a major benefit of R2-1706381's system is that the claimed QFI configuration permits mapping of multiple QoS flows to DRBs with no packet loss and less complexity. Ex-1006, 1-2. A POSITA would have understood that this same benefit could be realized in 3GPP TS 38.300's system. As a result, to the extent 3GPP TS 38.300 does not disclose the approach already, a POSITA would have been motivated to improve upon 3GPP TS 38.300's method by including a QFI configuration used to map QoS flows to DRBs with no packet loss and less complexity. This would minimize packet loss and simplify the process for mapping QoS flows to DRBs. *Id.* To reduce complexity and confusion, a POSITA would have been motivated to combine the proposal regarding default DRB handling in 3GPP TS 38.300 with the specific QFI configuration and setting described in R2-1706381.

106. In addition to being motivated to pursue the proposed combination, a POSITA would have had a reasonable expectation of success in meeting the limitations of the claimed invention in my opinion. 3GPP TS 38.300 itself teaches the need for QoS flow mapping. Ex-1007, 49-52. Especially given R2-1706381's disclosures, a POSITA would have known that it was possible for 3GPP TS 38.300 to employ a QFI configuration that was always set to a value indicating the QFI field is present in uplink for the default DRB.

107. Claim element 1A of the '754 Patent is therefore obvious in view of 3GPP TS 38.300 combined with R2-1706381.

c. Element 1B: establishing the default DRB with a presence of the QFI field in uplink; and

108. 3GPP TS 38.300 discloses claim element 1B of the '754 Patent. 3GPP TS 38.300 discloses “establishing the default DRB with a presence of the QFI field in uplink.” The specification states that, in step 2 of the disclosed method of the network node, the “gNB sends a DRB set up Request message to the UE including DRB parameters and the NAS message received at Step 1.” Ex-1007, 49. Further, the “UE establishes at least default DRB associated with the new PDU session. It creates the QFI to DRB mapping.” *Id.* After this, the “UE sends UL packets over the DRB, optionally including a QoS marking. If configured in step 2, UL data packets include a QoS marking (same as or corresponding to QFI) in the SDAP header.” *Id.* This disclosure confirms that the default DRB established by the network node has a presence of the QFI field in uplink. As a result, 3GPP TS 38.300 teaches establishing the default DRB with a presence of the QFI field in uplink. *See also supra* § XI(2)(b).

d. Element 1C: receiving a SDAP (Service Data Adaptation Protocol) PDU with the QFI field via the default DRB from the UE.

109. 3GPP TS 38.300 discloses claim element 1C of the '754 Patent. 3GPP TS 38.300 discloses “receiving a SDAP (Service Data Adaptation Protocol) PDU

with the QFI field via the default DRB from the UE.” The specification states that the “UE establishes at least default DRB associated with the new PDU session. It creates the QFI to DRB mapping.” Ex-1007, 49. Then, the “UE sends UL packets over the DRB, optionally including a QoS marking. If configured in step 2, UL data packets include a QoS marking (same as or corresponding to QFI) in the SDAP header.” *Id.* As a result, the node will receive a SDAP PDU with the QFI field present via the default DRB from the UE. Thus, 3GPP TS 38.300 teaches receiving a SDAP PDU with the QFI field via the default DRB from the UE. *See also supra* § XI(2)(c).

- e. **Claim 2: The method of claim 1, wherein the network node is not allowed to transmit a second RRC message to the UE for reconfiguring the QFI configuration for the default DRB to no presence of the QFI field.**

110. The combination of 3GPP TS 38.300 and R2-1706831 renders obvious Claim 2 of the '754 Patent. As I discussed above, Claim 1 of the '754 Patent is obvious in view of 3GPP TS 38.300 combined with R2-1706381. Further, to the extent that 3GPP TS 38.300 fails to teach “wherein the network node is not allowed to transmit a second RRC message to the UE for reconfiguring the QFI configuration for the default DRB to no presence of the QFI field,” as required by Claim 2, the combination of 3GPP TS 38.300 with R2-1706381 nevertheless renders this limitation obvious to a POSITA.

111. R2-1706381 discloses that “the network node is not allowed to transmit a second RRC message to the UE for reconfiguring the QFI configuration

for the default DRB to no presence of the QFI field,” as required by claim 2. The proposal teaches “the detailed formats of SDAP data PDU and QFI presence,” Ex-1006, 1, and the proposal explains that using PDUs with and without the QFI field brings complexity and confusion for SDAP layer processing. Ex-1006, 1. The proposal then describes a solution to this problem such that the “network configures UE *always* carrying QFI from the beginning of DRB establishment, even in 1-to-1 mapping period.” *Id.* (emphasis added). In addition, the proposal states that “UL PDU should *always* carry QFI (QoS Flow Indicator) information.” Ex-1006, 1 (emphasis added). Because R2-1706381 discloses that the network configures the UE to always carry QFI, a POSITA would understand from this disclosure that the network node is not allowed to transmit a second RRC message to the UE for reconfiguring the QFI configuration for the default DRB to no presence of the QFI field, as required by Claim 2.

112. In view of R2-1706381’s disclosure that the QFI configuration is *always* set to a value indicating the QFI field is present, a POSITA would have found it obvious to use this configuration in the system described by 3GPP TS 38.300 to arrive at the claimed invention of Claim 2. 3GPP TS 38.300 specifically contemplates the use of QFI information when it states that, “[t]he data packets may optionally include a QoS marking (same as or corresponding to QFI) in the SDAP header.” Ex-1007, 49. Accordingly, to reduce complexity and confusion, a POSITA

would have been motivated to combine the proposal regarding default DRB handling in 3GPP TS 38.300 with the specific QFI configuration and setting described in R2-1706381 to arrive at the claimed invention of Claim 2. A skilled artisan would have found it obvious to practice the proposed combination by adding the claimed QFI configuration where the network node is not allowed to transmit a second RRC message to the UE for reconfiguring the QFI configuration for the default DRB to no presence of the QFI field to the expressly disclosed method for default DRB handling in 3GPP TS 38.300.

113. A POSITA would have understood that a major benefit of R2-1706381's system is that the claimed QFI configuration always permits mapping of multiple QoS flows to DRBs with no packet loss and less complexity because QFI is always present. Ex-1006, 1-2. A POSITA would have understood that this same benefit could be realized in 3GPP TS 38.300's system. As a result, to the extent 3GPP TS 38.300 does not disclose the approach already, a POSITA would have been motivated to improve upon 3GPP TS 38.300's method by including a QFI configuration used to map QoS flows to DRBs with no packet loss and less complexity.

114. In addition to being motivated to pursue the proposed combination, a POSITA would have had a reasonable expectation of success in combining the proposals to arrive at the claimed invention of Claim 2. 3GPP TS 38.300 itself

teaches the need for QoS flow mapping. Ex-1007, 49-52. Especially given R2-1706381's disclosures, a POSITA would have known that it was equally possible for 3GPP TS 38.300 to employ a QFI configuration such that the network node is not allowed to transmit a second RRC message to the UE for reconfiguring the QFI configuration for the default DRB to no presence of the QFI field.

115. Claim 2 of the '754 Patent is therefore obvious in view of 3GPP TS 38.300 combined with R2-1706381 in my opinion.

f. Claim 3: The method of claim 1, wherein a header in the SDAP PDU includes at least the QFI field.

116. The combination of 3GPP TS 38.300 and R2-1706831 renders obvious Claim 3 of the '754 Patent. As I discussed above, Claim 1 of the '754 Patent is obvious in view of 3GPP TS 38.300 combined with R2-1706381. Further, 3GPP TS 38.300 discloses wherein a header in the SDAP PDU includes at least the QFI field, as required by Claim 3. The specification states that the "UE establishes at least default DRB associated with the new PDU session. It creates the QFI to DRB mapping." Ex-1007, 49. Then, the "UE sends UL packets over the DRB, optionally including a QoS marking. If configured in step 2, UL data packets include a QoS marking (same as or corresponding to QFI) in the SDAP header." *Id.* As a result, 3GPP TS 38.300 discloses wherein a header in the SDAP PDU includes at least the QFI field, as required by Claim 3.

117. Claim 3 of the '754 Patent is therefore obvious in view of 3GPP TS

38.300 combined with R2-1706381.

g. Claim 4: The method of claim 1, wherein the network node transmits an IP (Internet Protocol) packet included in the SDAP PDU to a core network.

118. The combination of 3GPP TS 38.300 and R2-1706831 renders obvious Claim 4 of the '754 Patent. As I discussed above, Claim 1 of the '754 Patent is obvious in view of 3GPP TS 38.300 combined with R2-1706381. Further, 3GPP TS 38.300 discloses that the network node transmits an IP (Internet Protocol) packet included in the SDAP PDU to a core network, as required by Claim 4. 3GPP TS 38.300 discloses that the gNB transmits IP packets included in SDAP PDUs to a core network. Ex-1007, 21, Figure 6.6-1. The IP packets are included in the SDAP PDUs, as shown in Figure 6.6-1. Ex-1007, 21. Further, 3GPP TS 38.300 discloses that the gNB transmits IP packets in SDAP PDUs to the UPF in the core network: “In the transport, IP layer point-to-point transmission is used to deliver the signaling PDUs.” Ex-1007, 11-12; *see also id.*, 38-40. As a result, 3GPP TS 38.300 discloses that the network node transmits an IP (Internet Protocol) packet included in the SDAP PDU to a core network, as required by Claim 4.

119. Claim 4 of the '754 Patent is therefore obvious in view of 3GPP TS 38.300 combined with R2-1706381.

h. Claim 5: The method of claim 1, wherein the network node is a base station (or gNB).

120. The combination of 3GPP TS 38.300 and R2-1706831 renders

obvious Claim 5 of the '754 Patent. To start, as discussed above, Claim 1 of the '754 Patent is obvious in view of 3GPP TS 38.300 combined with R2-1706381. Further, 3GPP TS 38.300 discloses wherein the network node is a base station (or gNB), as required by Claim 5. 3GPP TS 38.300 discloses that the network node is a “gNB.” Ex-1007, 38-40, 49-53; This is shown, for example, in Figure A.1-1. Ex-1007, 49. As a result, 3GPP TS 38.300 discloses wherein the network node is a base station (or gNB), as required by Claim 5.

121. Claim 5 of the '754 Patent is therefore obvious in view of 3GPP TS 38.300 combined with R2-1706381.

i. Element 6P: A network node, comprising:

122. *See* Element 1[P], *supra* § XI(2)(a).

j. Element 6A: a control circuit; a processor installed in the control circuit; and a memory installed in the control circuit and operatively coupled to the processor; wherein the processor is configured to execute a program code stored in the memory to:

123. 3GPP TS 38.300 discloses that the network node comprises a control circuit; a processor installed in the control circuit; and a memory installed in the control circuit and operatively coupled to the processor; wherein the processor is configured to execute a program code stored in the memory to perform certain steps. For example, 3GPP TS 38.300 discloses that the network node is a “gNB.” Ex-1007, 38-40, 49-53. This is shown, for example, in Figure A.1-1 in my opinion. Ex-1007,

49. A gNB is a base station or node that a POSITA would understand includes a control circuit, a processor installed in the control circuit, and a memory installed in the control circuit and operatively coupled to the processor, wherein the processor is configured to execute a program code stored in the memory to perform certain steps in my opinion.

124. Thus, 3GPP TS 38.300 discloses claim element 6A of the '754 Patent.

- k. **Element 6B: transmit a first RRC (Radio Resource Control) message with a DRB (Data Radio Bearer) configuration to a UE (User Equipment) for establishing a default DRB for a PDU (Protocol Data Unit) session, wherein the DRB configuration includes a QFI (QoS Flow Id) configuration used to indicate whether a QFI field is present or not in uplink for the default DRB and the QFI configuration is always set to a value indicating the QFI field is present in uplink for the default DRB;**

125. See Element 1A, *supra* § XI(2)(b).

- l. **Element 6C: establish the default DRB with a presence of the QFI field in uplink; and**

126. See Element 1B, *supra* § XI(2)(c).

- m. **Element 6D: receive a SDAP (Service Data Adaptation Protocol) PDU with the QFI field via the default DRB from the UE.**

127. See Element 1C, *supra* § XI(2)(d).

- n. **Claim 7: The network node of claim 6, wherein the network node is not allowed to transmit a second RRC message to the UE for reconfiguring the QFI configuration for the default DRB to no presence of the QFI field.**
128. *See* Claim 2, *supra* § XI(2)(e).
- o. **Claim 8: The network node of claim 6, wherein a header in the SDAP PDU includes at least the QFI field.**
129. *See* Claim 3, *supra* § XI(2)(f).
- p. **Claim 9: The network node of claim 6, wherein the network node transmits an IP (Internet Protocol) packet included in the SDAP PDU to a core network.**
130. *See* Claim 4, *supra* § XI(2)(g).
- q. **Claim 10: The network node of claim 6, wherein the network node is a base station (or gNB).**
131. *See* Claim 5, *supra* § XI(2)(h).

XII. CONCLUSION

132. This Declaration represents the opinions that I have formed to date based on the material currently available to me. I reserve the right to revise, supplement, and/or amend my opinions stated in this declaration based on new information that becomes available to me and on my continuing analysis of the materials available to me.

133. I declare that all statements made herein of my 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, imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Dated: June 4, 2024


Dr. Mark P. Mahon