UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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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. AND CELERITY IP, LLC.

Patent Owner.

Case IPR2024-01142

DECLARATION OF DR. ALEX HAIMOVICH, PH.D.

IN SUPPORT OF PETITION FOR INTER PARTES REVIEW OF

U.S. PATENT NO. 10,887,868

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I, Dr. Alexander Haimovich, do hereby declare and state as follows:

I. Background and Qualifications

1. I received my Ph.D. degree from the University of Pennsylvania in 1989 in Systems Engineering. Prior to that, I graduated from Drexel University with a Master's degree in Electrical Engineering in 1983, and I obtained a B.Sc. degree in Electrical Engineering from the Israel Institute of Technology in 1977. From 1983 until 1987, I worked as an engineer for the American Electronics Laboratories (AEL), a company in Lansdale, Pennsylvania that produced electronic warfare equipment for the Department of Defense. From 1987 until 1989, I taught communication courses at the New Jersey Institute of Technology (NJIT). Upon receiving the Ph.D. degree, I rejoined AEL for a short period, followed by joining a company that consulted for the U.S. Navy. In 1992, I came to NJIT as an associate professor.

2. At NJIT, over the years, I have taught practically all undergraduate and graduate communication courses offered by the Electrical and Computer Engineering Department (10 different courses from undergraduate to PhD level). I also initiated several new courses in communications/signal processing/radar in general, and in wireless communications, in particular. In the mid-1990's I designed and introduced a new graduate course in wireless communications ("Introduction to

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Wireless and Personal Communications Systems"), and later I created a new undergraduate course in wireless communications ("Wireless Communications Systems"). These courses are the key wireless courses being taught at NJIT. From time to time, I have also initiated and taught special topic courses on advanced topics in wireless communications.

3. I have developed an extensive research program, with several graduate students engaged in wireless research at any given time. I have supervised more than 20 PhD dissertations and numerous Masters theses. I currently supervise the work of several PhD students. My work has been disseminated extensively in over 230 publications, and I have been invited to present my research nationally and internationally.

4. From 2003-2005, I served as Director of the New Jersey Center for Wireless Telecommunication (NJCWT). The mission of the NJCWT was to function as a consortium of the four main research universities in the State of New Jersey, namely, NJIT, Princeton University, Rutgers University, and Stevens Institute of Technology, to interact and perform technology transfer with industry in the state. Separate from NJCWT, my research work has been extensively funded by federal agencies, such as the National Science Foundation, U.S. Air Force, U.S. Navy, U.S. Army, as well as by grants and contracts from industrial sponsors.

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5. I taught short courses on Orthogonal Frequency Division Multiplexing ("OFDM") and Multiple-Input Multiple-Output ("MIMO") wireless technologies in Europe. The courses were attended by participants from European wireless companies. I have developed an online course on OFDM that has been offered for a time through Institute of Electrical and Electronics Engineers (IEEE). IEEE is a non-profit organization, and it is the world's leading professional association for the advancement of Electrical Engineering Technology.

6. I have served in numerous professional leadership positions including chairing sessions at conferences. From 1997-2007, I was an associate editor of a top journal in communications ("IEEE Communications Letters").

7. I am a Fellow of the IEEE and hold the Ying Wu endowed Chair position at the New Jersey Institute of Technology.

8. Since 2013, I have served as the Director of the Center for Wireless Information Processing at NJIT. The Center supports research in the fields of wireless communications and signal processing.

9. Additional details about my employment history, fields of expertise, awards, publications, and other activities are further included in my curriculum vitae, Ex-1004.

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10. The ‘868 Patent relates to wireless communication systems such as LTE and 5G, and particularly to beam management involved in beamforming. As a result of my education, academic experience, and industrial experience, I am familiar with the technology related to the ‘868 Patent and with the state of that technology at the time the ‘868 Patent was filed. I recognize the technology of the ‘868 Patent as being well within the sphere of my experience and expertise, and I understand the technology described in the ‘868 Patent fully. Based on my education and experience, I believe I am qualified to submit expert analyses in this proceeding and specifically to submit this declaration.

11. I am being compensated for services provided in this matter at my customary rate, plus travel expenses. My compensation is not conditioned on the conclusions I reach as a result of my analysis or on the outcome of this matter. Similarly, my compensation is not dependent upon and in no way affects the substance of my statements in this declaration.

12. I have no financial interest in Petitioners AT&T Services Inc., T-Mobile USA, Inc., Cellco Partnership d/b/a Verizon Wireless, Ericsson Inc., and Nokia of America Corporation (collectively, “Petitioners”) or any of their subsidiaries. I also do not have any financial interest in Patent Owner ASUS Technology Licensing Inc. nor Patent Owner Celerity IP, LLC. I do not have any

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financial interest in the ‘868 Patent and have not had any contact with any of the named inventors of the ‘868 Patent (Yu-Hsuan Guo, Richard Lee-Chee Kuo and Meng-Hui Ou).

II. Assignment and Materials

13. I submit this declaration in support of Petitioner’s petition for *inter partes* review of U.S. Patent No. 10,887,868 (“the ‘868 Patent”).

14. I am not an employee of Petitioners or any affiliates or subsidiaries thereof.

15. I am being compensated at my usual consulting rate of $650 per hour for my time spent working on issues in this matter. My compensation does not depend upon the outcome of this matter or the opinions I express.

16. I have been asked to provide certain opinions relating to the patentability of the ‘868 Patent. Specifically, I have been asked to provide my opinion regarding (i) the level of ordinary skill in the art to which the ‘868 Patent pertains; and (ii) whether claims 5, 6, 8, 13, 14, 16 and 18 (“the Challenged Claims”) would have been rendered obvious over certain prior art references.

17. In forming my opinions I have reviewed the ‘868 Patent, its prosecution history, and all applications to which it claims priority.

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18. I have also reviewed U.S. Patent No. 11,539,419 to Byounghoon Jung, Jungmin Moon, Seunghoon Park, Anil Agiwal, Sunheui Ryoo, and Jungsoo Jung, (Ex-1005) and the provisional applications to which it claims priority, including Provisional Application No. 62/350,453 (Ex-1006 ("the Jung Provisional")) (collectively with Ex-1005, "Jung"), and U.S. Patent No. 11,096,195 to Gang Xiong, Wenting Chang, Huaning Niu, Yushu Zhang, and Yuan Zhu (Ex-1007) ("Xiong") and the provisional application to which it claims priority, Provisional Application No. 62/294,095 (Ex-1008).

19. I also reviewed any document cited herein.

III. Standards Applied

20. I understand that a claim in an issued patent is unpatentable as anticipated if the recited invention is described in a single prior-art reference that discloses each limitation, either expressly or inherently.

21. I further understand that a claim in an issued patent is unpatentable as obvious 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 to a person having ordinary skill in the relevant art at the time the alleged invention was made.

22. I further understand that the following factors are to be evaluated to determine whether the claimed subject matter is obvious: (1) the scope and content

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of the prior art; (2) the difference or differences, if any, between each claim of the patent and the prior art; and (3) the level of ordinary skill in the art at the time the time the alleged invention was made.

23. Unlike anticipation, obviousness does not require that every element of the claim be in a single prior art reference. Instead, I understand that obviousness may be shown by considering more than one item of prior art and by considering the knowledge of a person having ordinary skill in the art, so long as there is motivation or sufficient reasoning to combine these references and knowledge.

24. I understand that this motivation may be based on various rationales, including, but not limited to:

a. Combining prior art elements according to known methods to yield predictable results;

b. Simple substitution of one known element for another to obtain predictable results;

c. Use of known techniques to improve similar devices (methods, or products) in the same way;

d. Applying a known technique to a known device (method, or product) ready for improvement to yield predictable results

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e. "Obvious to try" – choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success;

f. Known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art; and

g. Some teaching, suggestion, or motivation in the prior art that would have led one of ordinary skill to modify the prior art reference or to combine prior art reference teachings to arrive at the claimed invention.

25. I have been informed and I understand that the following so-called objective indicia of non-obviousness, also known as "secondary considerations," are to be considered when assessing obviousness: (1) commercial success; (2) long-felt but unresolved need; (3) copying of the invention by others in the field; (4) initial expressions of disbelief by experts in the field; (5) failure of others to solve the problem that the inventor solved; (6) unexpected results; and (7) industry praise. I also understand that evidence of objective indicia of non-obviousness must be commensurate in scope with and have a nexus to the claimed subject matter.

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26. I understand that when considering obviousness, one must not refer to teachings in the specification of the patent itself. One can, however, refer to portions of the specification admitted to be prior art.

IV. Technological Background

27. A person of ordinary skill in the art in the pre-July 2016 timeframe would have been familiar with the background information I describe below.

A. The LTE standard

28. The '868 Patent relates to wireless communication networks, such as the Long-Term Evolution (LTE) standardized by the "3rd Generation Partnership Project" (3GPP). The first release of the LTE standard is known as release 8. Each release introduces new features. For example, release 8 included beamforming via transmission modes 4 and 7. That release was frozen in December 2008. *See* Appendix 1 at 7 (https://www.3gpp.org/ftp/Information/WORK_PLAN/Description_Releases/(Rel-08_description_20140924)). Then, release 9 introduced transmission mode 8 non-codebook-based precoding supporting up to two layers, which means supporting forming two simultaneous beams. That release was frozen in March 2010. *See* https://www.3gpp.org/specifications-technologies/releases/release-9. The latest version of the LTE standard frozen before the '868 Patent's priority date was

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release 13. Release 13 was frozen in March 2016. *See* https://www.3gpp.org/specifications-technologies/releases/release-13. Release 13 introduced CSI class B reporting, for which, CSI reference signals are beamformed, and the reporting is per-beam.

B. Control Signaling, and Reference Signals

29. The reference signals disclosed by the '868 Patent are transmitted in the downlink - the direction of transmission from a base station to a mobile terminal. In LTE, a base station is sometimes referred to as eNB, while a mobile terminal is often referred to as user equipment (UE).

30. In LTE, an OFDM symbol comprises a large number of modulation symbols (e.g., BPSK, QPSK, M-QAM) transmitted in parallel on tightly packed subcarriers. Each modulation symbol modulates a subcarrier over the time interval of the OFDM symbol. OFDM is implemented using IFFT/FFT processing.

31. LTE transmissions are organized into radio frames of 10 ms. Each frame consists of ten 1 ms subframes. For normal cyclic prefix, one subframe contains 14 OFDM symbols, split into two slots. Downlink subcarriers are grouped into resource blocks, where each resource block consists of 12 consecutive subcarriers in the frequency domain and, for normal cyclic prefix, 7 OFDM symbols

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in the time domain (see figure). One OFDM subcarrier by one OFDM symbol interval on the time-frequency grid is referred to as a resource element.

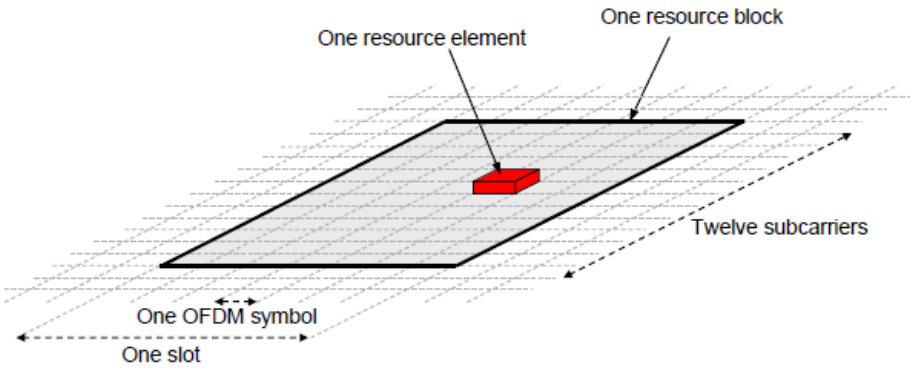


FIGURE 5.2

The LTE physical time–frequency resource.

Appendix 2 (Dahlman 2016) at 78.

32. An LTE downlink transmission consists of control signaling, data, and reference symbols. Reference symbols are modulation symbols known to both the base station and the UE. A UE may use reference symbols transmitted by the base station to estimate channel state information (CSI) in the downlink. A UE exploits CSI to compensate for channel effects in the processing of received signals. CSI is also fed back to the base station for setting parameters for subsequent downlink transmissions. CSI is further discussed below. An illustration of control symbols and reference symbols alongside data symbols is shown in the figure below.

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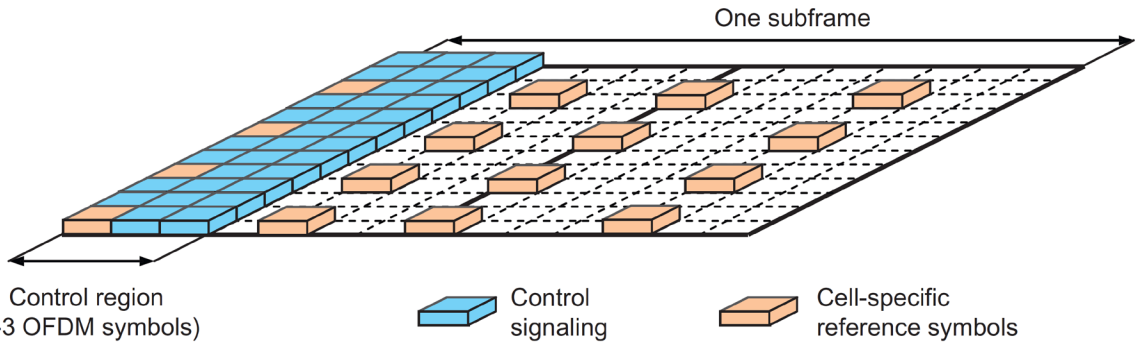


FIGURE 10.20

LTE time–frequency grid illustrating the split of the subframe into (variable-sized) control and data regions.

Appendix 2 (Dahlman 2016) at 131, Figure 6.20.

C. MIMO

33. The use of multiple antennas at both the transmitter and the receiver is referred to as MIMO (Multiple-Input Multiple-Output). There are different types of multi-antenna techniques, including beamforming. An illustration of a 2×2 MIMO configuration is shown in the figure.

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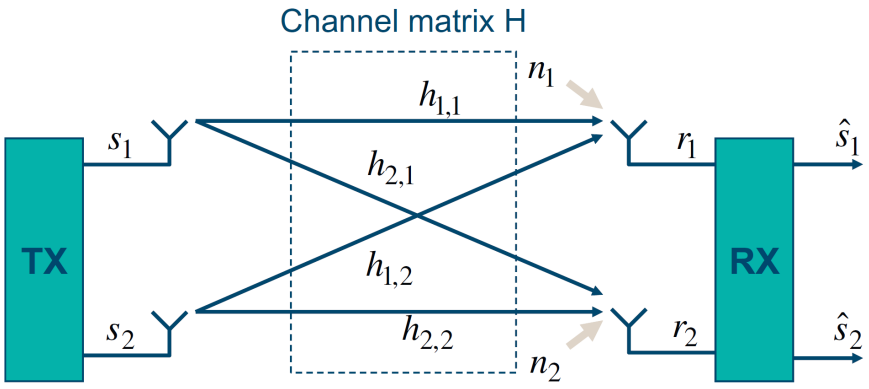


FIGURE 5.14

2 × 2 antenna configuration.

Appendix 3, Dahlman et al., 4G LTE/LTE-Advanced for Mobile Broadband, 2011 at 73, Figure 5.14.

34. A 2×2 MIMO configuration may support two separate data streams (depending on the values of the channel coefficients (h_{11}, h_{12}, h_{21}, h_{22}). A channel that supports two data streams is said to support *two layers*.

35. MIMO is typically implemented with antenna arrays. An antenna array may have antenna elements laid out in two dimensions. The figure below shows typical layouts of antenna array panels for 8, 12, and 16 antenna ports.

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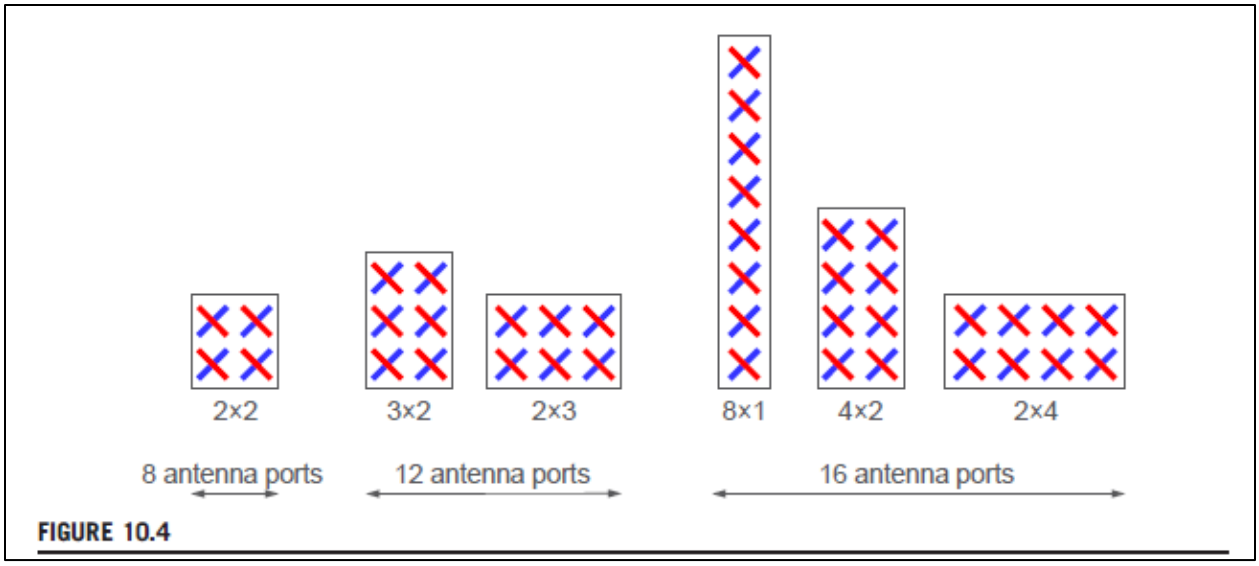


FIGURE 10.4

Appendix 2 (Dahlman 2016) at 281, Figure 10.4.

36. Beamforming at the transmitter is a form of MIMO with multiple antennas at the transmitter. To form a beam, multiple antenna elements transmit the same symbol, but the carrier phase is controlled separately at each element. By adjusting the phase at each antenna element it is possible to make all signals at the destination add constructively, thus creating a beam. A beam may be steered in different directions by applying different phase shifts. An exemplary one-dimensional array is shown in the figure below.

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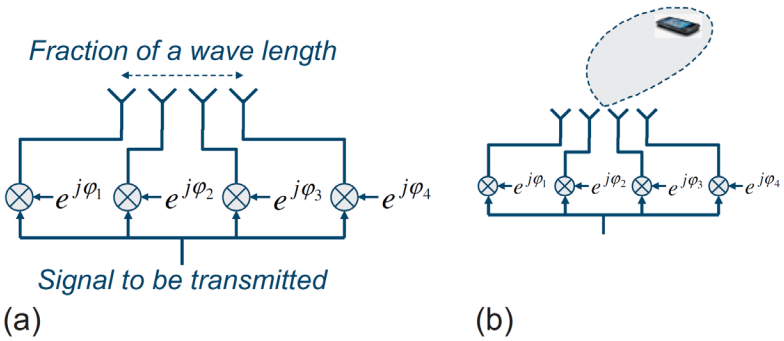
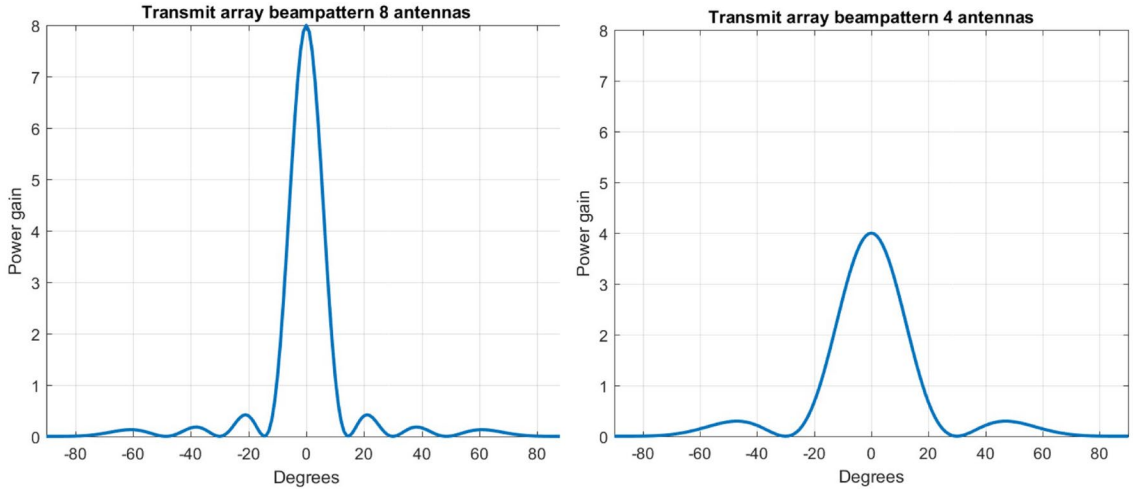


FIGURE 5.11

Classical beam-forming with high mutual antennas correlation: (a) antenna configuration; (b) beam-structure.

Appendix 3 (Dahlman 2011) at 69, Figure 5.11.

37. Increasing the number of antenna elements decreases the beamwidth and increases the antenna gain in the direction of the beam. In the examples shown in the side-by-side figures, beampatterns obtained using Matlab are shown for an 8-element array (left) and a 4-element array (right), respectively.



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38. Scheduling refers to the allocation of radio resources available to the system to make their utilization as efficient as possible. Wireless communications is subject to significant variations in channel conditions, which greatly affect the quality of communications. For this reason, scheduling is channel-dependent. The set of channel parameters that capture the current channel conditions is referred to as *channel state information* (CSI). Downlink transmissions are scheduled based on the CSI available at the base station. In LTE, the CSI in the downlink is estimated at a UE based on reference signals. Reference signals are known to the UE, and thus can be used to estimate the CSI. *CSI reports* are uplink transmissions sent from the UE to the base station that provide the base station with information on current channel conditions. The UE is able to calculate CSI by comparing the signal that it actually receives to the signal that it expected to receive based on the known reference signal.

39. Channel reciprocity refers to "exploiting channel reciprocity to estimate the downlink quality from uplink channel estimates" (Appendix 2 at 255). "This is especially of interest for TDD operation for which the use of the same frequency for uplink and downlink transmission typically leads to a higher degree of downlink/uplink channel reciprocity." Appendix 2 at 127.

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40. When there are multiple transmit-antenna elements, each antenna may transmit a different reference signal. When the channels from multiple transmit antennas to the UE are similar, the same reference signal may be transmitted by all the antennas. In the latter case, the UE estimates the combined effect of channels from multiple antennas. Since the CSI may relate to the combined effect of multiple transmissions, LTE uses the concept of an *antenna port*. An antenna port is a logical construction associated with the transmission of a reference signal. Thus, an antenna port may be formed by multiple physical antennas, but it corresponds to a single reference signal.

41. LTE Release 13 introduced CSI reporting Class B to support beamforming using a type of reference signals referred to as CSI-RS. In the example below, a 4×8 array panel transmits 4 CSI-RS resources. Each CSI-RS resources consists of two resource elements spanning two OFDM symbols. The CSI-RS are multiplexed both in the frequency and time domains. Each CSI-RS resource is transmitted over a different antenna port, and it corresponds to a different beam. The UE measures each of the CSI-RS resources and reports back CSI.

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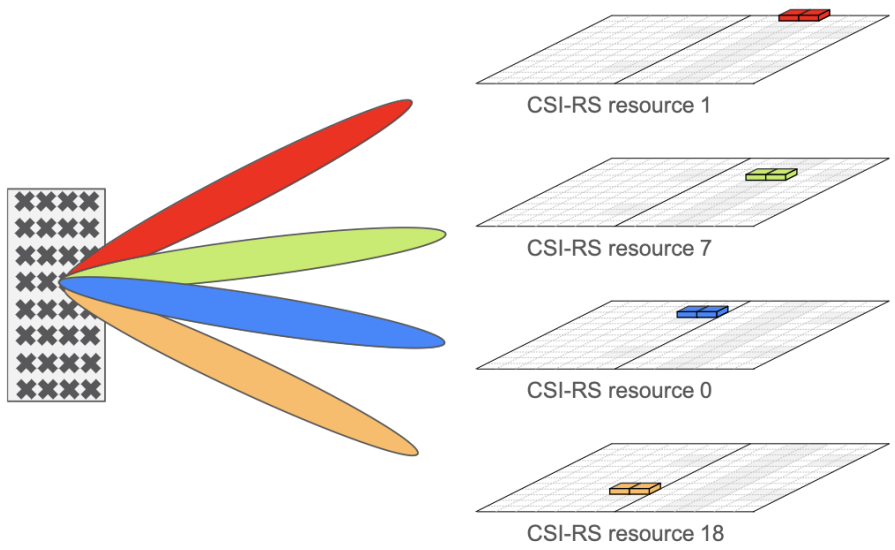


FIGURE 10.5
Example of CSI-RS resources for beam measurements.

Appendix 2 (Dahlman 2016) at 282.

D. Control Messages: MAC, Scheduling Request

42. The interface between a base station and a UE entails the exchange of data and signaling messages. The transfer of data and signaling uses hardware and software protocols. The protocols are grouped into layers, each of which handles one aspect of a transmission and reception process. The collection of layers is referred to as a protocol stack, with the upper layers handling system level tasks, and lower-level layers handling the physical transmission and reception of signals. The protocol stack has two planes. The user plane handles data, while the control plane handles signaling messages. Focusing on the control plane, the higher layer of the protocol

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stack is the Radio Resource Control (RRC) protocol. The Medium Access Control (MAC) layer is found below the RRC layer.

43. In LTE, RRC is used to configure various aspects of operation across the whole of a cell. RRC configurations may be updated every 5-80 ms, for example the configuration of CSI reports (Appendix 2 at 112). RRC messages to the whole of a cell are efficient from the point of view of minimizing signaling, since one signaling message reaches many UEs. But RRC signaling does not react as quickly to dynamic channel conditions, for example the rapid decrease in gain of a narrow beam associated with a moving terminal at high frequencies. As discussed below, Jung proposed using MAC signaling for beam management. The MAC signaling reacts quicker than RRC messages, may transmit messages in a specific subframe and may be directed to a single UE.

44. A scheduling request is a type of uplink control signaling indicating that a device needs an uplink resource for transmission.

E. 5G Development and Beamforming Contributions

45. 3GPP began the process of developing 5G New Radio (NR) in 2015. *See* https://www.ericsson.com/en/blog/2015/9/5g-now-started-in-3gpp. The earliest version of the 5G standard, release 15, was frozen in June 2018. *See* https://www.3gpp.org/technologies/5g-system-overview.

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46. It was understood at the time of NR's development that higher frequency bands, e.g., mm wave, should be used by NR. Beamforming was identified as a way to compensate for the increased path loss at the higher frequency bands. The figure below illustrates the lower gain of sector beam coverage at high frequency and the narrow beamwidth of high gain beams at high frequency. Narrow beams entail quicker drops in beam gains, and thus require rapid ability to change beams.

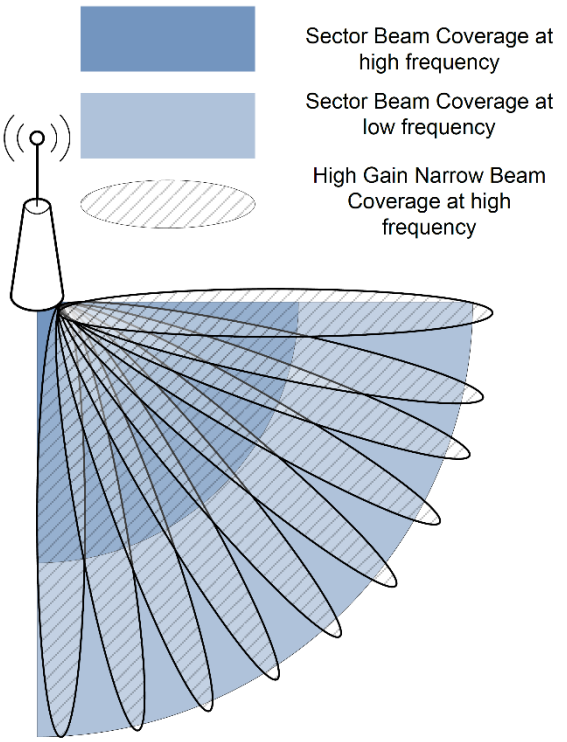


Figure 1. Illustration of providing cell coverage with sector beams and multiple high gain narrow beams

Appendix 4 (R2-162366).

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V. The ’868 Patent

143. The ’868 Patent (Ex-1001) is directed to a method and apparatus for beamforming in a wireless communication system. In particular, the patent claims systems and methods for a UE to derive a “UE beam,” based on a beam reference signal of a “network beam.” *See*, *e.g.*, Ex-1001 at claims 5 and 13. The UE receives “a first information” associated with the “network beam” via a “first signal” that is “a Medium Access Control (MAC) signaling[.]” *Id*. at 20:15–20.

144. The “UE beam” is used to transmit two specific pieces of information: (1) a periodic Channel State Information (CSI), and (2) a scheduling request. *Id*. Both pieces of information are then received “using the network beam, mapped to the UE beam[.]” *Id*. at 20:22–24.

The dependent claims add additional steps of: (1) transmitting a second signal indicating radio resources for: (i) the beam reference signal of the network beam and (ii) the periodic CSI; (2) wherein the second signal is a Radio Resource Control (RRC) message; and (3) transmitting to the UE an indication of candidates of network beams for communication with the network node. *Id*. at claims 6, 8, 14, 16, and 18.

A. Listing of the Challenged Claims and Claim Language

47. The challenged claims are reproduced below:

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Claim	Claim Language
5	A method of a network node for transmission or reception using beamforming, the method comprising: selecting a network beam; transmitting a first signal to a user equipment (UE) to indicate a first information associated with the network beam for the UE to derive, based on a beam reference signal of the network beam, a UE beam used to transmit a periodic Channel State Information (CSI) and to transmit a scheduling request, wherein the first signal is a Medium Access Control (MAC) signaling; and using the network beam, mapped to the UE beam, to receive the periodic CSI and to receive the scheduling request.
6	The method of claim 5, further comprising: transmitting a second signal indicating radio resources for the beam reference signal of the network beam and the periodic CSI.
8	The method of claim 6, wherein the second signal is a Radio Resource Control (RRC) message.
13	A network node for transmission or reception using beamforming comprising: a control circuit; a processor installed in the control circuit; and

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Claim	Claim Language
	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: select a network beam; transmit a first signal to a user equipment (UE) to indicate a first information associated with the network beam for the UE to derive, based on a beam reference signal of the network beam, a UE beam used to transmit a periodic Channel State Information (CSI) and to transmit a scheduling request, wherein the first signal is a Medium Access Control (MAC) signaling; and use the network beam, mapped to the UE beam, to receive the periodic CSI and to receive the scheduling request.
14	The network node of claim 13, wherein the processor is further configured to: transmit a second signal indicating radio resources for the beam reference signal of the network beam and the periodic CSI, wherein the second signal is a Radio Resource Control (RRC) message.
16	The method of claim 5, further comprising: transmitting, to the UE, an indication of candidates of network beams for communication with the network node.

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Claim	Claim Language
18	The network node of claim 13, wherein the processor is further configured to: transmit, to the UE, an indication of candidates of network beams for communication with the network node.

VI. Patentability Analysis

A. Level of Ordinary Skill in the Art

48. In my opinion, with regard to the '868 Patent, a person of ordinary skill in the art would have B.S. in Electrical Engineering, or a related field, and at least three years of experience designing, developing, and/or testing telecommunication systems. A person of ordinary skill in the art would also have familiarity with the wireless standards and well-known protocols for accessing wireless networks. This description is approximate, and a higher level of education or skill might make up for less experience, and vice-versa. As of the time of the invention of the '868 Patent, I qualify as a person of ordinary skill in the art.

B. Claim Construction

49. I have been told that claim terms in an *inter partes* review proceeding are to be given their ordinary and accustomed meaning as understood by a person of ordinary skill in the art. In my analysis of the Challenged Claims, I have applied the plain and ordinary meaning as understood by a person of ordinary skill in the art at the relevant time.

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VII. Descriptions of the Prior Art References

A. Jung

50. As I discuss below and in the remainder of this declaration, Jung teaches all aspects of claims 5, 6, 8, 3, 14, 16, and 18 of the '868 Patent. In this section, I provide an overview of Jung,

51. Jung describes a technique for beam management that exchanges beam state information between a UE and an eNB, tracks a change of a beam rapidly, and applies the beam to the transmission of information. Ex-1005 at 8:31-34. "The present disclosure relates to a beam feedback procedure that informs a beam using entity (eNB) of beam information observed and measured by a beam measuring entity UE in an environment and a wireless communication system where a UE and an eNB using MIMO antennas coexist, or a system employs a beamforming, particularly, a beamforming using MIMO antennas,..." Ex-1005 at 1:37-43.

52. Jung explains that in order to achieve high data rates, 5G is developed to be implemented also at high frequencies, such as mm wave: "when a center frequency of 30 or more GHz is used, the coverage area of an evolved NodeB (eNB) is reduced due to signal attenuation, and this causes the need to use a number of beams." Ex-1005 at 6:10-13. Forming a beam "obtains an antenna gain with directivity in a physically specified direction." Ex-1005 at 6:42-43. The use of beams

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with directivity compensates for the signal attenuation. "Using a number of antennas increases the intensity of directivity to be higher and thus makes it possible to transmit signals to a further distance, under the same power condition,..." Ex-1005 at 6:53-55. According to Jung, prior art has not addressed the issue of uplink communication failure due to rapid changes in channel conditions associated with a beam in use. Ex-1005 at 8:19-26. "In this case, a UE may have a chance to maintain the connectivity" by changing the serving beam. Ex-1005 at 8:53-54.

53. Jung teaches that "a UE performs the following three processes, (1) beam information measurement, (2) providing beam information, and (3) changing beams in use." Ex-1005 at 9:64-66. "Beam measurement is performed to measure channels of beam pairs created by a combination of beams between a UE and a neighboring eNB." Ex-1005 at 10:13-15. Beam measurement is based on a beam reference signal: "[t]he UE receives beam reference signal (BRS) transmitted from an eNB, measures received different beams by turns with respect to the BRS, and obtains a beam quality measurement value for the UE reception beam pairs and each eNB transmission beam." Ex-1005 at 16:35-40. "Beam feedback is an operation that a UE informs an eNB of its measuring beam information." Ex-1005 at 10:29-30. "Beam information feedback may be periodically or aperiodically performed." Ex-1005 at 10:34-35. The feedback may include channel state information. Ex-1005 at

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9:17-21. Ex-1005 at 36:50-54. An eNB may use the feedback to determine whether a beam pair needs to changed or not: "when the eNB ascertains that a beam applied to the UE needs to be changed in operation 3325, it transmits a beam change request message to the UE in operation 3330." Ex-1005 at 43:39-42.

54. Jung discloses that to react quickly to a change in channel conditions, a determination whether a beam needs to be changed or not has to be performed rapidly. Ex-1005 at 31:27-31. In view of this, Jung teaches signaling that is done at the Medium Access Control (MAC) level. For example, signaling of a threshold level (Ex-1005 at 16:65-17:3), signaling of a time interval for feedback (Ex-1005 at 27:60-28:3, Ex-1005 at 28:1-15) or signaling of a new beam ID (Ex-1005 at 42:29-34, Ex-1005 at Fig. 31A, Ex-1006 at 105).

55. Jung teaches a UE is capable of selecting a best UE beam based on the beam measurement results (Ex-1005 at 21:27-32. Ex-1005 at Fig. 11, Ex-1006 figure at 72). Jung further teaches a UE is capable of selecting a best UE beam for reception (Ex-1005 at 16:41-44) or for transmission (Ex-1006 at 101). Jung further discloses channel reciprocity (Ex-1005 at 36:46-49, Ex-1006 at 24, Ex-1006 at 28). A POSITA understands that channel reciprocity implies the same UE beam may be used for both reception and transmission.

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56. Jung discloses the use of a scheduling request for the allocation of resources in the uplink (Ex-1005 at 7:31-34, Ex-1005 at 25:65-26:1, Ex-1005 at 27:37-42). The scheduling request is transmitted on the best beam selected by the UE (Ex-1005 at 27:49-67).

B. Xiong

57. As I discuss below and in the remainder of this declaration, Jung in view of Xiong, teaches all aspects of claims 5, 6, 8, 13, 14, 16, and 18 of the '868 Patent. In this section, I provide an overview of Xiong.

58. Xiong relates to methods of sending scheduling requests using beamforming. Like Jung, the methods taught by Xiong are motivated by the expected use of higher frequency bands (mm wave) in 5G (Ex-1007 at 1:35-37). "However, higher frequency bands can have significant losses in the atmosphere due, in part, to absorption by oxygen and water vapor in the atmosphere." Ex-1007 at 1:37-40. Similar to Jung, Xiong teaches that beamforming can overcome losses at higher frequencies: "Beam forming can be a critical technology for the implementation of high frequency band system due to the fact that the beam forming gain can compensate for the severe path loss caused by atmospheric attenuation." Ex-1007 at 3:44-48.

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59. Xiong teaches a beam selected at the UE is used to transmit a scheduling request and other information: "The UE can select, at the UE, a selected eNodeB transmission (Tx) beam and a selected UE reception (Rx) beam based on a highest power beamforming reference signal (BRS) received power (BRS-RP). The UE can signal a transceiver of the UE to transmit to the eNodeB a scheduling request (SR), using the selected Rx beam..." Ex-1007 at Abstract. Embodiments include a beam reference signal (BRS) to be transmitted from an eNodeB. The BRS is used by the UE to select a UE receive beam. Ex-1007 at 5:54-62. Ex-1007 at Fig. 4.

60. Like Jung, Xiong also discloses channel reciprocity. Ex-1007 at 4:28-29. Ex-1007 at 6:58-63. A POSITA understand that in light of channel reciprocity, a UE beam that is used for reception may be also used for transmission. Similarly, a eNB selected for transmission may be used for reception. Therefore, Xiong teaches selecting the UE beam used for transmission and the eNB beam used for reception of scheduling requests. Ex-1007 at Fig. 4.

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VIII. Claims 5, 6, 8, 13, 14, 16, and 18 are Unpatentable

A. Ground #1: Claims 5, 6, 8, 13, 14, 16, and 18 are Obvious Under 35 U.S.C. § 103(a) by Jung

1. Claim 5

a. [Element 5Pre]: A method of a network node for transmission or reception using beamforming, the method comprising:

61. To the extent the preamble is considered limiting, Jung teaches "a method of a network node for transmission or reception using beamforming.":

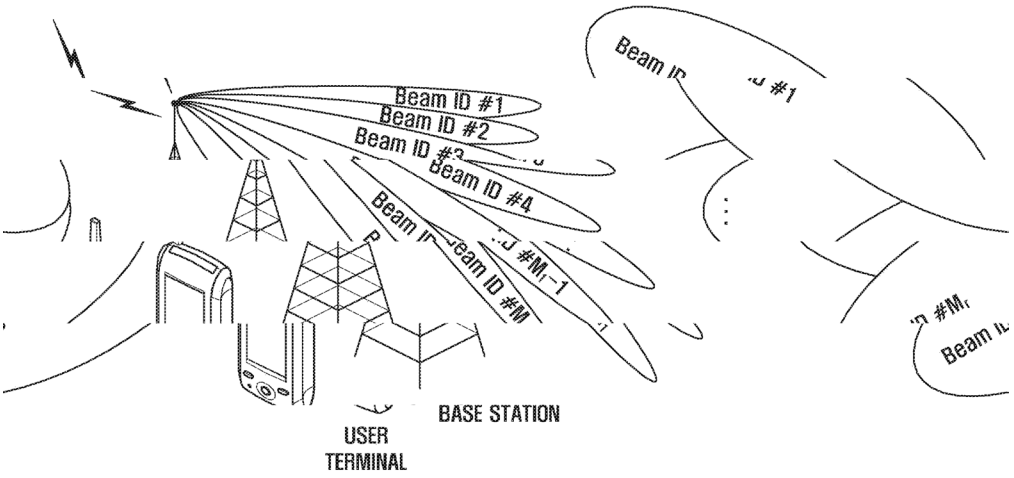
> A mobility application method of a user equipment (UE) residing in a system of wireless communication systems, which supports transmission/reception of data, using a beamforming, via multiple input multiple output (MIMO) antennas is provided. The method includes measuring beam measurement reference signals that a network transmitted using different transmission nodes and evolved NodeB **(**eNBs**)** and transmitting the measured information to the network in a system using a number of beams.

Ex-1005 at Abstract (emphasis added); Ex-1006 at 23.

62. In another example, "Referring to FIG. 1, a multiple beam system includes a UE and an eNB (base station) forming analogue beams in various

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directions. The analogue beam used by an eNB and a UE may be formed by a number of small antenna arrays. The analogue beam performs wireless transmission/reception in one direction, using one antenna array group once. When one or more antenna array groups which may be simultaneously operated are included, the analogue beam may perform wireless transmission/reception in one or more directions once." Ex-1005 at 9:41-46 (emphasis added). *See* Ex-1006 at 23.



Ex-1005 at Fig. 1; Ex-1006 at 23. "For example, in a system using a number of analogue beams for transmission/reception, a UE and an eNB select a specified beam which can be estimated to have high performance and perform the transmission/reception of information via the selected beam. In this case, the eNB pre-reserves a resource for uplink transmission by the UE, to use the best beam or a beam with the lowest number of problem that the eNB has known about at the pre-reservation time." Ex-1005 at 8:11-19 (emphasis added); *see* Ex-1006 at 20.

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63. A POSITA would thus have understood Jung to disclose a method of a network node for transmission or reception using beamforming.

b. [Element 5(a)]: selecting a network beam;

64. Jung teaches selecting a network beam.

65. Jung teaches "a method to for a UE to perform beam measurement and feedback[.]" Ex 1005 at 16:31-32. In some embodiments, the current serving beam may be the network beam. Jung discloses a current serving beam that is the "best beam." Jung teaches how a best beam is found: "[t]he UE selects a preferable beam in operation 920. The selected beam may be a best beam. The UE compares beam quality measurement values with each other, and selects the best UE reception beam for each eNB transmission beam." Ex-1005 at 16:41-44.

66. Jung provides further details how a best beam may be selected:

> "In the following embodiments of the present disclosure, when one beam of a beam measurement entity and one beam of a beam using entity, which may be estimated to have the best performance, are determined from among the analogue beams that a beam measurement entity and a beam using entity can use, the two beams of the two entities form one beam pair (or beam pairs), which is called 'best beam (or best beams).' Alternatively, the 'best beam (or best beams) may also be referred to as two

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> individual beams of the beam pair (or beam pairs). In an embodiment of the present disclosure, the 'best beam' is referred to as a beam with the best performance that a beam using entity (eNB) uses to communicate with a beam measurement entity (UE), from among a pair of best beams measured according to reference signals transmitted by the beam using entity (eNB), however, it should be understood that the present disclosure is not limited to the best beam as defined above."

Ex-1005 at 12:16-32 (emphasis added). *See* Ex-1006 at 32.

67. Jung discloses that under some conditions, a serving beam needs to be changed. "The UE determines whether a serving beam needs to be changed with another beam in operation 930. When the UE determines that a serving beam needs to be changed with another beam in operation 930, it is capable of feeding back its measured beam information to the eNB in operation 940." Ex-1005 at 16:49-53.

68. Jung discloses conditions leading to a beam change. For example,

> "A method of determining whether beam change is needed is performed as follows.
>
> A. The channel quality or performance of a serving beam (scheduling beam) is less than a specified threshold
>
> al. A current beam measurement value < a threshold"

Ex-1005, 43:66-44:3 (emphasis added). *See* Ex-1006 at 33-34.

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69. Jung discloses steps leading to a beam change. "[T]he UE measures a beam in operation 910." Ex-1005 at 16:35-36. "The UE selects a preferable beam in operation 920." *Id* at 16:41-42. "The UE determines whether a serving beam needs to be changed with another beam in operation 930." *Id* at 16:49-50. "[W]hen the eNB ascertains that a beam applied to the UE needs to be changed in operation 3325, it transmits a beam change request message to the UE in operation 3330." *Id* at 43:39-42.

70. A POSITA understands that when a serving beam needs to be changed to a new beam, the network beam element is met by the new beam:

> "1. 2. Method for an eNB to Change a Beam
> The eNB/UE is capable of using a new beam contained in a beam change request signal from a corresponding beam change time."

Ex-1005 at 45:3-6 (emphasis added).

71. When a beam is changed, "[a]n eNB or a UE is capable of determining a beam pair to be used later, based on received beam feedback information." Ex-1005 at 10:52-54 (emphasis added). *See* Ex-1006 at 25. Thus, a POSITA understands that when a beam is changed, the selected network beam is the beam selected "to be used later."

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72. In another example, the selected beam network may be the beam used by the eNB to transmit/receive to a UE: "UE may notify a corresponding UE of information regarding only one beam of an eNB, which will be used when the eNB transmits/receives information to the corresponding UE." Ex-1005 at 12:40-43 (emphasis added). *See* Ex-1006 at 25, 35.

73. Based on these disclosures in Jung, a POSITA would have understood Jung to teach Element 5(a).

c. [Element 5(b)]: transmitting a first signal to a user equipment (UE) to indicate a first information associated with the network beam for the UE to derive, based on a beam reference signal of the network beam, a UE beam used to transmit a periodic Channel State Information (CSI) and to transmit a scheduling request, wherein the first signal is a Medium Access Control (MAC) signaling

74. Jung teaches transmitting a first signal to a user equipment (UE) to indicate a first information associated with the network beam for the UE to derive, based on a beam reference signal of the network beam, a UE beam used to transmit

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a periodic Channel State Information (CSI) and to transmit a scheduling request, wherein the first signal is a Medium Access Control (MAC) signaling.

i. Element 5(b)(1) - Transmitting a first signal to a user equipment (UE) to indicate a first information associated with the network beam . . . wherein the first signal is a Medium Access Control (MAC) signaling

75. Jung teaches "transmitting a first signal to a user equipment (UE) to indicate a first information associated with the network beam . . . wherein the first signal is a Medium Access Control (MAC) signaling."

76. The '868 Patent specification provides an exemplary embodiment:

> "The first information indicates which network beam(s) is the **specific network beam**(s) **explicitly**."

Ex-1001 at 15:35-36.

77. Jung teaches an eNB (**network**) beam ID as first information indicating a **specific network beam explicitly**. For example,

> "In order to change an eNB beam (or a UE beam) used to communicate with UE, a beam change instruction frame transmitted by an eNB needs to include ID information regarding a beam that the eNB and the UE needs to share,

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such as, an eNB beam ID, a UE beam ID, a beam pair ID, and the like."

Ex-1005 at 42:20-25 (emphasis added), Ex-1006 at 85-86, 104-105.

78. A POSITA understands that a **specific** eNB beam ID indicates a **specific network beam explicitly**.

79. The '868 Patent specification discloses also an alternate exemplary embodiment of the first information:

> "The first information can indicate **which network beam or beams are associated with the specific** UE beam or beams."

Ex-1001 at 15:40-42.

80. Jung teaches ID information on a specific eNB (network) beam, the **specific associated** UE beam or the **specific pair** comprising an eNB beam and a UE beam. For example,

> "In order to change an eNB beam (or a UE beam) used to communicate with UE, a beam change instruction frame transmitted by an eNB needs to include ID information regarding a beam that the eNB and the UE needs to share, such as, an eNB beam ID, a UE beam ID, a **beam pair** ID, and the like."

Ex-1005 at 42:20-25 (emphasis added), Ex-1006 at 85–86, 104-105.

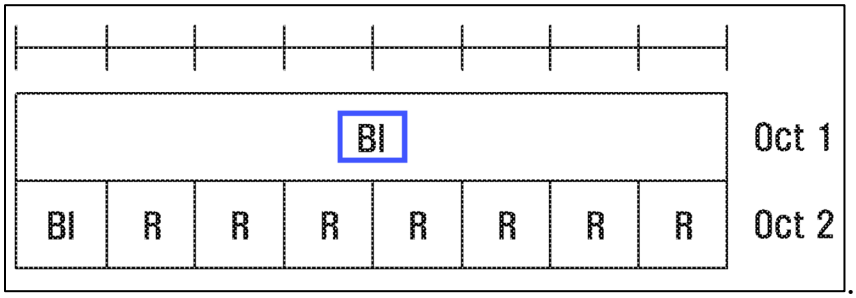
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81. A POSITA understands that an eNB beam ID and an associated UE beam ID or a **beam pair** ID teach which **network beam is associated with which UE beam explicitly**.

82. The beam ID may be included in a MAC CE. For example,

> "Referring to FIG. 31A, the structure of a frame (or MAC-CE, PHY DCI, MAC payload) including a beam ID of 9 bits is shown. For example, MAC CE may be beam change instruction MAC CE. PHY DCI may be instructed by xPDCCH order.
>
> BI (9-bit): a field indicating a beam index"

Ex-1005 at 42:29-34 (emphasis added).



Ex-1005 at Fig. 31A (emphasis added for BI = beam index).

6.1.3.7 BRS Beam Change Indication MAC Control Element

The BRS Beam Change Indication MAC control element is identified by a 5G-MAC PDU subheader with LCID as specified in table 6.2.1-1. It has a fixed size and consists of a 9-bit BI field. The BRS Beam Change Indication MAC control element is defined as follows (figure 6.1.3.7-1).

- BI (9-bit) : this field indicates the beam index;
- R : reserved bit, set to "0".

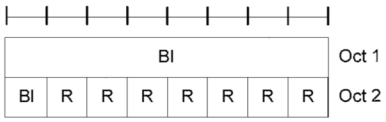


Figure 6.1.3.7-1: BRS Beam Change Indication MAC control element

Ex-1006 at 105 (emphasis added).

83. The '868 Patent discloses another exemplary embodiment of the first information:

> "In some methods, the first information indicates a **configuration related to a signal of the specific network beam or beams to be measured** (such as BRS)."

Ex-1001 at 15:42-45.

84. Jung teaches an eNB **configuring** a threshold to a UE to **measure a network beam** to determine whether a serving beam needs to be changed. The threshold may be set using a MAC-CE:

> "A. The channel quality or performance of a serving beam (scheduling beam) (or serving beams) is less than a specified threshold. The threshold may be a constant, or a fixed value, according to the standard, a value that an eNB

sets using an RRC message, MAC-CE, PHY DCI, and the like, or a value selected by the UE."

Ex-1005 at 16:65-17:3 (emphasis added).

85. A POSITA understands the threshold is a first information associated with a network beam.

86. Jung further discloses: "The eNB may notify a UE of the threshold of the conditions (a notification method a specified parameter of an RRC message, MAC data, a specified parameter of MAC-CE, a specified parameter of DCI, and the like)." Ex-1005 at 20:20-23 (emphasis added). *See* Ex-1006 at 88.

87. In particular, a threshold may be associated with a current beam or a new beam. For example, a current beam measurement value is compared to a threshold: " al. Current beam measurement value < threshold[.]" Ex-1005 at 17:4 (emphasis added). *See* Ex-1006 at 34. As discussed above, a current beam may be an embodiment of a network beam. A POSITA understands that since a threshold is associated with a current beam, it is associated with a network beam.

88. In another example, a new beam measurement value is compared to the threshold: "bl. New beam measurement value > threshold[.]" Ex-1005 at 17:25 (emphasis added). *See* Ex-1006 at 34. As discussed above, a new beam may be an embodiment of a network beam. A POSITA understands that since a threshold is associated with a new beam, it is associated with a network beam.

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89. In another exemplary embodiment of first information, Jung teaches "the eNB is capable of **configuring** a cycle or a time interval during which beam feedback is performed one or more times." Ex-1005 at 27:57-59 (emphasis added). *See* Ex-1006 at 82.

90. A POSITA understands that in addition to a threshold notification, Jung discloses also a time interval (or time duration) that meets the claim element. The time interval may be set using a MAC-CE message:

> "The eNB is capable of notifying individual UEs of the set cycle or the set time interval. The notification method may be one of the following message transmissions:
> Notify an RRC message that contains an element specifying a beam feedback duration
> Notify a Downlink Control message (via PDCCH) that contains an element specifying a beam feedback duration
> Notify a Downlink MAC-CE message (via PDSCH) that contains an element specifying a beam feedback duration"

Ex-1005 at 27:60-28:3 (emphasis added). *See* Ex-1006 at 82.

91. A POSITA understands a beam duration notification is a first information associated with the network beam. In particular, it is information on the duration the network beam transmits a beam reference signal and the time duration the network beam receives feedback from the UE. For example,

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> "Notify a Downlink MAC-CE message (via PDSCH) that contains an element specifying a beam feedback duration Notification using a method capable of containing an element specifying a beam feedback duration
> Candidates of a cycle or a time interval which can be set are as follows:
> [...]
> Every Beam Reference Signal measurement duration: a least beam observation cycle of a UE (e.g., Beam Reference Signal subframe transmission time interval)"

Ex-1005 at 28:1-15 (emphasis added). *See* Ex-1006 at 82.

92. In summary, a POSITA understands that a time duration notification also meets the first information element of the claim.

93. Based on these disclosures in Jung, a POSITA would have understood Jung to teach Element 5(b)(1).

ii. Element 5(b)(2) - Transmitting a first signal . . . for the UE to derive, based on a beam reference signal of the network beam, a UE beam

94. The MAC signals associated with these examples of "first information" are for the UE to derive, based on a beam reference signal of the network beam, a

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UE beam such that Jung further teaches "transmitting a first signal . . . for the UE to derive, based on a beam reference signal of the network beam, a UE beam."

95. Jung teaches determining a UE (beam measurement entity) best beam. For example, "[i]n the following embodiments of the present disclosure, when one beam of a beam measurement entity and one beam of a beam using entity, which may be estimated to have the best performance, are determined from among the analogue beams that a beam measurement entity and a beam using entity can use, the two beams of the two entities form one beam pair (or beam pairs), which is called 'best beam (or best beams).'" Ex-1005 at 12:16-23 (emphasis added). *See* Ex-1006 at 32.

96. Jung discloses UE operations include beam measurements based on beam reference signals. For example, "[t]he UE receives beam reference signal (BRS) transmitted from an eNB, measures received different beams by turns with respect to the BRS, and obtains a beam quality measurement value for the UE reception beam pairs and each eNB transmission beam." Ex-1005 at 16:35-40 (emphasis added).

97. Similarly, Jung also teaches beam measurements based on beam reference signals via the Jung Provisional. For example,

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> "UE receives a specified signal transmitted from an eNB and detects the channel quality (e.g., reference signal, etc.)"

Ex-1006 at 22 (emphasis added).

> "The term 'evolved Node B (eNB) is referred to as a beam using entity configured to: transmit a reference signal for beam measurement; allocate a resource to a beam measurement entity; and use the measurement beam information fed back by the beam measurement entity."

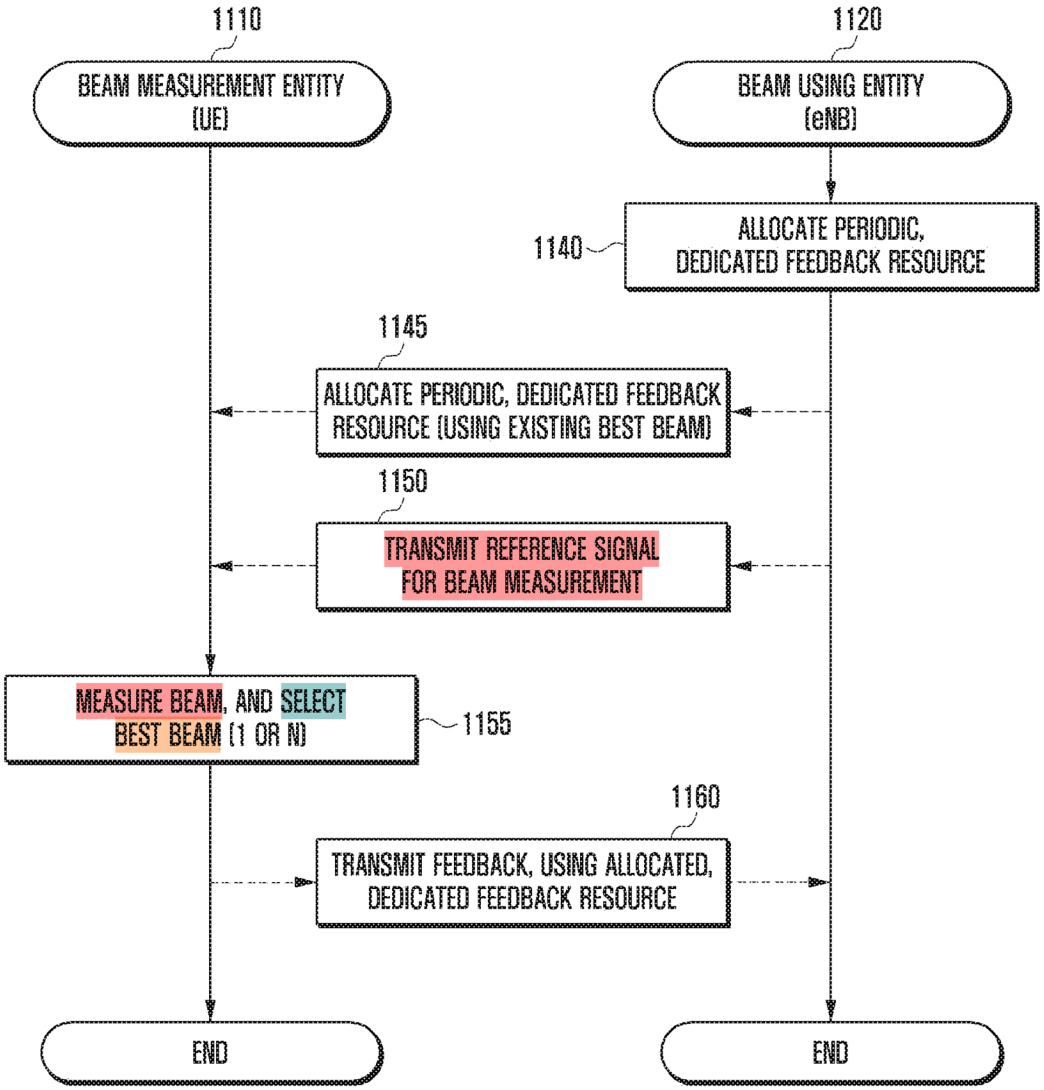
Ex-1006 at 32 (emphasis added).

> "i. Full beam sweep duration: a period of time that UE takes to observe all beam pairs of UE and an eNB.
>
> [...]
>
> iii. Every Beam Reference Signal measurement duration: a least beam observation cycle of UE (e.g., Beam Reference Signal subframe transmission time interval)"

Ex-1006 at 83 (emphasis added).

98. Jung teaches selecting a beam based on a reference signal for beam measurement. For example,

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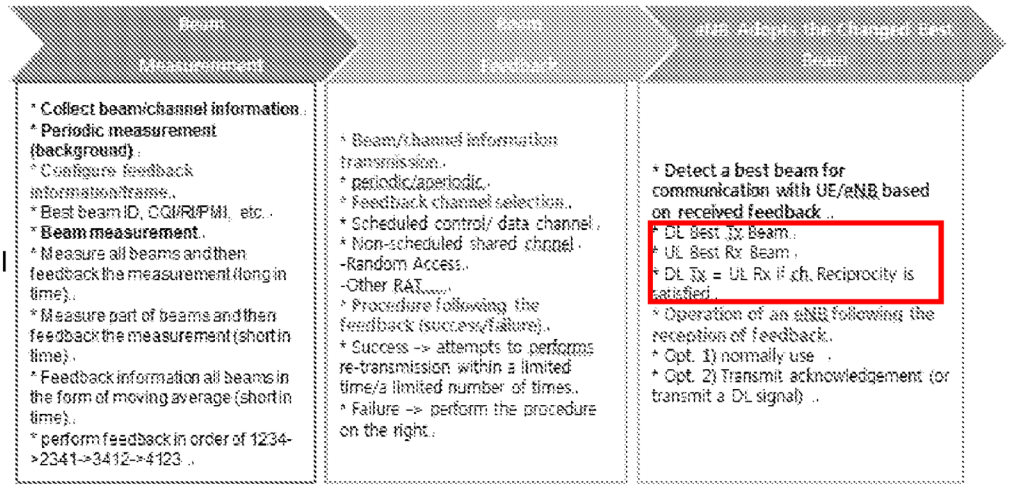


Ex-1005 at Fig. 11 (emphasis added). *See* Ex-1006 at 72.

99. Jung discloses **channel reciprocity**: "[w]hen **channel reciprocity** is assumed, **a best beam suitable for a UE to perform transmission is identical to a best beam that an eNB may use to perform transmission**." Ex-1005 at 36:46-49 (emphasis added). A POSITA understands a corollary of the **channel reciprocity** assumption is that **a best beam for reception is also a best beam for transmission**.

Jung also teaches beams that are **reciprocal** via the Jung Provisional. For example, the table below discloses that when **reciprocity** is satisfied, "**DL Tx = UL Rx**," in other words, the **same** network beam is used for **transmission and reception**.

1) Basic beam management and beam tracking procedure



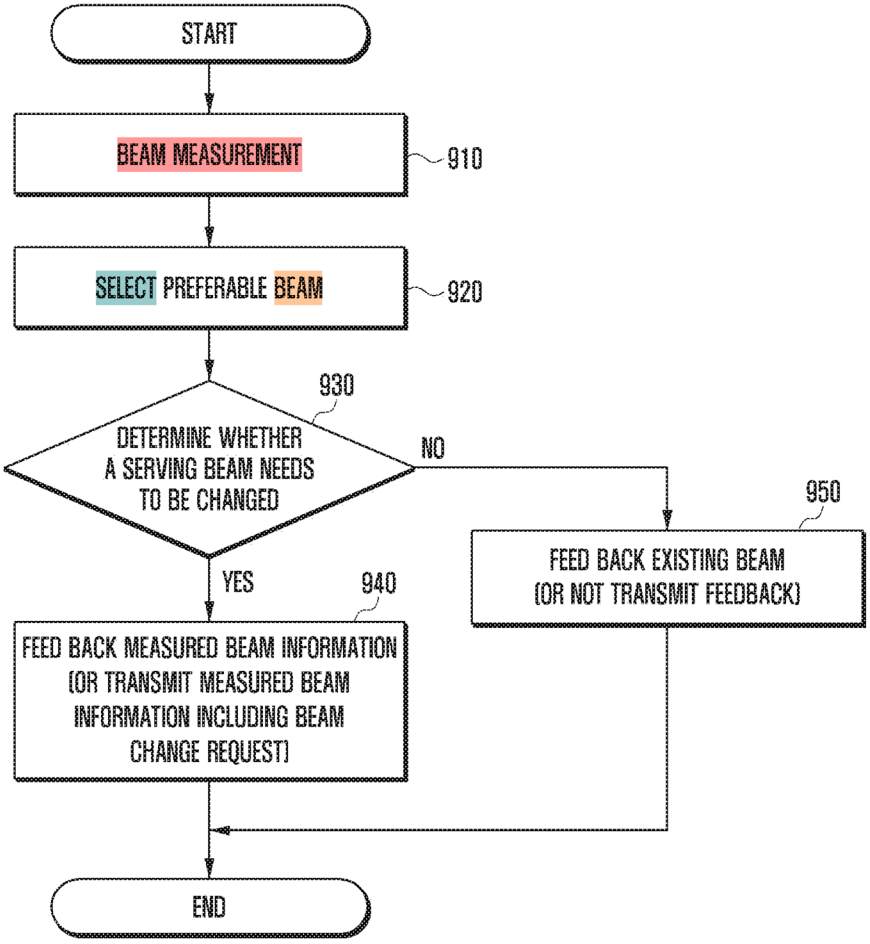
Ex-1006 at 24 (emphasis added).

100. Jung further teaches **channel reciprocity** via the Jung Provisional: "Assumption: Downlink beam measurement is only performed due to **channel reciprocity**." Ex-1006 at 28 (emphasis added).

101. Jung discloses selecting a reception beam: "[t]he UE selects a preferable beam in operation 920. The selected beam may be a best beam. The UE compares beam quality measurement values with each other, and selects the best UE reception beam for each eNB transmission beam." Ex-1005 at 16:41-44 (emphasis

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added). See figure below. In view of the **channel reciprocity** assumption, a POSITA understands this process derives a UE beam for reception as well as for transmission.



Ex-1005 at Fig. 9 (emphasis added). *See* Ex-1006 at 33.

102. Jung teaches numerous additional examples of the UE measuring a beam reference signal of a network beam and deriving a UE beam (in contrast with the eNB deriving the UE beam). For example,

> "The beam measurement entity 1110 measures a beam in operation 1155. The beam measurement entity 1110 is

capable of selecting a best beam based on the beam measurement result."

Ex-1005 at 21:27-32. *See Id*. at Fig. 11. *See* Ex-1006 figure at 72.

"The UE selects a preferable beam in operation 1520. The selected beam may be a best beam. The UE compares beam quality measurement values with each other, and selects the best UE reception beam for each eNB transmission beam."

Ex-1005 at 26:43-46.

103. Jung also teaches the UE measuring a beam of a network beam and deriving a UE beam for transmission via the Jung Provisional. For example,

"[Method of selecting and transmitting feedback beam of UE]

If beam feedback can be performed, based on events and via resources allocated by an eNB, as described above, UE is capable of selecting a beam via the following methods, and performing feedback based on the selected beam.

1. Method of selecting a feedback beam

A Feedback (1 or N) in order of quality of measured/estimated beam from the best"

Ex-1006 at 101 (emphasis added).

104. Jung also teaches "**1 or N**" refers to beam pairs of eNB and UE selected by the UE as preferable via the Jung Provisional: "Assuming that **one beam pair or**

N beam pairs from among a total number of avail beam pairs is/are selected as UE preferable beam pair." Ex-1006 at 33 (emphasis added).

105. Jung further discloses the UE measures a beam reference signal power and feeds back selected UE beam ID via the Jung Provisional:

6.1.3.9 BSI Feedback MAC Control Element

The Beam State Information (BSI) Feedback MAC control element is identified by a 5G-MAC PDU subheader with LCID as specified in table 6.2.1-2. It consists of N BSI fields, corresponding to N beams. The field BSI is defined as follows:

- BI_1 (9-bit) : this field indicates the Node-B beam index;
- BI_2 (9-bit) : this field indicates the UE beam index;
- BRSRP (7-bit): this field indicates the beam reference signal received power of the beam.

The BSI Feedback MAC control element is defined as follows (figure 6.1.3.9-1).

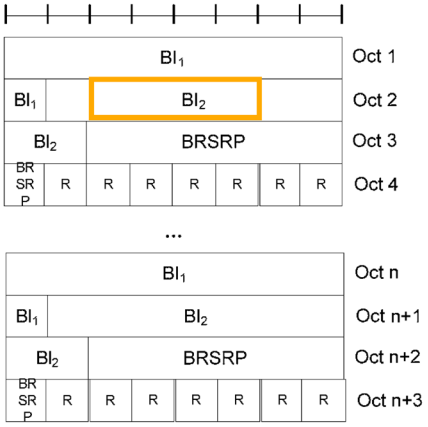


Figure 6.1.3.9-1: BSI Feedback MAC control element

Ex-1006 at 104 (emphasis added).

106. As discussed previously, Jung teaches a beam ID as a first information used to instruct a UE about a beam change. Jung discloses the beam ID could be of an eNB beam ID or a UE beam ID: "[i]n order to change an eNB beam (or a UE

beam) used to communicate with UE, a beam change instruction frame transmitted by an eNB needs to include ID information regarding a beam that the eNB and the UE needs to share, such as, an eNB beam ID, a UE beam ID, a beam pair ID, and the like." Ex-1005 at 42:20-25 (emphasis added). *See* Ex-1006 at 105. For example, a POSITA understands that a UE beam ID may be an index number from which a UE beam may be derived. Similarly, a POSITA understands that an eNB beam ID is an index number from which a an eNB beam may be derived. Once the eNB beam is known, a UE beam may be derived as the corresponding member of a beam pair: "when one beam of a beam measurement entity and one beam of a beam using entity, which may be estimated to have the best performance, are determined from among the analogue beams that a beam measurement entity and a beam using entity can use, the two beams of the two entities form one beam pair (or beam pairs), which is called 'best beam (or best beams).'" Ex-1005 at 12:17-23 (emphasis added). *See* Ex-1006 at 32.

107. As discussed previously, Jung teaches a threshold as a first information used to determine whether a beam needs to be changed: "When the performance of a beam in use becomes low or a beam (another beam) which is better than the beam in use is observed, a beam measurement entity (UE) determines that a beam in use needs to be changed." Ex-1005 at 11:3-6. *See* Ex-1006 at 17. Specifically, the

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threshold is used to determine whether beam needs to be changed: "Current beam measurement value < threshold[.]" Ex-1005 at 17:4 (emphasis added). *See* Ex-1006 at 32. A POSITA understands that if the threshold inequality is met and a new beam is selected, the new UE beam is derived using the threshold information and one of the methods discussed previously (see Ex-1005 at 16:41-44, *Id* at Fig. 9, *Id* at Fig. 11).

108. As discussed previously, Jung teaches a beam duration as a first information used to specify a UE beam feedback duration: "Notify a Downlink MAC-CE message (via PDSCH) that contains an element specifying a beam feedback duration. Notification using a method capable of containing an element specifying a beam feedback duration[.]" Ex-1005 at 28:1-5 (emphasis added). *See* Ex-1006 at 82. A POSITA understands the duration information is used to derive a feature (duration of operation) of the UE beam.

109. As discussed previously, Jung teaches a beam ID as a first information used to instruct a UE about a beam change. Jung discloses the beam ID could be of an eNB beam ID or a UE beam ID: "[i]n order to change an eNB beam (or a UE beam) used to communicate with UE, a beam change instruction frame transmitted by an eNB needs to include ID information regarding a beam that the eNB and the UE needs to share, such as, an eNB beam ID, a UE beam ID, a beam pair ID, and

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the like." Ex-1005 at 42:20-25 (emphasis added). *See* Ex-1006 at 105. For example, a POSITA understands that a UE beam ID may be an index number from which a UE beam may be derived. Similarly, a POSITA understands that an eNB beam ID is an index number from which a an eNB beam may be derived. Once the eNB beam is known, a UE beam may be derived as the corresponding member of a beam pair: "when one beam of a beam measurement entity and one beam of a beam using entity, which may be estimated to have the best performance, are determined from among the analogue beams that a beam measurement entity and a beam using entity can use, the two beams of the two entities form one beam pair (or beam pairs), which is called 'best beam (or best beams).'" Ex-1005 at 12:17-23 (emphasis added). *See* Ex-1006 at 32.

110. Based on these disclosures in Jung, a POSITA would have understood Jung to teach Element 5(b)(2).

111. To the extent that Jung does not disclose Element [5(b)(2)], it would have been obvious to a POSITA to modify Jung to meet that limitation. For example, to the extent that Jung's disclosure of a MAC signal indicating a beam change with an eNB beam ID, as discussed above, does not constitute a first information for the UE to derive a UE beam "based on a beam reference signal," it would have been obvious and to modify Jung to meet that limitation and a POSITA would have been

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motivated to do so. For instance, to the extent it is not directly disclosed, it would have been obvious to modify Jung so that it expressly teaches the first information (eNB beam ID) is for deriving the UE beam based on a beam reference signal.

112. Jung teaches determining a best beam comprising two entities that form one beam pair: an network beam and a UE beam (Ex-1005 at 12:16-23). The best beam pair is determined from measurements of beam reference signals: "The UE receives **beam reference signal (BRS)** transmitted from an eNB, measures received different beams by turns with respect to the BRS, and obtains a beam quality measurement value for the UE reception beam **pairs** and each eNB transmission beam." Ex-1005 at 16:35-40 (emphasis added). In another example, a network transmits a **beam reference signal** at step 1150, and UE measures a **best beam pair** based on the beam reference signal at step 1155 (Ex-1005 at Figure 11).

113. As discussed earlier, Jung discloses a MAC CE beam change instruction that includes an **eNB beam ID**:

> "In order to change an eNB beam (or a UE beam) used to communicate with UE, a beam change instruction frame transmitted by an eNB needs to include ID information regarding a beam that the eNB and the UE needs to share, such as, an **eNB beam ID**, a UE beam ID, a beam pair ID, and the like."

Ex-1005 at 42:20-25 (emphasis added), Ex-1006 at 104-105.

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114. A POSITA understands that since beam pairs are derived at the UE based on **beam reference signals**, given an **eNB beam ID**, a UE can derive a UE beam **implicitly** based on the beam reference signals. It would have been obvious for a POSITA to modify Jung so that, to the extent it does not already do so, it teaches that given an eNB beam ID, it **explicitly** checks results from prior beam measurements based on beam reference signals to derive the best UE beam corresponding to the eNB beam.

iii. Element 5(b)(3) - a UE beam used to transmit a periodic Channel State Information (CSI) and to transmit a scheduling request

115. Jung teaches "a UE beam used to transmit a periodic Channel State Information (CSI) and to transmit a scheduling request."

116. Jung teaches feeding back beam information periodically over a selected UE beam:

> "Another aspect of the present disclosure is to provide a method that feeds back beam information and changes beams in such a way that a UE periodically measures beam information and reports the information to an eNB, and the eNB and the UE select a restricted number of beams and transmit/receive information to/from each other via the

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selected beams, thereby increasing the resource use efficiency."

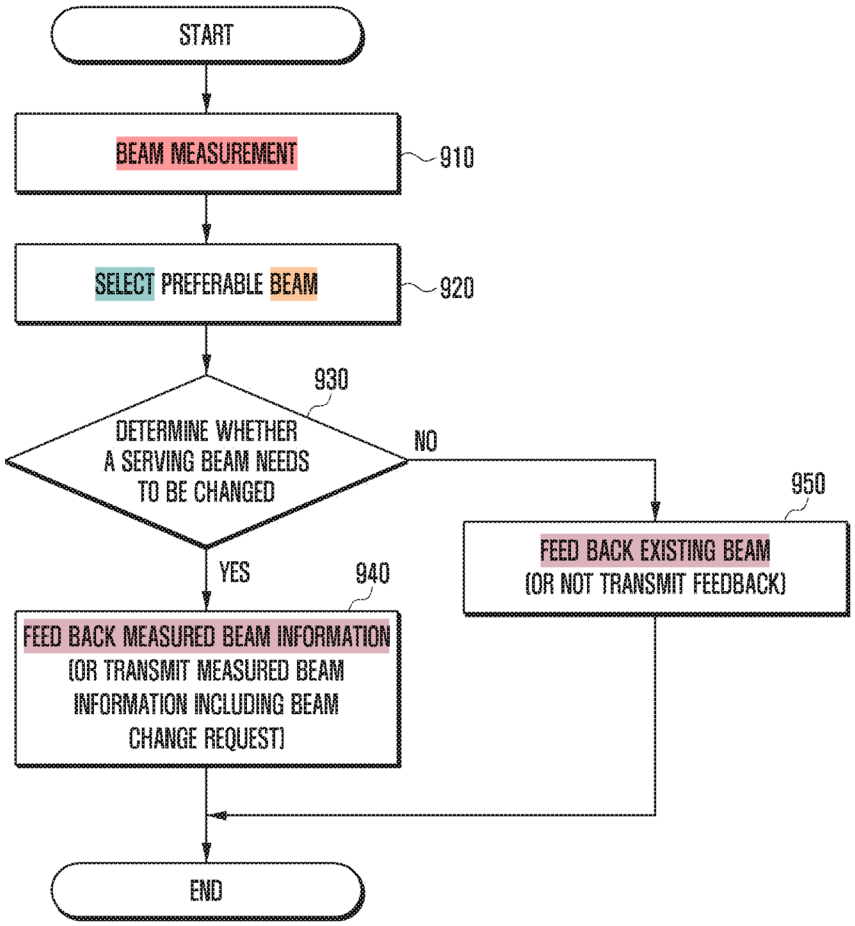
Ex-1005 at 2:50-57 (emphasis added). Ex-1006 at 25.

117. Jung discloses the UE selects a preferable beam. When the preferable beam is the current **serving beam**, the UE feeds back the existing beam.

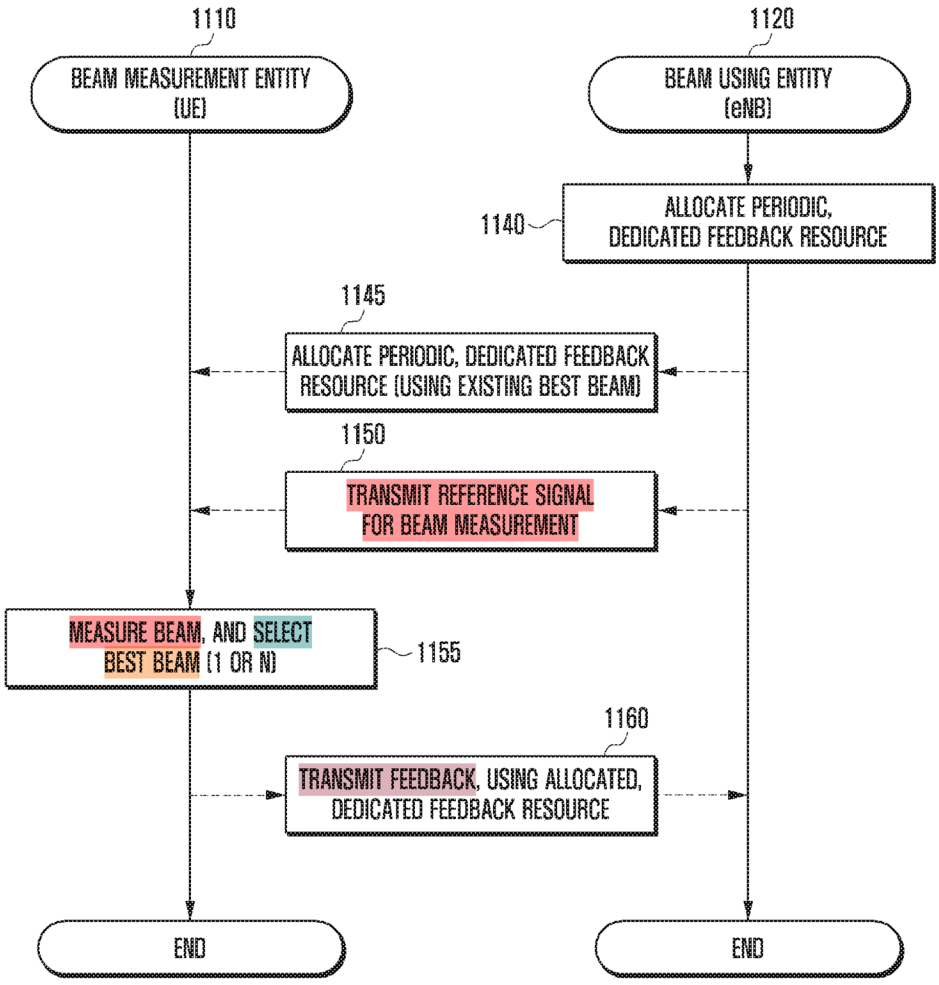
> "The UE determines whether a serving beam needs to be changed with another beam in operation 930. When the UE determines that a serving beam needs to be changed with another beam in operation 930, it is capable of feeding back its measured beam information to the eNB in operation 940. In addition, beam information can further include beam change request. On the other hand, when the UE determines that a serving beam does not need to be changed with another beam in operation in 930, it is capable of feeding back its pervious beam information to the eNB in operation 950. In addition, the UE can omit feedback of beam information in operation 950."

Ex-1005 at 16:49-60.

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Ex-1005 at Fig. 9 (emphasis added).



Ex-1005 at Fig. 11 (emphasis added).

118. Jung discloses multiple instances of beam information being fed back to the eNB. "An embodiment of the present disclosure designs a beam feedback procedure that informs an eNB of beam information observed and measured by the UE,..." Ex-1005 at 9:31-33 (emphasis added). "More specifically, a UE performs the following three processes, (1) beam information measurement, (2) providing beam information,..." *Id* at 9:64-65 (emphasis added). "Beam feedback is an operation that

a UE informs an eNB of its measuring beam information" *Id* at 9:17-21 (emphasis added). "Beam information feedback may be periodically or aperiodically performed, and a UE or an eNB may perform beam information feedback to each other" *Id* at 10:34-36 (emphasis added).

119. Jung teaches the beam information fed back may be channel state information (CSI):

> "Alternatively, a UE transmits an uplink transmission request (or a request for allocating a resource for uplink transmission) to an eNB, is allocated a resource, and transmits channel state information."

Ex-1005 at 9:17-21 (emphasis added).

> "The beam measurement information may be transmitted along with channel information in operation 2478.
> The channel measurement information may contain channel state information (CSI) and information regarding channel quality indicator (CQI)."

Ex-1005 at 36:50-54 (emphasis added).

120. Jung teaches transmitting a scheduling request. Specifically, Jung discloses that "[r]elated technology used in a wireless communication technology following the 3GPP standard has characteristics as follows." Ex-1005 at 7:24-26.

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> "A UE which needs to perform uplink transmission transmits a request for a resource that an eNB has allocated, i.e., scheduling request (SR), and is allocated the resource for uplink transmission."

Ex-1005 at 7:31-34 (emphasis added), Ex-1006 at 19.

121. Jung makes multiple disclosures of transmission of a scheduling request:

> "A measurement entity (UE) determines to transmit feedback, based on a timing and a criterion, and then requests resource allocation (scheduling request), or ..."

Ex-1005 at 25:65-26:1 (emphasis added).

> "In order to perform beam measurement information feedback based on UE's determination, each UE has been allocated a resource through which the UE can transmit information for requesting resource allocation (scheduling request) to an eNB."

Ex-1005 at 27:37-42 (emphasis added).

122. As discussed previously, Jung teaches determining a UE (beam measurement entity) best beam as part of a pair that comprises an eNB (beam using entity) best beam and a UE best beam: "[i]n the following embodiments of the present disclosure, when one beam of a beam measurement entity and one beam of a beam using entity, which may be estimated to have the best performance, are

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determined from among the analogue beams that a beam measurement entity and a beam using entity can use, the two beams of the two entities form one beam pair (or beam pairs), which is called 'best beam (or best beams).'" Ex-1005 at 12:16-23 (emphasis added). *See* Ex-1006 at 32.

123. Jung discloses that the scheduling request is transmitted by the UE on the beam selected by the UE as the "best beam":

> "The beam using entity 1220 is capable of allocating a periodic dedicated feedback resource to a best beam that it has recognized in operation 1275. Information regarding the best beam that the beam using entity 1220 has recognized may be information regarding a best beam included in feedback received from the beam measurement entity.
>
> B. When a periodic feedback transmission resource is not allocated, a measurement entity (UE) performs transmission of feedback in such a way as to periodically request the allocation of a resource (scheduling request), or transmit uplink information using a random access protocol, and the like.
>
> bl. Although a measurement entity does not have a resource which has been already allocated and is capable of periodically transmitting feedback, when the measurement entity has an allocated resource to transmit a

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> resource allocation request (scheduling request) in the uplink, it periodically transmits a corresponding resource allocation request to an eNB."

Ex-1005 at 22:49-67 (emphasis added). See Ex-1006 at 86.

124. Based on these disclosures in Jung, a POSITA would have understood Jung to teach Element 5(b)(3).

125. To the extent Jung does not explicitly teach a specific "UE beam used to transmit a periodic Channel State Information (CSI) and to transmit a scheduling request," a POSITA would have been motivated to modify Jung to teach that element.

126. Indeed, Jung has numerous references to a **serving beam** or **current serving beam**: Ex-1005 at 16:49-60, Id. at 16:65, 17:9 and others. As discussed previously, Jung discloses beams operate in pairs (Ex-1005 at 12:16-32, Id. at 16:35-40, Ex-1006 at 83). A pair comprises an eNB beam and a UE beam. In view of channel reciprocity (Ex-1005 at 36:46-49, Ex-1006 at 24, Ex-1006 at 28), a POSITA understands a UE beam may be used for both transmission and reception.

127. Jung teaches that in some cases the **current serving beam** does not need to be changed, and the UE "is capable of feeding back its pervious [sic] beam information" (Ex-1005 at 16:49-60). In such a case, it would have been obvious to a

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POSITA that the CSI report/scheduling request is transmitted by the UE on the **current serving beam**.

128. In summary, a POSITA would have understood Jung to teach transmitting a first signal to a user equipment (UE) to indicate a first information associated with the network beam for the UE to derive, based on a beam reference signal of the network beam, a UE beam used to transmit a periodic Channel State Information (CSI) and to transmit a scheduling request, wherein the first signal is a Medium Access Control (MAC) signaling.

d. [Element 5(c)]: using the network beam, mapped to the UE beam, to receive the periodic CSI and to receive the scheduling request.

129. Jung discloses using the network beam, mapped to the UE beam, to receive the periodic CSI and to receive the scheduling request.

130. As an initial matter, a POSITA understands that the **beam pair** formed of the network beam and the UE beam discussed in relation to element 5(b)(2) is a "network beam mapped to the UE beam." Ex-1005 at 12:16-23, Ex-1006 at 32, Ex-1005 at 16:35-40, Ex-1006 at 83. Second, as discussed in relation to element 5(b)(3), the UE beam transmits a periodic Channel State Information (CSI) and scheduling request.

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131. Jung discloses channel reciprocity: "[w]hen **channel reciprocity** is assumed, **a best beam suitable for a UE to perform transmission is identical to a best beam that an eNB may use to perform transmission**." Ex-1005 at 36:46-49 (emphasis added). A POSITA understands a corollary of the **channel reciprocity** assumption is that **a best beam for transmission is also a best beam for reception**.

132. The Jung patent specification includes multiple disclosures of a beam that both transmit and receive.

> "Another aspect of the present disclosure is to provide a method that feeds back beam information and changes beams in such a way that a UE periodically measures beam information and reports the information to an eNB, and the eNB and the UE select a restricted number of beams and transmit/receive information to/from each other via the selected beams, thereby increasing the resource use efficiency."

Ex-1005 at 2:50-57 (emphasis added).

> "For example, in a system using a number of analogue beams for transmission/reception, a UE and an eNB select a specified beam which can be estimated to have high performance and perform the transmission/reception of the information via the selected beam."

Ex-1005 at 8:12-16 (emphasis added).

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> "Alternatively, the beam measurement entity may notify a corresponding beam measurement entity of information regarding only one beam that a beam using entity will use (e.g., a UE may notify a corresponding UE of information regarding only one beam of an eNB, which will be used when the eNB transmits/receives information to the corresponding UE)."

Ex-1005 at 12:37-43 (emphasis added).

133. In view of **channel reciprocity**, A POSITA understands the CSI report and scheduling request transmitted on the UE beam are received on the network beam. In summary, a POSITA would thus understand Jung to disclose using the network beam, mapped to the UE beam, to receive the periodic CSI and to receive the scheduling request.

134. To the extent Jung does not explicitly teach a specific "using the network beam, mapped to the UE beam, to receive the periodic CSI and to receive the scheduling request," a POSITA would have been motivated to modify Jung to teach that element.

135. Indeed, Jung has numerous references to a **serving beam** or **current serving beam**: Ex-1005 at 16:49-60, Id. at 16:65, 17:9 and others. As discussed previously, Jung discloses beams operate in pairs (Ex-1005 at 12:16-32, Id. at 16:35-40, Jung Ex-1006 at 83). A pair comprises an eNB beam and a UE beam. In view of

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channel reciprocity (Ex-1005 at 36:46-49, Ex-1006 at 24, Ex-1006 at 28), a POSITA understands a network beam may be used for both transmission and reception.

136. Jung teaches that in some cases the **current serving beam** does not need to be changed, and the UE "is capable of feeding back its pervious beam information" (Ex-1005 at 49-60). In such case, it would have been obvious to a POSITA that the CSI report/scheduling request is transmitted by the UE on the current serving beam and is **received by the eNB on the current serving beam**.

2. Claim 6

a. [Element 6Pre]: The method of claim 5, further comprising

137. Jung renders obvious claim 5 for the reasons above.

b. [Element 6(a)]: transmitting a second signal indicating radio resources for the beam reference signal of the network beam and the periodic CSI.

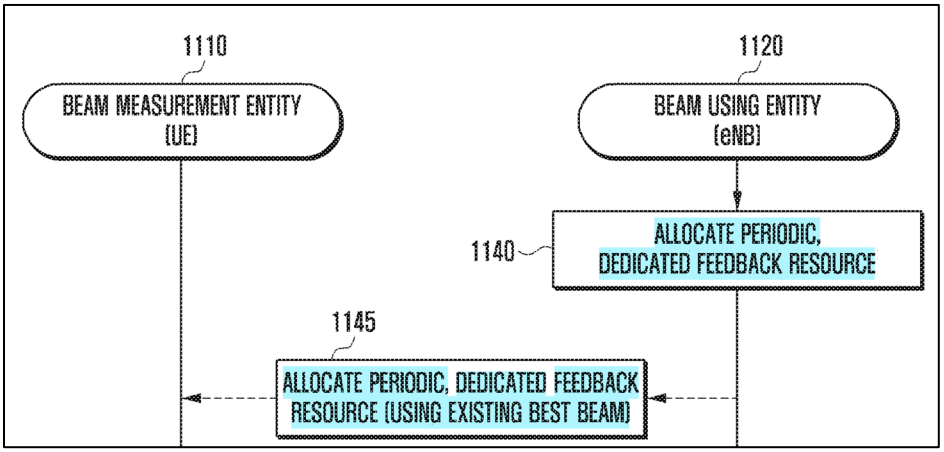
138. Jung discloses transmitting a second signal indicating radio resources for the beam reference signal of the network beam and the periodic CSI.

139. Jung discloses a second signal (distinct from the MAC signal indicating the first information) indicating resource allocation information:

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"The beam using entity 1120 is capable of allocating a feedback resource to the beam measurement entity 1110 in operation 1140. The feedback resource may be a periodic dedicated feedback resource. The beam using entity 1120 is capable of transmitting information regarding the allocated feedback resource to the beam measurement entity 1110 in operation 1145. Operations 1140 and 1145 may be commonly called 'feedback resource allocation.'"

Ex-1005 at 21:11-18 (emphasis added).



Ex-1005 at Fig. 11 (detail, emphasis added).

"A. A resource allocable entity (eNB) allocates resources at every time period and a measurement entity (UE) transmits feedback using a corresponding resource.

al. A resource allocable entity allocates resources, such as, a periodic frequency/time/resource block/sub-frame/symbol, and the like, to a specified UE, and

provides the UE with information, such as a corresponding allocated resource location, a UE feedback transmission cycle, and the like.

a2. Resource allocation information may be provided via part of a transmission signal, such as Preamble, RRC signal (e.g., RRC connection reconfiguration), IE of an RRC signal, MAC-CE, a broadcast message (e.g., master information block (MIB), system information block (SIB), ...), PHY downlink control information (PHY DCI), and the like."

Ex-1005 at 20:31-44 (emphasis added); Ex-1006 at 34, 83-84.

140. A POSITA understands that resources such as frequency/time/resource and block/sub-frame/symbol are radio resources.

141. Jung discloses an eNB allocating radio resources for beam feedback:

"C. Beam Feedback of UE

Available uplink beam feedback method:

a. Dedicated Feedback: Uplink beam feedback used in such a way that an eNB allocates a specified resource operated based on scheduling, such as beam/time/frequency, and the like, to a specified UE, and the UE transmits beam information to the eNB."

Ex-1005 at 11:27:33 (emphasis added); Ex-1006 at 34, 83-84.

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142. Jung further discloses allocating resources for a reference signal and for feedback:

> "Another aspect of the present disclosure is to provide a method of measuring a reference signal for selecting a transmission/reception node and a beam of a UE in an environment where transmission/reception points, in the same eNB maintaining the radio resource control (RRC) connection state with the UE, have different protocol architectures..., a method of allocating a reference signal for a transmission/reception node..., a method of signaling and allocating resources for receiving feedback of the measured information,..."

Ex-1005 at 2:34-43 (emphasis added); Ex-1006 at 52.

143. Jung discloses allocating a radio time resource for beam feedback. For example,

> "The eNB is capable of notifying individual UEs of the set cycle or the set time interval. The notification method may be one of the following message transmissions:
> Notify an RRC message that contains an element specifying a beam feedback duration"

Ex-1005 at 27:60-67 (emphasis added).

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144. A POSITA would thus understand Jung to disclose transmitting a second signal indicating radio resources for the beam reference signal of the network beam and the periodic CSI.

145. To the extent Jung does not explicitly teach a specific "transmitting a second signal indicating radio resources for the beam reference signal of the network beam" a POSITA would have been motivated to modify Jung to teach that element.

146. Indeed, it would have been obvious to a POSITA that the UE has to be notified of the configuration of beam reference signals in order to find, process and measure them.

3. Claim 8

a. [Element 8Pre]: The method of claim 6, further comprising

147. Jung renders obvious claim 6 for the reasons above.

b. [Element 8(a)]: the second signal is a Radio Resource Control (RRC) message.

148. Jung discloses that the second signal is a Radio Resource Control (RRC) message. For example,

> a2. Resource allocation information may be provided via part of a transmission signal, such as Preamble, RRC signal (e.g., RRC connection reconfiguration), IE of an

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> RRC signal, MAC-CE, a broadcast message (e.g., master information block (MIB), system information block (SIB), ...), PHY downlink control information (PHY DCI), and the like."

Ex-1005 at 20:39-44 (emphasis added); Ex-1006 at 83.

149. Jung further discloses allocating resources for a reference signal and for feedback when in RRC connected state. A POSITA knows that an RRC connected state means the eNB may send RRC messages to the UE:

> "Another aspect of the present disclosure is to provide a method of measuring a reference signal for selecting a transmission/reception node and a beam of a UE in an environment where transmission/reception points, in the same eNB maintaining the radio resource control (RRC) connection state with the UE, have different protocol architectures..., a method of allocating a reference signal for a transmission/reception node..., a method of signaling and allocating resources for receiving feedback of the measured information,..."

Ex-1005 at 2:34-43 (emphasis added); Ex-1006 at 50, 83.

150. Jung discloses allocating a radio time resource for beam feedback using an RRC message. For example,

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> "The eNB is capable of notifying individual UEs of the set cycle or the set time interval. The notification method may be one of the following message transmissions:
> Notify an RRC message that contains an element specifying a beam feedback duration"

Ex-1005 at 27:60-67 (emphasis added); Ex-1006 at 82.

151. A POSITA would thus have understood Jung to teach that the second signal is a Radio Resource Control (RRC) message.

4. Claim 13

a. [Element 13Pre(1)]: A network node for transmission or reception using beamforming comprising:

152. To the extent element 13Pre(1) is considered limiting, Jung renders obvious claim element 13Pre(1) for the reasons described above with respect to the preamble of claim 5.

b. [Element 13Pre(2)]: a control circuit; a processor installed in the control circuit; and a memory installed in the control circuit and operatively coupled to the

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processor; wherein the processor is configured to execute a program code stored in the memory to:

153. To the extent element 13Pre(2) is considered limiting, Jung renders obvious claim element 13Pre(2) for the reasons described above with respect to the preamble of claim 5.

c. [Element 13(a)]: select a network beam;

154. Jung renders obvious element 13(a) for the reasons above with respect to corresponding element 5(a).

d. [Element 13(b)]: transmit a first signal to a user equipment (UE) to indicate a first information associated with the network beam for the UE to derive, based on a beam reference signal of the network beam, a UE beam used to transmit a periodic Channel State Information (CSI) and to transmit a scheduling request, wherein the first signal is a Medium Access Control (MAC) signaling;

155. Jung renders obvious element 13(b) for the reasons above with respect to corresponding element 5(b).

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e. [Element 13(c)]: and use the network beam, mapped to the UE beam, to receive the periodic CSI and to receive the scheduling request.

156. Jung renders obvious element 13(c) for the reasons above with respect to corresponding element 5(c).

5. Claim 14

a. [Element 14Pre]: The network node of claim 13, wherein the processor is further configured to:

157. Jung renders obvious element 14Pre for the reasons above with respect to claim 13.

b. [Element 14(a)]: transmit a second signal indicating radio resources for the beam reference signal of the network beam and the periodic CSI

158. Jung renders obvious element 14(a) for the reasons above with respect to claim 6.

c. [Element 14(b)]: wherein the second signal is a Radio Resource Control (RRC) message.

159. Jung renders obvious element 14(b) for the reasons above with respect to claim 8.

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6. Claim 16

a. [Element 16Pre]: The method of claim 5, further comprising:

160. Jung renders obvious element 16Pre for the reasons above with respect to claim 5.

b. [Element 16(a)]: transmitting, to the UE, an indication of candidates of network beams for communication with the network node.

161. Jung discloses transmitting, to the UE, an indication of candidates of network beams for communication with the network node. For example, the candidate network beams are the eNB sweep beams received by a UE:

> "a4. An uplink resource for the beam feedback may be a resource through which corresponding UE that an eNB has known about can perform transmission/reception using a currently serving beam, a resource through which a UE can perform transmission/reception using a beam that an eNB determined as a receivable beam, or a resource through which a UE receives (sweep) a number of beams, which can be used by an eNB, by turns, within an interval."

Ex-1005 at 20:54-61 (emphasis added), Id. 23:3-11; Ex-1006 at 18, 34–35, 82–83.

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> "5G NB Tx Beam Sweep duration: a period of time that the UE takes to observe all eNB beam pairs for one UE beam"

Ex-1005 at 28:10-12 (emphasis added).

162. Thus, a POSITA would understand Jung to disclose transmitting, to the UE, an indication of candidates of network beams for communication with the network node.

7. Claim 18

a. [Element 18Pre]: The network node of claim 13, wherein the processor is further configured to:

163. Jung renders obvious element 18Pre for the reasons above with respect to claim 13.

b. [Element 18(a)]: transmit, to the UE, an indication of candidates of network beams for communication with the network node.

164. Jung renders obvious element 18(a) for the reasons above with respect to claim 16.

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B. Ground #2: Claims 5, 6, 8, 13, 14, 16, and 18 are Obvious Under 35 U.S.C. § 103 by Jung in view of Xiong

1. Motivation to Combine Jung and Xiong

a. Jung and Xiong Are From the Same Field of Endeavor and Are Directly Related

165. As an initial matter, one of ordinary skill in the art when considering the teachings of Jung would have also considered the teachings of Xiong, as they are analogous prior art pertaining to the same field of endeavor, namely, **beamforming** in a **5G** network. For example, "The present disclosure relates to a pre-5th-Generation (5G) or **5G** communication system to be provided for supporting higher data rates Beyond 4th-Generation (4G) communication system such as Long Term Evolution (LTE)." Ex 1005 at Abstract. "The present disclosure relates to a system, a method, and an apparatus that perform beam-tracking and beam feedback operation in a **beamforming**-based system." Ex-1005 at 1:30-32 (emphasis added).

166. Similarly, Xiong also addresses beamforming in a 5G network. For example, "A Third generation partnership project (3GPP) next generation wireless communication system fifth generation (**5G**) can provide access to information and sharing of data anywhere, anytime by various users and applications." Ex-1007 at 3:3-10 (emphasis added). "The UE can select, at the UE, a selected eNodeB transmission (Tx) beam and a selected UE reception (Rx) beam based on a highest

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power **beamforming** reference signal (BRS) received power (BRS-RP)." Ex-1007 at Abstract (emphasis added).

167. In particular, both references focus on transmission and reception beam management in high frequency systems, such as **mm wave**. For example,

> "In order to achieve a high data transmission rate, **5G** communication systems are being developed to be implemented in a band of extremely high frequency, or **millimeter wave** (**mm Wave**), e.g., a band of 60 GHz. In order to reduce the occurrence of stray electric waves in a band of extremely high frequency energy and to increase the transmission distance of electric waves in **5G** communication systems, various technologies being explored, for example **beamforming**, massive multiple input multiple output (MIMO), full dimensional MIMO (FD-MIMO), array antennas, analogue **beamforming**, large scale antennas, and the like."

Ex-1005 at 1:57-67 (emphasis added).

> "Broader bandwidth communication can be accomplished using higher frequency bands, such as centimeter (cm) wave and **millimeter (mm)** wave carrier frequencies. However, higher frequency bands can have significant losses in the atmosphere due, in part, to absorption by oxygen and water vapor in the atmosphere. Advances are

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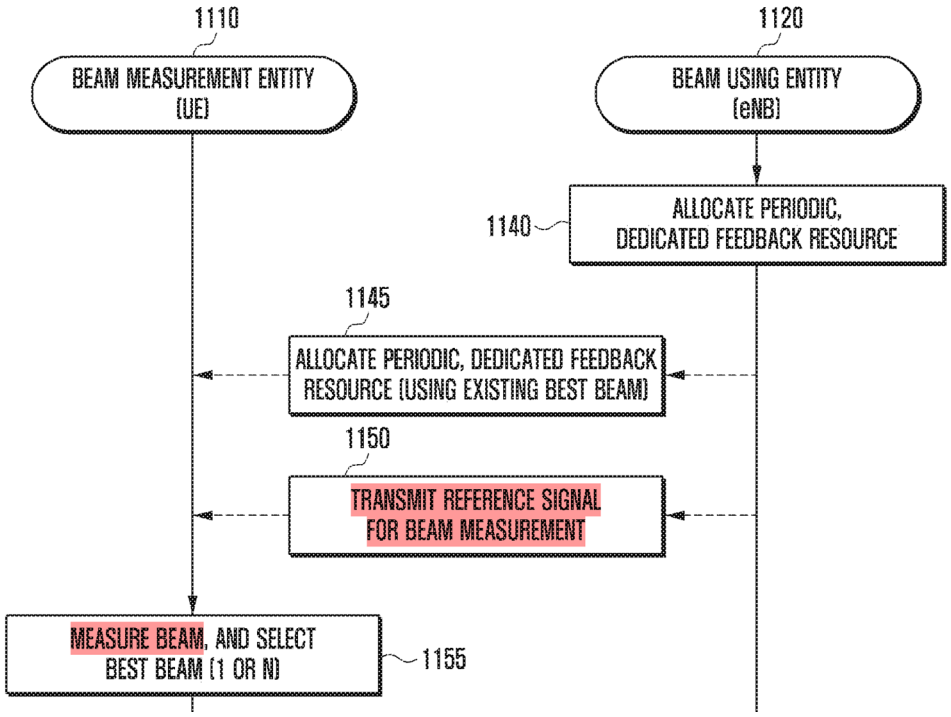
desired in the way signals are communicated in 3GPP systems to allow these higher frequency bands to be used."

Ex-1007 at 1:35-42 (emphasis added).

b. A POSITA Would Have Readily Observed that Jung and Xiong Address Beam Reference Signals and Beam Measurements

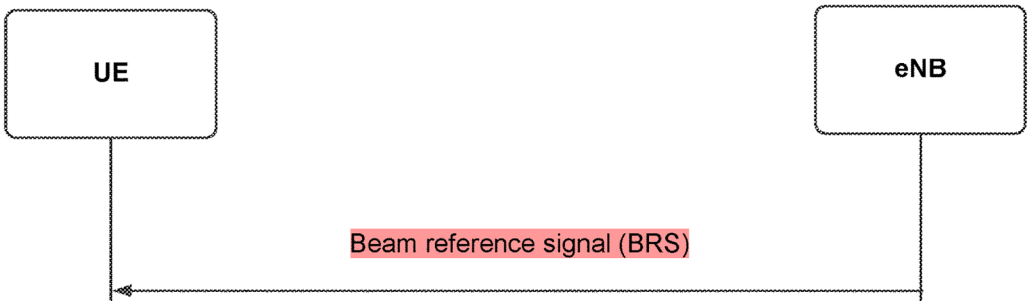
168. A POSITA would have been motivated to combine the teachings of Jung and Xiong. Both disclosures address utilization aspects of **beam reference signals** for **beam measurements**. For example, "The method includes measuring **beam measurement reference signals** that a network transmitted using different transmission nodes and evolved NodeB (eNBs) and transmitting the measured information to the network in a system using a number of beams." Ex-1005 at Abstract (emphasis added).

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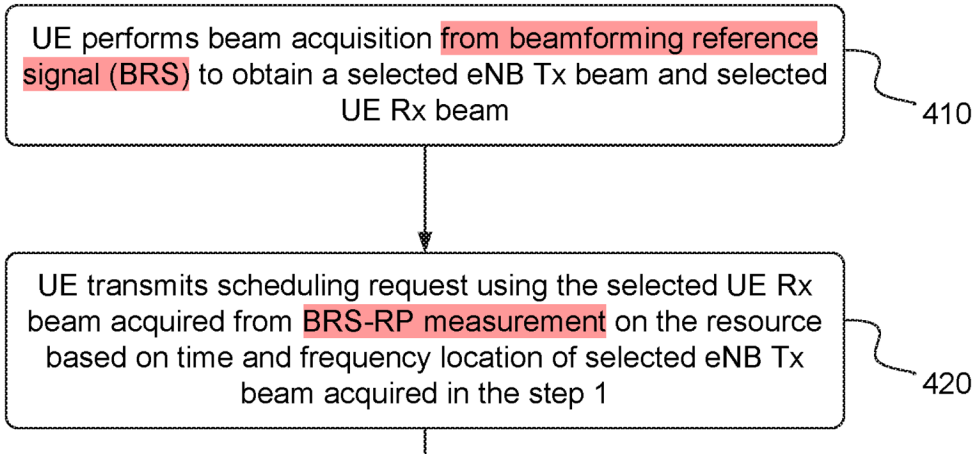


Ex-1005 at Fig. 11 (detail, emphasis added).

169. Similarly, Xiong discloses utilization aspects of **beam reference signals** for **beam measurements**. For example, "At block 420, the UE can transmit a scheduling request (SR) using a selected UE Rx beam acquired from **BRS-RP measurement** on the resource based on time and frequency location of a selected eNB Tx beam." Ex-1007 at 6:2-5 (emphasis added)



Ex-1007 at Fig. 3 (detail, emphasis added).

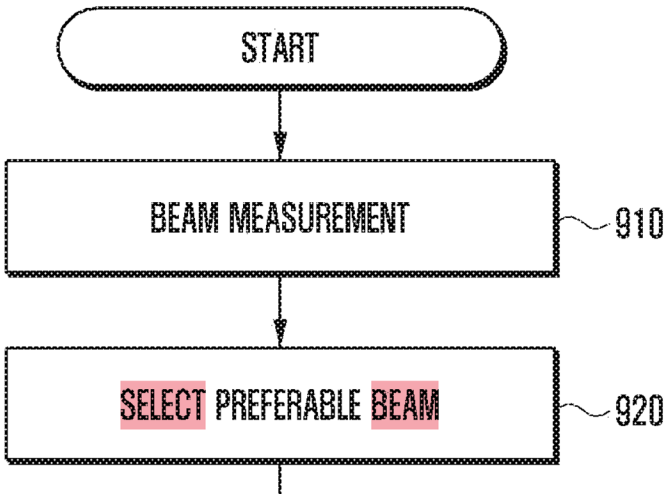


Ex-1007 at Fig. 4 (detail, emphasis added).

c. A POSITA Would Have Readily Observed that Jung and Xiong Both Address Methods Related to Beam Selection

170. A POSITA would have been motivated to combine the teachings of Jung and Xiong. Both disclosures address design aspects of **beam selection** methods. For example, "Another aspect of the present disclosure is to provide a method of measuring a reference signal for **selecting** a transmission/reception node and **a beam** of a UE..." Ex-1005 at 2:34-36 (emphasis added). "Another aspect of

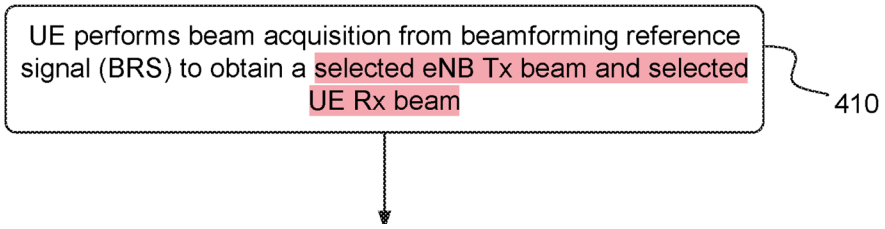
the present disclosure is to provide a method that feeds back beam information and changes beams in such a way that a UE periodically measures beam information and reports the information to an eNB, and the eNB and the UE **select a restricted number of beams** and transmit/receive information to/from each other via the **selected beams**, thereby increasing the resource use efficiency." Ex-1005 at 2:50-57 (emphasis added).



Ex-1005 at Fig. 9 (detail, emphasis added)

171. Similarly, Xiong discloses design aspects of **beam selection** methods. For example, "The UE can **select**, at the UE, a selected eNodeB transmission (Tx) beam and a **selected UE reception (Rx) beam** based on a highest power beamforming reference signal (BRS) received power (BRS-RP)." Ex-1007 at Abstract (emphasis added). "As compared to a legacy SR procedure in 3GPP LTE, embodiments of the present technology enable a beam reference signal (BRS) to be

transmitted from an eNodeB to allow the UE to measure the BRS received power (BRS-RP) and obtain a **selected eNodeB Tx beam and UE Rx beam**." Ex-1007 at 5:53-58 (emphasis added).



Ex-1007 at Fig. 4 (detail, emphasis added).

d. A POSITA Would Have Readily Observed that Jung and Xiong Both Address Methods Related to Channel Reciprocity

172. A POSITA would have been motivated to combine the teachings of Jung and Xiong. Both disclosures address beamforming methods related to **channel reciprocity**. For example, Jung teaches and explains **channel reciprocity**: "[w]hen **channel reciprocity** is assumed, **a best beam suitable for a UE to perform transmission is identical to a best beam that an eNB may use to perform transmission**." Ex-1005 at 36:46-49 (emphasis added). As discussed earlier, a POSITA understands that **channel reciprocity** implies that **a best beam for reception is also a best beam for transmission**. This concept is expressly taught

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also by Jung via the Jung Provisional's disclosure that "**DL Tx = UL Rx**," Ex-1006 at 24.

173. Similarly, Xiong addresses methods related to **channel reciprocity**. For example, "In one aspect, based on **channel reciprocity**, an eNodeB Tx beam can be the UE Rx beam." Ex-1007 at 4:28-29 (emphasis added). "In one embodiment, the selected eNodeB Tx beam, which can be **reciprocal** with the UE Rx beam, can have a BRS-RP with a BRS-RP that has a highest amplitude or a highest received power BRS-RP as compared to the BRS-RP for other eNodeB Tx beams." Ex-1007 at 6:58-63 (emphasis added); Ex-1008 at 12, 13, 16.

174. Thus a POSITA would have been motivated to combine the teachings of Jung and Xiong as both disclosures address methods related to channel reciprocity.

e. A POSITA Would Have Desired to Apply the Solutions in Xiong to Jung to Perform Scheduling Request

175. As discussed previously, the Jung Patent relates to a 5G network. In particular, it is concerned with beamforming designed to overcome the increased propagation loss at the high frequencies expected to be used in 5G. Beamforming introduces a spatial dimension in resource management, alongside time and frequency. Jung teaches the transmission of a beam reference signals over a selected network beam, and the selection of a best UE beam via measurements of the beam

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reference signals. The beams taught by Jung are reciprocal, meaning can be used for both transmission and reception.

176. Similarly, the Xiong patent also relates to beamforming methods designed to allow 5G systems to operate at mm wave frequencies. These methods include the transmission of beam reference signals, and the measurement of the beam reference signals to select beams. As in Jung, beams are reciprocal, and, for example, a UE beam selected for reception can also be used for transmission.

177. Jung teaches the allocation of a resource for transmitting a **scheduling request** for allocating a resource to perform beam measurement information feedback. For example, "A measurement entity (UE) determines to transmit feedback, based on a timing and a criterion, and then requests resource allocation (**scheduling request**)[.]" Ex-1005 at 25:65-26:1 (emphasis added), Ex-1006 at 19. "In order to perform beam measurement information feedback based on UE's determination, each UE has been allocated a resource through which the UE can transmit information for requesting resource allocation (**scheduling request**) to an eNB." Ex-1005 at 25:65-26:1 (emphasis added).

178. Xiong discloses transmitting a **scheduling request** expressly using "the selected UE Rx beam acquired from the BRS-RP measurement." Ex-1007 at Fig. 4; Ex-1008 at 13.

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179. In light of the fact that Jung already teaches at least the transmission of a **scheduling request**, a POSITA would have desired to apply the Xiong teaching of using the **selected UE beam and selected eNB beam** for the respectively, transmission and reception of the **scheduling request**.

2. Claim 5

a. [Element 5Pre]: A method of a network node for transmission or reception using beamforming, the method comprising:

180. To the extent the preamble is considered limiting, Jung discloses "a method of a network node for transmission or reception using beamforming" for the same reasons discussed above in Ground 1.

b. [Element 5(a)]: selecting a network beam;

181. Jung discloses or suggests selecting a network beam for the same reasons discussed above in Ground 1.

c. [Element 5(b)]: transmitting a first signal to a user equipment (UE) to indicate a first information associated with the network beam for the UE to derive, based on a beam reference signal of the network beam, a UE beam used to transmit a periodic Channel State

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Information (CSI) and to transmit a scheduling request, wherein the first signal is a Medium Access Control (MAC) signaling

182. Jung in view of Xiong discloses or suggests transmitting a first signal to a user equipment (UE) to indicate a first information associated with the network beam for the UE to derive, based on a beam reference signal of the network beam, a UE beam used to transmit a periodic Channel State Information (CSI) and to transmit a scheduling request, wherein the first signal is a Medium Access Control (MAC) signaling.

i. Element 5(b)(1) - Transmitting a first signal to a user equipment (UE) to indicate a first information associated with the network beam . . . wherein the first signal is a Medium Access Control (MAC) signaling

183. As discussed in Ground 1, Jung discloses transmitting a "Medium Access Control (MAC) signaling" to a UE to indicate a first information associated with the network beam. See Section VIII(A)(1)(c)(i).

ii. Element 5(b)(2) - Transmitting a first signal . . . for the UE to derive, based on a beam reference

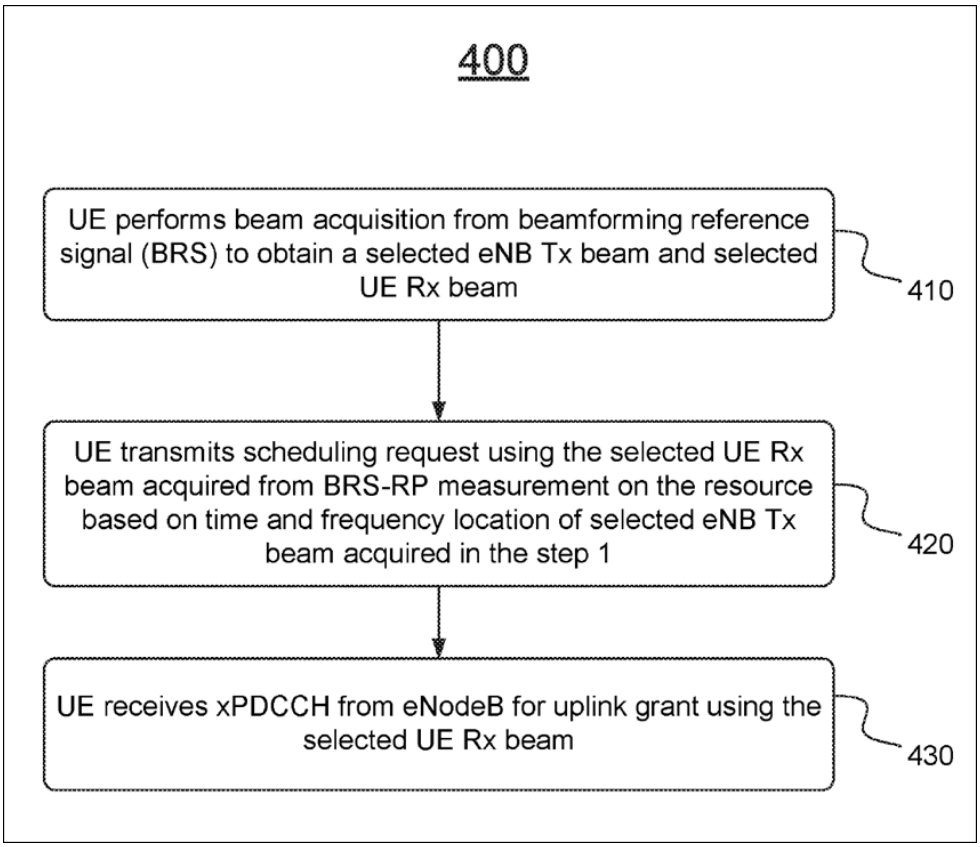
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signal of the network beam, a UE beam

184. As discussed in Ground 1, Jung discloses "Transmitting a first signal . . . for the UE to derive, based on a beam reference signal of the network beam, a UE beam." *See* Section VIII(A)(1)(c)(ii). As discussed in Ground 1, Jung discloses that the MAC signals associated with Jung's "first information" are for the UE to derive, based on a beam reference signal of the network beam, a UE beam. *See* Section VIII(A)(1)(c)(ii).

185. To the extent that Jung does not disclose transmitting a first signal for a UE to derive, based on a beam reference signal of the network beam, a UE beam, Xiong describes the UE deriving a UE beam based on a beam reference signal: between a transmission beam from a base station (a "beam using entity") and a UE (a "beam measurement entity"):

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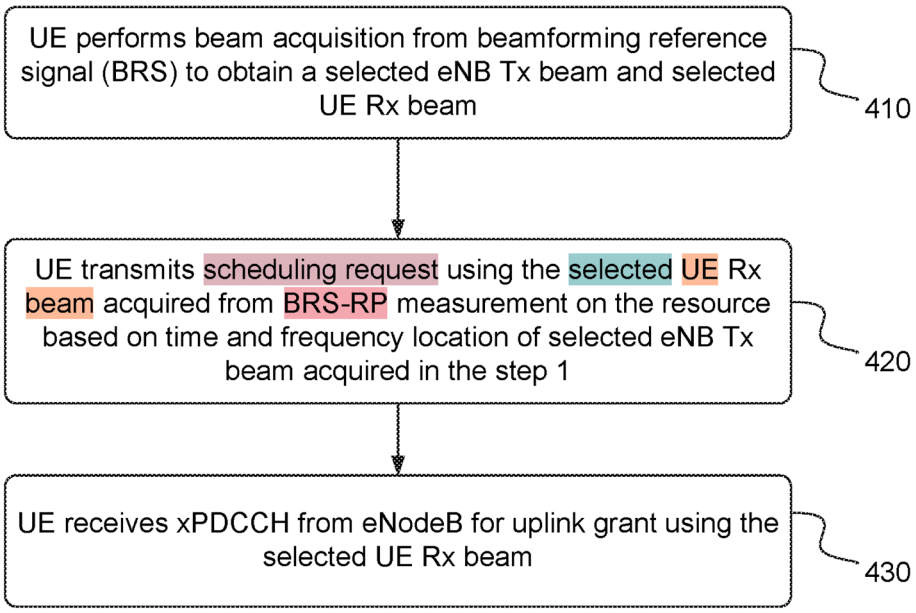
Ex-1007 at Fig. 4; *see also*, *e.g.*, Ex-1007 at 5:48–63; Ex-1008 at 13.

186. Thus, a POSITA would understand that the combination of Jung and Xiong discloses this claim element.

iii. Element 5(b)(3) - a UE beam used to transmit a periodic Channel State Information (CSI) and to transmit a scheduling request

187. As discussed in Ground 1, Jung discloses "a UE beam used to transmit a periodic Channel State Information and to transmit a scheduling request." *See* Section VIII(A)(1)(c)(iii). To the extent Jung does not disclose "derive ... a UE beam

used to transmit a scheduling request," Xiong expressly teaches "UE to transmit a scheduling request (SR) using the selected UE Rx beam," Ex-1007 at 4:31-32 (emphasis added).



Ex-1007 at Fig. 4 (emphasis added); Ex-1008 at 13.

188. As discussed earlier, both Jung and Xiong teach "channel reciprocity." Ex-1005 at 36:46-49. Ex-1007 at 4:28-29; Ex-1008 at 12, 13, 16. Thus a POSITA understands the "selected UE Rx beam" is also the selected UE beam used for transmission.

189. Based on these disclosures, a POSITA would have understood Jung in view of Xiong to teach a UE beam used to transmit a periodic Channel State Information (CSI) and to transmit a scheduling request.

190. Thus, a POSITA would have understood Jung in view of Xiong to teach transmitting a first signal to a user equipment (UE) to indicate a first information associated with the network beam for the UE to derive, based on a beam reference signal of the network beam, a UE beam used to transmit a periodic Channel State Information (CSI) and to transmit a scheduling request, wherein the first signal is a Medium Access Control (MAC) signaling.

d. [Element 5(c)]: using the network beam, mapped to the UE beam, to receive the periodic CSI and to receive the scheduling request.

191. As discussed in Ground 1, Jung discloses "using the network beam, mapped to the UE beam, to receive the periodic CSI and to receive the scheduling request." *See* Section VIII(A)(1)(c)(iii). To the extent Jung does not disclose "using the network beam, mapped to the UE beam, to receive the periodic CSI and to receive the scheduling request" Xiong expressly teaches that element: "the UE can transmit a scheduling request (SR) using a selected UE Rx beam acquired from BRS-RP measurement on the resource based on time and frequency location of a selected eNB Tx beam." Ex-1007 at 6:2-5 (emphasis added); Ex-1008 at 12, 13, 16.

192. As discussed earlier, both Jung and Xiong teach "channel reciprocity." Ex-1005 at 36:46-49; Ex-1006 at 24; Ex-1007 at 4:28-29; Ex-1008 at 12, 16. Thus a

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POSITA understands the "selected eNB Tx beam" is also the selected eNB beam used for reception.

193. A POSITA would thus understand Jung in view of Xiong to disclose using the network beam, mapped to the UE beam, to receive the periodic CSI and to receive the scheduling request.

3. Claim 6

a. [Element 6Pre]: The method of claim 5, further comprising

194. Jung in view of Xiong renders obvious claim 5 for the reasons above.

b. [Element 6(a)]: transmitting a second signal indicating radio resources for the beam reference signal of the network beam and the periodic CSI.

195. Jung discloses transmitting a second signal indicating radio resources for the beam reference signal of the network beam and the periodic CSI for the same reasons as discussed above in Ground 1.

4. Claim 8

a. [Element 8Pre]: The method of claim 6, further comprising

196. Jung in view of Xiong renders obvious claim 6 for the reasons above.

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b. [Element 8(a)]: the second signal is a Radio Resource Control (RRC) message.

197. Jung in view of Xiong discloses that the second signal is a Radio Resource Control (RRC) message. *See* claim 6 above.

5. Claim 13

a. [Element 13Pre(1)]: A network node for transmission or reception using beamforming comprising:

198. To the extent Element [13Pre(1)] is considered limiting, Jung in view of Xiong renders obvious claim Element [13Pre(1)] for the reasons described above with respect to the preamble of claim 5.

b. [Element 13Pre(2)]: 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:

199. To the extent Element [13Pre(2)] is considered limiting, Jung in view of Xiong renders obvious claim Element [13Pre(2)] for the reasons described above with respect to the preamble of claim 5.

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c. [Element 13(a)]: select a network beam;

200. Jung in view of Xiong renders obvious Element [13(a)] for the reasons above with respect to corresponding Element [5(a)].

d. [Element 13(b)]: transmit a first signal to a user equipment (UE) to indicate a first information associated with the network beam for the UE to derive, based on a beam reference signal of the network beam, a UE beam used to transmit a periodic Channel State Information (CSI) and to transmit a scheduling request, wherein the first signal is a Medium Access Control (MAC) signaling;

201. Jung in view of Xiong renders obvious Element [13(b)] for the reasons above with respect to corresponding Element [5(b)].

e. [Element 13(c)]: and use the network beam, mapped to the UE beam, to receive the periodic CSI and to receive the scheduling request.

202. Jung in view of Xiong renders obvious Element [13(c)] for the reasons above with respect to corresponding Element [5(c)].

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6. Claim 14

a. [Element 14Pre]: The network node of claim 13, wherein the processor is further configured to:

203. Jung in view of Xiong renders obvious Element [14Pre] for the reasons above with respect to claim 13.

b. [Element 14(a)]: transmit a second signal indicating radio resources for the beam reference signal of the network beam and the periodic CSI

204. Jung in view of Xiong renders obvious Element [14(a)] for the reasons above with respect to claim 6.

c. [Element 14(b)]: wherein the second signal is a Radio Resource Control (RRC) message.

205. Jung in view of Xiong renders obvious Element [14(b)] for the reasons above with respect to claim 8.

7. Claim 16

a. [Element 16Pre]: The method of claim 5, further comprising:

206. Jung in view of Xiong renders obvious Element [16Pre] for the reasons above with respect to claim 5.

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b. [Element 16(a)]: transmitting, to the UE, an indication of candidates of network beams for communication with the network node.

207. Jung discloses transmitting, to the UE, an indication of candidates of network beams for communication with the network node for the same reasons as discussed above in Ground 1.

8. Claim 18

a. [Element 18Pre]: The network node of claim 13, wherein the processor is further configured to:

208. Jung in view of Xiong renders obvious Element [18Pre] for the reasons above with respect to claim 13.

b. [Element 18(a)]: transmit, to the UE, an indication of candidates of network beams for communication with the network node.

209. Jung in view of Xiong renders obvious Element [18(a)] for the reasons above with respect to claim 16.

IX. Conclusion

210. As discussed above, it is my opinion that the challenged claims of the '868 Patent are not patentable.

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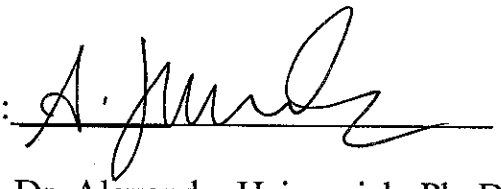
211. In signing this declaration, I recognize that the declaration will be filed as evidence in a contested proceeding before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross-examination in the proceeding and that cross-examination will take place within the United States. If cross-examination is required of me, I will appear for cross-examination within the United States during the time allotted for cross-examination.

212. I reserve the right to supplement my opinions in the future to respond to any arguments that Patent Owner raises and to account for new information as it becomes available to me.

213. 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 further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

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Executed on this 26th day of July 2024.

By: 

Dr. Alexander Haimovich, Ph. D.

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APPENDIX 1

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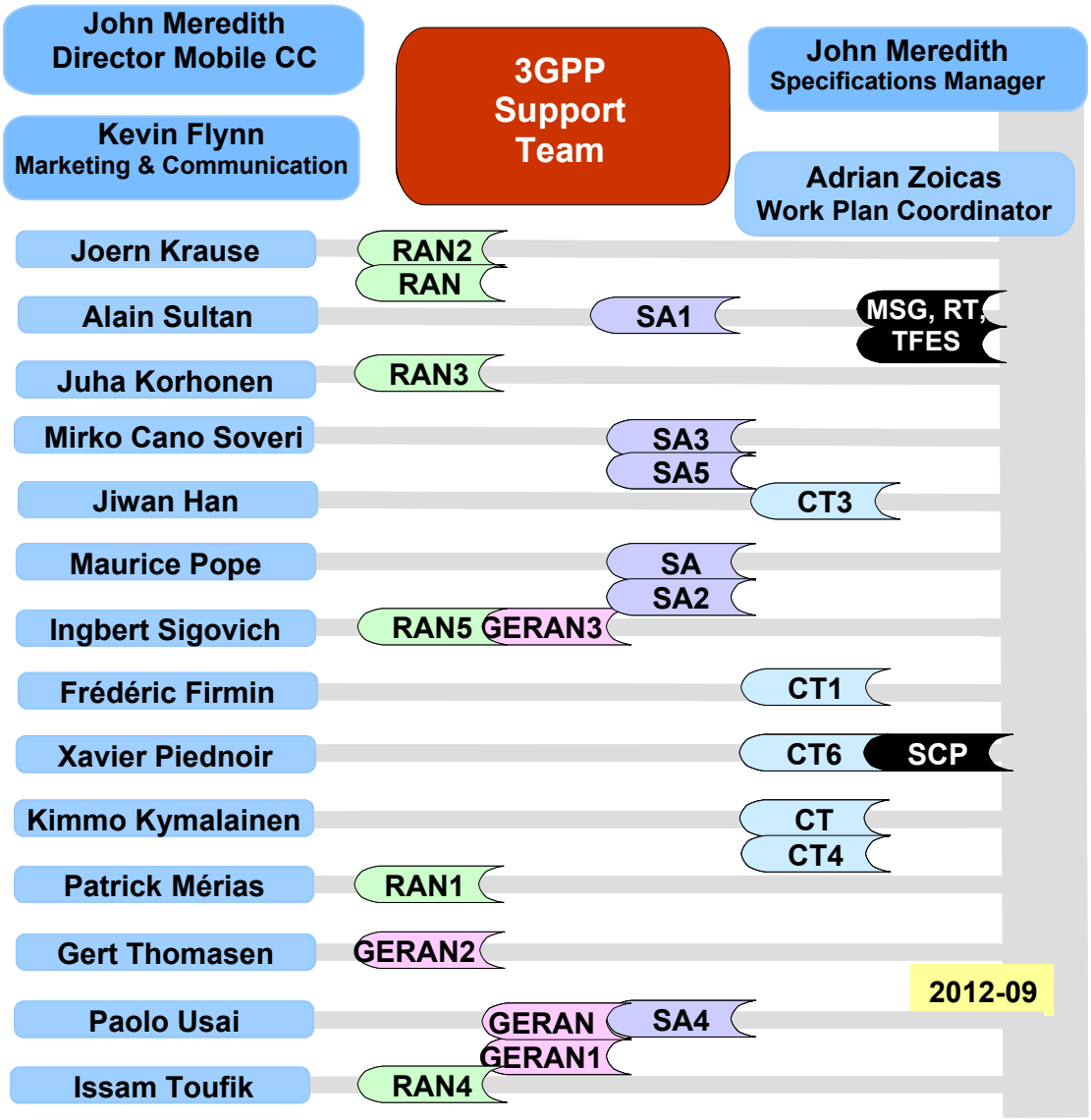
Foreword

The coloured highlight of the Unique IDentifier (UID) reflects the status of the work items e.g. ongoing, completed, etc. Stopped Features and Studies are listed at the end of the present document.

Legend:

Completed WI
Ongoing WI
Moved WI to/from another Release
Stopped WI

The present document has been produced by the ETSI MCC department.
The overall document was coordinated by Adrian Zoicas (MCC Work Plan Coordinator), who wishes to thank all the contributors for their dedication and quality of inputs.



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1 Scope

The present document contains a high-level description of the 3GPP Release 8 Features.
Its latest version is available at: http://www.3gpp.org/ftp/Information/WORK_PLAN/Description_Releases/

3G Release 8 - See version 8 of TR 21.101.

GSM/EDGE, Phase 2+ Release 8 - See Version 8 of TR 41.101.

Freeze Dates

Release	TS/TR version)	Functional freeze date, indicative only (see note)
Rel-8	8.x.y	Stage 1 frozen March 2008
		Stage 2 frozen June 2008
		Stage 3 frozen December 2008

Note: After "freezing", a Release can have no further additional functions added. However, detailed protocol specifications (stage 3) may not yet be complete. In addition, test specs may lag by some considerable time. A "frozen" Technical Specification is one which can have no further category B or C (new or modified functionality) Change Requests, other than to align earlier stages with later stages; thus all TSs pertaining to a Release may not necessarily be frozen at the time the Release itself is functionally frozen. Indeed since Release 7, the trend has been to freeze each of the three stages independently.

2 References

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 21.101: "Technical Specifications and Technical Reports for a UTRAN-based 3GPP system". Version 8.x.y

[3] 3GPP TS 41.101: "Technical Specifications and Technical Reports for a GERAN-based 3GPP system". Version 8.x.y

2.1 Specifications

Global information on the Specifications (also called "specs") can be found at:

http://www.3gpp.org/specs/specs.htm

The latest versions of all 3GPP specifications, containing the most recent corrections and additions, are available at:

http://www.3gpp.org/ftp/Specs/latest/

For specific purposes, older versions might be needed. These versions are available at:

http://www.3gpp.org/ftp/Specs/Archive/

where the specifications are sorted by series and then by folders containing all the available versions of a given spec (one folder per spec), for all Releases.

2.2 Tdocs

The Temporary Documents (tdocs) are mainly the original papers written by the 3GPP Members, and are the inputs for elaborating the specs. They are available (sorted by 3GPP technical groups (Technical Specification Groups (TSGs) and Working Groups (WGs)) at:

http://www.3gpp.org/ftp/

starting with 'tsg....'.

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2.3 Work Plan, Work Items and Study Items

Work Item Description ("WID") (also called WI Description) and Study Item (also called "Feasibility Studies") are forms which initial version provides the target to be reached before starting the technical work. Potential subsequent versions narrow the target and foreseen completion date according the actual progress. They are stored in:

http://www.3gpp.org/ftp/Information/WI_Sheet/

The 3GPP Work Plan is a living document, updated roughly each month, which contains the full list of Work Items and Study Items, as well as summary information for each WI, as: the WG in charge of it, its starting date and (foreseen or actual) completion date, the actual progress, etc. The Work Plan is available at:

http://www.3gpp.org/ftp/Information/WORK_PLAN/

2.4 Change Request database

A specification is originally drafted and maintained by a rapporteur, who compiles the contents from discussions in the WGs and TSGs. When it is considered to be 80% complete, it is brought under a so-called "change control" process. After this, changes to the specification can only be made using Change Requests that are usually agreed by consensus in the Working Group responsible for the specification, and then formally approved by the relevant Technical Specification Group.

The Change Request database contains all available information on Change Requests, including a Work Item code, a Change Request number that is unique within the specification (different versions are possible, but only one can ever be approved), the status of each Change Request and references to relevant temporary document numbers and meetings. This database is available in:

http://www.3gpp.org/ftp/Information/Databases/Change_Request/

Further information on CR is available at:

http://www.3gpp.org/specifications/change-requests

3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [x] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

EPC	
EPS	Evolved Packet System
E-UTRAN	
GAA	Generic Authentication Architecture
IMS	IP Multimedia Subsystem
LTE	
RAB	Radio Access Bearer
RLC	Radio Link Control
RTP	Real Time Protocol
SAES	System Architecture Evolution Specification
SIP	Session Initiated Protocol (IETF)

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4 3GPP System Architecture Evolution Specification-Evolved Packet System (SAES) UID_320005

Resources: S1,S2,S3,S5,C1,C3,C4,C6

References

Document	Title/Contents
	WID(s)
SP-080132	WID on 3GPP System Architecture Evolution Specification (SAES) - covers S1,S2,S3
	Impacted Specifications
-	See following subclauses
	New Dedicated Specifications/Reports
-	See following subclauses

Supporting Individual Members: Motorola. Nortel, Fujitsu, Vodafone, T-Mobile International, Huawei, NTT DoCoMo, Nokia, NEC, Nokia Siemens Networks, Ericsson, Qualcomm, 3, Samsung, at&t, BT, SoftBank Mobile Corp, China Mobile, Orange, Toshiba, LG Electronics, Intel, TeliaSonera, ZTE, Telecom Italia, Alcatel-Lucent, Marvell, RITT, CATT, Sprint, Rogers Wireless, Telefonica O2 Europe, KPN, Verizon Wireless, IPWireless, Telenor.

UID	Name	Resource	Hyperlink
320005	**3GPP System Architecture Evolution Specification - Evolved Packet System (non RAN aspects)**	SP,CP	SP-080132
350027	**SAE for support for non-3GPP accesses**	S2,S3,C1,C4	SP-080132
350044	Stage 2 for Host-based Mobility aspects	S2	SP-080132
350045	Stage 2 for Network-based Mobility aspects	S2	SP-080132
360022	Stage 3 for Mobility management based on DSMIP v6	C1	CP-080493
390009	Stage 3 for Mobility management based on MIP v4	C1	CP-080493
380030	Stage 3 for Inter-system mobility between E-UTRAN and non 3GPP accesses	C1	CP-080493
360019	Stage 2 for Optimized Dual-Radio Handover with WiMAX	S2	SP-080132
390045	Stage 2 Security aspects for non-3GPP Access	S3	SP-080132
370010	Stage 3 security aspects for DSMIP v6 Access	C1	CP-080493
390172	Stage 3 security aspects for MIPv4 Access	C1	CP-080493
360021	Stage 3 for Access to the EPC via non-3GPP access networks	C1	CP-080493
370011	Stage 3 for interfaces within EPC	C4	CP-090247
340057	Stage 3 for Interfaces EPC - non-3GPP IP access	C4	CP-090247
340058	Stage 3 for AAA/HSS related	C4	CP-090247
340059	Stage 3 for EPC - AAA interface	C4	CP-090247
350030	**Single Radio Voice Call Continuity for 3GPP (SRVCC)**	S2,C1,C4	SP-070949
350130	Stage 2 for 2G/3G SRVCC	S2	SP-070949
410005	Stage 3 for SRVCC in EPS	C1	CP-080793
410006	MME to MSC interface for SRVCC	C4	CP-080793
360020	**Voice Call Continuity for CDMA2000 1X**	S2	SP-080132
350031	**SAE impacts on IMS**	S2	SP-080132
390036	**CS Fallback in EPS**	S2,C1,C4	SP-080097
400001	Stage 2 for CS Fallback in EPS	S2	SP-080097
400102	Stage 3 for CS Fallback in EPS	C1	CP-080791
400003	Stage 3 for CS Fallback in EPS	C4	CP-080791
390039	**System enhancements for the use of IMS services in local breakout**	S2	SP-080090
390010	**EPC Data Definitions**	S5	not applicable
380037	EPC Network Resource Model (NRM) Integration Reference Point (IRP)	S5	SP-070737
390011	Performance measurements for EPC	S5	SP-080061
380038	**EPC Charging**	S5	SP-070736
390018	**Issues for CT1 TR 24.801**	C1	CP-080068
390019	**Issues for CT3 TR 29.804**	C3	CP-080068
400104	**Domain Name System Procedures for Evolved Packet System (DEPS)**	C4	CP-080280
410007	**InterWorking Function (IWF) between MAP based and Diameter based interfaces**	C4	CP-080644
390021	**CT6 aspects of SAE**	C6	CP-080164
390121	CT6 aspects of SAE	C6	CP-080164
420018	Test interworking of LTE Terminals with the USIM	C6	CP-080899

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The WID SP-080132 covers:

- Administrative fixes to the Feature-level SAE WID;
- Explicit addition of specifying network-controlled dual radio handovers between 3GPP accesses (GERAN, UTRAN, E-UTRAN) and Mobile WiMAX.

To ensure competitiveness in a longer time frame, an evolution of the 3GPP **access technology** needs to be considered.

Also, the ability of the 3GPP system to cope with the rapid growth in IP data traffic, the Packet-Switched technology utilized within 3G mobile networks requires further enhancement.
A continued evolution and optimization of the system concept is also necessary in order to maintain a competitive edge in terms of both performance and cost.

Important parts of such a continued **system evolution** include:

- Reduced latency;
- Higher user data rates;
- Improved system capacity and coverage, and reduced overall cost for the operator;
- Potential network and traffic cost reduction;
- Flexible accommodation and deployment of existing and new access technologies with mobility by a common IP-based network.

The objective of this work is to produce specifications to satisfy the needs of 3GPP System Evolution, namely:

- Overall architecture impacts from SA1 Rel-7 TR 22.978 "All-IP network (AIPN) feasibility study" (FS_AIPN) UID_31059, and from SA2 TR 23.882 "Study on 3GPP System Architecture Evolution" (FS_SAE) UID_32085 e.g.:

    - Support of a variety of different access systems (existing and future), mobility and service continuity between these access systems, and access selection based on combinations of operator policies, user preferences and access network conditions;
    - How to realize improvements in basic system performance e.g. communication delay, communication quality, connection set-up time etc.;
    - How to maintain the negotiated QoS across the whole system; in particular to address include inter-domain and inter-network interworking;
    - Identify the capability expansion required taking into account migration and co-existence with the existing system.

Overall architecture impacts from TSG-RAN on 3G Long-Term Evolution (TR 25.912 Study on Evolved UTRA and UTRAN UID_20023). The architectural developments should take into account the targets for the evolution of the radio-interface, e.g.:

    - whether there is a need for a modified network architecture and/or different functional split between network nodes (compared to the current 3GPP architecture);
    - how to provide a very low latency (including C-plane) for the overall network (including core network, radio access network and radio access technology);
    - how to provide the efficient support of the various types of services, especially from the PS domain (e.g. Voice over IP, Presence).

The Stage 2 is broken down into:

TS 23.401 SAE architecture aspects dealing with GPRS enhancements for **LTE access** and support for **pre-SAE/LTE 3GPP accesses**

TS 23.402 Architecture enhancements, including PCC and AAA aspects, adding **non-3GPP access** for both roaming and non-roaming scenarios. This aims at an IETF-based solution with the intention of being applicable to non-3GPP access networks (both fixed and wireless). This also includes specifying network-controlled dual radio handovers between 3GPP accesses (GERAN, UTRAN, E-UTRAN) and Mobile WiMAX.

Aspects common to both (e.g. S1 interface, interface with HSS, LTE specific PCC architecture functionality, etc) are covered in TS 23.401.

The architecture used as a basis for the two above is based on the TSG SA guidance to SA2 given in SP-060925.

SA3 Security aspects are covered in:

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TS 33.401 Security architecture (security features and mechanisms) for the Evolved Packet System (EPS) and the Evolved Packet Core (EPC), and the security procedures performed within EPS including EPC and E-UTRAN.

TS 33.402 Security features and the security mechanisms for inter-access mobility between 3GPP access system and non-3GPP access systems.

4.1 Requirements for evolution of the 3GPP system architecture (AIPN-SAE) UID_320022

Resources: S1

References

Document	Title/Contents
WID(s)	
SP-080132	WID on 3GPP System Architecture Evolution Specification (SAES) - covers S1,S2,S3
Impacted Specifications	
TS 22.011	Service accessibility
TS 22.246	MBMS user services; Stage 1
New Dedicated Specifications/Reports	
TS 22.278	Service requirements for the Evolved Packet System (EPS)

UID	Name	Resource	Hyperlink	Notes	TS_TR
320022	**Requirements for evolution of the 3GPP system architecture**	S1	SP-080132	SP#38 completed	22.011, 22.246, new 22.278

4.2 High level and common (for all accesses) functions (EPS-ComF) UID_370005

Resources: S2,S3

References

Document	Title/Contents
WID(s)	
SP-080132	WID on 3GPP System Architecture Evolution Specification (SAES) - covers S1,S2,S3
Impacted Specifications	
TS 33.210	3G security; Network Domain Security (NDS); IP network layer security
TS 33.310	Network Domain Security (NDS); Authentication Framework (AF)
New Dedicated Specifications/Reports	
TS 23.402	Architecture enhancements for non-3GPP accesses
TS 33.401	3GPP System Architecture Evolution (SAE); Security architecture

UID	Name	Resource	Hyperlink	Notes	TS_TR
370005	**High level and common (for all accesses) functions**	SP,CP	SP-080132	-	-
350024	Stage 2 for High level functions	S2	SP-080132	SP#40 completed	new 23.402
390044	Stage 2 Security Architecture	S3	SP-080132	SP#42 completed	33.210, 33.310, new 33.401

SA2 new TS 23.402 contains Stage 2 for High level functions.

SA3 new TS 33.401 specifies the security architecture; more specifically, the security features and the security mechanisms for EPS, and the security procedures performed within the EPS.

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CT1 aspects of System Architecture Evolution

Resources: C1

References

Document	Title/Contents
WID(s)	
CP-080493	WID on CT1 aspects of System Architecture Evolution
Impacted Specifications	
TS 23.122	Non-Access-Stratum (NAS) functions related to Mobile Station (MS) in idle mode
TS 24.229	Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3
TS 27.007	AT command set for User Equipment (UE)
New Dedicated Specifications/Reports	
TS 24.302	Access to the Evolved Packet Core (EPC) via non-3GPP access networks; Stage 3
TS 24.305	Selective Disabling of UE Capabilities (SDoUE) Management Object (MO)

UID	Name	Resource	Hyperlink	Notes	TS_TR
340051	Stage 3 (CT1) for SAE impact on services, network functions and capabilities	C1	CP-080493	CP#43 completed	24.229, 27.007, new 24.305
340049	Stage 2/3 for Network selection procedures	C1	CP-080493	CP#42 completed	23.122, new 24.302

This work covers protocols and procedures used in the EPS or used between the UE and the EPC network via non-3GPP access networks. Furthermore, existing 3GPP specifications shall be enhanced to support inter-system mobility between 3GPP legacy radio access networks and E-UTRAN. CT1 work can be split into four groups:

1) High level functions and procedures common for all accesses:
   - Stage 2/3 for Network selection procedures
   - Stage 3 (CT1) for SAE impact on services, network functions and capabilities; e.g. impact of EPS on IMS
2) Support of E-UTRA
3) Support of interoperation between EPS and legacy cellular PS accesses
4) Support of non-3GPP accesses

Unified guidelines of Diameter usage within 3GPP

Resources: C3

References

Document	Title/Contents
WID(s)	
CP-080055	WID on Unified guidelines of Diameter usage within 3GPP
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TR 29.909	Diameter-based protocols usage and recommendations in 3GPP

UID	Name	Resource	Hyperlink	Notes	TS_TR
370017	Unified guidelines for Diameter usage within 3GPP	C3	CP-080055	CP#42 completed	new 29.909

This work covers Unified guidelines of Diameter usage within 3GPP.

Diameter has been widely used in 3GPP, especially in CT3, CT4 and SA5. It is foreseen that Diameter will still be used more widely in SAE EPC system. However there were inconsistent rules and principles across WGs of how to derive new Diameter applications from the IETF specification. In addition, Diameter application version control across different releases is a 3GPP-specific issue and not considered by IETF when developing the Diameter BASE protocol. RFC3588 had some unresolved issues and 3GPP had to make its own solution. IETF is now trying to solve

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known problems with a RFC3588bis and new usage recommendations. Different principles or rules of Diameter usage across 3GPP WGs may lead to unexpected inter-operability problems.

This work creates a common set of principles, rules and recommendations across 3GPP WGs to ensure Diameter-based interfaces have the same treatment for release control and generating new applications-id. Also to address in a unified manner the use/re-use of AVPs, and other Diameter BASE related decisions. To achieve maximum benefit from this work it is strongly recommended that all 3GPP Diameter-based protocols follow these recommendations.

New TR 29.909 contains guidelines accepted by consensus of all involved 3GPP WGs, including:

- Current situation of Diameter usage in different WGs (CT3, CT4, SA5) in Rel-6/7;
- Recommendations and conditions to re-use existing Diameter applications (3GPP or IETF application-id), commands, AVPs and/or AVP values);
- Recommendations and conditions to define new Diameter applications, commands, AVPs and/or AVP values. Cross-release issue had been considered;
- Whether to apply the guidelines back to existing Diameter applications or only to new SAE Diameter interfaces, including potential impacts on existing implementations, potential benefits, etc; This took into account that with the new Diameter BASE RFC3588bis, existing usage of Diameter may need to be revised in 3GPP anyway.
- Recommendations are based on ongoing work in IETF about Diameter application design (DIME wg).

TR 29.909, has a secondary role, as placeholder in an informative annex for Diameter inter-operator considerations with brief guidelines on how to deploy and realize the inter-operator Diameter-based roaming infrastructure.

Inter-working between Evolved Packet Core network and external networks

Resources: C3

References

Document	Title/Contents
	WID(s)
CP-080772	WID on Inter-working between Evolved Packet Core network and external networks
	Impacted Specifications
TS 29.061	Interworking between the Public Land Mobile Network (PLMN) supporting packet based services and Packet Data Networks (PDN)
	New Dedicated Specifications/Reports
-	-

UID	Name	Resource	Hyperlink	Notes	TS_TR
340054	Stage 3 SAE impact on existing capabilities	C3	CP-080772	CP#42 completed	29.061
340023	Stage 3 EPC interworking with external PDNs (SGi)	C3	CP-080772	CP#44 completed	29.061

This work covers inter-working with external networks, namely Stage 3 SAE impact on existing capabilities and Stage 3 EPC interworking with external PDNs (supporting SGi interface) impacting TS 29.061:

- Interworking with PDN (IP/DHCP/RADIUS/Diameter) supporting EPS
- Interworking with IMS supporting EPS
- Interworking with MBMS supporting EPS
- Message Flows and message definitions

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PCC within System Architecture Evolution

Resources: C3

References

Document	Title/Contents
WID(s)	
CP-080576	WID on PCC within System Architecture Evolution
Impacted Specifications	
TS 29.212	Policy and Charging Control over Gx reference point
TS 29.213	Policy and Charging Control signalling flows and QoS parameter mapping
TS 29.214	Policy and Charging Control over Rx reference point
New Dedicated Specifications/Reports	
TS 29.215	Policy and Charging Control over S9 reference point

UID	Name	Resource	Hyperlink	Notes	TS_TR
340022	Stage 3 PCC within SAE	C3	CP-080576	CP#44 completed	29.212, 29.213, 29.214, new 29.215

This work covers Stage 3 PCC within SAE divided into four groups covering the main three interfaces and some common issues; impacting existing TS 29.212, TS 29.213, TS 29.214:

- Gx support for S7, S7a, S7c interfaces
- Rx protocol evolution
- S9 protocol to support roaming scenarios (new TS 29.215)
- Signalling Flows, Mapping Tables and binding

CT4 aspects of Evolved Packet System

Resources: C4

References

Document	Title/Contents
WID(s)	
CP-090247	WID on CT4 aspects of Evolved Packet System
Impacted Specifications	
TS 23.003	Numbering, addressing and identification
New Dedicated Specifications/Reports	
TS 29.274	General Packet Radio Service (GPRS); Evolved GPRS Tunnelling Protocol (eGTP) for EPS
TS 29.275	Proxy Mobile IPv6 (PMIPv6) based Mobility and Tunnelling protocols; Stage 3

UID	Name	Resource	Hyperlink	Notes	TS_TR
340062	Stage 3 (CT4) of SAE impact on existing capabilities	C4	CP-090247	CP#43 completed	new (29.274, 29.275)
340028	Stage 3 for SAE / LTE identities	C4	CP-090247	CP#43 completed	23.003

This work covers Stage 3 for SAE impact on existing capabilities (new TS 29.274, TS 29.275) and Stage 3 for SAE / LTE identities (changes to TS 23.003).

WID CP-080279 includes selection and specification of protocols and procedures to be used within EPC, between EPC and current GPRS core network, between EPC and HSS/AAA, and between 3GPP and non-3GPP access, and describes impacts and required enhancements for related network protocols, including GTP and IETF protocols based on Stage 2 architecture. The CT4 can be divided into the five categories:

- MME related interfaces based on the Diameter protocol;
- New and enhanced 3GPP AAA interfaces;
- GTP enhancements;
- PMIP based Mobility and Tunnelling protocols;
- Optimized handover procedures and protocol between E-UTRAN access and non-3GPP accesses;

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4.3 SAE for LTE access (SAES-LTE) UID_350025

Resources: S2,C1,C3,C4

References

Document	Title/Contents
	WID(s)
SP-080132	WID on 3GPP System Architecture Evolution Specification (SAES) - covers S1,S2,S3
CP-090247	CT4 WID on aspects of Evolved Packet System (EPS)
CP-080493	CT1 WID on aspects of System Architecture Evolution
CP-080576	CT3 WID on PCC within System Architecture Evolution
	Impacted Specifications
SA2	TS 23.060, 23.002, 23.246, 23.203, 23.107, 23.234, 23.271
CT1	TS 24.007, 24.008
TS 29.213	Policy and charging control signalling flows and Quality of Service (QoS) parameter mapping - C3
	New Dedicated Specifications/Reports
TS 23.401	General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access
TS 24.301	Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3 - C1
TS 29.272	Evolved Packet System (EPS); Mobility Management Entity (MME) and Serving GPRS Support Node (SGSN) related interfaces based on Diameter protocol - C4
TS 29.274	3GPP Evolved Packet System (EPS); Evolved General Packet Radio Service (GPRS) Tunnelling Protocol for Control plane (GTPv2-C); Stage 3 - C4
TS 29.275	Proxy Mobile IPv6 (PMIPv6) based Mobility and Tunnelling protocols; Stage 3 - C4
TS 29.279	Mobile IPv4 (MIPv4) based Mobility protocols; Stage 3 - C4
TS 29.282	Mobile IPv6 vendor specific option format and usage within 3GPP - C4

UID	Name	Resource	Hyperlink	TS_TR
350025	**SAE for LTE access**	-	SP-080132	-
340060	CT4 Stage 3 for protocol between EPCs	C4	CP-090247	29.274, 29.275
350042	SAES-SA-FP_LTE with GTP variant	S2,C4	SP-080132	-
370006	Stage 2 for SAES-SA-FP_LTE with GTP variant	S2	SP-080132	23.401, 23.060, 23.002, 23.246, 23.203, 23.107, 23.234, 23.271
340055	CT4 Stage 3 for GTP v2 protocol	C4	CP-090247	29.274
350043	SAES-SA-FP_LTE with PMIP variant	S2,C4	SP-080132	-
370007	Stage 2 for SAES-SA-FP_LTE with PMIP variant	S2	SP-080132	-
370018	CT4 Stage 3 for PMIP protocol within EPC	C4	CP-090247	29.275, 29.282
410004	Mobile IPv4 (MIPv4) based Mobility protocols	C4	CP-090247	29.279
340020	Stage 3 for UE NAS mobility procedures in idle and active mode	C1	CP-080493	24.007, 24.301
340050	Stage 3 for Session management, bearer control and QoS aspects	C1	CP-080493	24.007, 24.301
340053	Stage 3 for security aspects of LTE Access	C1	CP-080493	24.008, 24.301
340025	Stage 3 for QoS mechanisms	C3	CP-080576	29.213
340026	Stage 3 for EPC - HSS interface	C4	CP-090247	29.272

CP-090247 WID on CT4 aspects of Evolved Packet System (EPS)

UID	Name	Resource	Hyperlink	TS_TR
340060	CT4 Stage 3 for protocol between EPCs	C4	CP-090247	29.274, 29.275
340055	CT4 Stage 3 for GTP v2 protocol	C4	CP-090247	29.274
370018	CT4 Stage 3 for PMIP protocol within EPC	C4	CP-090247	29.275, 29.282
410004	Mobile IPv4 (MIPv4) based Mobility protocols	C4	CP-090247	29.279
340026	Stage 3 for EPC - HSS interface	C4	CP-090247	29.272

This work produced specifications for protocols and procedures under CT4 responsibility used in EPC which can be classified into the five following categories:

1) MME related interfaces based on the Diameter protocol;
- S6a protocol specification
- S13 protocol specification
- Gr protocol interaction with S6a

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2) New and enhanced 3GPP AAA interfaces;
- S6b protocol specification, also covering I-WLAN Mobility H2 interface
- Definition of SWx, SWm, SWa, STa, possibly replacing existing interfaces in I-WLAN

3) GTP enhancements;
- GTP-based S5 and GTP-based S8
- S10 and S11
- S3 and S4
- S1-U, impact of S12 and X2 will be evaluated

4) PMIP based Mobility and Tunnelling protocols;
- PMIP-based S5 and PMIP-based S8
- S2a and S2b

5) Optimized handover procedures and protocol between EUTRAN access and non-3GPP accesses;
- cdma2000 HRPD access
- S101, S103
- cdma2000 1xRTT access
- S102

CP-080493 WID on CT1 aspects of System Architecture Evolution

UID	Name	Resource	Hyperlink	TS_TR
340020	Stage 3 for UE NAS mobility procedures in idle and active mode	C1	CP-080493	24.007, 24.301
340050	Stage 3 for Session management, bearer control and QoS aspects	C1	CP-080493	24.007, 24.301
340053	Stage 3 for security aspects of LTE Access	C1	CP-080493	24.008, 24.301

CT1 specified protocols for mobility management, session management, and control of NAS security.

It covers work on protocols and procedures used in the EPS or used between the UE and the EPC network via non-3GPP access networks. Furthermore, existing 3GPP specifications were enhanced to support inter-system mobility between 3GPP legacy radio access networks and E-UTRAN. CT1 work can be split into four groups:

1) High level functions and procedures common for all accesses:
- Network selection procedures (stage 2 and 3)
- Impact on services, network functions and capabilities (e.g. impact of EPS on IMS, etc.)

2) Support of E-UTRA
- UE non-access stratum mobility procedures in idle and active mode
- Session management, bearer control and QoS aspects
- Security aspects for E-UTRA

3) Support of interoperation between EPS and legacy cellular PS accesses
- Inter-system mobility between E-UTRAN and GERAN/UTRAN
- Inter-system mobility between E-UTRAN and cdma2000

4) Support of non-3GPP accesses
- Access to the EPC via non-3GPP access networks
- Mobility management based on mobile IP
- Inter-system mobility between E-UTRAN and non-3GPP accesses
- Security aspects for non-3GPP Access

CP-080576 CT3 WID on PCC within System Architecture Evolution

UID	Name	Resource	Hyperlink	TS_TR
340025	Stage 3 for QoS mechanisms	C3	CP-080576	29.213

This work produced specifications for PCC protocols and procedures under CT3 responsibility used in EPS and classified into four groups covering the main three interfaces and some common issues:

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1) Gx protocol evolution and Gxx protocol specification
2) Rx protocol evolution
3) S9 protocol to support roaming scenarios
4) Signalling Flows, Mapping Tables and binding

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4.4 SAE for Interoperation between LTE and legacy cellular PS accesses UID_350026

Resources: S2,C1,C4

References

Document	Title/Contents
WID(s)	
SP-080132	WID on 3GPP System Architecture Evolution Specification (SAES) - covers S1,S2,S3
CP-080493	CT1 WID on aspects of System Architecture Evolution
CP-090247	CT4 WID on aspects of System Architecture Evolution
Impacted Specifications	
TS 24.008	Mobile radio interface Layer 3 specification; Core network protocols; Stage 3
New Dedicated Specifications/Reports	
TS 24.301	Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3
TS 24.302	Access to the Evolved Packet Core (EPC) via non-3GPP access networks; Stage 3

UID	Name	Resource	Hyperlink	TS_TR
350026	**SAE for Interoperation between LTE and legacy cellular PS accesses**	S2,C1,C4	SP-080132	-
370008	Stage 2 for Interoperation between LTE and 2G/3G	S2	SP-080132	23.401, 23.402
380031	Stage 3 for Inter-system mobility between E-UTRAN and 2G/3G	C1	CP-080493	24.008, 24.301
340018	Stage 2 GPRS enhancements for LTE access	S2	SP-080132	23.401
390008	Stage 2 GPRS for EPC (23.060, etc.)	S2	SP-080132	23.060
340056	Stage 3 for EPC - GPRS	C4	CP-090247	29.274, 29.275, 29.281
380032	Stage 3 for EPC to UTRAN	C4	CP-090247	29.274, 29.275, 29.281
380033	Stage 3 for EPC to 3GPP2	C4	CP-090247	29.277, 29.276
370009	Stage 2 for Interoperation between LTE and CDMA2000	S2	SP-080132	23.401, 23.402
360023	Stage 3 for Inter-system mobility between E-UTRAN and CDMA2000	C1	CP-080493	24.301, 24.302
340061	Stage 3 for MME - SGSN signalling free protocol	C4	CP-090247	29.272, 29.274

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4.5 SAE for support for non-3GPP accesses (SAES-SA-FP_n3GPP) UID_350027

Resources: S2,S3,C1,C4

References

Document	Title/Contents
WID(s)	
SP-080132	WID on 3GPP System Architecture Evolution Specification (SAES) - covers S1,S2,S3
CP-080493	CT1 WID on aspects of System Architecture Evolution
CP-090247	CT4 WID on aspects of System Architecture Evolution
Impacted Specifications	
TS 33.210	3G security; Network Domain Security (NDS); IP network layer security
TS 33.310	Network Domain Security (NDS); Authentication Framework (AF)
New Dedicated Specifications/Reports	
TS 24.301	Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3
TS 24.302	Access to the Evolved Packet Core (EPC) via non-3GPP access networks; Stage 3
TS 24.303	Mobility management based on Dual-Stack Mobile IPv6; Stage 3
TS 24.304	Mobility management based on Mobile IPv4; User Equipment (UE) - foreign agent interface; Stage 3
TS 33.402	3GPP System Architecture Evolution (SAE); Security aspects of non-3GPP accesses

UID	Name	Resource	Hyperlink	TS_TR
350027	**SAE for support for non-3GPP accesses**	-	SP-080132	-
350044	Stage 2 for Host-based Mobility aspects	S2	SP-080132	23.402
350045	Stage 2 for Network-based Mobility aspects	S2	SP-080132	23.402
360022	Stage 3 for Mobility management based on DSMIPv6	C1	CP-080493	24.303
521011	(IETF) Stage 3 for Mobility management based on DSMIPv6	C1-IETF	CP-080493	RFC 6610 (was draft-ietf-mip6-hiopt)
521012	(IETF) Stage 3 for Mobility management based on DSMIPv6	C1-IETF	CP-080493	SP#53/IETF#81: RFC 6275 completed (was draft-ietf-mext-rfc3775bis)
390009	Stage 3 for Mobility management based on MIP v4	C1	CP-080493	24.304
380030	Stage 3 for Inter-system mobility between E-UTRAN and non 3GPP accesses	C1	CP-080493	24.008, 24.301
360019	Stage 2 for Optimized Dual-Radio Handover with WiMAX	S2	SP-080132	23.402
390045	Stage 2 Security aspects for non-3GPP Access	S3	SP-080132	33.402, 33.210, 33.310
370010	Stage 3 security aspects for DSMIPv6 Access	C1	CP-080493	24.303
390172	Stage 3 security aspects for MIPv4 Access	C1	CP-080493	24.304
360021	Stage 3 for Access to the EPC via non-3GPP access networks	C1	CP-080493	24.302, 24.312
370011	Stage 3 for interfaces within EPC	C4	CP-090247	29.274, 29.281
340057	Stage 3 for Interfaces EPC - non-3GPP IP access	C4	CP-090247	29.273, 29.275
521013	(IETF) Stage 3 for Interfaces EPC - non-3GPP IP access	C4-IETF	CP-090247	RFC 6611 (was draft-ietf-mip6-bootstrapping-integrated)
340058	Stage 3 for AAA/HSS related	C4	CP-090247	29.273
340059	Stage 3 for EPC - AAA interface	C4	CP-090247	29.273

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4.5.1 Conformance Test Aspects – Mobility management based on DSMIPv6 UID_450022

Resources: R5

References

Document	Title/Contents
WID(s)	
RP-090754	WID on Conformance Test Aspects – Mobility management based on DSMIPv6 (Dual-Stack Mobile IPv6)
Impacted Specifications	
TS 36.508	Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); Common test environments for User Equipment (UE) conformance testing
TS 36.523-1	Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); User Equipment (UE) conformance specification; Part 1: Protocol conformance specification
TS 36.523-2	Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); User Equipment (UE) conformance specification; Part 2: Implementation Conformance Statement (ICS) proforma specification
TS 36.523-3	Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); User Equipment (UE) conformance specification; Part 3: Test Suites
New Dedicated Specifications/Reports	
-	-

Testing for CT1's UID_360022 (24.303) under Rel-8 Feature SAES

UID	Name	Hyperlink	Status_Report	rapporteur	Notes	TS_TR
450022	**Conformance Test Aspects – Mobility management based on DSMIPv6 (Dual-Stack Mobile IPv6)**	RP-090754	RP-100738	Qualcomm	RP#49 completed	36.508, 36.523-1, 36.523-2, 36.523-3

CT1's TS 24.303 provides the signalling procedures for accessing the 3GPP Evolved Packet Core network and handling the mobility between 3GPP and non-3GPP accesses via the S2c reference point defined in TS 23.402.

This work item provides conformance test specifications in order to verify correct functionality of the UE when moving between 3GPP and non-3GPP access networks.

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4.6 Single Radio Voice Call Continuity for 3GPP (SAES-SRVCC) UID_350030

Resources: S2,C1,C4

References

Document	Title/Contents
WID(s)	
SP-070949	SA2 WID on Single Radio Voice Call Continuity for 3GPP (SRVCC)
CP-080793	WID for CT (CT1/CT4) aspects of SRVCC to make it CT Wide
Impacted Specifications	
TS 23.009, 24.008	CT1
TS 23.003, 23.008	CT4
New Dedicated Specifications/Reports	
TS 23.216	Single Radio Voice Call Continuity (SRVCC); Stage 2 - S2
TS 24.301	Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3 - C1
TS 29.274	3GPP Evolved Packet System (EPS); Evolved General Packet Radio Service (GPRS) Tunnelling Protocol for Control plane (GTPv2-C); Stage 3 - C4
TS 29.277	Optimized Handover Procedures and Protocols between EUTRAN Access and 1xRTT Access - C4
TS 29.280	Evolved Packet System (EPS); 3GPP Sv interface (MME to MSC, and SGSN to MSC) for SRVCC - C4

Supporting Individual Members: Motorola, Nortel, Vodafone, Huawei, Nokia, Nokia Siemens Networks, Ericsson, Qualcomm, at&t, Orange, TeliaSonera, Telecom Italia, Alcatel-Lucent, Verizon Wireless, Samsung.

UID	Name	Resource	Hyperlink	TS_TR
350030	**Single Radio Voice Call Continuity for 3GPP (SRVCC)**	S2,C1,C4	SP-070949	-
350130	Stage 2 for 2G/3G SRVCC	S2	SP-070949	new 23.216
410005	Stage 3 for SRVCC in EPS	C1	CP-080793	23.009, 24.008, new 24.301
410006	MME to MSC interface for SRVCC	C4	CP-080793	23.003, 23.008, new (29.274, 29.277, 29.280)

To ensure competitiveness in a longer time frame, i.e. for the next 10 years and beyond, an evolution of the 3GPP access technology needs to be considered.
Also, the ability of the 3GPP system to cope with the rapid growth in IP data traffic, the Packet-Switched technology utilized within 3G mobile networks requires further enhancement. A continued evolution and optimization of the system concept is also necessary in order to maintain a competitive edge in terms of both performance and cost.
Important parts of such a continued system evolution include

- reduced latency,
- higher user data rates,
- improved system capacity and coverage, and reduced overall cost for the operator.
- Potential network and traffic cost reduction
- Flexible accommodation and deployment of existing and new access technologies with mobility by a common IP-based network

This work addresses the Single Radio Voice Call Continuity (SRVCC) aspects of System Architecture Evolution. SA2 specified the architecture enhancements for SRVCC between E-UTRAN access and 3GPP2's 1xRTT / 3GPP's UTRAN/GERAN accesses for Circuit Switched (CS) calls that are anchored in the IMS. SA2 documented overall SRVCC architecture and Stage 2 specifications for the 3GPP components (i.e., excluding 3GPP2 specific components).

UID	Name	Resource	Hyperlink	TS_TR
410005	Stage 3 for SRVCC in EPS	C1	CP-080793	23.009, 24.008, new 24.301
410006	MME to MSC interface for SRVCC	C4	CP-080793	23.003, 23.008, new (29.274, 29.277, 29.280)

Supporting Individual Members: Nokia Siemens Networks, Nokia, Motorola, Vodafone, Telecom Italia, InterDigital, Alcatel-Lucent, Qualcomm Europe, Ericsson, Nortel Networks.

This work is linked to the 3GPP work items:

- IMS Centralized Services (ICSRA-St2) (Unique ID 380040)

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- IMS Service Continuity (IMS-Cont) (Unique ID 390056)

TSG CT enhanced the relevant 3GPP protocol specifications to support the following aspects:

- Procedures to support call control state synchronization between UE and network when SRVCC is executed from PS to CS domain (i.e., change from SIP to TS 24.008 CC state machine, including a change from CC state Null to Active)
- Procedures to support mobility management control state synchronization between UE and CS core network after SRVCC is executed (The MSC server performs LA Update on behalf of the UE)
- indication of SRVCC capabilities by the UE to the CN
- indication of supported CS voice codecs for handover preparation with the target cell
- define protocol and stage 3 procedures between MME and MSC (Sv Interface) for SRVCC from E-UTRAN to 3GPP UTRAN/GERAN, between SGSN and MSC (Sv Interface) for SRVCC from UTRAN (HSPA) to 3GPP UTRAN/GERANand between the MME and the 1x CS IWS (S102 Interface) for SRVCC from E-UTRAN to CDMA 2000 1xRTT.

4.7 Voice Call Continuity for CDMA2000 1X (SAES-VCC_1X) UID_360020

Resources: S2

References

Document	Title/Contents
	WID(s)
SP-080132	WID on 3GPP System Architecture Evolution Specification (SAES) - covers S1,S2,S3
	Impacted Specifications
TS	?
	New Dedicated Specifications/Reports
TS	?

4.8 SAE impacts on IMS (SAES-SA_IMS) UID_350031

Resources: S2

References

Document	Title/Contents
	WID(s)
SP-080132	WID on 3GPP System Architecture Evolution Specification (SAES) - covers S1,S2,S3
	Impacted Specifications
TS	?
	New Dedicated Specifications/Reports
TS	?

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4.9 CS Fallback in EPS (SAES-CSFB) UID_390036

Resources: S2,C1,C4

References

Document	Title/Contents
	WID(s)
SP-080097	S2 WID on CS Fallback in EPS
CP-080791	C1 WID on Stage 3 for CS Fallback in EPS
	Impacted Specifications
CT1	TS 24.007, 24.008, 24.011, 29.018
CT4	TS 23.007, 23.008
	New Dedicated Specifications/Reports
TS 23.272	Circuit Switched (CS) fallback in Evolved Packet System (EPS); Stage 2 - S2
TS 23.401	General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access - S2
TS 24.301	Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3 -C1
TS 29.118	Mobility Management Entity (MME) - Visitor Location Register (VLR) SGs interface specification - C1
TR 24.801	3GPP System Architecture Evolution (SAE); CT WG1 aspects
TS 29.274	3GPP Evolved Packet System (EPS); Evolved General Packet Radio Service (GPRS) Tunnelling Protocol for Control plane (GTPv2-C); Stage 3 - C4
TS 29.277	Optimized Handover Procedures and Protocols between EUTRAN Access and 1xRTT Access - C4

UID	Name	Resource	Hyperlink	TS_TR
390036	**CS Fallback in EPS**	-	SP-080097	-
400001	Stage 2 for CS Fallback in EPS	S2	SP-080097	new (23.272, 23.401)
400102	Stage 3 for CS Fallback in EPS	C1	CP-080791	24.007, 24.008, 24.011, 29.018, new (24.301, 24.801, 29.118)
400003	Stage 3 for CS Fallback in EPS	C4	CP-080791	23.007, 23.008, 29.274, new 29.277

In order to guarantee support of legacy CS services such as voice for UEs camped on E-UTRAN, mobile operators are expected to deploy IMS. Many operators however will continue to have access to already deployed 2G/3G CS network for foreseeable future which can also be used as a fallback. Such CS fallback can help to:

- provide smooth transition to LTE by better utilising an already deployed CS infrastructure for voice services with UE with LTE and 2G/3G capability.
- decouple the deployment of IMS from the deployment of the Evolved Packet System for other operators who choose not to use LTE for legacy CS services at all but instead use UE with LTE and 2G/3G capability for delivery of CS services such as voice over 2G/3G CS domain,

In order to achieve these goals a mechanism is required to inform UE with LTE and 2G/3G capability of incoming/outgoing CS calls and thus may trigger the reselection of a suitable CS domain access (either 2G or 3G).

This work specifies the architecture enhancements for functionality to enable Fallback from E-UTRAN access to 2G/3G CS domain access. Using this functionality, voice and other CS-domain services (e.g. CS UDI video / SMS/ LCS / USSD) are realized by reuse of CS infrastructure. It documents overall CS Fallback architecture and stage 2 level specifications for the 3GPP components. Roaming aspects were documented as well.

CT1 and CT4 specified Stage3 capabilities and functionalities according to SA2 Stage 2 in TS 23.272 as follows:

- combined EPS/IMSI attach and tracking area update procedures based on similar mechanisms as those used by the combined GPRS attach and routing area update procedures from 3GPP TS 24.008, in order to register the UE to the CS domain for future Fallback from E-UTRAN access to 2G/3G CS domain access;
- IMSI or combined EPS/IMSI detach procedure, both UE and network initiated, based on similar mechanisms as those used by the GPRS detach procedure from 3GPP TS 24.008;
- CS fallback related capability for the UE to receive the CS paging request via EPS and respond to this paging via the GERAN/UTRAN, or to request a CS call in E-UTRAN and establish the call in GERAN/UTRAN;
- procedures for supporting Mobile originating and Mobile terminating SMS in EPS;
- procedures required for the support of CS fallback to 1xRTT;
- procedures on the SGs interface between the MME and the MSC, based on the Gs interface procedures.

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4.10 System enhancements for the use of IMS services in local breakout (SAES-IMS_LBO) UID_390039

Resources: S2

References

Document	Title/Contents
WID(s)	
SP-080090	SA2 WID on System enhancements for the use of IMS services through local breakout
Impacted Specifications	
TS 23.228, 23.221, 23.203	S2
New Dedicated Specifications/Reports	
-	-

UID	Name	Resource	Hyperlink	TS_TR
390039	**System enhancements for the use of IMS services in local breakout**	S2	SP-080090	23.228, 23.221, 23.203

IMS services, like voice and video conferencing, can greatly benefit of Local BreakOut (LBO). This allows reducing cost per bit of data traffic exchanged by roaming customers, since at least part of it can be handled directly by the visited operator, with no need to waste bandwidth on the international links between the home and visited PLMNs. Moreover, LBO offers better performance to the customers, since the locally routed traffic faces lower delays.

The work introduces system enhancements for LBO into Stage 2 specifications, under the assumption that IMS signalling and IMS bearer traffic are both anchored at a PDN GW in the VPLMN. In particular it identified:

- solutions for the home Operator to control whether the IMS user may access to IMS services through a PDN in the VPLMN;
- solutions to allow the UE to establish connectivity to a single PDN GW in the VPLMN and use IMS services through local breakout;
- if methods are necessary to discover a P-CSCF in the VPLMN or in the HPLMN, after the UE has connected to the visited PDN GW;
- requirements for the connectivity between the PDNs and/or interactions with network entities such as NAT (as specified in TS 23.228);
- interactions with and support of PCC;
- legal intercept implications.

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4.11 EPC Data Definitions (EPC-OAM) UID_390010

Resources: S5

The EPC Data Definitions Building Block of the SAES Feature covers several independent Work Tasks as follows:

- EPC Network Resource Model (NRM) Integration Reference Point (IRP)
- Performance measurements for EPC

EPC Network Resource Model (NRM) Integration Reference Point (IRP) UID_380037

References

Document	Title/Contents
	WID(s)
SP-070737	WID on EPC Network Resource Model (NRM) Integration Reference Point (IRP)
	Impacted Specifications
-	-
	New Dedicated Specifications/Reports
TS 32.751	Telecommunication management; Evolved Packet Core (EPC) Network Resource Model (NRM) Integration Reference Point (IRP); Requirements
TS 32.752	Telecommunication management; Evolved Packet Core (EPC) Network Resource Model (NRM) Integration Reference Point (IRP): Information Service (IS)
TS 32.753	Telecommunication management; Evolved Packet Core (EPC) Network Resource Model (NRM) Integration Reference Point (IRP): Common Object Request Broker Architecture (CORBA) Solution Set (SS)
TS 32.755	Telecommunication management; Evolved Packet Core (EPC) Network Resource Model (NRM) Integration Reference Point (IRP): Bulk CM eXtensible Markup Language (XML) file format definition

UID	Name	Resource	Hyperlink	TS_TR
380037	EPC Network Resource Model (NRM) Integration Reference Point (IRP)	S5	SP-070737	new (32.751, 32.752, 32.753, 32.755)

The Evolved Packet Core (EPC) is defined by 3GPP with different Network Elements from the UTMS Core Network. The Network Resource Model (NRM) of the UTMS Core Network is not applicable to EPC.

The EPC system needs to be managed. 3GPP network management paradigm necessitates the standardization of the representations of various managed resources. The standardization of the EPC system managed resources is captured in the so-called EPC Network Resource Model (NRM).

The EPC architecture and capabilities evolve from those defined for UTMS Core Network. The management of the EPC system should also evolve from that for managing the UTMS Core Network. In particular, the NRM for EPC should align and resemble those specified for the Core managed network resources.

The alignment of EPC NRM with Core NRM will have the following benefits:

- The system architecture of EPC evolves from Core network and the existing Core network NRM is proven in operation. Therefore, the alignment will result in a specification that has a higher chance of being bug free when compared to a "brand new" designed specification.
- It will minimise both the standardisation and product development efforts and maintenance efforts (i.e. the cost and time for development including testing and reduction of training cost when the management paradigms for EPC and Core network remained similar);
- It will shorten the time to market for EPC systems;
- It will facilitate a seamless coexistence with Core network management systems.

TS 32.75x-series define the EPC NRM IRP using the same principles as for the UMTS Core network NRM.
It has identical characteristics as those defined for other NRMs such as UMTS Core network NRM.
The DN of its instances uses the same name convention as all instances, whose IOCs are defined in various NRM IRPs.
Its IOCs integrate identically with other NRM (e.g. UMTS/GSM NRM IRP) with the IOCs defined in Generic NRM IRP. Operations and notifications defined in various Interface IRPs that work with existing instances of various NRM IRPs work without change with the new instances of EPC.

Similar to existing 3GPP NRM IRPs such as UTRAN and Core Network NRM IRP, the EPC NRM IRP focuses only on the representation of the network resources in question. It does not deal with the applications or usage of the IOCs.

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This work defines the NRM for EPC, e.g. MME, HSS, Serving GW, PDN GW.

Performance measurements for EPC UID_390011

References

Document	Title/Contents
WID(s)	
SP-080061	WID on Performance measurements for EPC
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TS 32.426	Telecommunication management; Performance Management (PM); Performance measurements Evolved Packet Core (EPC) network

UID	Name	Resource	Hyperlink	TS_TR
390011	Performance measurements for EPC	S5	SP-080061	new 32.426

The Evolved Packet Core (EPC) network defined by 3GPP adds new Network Elements, such as MME, UPE, Serving gateway, Packet Data Network (PDN) gateway etc. See TS 23.401 for the non-roaming and roaming architectures for 3GPP accesses. New interfaces between Network Elements and signalling over those interfaces are also introduced and are different from the pre-Rel-8 Core Network.

Performance Management (PM) is one of basic management function for EPC, and performance measurements are the base for PM. Existing performance measurements defined in TS 32.406/7/8/9 cannot meet the EPC management requirements. Hence, it is necessary to define new performance measurements for EPC.

The management of EPC evolves from the pre-Rel-8 management architecture, and PM IRP (TS 32.41x-series) were reused, so that performance measurement definitions reuse the template defined in TS 32.404.

TS 32.426 defines performance measurements for EPC with the same template as defined in TS 32.404.

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4.12 EPC Charging (EPC-CH) UID_380038

Resources: S5

References

Document	Title/Contents
WID(s)	
SP-070736	WID on Evolved Packet Core (EPC) Charging
Impacted Specifications	
TS 32.240	Charging architecture and principles
TS 32.251	Packet Switched (PS) domain charging
TS 32.252	Wireless Local Area Network (WLAN) charging
TS 32.296	Online Charging System (OCS): Applications and interfaces
TS 32.298	Charging Data Record (CDR) parameter description
TS 32.299	Diameter charging applications
New Dedicated Specifications/Reports	
-	-

UID	Name	Resource	Hyperlink	TS_TR
380038	**EPC Charging**	S5	SP-070736	32.240, 32.296, 32.251, 32.252, 32.298, 32.299

The Evolved 3GPP System needs reliable and efficient charging solutions. As the EPC is an evolution of UMTS, also the charging solutions should evolve.

SA5 Study UID_350004 concludes in TR 32.820 (Study on charging management; 3GPP Evolved Packet Core (EPC): Charging aspects) that reusing existing UMTS charging specifications has the following benefits:

- • It is proven in operation;
- • Minimizes both the standardisation and product development efforts (i.e. the cost and time);
- • Provides a base, on which more functionality can be developed;
- • Shortens the time to market for Evolved 3GPP systems;
- • Facilitates a seamless coexistence with UMTS charging systems.
- • Considers also non-3GPP access;
- • Enables an easy migration for the Operator to the new solution.

This work adds via CRs the charging for the EPC Architecture following the recommendations given in TR 32.820.

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4.13 Domain Name System Procedures for Evolved Packet System (DEPS) UID_400004

Resources: C4

References

Document	Title/Contents
WID(s)	
CP-080280	WID on Domain Name System Procedures for Evolved Packet System (DEPS)
Impacted Specifications	
TS 23.003	Numbering, addressing and identification
New Dedicated Specifications/Reports	
TS 29.303	Domain Name System Procedures; Stage 3

UID	Name	Resource	Hyperlink	TS_TR
400104	**Domain Name System Procedures for Evolved Packet System (DEPS)**	C4	CP-080280	23.003, new 29.303

Rel-8 EPS work has shown that existing pre-Rel-8 DNS procedures for gateway selection are not adequate in EPS. Furthermore, EPS APN naming and subsequent DNS procedures are further complicated by the multiple protocol support (i.e. GTP and Proxy Mobile IP) in Rel-8 gateway nodes and over the inter-operator roaming connections. Well defined DNS procedures for EPS are needed for more advanced DNS usage than using A or AAAA query types.

This work provides Stage 2 procedures and Stage 3 descriptions for DNS usage that cover the EPC node selection (e.g. SGW and PGW nodes) excluding the UE initiated ePDG and Home Agent discovery and selection procedures. The DNS based node selection may be affected by the selected APN, desired protocol support (e.g. GTP or PMIP), and other operational and deployment related information (e.g. service area). The DNS procedures cover both intra- and inter-operator cases.

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4.14 IWF between MAP based and Diameter based interfaces (SAES-MAP2Diam) UID_410007

Resources: C4

References

Document	Title/Contents
WID(s)	
CP-080644	WID on InterWorking Function (IWF) between MAP based and Diameter based interfaces
Impacted Specifications	
New Dedicated Specifications/Reports	
TS 29.305	InterWorking Function (IWF) between MAP based and Diameter based interfaces

UID	Name	Resource	Hyperlink	TS_TR
410007	**InterWorking Function (IWF) between MAP based and Diameter based interfaces**	C4	CP-080644	new 29.305

This work was triggered by the Rel-8 Study UID_380023 (FS_MAP2Diam) which produced TR 29.805 InterWorking Function (IWF) between MAP based and Diameter based interfaces.

TSG SA has set the requirement for interworking between SAE/LTE and the legacy system.
Some MAP based interfaces are used in legacy systems and CT4 choose the Diameter protocol for S6a/S6d/S13 in EPS. CT4 specified S6a/S6d/S13 related interworking scenarios to be used between EPC networks or between EPC and GPRS core network. Interworking for the other interfaces may be specified in later 3GPP Releases.

CT4 has produced protocol mapping between Diameter based S6a/S6d/S13 and MAP based Gr/Gr+/Gf for the EPS, including description of scenarios, description of mapping procedures and mapping of related messages/parameters.

4.15 CT6 aspects of SAE UID_390121

Resources: C6

References

Document	Title/Contents
WID(s)	
CP-080164	WID on CT6 aspects of System Architecture Evolution
Impacted Specifications	
TS 31.102	Characteristics of the Universal Subscriber Identity Module (USIM) application [Support of SAE identities in USIM]
TS 31.111	Universal Subscriber Identity Module (USIM) Application Toolkit (USAT) [Support of SAE identities in USAT]
New Dedicated Specifications/Reports	
-	-

UID	Name	Resource	Hyperlink	TS_TR
390121	CT6 aspects of SAE	C6	CP-080164	31.102, 31.111

CT6 is responsible within 3GPP for specifications of smart card based network authentication applications such as the Subscriber Identity Module (SIM) used in 2G systems, USIM (Universal Subscriber Identity Module) used in 3GPP systems and ISIM (IM Services Identity Module) excluding security algorithms which are developed by SA3.

This work produced specifications for USIM data and procedures used in EPS.
It specified Network Measurement Results collection via USAT.

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4.15.1 Test interworking of LTE Terminals with the USIM UID_420018

Resources: C6

References

Document	Title/Contents
WID(s)	
CP-090711	WID on Test interworking of LTE Terminals with the USIM
Impacted Specifications	
TS 31.121	UICC-terminal interface; Universal Subscriber Identity Module (USIM) application test specification
TS 31.124	Mobile Equipment (ME) conformance test specification; Universal Subscriber Interface Module Application Toolkit (USAT) conformance test specification
New Dedicated Specifications/Reports	
-	-

UID	Name	Hyperlink	Notes	TS_TR
420018	Test interworking of LTE Terminals with the USIM	CP-100598	CP#50 completed. Steering of Roaming test cases have been introduced. Remaining issues CSG display testing (Provide Local Information, Call Control for EPS/PDN, Event Download (Access Technology Change - Multiple Access Technologies)	31.121, 31.124

Development of conformance test cases for Rel-8 terminals supporting E-UTRA/EPC covering the interworking of the USIM application and USIM application toolkit (USAT) on the UICC and E-UTRA/EPC. To cover the handling of a Pre-Rel-8 USIM used for access to E-UTRAN/EPC and also the handling of a Rel-8 or later USIM used for access to E-UTRAN/EPC it is proposed to structure the WI into these 2 main parts.

The objective of this work item proposal is the specification of test cases to verify terminal interworking with the USIM application and USIM application toolkit (USAT) on the UICC and with E-UTRA/EPC. Therefore the USIM application specification TS 31.102, the USIM application toolkit specification TS 31.111, the E-UTRA specifications (mainly TS 36.331) and EPC specifications (mainly 24.301) are considered in this WI to ensure that the terminal is acting on the network side according to the parameters specified on the USIM and vice versa. For this the existing test specifications TS 31.121 and TS 31.124are reused and will be extended where appropriate.

The following structure for the test specification is proposed:

Pre-Rel-8 USIM used for access to E-UTRAN/EPC (compatibility with existing USIM capabilities and procedures)

- Items are for study

Rel-8 or later USIM (enhanced specific LTE EFs and functions on the USIM and for USAT) used for access to E-UTRAN/EPC

- Use E-UTRA as new RAT for PLMN selection and registration for EPS services
- Handling EMM parameter for EPS Mobility Management and EPS NAS Security context (TS 24.301, TS 31.102) to be stored on a Rel-8 or later USIM
- CSG list handling for USIM and USAT
- Further PS specific USIM features used in EPC not tested yet, FFS
- Further items for USIM are FFS
- Support of E-UTRAN in Provide Local Information for NMR
- Support of EPS in USAT: BIP, Provide Local Information, Call control
- Further Items for USAT are for FFS.

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4.15.2 Test interworking of ISIM terminals with IMS UID_490015

Resources: C6

References

Document	Title/Contents
	WID(s)
CP-100602	WID on Test interworking of IP Multimedia Services Identity Module (ISIM) terminals with IP Multimedia Subsystem (IMS)
	Impacted Specifications
TS 31.121	UICC-terminal interface; Universal Subscriber Identity Module (USIM) application test specification
TS 31.124	Mobile Equipment (ME) conformance test specification; Universal Subscriber Interface Module Application Toolkit (USAT) conformance test specification
	New Dedicated Specifications/Reports
TS 31.134	Mobile Equipment (ME) conformance test specification; IP Multimedia Services Identity Module (ISIM) interworking with IP Multimedia Subsystem (IMS) test specification

UID	Name	Hyperlink	Notes	TS_TR
490015	Test interworking of IP Multimedia Services Identity Module (ISIM) terminals with IP Multimedia Subsystem (IMS)	CP-100602	CP#52 completed.Linked to Rel-5 UID_1273 Provisioning of IP-based multimedia services (24.229, 31.103), Rel-8 UID_390021 CT6 aspects of SAE, UID_420018 Test interworking of LTE Terminals with the USIM, Rel-9 UID_450018 Testing SMS over IMS in E-UTRAN (34.229).	31.121, 31.124, new TS 31.134

Justification

Development of conformance test for Rel-8 and onwards terminals with IMS support based on the use of the IP Multimedia Services Identity Module (ISIM) application.

Objective

The objective of this work item proposal is the evaluation of existing test cases and when appropriate specification of test cases to verify terminal interworking with the ISIM application and USIM application toolkit (USAT) on the UICC and the IP Multimedia Subsystem, especially in combination with the E-UTRA/EPC. Therefore the ISIM application specification TS 31.103, the USIM application toolkit specification TS 31.111 and the IP multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP) specification TS 24.229 are considered in this WI to ensure that the terminal is acting on the network side according to the parameters specified on the ISIM and vice versa. For IMS related USIM/USAT tests the existing test specifications TS 31.121 and TS 31.124 are reused and will be extended where appropriate.

Evaluation of features and available tests to ensure the correct support of the following features (the list is not exhaustive):

- Handling of User IDs stored on the ISIM
- Usage of Home Domain Name as stored on the ISIM
- Handling of P-CSCF addresses as stored on the ISIM

Evaluation of tests and definition/adaptation of test cases to ensure the correct support of the following features

- Support of IMS with USIM/ISIM interworking: Short Message Service storage on USIM
- Support of IMS in USAT: Send Short Message, SMS-PP Data Download

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5 3G Long Term Evolution - Evolved Packet System RAN part (LTE) UID_20068

Resources: RP,S5

References

Document	Title/Contents
	WID(s)
RP-080747	WID on 3G Long Term Evolution
	Impacted Specifications
-	-
	New Dedicated Specifications/Reports
TR 36.938	Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Improved network controlled mobility between E-UTRAN and 3GPP2/mobile WiMAX radio technologies
TS 36.300	Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access (E-UTRAN); Overall description; Stage 2

Supporting Individual Members:NTT DoCoMo, Alcatel-Lucent, CATT, AT&T, Ericsson, ETRI, Freescale, Fujitsu, Intel, Institute for Infocomm Research, LG Electronics, Motorola, Mitsubishi Electric, NEC, Nokia, Nokia Siemens Networks, Nortel, Panasonic, Philips, RIM, Samsung, Sharp, Texas Instruments, T-Mobile, Toshiba, KDDI, Verizon Wireless, ZTE.

Status report in RP-080741

UID	Title	Acronym	WG	WID	SR
20068	**Rel-8 LTE – 3G Long Term Evolution - Evolved Packet System RAN part**	LTE	RP,S5	RP-070131	RP-080741
330018	**LTE – Physical Layer**	LTE-Phys	R1	RP-060630	RP-080741
330019	**LTE – Radio Interface Layer 2 and 3 Protocol Aspect**	LTE-L23	R2	RP-060630	RP-080741
330020	**LTE – eUTRAN Interfaces**	LTE-interfaces	R3	RP-060630	RP-080741
330021	**LTE – Evolved UTRA and UTRAN RF Radio Transmission/Reception, System Performance Requirements and Conformance Testing**	LTE-RF	R4	RP-060630	RP-080741
370046	**LTE – FDD repeaters**	LTE-Repeaters	R4	RP-070749	RP-090037
390001	**E-UTRAN Data Definitions**	E-UTRAN-OAM	S5		
390004	**Self-Organizing Networks (SON)**	LTE_SON-OAM	S5	SP-080275	

UID	Title	Acronym	WG	WID
390001	**E-UTRAN Data Definitions**	E-UTRAN-OAM	S5	
370001	Subscriber and Equipment Trace for E-UTRAN and EPC	E-UTRAN-OAM	S5	SP-070617
380036	E-UTRAN Network Resource Model (NRM) Integration Reference Point (IRP)	E-UTRAN-OAM	S5	SP-070738
390002	Performance measurements for E-UTRAN	E-UTRAN-OAM	S5	SP-080062
390003	Key Performance Indicators (KPIs) for E-UTRAN	E-UTRAN-OAM	S5	SP-080063

UID	Title	Acronym	WG	WID
390004	**Self-Organizing Networks (SON)**	LTE_SON-OAM	S5	SP-080275
390104	SON Concepts and requirements	LTE_SON-OAM	S5	SP-080275
390005	Self-Establishment of eNBs, including automated Software Management	LTE_SON-OAM	S5	SP-080849
390006	SON Automatic Neighbour Relations (ANR) List Management	LTE_SON-OAM	S5	SP-080066

http://www.3gpp.org/Highlights/LTE/LTE.htm

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5.1 Long Term Evolution of the 3GPP radio technology

3GPP work on the Evolution of the 3G Mobile System started with the RAN Evolution Workshop, 2 - 3 Nov 2004 in Toronto, CANADA. The Workshop was open to all interested organizations, members and non members of 3GPP. Operators, manufacturers and research institutes presented more than 40 contributions with views and proposals on the evolution of the Universal Terrestrial Radio Access Network (UTRAN).

A set of high level requirements was identified in the Work Shop:

- Reduced cost per bit
- Increased service provisioning – more services at lower cost with better user experience
- Flexibility of use of existing and new frequency bands
- Simplified architecture, Open interfaces
- Allow for reasonable terminal power consumption

It was also recommended that the Evolved UTRAN should bring significant improvements to justify the standardization effort and it should avoid unnecessary options. On certain aspects, the collaboration with 3GPP SA WGs was found to be essential: the new split between the Access Network and the Core Network, and the characteristics of the throughput that new services would require demanded close architectural coordination.

With the conclusions of this Workshop and with broad support from 3GPP members, a Feasibility Study on the UTRA & UTRAN Long Term Evolution was started in Dec 2004. The objective was "to develop a framework for the evolution of the 3GPP radio-access technology towards a high-data-rate, low-latency and packet-optimized radio-access technology" The study focused on supporting services provided from the PS-domain, involving:

- Related to the radio-interface physical layer (downlink and uplink):
  - e.g. means to support flexible transmission bandwidth up to 20 MHz, introduction of new transmission schemes and advanced multi-antenna technologies
- Related to the radio interface layer 2 and 3:
  - e.g. signalling optimization
- Related to the UTRAN architecture:
  - identify the optimum UTRAN network architecture and functional split between RAN network nodes
- RF-related issues

In addition, the Next Generation Mobile Networks (NGMN) initiative provided a set of recommendations for the creation of networks suitable for the competitive delivery of mobile broadband services. The NGMN goal is "to provide a coherent vision for technology evolution beyond 3G for the competitive delivery of broadband wireless services".

The NGMN long-term objective is to "establish clear performance targets, fundamental recommendations and deployment scenarios for a future wide area mobile broadband network". In a white paper (March 2006), they provided relative priorities of key system characteristics, System recommendations and detailed requirements.

Emphasis was also on the IPR side, where the goal was "to adapt the existing IPR regime to provide a better predictability of the IPR licenses (...) to ensure Fair, Reasonable And Non-Discriminatory (FRAND) IPR costs" (NGMN White paper, Mar 2006).

All RAN WGs participated in the study, with collaboration from SA2 in the key area of the network architecture.
The first part of the study resulted in agreement on the requirements for the Evolved UTRAN.

5.1.1 Study phase and requirements

As a result, TR 25.913 contains detailed requirements for the following criteria:

Peak data rate

- Instantaneous downlink peak data rate of 100 Mb/s within a 20 MHz downlink spectrum allocation (5 bps/Hz)
- Instantaneous uplink peak data rate of 50 Mb/s (2.5 bps/Hz) within a 20MHz uplink spectrum allocation)

Control-plane latency

- Transition time of less than 100 ms from a camped state, such as Release 6 Idle Mode, to an active state such as Release 6 CELL_DCH
- Transition time of less than 50 ms between a dormant state such as Release 6 CELL_PCH and an active state such as Release 6 CELL_DCH

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Control-plane capacity

- At least 200 users per cell should be supported in the active state for spectrum allocations up to 5 MHz

User-plane latency

- Less than 5 ms in unload condition (i.e. single user with single data stream) for small IP packet

User throughput

- Downlink: average user throughput per MHz, 3 to 4 times Release 6 HSDPA
- Uplink: average user throughput per MHz, 2 to 3 times Release 6 Enhanced Uplink

Spectrum efficiency

- Downlink: In a loaded network, target for spectrum efficiency (bits/sec/Hz/site), 3 to 4 times Release 6 HSDPA)
- Uplink: In a loaded network, target for spectrum efficiency (bits/sec/Hz/site), 2 to 3 times Release 6 Enhanced Uplink

Mobility

- E-UTRAN should be optimized for low mobile speed from 0 to 15 km/h
- Higher mobile speed between 15 and 120 km/h should be supported with high performance
- Mobility across the cellular network shall be maintained at speeds from 120 km/h to 350 km/h (or even up to 500 km/h depending on the frequency band)

Coverage

- Throughput, spectrum efficiency and mobility targets above should be met for 5 km cells, and with a slight degradation for 30 km cells. Cells range up to 100 km should not be precluded.

Further Enhanced Multimedia Broadcast Multicast Service (MBMS)

- While reducing terminal complexity: same modulation, coding, multiple access approaches and UE bandwidth than for unicast operation.
- Provision of simultaneous dedicated voice and MBMS services to the user.
- Available for paired and unpaired spectrum arrangements.

Spectrum flexibility

- E-UTRA shall operate in spectrum allocations of different sizes, including 1.25 MHz, 1.6 MHz, 2.5 MHz, 5 MHz, 10 MHz, 15 MHz and 20 MHz in both the uplink and downlink. Operation in paired and unpaired spectrum shall be supported
- The system shall be able to support content delivery over an aggregation of resources including Radio Band Resources (as well as power, adaptive scheduling, etc) in the same and different bands, in both uplink and downlink and in both adjacent and non-adjacent channel arrangements. A "Radio Band Resource" is defined as all spectrum available to an operator

Co-existence and Inter-working with 3GPP Radio Access Technology (RAT)

- Co-existence in the same geographical area and co-location with GERAN/UTRAN on adjacent channels.
- E-UTRAN terminals supporting also UTRAN and/or GERAN operation should be able to support measurement of, and handover from and to, both 3GPP UTRAN and 3GPP GERAN.
- The interruption time during a handover of real-time services between E-UTRAN and UTRAN (or GERAN) should be less than 300 msec.

Architecture and migration

- Single E-UTRAN architecture
- The E-UTRAN architecture shall be packet based, although provision should be made to support systems supporting real-time and conversational class traffic
- E-UTRAN architecture shall minimize the presence of "single points of failure"
- E-UTRAN architecture shall support an end-to-end QoS
- Backhaul communication protocols should be optimised

Radio Resource Management requirements

- Enhanced support for end to end QoS
- Efficient support for transmission of higher layers
- Support of load sharing and policy management across different Radio Access Technologies

Complexity

- Minimize the number of options
- No redundant mandatory features

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The Study phase was concluded in Sep 2006 and the Implementation WID for 3G Long Term Evolution was created. As expected, in particular the E-UTRA system will provide significantly higher data rates than Rel-6 WCDMA. The increase in data rate is achieved especially through higher transmission bandwidth and support for MIMO.

In particular, the study showed that simultaneous support for UTRA and E-UTRA UEs in the same spectrum allocation was possible.

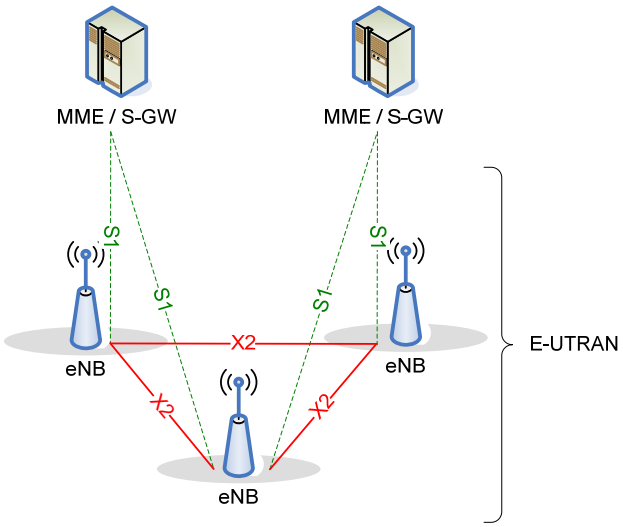
Solutions chosen for the physical layer and Layers 2/3 showed a convergence between paired spectrum and unpaired spectrum solutions for the Long Term Evolution (e.g. initial access, handover procedures, measurements, frame and slot structures).

5.1.2 Specification phase and achievements

Architecture

The E-UTRAN overall architecture is described in TS 36.300 and TS 36.401.

The E-UTRAN consists of eNBs which are interconnected with each other by the X2 interface. Each eNB is connected to the Evolved Packet Core (EPC) network by the S1 interface. On the User Plane the S1 interface terminates the Serving Gateway (S-GW), on the Signalling Plane the S1 interface terminates the Mobility Management Entity (MME).The eNBs are terminating points for Control- and User Plane towards the UEs in the Evolved UTRA.



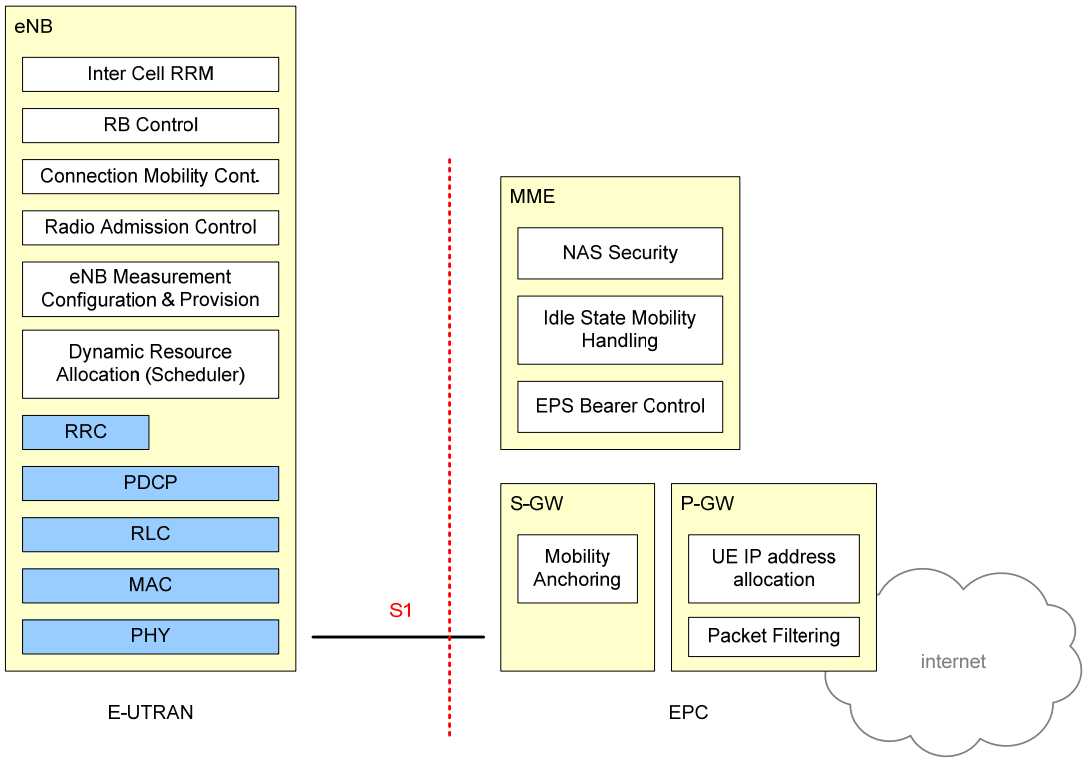
Overall Architecture

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eNB Functions

The eNB hosts the following functions:

- Functions for Radio Resource Management: Radio Bearer Control, Radio Admission Control, Connection Mobility Control, Dynamic allocation of resources to UEs in both uplink and downlink (scheduling)
- IP header compression and encryption of user data stream
- Selection of an MME at UE attachment when no routing to an MME can be determined from the information provided by the UE
- Routing of User Plane data towards Serving Gateway
- Scheduling and transmission of paging messages (originated from the MME)
- Scheduling and transmission of broadcast information (originated from the MME or O&M
- Measurement and measurement reporting configuration for mobility and scheduling



Functional Split between E-UTRAN and EPC

General principles of the E-UTRAN Architecture (see TS 36.401)

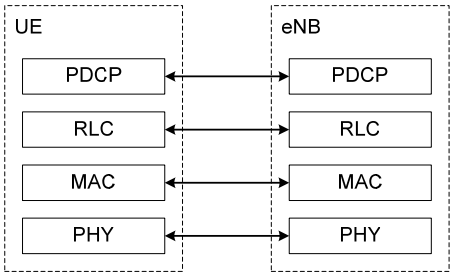
The general principles guiding the definition of E-UTRAN Architecture as well as the E-UTRAN interfaces are the following:

- Logical separation of signalling and data transport networks
- E-UTRAN and EPC functions are fully separated from transport functions. Addressing scheme used in E-UTRAN and EPC shall not be tied to the addressing schemes of transport functions. The fact that some E-UTRAN or EPC functions reside in the same equipment as some transport functions does not make the transport functions part of the E-UTRAN or the EPC.
- Mobility for RRC connection is fully controlled by the E-UTRAN.
- When defining the E-UTRAN interfaces the following principles were followed: the functional division across the interfaces shall have as few options as possible.
- Interfaces should be based on a logical model of the entity controlled through this interface.
- One physical network element can implement multiple logical nodes.

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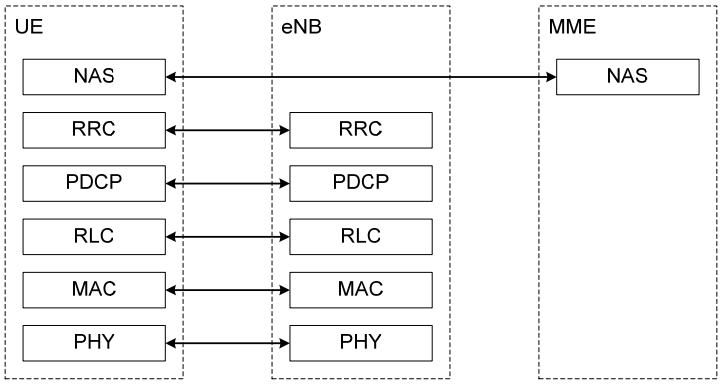
5.1.3 Radio Interface

The figure below shows the protocol stack for the user-plane, where PDCP, RLC and MAC sublayers (terminated in eNB on the network side) perform header compression, ciphering, scheduling, ARQ and HARQ.



User-plane protocol stack

The figure below shows the protocol stack for the control-plane. The NAS control protocol is mentioned for information only and is part of UE -EPC communication. The PDCP sublayer performs e.g. ciphering and integrity protection, RLC and MAC sublayers perform the same functions as for the user plane. The RRC performs broadcast, paging, RRC connection management, Radio Bearer control, Mobility functions, UE measurement reporting and control.



Control-plane protocol stack

Band Arrangement

E-UTRA is designed to operate in the frequency bands defined in table below. The requirements are defined for 1.4, 3, 5, 10, 15 and 20MHz bandwidth with a specific configuration in terms of number of resource blocks (6, 15, 25, 50, 75 and 100 RB).

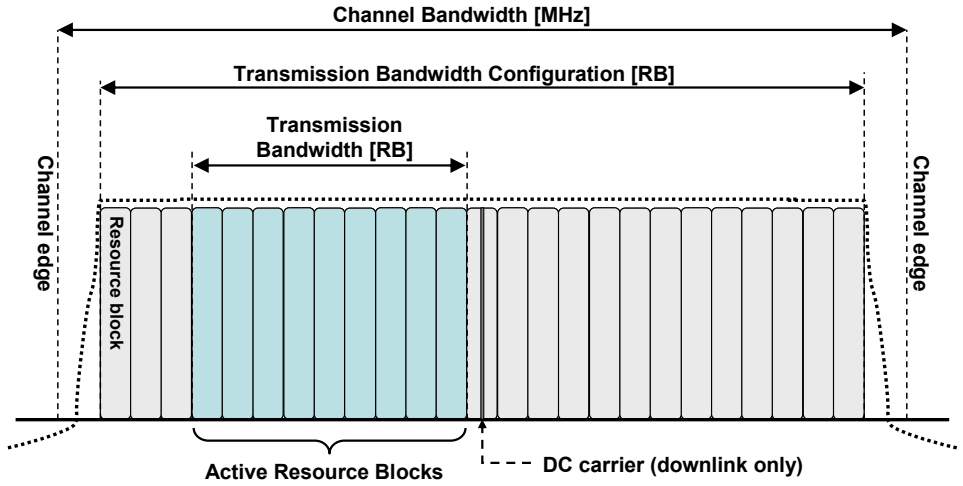
The figure below shows the relation between the total channel bandwidth, the transmission bandwidth configuration i.e. the number of resource blocks.

The channel raster is 100KHz (the center frequency must be a multiple of 100KHz).

To support transmission in paired and unpaired spectrum, two duplex modes are supported: Frequency Division Duplex (FDD), supporting full duplex and half duplex operation, and Time Division Duplex (TDD).

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E-UTRA Band	Uplink (UL) eNode B receive UE transmit			Downlink (DL) eNode B transmit UE receive			UL-DL Band separation	Duplex Mode
	F_{UL_low}	–	F_{UL_high}	F_{DL_low}	–	F_{DL_high}	F_{DL_low} - F_{UL_high}	
1	1920 MHz	–	1980 MHz	2110 MHz	–	2170 MHz	130 MHz	FDD
2	1850 MHz	–	1910 MHz	1930 MHz	–	1990 MHz	20 MHz	FDD
3	1710 MHz	–	1785 MHz	1805 MHz	–	1880 MHz	20 MHz	FDD
4	1710 MHz	–	1755 MHz	2110 MHz	–	2155 MHz	355 MHz	FDD
5	824 MHz	–	849 MHz	869 MHz	–	894MHz	20 MHz	FDD
6	830 MHz	–	840 MHz	875 MHz	–	885 MHz	35 MHz	FDD
7	2500 MHz	–	2570 MHz	2620 MHz	–	2690 MHz	50 MHz	FDD
8	880 MHz	–	915 MHz	925 MHz	–	960 MHz	10 MHz	FDD
9	1749.9 MHz	–	1784.9 MHz	1844.9 MHz	–	1879.9 MHz	60 MHz	FDD
10	1710 MHz	–	1770 MHz	2110 MHz	–	2170 MHz	340 MHz	FDD
11	1427.9 MHz	–	1452.9 MHz	1475.9 MHz	–	1500.9 MHz	23 MHz	FDD
12	[TBD]	–	[TBD]	[TBD]	–	[TBD]	[TBD]	FDD
13	777 MHz	–	787 MHz	746 MHz	–	756 MHz	21	FDD
14	788 MHz	–	798 MHz	758 MHz	–	768 MHz	20	FDD
…								
33	1900 MHz	–	1920 MHz	1900 MHz	–	1920 MHz	N/A	TDD
34	2010 MHz	–	2025 MHz	2010 MHz	–	2025 MHz	N/A	TDD
35	1850 MHz	–	1910 MHz	1850 MHz	–	**1910 MHz**	N/A	TDD
36	1930 MHz	–	1990 MHz	1930 MHz	–	1990 MHz	N/A	TDD
37	1910 MHz	–	1930 MHz	1910 MHz	–	1930 MHz	N/A	TDD
38	2570 MHz	–	2620 MHz	2570 MHz	–	2620 MHz	N/A	TDD
39	1880 MHz	-	1920 MHz	1880 MHz	-	1920 MHz	N/A	TDD
40	2300 MHz	-	2400 MHz	2300 MHz	-	2400 MHz	N/A	TDD



Relation between Channel bandwidth and transmission bandwidth configuration

Transmission scheme

The multiple access scheme for the LTE physical layer is based on Orthogonal Frequency Division Multiple Access (OFDM) with a Cyclic Prefix (CP) in the downlink and a Single Carrier Frequency Division Multiple Access (SC-FDMA) with CP in the uplink.

OFDMA technique is particularly suited for frequency selective channel and high data rate. It transforms a wideband frequency selective channel into a set of parallel flat fading narrowband channels, thanks to CP. This ideally, allows the receiver to perform a low complex equalization process in frequency domain, i.e. 1 tap scalar equalization.

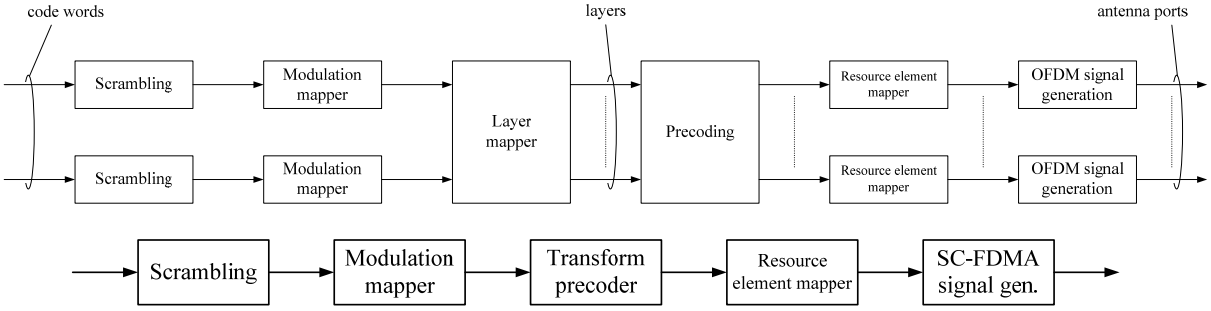
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The baseband signal representing a downlink physical channel is defined in terms of the following steps:

- scrambling of coded bits in each of the code words to be transmitted on a physical channel
- modulation of scrambled bits to generate complex-valued modulation symbols
- mapping of the complex-valued modulation symbols onto one or several transmission layers
- precoding of the complex-valued modulation symbols on each layer for transmission on the antenna ports
- mapping of complex-valued modulation symbols for each antenna port to resource elements
- generation of complex-valued time-domain OFDM signal for each antenna port

The baseband signal representing the physical uplink shared channel is defined in terms of the following steps, as shown in the below figure:

- scrambling
- modulation of scrambled bits to generate complex-valued symbols
- transform precoding to generate complex-valued symbols
- mapping of complex-valued symbols to resource elements
- generation of complex-valued time-domain SC-FDMA signal for each antenna port



Uplink physical channel processing

RF Related Requirements

In TS 36.101 and TS 36.104 different requirements can be found for the RF. In particular the following classification can be done.

For the UE transmitter, requirements are given for the following quantities:

- Transmit signal quality (Error Vector Magnitude (EVM));
- Maximum Output Power (MOP), Maximum Power Reduction (MPR), Output power dynamics;
- Output RF spectrum emission: (Occupied bandwidth, spectrum emission mask. Out of band emission, Adjacent Carrier Leakage Ratio (ACLR), spurious emission);
- Transmit intermodulation.

For the UE receiver, requirements are given for the following quantities:

- Reference sensitivity power level
- Maximum Input level
- Adjacent Channel sensitivity
- Blocking characteristic
- Spurious response
- Intermodulation characteristics
- Spurious emissions.

For the BS transmitter, requirements are given for the following quantities:

- Base station output power and output power dynamics, Transmit ON/OFF power;
- Transmitted signal quality, EVM and frequency error;
- Unwanted emissions (occupied bandwidth, ACLR, Operating band unwanted emissions, transmitter spurious emissions);
- Transmitter intermodulation.

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For the BS receiver, requirements are given for the following quantities:

- Reference sensitivity level;
- Dynamic range;
- In-channel selectivity, Adjacent Channel Selectivity (ACS), blocking and narrow band blocking;
- Receiver spurious emissions;
- Receiver intermodulation.

In E-UTRA, the variable bandwidth of the system presents a special problem in the definition of the RF requirements; there may be the need to define some parameters as many times as there are bandwidth modes. Special attention has been given also to the coexistence issue, since LTE has to coexist with all the other already existing systems.

Performance requirements can be found in TS 36.101 and TS 36.104.

TS 36.113 covers the assessment of E-UTRA base stations, repeaters and associated ancillary equipment in respect of Electromagnetic Compatibility.

TS 36.141 specifies the Radio Frequency (RF) test methods and conformance requirements for E-UTRA Base Stations (BS) operating either in the FDD mode (used in paired bands) or the TDD mode (used in unpaired bands). These have been derived from, and are consistent with the E-UTRA Base Station (BS) specifications defined in TS 36.104.

Layer 1

The Layer 1 is defined in a bandwidth agnostic way based on resource blocks, allowing the LTE Layer 1 to adapt to various spectrum allocations. A resource block spans either 12 sub-carriers with a sub-carrier bandwidth of 15kHz or 24 sub-carriers with a sub-carrier bandwidth of 7.5kHz each over a slot duration of 0.5 ms.

The radio frame structure type 1 is used for FDD (for both full duplex and half duplex operation) and has a duration of 10 ms and consists of 20 slots with a slot duration of 0.5 ms. Two adjacent slots form one sub-frame of length 1 ms. The radio frame structure type 2 is used for TDD and consists of two half-frames with a duration of 5 ms each and containing each 8 slots of length 0.5 ms and three special fields (DwPTS, GP and UpPTS) which have configurable individual lengths and a total length of 1 ms. A sub-frame consists of two adjacent slots, except for sub-frames 1 and 6, which consist of DwPTS, GP and UpPTS. Both 5 ms and 10 ms switch-point periodicity are supported.

To support a Multimedia Broadcast and Multicast Service (MBMS), LTE offers the possibility to transmit Multicast/Broadcast over a Single Frequency Network (MBSFN), where a time-synchronized common waveform is transmitted from multiple cells for a given duration. MBSFN transmission enables highly efficient MBMS, allowing for over-the-air combining of multi-cell transmissions in the UE, where the cyclic prefix is utilized to cover the difference in the propagation delays, which makes the MBSFN transmission appear to the UE as a transmission from a single large cell. Transmission on a dedicated carrier for MBSFN with the possibility to use a longer CP with a sub-carrier bandwidth of 7.5 kHz is supported as well as transmission of MBSFN on a carrier with both MBMS transmissions and point-to-point transmissions using time division multiplexing.

Transmission with Multiple Input and Multiple Output antennas (MIMO) are supported with configurations in the downlink with two or four transmit antennas and two or four receive antennas, which allow for multi-layer transmissions with up to four streams.

Under Single-User MIMO, the base station allocates 1 or 2 streams to the selected user, in the case of Multi-User MIMO the allocation of different (1 or 2) streams is done to different users. This is supported in both UL and DL.

The physical channels defined in the downlink are:

- Physical Downlink Shared Channel (PDSCH);
- Physical Multicast Channel (PMCH);
- Physical Downlink Control Channel (PDCCH);
- Physical Broadcast Channel (PBCH);
- Physical Control Format Indicator Channel (PCFICH);
- Physical Hybrid ARQ Indicator Channel (PHICH).

The physical channels defined in the uplink are:

- Physical Random Access Channel (PRACH),
- Physical Uplink Shared Channel (PUSCH),
- Physical Uplink Control Channel (PUCCH).
- In addition, signals are defined as reference signals, primary and secondary synchronization signals.

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The modulation schemes supported in the downlink and uplink are QPSK, 16QAM and 64QAM.

The channel coding scheme for transport blocks in LTE is Turbo Coding as for UTRA, with a coding rate of R=1/3, two 8-state constituent encoders and a contention-free Quadratic Permutation Polynomial (QPP) turbo code internal interleaver. Trellis termination is used for the turbo coding. Before the turbo coding, transport blocks are segmented into byte aligned segments with a maximum information block size of 6144 bits. Error detection is supported by the use of 24 bit CRC.

There are several Physical layer procedures involved with LTE operation:

- Cell search;
- Power control;
- Uplink synchronization and Uplink timing control;
- Random access related procedures;
- HARQ related procedures.

Through the control of physical layer resources in the frequency domain as well as in the time and power domain, implicit support of interference coordination is provided in LTE.

See TS 36.201 and TS 36.211 for more information.

5.1.4 Mobility and Radio Resource Management

Radio characteristics are measured by the UE and the eNode-B and reported to higher layers in the network. These include, e.g. measurements for intra- and inter-frequency handover, inter RAT handover, timing measurements and measurements for RRM.

Measurements for inter-RAT handover are defined in support of handover to GSM, UTRA FDD and UTRA TDD.

Measurements to be performed by a UE for mobility are classified in at least three measurement types:

- Intra-frequency E-UTRAN measurements;
- Inter-frequency E-UTRAN measurements;
- Inter-RAT measurements for UTRAN and GERAN.

In E-UTRAN RRC_CONNECTED state, network-controlled UE-assisted handovers are performed and various DRX cycles are supported.

E-UTRAN supports radio access network sharing based on support for multi-to-multi relationship between E-UTRAN nodes and EPC nodes (S1-flex).

Service-based redirection between GERAN / UTRAN and E-UTRAN is supported in both directions.

E-UTRAN mechanisms to support idle and active mode mobility between E-UTRAN and cdma2000 HRPD or 1XRTT.

5.1.5 Support for self configuration and optimization

Self-configuration process is defined as the process where newly deployed nodes are configured by automatic installation procedures to get the necessary basic configuration for system operation.

This process works in pre-operational state. Pre-operational state is understood as the state from when the eNB is powered up and has backbone connectivity until the RF transmitter is switched on.

Self-optimization process is defined as the process where UE & eNB measurements and performance measurements are used to auto-tune the network.

This process works in operational state. Operational state is understood as the state where the RF interface is additionally switched on.

5.1.6 System Architecture Evolution

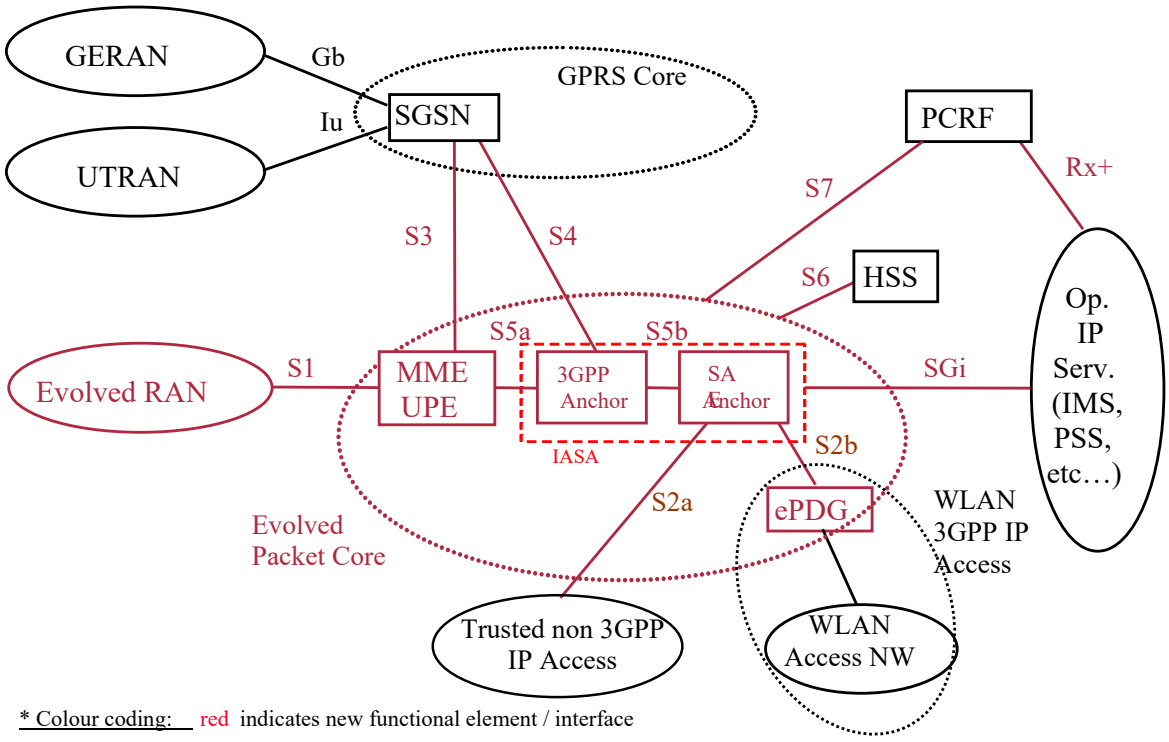
SA2 started its own Study on System Architecture Evolution (SAE) whose objective was "to develop a framework for an evolution or migration of the 3GPP system to a higher-data-rate, lower-latency, packet-optimized system that

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supports, multiple RATs. The focus of this work is on the PS domain with the assumption that voice services are supported in this domain". It was initiated when it became clear that the future is IP with everything (the All-IP Network (AIPN) - see TR 22.978), and that access to the 3GPP network would ultimately be not only via UTRAN or GERAN but by WiFi, WiMAX, or even wired technologies. Thus SAE has as its main objectives:

- Impact on overall architecture resulting from RAN's LTE work;
- Impact on overall architecture resulting from SA1's AIPN work;
- Overall architectural aspects resulting from the need to support mobility between heterogeneous access networks.

This figure from TR 23.882 shows the evolved system architecture, possibly relying on different access technologies:



Logical high level architecture for the evolved system

New reference points have been defined:

S1: It provides access to Evolved RAN radio resources for the transport of user plane and control plane traffic. The S1 reference point shall enable MME and UPE separation and also deployments of a combined MME and UPE solution.

S2a: It provides the user plane with related control and mobility support between a trusted non 3GPP IP access and the SAE Anchor.

S2b: It provides the user plane with related control and mobility support between ePDG and the SAE Anchor.

S3: It enables user and bearer information exchange for inter 3GPP access system mobility in idle and/or active state. It is based on Gn reference point as defined between SGSNs.

User data forwarding for inter 3GPP access system mobility in active state (FFS).

S4: It provides the user plane with related control and mobility support between GPRS Core and the 3GPP Anchor and is based on Gn reference point as defined between SGSN and GGSN.

S5a: It provides the user plane with related control and mobility support between MME/UPE and 3GPP anchor.

It is FFS whether a standardized S5a exists or whether MME/UPE and 3GPP anchor are combined into one entity.

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S5b: It provides the user plane with related control and mobility support between 3GPP anchor and SAE anchor. It is FFS whether a standardized S5b exists or whether 3GPP anchor and SAE anchor are combined into one entity.

S6: It enables transfer of subscription and authentication data for authenticating/authorizing user access to the evolved system (AAA interface).

S7: It provides transfer of (QoS) policy and charging rules from PCRF to Policy and Charging Enforcement Point (PCEP).
The allocation of the PCEP is FFS.

SGi: It is the reference point between the Inter AS Anchor and the packet data network. Packet data network may be an operator external public or private packet data network or an intra operator packet data network, e.g. for provision of IMS services. This reference point corresponds to Gi and Wi functionalities and supports any 3GPP and non-3GPP access systems.

The interfaces between the SGSN in 2G/3G Core Network and the Evolved Packet Core (EPC) will be based on the GTP protocol. The interfaces between the SAE MME/UPE and the 2G/3G Core Network will be based on the GTP protocol.

5.2 LTE – Physical Layer (LTE-Phys) UID_330018

Resources: R1

References

Document	Title/Contents
WID(s)	
RP-060630	WID on 3G Long Term Evolution – Physical Layer
Impacted Specifications	
TS 25.215	Physical layer; Measurements (FDD)
TS 25.225	Physical layer; Measurements (TDD)
New Dedicated Specifications/Reports	
TS 36.201	Evolved Universal Terrestrial Radio Access (E-UTRA); Long Term Evolution (LTE) physical layer; General description
TS 36.211	Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation
TS 36.212	Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding
TS 36.213	Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures
TS 36.214	Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer - Measurements

This work specifies the physical layer part of the 3G Long Term Evolution (3G LTE) including:

- Physical channels and mapping of transport channels
- Channel coding and physical channel mapping
- MIMO and transmit diversity
- MBMS functionality in physical layer
- Physical layer procedures
- Physical layer measurements
- UE physical layer capabilities

It includes also the verification of the performance of the 3G LTE physical layer.

Status report in RP-080741.

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5.3 LTE – Radio Interface Layer 2 and 3 Protocol Aspect (LTE-L23) UID_330019

Resources: R2

References

Document	Title/Contents
WID(s)	
RP-060630	R2 WID on 3G Long Term Evolution – Radio Interface Layer 2 and 3 Protocol Aspects
Impacted Specifications	
TS 25.302	Services provided by the physical layer
TS 25.304	User Equipment (UE) procedures in idle mode and procedures for cell reselection in connected mode
TS 25.331	Radio Resource Control (RRC); Protocol specification
New Dedicated Specifications/Reports	
TS 36.302	Evolved Universal Terrestrial Radio Access (E-UTRA); Services provided by the physical layer
TS 36.304	Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) procedures in idle mode
TS 36.306	Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio access capabilities
TS 36.314	Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Layer 2 - Measurements
TS 36.321	Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification
TS 36.322	Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Link Control (RLC) protocol specification
TS 36.323	Evolved Universal Terrestrial Radio Access (E-UTRA); Packet Data Convergence Protocol (PDCP) specification
TS 36.331	Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification

This work specifies the radio interface layer 2 and 3 protocol part of the 3G Long Term Evolution (3G LTE) including:

- Radio interface protocol architectures (including mobility solutions and self-optimisation of the E-UTRAN nodes)
- MAC, RLC, PDCP and RRC protocols
- UE capabilities

Status report in RP-080741.

5.4 LTE – eUTRAN Interfaces (LTE-interfaces) UID_330020

Resources: R3

References

Document	Title/Contents
WID(s)	
RP-060630	R3 WID on 3G Long Term Evolution – eUTRAN Interfaces
Impacted Specifications	
TS 25.413	UTRAN Iu interface Radio Access Network Application Part (RANAP) signalling
New Dedicated Specifications/Reports	
TS 36.401	Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Architecture description
TS 36.410	Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 layer 1 general aspects and principles
TS 36.411	Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 layer 1
TS 36.412	Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 signalling transport
TS 36.413	Evolved Universal Terrestrial Radio Access (E-UTRA) ; S1 Application Protocol (S1AP)
TS 36.414	Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 data transport
TS 36.420	Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 general aspects and principles
TS 36.421	Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 layer 1
TS 36.422	Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 signalling transport
TS 36.423	Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 Application Protocol (X2AP)
TS 36.424	Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 data transport

This work specifies the eUTRAN interfaces (currently S1 and X2) part of the 3G LTE including:

- Control plane protocols
- User plane protocols

RAN3 has ensured multi-vendor inter-operability and has considered aspects of self-optimization and self-configuration of the E-UTRAN nodes and possible impacts on eUTRAN interfaces.

Petitioners' Exhibit 1003, p. 147
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Status report in RP-080741.

5.5 LTE – RF Radio Transmission/Reception, System Performance Requirements and Conformance Testing (LTE-RF) UID_330021

Resources: R4

References

Document	Title/Contents
WID(s)	
RP-060630	WID on 3G Long Term Evolution – RF Radio Transmission/Reception, System Performance Requirements and Conformance Testing
Impacted Specifications	
TS 25.123	Requirements for support of radio resource management (TDD)
TS 25.133	Requirements for support of radio resource management (FDD)
New Dedicated Specifications/Reports	
TS 36.101	Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception
TS 36.104	Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception
TS 36.113	Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) and repeater ElectroMagnetic Compatibility (EMC)
TS 36.124	Evolved Universal Terrestrial Radio Access (E-UTRA); Electromagnetic compatibility (EMC) requirements for mobile terminals and ancillary equipment
TS 36.133	Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management
TS 36.141	Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) conformance testing
TR 36.942	Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Frequency (RF) system scenarios

This work specifies the radio transmission and reception performance requirements, RRM performance requirements and Base Station conformance testing part of the 3G LTE including:

- UE radio transmission and reception
- Base Station radio transmission and reception
- Base Station conformance testing
- Requirements for support of Radio Resource Management
- Selection of necessary combinations of bandwidth and frequency band to be standardised and their priority

Status report in RP-080741.

Petitioners' Exhibit 1003, p. 148
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5.6 LTE FDD repeaters (LTE-Repeaters) UID_370046

Resources: R4

References

Document	Title/Contents
WID(s)	
RP-070749	WID on LTE FDD repeaters
Impacted Specifications	
TS 25.113	Base station and repeater electromagnetic compatibility (EMC)
New Dedicated Specifications/Reports	
TS 36.106	E-UTRA FDD repeater transmission and reception (Corresponding to TS 25.106)
TS 36.143	E-UTRA repeater conformance testing (Corresponding to TS 25.143)

In UTRA, FDD repeaters have proven to be useful for coverage adjustments and interference mitigation.
This is expected to remain also in E-UTRA, however it may pose new or different requirements on the repeaters.
RAN4 has developed core and conformance specifications for LTE FDD repeaters.

Status report in RP-090037.

5.7 LTE – Terminal Conformance Test Specifications (LTE-UEConTest) UID_25029

Covers Testing for Feature UID_20068 (LTE)

Resources: R5

UID	Title	WID	Status Report	TS_TR
25029	**Rel-8 LTE – Terminal Conformance Test Specification**			
25041	**3G LTE – Terminal Protocol Conformance Test Specifications**	RP-080647	RP-091060	36.521-1, 36.521-2, 36.508, 36.509, 36.523-1, 36.523-2, 36.523-3
25042	**LTE – Terminal Radio Transmission and Reception Conformance Test Specifications**	RP-080601	RP-091059	36.521-1, 36.521-2, 36.521-3, new TR 36.903 (RP#50 v100 for Approval)

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5.8 E-UTRAN Data Definitions (E-UTRAN-OAM) UID_390001

Resources: S5

The E-UTRAN Data Definitions Building Block of the LTE Feature covers several independent Work Tasks as follows:

- E-UTRAN Network Resource Model (NRM) Integration Reference Point (IRP)
- Performance measurements for E-UTRAN
- Key Performance Indicators (KPIs) for E-UTRAN
- Subscriber and Equipment Trace for eUTRAN and EPC

5.8.1 E-UTRAN Network Resource Model (NRM) Integration Reference Point (IRP) UID_380036

References

Document	Title/Contents
WID(s)/Status Report	
SP-070738	WID on E-UTRAN Network Resource Model (NRM) Integration Reference Point (IRP)
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TS 32.761	Telecommunication management; E-UTRAN Network Resource Model (NRM) Integration Reference Point (IRP); Requirements
TS 32.762	Telecommunication management; E-UTRAN Network Resource Model (NRM) Integration Reference Point (IRP): Information Service (IS)
TS 32.763	Telecommunication management; E-UTRAN Network Resource Model (NRM) Integration Reference Point (IRP): Common Object Request Broker Architecture (CORBA) Solution Set (SS)
TS 32.765	Telecommunication management; E-UTRAN Network Resource Model (NRM) Integration Reference Point (IRP): Bulk CM eXtensible Markup Language (XML) file format definition

Supporting Individual Members: Ericsson, Huawei, Motorola, Nokia Siemens Networks, China Mobile, Nortel, T-Mobile, Telefonica, Vodafone, ZTE.

The E-UTRAN system is defined by 3GPP with different Network Elements from the UTRAN.
The Network Resource Model (NRM) of the UTRAN is not applicable to E-UTRAN.

The E-UTRAN system needs to be managed. 3GPP network management paradigm necessitates the standardization of the representations of various managed resources. The standardization of the E-UTRAN system managed resources is captured in the so-called E-UTRAN Network Resource Model (NRM).

The E-UTRAN architecture and capabilities evolve from those defined for UMTS. The management of the E-UTRAN system should also evolve from that for managing UMTS. In particular, the NRM for E-UTRAN should align and resemble those specified for UTRAN network resources.

The alignment of E-UTRAN NRM with UTRAN NRM leads to the following benefits:

- The system architecture of E-UTRAN evolves from UTRAN and the existing UTRAN NRM is proven in operation. Therefore, the alignment will result in a specification that has a higher chance of being bug-free when compared to a "brand new" designed specification.
- It will minimise both the standardization and product development efforts and maintenance efforts (i.e. the cost and time for development including testing and reduction of training cost when the management paradigms for E-UTRAN and UTRAN remained similar);
- It will shorten the time to market for E-UTRAN system;
- It will facilitate a seamless coexistence with UMTS management systems.

TS 32.76x-series define the E-UTRAN NRM IRP using the same principles as for the UTRAN NRM.
It has identical characteristics as those defined for other NRMs such as UTRAN/GSM NRM(s).
The DN of its instances uses the same name convention as all instances whose IOCs are defined in various NRM IRPs.
Its IOCs integrate identically with other NRM (e.g. UMTS/GSM NRM IRP) with the IOCs defined in Generic NRM IRP.

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5.8.2 Performance measurements for E-UTRAN UID_390002

References

Document	Title/Contents
WID(s)/Status Report	
SP-080062	WID on Performance measurements for E-UTRAN
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TS 32.425	Telecommunication management; Performance Management (PM); Performance measurements E-UTRAN

Supporting Individual Members: Motorola, Huawei, Vodafone, Nortel, ZTE, T-Mobile, Nokia Siemens Networks, CMCC,
Telecom Italia, Orange, Ericsson, Telefonica.

The E-UTRAN system is defined by 3GPP with different Network Elements from the UTRAN, and the interfaces between Network Elements and signalling over the interfaces are also different from the UTRAN.
The performance measurements of the UTRAN are not applicable to E-UTRAN.

The E-UTRAN system needs to be managed. Performance measurements are the basic data for Performance Management (PM), and also the supporting data for the SON (Self Organizing Networks) functionalities.

Each of the E-UTRAN performance measurements shall be motivated by the use case or requirement for PM or SON.
For PM, the use case or requirement for each proposed performance measurement is in the scope of this WI.
For SON, the use case or requirement is out of the scope of this WI.
This WI defines only the E-UTRAN performance measurements which are clearly stated as mandatory over Itf-N.
In case of SON use cases, requirements or solutions are covered by other SA5 WIs on SON (UID_390004).

The E-UTRAN architecture and capabilities evolved from those defined for UMTS. The management of the E-UTRAN system should also evolve from that for UMTS. In particular, the PM IRP is reused for E-UTRAN Performance Management. So the performance measurement definition for E-UTRAN is managed via PM IRP, i.e. the performance measurement definition has a consistent format which can be collected and monitored via PM IRP.

TS 32.425 defines E-UTRAN performance measurements to be transferred over Itf-N supporting PM or SON:

1. Only the performance measurements necessary to be transferred over Itf-N are in the scope of this WI; but includes if necessary E-UTRAN performance measurements for other management interfaces (e.g. Itf-P2P).
2. This WI covers the performance measurements for macro eNodeB and home eNodeB.
3. The E-UTRAN performance measurements are defined in a top-down approach. Each measurement definition has at least one supporting use case or requirement agreed before being inserted into the TS.
   For PM purpose in E-UTRAN, the related use case or requirement was agreed under this WI.
   For SON purpose in E-UTRAN, this WI only defines the related E-UTRAN performance measurements which are clearly stated as mandatory over Itf-N in the SON use cases, requirements or solutions, which are covered by other SA5 WIs on SON (UID_390004).

The performance measurements have identical characteristics as those defined for other network domains such as UTRAN, CN, IMS, etc.
The performance measurement definition follows the same concept and requirements addressed in TS 32.401.
The performance measurement definition follows the same definition and template addressed in TS 32.404.

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5.8.3 Key Performance Indicators (KPIs) for E-UTRAN UID_390003

References

Document	Title/Contents
WID(s)/Status Report	
SP-080063	WID on Key Performance Indicators (KPIs) for E-UTRAN
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TS 32.450	Telecommunication management; Key Performance Indicators (KPI) for E-UTRAN: Definitions
TS 32.451	Telecommunication management; Key Performance Indicators (KPI) for E-UTRAN: Requirements

Supporting Individual Members: Ericsson, China Mobile, Nokia Siemens Networks, Telefonica, Vodafone, Telecom Italia, T-Mobile, Nortel.

Performance Management (PM) is important for operators to manage their radio networks. For the competitiveness of E-UTRAN as a technology it is essential that PM provides the operator an indication of the E-UTRAN Network Elements (NE) performance. End-user perception of service availability and quality should be taken into account.

TS 32.450, TS 32.451 define a set of KPIs for performance evaluation of E-UTRAN NEs' in line with TR 32.816 and the following; KPIs shall:

- show the performance of a E-UTRAN NE, not how the implementation in the NE works;
- be of value to the operator in terms of improving network performance, thereby enabling enhanced end-user perception;
- be based on well described use cases;
- be based on information available on standardized interfaces;
- be standardized either by using a formula or on a high level by using a textual description;

Examples of E-UTRAN KPI categories relevant for standardization:
- Accessibility (see definition in ITU-T E.800);
- Retainability (see definition in ITU-T E.800);
- Integrity (see definition in ITU-T E.800); this contains the connection quality related KPIs;
- Mobility (this contains the Handover related KPIs);
- Utilization (this contains KPIs related to what extent available E-UTRAN resources are utilized);
- Availability (this contains KPIs that indicate the availability of the RAN towards UEs for access).

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5.8.4 Subscriber and Equipment Trace for eUTRAN and EPC UID_370001

References

Document	Title/Contents
	WID(s)/Status Report
SP-070617	WID on Subscriber and Equipment Trace for eUTRAN and EPC
	Impacted Specifications
TS 32.421	Telecommunication management; Subscriber and equipment trace; Trace concepts and requirements
TS 32.422	Telecommunication management; Subscriber and equipment trace; Trace control and configuration management
TS 32.423	Telecommunication management; Subscriber and equipment trace; Trace data definition and management
TS 32.441	Telecommunication management; Trace Management Integration Reference Point (IRP): Requirements
TS 32.442	Telecommunication management; Trace Management Integration Reference Point (IRP): Information Service (IS)
TS 32.443	Telecommunication management; Trace Management Integration Reference Point (IRP): Common Object Request Broker Architecture (CORBA) Solution Set (SS)
TS 32.445	Telecommunication management; Trace Management Integration Reference Point (IRP): eXtensible Markup Language (XML) file format definition
	New Dedicated Specifications/Reports
-	-

Supporting Individual Members: Ericsson, NSN, Huawei, Nortel, China Mobile, Vodafone, T-Mobile.

The use cases for the existing Subscriber and Equipment trace are valid also for eUTRAN and EPC. Therefore the existing Subscriber and Equipment Trace function and IRP need to include the eUTRAN and EPC nodes and interfaces as well as new requirements from TR 32.816 (Study on Management of LTE and SAE).
Work is also needed in RAN3, CT1, CT4.

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5.9 Self-Organizing Networks (SON) (LTE_SON-OAM) UID_390004

Resources: S5

Supporting Individual Members: T-Mobile, Vodafone, Telefonica, Telecom Italia, Huawei, China Mobile, Ericsson, Motorola, Nokia Siemens Networks, Nortel, Orange, TeliaSonera, ZTE

The Self-Organizing Networks (SON) Building Block of the LTE Feature contains the following Work Tasks:

- SON Concepts and requirements
- Self-Establishment of eNBs
- SON Automatic Neighbour Relations (ANR) List Management

Main drivers for Self-Organizing Networks (SON) are:

- The number and structure of network parameters have become large and complex
- Quick evolution of wireless networks has led to parallel operation of 2G, 3G, EPC infrastructures
- The rapidly expanding number of Base Stations needs to be configured and managed with the least possible human interaction

SON is part of 3GPP Rel-8 and the ongoing work in TSG RAN needs OAM support.
SON use cases are part of the SA5 TR 32.816 Study on management of E-UTRAN and EPC.
The SA5 Rel-8 work on E-UTRAN NRM (UID_380036) is not covering application-specific operations.
Co-ordinated work on **ALL** aspects of SON, including management requirements resulting from TSG RAN, is needed.
A higher level work item is needed for SON-related requirements and results within SA5.

5.9.1 SON Concepts and requirements UID_390104

References

Document	Title/Contents
WID(s)/Status Report	
SP-080275	WID on Self-Organizing Networks (SON)
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TS 32.500	Telecommunication management; Self-Organizing Networks (SON); Concepts and requirements

Supporting Individual Members: T-Mobile, Vodafone, Telefonica, Telecom Italia, Huawei, China Mobile, Ericsson, Motorola, Nokia Siemens Networks, Nortel, Orange, TeliaSonera, ZTE.

TS 32.500 covers:

- SON requirements for OAM;
- Infrastructure for SON in the OAM system;
- Self-configuration, Self-Optimization and self-healing, Neighbour Relation handling (intra-E-UTRAN, 2G, 3G);
- Defines the necessary Interface IRPs.

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5.9.2 Self-Establishment of eNBs UID_390005

References

Document	Title/Contents
WID(s)/Status Report	
SP-080849	WID on Self-Establishment of eNBs
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TS 32.501	Telecommunication management; Self-Configuration of Network Elements; Concepts and Integration Reference Point (IRP) Requirements
TS 32.502	Telecommunication management; Self-Configuration of Network Elements Integration Reference Point (IRP); Information Service (IS)
TS 32.531	Telecommunication management; Software management; Concepts and Integration Reference Point (IRP) Requirements
TS 32.532	Telecommunication management; Software management Integration Reference Point (IRP); Information Service (IS)
TS 32.533	Telecommunication management; Software management Integration Reference Point (IRP); Common Object Request Broker Architecture (CORBA) Solution Set (SS)

Supporting Individual Members: Nokia Siemens Networks, Ericsson, Huawei, T-Mobile, Vodafone, Nortel, Motorola, ZTE, Telefonica, Telecom Italia, China Mobile, Motorola, Orange, TeliaSonera.

This work standardizes the functions required in LTE for an automated establishment of new eNBs into the network. This WI does not refer to HNB.
This WI has a strong link with the WIs on E-UTRAN NRM IRP (UID_390001) and EPC NRM IRP (UID_390010).

Self-configuration includes an automated establishment of IP connectivity between the eNB and the Element Manager, an automated download of software and an automated download of radio and transport configuration data. It may also include an automatic setup of X2 and S1 interfaces. Appropriate security mechanisms are needed. Newly established eNBs might also perform self-test and send out reports about the results.

This work defines:

1. Management reference model supporting this use case;
2. Requirements;
3. Elements for NRM IRPs;
4. Interface IRPs for the interaction patterns on open interfaces;
5. Security mechanisms;
6. Mechanisms for software download related to self-establishment;
7. Reports of self-test results.

TS 32.501 covers concepts and requirements for Self-establishment of eNodeBs.

TS 32.502 contains the Stage 2 for Self-establishment of eNodeBs.

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5.9.3 SON Automatic Neighbour Relations (ANR) List Management UID_390006

References

Document	Title/Contents
	WID(s)/Status Report
SP-080066	WID on SON Automatic Neighbour Relations (ANR) List Management
	Impacted Specifications
TS 32.761	Telecommunication management; E-UTRAN Network Resource Model (NRM) Integration Reference Point (IRP); Requirements
TS 32.762	Telecommunication management; E-UTRAN Network Resource Model (NRM) Integration Reference Point (IRP): Information Service (IS)
TS 32.763	Telecommunication management; E-UTRAN Network Resource Model (NRM) Integration Reference Point (IRP): Common Object Request Broker Architecture (CORBA) Solution Set (SS)
TS 32.765	Telecommunication management; E-UTRAN Network Resource Model (NRM) Integration Reference Point (IRP): Bulk CM eXtensible Markup Language (XML) file format definition
	New Dedicated Specifications/Reports
TS 32.511	Telecommunication management; Self-Organizing Networks (SON); Automatic Neighbour Relation (ANR) management; Concepts and requirements

Supporting Individual Members: Ericsson, Huawei, T-Mobile, China Mobile, Motorola, Nokia Siemens Networks, Nortel, Orange, Telefonica, TeliaSonera, Vodafone, ZTE.

In the context of LTE, it is necessary to automate, as much as possible, the discovery of neighbour relations.
The goal is to reduce the reliance on traditional configuration methods (e.g. manual configuration, configuration by planning tools in GSM case) in the context of growing complexity and scale of the new generation of mobile networks.

The Automatic Neighbour Relation (ANR) function includes the relations to LTE cells on other eUTRAN frequencies and 2G and 3G cells.

The objectives are to identify and define functions that collectively, support the automation of neighbour relations discovery and, to identify the actors of this automation and to define necessary open interfaces among various identified functions and actors.

This automation is not a replacement of the "traditional configuration methods", which must work together in a way that operators remain in control of the degree of automation and "traditional configuration methods" involved.

This work:

- Defines use cases;
- Identifies actors and defines various functional blocks that collectively support the subject automation;
- Identifies interfaces where standardization is required;
- Defines necessary security mechanisms.

TS 32.511 covers concepts and requirements for Automatic Neighbour Relation (ANR) management.

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6 Home NodeB / eNodeB

UID	Name	Acronym	Resource	Hyperlink
380065	Home NodeB / eNodeB	HomeNB	S1,C1,C4	SP-070952
390033	UTRA HNB	HNB	RP,S5	not applicable

6.1 Home NodeB / eNodeB (HomeNB) UID_380065

Resources: S1,C1,C4

UID	Name	Resource	Hyperlink	TS_TR
380065	Home NodeB / eNodeB	S1,C1,C4	SP-070952	-
380066	**Stage 1 for Home NodeB / eNodeB**	S1	SP-070952	22.011, 22.115
420019	**Support of Closed Subscriber Group (CSG)**	C4	non-existent	29.002, 29.272, 23.008, 23.003
410012	**CSG and Idle Mode Mobility for LTE Home eNodeB**	C1	CP-080498	23.122, 24.301, 24.801, 24.285
410013	**CSG and Idle Mode Mobility for 3G Home NodeB**	C1	CP-080792	23.122, 24.008, 24.285

6.1.1 Stage 1 for Home NodeB / eNodeB UID_380066

Resources: S1

UID	Name	Resource	Hyperlink	Notes	TS_TR
380066	**Stage 1 for Home NodeB / eNodeB**	S1	SP-070952	SP#39 completed	22.011, 22.115

Supporting Individual Members: Vodafone, T-Mobile, Motorola, Telecom Italia Mobile, SK Telecom, Samsung, SHARP, TOSHIBA , Fujitsu, NEC, Huawei, TeliaSonera, Alcatel-Lucent.

There is ongoing work in several 3GPP groups (e.g. RAN2, RAN4, CT1, SA3) on specifying Home NodeB and Home eNodeB (e.g. TR 25.820, TS 36.300).

"Home NodeB and Home eNodeB" refer to the deployment as small UTRA and E-UTRA cells, respectively, in domestic, small office and similar environments. The Home Node B/eNodeB interconnects with the 3G core / Evolved Packet Core (EPC) over a fixed broadband (e.g. DSL, Cable, etc.) access network.

Although many of the existing service requirements for NodeB and eNodeB access apply equally to Home NodeB/eNodeB, additional service requirements may also be needed to address e.g. security, quality, charging and access restrictions resulting from the envisaged deployment scenarios. It is expected that Home NodeB and Home eNodeB will have common requirements.

As there are ongoing trials of Home NodeBs using non-standardized solutions, this work develops common and, when needed, specific requirements for both Home NodeB/eNodeB access systems. The derived requirements support related ongoing work in other 3GPP TSGs.

Initial work focussed on reviewing this topic, drawing upon the work on SoLSA, with a view to identifying modifications to existing specifications.

Consideration was given to service requirements for e.g.:

- Home NodeB UTRA access to 3G services;
- Home eNodeB E-UTRA access to Evolved Packet System services;
- Support for Closed Subscriber Groups (CSG);
- Support of Emergency Calls;
- OAM Issues;
- Localization of Home NodeB/eNodeB to comply with Radiocommunications license conditions;
- Localization of Home NodeB/eNodeB to comply with Emergency call requirements;
- Authentication of Home NodeB/eNodeB.

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Service requirements for both UTRA an E-UTRA access for Home NodeB/eNodeB take into account access capabilities and possible limitations e.g. QoS and bandwidth restrictions. Particular attention was given to the operation of the equipment in accordance with the licence granted to the PLMN operator.

MMI-Aspects - the need for possible deployment requirements (e.g. plug&play) and remote configuration by the PLMN operator, and degree of control appropriate for the user of the Home Node B/eNodeB were considered.

Consideration was given to differential charging for different classes of subscriber e.g. the owner of the Home NodeB/eNodeB and authorized ‘visiting guest' subscribers.

6.1.2 Support of Closed Subscriber Group (CSG) UID_420019

Resources: C4

UID	Name	Resource	Hyperlink	Notes	Impacted_TS_TR
420019	**Support of Closed Subscriber Group (CSG)**	C4	non-existent	CP#43 completed. SP#42 SP-080874 22.011CR0141 confirmed Requirement to support roaming subscribers with CSG home network subscription but did NOT confirmed requirement for home network independent support of roamers in CSG	29.002, 29.272, 23.008, 23.003

At SP#42 SP-080874 22.011CR0141 confirmed the Requirement to support roaming subscribers with CSG home network subscription but did NOT confirmed requirement for home network independent support of roamers in CSG.

This impacted the following CT4 specifications: TS 23.003, TS 23.008, TS 29.002 and TS 29.272.

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6.1.3 CSG and Idle Mode Mobility for LTE Home eNodeB UID_410012

Resources: C1

UID	Name	Hyperlink	Notes	TS_TR
410012	**CSG and Idle Mode Mobility for LTE Home eNodeB**	CP-080498	CP#43 completed	23.122, 24.301, 24.801, 24.285

6.1.4 CSG and Idle Mode Mobility for 3G Home NodeB UID_410013

Resources: C1

UID	Name	Hyperlink	Notes	TS_TR
410013	**CSG and Idle Mode Mobility for 3G Home NodeB**	CP-080792	CP#43 completed	23.122, 24.008, 24.285

Supporting Individual Members: Huawei, Qualcomm, T-Mobile, Vodafone, Telecom Italia, ZTE, Alcatel-Lucent.

Linked work items

SA3	Study on Home (e)NodeB Security (UID_380085)
RAN4/3/2	Study on 3G Home NodeB/eNodeB (UID_350039)
RAN3	UTRAN architecture for 3G HNB (UID_40054)
RAN2	Support of UTRA HNB (UID_400053)
RAN4	Study on 3G Home NodeB/eNodeB (UID_350039)
SA5	Study of Self-Organizing Networks (SON) related OAM interfaces for Home NodeB (UID_360007)

SA1 has completed the service requirements for LTE Home NodeB (HeNB) in the scope of Rel-8. A single standardized solution gives operators a true multi-vendor environment for both terminals and infrastructure.

Architecture and protocols are developed in several WGs e.g. RAN2, RAN3, RAN4, SA3, SA5 (see linked WIs).

These can be deployed as small (E-)UTRA cells in domestic and Small Office Home Office (SoHo) environments.
The 3G HNB interconnects with the 3G core network over a fixed broadband (e.g. DSL, Cable, etc.) access network via a HNB access gateway (concentrator).
The HeNB interconnects with the EPC core over a fixed broadband (e.g. DSL, Cable, etc.) access network.

RAN4 TR 25.820 (3G Home NodeB Study Item Technical Report) concluded that HNB introduction would have detrimental effects on legacy mobiles (e.g. battery life) and legacy system performance (MM signalling), Closed Subscriber Group (CSG) functionality is required to mitigate some of these aspects and improve the system performance as the number of Rel-8 mobile population grows.
On 3G HNB, CT defined a basic mechanism to support the CSG concept and idle mode mobility to/from CSG cells.

For HeNB deployment, there are no legacy issues like for Home NodeB (HNB) deployment in UMTS. It is thus expected that more optimized solutions for support of CSG HeNBs would be developed by 3GPP TSG CT. If this functionality is not provided in E-UTRAN in Rel-8 then E-UTRAN will have the same legacy problems in Rel-9 as GSM and UMTS have had in the past when SoLSA and HNB have been introduced.

Objective

One of the main issues with the deployment of HNBs in an existing UMTS network is to maintain backward compatibility of pre-Rel-8 terminals in a UMTS network supporting HNBs.
Hence, the work specific to 3G HNB was restricted by the requirement to reuse as much as possible legacy procedures.
CT looked at the CSG concept and the terminal Idle Mode mobility to/from macro 3G cell from/to CSG.

The design of the new EPC takes into account the requirement to support the CSG concept for HeNBs leading to a more integrated solution for HeNB support in LTE than in UMTS. The CT work:

- Defines the usage of CSG id at NAS layer at the UE side and at network side
- Defines a CSG white list to indicate the CSGs to which a UE has access
- Provides required signalling and mechanisms for LTE CSG white list configuration and management.
- Defines the idle mode mobility procedures to/from macro LTE cell from/to LTE CSG in terms of HeNB validation at CN level.

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6.2 UTRA HNB UID_390033

Resources: R2,R3,R4,S5

UID	Name	Acronym	Resource	Hyperlink
390033	**UTRA HNB**	HNB	RP,S5	not applicable
400053	**Support of UTRA HNB**	HNB-supp	R2	RP-080752
400054	**UTRAN Architecture for 3G HNB**	HNB-arch	R3	RP-080487
390034	**FDD Home NodeB RF requirements**	HNB-RF	R4	RP-080971
430023	Conformance Test Aspects – UTRA HNB (FDD)	HNB-UEConTestFDD	R5	RP-090023
420037	**3G Home NodeB OAM&P Type 1 Management Interface**	HNB-3G_OAM	S5	SP-080708

6.2.1 Support of UTRA HNB UID_400053

Resources: R2

UID	Name	Hyperlink	Status_Report	Notes	TS_TR
400053	**Support of UTRA HNB**	RP-080752	RP-090040	RP#43 completed	25.304, 25.306, 25.331, new 25.367

Supporting Individual Members: Huawei, T-Mobile Intl, TeliaSonera, Telecom Italia, Qualcomm.

RAN2 study on legacy Home NB support for UTRA [R2-075466] concluded that the presently available mechanisms for legacy mobile mobility for UTRA Home NB deployments are not optimal and hence require compromises in deployment. In the case where UTRA and LTE Home NB deployment reach dense levels the effect on RAN & CN signalling load, UE performance and finally UE battery life may become significant.

By implementing specific mobility procedures in Rel-8 mobiles to support a CSG like cell concept, it should be possible to obviate the disadvantages posed by UTRA Home NB deployments for Rel-8 mobiles. As the percentage of Rel-8 mobiles population grows, the signalling load on the network will diminish and user experience can be enhanced.

The work specifies enhanced Rel-8 UTRA IDLE mode mobility and to consider enhancements to the ACTIVE mode mobility in order to support the CSG like cell concept (UTRA and LTE).

RAN2 investigated the adoption of agreed LTE CSG like concepts for UTRA. It is important that legacy mechanisms for UTRA Home NB co-exist with the concepts chosen by this WI to ensure pre-Rel-8 UTRAN UE are supported. The optimization of UTRA Home NB concepts for the support of legacy terminals was not excluded.

For Rel-8 the following were considered:

- Support of CSG (Closed Subscriber Group or restricted association)
- Minimize the impact to UEs camped on UTRA macro cells
- Minimize the impact to UEs in CELL_DCH on UTRA macro cells
- Cell selection/reselection from UTRA macro cell to UTRA Home NB
- Cell selection/reselection from UTRA Home NB to UTRA
- Cell selection/reselection of UEs between UTRA Home NBs
- Handover of ACTIVE UE from UTRA Home NB to UTRA macro cell
- Cell selection/reselection from UTRA Home NB to GERAN macro cell

If there is a technical need (e.g. to limit excessive interference) the following objectives were envisaged

- Handover of ACTIVE UE from macro UTRA cell to UTRA CSG Home NB in coverage of UTRA Home NB
- Support of semi-open access operation (or signalling association) where a UE can exchange signalling and limited data on non suitable UTRA Home NB

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6.2.2 UTRAN Architecture for 3G HNB UID_400054

Resources: R3

UID	Name	Hyperlink	Status_Report	Notes	TS_TR
400054	**UTRAN Architecture for 3G HNB**	RP-080487	RP-090042	RP#42 completed	25.401, 25.410, 25.412, 25.413, 25.414, 25.415, new (25.467, 25.468, 25.469)

Supporting Individual Members: Alcatel-Lucent, Kineto, Nokia Siemens Networks, Nokia, Huawei, Telefonica, NEC, Motorola, TeliaSonera, Samsung, Vodafone, TIM, T-Mobile, AT&T.

RAN3 Study on deployment of 3G Home Node B in UTRAN concluded that the support of the 3G Home Node B could be ensured in principle within the framework in the UTRAN architecture defined in TS 25.401, with the support of pre-Rel-8 UEs and Core Networks. It was also concluded that new functions such as the HNB Registration and UE Registration would be supported via the new protocol Home NodeB Application Protocol (HNBAP) between the 3G HNB and HNB-GW.

However, [R3-081588] lists a number of possible alternatives for the definition of the protocol stacks at the Iuh interface (between the 3G HNB and the 3G HNB-GW), and reports that the functional split between 3G HNB and 3G HNB-GW for the legacy UTRAN functions remains for further study, as well as the HNB-GW Discovery procedure.

This work

- specifies an architecture for 3G HNB access, comprising
  - a reference network architecture
  - an exhaustive list of new HNB specific functions together with the definition of the functional split between the 3G HNB and the 3G HNB-GW.
- defines and specifies the Iuh interface between the 3G HNB and the 3G HNB-GW comprising
  - the signalling transport with the aim to reduce the number of alternatives considered in section 7.3 in TR 25.820 for the signalling transport protocol stack at the Iuh interface (between the 3G HNB and the 3G HNB-GW), in any "CN" (CS/PS/BC) domain, a single solution (i.e. no alternatives) shall be specified for 3G HNBs of the new Home NodeB BS class which is expected to be specified by RAN4. The use of this architecture for Home Node B operating in unrestricted access mode shall not be precluded as per SA1 requirements
  - the user data transport- the C-plane functions (e.g. HNB Registration and UE Registration).
- specifies the HNB-GW Discovery procedure mentioned in [R3-081588]
- specifies the impacts of the HNB (auto)-configuration aspects on the UTRAN signalling.

RAN3 liaised for feedback based on the RAN3 agreed architecture and functions for 3G HNB with:

- SA1 for service aspects
- SA2 for the general architectural aspects
- SA3 for security aspects
- SA5 for configuration aspects
- RAN2 for mobility and access control aspects
- RAN4 for radio aspects
- CT1 for the use of NAS message in the various access control mechanisms

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6.2.3 FDD Home NodeB RF requirements UID_390034

Resources: R4

UID	Name	Hyperlink	Status_Report	Notes	TS_TR
390034	**FDD Home NodeB RF requirements**	RP-080971	RP-090041	RP#43 completed	25.104, 25.141, new 25.967

Supporting Individual Members: Motorola, T-Mobile International, Nokia Siemens Networks, NEC, Alcatel-Lucent.

Within the course of increasing UMTS terminal penetration and Fixed-Mobile Convergence, an upcoming demand for 3G Home NodeBs is observed to provide attractive services and data rates in the home environment.

UTRAN is not optimally suited for this application as UTRAN was developed and defined under the assumption of coordinated network deployment whereas home NodeBs are typically associated with uncoordinated and large scale deployment.

This work amends the UTRAN NodeB related RF specifications as proposed in TR 25.820 to support the Home NodeBs application. The scope of this work is limited to the UTRA FDD mode.

TR 25.820 on Home (e)NodeB feasibility concluded on RAN4 related matters that:

- Home NodeBs will not significantly degrade the performance of networks deployed in other channels.
- Dedicated carrier deployment of Home Node B's is feasible for both open and closed subscriber group systems in a wide range of deployment configurations.
- Co-channel carrier deployment of Home Node B's is feasible for both open and closed subscriber group systems. However, especially in the case of CSG there will be an increased level of interference relative to dedicated deployment; interference mitigation techniques have been studied to reduce this.
- Home Node Bs can provide reasonable performance whether deployed in isolation or whether multiple Home Node Bs are deployed in the same area. However, in high density deployments, techniques may be needed to mitigate inter-HNB interference.
- Home Node Bs can be engineered to radiate only when it is confirmed that such an emission complies with regulatory requirements in force where that Home NodeB is operating.
- Home NodeBs can support UE speeds up to 30 km/h.

6.2.3.1 Conformance Test Aspects – UTRA HNB (FDD) UID_430023

Resources: R5

UID	Name	Hyperlink	Status_Report	Notes	TS_TR
430023	**Conformance Test Aspects – UTRA HNB (FDD)**	RP-090023	RP-100482	RP#48 completed	34.108, 34.123-1, 34.123-2, 34.123-3

RAN2 study on legacy Home NB support for UTRA [R2-075466] concluded that the available mechanisms for legacy mobile mobility for UTRA Home NB deployments are not optimal and hence require compromises in deployment.
In case UTRA Home NB deployment reaches dense levels the effect on RAN and CN signalling load, UE performance degradation and UE battery life reduction may become significant.
Core specifications have therefore been enhanced for Rel-8 to support UTRA HNB by introducing the Closed Subscriber Group (CSG) concept for access and mobility control.
Corresponding work on the related UE conformance testing is now needed.

Impacted core specifications relevant for RAN5 test specifications for UTRA HNB (FDD) are:

TS 25.304	User Equipment (UE) procedures in idle mode and procedures for cell reselection in connected mode
TS 25.331	Radio resource control (RRC) protocol specification
TS 25.367	Mobility Procedures for Home NodeB (Stage 2)

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6.2.4 3G Home NodeB OAM&P (type 1 definition) UID_420037

Resources: S5

UID	Name	Hyperlink	Notes	TS_TR
420037	**3G Home NodeB OAM&P Type 1 Management Interface**	SP-080708	SP#44 completed	new (32.581, 32.582, 32.583, 32.584)

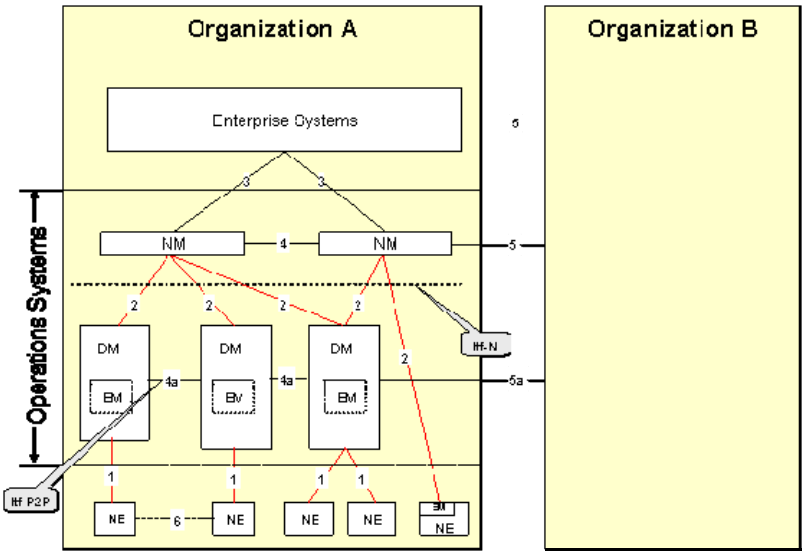
Supporting Individual Members: Huawei , Nokia Siemens Networks, Ericsson, Vodafone, T-Mobile, Telefonica, Alcatel-Lucent, IPAccess, China Mobile, Telecom Italia, Airvana, Motorola, ZTE, Qualcomm, Samsung.

SA5 provided OAM solution for 3G HNB complementing work in the Broadband Forum and 3GPP TSG RAN. SA5 standardized management services specific to HNB along the following:

- Quantity of HNB is likely to be large
- There may be many HNB vendors
- HNB may be purchased easily by end-users in market
- Location of HNB could be in a private residence which may not be accessible for frequent on-site maintenance

SA5 studied HNB OAM and SON aspects. The management differences between HNB and macro NodeB are listed in TR 32.821 (Study of Self-Organizing Networks (SON) related OAM Interfaces for HNB). TR32.821 lists requirements for managing HNB and the consequences on the management interface for HNB.

SA5 agreed to standardize the interfaces type 1 and 2 for Home NodeB OAM&P shown in the following figure. However, standardization of management on interface type 2 is not covered in Rel-8.



This work provides the OAM solution for 3G HNB on interface type 1 management. The work includes:

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7 IP Multimedia Subsystem (IMS)

UID	Name	Acronym	Resource	Hyperlink
370025	IMS Centralized Service Control (ICSRA)	ICSRA	S1,S2,C1,C3,C4	SP-070924
370059	IMS Multimedia Telephony and Supplementary Services	IMSTSS	S1,S5,C1,C3,C4	-
390035	3GPP2 Input to Common IMS	CIMS_3GPP2	S1,S2,S3,C1,C3,C4	SP-080220
350005	IMS Enhancements for support of Packet Cable access	PktCbl	S2,S3,C1,C3,C4	-
360012	IMS System enhancements for corporate network access	IMS_Corp	S2,S1,C1,C4	SP-080095
380069	Maintenance of TISPAN documentation	MAINTISP	S2,C1,C3,C4	-
390056	IMS Service Continuity	IMS-Cont	S2,S1,C1	SP-080092
370078	Security Enhancements for IMS	IMS-Sec	S3,C1,C4	SP-070496
34046	IMS initiated and controlled PSS and MBMS User Service	IMS_PSS_MBMS_US	S4,S3	SP-080201
713024	Multimedia interworking between IMS and CS networks	MIW-IMS	C3,C4	CP-070729
360029	IMS Stage 3 IETF Protocol Alignment	IMSProtoc2	C1	CP-080794
380014	Interworking between User-to-User Signalling (UUS) and SIP	UUSIW	C1,C3	CP-070782
380018	Support of Overlap signalling	Overlap	C3,C1,C4	CP-070731
380035	AS/MRFC Stage 2 and 3	MRFC_TS	C1	CP-070784
400012	IMS Restoration Procedures	IMS_RP	C4,C1	CP-080447
410003	IMS Application Server Service Data Descriptions for AS interoperability	IMS_ASIO	C4	CP-080451

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7.1 IMS Centralized Service Control (ICSRA) UID_370025 (open IETF)

Resources: S1,S2,C1,C3,C4,IETF

References

Document	Title/Contents
WID(s)	
SP-070924	S1 WID on IMS Centralized Service Control - Requirement and Architecture (ICSRA)
CP-080492	CT WID on IMS Centralized Service Control – Protocol, Addressing, Subscriber Data (ICSPASD)
Impacted Specifications	
TS 22.101	Service aspects; service principles
TS 23.206	Voice Call Continuity (VCC) between Circuit Switched (CS) and IP Multimedia Subsystem (IMS); Stage 2 - S2
TS 24.229	Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3 - C1
TS 23.003	Numbering, addressing and identification - C4 Add ICS specific IMPI and temporary IMPU
TS 29.232	Media Gateway Controller (MGC) - Media Gateway (MGW) interface; Stage 3 - C4 Extension to Mc interface protocol for supporting Mb user plane
TS 23.018	Basic call handling; Technical realization - C4 Updates to the call set-up and termination procedures, and interactions with supplementary services
TS 29.002	Mobile Application Part (MAP) specification - C4 Update subscriber profile and MAP messaging to indicate attempt of IMS login by MSC Server enhanced for ICS
New Dedicated Specifications/Reports	
TS 23.292	IP Multimedia System (IMS) centralized services; Stage 2 - S2
TS 24.292	IP Multimedia Core Network subsystem Centralized Services; Stage 3 - C1
TS 24.293	ICS Protocol over USSD bearer (C1)
TS 29.292	Mobile Radio Interface NAS signalling - SIP translation/conversion - C3

Supporting Individual Members: Alcatel-Lucent, Nortel Networks, AT&T, Telecom Italia, Samsung, LG Electronics, Nokia Siemens Networks, Nokia, Huawei, Ericsson, Motorola, NEC, Orange, ZTE, Fujitsu, Verizon, Telcordia, RIM.

UID	Name	Resource	Hyperlink	WI_rapporteur	Notes	TS_TR
380039	**Stage 1**	S1	SP-070924	AT&T	SP#39 completed	22.101
380040	**Stage 2**	S2	SP-070924	Alcatel-Lucent	SP#40 completed	23.292, 23.206
400205	**Stage 3**	C1,C3,C4,IETF	CP-091046	Ericsson	CP#46 completed	-
400005	CT1 aspects	C1	CP-091046	Ericsson	CP#46 completed	24.229, new (24.292, 24.286)
521014	(IETF) CT1	C1-IETF	CP-091046	Roland Jesske	Submitted to IESG for publication	draft-ietf-salud-alert-info-urns
521015	(IETF) CT1	C1-IETF	CP-091046	Andrew Allen	CP#59 completed	RFC 6871 (was draft-ietf-mmusic-sdp-media-capabilities)
521016	(IETF) CT1	C1-IETF	CP-091046	Andrew Allen	CP#64 complete	RFC 7195 (was draft-ietf-mmusic-sdp-cs)
521017	(IETF) CT1	C1-IETF	CP-091046	Andrew Allen	CP#62 completed	RFC7006 (was draft-ietf-mmusic-sdp-miscellaneous-caps)
400006	CT3 aspects	C3	CP-091046	Mavenir	CP#43 completed	new 29.292
400007	CT4 aspects	C4	CP-091046	Ericsson	CP#42 completed	23.003, 29.232, 23.018, 29.002
521018	(IETF) CT4 aspects	C4-IETF	CP-091046	Andrew Allen	CP#64 complete	RFC 7254 (was draft-montemurro-gsma-imei-urn)
400105	Deleted – I1 interface	C1	CP-080492	Huawei	CP#41 work stopped	24.293

Communication networks are evolving towards packet-based infrastructures. A single common consolidated core network offers service providers the possibility of reduced core network complexity and maintenance. As service providers shift their core network infrastructure from the CS domain to a consolidated common IMS infrastructure, the need was identified to enable the consistent provision of services to subscribers over a variety of accesses, including CS domain and PS domain accesses.

A Study on Centralized IMS Services (FS_ICS) UID_380034 has been conducted by SA1 (TR 22.892) and SA2 (TR 23.892) on call/session establishment via CS domain access and IP-CAN and on calls/sessions transferred across CS domain access and IP-CAN, including the interactions with domain selection.
Handling of the multiple media enabled by the multimedia telephony communication service has been investigated. Requirements and architecture solutions in the TRs are applicable to terminals with or without VCC capabilities. Impact on legacy terminals with the same subscription (e.g. USIM swapping) have also been studied.

With this background, the result of this work is:

- SA1 captured the findings from TR 22.892 and developed further into TS 22.101;

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- SA2 developed Stage 2 meeting TS 22.101 requirements for ICS in new TS 23.292 (Stage 2 being based on TR 23.892 conclusions).

The provision of a consistent user experience is described in the cases:

- where users access services via CS or PS access; and
- where domain transfer between CS and PS access is required.

CT WGs specified the necessary Stage 3 as follows:

- CT1:
  - enhancements to IMS call control protocol (based on SIP and SDP) and to UE functionality;
  - ICS Protocol over USSD (Unstructured Supplementary Service Data) bearer;
- CT3: protocol translation/conversion for the MSC Server;
- CT4:
  - ICS specific naming/addressing and any required Core Network protocol enhancements and/or additions;
  - Enhancements to Mc interface to support the Mb user plane interface;
  - Investigate any impacts to the subscriber data in the CS domain and IMS;

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7.2 IMS Multimedia Telephony and Supplementary Services (IMSTSS) UID_370059 (open IETF)

Resources: S1,S5,C1,C3,C4,IETF

UID	Name	Acronym	Resource	Rapporteur
370060	**General aspects of IMS Sup Services**	IMSSS-Gal	S1,C1,C3,C4	Ericsson
370062	**IMS Multimedia Telephony Service**	IMS-MMTel	S1,S5	-
380006	**CCBS)/CCNR on IMS**	CCBS_CCNR	C1,C3,IETF	Deutsche Telekom
390058	**Flexible Alerting**	FA	S1,C1	Nortel
380009	**Communication Wait on IMS**	CW_IMS	C1,C3,IETF	Deutsche Telekom
370103	**IMS Charging**	CH8	S5	Alcatel-Lucent

General aspects of IMS Sup Services (IMSSS-Gal) UID_370060

Resources: S1,C1,C3,C4

References

Document	Title/Contents
	WID(s)
SP-070691	S1 WID on TISPAN Service and Capability for Core IMS (TISCAP-R8)
CP-080213	WID on Documentation of TISPAN NGN R1 and R2 in 3GPP TSG CT
	Impacted Specifications
TS 22.101	Service aspects; Service principles
TS 22.115	Service aspects; Charging and billing
TS 22.228	Service requirements for the IMS
TS 24.141	Presence service using the IP Multimedia (IM) Core Network (CN) subsystem; Stage 3
TS 24.147	Conferencing using the IP Multimedia (IM) Core Network (CN) subsystem; Stage 3
TS 24.173	IMS Multimedia telephony service and supplementary services; Stage 3
TS 24.229	Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3
TS 24.247	Messaging service using the IP Multimedia (IM) Core Network (CN) subsystem; Stage 3
TS 24.341	Support of SMS over IP networks; Stage 3
TS 29.162	Interworking between the IM CN subsystem and IP networks
TS 29.163	Interworking between the IP Multimedia (IM) Core Network (CN) subsystem and Circuit Switched (CS) networks
TS 29.228	IP Multimedia (IM) Subsystem Cx and Dx Interfaces; Signalling flows and message contents
TS 29.229	Cx and Dx interfaces based on the Diameter protocol; Protocol details
	New Dedicated Specifications/Reports
TS 24.604	Communication Diversion (CDIV) using IP Multimedia (IM)Core Network (CN) subsystem; Protocol specification
TS 24.605	Conference (CONF)using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification
TS 24.606	Message Waiting Indication (MWI)using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification
TS 24.607	Originating Identification Presentation (OIP) and Originating Identification Restriction (OIR) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification
TS 24.608	Terminating Identification Presentation (TIP) and Terminating Identification Restriction (TIR)using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification
TS 24.610	Communication HOLD (HOLD) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification
TS 24.611	Anonymous Communication Rejection (ACR) and Communication Barring (CB)using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification
TS 24.616	Malicious Communication Identification (MCID)using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification
TS 24.623	Extensible Markup Language (XML) Configuration Access Protocol (XCAP) over the Ut interface for Manipulating Simulation Services
TS 24.628	Common Basic Communication procedures using IP Multimedia (IM)Core Network (CN) subsystem; Protocol specification
TS 24.629	Explicit Communication Transfer (ECT)using IP Multimedia (IM)Core Network (CN) subsystem;; Protocol specification
TS 24.647	Advice Of Charge (AOC) using IP Multimedia (IM)Core Network (CN) subsystem; Protocol Specification
TS 24.654	Closed User Group (CUG) using IP Multimedia (IM) Core Network (CN) subsystem, Protocol Specification
TS 29.658	TISPAN; SIP Transfer of IP Multimedia Service Tariff Information; Protocol specification

Supporting Individual Members: BT, Telecom Italia, TeliaSonera, T-Mobile, Ericsson, Vodafone, Alcatel-Lucent, Nortel Networks.

UID	Name	Acronym	Resource	Hyperlink	Rapporteur	Notes	TS_TR
370060	**General aspects of IMS Sup Services**	IMSSS-Gal	S1,C1,C3,C4	SP-070691	Ericsson	CP#43 completed	-

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370023	Service and Capability for Core IMS - inclusion of TISPAN requirements	TISCAPR8	S1	SP-070691	Ericsson	SP#39 completed	22.228, 22.115, 22.101
380001	Documentation of TISPAN R1 and R2 in CT1	REDOC_TIS-C1	C1	CP-080213	NSN	CP#41 completed	24.141, 24.147, 24.173, 24.229, 24.247, 24.341, 24.604, 24.605, 24.606, 24.607, 24.608, 24.610, 24.611, 24.616, 24.623, 24.628, 24.629, 24.647, 24.654
380002	Documentation of TISPAN R1 and R2 in CT3	REDOC_TIS-C3	C3	CP-080213	NSN	CP#43 completed	29.162, 29.163, 29.658
380003	Documentation of TISPAN R1 and R2 in CT4	REDOC_TIS-C4	C4	NSN	NSN	CP#41 completed	29.228, 29.229

SA1 WID SP-070691 on Service and Capability for Core IMS, addressed the transfer in 3GPP of TISPAN Stage 1 service and capability requirements, needed to implement the core IMS specification for the Common IMS concept. This work is limited to the transfer, adaption and integration of requirements from TISPAN Stage 1 TS 0181005v2.1.0 WID 1040 "Service and capability requirements" (Release2) into he 3GPP TS 22.228, TS 22.101 and TS 22.115.

Requirements impacting TS 22.173 and TS 22.182 were covered by separate WIDs.

CT was dealing with shifting the ownership of TISPAN R1 and R2 Stage-3 into the 3GPP CT WGs. This work provides for redocumentation of existing TISPAN NGN R1 and NGN R2 specifications in 3GPP Rel-8. In addition minor technical enhancements were provided. However, the work does not cover any major functional change.

How to handle SIP charging (TS 183 058) in 3GPP is for further study. Whether Basic Communication (TS 183 028) should become a standalone specification or can be documented in TS 24.229 is for further study. Handling of SMS (24.341) – 183 051 –(No technical change – generic reference to release 7) is for further study.

Handling of IMS messaging (24.247) – 183 041 (No technical change – references 3GPP 24.147 6.4.0) and Presence (24.141) – 283 030 – (has OMA parts – references 3GPP 24.141 7.0.0) are for further study. Responsibility for Stage 1 and Stage 2 is currently still with TISPAN.

IMS Multimedia Telephony Service (IMS-MMTel) UID_370062

Resources: S1,S5

References

Document	Title/Contents
	WID(s)
SP-070569	S1 WID on Merging TISPAN MMTel [requirements] for Common IMS
SP-080848	S5 WID on Multimedia Telephony Service and Supplementary Services (MMTel) Charging
	Impacted Specifications
TS 22.173	IP Multimedia Core Network Subsystem (IMS) Multimedia Telephony Service and supplementary services; Stage 1
TS 32.298	Telecommunication management; Charging management; Charging Data Record (CDR) parameter description [Add MMTel ASN.1 structure]
TS 32.299	Telecommunication management; Charging management; Diameter charging applications [Add MMTel AVPs and descriptions]
	New Dedicated Specifications/Reports
TS 32.275	Telecommunication management; Charging management; MultiMedia Telephony (MMTel) charging

Supporting Individual Members SP-070569: BT, Telecom Italia, TeliaSonera, T-Mobile, Vodafone, Nokia Siemens Networks, Alcatel-Lucent, RIM, Portugal Telecom, Orange, Ericsson.

Supporting Individual Members SP-080848: Alcatel-Lucent, Verizon Wireless, Nortel, Motorola

UID	Name	Acronym	Resource	Hyperlink	Rapporteur	Notes	TS_TR
370062	**IMS Multimedia Telephony Service**	IMS-MMTel	S1,S5	-	-	SP#43 completed	-
370024	Merging TISPAN MMTel [requirements] for Common IMS	TMMTEL	S1	SP-070569	NSN	SP#38 completed	22.173

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380041	Multimedia Telephony Service and Supplementary Services (MMTel) offline Charging	MMTel-CH	S5	SP-080848	Alcatel-Lucent	CP#43 completed	32.275, 32.298/299

SA1 addressed the transfer in 3GPP of TISPAN Stage 1 Multimedia Telephony (MMTEL) Release 2, needed to implement the MMTEL for the Common IMS concept.

As a result, TISPAN Stage 1 TS 181 002 v.2.2.3 (Release 2) was transferred and integrated into 3GPP TS 22.173. Requirements relevant to MMTEL contained in TISPAN TS 181 005 v2.1.0 were also integrated in TS 22.173.

The SA5 IMS charging specifications were not fully covering MMTel supplementary services. Thus, supplementary service charging was included in IMS session charging.

SA5 introduced MMTel charging in 3GPP IMS as a new TS 32.275. Existing TS 32.298 and TS 32.299 added MMTel supplementary services AVPs from Telephone Application Server and corresponding charging fields in the Charging Data Records (CDRs).

Call Completion on Busy Subscriber (CCBS)/Call Completion on Non-Reachable (CCNR) on IMS UID_380006

Resources: C1,C3

References

Document	Title/Contents
	WID(s)
CP-080215	WID on NGN IMS Supplementary Services; Call Completion on Busy Subscriber (CCBS), Call Completion No Reply (CCNR)
	Impacted Specifications
TS 24.173	IMS Multimedia telephony service and supplementary services; Stage 3
TS 24.229	Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3
TS 29.163	Interworking between the IP Multimedia (IM) Core Network (CN) subsystem and Circuit Switched (CS) networks - C3
	New Dedicated Specifications/Reports
TS 24.642	Completion of Communications to Busy Subscriber (CCBS) and Completion of Communications by No Reply (CCNR) using IP Multimedia (IM)Core Network (CN) subsystem; Protocol Specification

Supporting Individual Members: Deutsche Telekom, T-Mobile, Huawei, Nokia Siemens Networks, Telecom Italia.

UID	Name	Acronym	Resource	Hyperlink	Notes	TS_TR
380007	CT1 part	CCBS_CCNR	C1	CP-080215	CP#43 completed	24.642, 24.229, 24.173
380008	CT3 part	CCBS_CCNR	C3	CP-080215	CP#42 completed	29.163
521019	(IETF) Stage 3	CCBS_CCNR	C1-IETF,C3-IETF	CP-080215	CP#60 completed	RFC 6910 (was draft-ietf-bliss-call-completion)

As part of the agreement of moving common IMS work from ETSI TISPAN to 3GPP, there is a need to ensure that the work on simulation services that are still not frozen within TISPAN is continued within 3GPP. Within TISPNA the WI 3035 (TS183042) on the description for CCBS and CCNR is still within the draft status.

This work creates Stage 3 for CCBS/CCNR-like service in 3GPP IMS. New capabilities are in line with RFC3427. Interoperability between networks was taken into consideration. Interworking was specified.

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Flexible Alerting (FA) UID_390058

Resources: S1,C1

References

Document	Title/Contents
	WID(s)
CP-080219	WID on IMS Flexible Alerting Supplementary Service
	Impacted Specifications
TS 22.173	IP Multimedia Core Network Subsystem (IMS) Multimedia Telephony Service and supplementary services; Stage 1
TS 24.173	IMS Multimedia telephony service and supplementary services; Stage 3
	New Dedicated Specifications/Reports
TS 24.239	IP Multimedia Subsystem (IMS) Flexible alerting supplementary service - C1

Supporting Individual Members: Nortel Networks, Ericsson, Alcatel-Lucent, Qualcomm Europe, Tatara Systems, US Cellular, Motorola, Sprint.

UID	Name	Acronym	Resource	Hyperlink	Rapporteur	Notes	TS_TR
390058	**Flexible Alerting**	FA	S1,C1	CP-080219	Nortel	CP#43 completed	-
390059	Stage 1 FA	FA	S1	-	Telecom Italia	SP#40 completed	22.173
390015	Stage 3 FA	FA	C1	CP-080219	Nortel	CP#43 completed	24.239, 24.173

During the joint workshop on common IMS in January 2008, 3GPP and 3GPP2 agreed on principles to incorporate parts of 3GPP2 MMD/IMS related specifications into 3GPP within the Rel-8 timeframe. This work incorporates the Flexible Alerting supplementary service specified in 3GPP2 X.P0055: MMD Supplementary Services.

SA1 covered Stage 1 in TS 22.173.

CT1 covered Stage 3 in TS 24.173 and new TS 24.239.

Communication Wait on IMS (CW_IMS) UID_380009

Resources: C1,C3

References

Document	Title/Contents
	WID(s)
CP-080214	WID on NGN IMS Supplementary Services; Call Waiting (CW) [Definition of Communication Wait Service]
	Impacted Specifications
TS 24.229	Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3
TS 24.173	IMS Multimedia telephony service and supplementary services; Stage 3
TS 29.163	Interworking between the IP Multimedia (IM) Core Network (CN) subsystem and Circuit Switched (CS) networks - C3
	New Dedicated Specifications/Reports
TS 24.615	Communication Waiting (CW) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol Specification

Supporting Individual Members: Deutsche Telekom, T-Mobile, Huawei Technologies; NSN, Telecom Italia.

UID	Name	Acronym	Resource	Hyperlink	Rapporteur	Notes	TS_TR
380009	**Communication Wait on IMS**		C1,C3,IETF				-
380010	CT1 part	CW_IMS	C1	CP-080214	Deutsche Telekom	CP#43 completed	24.615, 24.229, 24.173
521020	(IETF) Stage 3	CW_IMS	C1-IETF	CP-080214	Roland Jesske	Submitted to IESG for publication	draft-ietf-salud-alert-info-urns
380011	CT3 part	CW_IMS	C3	CP-080214	Deutsche Telekom	CP#42 completed	29.163

As part of the agreement of moving common IMS work from ETSI TISPAN to 3GPP, there is a need to ensure that the work on simulation services that are still not frozen within TISPAN is continued within 3GPP. Within TISPAN the WI 3027 (TS183015) on the description for CW like service is still within the draft status.

This work creates Stage 3 for CW-like service in 3GPP IMS. New capabilities are in line with RFC3427. Interoperability between networks was taken into consideration. Interworking was specified.

Advice of Charge (AoC) support in IMS Charging UID_380042

Resources: S5

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References

Document	Title/Contents
WID(s)	
SP-070739	WID on Advice of Charge (AoC) support in IMS Charging
Impacted Specifications	
TS 32.240	Telecommunication management; Charging management; Charging architecture and principles
TS 32.260	Telecommunication management; Charging management; IP Multimedia Subsystem (IMS) charging
TS 32.296	Telecommunication management; Charging management; Online Charging System (OCS): Applications and interfaces
TS 32.298	Telecommunication management; Charging management; Charging Data Record (CDR) parameter description
TS 32.299	Telecommunication management; Charging management; Diameter charging applications [Add AVPs for AoC]
New Dedicated Specifications/Reports	
TS 32.280	Telecommunication management; Charging management; Advice of Charge (AoC) service

Supporting Individual Members: Nokia Siemens Networks, Alcatel-Lucent, Amdocs, Ericsson, Orange, Nortel, T-Mobile.

UID	Name	Acronym	Hyperlink	Notes	TS_TR
380042	**AoC support in IMS Charging**	IMSTSS	SP-070739	SP#43 completed	32.240, 32.260, 32.296, 32.298, 32.299, new 32.280

AoC service is standardized in 3GPP and available for CS and PS networks based on Charge Advice Information (CAI).
TISPAN introduced AoC based on Tariff Information according to ITU Recommendations and ETSI specifications.
AoC service is becoming available in 3G IMS networks, hence the usage of AoC should be defined in 3GPP.

AoC is currently listed in the 3GPP charging requirements TS 22.115.
High level description on AoC Information and Charging levels is specified in TS 22.086 and TS 23.086.
AoC is based on the Charge Advise Information (CAI) defined in TS 22.024.
Support of subscribed AoC in CAMEL for CS and PS networks is specified in TS 23.078.
Requirement for AoC support in TISPAN is handled in WID02037 and considers the SIP transfer of charging information in WID 3113.

The transport of tariff information, the evaluation and the advice to the mobile subscriber is not described in IMS.

This work introduces AoC in 3GPP IMS Charging and is limited to support AoC information on the corresponding charging interfaces as well as in the OCS (Online Charging System).

A new TS 32.280 contains definitions for AoC and description of AoC in IMS Charging. It contains the AoC Information for charging purposes. The determination for SIP transport of tariff information followed the requirements in TS 22.273. The mechanism for tariff change and support of the tariff format adhered on the existing 3GPP principles. Additions, e.g. for different use case or simplifications is For Further Study.

AoC service provision and information transfer is made available as a SIP-based IMS service.
Transfer of tariff information is outside the scope of this WID but is For Further Study in other 3GPP groups.

The presentation of the AoC information at the UE/ME is outside the scope of this WID but is For Further Study in other 3GPP groups.

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Add Interconnection Border Control Function (IBCF) to IMS Charging UID_370003

Resources: S5

References

Document	Title/Contents
WID(s)	
SP-070621	WID on Add Interconnection Border Control Function (IBCF) to IMS Charging
Impacted Specifications	
TS 32.260	Telecommunication management; Charging management; IP Multimedia Subsystem (IMS) charging Add flows and AVP/CDR tables for IBCF [Match the assignments of other IMS nodes]
TS 32.298	Telecommunication management; Charging management; Charging Data Record (CDR) parameter description [Add IBCF CDR field description, Match the assignments of other IMS nodes]
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: Alcatel-Lucent, AT&T, Nortel, Ericsson, Amdocs, Huawei, NSN, T-Mobile.

UID	Name	Acronym	Hyperlink	Notes	TS_TR
370003	**Add Interconnection Border Control Function (IBCF) to IMS Charging**	IMSTSS	SP-070621	SP#39 completed	32.260, 32.298

The Interconnect Border Control Function (IBCF) is becoming available in 3G networks, but SA5 IMS Charging TSs do not recognize nor keep charging records for the IBCF. This work is linked to:

- System enhancements for fixed broadband access to IMS (UID_32074)
- System enhancements for fixed broadband access to IMS - TISPAN Rel-1 related aspects (UID_7001)

SA5 current IMS charging specifications cover all IMS entities (e.g. S-CSCF, I-CSCF, P-CSCF, SIP-AS, MGCF, MRFC, BGCF) excepting IBCF. Thus it is impossible to generate CDRs in IBCF as required by the Rel-7 Stage 2 IMS specifications.

This work adds full functionality for IBCF into IMS Charging TS 32.260 and TS 32.298.

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7.3 3GPP2 Input to Common IMS (CIMS_3GPP2) UID_390035

Resources: S1,S2,S3

References

Document	Title/Contents
WID(s)	
SP-080220	S1 WID on 3GPP2 Input to Common IMS - covers S1,S2,S3
Impacted Specifications	
TS 22.141	Presence service; Stage 1
TS 22.153	Multimedia priority service
TS 22.173	IP Multimedia Core Network Subsystem (IMS) Multimedia Telephony Service and supplementary services; Stage 1
TS 22.228	Service requirements for the Internet Protocol (IP) multimedia core network subsystem (IMS)
TS 23.002	Network architecture
TS 23.141	Presence service; Architecture and functional description; Stage 2
TS 23.167	IP Multimedia Subsystem (IMS) emergency sessions
TS 23.203	Policy and charging control architecture
TS 23.228	IP Multimedia Subsystem (IMS); Stage 2 (SA2)
TS 33.141	Presence service; Security
TS 33.203	3G security; Access security for IP-based services
TS 33.210	3G security; Network Domain Security (NDS); IP network layer security
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: Alcatel-Lucent, Camiant, China Unicom, Ericsson, Huawei, KDDI, Motorola, Nortel, Qualcomm, Sprint, US Cellular, Verizon, ZTE, Nokia Siemens Networks, SK Telecom, NEC.

UID	Name	Resource	Hyperlink	TS_TR
390035	3GPP2 Input to Common IMS	-	SP-080220	-
390050	**Stage 1 CIMS_3GPP2 (SA1)**	S1	SP-080220	22.228, 22.173, 22.101, 22.153
390051	**Stage 2 CIMS_3GPP2 (SA2)**	S2	SP-080220	23.002, 23.141, 23.203, 23.167, 23.228
390052	**Security CIMS_3GPP2 (SA3)**	S3	SP-080220	33.141, 33.203, 33.210

During the joint workshop on common IMS in January 2008, 3GPP and 3GPP2 agreed on principles to incorporate parts of 3GPP2 MMD/IMS related specifications into 3GPP. This work item covers work to incorporate SA WG related 3GPP2 IMS specifications, including security, OA&M into 3GPP.

This work item covers documentation of existing 3GPP2 MMD/IMS specifications to be handled by SA WGs in Rel-8.

- **3GPP2 stage 1 specifications to be incorporated include:**
- S.R0058: IP Multimedia Domain – System Requirements
- S.R0062: Presence for Wireless Systems – Stage 1 Requirements
- S.R0120: All-IP System – MMD Policy Enhancements – System Requirements
- S.R0123: Enhanced MMD Security – Stage 1 Requirements
- S.R0125: VoIP Supplementary Services Feature Descriptions (e.g., Flexible Alerting, CRBT)

- **3GPP2 stage 2 specifications to be incorporated include:**
- X.S0013-002: All-IP Core Network Multimedia Domain - IP Multimedia Subsystem – Stage 2
- X.S0013-007: All-IP Core Network Multimedia Domain: IP Multimedia Subsystem - Charging Architecture
- X.S0013-008: All-IP Core Network Multimedia Domain: IP Multimedia Subsystem - Accounting Information Flows and Protocol
- X.S0013-012: All-IP Core Network Multimedia Domain: Service Based Bearer Control – Stage 2
- X.S0027-001: Presence Service: Architecture and Functional Description
- X.S0027-002: Presence Security
- X.S0049: All-IP Network Emergency Call Support
- X.P0053: All-IP System – MMD Policy Enhancements
- X.P0055: MMD Supplementary Services (e.g. Flexible Alerting, CRBT)
- S.S0086: IMS Security Framework

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Security for Common IMS is covered by the Feature IMS-Sec (Security Enhancements for IMS UID_370078).

Resources: C1,C3,C4

References

Document	Title/Contents
	WID(s)
CP-080795	CT1 WID on 3GPP2 Input to Common IMS
	Impacted Specifications
TS 23.218	IP Multimedia (IM) session handling; IM call model; Stage 2 (CT1)
TS 24.141	Presence service using the IP Multimedia (IM) Core Network (CN) subsystem; Stage 3 - C1
TS 24.147	Conferencing using the IP Multimedia (IM) Core Network (CN) subsystem; Stage 3 - C1
TS 24.173	IMS Multimedia telephony service and supplementary services; Stage 3 - C1
TS 24.229	Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3 - C1
TS 24.247	Messaging service using the IP Multimedia (IM) Core Network (CN) subsystem; Stage 3 - C1
TS 24.604	Communication Diversion (CDIV) using IP Multimedia (IM)Core Network (CN) subsystem; Protocol specification - C1
TS 24.605	Conference (CONF)using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification - C1
TS 24.606	Message Waiting Indication (MWI)using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification - C1
TS 24.607	Originating Identification Presentation (OIP) and Originating Identification Restriction (OIR) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification - C1
TS 24.608	Terminating Identification Presentation (TIP) and Terminating Identification Restriction (TIR)using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification - C1
TS 24.610	Communication HOLD (HOLD) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification - C1
TS 24.611	Anonymous Communication Rejection (ACR) and Communication Barring (CB)using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification - C1
TS 24.629	Explicit Communication Transfer (ECT) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification - C1
TS 24.930	Signalling flows for the session setup in the IP Multimedia core network Subsystem (IMS) based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3 - C1
TS 29.163	Policy and Charging Control signalling flows and QoS parameter mapping - C3
TS 29.212	Policy and charging control over Gx reference point - C3
TS 29.213	Policy and Charging Control signalling flows and QoS parameter mapping - C3
TS 29.214	Policy and charging control over Rx reference point - C3
TS 29.228	IP Multimedia (IM) Subsystem Cx and Dx Interfaces; Signalling flows and message contents - C4
TS 29.229	Cx and Dx interfaces based on the Diameter protocol; Protocol details - C4
TS 29.328	IP Multimedia Subsystem (IMS) Sh interface; Signalling flows and message contents - C4
TS 29.329	Sh interface based on the Diameter protocol; Protocol details - C4
	New Dedicated Specifications/Reports
TS 24.238	Session Initiation Protocol (SIP) based user configuration; Stage 3 - C1

Supporting Individual Members: Alcatel-Lucent, Camiant, China Unicom, Ericsson, Huawei, KDDI, Motorola, Nortel, Qualcomm Europe, Sprint, US Cellular, Verizon, Nokia Siemens Networks.

UID	Name	Resource	Hyperlink	TS_TR
390013	**Stage 3 CIMS_3GPP2 (CT1)**	C1	CP-080795	23.218, 24.141, 24.147, 24.173, 24.229, 24.238, 24.247, 24.604, 24.605, 24.606, 24.607, 24.608, 24.610, 24.611, 24.629, 24.930
390026	**Stage 3 CIMS_3GPP2 (CT3)**	C3	CP-080795	29.163, 29.212, 29.213, 29.214
390027	**Stage 3 CIMS_3GPP2 (CT4)**	C4	CP-080795	29.228, 29.229, 29.328, 29.329

This work item covers the incorporation of CT WGs related 3GPP2 IMS specifications into 3GPP.

This work covers documentation of existing 3GPP2 MMD/IMS specifications to be handled by CT WGs in Rel-8.

- **3GPP2 specifications to be incorporated include:**
- X.S0013-003: All-IP Core Network Multimedia Domain: IP Multimedia (IMS) Session Handling; IP Multimedia (IM) Call Model; Stage 2
- X.S0013-004: All-IP Core Network Multimedia Domain: IP Multimedia Call Control Protocol Based on SIP and SDP Stage 3

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- X.S0013-005: All-IP Core Network Multimedia Domain: IP Multimedia Subsystem Cx Interface Signalling Flows and Message Contents
- X.S0013-006: All-IP Core Network Multimedia Domain: Cx Interface Based on the Diameter Protocol; Protocol Details
- X.S0013-009: IMS/MMD Call Flow Examples
- X.S0013-010: All-IP Core Network Multimedia Domain: IP Multimedia Subsystem Sh Interface; Signalling Flows and Message Contents - Stage 2
- X.S0013-011: All-IP Core Network Multimedia Domain: Sh Interface Based on Diameter Protocols Protocol Details - Stage 3
- X.S0013-013: All-IP Core Network Multimedia Domain: Service Based Bearer Control – Tx Interface Stage-3
- X.S0013-014: All-IP Core Network Multimedia Domain: Service Based Bearer Control – Ty Interface Stage-3
- X.S0013-016: All-IP Core Network Multimedia Domain: Messaging service using the IP Multimedia (IM) Subsystem (IMS)
- X.S0027-003: Presence Service using IP Multimedia Core Network Subsystem; stage 3
- X.S0029: Conferencing Using the IP Multimedia (IM) Core Network (CN) Subsystem
- X.S0049: All-IP Network Emergency Call Support
- X.S0050: Session Initiation Protocol (SIP) - ISDN User Part (ISUP) Interworking
- X.P0055: MMD Supplementary Services

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7.4 IMS Enhancements for support of Packet Cable access (PktCbl) UID_350005

Cable requirements are driven by cable deployments. As such, this work does not place additional requirements on mobile networks or non-cable network operators.

UID	Name	Resource	Hyperlink
350005	**IMS Enhancements for support of Packet Cable access**	-	-
350008	**IMS Enhancements for Cable Client Types and Deployment Models**	S2,C1	SP-070105
350011	**IMS Inter-working aspects in Support of Cable Regulatory requirements**	S2,C1,C3	SP-070107
340008	**IMS Enhancements for Security Requirements in Support of Cable Deployments**	S3,C1,C3,C4	SP-060933

IMS Enhancements for Cable Client Types and Deployment Models (PktCbl-Deploy) UID_350008

Resources: S2, C1

References

Document	Title/Contents
WID(s)	
SP-070105	S2 WID on IMS Enhancements for Cable Client Types and Deployment Models
CP-070122	C1 WID on IMS Protocol Enhancements for Cable Client Types and Deployment Models
Impacted Specifications	
TS 23.228	IP Multimedia Subsystem (IMS); Stage 2 [Changes to support cable client configuration requirements]
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members SP-070105: CableLabs, Nortel, Cisco, Samsung, Siemens, Motorola, Hewlett-Packard

UID	Name	Resource	Hyperlink	TS_TR
350008	**IMS Enhancements for Cable Client Types and Deployment Models**	S2,C1	SP-070105	-
350009	Architecture aspects of PktCbl-Deploy	S2	SP-070105	23.228
350010	CT1 aspects of PktCbl-Deploy	C1	CP-070122	-

Cable networks support certain deployment models and client types currently not supported by 3GPP Rel-7 IMS. This work addresses IMS architectural enhancements needed to support cable client types and deployment models.

The following client types and scenarios were identified:

- Embedded client types (e.g. embedded cable modems and IMS clients)
- Software-based Clients that are retrieved, or installed, on computing platforms that are not under operator control
- Clients that may use different physical layer technologies to access the cable network (e.g. DOCSIS, WiFi, Ethernet)
- Clients that can connect via NAT and/or Firewall devices
- Clients without existing relationship with Service Providers (i.e. no prior pre-configuration on the client or in the Service Provider's network)

Requirements:

- Ability to configure and manage these client types
- Ability to update the configuration of clients dynamically
- Ability to configure devices without requiring pre-configuration
- Ability to choose a Service Provider to obtain configuration

Currently, the IMS defines protocol-specific data element definitions. Enhancing this to allow for a wider choice of protocols provides more flexibility to cable (and other) architectures that may leverage existing or newer protocols for various reasons (e.g. one protocol may not cater to all the requirements).

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SA2 TS 23.228 was impacted by this work, however no CT specification was effected vs. WID (TS 24.229, TS 24.167; no record in CR Database).

IMS Inter-working aspects in Support of Cable Regulatory requirements (PktCbl-Intw) UID_350011

Resources: S2, C1,C3

References

Document	Title/Contents
WID(s)	
SP-070107	S2 WID on IMS Inter-working Aspects in Support of Cable Regulatory requirements
CP-070575	C1 WID on IMS Inter-working Protocol Aspects in Support of Cable Regulatory requirements
Impacted Specifications	
TS 23.228	IP Multimedia Subsystem (IMS); Stage 2 [S2 - Protocol enhancements addressing regional and performance requirements of cable deployments]
TS 24.229	Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3 - C1,C3
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: CableLabs, Nortel, Cisco, Samsung, Alcatel-Lucent, Siemens, Motorola, Hewlett-Packard, Ericsson.

UID	Name	Resource	Hyperlink	TS_TR
350011	**IMS Inter-working aspects in Support of Cable Regulatory requirements**	S2,C1,C3	SP-070107	-
350012	Architecture PktCbl-Interwork	S2	SP-070107	23.228
350013	CT1,CT3 PktCbl-Interwork	C1,C3	CP-070575	24.229

This work addresses IMS inter-working aspects driven by the regulatory requirements of cable networks, including:

- Local Number Portability (LNP) for the IMS
- Equal Access Circuit Carrier
- SIP to ISUP interworking of Local Number Portability and Equal Access Circuit Carrier parameters

Local Number Portability for the IMS is limited to telephony services, and therefore only applies to TEL URIs and SIP URIs with the parameter user=phone. Other forms of SIP URIs are not subject to LNP.

Equal Access Circuit Carrier Routing is for the purpose of preferred Circuit Switched transit carrier selection.

SA2 TS 23.228, CT3 TS 29.163 were impacted by this work, however CT1 TS 24.229 was not effected vs. WID (no record in CR Database).

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IMS Enhancements for Security Requirements in Support of Cable Deployments (PktCbl-Sec) **UID_340008**

Resources: S3,C1,C4

References

Document	Title/Contents
WID(s)	
SP-060933	S3 WID on IMS Enhancements for Security Requirements in Support of Cable Deployments
CP-070124	C3 WID on IMS Protocol Aspects for Security Requirements in Support of Cable Deployments
Impacted Specifications	
TS 23.008	Organization of subscriber data [C4 - Changes to address security enhancements of cable clients]
TS 24.229	Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3 [C1 - provisioning, configuration and management of clients in cable networks]
TS 29.228	IP Multimedia (IM) Subsystem Cx and Dx Interfaces; Signalling flows and message contents [C4 - Changes to address security enhancements of clients in cable networks]
TS 29.229	Cx and Dx interfaces based on the Diameter protocol; Protocol details [C4 - Changes to address security enhancements of clients in cable networks]
TS 33.203	3G security; Access security for IP-based services
TS 33.210	3G security; Network Domain Security (NDS); IP network layer security [security requirements for cable deployment models]
TS 33.220	Generic Authentication Architecture (GAA); Generic bootstrapping architecture [security requirements for cable deployment models]
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: CableLabs, Cisco, Lucent, Motorola, Nortel, Samsung, Siemens.

UID	Name	Resource	Hyperlink	TS_TR
340008	**IMS Enhancements for Security Requirements in Support of Cable Deployments**	-	SP-060933	-
350033	SA3 Aspects of PktCbl-Sec	S3	SP-060933	33.203, 33.210, 33.220
350006	CT1 Aspects of PktCbl-Sec	C1	CP-070124	24.229
380029	CT3 Aspects of PktCbl-Sec	C3	CP-070124	29.163
350007	CT4 Aspects of PktCbl-Sec	C4	CP-070124	29.228, 29.229, 23.008

Cable networks support deployment models and client types, currently not completely supported or enabled in 3GPP Rel-7 IMS. This work enhances IMS to address security aspects of clients in cable network deployments e.g.:

- Subscriber first selects and installs a UE independent of the Service Provider and without pre-provisioning of Service Provider information or credentials;
- Service Provider is then able to provide emergency, informative or trial services without requiring pre-configuration of information;
- UE downloads necessary configuration data at boot-time;

For supporting the needed range of cable client types, the IMS was enhanced to support multiple types of client credentials. This required a framework capable of supporting, at a minimum, the following types of credentials used in cable environment:

- ISIM or USIM within UICC;
- Username and Pre-shared key;
- Certificates;

Cable requirements being driven by cable deployments, no additional requirements on mobile networks or non-cable network operators were posed. Enhancements were pursued so that any other broadband access networks with similar requirements (e.g. TISPAN NASS) may choose to support the enhancements required for cable networks.
These enhancements are only for non-3GPP access networks and not intended for 3GPP access networks.

In SA3 TS 33.203 a normative annex on Access security with TLS has been added to address Security Requirements for cable deployments.

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In an environment where multiple types of security are supported, the solution must enable a mechanism for automatic discovery of the security mechanism to be used, and to ensure compatible interworking between client and network. Note: there is no intention to overcome the requirements that for IMS access over UTRAN and GERAN based 3GPP systems UICC-based mechanisms are the only supported mechanisms.

In order to support the needed cable deployment models, the cable enhancements to IMS shall support a framework for the following signalling security requirements to be negotiated between the UE and P-CSCF:

- Signalling with clients behind NAT and Firewall devices
- Client types that cannot rely on the underlying platform
- Performance efficiency for wide variety of clients
- Ability for the network to make use of lower layer access security and relax the creation of security associations between the UE and the P-CSCF based on operator discretion (for example. when the underlying access is granted via the Data Over Cable Service Interface Specification (DOCSIS), IP-CAN)

CT1, CT4 affected specifications: TS 24.229, TS 23.008, TS 29.228 and TS 29.229.

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7.5 IMS System enhancements for corporate network access (IMS_Corp) UID_360012

Resources: S2,S1,C1,C4,IETF

References

Document	Title/Contents
WID(s)	
SP-080095	S1 WID on IMS System enhancements for corporate network access
CP-080220	C1 WID on IMS protocol enhancements for corporate network access
Impacted Specifications	
TS 23.003	Numbering, addressing and identification (C4) Identities associated with business communication
TS 23.008	Organization of subscriber data (C4) Enhancements to HSS for business communication
TS 23.228	IP Multimedia Subsystem (IMS); Stage 2 (S2) Changes to fulfil requirements for access to corporate network
TS 24.229	Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3 (C1) Enhancements to SIP in order to support business communications
TS 24.503	TISPAN; IP Multimedia Call Control Protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP) Stage 3 [3GPP TS 24.229 (Release 7), modified] (C1)
TS 29.228	IP Multimedia (IM) Subsystem Cx and Dx Interfaces; Signalling flows and message contents (C4) Enhancements to Cx protocol to support wildcarded public user identities and any issue with PNP numbers
TS 29.229	Cx and Dx interfaces based on the Diameter protocol; Protocol details (C4) Enhancements to Cx protocol to support wildcarded public user identities and any issue with PNP numbers
TS 29.433	TISPAN; IP Multimedia; Diameter based protocol for the interfaces between the Call Session Control Function and the User Profile Server Function/Subscription Locator Function; Signalling flows and protocol details [3GPP TS 29.228 and 29.229 modified] (C4)
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: Telecom Italia, Alcatel-Lucent, Ericsson, Orange, Telenor, TeliaSonera, NSN, RIM.

UID	Name	Hyperlink	Rapporteur	Notes	TS_TR
390049	**SA1 aspects**	SP-080095	Telecom Italia	SP#40 completed	-
360014	**SA2 aspects**	SP-080095	Orange	no Stage 2 impacts	23.228
390022	**CT1 aspects**	CP-080220	Alcatel-Lucent	CP#47 completed	24.229, 24.503
531002	**(IETF) CT1**	CP-080220	Keith Drage	CP#65 completed	RFC 7316 (was draft-vanelburg-dispatch-private-network-ind)
390023	**CT4 aspects**	CP-080220	Alcatel-Lucent	CP#42 completed	29.228, 29.229, 23.003, 23.008, 29.433

The standardization of fixed broadband access to IMS is addressed by a number of SDOs, e.g. ETSI and ITU-T in the framework of NGN. A set of enhancements to the IMS has already been implemented in Rel-7 based on TISPAN Rel-1 requirements. There is a need to capture new requirements from the industry for IMS in 3GPP Rel-8, especially to support requirements coming from TISPAN R2. One of these requirements is to support corporate, private and residential network access to IMS.

This work implements necessary enhancements to IMS within 3GPP to fulfil this new requirement. It covers IMS architectural enhancements necessary in the 3GPP system to support the access to IMS from e.g. corporate, private, residential networks. One of the scenarios required to be supported is the connection of a corporate network to IMS, where the corporate network has an IMS subscription and the users of the corporate network are owned and managed by the corporate network.

CT WGs work

There is a need to capture enhancements to IMS covering corporate network access. Business communication is covered by ETSI TISPAN, which defines only the Next Generation Corporate Network (NGCN) and AS aspects, and potentially the configuration issues of an IMS providing such business communication. Common IMS is defined by 3GPP, and any required modifications to IMS should therefore be covered within appropriate 3GPP specifications.

The SA1 parent feature (SP-080095) also mentions residential networks. Extension of this CT WGs work item to cover access to IMS by residential networks is for further study.

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This work provides IMS protocol enhancements in the 3GPP system supporting the access to IMS from NGCNs. (scenarios are covered by ETSI TISPAN in DTS/TISPAN-02040). Such extensions to core IMS include:

- distinction of private network traffic from public network traffic, and any special handling of the signalling associated with such distinguished private network traffic by the core IMS, e.g. identity, emergency calls
- protocol issues wildcarded public user identities
- support of PNP numbers
- extension of trust domains to include the NGCN
- support of complex equipment on customer's premises, i.e. the end device is no longer a SIP UA as seen from IMS

7.6 Maintenance of TISPAN documentation (MAINTISP) UID_380069

Resources: S2,C1,C3,C4,IETF

References

Document	Title/Contents
WID(s)	
SP-070916	WID on Maintenance of TISPAN release 2 common IMS
CP-080229	WID on Maintenance of TISPAN release 2 common IMS
SP-070823	WID on Documentation of TISPAN NGN R1 and R2 in 3GPP SA WG2
Impacted Specifications	
TS 23.167	IP Multimedia Subsystem (IMS) emergency sessions (SA2)
TS 23.228	IP Multimedia Subsystem (IMS); Stage 2 (SA2)
TS 23.231	SIP-I based circuit-switched core network; Stage 2 (SA2)
TS 24.447	TISPAN; NGN IMS Supplementary Services; Advice Of Charge (AOC) (CT1)
TS 24.451	TISPAN; Support of SMS and MMS over NGN IMS subsystem; Stage 3 [Endorsement of 3GPP TS 24.341 Release 7] (CT1)
TS 24.454	TISPAN; PSTN/ISDN simulation services; Protocol specification Closed User Group (CUG) (CT1)
TS 24.503	TISPAN; IP Multimedia Call Control Protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP) Stage 3 [3GPP TS 24.229 (Release 7), modified] (CT1)
TS 24.505	TISPAN; PSTN/ISDN simulation services: Conference (CONF); Protocol specification (CT1)
TS 24.508	PSTN/ISDN simulation services Terminating Identification Presentation (TIP) and Terminating Identification Restriction (TIR); Protocol specification (CT1)
TS 24.516	TISPAN; PSTN/ISDN simulation services; Malicious Communication Identification (MCID); Protocol specification (CT1)
TS 24.528	TISPAN; Common Basic Communication procedures; Protocol specification (CT1)
TS 24.529	TISPAN; PSTN/ISDN simulation services: Explicit Communication Transfer (ECT); Protocol specification (CT1)
TS 29.458	TISPAN; SIP Transfer of IP Multimedia Service Tariff Information; Protocol specification (CT3)
TS 29.527	TISPAN; Endorsement of the SIP-ISUP Interworking between the IP Multimedia (IM) Core Network (CN) subsystem and Circuit Switched (CS) networks [3GPP TS 29.163 (Release 7), modified] (CT3)
New Dedicated Specifications/Reports	
TS 24.406	TISPAN; PSTN/ISDN simulation services; Message Waiting Indication (MWI): Protocol specification (CT1)
TS 24.407	TISPAN; PSTN/ISDN simulation services; Originating Identification Presentation (OIP) and Originating Identification Restriction (OIR); Protocol specification (CT1)
TS 24.410	TISPAN; NGN Signalling Control Protocol; Communication HOLD (HOLD) PSTN/ISDN simulation services; Protocol specification (CT1)
TS 24.411	TISPAN; PSTN/ISDN simulation services: Anonymous Communication Rejection (ACR) and Communication Barring (CB); Protocol specification (CT1)
TS 24.423	TISPAN; PSTN/ISDN simulation services; Extensible Markup Language (XML) Configuration Access Protocol (XCAP) over the Ut interface for Manipulating NGN PSTN/ISDN Simulation Services (CT1)
TS 24.430	TISPAN; Presence Service Capability; Protocol Specification [3GPP TS 24.141 V7.0.0, modified and OMA-TS-Presence_SIMPLE-V1_0, modified] (CT1)
TS 29.412	TISPAN; Interworking; Trunking Gateway Control Procedures for interworking between NGN and external CS networks (CT3)
TS 29.421	TISPAN; NGN Release 1; Endorsement of 3GPP TS 29.162 Interworking between IM CN Sub-system and IP networks (CT3)
TS 29.433	TISPAN; IP Multimedia; Diameter based protocol for the interfaces between the Call Session Control Function and the User Profile Server Function/Subscription Locator Function; Signalling flows and protocol details [3GPP TS 29.228 and 29.229 modified] (CT4)
TS 23.506	TISPAN; IP Multimedia Subsystem (IMS); Stage 2 description [3GPP TS 23.228 Release 7, modified]
TS 23.507	TISPAN; Voice Call Continuity (VCC); Stage 2 [3GPP TS 23.206 Release 7, modified] (SA2)
TS 23.517	TISPAN; IP Multimedia Subsystem (IMS); Functional architecture (SA2)
TS 23.521	Telecommunications and Internet converged Services and Protocols for Advanced Networks (TISPAN); Support of Short Message Service (SMS) over NGN IMS subsystem; Stage 2; [Endorsement of 3GPP TS 23.204 Release 7] (SA2)

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Supporting Individual Members SP-070916: Telecom Italia, BT, TeliaSonera, T-Mobile, Ericsson, Vodafone, Portugal Telecom, Alcatel-Lucent. Huawei, Nokia, Nokia Siemens Networks, Orange, China Mobile, Nortel, AT&T.

Supporting Individual Members CP-080229: Alcatel-Lucent, BT, Deutsche Telekom, Ericsson, Huawei Technologies, Nokia, Nokia Siemens Networks, Nortel Networks, Telecom Italia

Supporting Individual Members SP-070823: Alcatel-Lucent, Deutsche Telekom, Huawei, Ericsson, Nortel Networks, Nokia, Nokia Siemens Networks, Telecom Italia.

UID	Name	Acronym	Resource	Hyperlink	WI_rapporteur	Notes	TS_TR
380005	**Maintenance of TISPAN R2**	MAINT_R2	C1,C3,C4	CP-080229	Alcatel-Lucent	CP#39 completed	24.406, 24.407, 24.410, 24.411, 24.423, 24.430, 24.447, 24.451, 24.454, 24.503, 24.505, 24.508, 24.516, 24.528, 24.529, 29.412, 29.421, 29.433, 29.458, 29.527, 29.624
521021	**Deleted - (IETF) Maintenance of TISPAN R2**	MAINT_R2	C1-IETF	CP-080229	Andrew Allen	CP#64 Draft removed from 3GPP documentation	draft-avasarala-dispatch-comm-div-notification
380043	**Documentation of TISPAN NGN R1 and R2 in 3GPP SA2**	IMS_Comm_Doc	S2	SP-070823	Nokia Siemens Networks	SP#40 completed	23.228, 23.204, 23.167
380044	**Maintenance of TISPAN release 2 common IMS**	IMS_Comm_Mtce8	S2	SP-070916	Telecom Italia	SP#38 completed	23.506, 23.507,23.517, 23.521

During the 3GPP SA WG2 and TISPAN WG2 joint meeting on Common IMS in Nov 2007 in Ljubljana, 3GPP and TISPAN agreed on the principles of shifting TISPAN specifications to 3GPP within the Rel-8 timeframe. This work item covers this activity.

As part of the agreement of moving common IMS work from ETSI TISPAN to 3GPP, there is a need to ensure that maintenance occurs of the TISPAN R2 deliverables, published as ETSI standards. TISPAN has a CR process similar to 3GPP, where as essential corrections are identified, they should be made to older releases to which they are appropriate. This WI allocates a WI code to be used on such essential corrections to TISPAN R2, with mirrors 3GPP Rel-8 onwards.

Additionally, if the maintenance process can be made simpler by some re-documentation, e.g. by changing the TISPAN deliverable from being dependent on a specific version of a 3GPP specification, to being one where the dependency is on a specific release but not a specific version, then such changes are also allowed under this work item. Such redocumentation must not result in any technical change.

Due to some issues with 3GPP maintaining directly the TISPAN specifications, the mechanism for doing this will be to create new 3GPP Rel-8 specifications with identical contents to those of the TISPAN R2 specifications. These new specifications will exist independently of any transfer of material into 3GPP specifications that will represent 3GPP Rel-8 output. The corollary of this is that in association with this work item, ETSI TISPAN will need to delete the contents of their specifications and replace them with references to these new 3GPP specifications.

This work item does not provide any new feature or enhancement of a feature; but only a work item code to be used for maintenance of TISPAN R2; such changes shall be essential corrections, as defined by 3GPP and TISPAN CR process.

This work item also provides a work item code for appropriate re-documentation to assist the above, with the constraint that such a change shall not result in any technical change to TISPAN R2 or to frozen 3GPP releases.

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7.7 IMS Service Continuity (IMS-Cont) UID_390056

Resources: S2,S1,C1

References

Document	Title/Contents
	WID(s)
SP-080092	S2 WID on IMS Service Continuity (IMS-Cont)
CP-080491	C1 WID on IMS Service Continuity - Stage 3
	Impacted Specifications
TS 23.292	IP Multimedia System (IMS) centralized services; Stage 2 - S2
TS 24.229	Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3 - C1
	New Dedicated Specifications/Reports
TS 23.237	IP Multimedia Subsystem (IMS) service continuity - S2
TS 24.216	Communication Continuity Management Object (MO) - C1
TS 24.237	IP Multimedia Subsystem (IMS) Service Continuity; Stage 3 - C1

Supporting Individual Members: BT, KDDI, Huawei, LG Electronics, NEC, Orange, Qualcomm, SK Telecom, Telcordia, Telecom Italia, Toshiba, Marvell, Nortel, Motorola, Nokia, Nokia Siemens Networks, Infineon Technologies.

UID	Name	Resource	Hyperlink	TS_TR
390056	**IMS Service Continuity**	S2,S1,C1	SP-080092	-
390072	**Stage 1 IMS Service Continuity**	S1	SP-080092	-
390057	**Stage 2 IMS Service Continuity**	S2	SP-080092	23.237, 23.292
400011	**Stage 3 IMS Service Continuity**	C1	CP-080491	24.237, 24.229, 24.216

SA2 work

SA2 analyzed the related VCC Rel-7 and the Rel-8 TR 23.893 Study on Multimedia Session Continuity (FS_MMSC UID_350051), and agreed to pursue two specifications; one related to Centralized IMS Service Control (TS 23.292) and the other related to IMS Service Continuity (TS 23.237).

VCC Rel-7 only covers voice media and supports domain transfer between CS and IMS within 3GPP; developed within the distributed control of services framework. These limitations raise requirements on the current architecture and its logical entities for covering more effectively the wider scope and providing Service Continuity within the centralized control of services framework.

In Rel-8 several WIDs/SIDs (e.g. encompassing VCC Rel-7, ICS, MMSC) are dealing with different aspects and scopes of Service Continuity. Hence, these different aspects need to be included into a single TS handling the general Service Continuity issue.

The work provides IMS Service Continuity by using the IMS Centralized Services framework, based on the conclusions from TR 23.893 (Multimedia session continuity) and TR 23.892 (IMS centralized services) as follows:

- CS-PS session continuity using the IMS Centralized Services. This is an enhancement of the VCC Rel-7 and includes enhancements and possible renaming of VCC Application functionalities defined in TS 23.206;
- PS-PS session continuity;
- PS-PS session continuity in conjunction with PS-CS continuity;
- Mobility of media components of a session between different terminals under the control of the same user.

IMS Service Continuity was restricted to Service Continuity using IMS procedures, i.e. mobility mechanisms on the IP-CAN (Internet Protocol Connectivity Access Network) level are not within the scope of this WID.

This WID does not overlap with the features SAES and Single Radio Voice Call Continuity for 3GPP (SAES-SRVCC).

CT1 work

This work enhances the relevant 3GPP protocol specifications to support the following aspects:

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- Procedures to support PS-CS service continuity using the IMS Centralized Services (see TS 23.292). This is an enhancement of the VCC Rel-7 and includes migration and evolution of the Rel-7 VCC procedures from TS 24.206 for support of service continuity, e.g. continuity of mid call services.
- Procedures to support PS-PS session continuity
- Procedures to support PS-PS session continuity in conjunction with PS-CS continuity
- Procedures to support mobility of media components of a session between different terminals under the control of the same subscriber

This work item considered necessary terminal/UE enhancements to enable the objective.

Consistent user experience is ensured where users need continuity of services between heterogeneous access systems (e.g. different radio accesses).

Billing/charging impact was evaluated. Specifically, the ability to generate the appropriate accounting parameters as subscribers move between various access networks is necessary.

No new protocol is expected for security issues covered in the parent feature.

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7.8 Security Enhancements for IMS (IMS-Sec) UID_370078

Resources: S3,C1,C4

References

Document	Title/Contents
	WID(s)
SP-070496	S3 WID on Security Enhancements for IMS
CP-070781	C1 WID on NASS Bundled Authentication
	Impacted Specifications
TS 23.008	Organization of subscriber data - C4 (Add line identity relating to NBA over the Cx interface)
TS 24.229	Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3 - C1 (Specify NBA as alternative to existing security mechanisms)
TS 29.228	IP Multimedia (IM) Subsystem Cx and Dx Interfaces; Signalling flows and message contents - C4 (Add parameters, information element names and mappings relating to NBA over the Cx interface)
TS 29.229	Cx and Dx interfaces based on the Diameter protocol; Protocol details - C4 (Add ABNF relating to NBA over the Cx interface)
TS 33.141	Presence service; Security
TS 33.203	3G security; Access security for IP-based services
TS 33.803	Coexistence between TISPAN and 3GPP authentication schemes
TS 33.978	Security aspects of early IP Multimedia Subsystem (IMS)
	New Dedicated Specifications/Reports
-	-

Supporting Individual Members: Alcatel-Lucent, BT, Ericsson, Nokia Siemens Networks, Nokia, Rogers Wireless, Telecom Italia, Telenor, T-Mobile, Vodafone.

UID	Name	Resource	Hyperlink	TS_TR
370078	**Security Enhancements for IMS**	S3,C1,C4	SP-070496	-
360017	**Stage 2 for IMS-Sec**	S3	SP-070496	33.203, 33.141, 33.803
390054	**CT1 part of Stage 3 for IMS-Sec**	C1	-	-
390154	**CT4 part of Stage 3 for IMS-Sec**	C4	-	-
380012	**CT1 part of NASS Bundled Authentication**	C1	CP-070781	24.229
380013	**CT4 part of NASS Bundled Authentication**	C4	CP-070781	29.229, 29.228, 23.008

SA3 extended the existing IMS security architecture to meet the new security requirements coming from common IMS.

Stage 2 security enhancements for IMS address TS 33.203, TS 33.141, TR 33.978, TR 33.828 and TR 33.803. A series of normative annexes added to TS 33.203, take into account alternative authentication methods to Full IMS AKA:

- NASS-IMS Bundled Authentication (NBA);
- SIP Digest - based authentication;
- Access security with TLS;
- 3GPP2 Access;

Another new annex covers the co-existence of authentication schemes; explaining how to handle in Common IMS the following authentication mechanisms: Full IMS AKA, Early IMS (re-named GIBA, GPRS-IMS Bundled Authentication), NBA, SIP Digest.

SA3 continued the work on co-existence of authentication schemes, ensuring that all IMS security solutions could co-exist. It assessed how an operator can control what authentication schemes can be used in his network.

SA3 identified requirements and specified solutions on media protection for IMS.

SA3 identified which parts of the work performed in TISPAN should be moved to 3GPP, and how the work in TISPAN is integrated into 3GPP specifications.

SA3 specified mechanisms to protect users from unsolicited IMS communication and reduced the number of options for solving the same requirement. Lawful interception was also covered.

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CT WGs work on NASS (Network Attachment Sub-System) Bundled Authentication

TISPAN R1 has an authentication mechanism entitled NASS Bundled Authentication (NBA).
NBA works by extending the successful authentication in the NASS layer to the service layer.

During the network attachment, the NASS authenticates the UE and allocates an IP address. It stores the layer-2 and layer-3 identities in the NASS profile. When UE registers with the P-CSCF, the P-CSCF queries the NASS (actually the CLF functional entity), to obtain its location information. The P-CSCF embeds the location information into the SIP message and forwards it towards the S-CSCF for verification. The S-CSCF verifies this location information with the location information obtained from the UPSF. On successful verification, the user is authenticated at the IMS layer.

As part of the Common IMS work, SA3 have agreed to re-document the TISPAN R1 mechanism as a normative annex to TS 33.203. As a result, work is necessary in specifications owned by TSG CT. Preventing fraud attack is an important aspect of this WID that CT1 must implement in the protocol based on the SA3 requirements.

CT1, CT4 documented NASS Bundled Authentication (NBA) in TSG CT owned specifications.

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7.9 IMS initiated and controlled PSS and MBMS User Service (IMS_PSS_MBMS_US) UID_34046

Resources: S4,S3,IETF

References

Document	Title/Contents
WID(s)	
SP-080201	WID on IMS initiated and controlled PSS and MBMS User Service
Impacted Specifications	
TS 26.234	Transparent end-to-end Packet-switched Streaming Service (PSS); Protocols and codecs - S4
TS 26.346	Multimedia Broadcast/Multicast Service (MBMS); Protocols and codecs - S4
TS 33.246	3G Security; Security of Multimedia Broadcast/Multicast Service (MBMS) - S3
New Dedicated Specifications/Reports	
TS 26.237	IMS based PSS and MBMS User Service; Protocols - S4

Supporting Individual Members: Ericsson, RealNetworks, Apple Inc, Huawei, Orange, Telecom Italia, China Mobile, Verizon Wireless.

UID	Name	Resource	Hyperlink	Notes	TS_TR
34046	**IMS initiated and controlled PSS and MBMS User Service**	S2,S4,C3,C4	SP-080201	SP#39 WID approved	-
34146	**IMS initiated and controlled PSS and MBMS User Service**	S2,S4,C3,C4	SP-080201	SP#43 completed	26.237, 26.234, 26.346, 33.246
521022	**(IETF) IMS initiated and controlled PSS and MBMS User Service**	S4-IETF	SP-080201	SP#53/IETF#81: RFC 6080 included in 26.237	draft-ietf-sipping-config-framework

This work is linked to SA4 Extending PSS and MBMS User Services for optimized Mobile TV (PSS_MBMS_OMTV) UID_34043.

IMS facilitates multimedia service creation and deployment. It allows operators to apply policy controls over the traffic, control QoS and charging with a single management infrastructure. It allows the use of a common PS infrastructure. Today the IMS is mainly deployed for Voice and Multimedia Telephony applications with the support of enablers like presence and group management.

Multimedia services based on PSS and MBMS use protocols like RTSP, FLUTE and HTTP. This limits the possibilities of service blending and cost optimizations on the infrastructure. It would be beneficial to allow for PSS and MBMS User Services to be initiated and controlled via SIP.

Also, as customers use already-deployed PSS services, the ARPU can be increased by bundling these services into IMS applications that would bring all the features of IMS stated above (QoS, charging etc.). It should be possible to re-use the full functionality of PSS or MBMS as it stands today.

For these reasons 3GPP specified IMS initiated and controlled PSS and MBMS User Service. The same reasons have been guiding the specifications on IPTV in TISPAN, ATIS IIF (IPTV Interoperability Forum) and Open IPTV Forum.

The objective is to provide convergence and avoid inconsistencies with IMS-based IPTV solution provided in TISPAN, ATIS IIF and Open IPTV Forum, by aligning architecture and procedures defined in their specifications and adaptation towards 3GPP PSS and MBMS User Service. The specification work has been done in the following order:

1) Unicast streaming over PSS: e.g. Mobile TV using PSS, streaming radio services
2) MBMS streaming: e.g. Mobile TV using MBMS
3) Other Multimedia streaming/download services

SA4 does not foresee any impact on IMS core itself. This work enables the use of IMS charging in the context of PSS and MBMS User Service. It has no impact on charging specifications. The service allows:

- Blending of PSS and MBMS User Services with IMS communication services;
- A unique registration and profile management for all multimedia services.

This work specified:

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- how to use the SIP protocol to initiate and control PSS and MBMS User Services
- how to use the core IMS functions and enablers in order to utilize mechanisms such as QoS and Policy control to improve the service experience

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7.10 Multimedia interworking between IMS and CS networks (MIW-IMS) UID_713024

Resources: C3,C4

References

Document	Title/Contents
WID(s)	
CP-070729	C3 WID on Multimedia interworking between IM CN subsystem and circuit switched networks
Impacted Specifications	
TR 29.863	Feasibility Study for the multimedia inter-working between the IP Multimedia Core Network (CN) Subsystem (IMS) and Circuit Switched (CS) networks - C3
TS 29.163	Interworking between the IP Multimedia (IM) Core Network (CN) subsystem and Circuit Switched (CS) networks - C3
TS 29.332	Media Gateway Control Function (MGCF) - IM Media Gateway (IM-MGW); Mn interface - C4
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: Nortel, Vodafone, Orange, Nokia, Siemens, Ericsson, Huawei.

UID	Name	Resource	Hyperlink	TS_TR
713024	**Multimedia interworking between IMS and CS networks**	S2,C3,C4	CP-070729	-
7013	**Note: Stages 1 and 2 defined in earlier Release**	S2	-	-
7014	**Stage 3 of MW-IMS**	C3	CP-070096	29.863, 29.163
380021	**Stage 3 for MW-IMS, MONA extension**	C3	CP-070729	29.863, 29.163
380022	**Mn interface (MGCF – IM MGW)**	C4	CP-070729	29.332

NOTE: SA1 Stage 1 and SA2 Stage 2 have been defined in earlier Releases.

Within UMTS, the capability of IP-based Multimedia (IM) services enables supporting basic multimedia calls to and from Circuit Switched (CS) networks (i.e. PSTN, ISDN and GSM/UMTS CS networks). These multimedia calls will require interworking functions within the IMS.

The UMTS architecture includes Media Gateway (MGW) functionality for interworking between the GGSN Gi reference point and CS networks for the user plane, and Media Gateway Control Function (MGCF) and Signalling Gateway (SGW) functionality to allow interworking between the Call Session Control Function (CSCF) and CS networks in the control plan.

This work provides functionality for supporting basic multimedia calls required within the:

- MGW to deliver the user plane aspects between IMS and CS networks;
- MGCF and SGW to deliver the control plane aspects between IMS and CS networks;

In order to support basic multimedia calls, the work addressed the control plane interworking:

- between the AMR codec used in the IMS and possibly other codec types used in CS networks) in order to support basic multimedia calls;
- the mapping required between 3GPP profile of SIP and ISUP/BICC, SDP, 324M control protocols, if required) to enable the IMS to communicate with CS networks;

The areas addressed encompass transport protocol, transcoding and signalling issues for negotiation and mapping of bearer capabilities and QoS information.

As a first step, CT3 Rel-7 TR 29.863 was continued to study all implications of the user and control plane interworking.

Subsequently the functionality was added:

- Stage 3 of MW-IMS and Stage 3 for MW-IMS (MONA extension) to existing CT3 TS 29.163;

Mn interface (MGCF – IM MGW) to existing CT4 TS 29.332;

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7.11 IMS Stage-3 IETF Protocol Alignment (IMSProtoc2) UID_360029 (open IETF)

Resources: C1,IETF

References

Document	Title/Contents
WID(s)	
CP-080794	WID on IMS Stage-3 IETF Protocol Alignment
Impacted Specifications	
TR 24.930	Signalling flows for the session setup in the IP Multimedia core network Subsystem (IMS) based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3
TS 23.218	IP Multimedia (IM) session handling; IM call model; Stage 2
TS 24.229	Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: Alcatel-Lucent, Huawei, Nortel Networks, Nokia, Nokia Siemens Networks.

UID	Name	Resource	Hyperlink	Rapporteur	Notes	TS_TR
360129	**CT1 aspects of IMS Stage 3 IETF Protocol Alignment - phase 2**	C1	CP-080794	Alcatel-Lucent	CP#43 completed	23.218, 24.229, 24.930
521023	**(IETF)**	C1-IETF	CP-080794	Andrew Allen	CP#58 completed. ietf-draft discontinued. Documented within 3GPP	draft-bakker-sipping-3gpp-ims-xml-body-handling
521024	**(IETF) (RFC 6544)**	C1-IETF	CP-080794	Keith Drage	CP#56 completed	RFC 6544 (was draft-ietf-mmusic-ice-tcp)
521025	**(IETF)**	C1-IETF	CP-080794	Roland Jesske	Submitted to IESG for publication	draft-ietf-salud-alert-info-urns

Rel-7 work on IMS protocol fulfilled a useful purpose in separating all minor IMS enhancements needing progress. Rel-8 WID has an identical scope (with the removal of 24.930).

IMS was defined in Rel-5 to support IP Multimedia services and provided the basis for IP Multimedia support. Rel-6 and Rel-7 further improvements were made. Rel-8 identified new capabilities and there is still significant IETF ongoing work that should be documented in relation to its impact on IMS.

This work aligned protocol between 3GPP Stage 3 IMS and IETF, reviewed IETF provided SIP capabilities, and documented whether these capabilities are supported in the IMS or not.

In addition, minor technical enhancements to IMS, not of sufficient significance to be normally covered by a work item, were covered by this work item.

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7.12 Interworking between User-to-User Signalling (UUS) and SIP (UUSIW) UID_380014 (open IETF)

Resources: C1,C3,IETF

References

Document	Title/Contents
	WID(s)
CP-070782	C1 WID on UUS interworking
	Impacted Specifications
TS 29.163	Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3 - C1
TS 24.229	Combining Circuit Switched (CS) and IP Multimedia Subsystem (IMS) services; Stage 3 - C1
TS 24.279	Interworking between the IP Multimedia (IM) Core Network (CN) subsystem and Circuit Switched (CS) networks - C3
	New Dedicated Specifications/Reports
-	-

Supporting Individual Members: Huawei, Infineon, LG Electronics, Deutsche Telekom, Ericsson.

UID	Name	Resource	Hyperlink	Rapporteur	Notes	TS_TR
380015	**CT1 part**	C1	CP-070782	Huawei	CP#42 completed	24.279, 24.229
521026	**(IETF)**	C1-IETF,C3-IETF	CP-070782	Roland Jesske	Submitted to IESG for publication	draft-ietf-cuss-sip-uui
551001	**(IETF)**	C1-IETF,C3-IETF	CP-070782	Keith Drage	Submitted to IESG for publication	draft-ietf-cuss-sip-uui-isdn
380016	**CT3 part**	C3	CP-070782	Huawei	CP#43 completed	29.163

SA1 identified the requirement of MGCF (Media Gateway Control Function) interworking between UUS and SIP. This MGCF interworking makes possible the CSI (CAMEL Subscription Information) capability exchange between UEs that use CSI and UEs that use IMS with IMS origination and CSI termination.

The purpose of CSI capability exchange is to enrich communication for CSI termination. So the user of CSI capable UE can expect same user experience in case remote party is IMS capable UE.

Hence, Stage 3 should properly cover the MGCF interworking to enable transportation of CSI capability information and the CSI capability exchange for IMS originated sessions leading to CSI session termination.

This work aligns the agreed Stages1 and 2 with Stage 3 along with the provision of relevant Stage 3 capabilities and functionalities to elaborate the MGCF interworking as defined in TS 22.228 and the functional involvement of the CSI capability exchange defined in TS 23.279.

TS 22.228 requires IMS support interoperability of UUS service with the PSTN/ISDN and vice versa. This was applied from TISPAN Stage 1.

Stage 2 requirement of CSI capability exchange and MGCF interworking between UUS1 and SIP is part of TS 23.279.

This work:

- implements the MGCF interworking between UUS and corresponding SIP as defined in Stage 1 requirements (CT3 related part);
- includes UUS into SIP header (CT3 and CT1 common part);
- includes CSI capability exchange feature in CT1 as defined in Stage 2 (CT1 related part)

NOTE 1: This work only covers UUS1 implicit aspects of UUS interworking

NOTE 2: Extensions to SIP should be developed in accordance with 3GPP agreements with IETF, see RFC 3113.

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7.13 Support of Overlap signalling (Overlap) UID_380018

Resources: C3,C1,C4

References

Document	Title/Contents
	WID(s)
CP-070731	C3 WID on Support of Overlap within the common IMS
	Impacted Specifications
TS 24.229	Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3 - C1
TS 29.163	Interworking between the IP Multimedia (IM) Core Network (CN) subsystem and Circuit Switched (CS) networks - C3
TS 29.228	IP Multimedia (IM) Subsystem Cx and Dx Interfaces; Signalling flows and message contents - C4
TS 29.229	Cx and Dx interfaces based on the Diameter protocol; Protocol details
	New Dedicated Specifications/Reports
-	-

Supporting Individual Members: Deutsche Telekom, T-Mobile, Huawei, Alcatel-Lucent, British Telecom, Telecom Italia, Nortel Networks.

UID	Name	Resource	Hyperlink	TS_TR
380018	**Support of Overlap signalling**	C3,C1,C4	CP-070731	-
380019	**Stage 3 Overlap (CT1)**	C1	CP-070731	24.229
380020	**Stage 3 Overlap (CT3)**	C3	CP-070731	29.163
380120	**Stage 3 Overlap (CT4)**	C4	CP-070731	29.228, 29.229

As part of the agreement of moving common IMS work from ETSI TISPAN to 3GPP, there is a need to ensure that work on Overlap Signalling in TISPAN is continued within 3GPP. Within TISPAN the feasibility study WI3111 (TR 183 056) evaluates overlap related procedures, some of which may be needed for IMS to support Overlap Signalling.

This work specifies a method inside IMS for supporting Overlap Signalling originating from networks using Overlap Signalling. The solution is based on requirements from SA1 and architectural input from SA2.

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7.14 AS/MRFC stage 2 and 3 work (MRFC_TS) UID_380035

Resources: C1

References

Document	Title/Contents
WID(s)	
CP-070784	WID on Media Server Control using the IP Multimedia (IM) Core Network (CN) system (AS/MRFC stage 2/3)
Impacted Specifications	
TS 23.218	IP Multimedia (IM) session handling; IM call model; Stage 2
TS 24.147	Conferencing using the IP Multimedia (IM) Core Network (CN) subsystem; Stage 3
TS 24.229	Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3
TS 24.247	Messaging service using the IP Multimedia (IM) Core Network (CN) subsystem; Stage 3
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: Hewlett-Packard, Comverse Network Systems, IAESI, Huawei.

UID	Name	Resource	Hyperlink	Notes	TS_TR
380035	**AS/MRFC Stage 2 and 3**	C1	CP-070784	-	-
380135	**AS/MRFC Stage 2**	C1	CP-070784	CP#42 completed	23.218
380235	**AS/MRFC Stage 3**	C1	CP-070784	CP#42 completed	24.229, 24.147, 24.247
521027	**(IETF) AS/MRFC Stage 2 and 3**	C1-IETF	CP-070784	CP#56 RFC 6505 completed	RFC 6505 (was draft-ietf-mediactrl-mixer-control-package)

This work was triggered by the CT1 Study UID_7048 (MRFC).

The SIP signalling used between an AS and an MRFC (Media Resource Function Controller) is specified but not the format of the media commands/instructions and results/events used for controlling a Media Resource Function.

TR 24.880 (Study on AS-MRFC media server control protocol UID_7048) studied requirements, options and alternatives for Media Server Control (MSC) of a Media Resource Function and made recommendations for MSC specification.

CT1 produced stage 2 and stage 3 by following the recommendations from TR 24.880:

- Create Cr reference point that can be used for both delegation and protocol models, and would support the functions of both the Cr and Sr interfaces;
- Use VoiceXML 2.1 standard or VoiceXML 3.0 working draft (the decision to be taken depending on availability of the VoiceXML 3.0 working draft);
- Use RFC 4240 and draft-ietf-mediactrl-vxml needs to be specified;
- Specify AS/MRFC conferencing split and a corresponding media conference policy that can be used by a media server control method;
- Use SCXML or CCXML profile together with the delegation model;
- For the protocol model, to align requirements with and to specify the use of IETF mediactrl protocol. If this work is not available in Rel-8 then use an existing protocol such as MSCML (RFC 4722).

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7.15 IMS Restoration Procedures (IMS_RP) UID_400012

Resources: C4,C1

References

Document	Title/Contents
	WID(s)
CP-080447	WID on IMS Restoration Procedures
	Impacted Specifications
TS 24.229	Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3 - C1 [Added new information elements and detailed behaviour]
TS 29.228	IP Multimedia (IM) Subsystem Cx and Dx Interfaces; Signalling flows and message contents - C4 [Updated ABNF command]
TS 29.229	Cx and Dx interfaces based on the Diameter protocol; Protocol details - C4 [Defined new AVPs]
TS 29.230	Diameter applications; 3GPP specific codes and identifiers - C4 [Updated procedures of network elements handling SIP signalling]
	New Dedicated Specifications/Reports
TS 23.380	IMS Restoration Procedures - C4

Supporting Individual Members: Ericsson, Vodafone, France Telecom, Huawei, Nortel, Hewlett-Packard, ZTE, Alcatel-Lucent.

UID	Name	Resource	Hyperlink	TS_TR
400012	**IMS Restoration Procedures**	C4,C1	CP-080447	-
400026	**IMS Restoration Procedures**	C4	CP-080447	23.380, 29.228, 29.229, 29.230, 23.008
400027	**IMS Restoration Procedures**	C1	CP-080447	24.229

This work is triggered by TR 23.820 Study on Restoration Procedures (FS_IMS_RP) UID_350018.

This work specifies the procedures recommended in TR 23.820, e.g. covering the S-CSCF service interruption scenario.

7.16 IMS Application Server Service Data Descriptions for AS interoperability (IMS_ASIO) UID_410003

Resources: C4

References

Document	Title/Contents
	WID(s)
CP-080451	WID on IMS Application Server Service Data Descriptions for AS interoperability
	Impacted Specifications
TS 29.328	IP Multimedia Subsystem (IMS) Sh interface; Signalling flows and message contents
TS 29.329	Sh interface based on the Diameter protocol; Protocol details
	New Dedicated Specifications/Reports
TS 29.364	IP Multimedia Subsystem (IMS) Application Server (AS) service data descriptions for AS interoperability

Supporting Individual Members: Alcatel-Lucent, Verizon Wireless, Nortel Networks, Nokia-Siemens Networks, ZTE.

UID	Name	Resource	Hyperlink	TS_TR
410003	**IMS Application Server Service Data Descriptions for AS interoperability**	C4	CP-080451	29.328, 29.329, 29.364

This work is triggered by TR 29.864 Study on IMS Application Server (AS) service data descriptions for AS interoperability UID_360030 (FS_IMS_ASIO).

Application data for IMS is defined as being 'Transparent'. Transparency in this case refers to the fact that the HSS, and the Sh interface, do not semantically understand the data just syntactically how to deal with its entirety. ASs are free to

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store data without an openly distributed definition of the stored content, however, because the data is transparent (the format is not standardized) it is potentially an issue for one AS to make use of data defined for another AS (e.g. the ASs are supplied by different vendors).

Standardizing the data formats facilitates interoperation among ASs supplied by the same, or different, vendors. These AS vendors may be primary and secondary suppliers of the same Service Provider (SP) within a SP's IMS network. This is especially true of mature services, such as the features provided in basic voice subscriptions, and is likely to be true of any future services that achieve a wide deployment.

There has already been work incorporated into 3GPP from TISPAN that point towards the need to define common data. The UE may update a service setting (e.g. a forwarded to number) in an AS via the Ut interface. The AS may store this information in transparent data in the HSS, but unless the data is defined it cannot be shared with other ASs.

Some benefits of standardizing the data formats for services:

1 Multi-vendor AS support.

Today's telecom SPs regularly use two or more vendors to provide identical capabilities. Standardization has facilitated this, as products must conform to the defined interfaces. Service providers use this to build competition among vendors and to build business contingencies. The AS market, especially for high penetration services, is expected to follow a similar path.

2 Data Synchronization

In defining IMS centralized services, interworking between the HLR/HSS and the Telephony Application Server may occur to exchange data that is administered in the CS domain and IMS. The definition of IMS AS service data descriptions facilitates this exchange.

3 Feature Interaction

Advertising and defining data for each application is expected to increase communication regarding features within applications. This will make the integration of complex features more likely to succeed, as the information is available to examine for interactions.

4 User re-homing and load balancing

To facilitate re-homing of users to application servers and load balancing, the definition of IMS AS service data descriptions increases the opportunity for hosting services on alternative ASs.

This work standardized the necessary components of an AS subscriber data definition by using the methods proposed in TR 29.864. These procedures enable applications to define, extend and publish data definitions.

Redefine the OMA XDM XML based data of the AS providing Presence, IM, etc. is out of the scope of this work.

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8 WLAN interworking with a 3GPP system (I-WLAN)

Interworking WLAN (I-WLAN): A WLAN that interworks with a 3GPP system (TR 21.905).

WLAN Wireless Local Area Network

8.1 I-WLAN Network Selection Principle (IWLANNSP) UID_340030

Resources: S1,C1,C6

References

Document	Title/Contents
	WID(s)
SP-060932	S1 WID on I-WLAN NSP
CP-080217	C1,C6 WID on I-WLAN NSP
	Impacted Specifications
TS 22.234	Requirements on 3GPP system to Wireless Local Area Network (WLAN) interworking - S1 (Added NSP requirements to I-WLAN Network Selection)
TS 24.234	3GPP system to Wireless Local Area Network (WLAN) interworking; WLAN User Equipment (WLAN UE) to network protocols; Stage 3 - C1 (Add NSP requirements to I-WLAN Network Selection)
TS 31.102	Characteristics of the Universal Subscriber Identity Module (USIM) application - C6 (Added provisioning files)
TS 31.111	Universal Subscriber Identity Module (USIM) Application Toolkit (USAT) - C6 (Added steering of roaming procedures)
	New Dedicated Specifications/Reports
-	-

Supporting Individual Members: O2, RIM, Gemalto, Softbank Mobile.

UID	Name	Resource	Hyperlink	TS_TR
340030	**I-WLAN Network Selection Principle (NSP)**	S1,C1,C6	SP-060932	-
390024	**Stage 1 for I-WLAN NSP**	S1	SP-060932	22.234
390025	**Stage 3 for I-WLAN NSP**	C1	CP-080217	24.234
390125	**Stage 3 for I-WLAN NSP**	C6	CP-080217	31.102, 31.111

SA1 aligned the requirements for the selection of I-WLAN access in TS 22.234 (Requirements for WLAN Interworking) to the ones applicable to PLMN network selection in TS 22.011 (Service accessibility).
Due to changes of the network selection mechanism in TS 22.011, the following SA1,CT1 alignment was needed:

- Automatic PLMN selection procedure by WLAN UE (TS 22.234, TS 24.234);
- Manual PLMN Selection Mode Procedure by WLAN UE (TS 22.234, TS 24.234);
- Operator management of network preferences for I-WLAN (TS 22.234);

MMI aspects considered: Identification and manual choice of PLMNs by I-WLAN UE.

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8.2 Mobility between 3GPP-WLAN Interworking and 3GPP Systems (IWLAN_Mob) UID_370049

Resources: S2,C1

References

Document	Title/Contents
	WID(s)
SP-070701	S2 WID on Mobility between 3GPP-WLAN Interworking and 3GPP Systems
CP-080320	WID on CT1 aspects of mobility between 3GPP WLAN Interworking and 3GPP Systems
	Impacted Specifications
TS 24.303	Mobility management based on Dual-Stack Mobile IPv6; Stage 3 - C1
	New Dedicated Specifications/Reports
TS 23.327	Mobility between 3GPP-WLAN interworking and 3GPP systems - S2
TS 24.327	Mobility between 3GPP WLAN Interworking and 3GPP Systems; GPRS and 3GPP I-WLAN Aspects; stage 3 - C1

Supporting Individual Members: Orange, China Mobile, Telenor, Nokia Siemens Networks, Nokia, Ericsson, Airvana, Marvell, Qualcomm, Bridgewater.

UID	Name	Resource	Hyperlink	TS_TR
370049	**Mobility between 3GPP-WLAN Interworking and 3GPP Systems**	S2,C1	SP-070701	-
380045	**Stage 2: I-WLAN Mobility**	S2	SP-070701	new 23.327
400013	**CT1 aspects of I-WLAN Mobility**	C1	CP-080320	24.303, new 24.327

This work is linked to SAE for support of non-3GPP accesses (UID_350027).

TS 23.234 (3GPP system to WLAN interworking; System description) provides the possibility to offer access to IP services via WLAN (and other compatible IP access technologies) by interworking with Rel-6 3GPP systems.
As defined in Rel-6 TR 22.934, service continuity (scenario 4) and seamless services (scenario 5) at a change of the access network (between I-WLAN and GPRS) are desirable enhancements to improve the user experience.

The work was based on architectural/functional/procedural definitions described in TS 23.234 (3GPP system to WLAN interworking; System description) and TS 23.060 (GPRS; Service description; Stage 2).
Synergies and smooth migration to SAE was considered.

New SA2 TS 23.327 specifies the stage 2 system description for providing mobility between 3GPP-Wireless Local Area Network Interworking (I-WLAN) and 3GPP Systems. It defines a technical solution based on the working principles of DS-MIPv6 with necessary enhancement of the I-WLAN architecture for supporting mobility and roaming between 3GPP-WLAN Interworking system and 3GPP Systems so that ongoing 3GPP PS based services can be maintained with minimal impact on the end-user's perceived quality on the services at a change of the access network (between I-WLAN and 3GPP Access Systems.
TS 23.327 includes both non-roaming and roaming scenarios and covers all aspects, including mobility between 3GPP Systems and I-WLAN with access authentication and charging.

CT1 part of work is linked to SAE for support of non-3GPP accesses (UID_350027) particularly to Stage 3 for Inter-system mobility between E-UTRAN and non 3GPP accesses (UID_380030). CT1 produced the specifications for the H1 reference point and associated procedures used for the mobility between I-WLAN and 3GPP legacy systems. On Service Aspects, minimum interruptions are expected to the applications running on UE during the change between 3GPP and I-WLAN systems. Collection of accounting information when the UE changes accesses shall be specified with maximum re-use of existing 3GPP charging specifications. The service continuity across the access systems shall not compromise the security mechanisms of the individual access system.

New CT1 TS 24.327 specifies Stage 3 referencing where appropriate TS 24.303 Mobility management based on Dual-Stack Mobile IPv6; Stage 3.

8.2.1 Conformance Test Aspects – Mobility between 3GPP WLAN Interworking and 3GPP Systems UID_460006

Resources: R5

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Supporting Individual Members: Orange, Qualcomm, ZTE, TeliaSonera.

UID	Name	Hyperlink	Status_Report	Notes	TS_TR
460006	**Conformance Test Aspects – Mobility between 3GPP WLAN Interworking and 3GPP Systems**	RP-091349	RP-100740	RP#49 completed. Testing for Rel-8 UID_400013 CT1 aspects of mobility between 3GPP WLAN Interworking and 3GPP Systems (24.327)	34.108, 34.123-1, 34.123-2, 34.123-3

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9 Pan-European in-vehicle emergency call (eCall)

UID	Name	Resource	Hyperlink	Notes
330005	eCall Data Transfer	S1,C1	SP-060678	Linked to SA4 Feature UID_34042 (eCall_Phase2)
360015	Study on Transferring of emergency call data – in-band modem solution	S4	SP-060935	Spin-off WID UID_34042 (eCall_Phase2)
34042	eCall data transfer Phase 2: Comparison of alternative in-band modem solutions and standardization of one in-band modem solution	S4	SP-070756	Triggered by Study UID_360015 (eCALLIBMS). Linked to SA1 Feature UID_330005 (EData)
450001	eCall Conformance Testing	G3new	GP-091098	Testing for Rel-8 eCall_Phase2 (UID_34042) and EData (UID_330005)
450023	Conformance Test Aspects – non-modem procedures of eCall sessions in UTRA	R5	RP-090952	Testing for Rel-8 eCall_Phase2 (UID_34042) and Edata (UID_330005)

9.1 eCall Data Transfer (EData) UID_330005

Resources: S1,C1

References

Document	Title/Contents
WID(s)	
SP-060678	S1 WID on eCall Data Transfer – Requirements
CP-080316	C1 WID on Transfer of data during an emergency call (EData)
Impacted Specifications	
TS 22.101	Service principles
TS 22.105	Services and service capabilities
TS 24.008	Mobile radio interface Layer 3 specification; Core network protocols; Stage 3
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: Airbiquity, T-Mobile, Vodafone, Wavecom

UID	Name	Resource	Hyperlink	TS_TR
330005	eCall Data Transfer	S1,C1	SP-060678	-
370081	eData Requirements	S1	SP-060678	22.101, 22.105
400014	Transfer of data during an emergency call	C1	CP-080316	24.008

This work is linked to SA4 Study on "eCall data transfer Phase 2: Comparison of alternative in-band modem solutions and standardization of one in-band modem solution" (eCall_Phase2) UID_34042

This WID identifies the necessary requirements, from SA1 Rel-7 TR 22.967 (Transferring of emergency call data) and ETSI MSG agreed documents, for the transmission of a Minimum Set of Data (MSD), i.e. 140 bytes maximum, from the In Vehicle System (IVS) to a Public Safety Answering Point (PSAP). As explained in the document 1609/6/EN WP125 on EU's Article 29 Working Party, the Minimum Set of Data (MSD) consists of the following (i) time of incident, (ii) precise location including direction of driving, (iii) vehicle identification, (iv) eCall qualifier giving the severity of the incident (as a minimum, as indication if eCall has been manually or automatically triggered), (v) information about a possible service provider.

As part of the EU Commission eSafety initiative, ETSI MSG was requested to standardize the transmission of a MSD sent from a suitably equipped vehicle to a PSAP. The intention (of eCall) is to supplement TS12 emergency voice calls with emergency related data from a vehicle e.g. accurate location information, that will enable the emergency services to reach accident victims more rapidly, with the potential to save more lives.

SA1 TR 22.967 examined the issues associated with the transmission of emergency call data from a vehicle to a PSAP. In order to progress work in other 3GPP groups supporting the EU Commission's proposed pan-European eCall service, this work identifies (only) those requirements necessary for the transmission of the MSD from the IVS to a PSAP.

SA1 added in TS 22.101 the requirements for supporting the transfer of data during an emergency call.

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SA4 and SA1 have agreed to send the data will by using an in-band modem.

SA4 TR 26.967 indicates that unmodified CTM as standardized can not fulfil all the eCall requirements; i.e. applying the proposed robust Pull-Protocol on application layer, transmits the MSD (Minimum Set of incident Data) of 140 bytes in 29 sec instead of the required 4 sec. Unmodified CTM as standardized also does not include a transport layer acknowledgement. This is not necessarily a disadvantage; TR 26.967 shows that a flexible half-duplex application layer protocol can simply be added.

To fulfil some of the SA1 requirements, CT1 needed to modify the mobility management and the emergency call set up.

CT1 TS 24.008 includes the Stage 3 enhancements to mobility management and call control procedures.

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9.2 Study on Transferring of emergency call data – in-band modem solution (eCALLIBMS) UID_360015

Resources: S4

References

Document	Title/Contents
WID(s)	
SP-060935	SID on Transferring of emergency call data – in-band modem solution
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TR 26.967	eCall data transfer; In-band modem solution

Supporting Individual Members: Airbiquity, T-Mobile, Vodafone, Wavecom.

As part of the EU Commission eSafety initiative, ETSI MSG were requested to standardize the transmission of a Minimum Set of Data (MSD) sent from a suitably equipped vehicle to a Public Safety Answering Point (PSAP). The intention (of eCall) is to supplement E112 and 112 (TS12) emergency voice calls with emergency related data from a vehicle e.g. accurate location information, that should enable emergency services to reach faster accident victims, with the potential to save more lives annually. GSME Position Paper on eCall investigated SMS, UUS (User to User Signalling), USSD (Unstructured Supplementary Service Data), GSM CS data, DTMF and in-band modem solutions. In-band modem solution resulted as the preferred option.

SA1 Rel-7 TR 22.967 (Transferring of emergency call data) examined the transmission of emergency call data from a vehicle to a PSAP. SA1 set requirements for adding data component to E112 and 112 (TS12) emergency calls and eCall MSD (data) transfer requirements necessary for the transmission of the MSD (140 bytes maximum), from the In Vehicle System (IVS) to a PSAP.

For eCall, SA4 has studied the in-band modem solution and any necessary interface to the ME. Because eCall is a European regional requirement, it shall not impact the global circulation of terminals. SA4 investigated the suitability of existing 3GPP in-band solutions satisfying the requirements for eCall (e.g. Cellular Text telephony Modem - CTM). In case no existing solution is suitable, an alternative in-band solution for eCall should be specified.

SA4 TR 26.967 concludes that unmodified CTM cannot fulfil all eCall requirements, i.e. applying the proposed robust Pull-Protocol on application layer, transmits the MSD of 140 bytes in 29 seconds instead of the required 4 seconds. Unmodified CTM also does not include a transport layer acknowledgement.

Spin-off implementation work UID_34042 (eCall_Phase2).

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9.3 eCall data transfer Phase 2: Comparison of alternative in-band modem solutions and standardization of one in-band modem solution (eCall_Phase2) UID_34042

Resources: S4

References

Document	Title/Contents
	WID(s)
SP-070756	WID on eCall data transfer Phase 2: Comparison of alternative in-band modem solutions and standardization of one in-band modem solution
	Impacted Specifications
TS 26.226	Cellular text telephone modem; General description
	New Dedicated Specifications/Reports
TS 26.267	eCall data transfer; In-band modem solution; General description
TS 26.268	eCall data transfer; In-band modem solution; ANSI-C reference code
TS 26.269	eCall data transfer; In-band modem solution; Conformance testing
TR 26.967	eCall data transfer; In-band modem solution [Characterizes the performance under various radio and network conditions]
TR 26.969	eCall data transfer; In-band modem solution; Characterization report

Supporting Individual Members:

UID	Name	Resource	Hyperlink	TS_TR
34042	**eCall data transfer Phase 2: Comparison of alternative in-band modem solutions and standardization of one in-band modem solution**	S4	SP-070756	26.226 new (26.267, 26.268, 26.269, 26.967, 26.969)

This work was triggered by Study UID_360015 (eCALLIBMS).

This work is linked to SA1 Feature UID_330005 (EData)

As part of the EU Commission eSafety initiative, ETSI MSG were requested to standardize the transmission of a Minimum Set of Data (MSD) sent from a suitably equipped vehicle to a Public Safety Answering Point (PSAP). eCall will supplement E112 and 112 (TS12) emergency voice calls with emergency related data from a vehicle, e.g. accurate location information, enabling emergency services to reach accident victims more rapidly. GSME has investigated numerous options and identified that the GSME preferred option be based on an in-band modem solution.

Consideration of in-band modem solutions in Phase 1 was limited to existing 3GPP standards, i.e. CTM (Cellular Text telephony Modem), a data delivery technology developed for text telephony.
As agreed at SA4#45 (subsequently confirmed by 3GPP TSG SA, ETSI TC MSG and the European Commission), unmodified CTM as standardized does not fulfil all the eCall requirements. Further, SA, MSG and the EC all agreed that 3GPP should proceed "as soon as possible" with the evaluation of alternative in-band modem data transfer solutions and the standardization of one in-band modem solution for eCall.

SA4 examined alternative in-band modem solutions (in-band modem and any necessary interface to the ME) for eCall, and subsequently standardized the best ranked solution fulfilling the requirements. Comparison criteria were developed and compared to the performance of each proposed in-band modem solution.

SA4 TR 26.967 indicates that unmodified CTM as standardized can not fulfil all the eCall requirements; i.e. applying the proposed robust Pull-Protocol on application layer, transmits the MSD (Minimum Set of incident Data) of 140 bytes in 29 sec instead of the required 4 sec. Unmodified CTM as standardized also does not include a transport layer acknowledgement. This is not necessarily a disadvantage; TR 26.967 shows that a flexible half-duplex application layer protocol can simply be added.

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9.4 eCall Conformance Testing UID_450001

Resources: G3new

References

Document	Title/Contents
WID(s)	
GP-091098	WID on eCall Conformance Testing
Impacted Specifications	
TS 51.010-1, 51.010-2	
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: Ericsson, Qualcomm

UID	Name	Resource	Hyperlink	Notes	TS_TR
450001	eCall Conformance Testing	G3new	GP-091098	GP#47 completed. GP#43 WID approved. Testing for Rel-8 eCall_Phase2 (UID_34042) and EData (UID_330005)	51.010-1, 51.010-2

Testing for Rel-8 eCall_Phase2 (UID_34042) and EData (UID_330005)

The eCall in-band modem is a modulation protocol to transfer data over the mobile voice channel. It is specified in TS 26.267 and TS 26.268, and a corresponding conformance specification is contained in TS 26.269.

Non-modem procedures required for eCalls have been specified in TS 22.101 while protocol support for eCall is defined in TS 24.008. This work developed conformance test cases to verify protocol behaviour for activites such as registration for eCall, connection establishment for eCall and behaviour during eCall inacitivity period

This work introduces conformance testing for non-modem procedures of eCall sessions in the GERAN conformance test specifications.

9.5 Conformance Test Aspects - non-modem procedures of eCall sessions in UTRA UID_450023

Resources: R5

References

Document	Title/Contents
WID(s)	
RP-090952	WID on Conformance Test Aspects - non-modem procedures of eCall sessions in UTRA
Impacted Specifications	
TS 34.108	Common test environments for User Equipment (UE); Conformance testing
TS 34.123-1	User Equipment (UE) conformance specification; Part 1: Protocol conformance specification
TS 34.123-2	User Equipment (UE) conformance specification; Part 2: Implementation conformance statement (ICS) specification
TS 34.123-3	User Equipment (UE) conformance specification; Part 3: Abstract test suites (ATSs)
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members:

UID	Name	Resource	Hyperlink	Status_Report	TS_TR
450023	Conformance Test Aspects – non-modem procedures of eCall sessions in UTRA	R5	RP-090952	RP-100489	34.108, 34.123-1, 34.123-2, 34.123-3

Testing for Rel-8 eCall_Phase2 (UID_34042) and Edata (UID_330005)

The pan-European in-vehicle emergency call, "eCall" is an emergency call generated either manually by the vehicle occupants or automatically via activation of in-vehicle sensors after an accident. Various solutions for eCall were evaluated by SA4 during eCall Phase 1 and eCall Phase 2. A candidate proposal from eCall Phase 2 was selected by

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SA4 and approved by SA plenary #43 (March 2009). The SA specifications are TS 22.101, TS 26.267 and TS 26.268 while the protocol related aspects of eCall are defined in TS 24.008 and 3GPP TS 31.102. The in-band modem test specification is in TS 26.269.

The eCall modem specification was also approved as an ETSI eCall in-band modem standard and adopted by the European Commission and CEN as the Pan-European eCall Standard.

When activated, the in-vehicle eCall device establishes an emergency call carrying both voice and data directly to the most appropriate Public Safety Answering Point (PSAP). The voice call enables the vehicle occupants to communicate with the PSAP operator. At any time during the call, a Minimum Set of Data (MSD) can be sent to the PSAP operator receiving the voice call.

Aside from the in-band modem component specified in TS 26.267 and TS 26.268, full support of eCall sessions requires that the UE perform non-modem related procedures. Therefore, there is a need for conformance testing for eCall by developping test cases for non-modem related protocols as required. The following are some of the non-modem procedures related to eCall:

1. In eCall only mode, blocking of calls to numbers other than to PSAP, test and reconfiguration numbers
2. In eCall only mode, ability to set up calls to PSAP, test number and reconfiguration numbers
3. In eCall only mode, non-execution of mobility management procedures when the terminal changes location areas and non-execution of periodic location update procedure

The eCall in-band modem is a modulation protocol to transfer data over the mobile voice channel. It is specified in TS 26.267 and TS 26.268, and a corresponding conformance specification is contained in TS 26.269.

Non-modem procedures required for eCalls have also been specified in TS 22.101, TS 24.008 and TS 31.102. This work developed conformance test cases to address the non-modem aspects of eCall sessions.

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10 SA1 Features

10.1 Enhancements for Voice Group Call Service (VGCS) Applications (EVA) UID_7042

Resources: S1,C1,C4,G2

References

Document	Title/Contents
WID(s)	
SP-070904	S1 WID on Enhancements for Voice Group Call Service (VGCS) Applications (EVA)
SP-070653	S1 WID on VGCS/VBS and GPRS Interactions
CP-060260	C1 WID on Enhancements for VGCS Applications
GP-071855	G2 WID on Enhancements for VGCS Applications
Impacted Specifications	
TS 42.068	Voice Group Call Service (VGCS); Stage 1 - SA1
TS 42.069	Voice Broadcast Service (VBS); Stage 1 - SA1
TS 43.068	Voice Group Call Service (VGCS); Stage 2 - CT1
TS 44.068	Group Call Control (GCC) protocol - CT1
TS 29.002	Mobile Application Part (MAP) specification - CT4
TS 48.008	Stage 3 enhancements for the transfer of application specific data - G2
TS 44.018	Stage 3 enhancements for the transfer of application specific data - G2
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: Nortel Networks, Nokia Siemens Networks, Huawei, Vodafone.

UID	Name	Resource	Hyperlink	TS_TR
7042	**Enhancements for Voice Group Call Service (VGCS) Applications (EVA)**	-	SP-070904	
320021	SA1 aspects of EVA	S1	SP-070904	42.068
370019	VGCS/VBS and GPRS Interactions	S1	SP-070653	42.068, 42.069
320019	CT1 aspects of EVA	C1	CP-060260	43.068, 44.068
320020	CT4 aspects of EVA	C4	CP-060260	29.002
52148	GERAN2 aspects of EVA	G2	GP-071855	44.018, 48.008

Enhancements for VGCS Applications (EVA) Stage 1:

SA1 work under WID SP-070904 provides additional optional Voice Group Call Service (VGCS) functions to allow for the support of VGCS applications in railway and public networks, including:

- Transfer of railways application-specific control information, requiring short round trip delay. Railways requirement is for the transfer of shunting commands from the chief shunter to group members, to be acknowledged by the train cab driver.
- A means to request dispatchers to rejoin a group call. Railways requirement is for a simple solution (e.g. pressing a single button, and without the requestor having to leave the group call). Use of a point-to-point call for contacting the dispatcher is not acceptable because too many MMI actions would be needed.
- *Listener identity information – useful for public authority application (e.g. a police chief wants to know who is listening in order to assign tasks to group members) and railway networks (e.g. for dispatchers to identify if members are listening). - not fulfilled by G2 - see GP-071855*

This service provides the ability to:

- Send and receive a small amount of data between group members, including dispatchers;
- Send an indication/ small amount of data from service subscribers to the network;
- Transfer critical data within a short time period (500ms) without impacting voice quality of the group call;
- *Gather information on the identities of current listeners, which should not be older than a specified time interval, and to inform dispatchers on the identities of current listeners. Also, this information may be provided to service subscribers. - not fulfilled by G2 - see GP-071855*

GERAN2 added in existing TS 48.008 and TS 44.018 additional optional VGCS functions meeting the above purposes. The intent was to have a future-proof solution that can be used to meet potential future application needs.

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VGCS/VBS and GPRS Interactions:

SA1 work under WID SP-070653 covers the VGCS/VBS (Voice Group Call Service/Voice Broadcast Service) and GPRS interactions.
Requirements for use of VGCS/VBS in public networks for communication of public authority officials have been defined already.

The improvements of the VGCS/VBS service functionality cover the following aspects:

- When a Class B MS is engaging in a GPRS data session and a VGCS/VBS (emergency) call is coming, the GPRS data session may be immediately aborted and the VGCS/VBS call will be accepted.
- Incoming call's priority information is now provided to the GPRS application, so the GPRS application can choose to interrupt the GPRS data session and accept the incoming call or not based on this priority information.

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10.2 Personal Network Management (PNM) UID_31081

Resources: S1,C1,S3

References

Document	Title/Contents
	WID(s)
SP-080327	S1 WID on Personal Network Management (PNM)
CP-080065	C1,C4 WID on Personal Network Management
	Impacted Specifications
TS 22.259	Service requirements for Personal Network Management (PNM); Stage 1 - S1
TS 24.229	Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3 - C1
	New Dedicated Specifications/Reports
TS 23.259	Personal Network Management (PNM); Procedures and information flows - C1
TS 24.259	Personal Network Management (PNM); Stage 3 - C4

Supporting Individual Members: Vodafone, NTT DoCoMo, NEC, Toshiba, Panasonic, Telcordia Technologies, Huawei.

UID	Name	Resource	Hyperlink	TS_TR
31081	**Personal Network Management**	S1,C1,S3	SP-080327	-
7012	**Stage 1 for PNM**	S1	SP-080327	22.259
350050	**Stage 2 for PNM**	C1	CP-080065	23.259
350041	**Stage 3 for PNM**	C1,C4	CP-080065	-
350001	CT1 aspects of Stage 3 PNM	C1	CP-080065	24.259, 24.229
350002	CT4 aspects of Stage 3 PNM	C4	CP-080065	-

The purpose of this WI is to define a Personal Network (PN) and a Personal Area Network (PAN) within the scope of All IP Based Network (AIPN).

AIPN has been studied some time ago and TR 22.978 was approved at 3GPP SP#27. In the context of this feasibility study, requirements on prospective PNs and PANs were discussed and considered for progress even beneficial for deployment in a mixed CS/PS domain, independent from AIPN or its successor EPS.

This Work Item was established to address such requirements and cater for creation of respective specifications.

"Personal Network: *A Personal Network, in the context of AIPN, consists of more than one device (terminal or server provided by the AIPN operator) under the control of one user providing access to the AIPN. These devices are interconnected by the AIPN such that the user perceives a continuous secure connection regardless of their relative locations. The user controls the PN using facilities provided by the AIPN."*

Why this feature: Already now, many subscriber own more than one terminal and subscription, e.g. ordinary handset for telephony, car phone, PDA for emails when on the move, data card with laptop for work when in semi-stationary mode. Although those devices mainly taken for particular usage, many are able to support more than one sort of services, e.g. telephony is supported by all but the data card. Customers may not carry always their full set of "gadgets", but still want to be reachable. Management for the user by setting forwarding options, switch on and off terminals, providing partners with multiple addresses is not very customer friendly. The Personal network will provide the efficient means for the customer to manage their terminals.

"Personal Area Network: *A Personal Area Network (PAN), in the context of AIPN consists of more than one device (terminal) controlled by, and physically close to, the same user (person). All the devices within a PAN use the same USIM. These devices are connected together using internal PAN means. The user obtains services from the AIPN using his multiple devices which all access the users USIM through the PAN to gain access to the AIPN. The user controls the PAN directly."*

Why this feature: Complimentary to the Personal Network, customers use devices which are capable to support certain services, but neither they are equipped with USIM nor with the radio access means, e.g. a PDA or laptop might be better suited to play a video stream with reasonable quality that a 3G phone with very limited screen size. Current interconnection means between auxiliary devices and 3G terminals are very much of a proprietary nature and come with security constrains, e.g. for setting up a session via an auxiliary device.

Further advanced features on PAN, initially planned to be part of Release 8, will finally be included in a later release.

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10.2.1 Key establishment between a UICC hosting device and a remote device (PNM) UID_340010

Resources: S3

References

Document	Title/Contents
WID(s)	
SP-060839	S3 WID on Key establishment between a UICC hosting device and a remote device
Impacted Specifications	
TS 33.259	Key establishment between a UICC hosting device and a remote device - S3
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: 3, Ericsson, Nokia, Rogers Wireless, Vodafone.

UID	Name	Resource	Hyperlink	TS_TR
31081	**Personal Network Management**	-	SP-080327	-
340010	**Key establishment between a UICC hosting device and a remote device**	S3	SP-060839	33.259

This work was moved from Rel-7 to Rel-8 Feature => BB as per SA3/SA WID in SP-060839, keeping the same UID

TS 22.259 describes the service requirements for the Personal Network Management (PNM). PNM allows the user to manage his Personal Network Elements (PNEs), Personal Networks (PNs) and Personal Area Networks (PANs).

TS 22.259 describes PNM use cases requiring secure links established among locally connected devices of a PAN. One example is when a video service is terminating in a PNE (e.g. a laptop) of a PAN and the service is routed through the PNE holding the (U)SIM (i.e. the UE), the local link between the two devices needs to be secured.

This calls for mechanisms to establish a shared key between the UICC hosting device and other PNEs in the PAN. The UICC hosting device may have a (U)SIM that is not able to support secure interaction between the UICC and remote entities, also these devices should have a way to securely communicate with remote entities.

In a PAN there may reside devices with communication capabilities that do not hold a (U)SIM. For interoperability reasons, it is beneficial, if the means to provision a UICC hosting device and a remote device with a shared secret are as agnostic as possible to the nature of the remote device.

This work defines how to provision a shared key between a UICC hosting device and a remote device via a local interface. Authorisation (e.g. determining which terminal can securely connect to which device) was studied as well.

Establishment of a shared key between a UICC hosting device and a remote device allows operators to provide a wide range of sensitive applications that require a secure local interface to protect the data exchanged between the UICC hosting device and remote devices.

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10.3 IP Interconnection of Services (IPinterc) UID_380060

UID	Name	Acronym	Resource	Hyperlink
380060	**IP Interconnection of Services**	IPinterc	S1,S2,S5,C3	SP-080565
380061	**Stage 1 for IPinterc**	IPinterc	S1	SP-080565
7005	**System enhancements for interconnection interfaces between two IMSs**	IMS_NNI	S2,S5,C3	SP-080554
360024	Stage 2 for IMS_NNI	IMS_NNI	S2	SP-080554
360011	IMS inter-operator service interconnection interface	FBI2-IOPSI	C3	CP-080578
330011	Charging harmonization for NGN between 3GPP and ATIS-TMOC	FBI2-TISP2-CH	S5	SP-060545

10.3.1 Stage 1 for IP Interconnection of Services UID_380061

Resources: S1

References

Document	Title/Contents
WID(s)	
SP-070871	S1 WID on Stage 1 Specification of Requirements for IP Interconnection of Services
Impacted Specifications	
TS 22.228	Service requirements for the Internet Protocol (IP) multimedia core network subsystem (IMS); Stage 1 (IMS Interconnection)
TS 22.101	Service aspects; Service principles (CS Services Interconnection)
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: Telefonica O2 Europe; Telecom Italia, BT, Sprint, Vodafone.

UID	Name	Acronym	Resource	Hyperlink	TS_TR
380060	**IP Interconnection of Services**	IPinterc	S1,S2,S5,C3	SP-080565	-
380061	**Stage 1 for IPinterc**	IPinterc	S1	SP-080565	22.101, 22.228

Stage 1 covers IMS_NNI (UID_360024), SIP_Nc (UID_360026), CS-IBCF (UID_400008).

Linked work items:

IMS_NNI	Inter-IMS Network to Network Interface (UID_7005)
SIP_Nc	Support of (G)MSC-S – (G)MSC-S Nc Interface based on the SIP-I protocol (UID_360025)
CS-IBCF	CS-IBCF and CS-TrGW definition in 3GPP specifications (UID_400008)

Support IP inter-connect for MSC Server and IMS as proposed by external bodies (e.g. GSMA, ETSI).

Service Aspects: Define interoperability requirements of IP based services to ensure transparency to the end user.

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10.3.2 System enhancements for interconnection interfaces between two IMSs (IMS_NNI) UID_7005

Resources: S2,C3

References

Document	Title/Contents
WID(s)	
SP-080554	WID on System enhancements for interconnection interfaces between two IM CN subsystem networks (IMS-NNI)
CP-080054	WID on IMS inter-operator service interconnection interface
Impacted Specifications	
TS 23.002	Network architecture
TS 23.228	IP Multimedia Subsystem (IMS); Stage 2
New Dedicated Specifications/Reports	
TR 29.865	Inter-IMS network to network interface - C3
TS 29.165	Inter-IMS Network to Network Interface (NNI) - C3

Supporting Individual Members: Ericsson, Orange, Telecom Italia, Telenor, TeliaSonera, Alcatel-Lucent; Nokia Siemens Networks; Huawei.

UID	Name	Acronym	Resource	Hyperlink	TS_TR
380060	IP Interconnection of Services	IPinterc	S1,S2,S5,C3	SP-080565	-
7005	**System enhancements for interconnection interfaces between two IMSs**	IMS_NNI	S2,S5,C3	SP-080554	-
360024	Stage 2 for IMS_NNI	IMS_NNI	S2	SP-080554	23.002, 23.228
360011	IMS inter-operator service interconnection interface	FBI2-IOPSI	C3	CP-080578	29.865, 29.165

IMS enables supporting basic voice over IP calls as well as other multimedia services (e.g. video calls). These services require a well defined Inter-IMS Network-to-Network Interface (II-NNI) supporting interoperability between IMS networks. Standardized II-NNI ease IMS networks comply with national / international regulations on interoperability.

II-NNI signalling profile provides a standard reference for service interconnection between two IMS networks.

Stage 1 for IMS_NNI is covered by the SA1 Feature IPinterc UID_380060 in TS 22.228 and TS 22.101.

SA2 provided the necessary architectural enhancements in TS 23.002 and TS 23.228 (specified signalling profiles of those interfaces and ensured the alignment with ITU-T Q.3401 (NNI interface).

CT3 provided II-NNI signalling on Ici and Izi reference points between IMS networks for end-to-end service interoperability. The work addressed control plane signalling (3GPP profile of SIP and SDP protocols) and other interconnection aspects e.g. common basic communication procedures, SIP headers used at II-NNI, security, Numbering/naming/addressing and charging information of SIP signalling; covered by a set of 3GPP specifications.

CT3 goal was not to define new protocols or new profiles of existing protocols, but to identify protocols and profiles produced elsewhere in 3GPP applicable to these interfaces. As such, any recommendation in TR 29.865 for protocol change or additional profiling was taken to the WG owning it for documentation in the base specification. Furthermore the CT3 work addressed issues related to the user plane (Izi). Security functionalities and Charging information needed at the interconnection between two IMS networks were investigated.

CT3 TR 29.865 collected all implications of control and user plane on II-NNI interconnection, including:

- Definition of II-NNI based on the existing 3GPP IMS profile;
- Integration, if required, in existing 3GPP specifications;

Based on TR 29.865 conclusions, a new CT3 TS 29.165 specifies the II-NNI interconnection.

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10.3.2 SA5 Charging harmonization for NGN between 3GPP and ATIS-TMOC UID_330011

Resources: S5

References

Document	Title/Contents
	WID(s)
SP-060545	WID on SA5 Charging harmonization for NGN between 3GPP and ATIS-TMOC
	Impacted Specifications
TS 32.297	Telecommunication management; Charging management; Charging Data Record (CDR) file format and transfer
	New Dedicated Specifications/Reports
-	-

Supporting Individual Members: Amdocs, Orange, Lucent Technologies, Ericsson, Huawei, Cingular.

UID	Name	Acronym	Resource	Hyperlink	TS_TR
380060	**IP Interconnection of Services**	IPinterc	S1,S2,S5,C3	SP-080565	-
7005	**System enhancements for interconnection interfaces between two IMSs**	IMS_NNI	S2,S5,C3	SP-080554	-
330011	Charging harmonization for NGN between 3GPP and ATIS-TMOC	FBI2-TISP2-CH	S5	SP-060545	32.297

The standardization of the NGN is addressed by a number of SDOs. (e.g. ETSI TISPAN, ITU-T and ATIS-TMOC). External standards organizations were defining NGN session control using IMS as a platform. This embeds IMS as the framework for advanced services for many types of operators.

ITU-T SG4 identified harmonization possibilities between ATIS TMOC and 3GPP for the NGN charging, and they were requested to make an effort to harmonize their standards. To accomplish harmonization the charging architecture incorporates an optional solution to the existing 3GPP solution, namely:

- ATIS-TMOC's protocol (IPDR/SP IPDR/F) is adopted as an alternative protocol on the Bx reference point.

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10.4 Support of (G)MSC-S – (G)MSC-S Nc Interface based on the SIP-I protocol (SIP_Nc) UID_360025

Resources: C4,C3,S1

References

Document	Title/Contents
WID(s)	
CP-080282	WID on Support of (G)MSC-S – (G)MSC-S Nc Interface based on the SIP-I protocol
Impacted Specifications	
TS 23.153	Out of band transcoder control; Stage 2 [CT4 - allow for a 3GPP SIP-I based codec negotiation with RTP-based bearer]
TS 23.172	Technical realization of Circuit Switched (CS) multimedia service; UDI/RDI fallback and service modification; Stage 2 [CT3 - SIP-I procedures with SCUDIF]
TS 23.202	Circuit switched data bearer services [CT3 - Stage 2 SIP-I impacts on CSD]
TS 23.205	Bearer-independent circuit-switched core network; Stage 2 [CT4 - reflect that content is normative if using a BICC-based Nc interface. Add reference to new Stage 2 for SIP-I based Nc Interface.]
TS 29.007	General requirements on interworking between the Public Land Mobile Network (PLMN) and the Integrated Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN) [CT3 - Stage 3 SIP-I impacts on CSD]
TS 29.163	Interworking between the IP Multimedia (IM) Core Network (CN) subsystem and Circuit Switched (CS) networks CT3 - include 3GPP SIP-I as a valid protocol for interworking between IMS and CS networks]
TS 29.232	Media Gateway Controller (MGC) - Media Gateway (MGW) interface; Stage 3 [CT4 - add new procedures on Mc interface supporting RTP-based bearer on the Nb interface]
TS 29.332	Media Gateway Control Function (MGCF) – IM Media Gateway; Mn Interface [CT4 - reflect impact for terminations used for SIP-I based Nc interface]
TS 29.414	Core network Nb data transport and transport signalling [CT3 - impact for Bearer Multiplexing. IPBCP is not applicable to SIP-I]
New Dedicated Specifications/Reports	
TS 23.231	SIP-I based circuit-switched core network; Stage 2 [CT4 - SIP-I based Nc Interface; contains call flows, scenarios and procedures]
TS 29.231	Application of SIP-I Protocols to Circuit Switched (CS) core network architecture; Stage 3 [CT4 - Stage 3 SIP-I based Nc profile definition; contains also the codec negotiation mechanism]
TS 29.235	Interworking between SIP-I based circuit-switched core network and other networks [CT3 - Specify 3GPP SIP-I interworking with BICC, ISUP, external SIP-I networks]

Supporting Individual Members: Vodafone, Nokia Siemens Networks, Alcatel-Lucent, Ericsson, Nortel, Huawei, TeliaSonera, T-Mobile.

Stage 1 for SIP_Nc is covered by the SA1 Feature IPinterc UID_380060 in TS 22.228 and TS 22.101.

As the industry trend moves from Voice over TDM to Voice over IP, the majority of networks (fixed telephony, enterprise, IMS) are moving towards SIP-based signalling. 3GPP has defined in Rel-7 an interworking scenario for external SIP-I interworking into the bearer independent Circuit Switched network.

In order to avoid the use of a heavyweight interworking function (BICC to external SIP-I) and to provide commonality of products between wireless and wireline networks, this work provides the implementation of SIP-I on the Nc Interface as an alternative protocol to Bearer Independent Call Control (BICC). This provides the additional benefits such as:

- Provides a standardised SIP-I based Nc Interface improving network interconnections by reducing potential signalling interworking to external SIP-I networks;
- Eases interworking for IP-Interconnect and converges SIP-I signalling across the industry, wireless and wireline;
- Standardises end-to-end service between mobile subscribers that may be located in different networks, e.g. support of codec negotiation over SIP-I based IP transit network to enable OoBTC/TrFO;
- Provides migration of PLMN towards common NGN based SIP-I signalling;

CT3, CT4 provided Stage 2 and Stage 3 defining related procedures and a SIP-I profile to be used on the Nc Interface as an alternative to the existing BICC definition. This work has used CT4 Rel-7 TR 29.802 as feasibility basis and CT4's TS 23.205 and TS 23.153 for input to requirements and architecture of the bearer-independent CS core network to provide the following:

- Support for interworking SIP-I on the Nc interface with an external SIP-I based signalling network.

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- Support for interworking SIP-I on the Nc interface with a BICC-based Nc interface.
- Support for interworking SIP-I on the Nc Interface with the 3GPP IMS.
- Support for Interworking SIP-I on the Nc interface with an ISUP based signalling network.
- Definition of a SIP-I Profile on the Nc Interface in order to provide the requirements to fulfil 3GPP CS mobile core network telephony.
- Support for RTP-based bearer on the user plane when utilising SIP-I on the Nc Interface, and provide support on the Mc Interface to support this bearer on the Nb Interface.
- The functional capabilities that currently exist for a 3GPP BICC implementation (e.g. OoBTC/TrFO, SCUDIF, CSD, etc.) on the Nc Interface.

NOTE: The interworking scenario 3GPP IMS – external SIP-I networks is not within the scope of this WI.

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10.5 Earthquake and Tsunami Warning System Requirements and Solutions (ETWS) UID_370051

Resources: S1,S2,C1,C4,G2

References

Document	Title/Contents
	WID(s)
SP-070815	S1 WID on Earthquake and Tsunami Warning System Requirements and Solutions (ETWS)
CP-080951	C4 WID on Earthquake and Tsunami Warning System
SP-090154	GERAN2 LS to TSG SA, CT1, RAN2
	Impacted Specifications
TS 23.041	Technical realization of Cell Broadcast Service (CBS) - C1
TS 44.018	Mobile radio interface layer 3 specification; Radio Resource Control (RRC) protocol
TS 44.060	General Packet Radio Service (GPRS); Mobile Station (MS) - Base Station System (BSS) interface; Radio Link Control / Medium Access Control (RLC/MAC) protocol
	New Dedicated Specifications/Reports
TR 23.828	Earthquake and Tsunami Warning System (ETWS); Requirements and solutions; Solution placeholder - S2
TS 22.168	Earthquake and Tsunami Warning System (ETWS) requirements - S1
TS 23.041	General Packet Radio Service (GPRS) enhancements for E-UTRAN access - S2
TS 29.168	Cell Broadcast Centre interfaces with the Evolved Packet Core; Stage 3 - C4

Supporting Individual Members: NTT DoCoMo, OKI, Panasonic, Sharp, Softbank, Toshiba, eMobile, NEC, Qualcomm.

UID	Name	Resource	Hyperlink	TS_TR
370051	**Earthquake and Tsunami Warning System**	S1,S2,CP,G2	SP-070815	-
370052	**Stage 1 for ETWS**	S1	SP-070815	22.168
380056	**SA2 aspects of ETWS**	S2	SP-070815	23.828, 23.401
400015	**CT1 aspects of ETWS**	C1	CP-080951	23.041
410021	**CT4 aspects of ETWS**	C4	CP-080951	29.168
430045	**ETWS primary notification message definition in GERAN**	G2	SP-090154	44.018, 44.060

ETWS introduces a means to deliver Warning Notification simultaneously to many mobile users who should evacuate from approaching Earthquake or Tsunami. A mobile user receiving a Warning Notification finds out that a nearby threat is approaching or happened already and is able to determine where and when to evacuate. Mobile phones are the closest media for people. This system helps people in disaster situations.

This service needs quick and optimized information delivery. Currently it is not possible to predict an Earthquake is imminent. This work specifies:

- Requirements for ETWS;
- Functional requirements;
- Defines the system architecture and functions of ETWS;
- Roaming aspects for terminals (e.g. impact on inbound roaming terminals);

SA1 TR 22.968 (Study on requirements for a Public Warning System (PWS) service) UID_320025, shows that the requirements for PWS and the expected timelines for deployment differ in each region. In Japan Earthquake Early Warning system is required urgently to help mitigate human and social damages. Therefore this work is a "Regional" specific part of PWS for Japan implementing the most urgent aspects. To avoid possible conflict with ongoing generic work on PWS, this part of the system is called ETWS.

ETWS is a subset of PWS and as such does not exclude or conflict with the ongoing work on PWS.

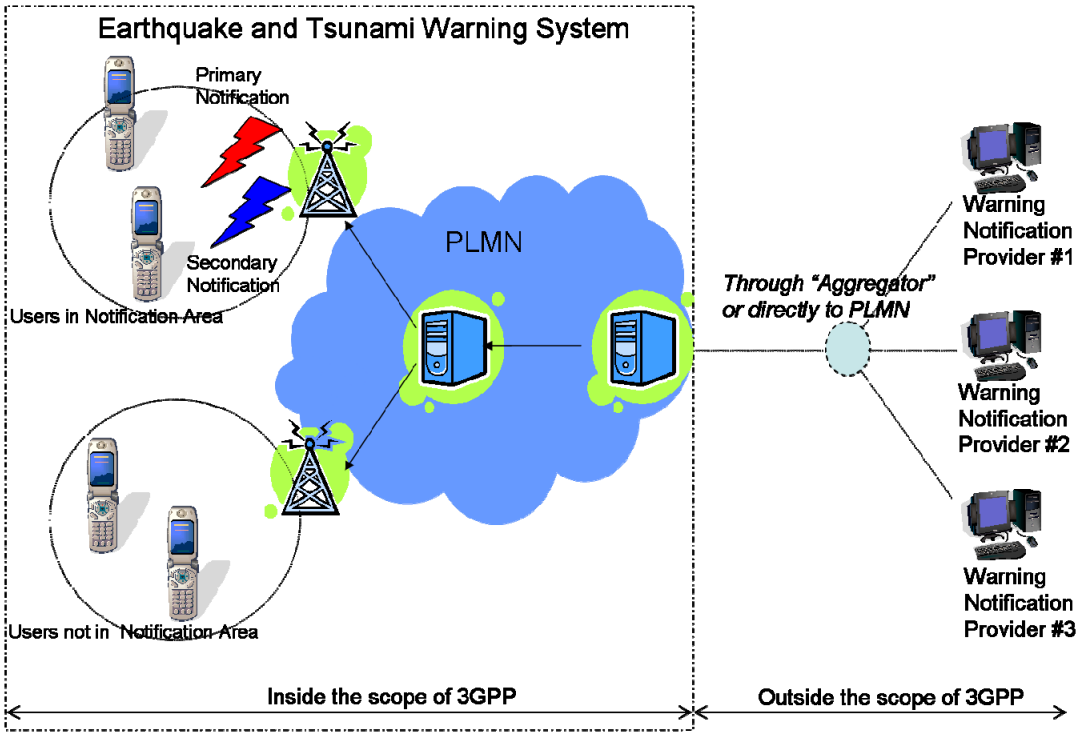
As this service is applicable to emergency situations, an effort was made to define a service that can be provided over existing mobile networks in the near term. The impacts on power consumption, current specifications and existing networks by the introduction of this service have been minimized. Support of this service is optional.

The work took into account related work in other bodies. Despite the only current regulatory requirement is coming from Japan, solutions for GERAN are also within the scope of ETWS.

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Simple mechanisms within existing mobile networks based on available approaches (e.g. CBS and MBMS for GERAN/UTRAN and eMBMS for E-UTRAN) have been preferred.

The table below from TS 22.168 shows what is within the 3GPP scope of ETWS.



Following the decision in TSG SP# 43 to incorporate support of ETWS over GERAN in Rel-8, TSG GERAN have approved a complete set of Rel-8 CRs (to TS 44.018 and 44.060) introducing ETWS:

- solution covers sending primary notification in idle/dedicated/packet idle/packet transfer/dual transfer modes;
- it is based on CT1 CR to TS 23.041, defining the primary notification message;
- due to this definition of the primary notification in TS 23.041, the security issues with duplicate detection identified in RAN2 do not affect GERAN.

10.5.1 Conformance Test Aspects – UMTS Earthquake and Tsunami Warning System FDD UID_440011

Resources: R5

References

Document	Title/Contents
WID(s)	
RP-090467	WID on Conformance Test Aspects – UMTS Earthquake and Tsunami Warning System (ETWS) FDD
Impacted Specifications	
TS 34.108	Common test environments for User Equipment (UE); Conformance testing
TS 34.123-1	User Equipment (UE) conformance specification; Part 1: Protocol conformance specification
TS 34.123-2	User Equipment (UE) conformance specification; Part 2: Implementation conformance statement (ICS) specification
TS 34.123-3	User Equipment (UE) conformance specification; Part 3: Abstract test suites (ATSs)
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: NTT DoCoMo, Panasonic, Fujitsu, NEC, Nokia, Qualcomm, Sony Ericsson

Testing for Rel-8 ETWS UID_370051.

UID	Name	Resource	Hyperlink	Status_Report	TS_TR

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440011	**Conformance Test Aspects – UMTS Earthquake and Tsunami Warning System (ETWS) FDD**	R5	RP-090467	RP-100068	34.108, 34.123-1, 34.123-2

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10.6 In Case of Emergency (ICE) numbers storage and easy access on UICC UID_380059

Resources: S1,C6

References

Document	Title/Contents
WID(s)	
SP-070944	S1 WID on ICE – In Case of Emergency
Impacted Specifications	
TS 22.101	Service aspects; Service principles - S1 [Added A.x Requirements for "In Case of Emergency" (ICE) information]
TS 22.030	Man-Machine Interface (MMI) of the User Equipment (UE) - S1 [Added 6.x In Case of Emergency information access procedure]
TS 31.102	Characteristics of the Universal Subscriber Identity Module (USIM) application- C6 [Added EF-ICE (In Case of Emergency Dialling Numbers)
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: Vodafone, Vodafone D2, SwissCom, T-Mobile, AT&T, Gemalto, RIM.

UID	Name	Resource	Hyperlink	TS_TR
380059	**In Case of Emergency numbers storage and easy access on UICC**	S1,C6	SP-070944	-
380159	**Stage 1 for ICE**	S1	SP-070944	22.030, 22.101
380259	**CT6 aspects of ICE**	C6	SP-070944	31.102

The In Case of Emergency (ICE) program is used to enable first responders, such as paramedics, fire-fighters, police officers, to identify victims and contact their next of kin to obtain important medical information.

In some countries 80% or more people carry a mobile phone, and the police or paramedics often use them to identify victims at road traffic accidents or other incidents. The idea of ICE is that everyone should put an emergency contact name and number into his/her mobile phone under the headword "ICE". This would give the emergency services personnel a standard place to look for contacts.

While this contact list has been introduced by some operators on a proprietary mobile phone dependent way, a standardised solution is not available, making the use for "first responders" difficult, if not impossible.

This work defines the UE capability to store one or more ICE information on the UICC which the subscriber can optionally configure. Provision is made for direct and unambiguous read access from UE to the ICE information stored on the UICC.

The MMI is modified to provide unambiguous identification of ICE information and easy read access. Under control of the subscriber, the ICE information can be made accessible even when the UE/UICC security features have been enabled (e.g. keypad is locked).

The following table provides an example of ICE information stored on the UICC (extract from TS 22.101):

Table: "ICE information" example

ICE information type	ICE information type value	ICE information value 1	ICE information value 2
Phone Number	"Contact in case of emergency"	My Wife	+33645661234
Phone Number	"Contact in case of emergency"	Family Smith	+33645654321
Phone Number	"Contact in case of emergency"	My Family doctor: Dr. Jones	+336432341111
Free Format	"Medical Information"	My blood type is A+, I am allergic to etc.	N/A
Free Format	"Home Postal Address"	15 rue de la Paix, Paris, France	N/A
Free Format	"Language"	French	N/A
Free Format	"Travel Information"	London, from 3rd July. to 29th July, 2008	N/A

NOTE: ICE Graphics was not included in Rel-8.

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10.7 Local Charging Zone Requirements (LCZR) UID_330006

Resources: S1

References

Document	Title/Contents
WID(s)	
SP-060482	S1 WID on Local Charging Zone Requirements
Impacted Specifications	
TS 22.115	Service aspects; Charging and billing
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: China Mobile, Huawei, ZTE, Alcatel.

UID	Name	Acronym	Resource	Hyperlink	TS_TR
330006	Local Charging Zone Requirements	LCZR	S1	SP-060482	22.115

In a large scale network, different tariffs apply to HPLMN subscribers when they are in different parts of the network. It is expected that the users are aware of where they are and decide whether to originate/accept a service.

The Local Charging Zone (LCZ) concept has been introduced to represent the part of the network that applies the same tariff for a group of users and believed much simpler and more generic (e.g. applicable to both UTRAN and GERAN) than the concept of SoLSA (Support of Localised Service Area) which is currently applied to GERAN only.
To obtain a solution quickly and for simplification reasons, the impacts on Core Network should be avoided if possible.

This work defines the concept of LCZ and specifies the related requirements for e.g.:

- Relationship between LCZs;
- Indication of the LCZ to users;
- User's decision of whether to accept/originate a service;
- Priority of LCZs (FFD);

Differentiated charging can be achieved via the already-existing cell-based charging mechanism.

Stage 1 completed.

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10.8 Customized Alerting Tone (CAT) service UID_340029

Resources: S1,C1,C3,C4

References

Document	Title/Contents
	WID(s)
SP-070122	S1 WID on Support of Customised Alerting Tone Service
SP-070880	S1 WID on TISPAN Customized Multimedia Information Services (TISCMI-R8)
CP-080496	C1 WID on IMS CAT Supplementary Service
	Impacted Specifications
TS 23.014	Support of Dual Tone Multi-Frequency (DTMF) signalling - C1
TS 23.205	Bearer-independent circuit-switched core network - C4
TS 23.231	SIP-I based circuit-switched core network - C4
TS 24.008	Mobile radio interface Layer 3 specification; Core network protocols; Stage 3 - C1
TS 29.002	Mobile Application Part (MAP) specification - C4
TS 29.163	Interworking between the IP Multimedia (IM) Core Network (CN) subsystem and Circuit Switched (CS) networks - C3
	New Dedicated Specifications/Reports
TS 22.182	Customized Alerting Tone (CAT) requirements; Stage 1 - S1
TS 24.182	IP Multimedia Subsystem (IMS) Customized Alerting Tones (CAT) - C1

Supporting Individual Members: China Mobile, Ericsson, Huawei, NEC, Comverse, Lucent

UID	Name	Resource	Hyperlink	TS_TR
340029	**Customized Alerting Tone (CAT) Service**	S1,C1,C3,C4	SP-070122	-
370028	**Stage 1 for CAT**	S1	SP-070122	22.182
370029	**TISPAN requirements for customized multimedia information services**	S1	SP-070880	22.182
390014	**IMS CAT Supplementary Service**	C1	CP-080496	24.182
390071	**CAT solution for voice and video call in CS domain**	C3	CP-080496	29.163
410010	**CAT Service in 3GPP CS domain**	C4	CP-080445	23.205, 23.231, 29.002
410015	**CAT Service in 3GPP CS domain**	C1	CP-080445	24.008, 23.014

Stage 1 for CAT (SP-070122):

The Customized Alerting Tone Service (CAT service) is an operator specific service by which an operator enables the subscriber to customize the alerting tone which is played to the calling party. CAT service should not negatively affect the conversation between calling and called parties. The caller can experience favourite songs, multi-media clips or other CAT instead of the traditional ringing tones.

As there are many methods to realize the basic functions of CAT in CS domain and IMS, standardization work was needed especially for roaming and interworking support. Furthermore, more and more additional features of CAT are expected by the subscribers, e.g. a user may be able to easily subscribe to the same alerting tone at the same time as he/she is hearing it by for instance pressing a key.

Following TR 22.982 (Study of Customized Alerting Tone requirements) this work specifies the CAT service in 3GPP.

Multiple domains roaming/interworking and interaction with other services such as IMS based services, Supplementary Services, Charging and User profile have also been specified based on the same study TR 22.982.

TISPAN requirements for customized multimedia information services (SP-070880):

This WID adds in 3GPP TS 22.182 the TISPAN CAT requirements developed by TISPAN for Fixed NGN in WID 1040 for "Customized Terminating Multimedia Information Services", needed to implement the core IMS specification in light of the Common IMS concept.

CT1, CT3 work on IMS CAT Supplementary Service (CP-080496)

Linked work items:

- 3GPP2 Input to Common IMS
- UID_380078 Study on the Architecture of IMS based Customized Alerting Tone

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During the joint workshop on common IMS in Jan 2008, 3GPP and 3GPP2 agreed on principles to incorporate parts of 3GPP2 MMD/IMS related specifications into 3GPP within the Rel-8 timeframe.

CT1 TS 24.182 and CT3 TS 29.163 specify Stage 3 for IMS CAT Supplementary Service in 3GPP2's X.P0055 (MMD Supplementary Services), the service requirements in TS 22.182 and the recommendations in TR 23.872.

CT4, CT1 work on Support of Customized Alerting Tone (CAT) Service in 3GPP CS domain

Linked work item

- UID_360031 Study on Customized Alerting Tone (CAT) solution for voice and video call in CS domain

SA1 TS 22.182 specifies the requirements for supporting CAT Service both in CS domain and in IMS domain, and CT4 TR 29.882 has studied providing audio and multimedia customized alerting tone in CS domain (UID_360031).

This work defines essential functional requirement of GMSC Server switch architecture on the network functions and the interfaces impacted by the provision of CAT Service in CS domain:

- Essential behaviour of the originating VMSC Server to enable both-way through-connect the bearer a multimedia call during the alerting phase.
- Enhancement on the Nc signalling protocol to support the transport of the calling party UE CAT capability (multiple H.245 call negotiations, transmission of DTMFs during multimedia call through the H.245 UserInputIndication message)
- Enhancement on the NAS Signalling to enable the calling party UE to indicate its CAT capability
- Enhancement on the NAS Signalling to enable the originating VMSC Server to indicate the calling party UE start of the multimedia call setup during the alerting phase
- Enabling the transmission of DTMFs during multimedia call through the H.245 UserInputIndication message for CAT stop and CAT copy
- ATI from GMSC to HLR-A for retrieval of the calling party UE CAT capability

Impacted specifications CT4 (TS 23.205, TS 23.231, TS 29.002) and CT1 (TS 24.008, TS 23.014).

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10.9 Service-Level Interworking for Messaging Services (MESSIW) UID_340031

Resources: S1,S2,C3,C1

References

Document	Title/Contents
	WID(s)
SP-070816	S1,S2 WID on Support of Service-Level Interworking for Messaging Services
CP-080575	C3 WID on Support of Service-Level Interworking for Messaging Services - Stage 3
	Impacted Specifications
TS 22.105	Services and service capabilities - S1
TS 22.340	IP Multimedia Subsystem (IMS) messaging; Stage 1 - S1
TS 23.204	Support of Short Message Service (SMS) over generic 3GPP Internet Protocol (IP) access; Stage 2 - S2
TS 24.229	Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3 - C1
TS 24.341	Support of SMS over IP networks; Stage 3 - C1 [Interaction with service level interworking at the IP-SM-GW. Cover interaction with service level interworking, Add reference to new stage 3 TS]
	New Dedicated Specifications/Reports
TR 23.811	Service level interworking for messaging services; Stage 2 - S2
TS 29.311	Service Level Interworking for Messaging Services; Stage 3 - C3

Supporting Individual Members: Huawei, Comverse, China Mobile, BT, Ericsson, Telecom Italia, Orange, RIM, ZTE.

UID	Name	Resource	Hyperlink	TS_TR
340031	**Service-Level Interworking for Messaging Services**	S1,S2,C3,C1	SP-070816	-
350047	**Stage 1 for MESSIW**	S1	SP-070816	22.105, 22.340
350048	**Stage 2 for MESSIW**	S2	SP-070816	23.811, 23.204
400016	**Stage 3 for MESSIW**	C3	CP-080773	29.311
400017	**Stage 3 for MESSIW**	C1	CP-080773	24.229

There is interest in service-level interworking for messaging services, e.g. between Short Message (SM) and existing Instant Messaging (IM) services. Other types of messaging interworking need also to be considered.

This work 1st defines the scenarios for service-level interworking between:

- SMS and IM services;
- Interworking scenarios as requested by OMA in SP-060851;

In a 2nd step, it implements the solution(s) fulfilling the required service-level interworking scenarios and requirements.

This work considered with priority the following aspects:

- Provide a consistent service experience to the user when service-level interworking takes place;
- Determine the scenarios where this service-level interworking is applicable;
- Provide requirements for suitable security mechanisms for interworked messages (e.g. stop certain messages from being interworked);
- Provide the service-level interworking authorization;
- Avoid overlap with OMA;
- Provide appropriate mechanisms to apply charging principles for interworking;
- Provide requirements to support service-level interworking;
- Consider interaction with existing functionality in TS 23.040 (Technical realization of Short Message Service);

SA2 TR 23.811 concluded that the two Alternative Architectures for the service-level interworking are identical in the terminating cases and only differ in the originating case. Alternative 1 is using iFCs to route the Instant Messages to the IP-SM-GW, while Alternative 2 goes through BGCF in order to reach IP-SM-GW. TR 23.811 recommends to include Alternative 1 in SA2 TS 23.204. The architecture and flows have been added to TS 23.204 and TR 23.811 was not updated anymore.

SA2 added the service-level interworking via CR to TS 23.204.

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CT3 work enhances the relevant 3GPP protocols to support the requirements in TS 23.204 including:

- Procedures to implement service level interworking between SM and IM guaranteeing that existing SMS and IM services are not impacted;
- Enhancement of the IP-SM-GW as an Application Server to support service selection, authorization and mapping between SM and IM protocols;
- Interaction between service level interworking and transport layer interworking;

CT3 new TS 29.331 contains Stage3 supporting this feature under 3GPP IMS architecture.

10.10 Multimedia Priority Service (PRIOR) UID_340044

Resources: S1,C1,C4

References

Document	Title/Contents
	WID(s)
SP-060780	S1 WID on Multimedia Priority Service Requirements
CP-070576	C1 WID on Multimedia Priority Service
	Impacted Specifications
TS 23.008	Organization of subscriber data - C4
TS 24.229	Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3 [CT1 - use Resource-Priority header and associated RFCs in IMS SIP]
TS 29.228	IP Multimedia (IM) Subsystem Cx and Dx interfaces; Signalling flows and message contents - C4
TS 29.229	Cx and Dx interfaces based on the Diameter protocol; Protocol details - C4
	New Dedicated Specifications/Reports
TS 22.153	Multimedia Priority Service - S1

Supporting Individual Members: Lucent, Cingular, Telcordia, NCS, T-Mobile, Nortel Networks.

UID	Name	Resource	Hyperlink	TS_TR
340044	**Multimedia Priority Service**	S1,C1,C3,C4	SP-060780	-
320023	**Service Requirements for PRIOR**	S1	SP-060780	22.153
340012	**Stage 3 for PRIOR**	C1	CP-070576	24.229
370021	**Stage 3 for PRIOR**	C4	CP-070576	23.008, 29.228, 29.229

The response to emergency situations (e.g. floods, hurricanes, earthquakes, terrorist attacks) depends on the communication capabilities of public networks. In most cases, emergency responders use private radio systems to aid in the logistics of providing critically needed restoration services. However, certain government and emergency management officials and other authorised users have to rely on public network services when the communication capability of the serving network may be impaired, for example due to congestion or partial network infrastructure outages, perhaps due to a direct or indirect result of the emergency situation.

Multimedia Priority Service, supported by the 3GPP system set of services and features, is one element creating the ability to deliver calls or complete sessions of a high priority nature from mobile to mobile networks, mobile-to-fixed networks, and fixed-to-mobile networks.

The scope of this work is to specify those requirements of MPS necessary to provide an end-to-end service and to interwork with external networks where needed. Service interactions with external networks are considered within the scope of this work, although these interactions may be specified in other standards.

This work defines prioritized service provision for Packet (e.g. IP) based multimedia services including data, video, audio and text transmission capabilities. It is based on the results of the Rel-7 TR 22.953 (Multimedia priority service feasibility study). The Circuit Switched counterpart was described in the Rel-6 TR 22.952 (Priority service guide).

The Multimedia Priority Service is intended to be utilised for both Voice and Data in PS domain and IMS. Interaction with other services/capabilities (e.g. VCC, POC) was considered.

SA1 new TS 22.153 contains Stage 1 for Multimedia Priority Service. No Stage 2 impact was identified by SA2.

CT1,CT4 have specified the protocols for the use of the Multimedia Priority Service (see table above).

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10.11 Open Service Access (OSA8) UID_360010

Resources: S1,C5

References

Document	Title/Contents
	WID(s)
SP-070692	S1 WID on OSA Stage 1
CP-080429	C5 WID on OSA Stage 2/3 enhancements
	Impacted Specifications
TS 22.127	Service requirement for the Open Services Access (OSA); Stage 1 (SA1)
TS 23.198	Open Service Access (OSA); Stage 2 (CT5)
-	**Stage 3 Specifications**
TS 29.198-01	OSA API; Part 1: Overview
TS 29.198-02	OSA API; Part 2: Common data definitions
TS 29.198-03	OSA API; Part 3: Framework
TS 29.198-04-1	OSA API; Part 4: Call control; Subpart 1: Call control common definitions
TS 29.198-04-2	OSA API; Part 4: Call control; Subpart 2: Generic call control SCF
TS 29.198-04-3	OSA API; Part 4: Call control; Subpart 3: Multi-party call control SCF
TS 29.198-04-4	OSA API; Part 4: Call control; Subpart 4: Multimedia call control SCF
TS 29.198-04-5	OSA API; Part 5: Call control; Subpart 5: Conference call control SCF
TS 29.198-05	OSA API; Part 5: User interaction SCF
TS 29.198-06	OSA API; Part 6: Mobility SCF
TS 29.198-07	OSA API; Part 7: Terminal capabilities SCF
TS 29.198-08	OSA API; Part 8: Data session control SCF
TS 29.198-11	OSA API; Part 11: Account management SCF
TS 29.198-12	OSA API; Part 12: Charging SCF
TS 29.198-13	OSA API; Part 13: Policy management SCF
TS 29.198-14	OSA API; Part 14: Presence and Availability Management (PAM) SCF
TS 29.198-15	OSA API; Part 15: Multi-media Messaging (MM) SCF
TS 29.198-16	OSA API; Part 16: Service broker SCF
TS 29.199-01	OSA; Parlay X web services; Part 1: Common
TS 29.199-02	OSA; Parlay X web services; Part 2: Third party call
TS 29.199-03	OSA; Parlay X web services; Part 3: Call notification
TS 29.199-04	OSA; Parlay X web services; Part 4: Short messaging
TS 29.199-05	OSA; Parlay X web services; Part 5: Multimedia messaging
TS 29.199-06	OSA; Parlay X web services; Part 6: Payment
TS 29.199-07	OSA; Parlay X web services; Part 7: Account management
TS 29.199-08	OSA; Parlay X web services; Part 8: Terminal status
TS 29.199-09	OSA; Parlay X web services; Part 9: Terminal location
TS 29.199-10	OSA; Parlay X web services; Part 10: Call handling
TS 29.199-11	OSA; Parlay X web services; Part 11: Audio call
TS 29.199-12	OSA; Parlay X web services; Part 12: Multimedia conference
TS 29.199-13	OSA; Parlay X web services; Part 13: Address list management
TS 29.199-14	OSA; Parlay X web services; Part 14: Presence
TS 29.199-15	OSA; Parlay X web services; Part 15: Message broadcast
TS 29.199-16	OSA; Parlay X web services; Part 16: Geocoding
TS 29.199-17	OSA; Parlay X web services; Part 17: Application-driven Quality of Service (QoS)
TS 29.199-18	OSA; Parlay X web services; Part 18: Device capabilities and configuration
TS 29.199-19	OSA; Parlay X web services; Part 19: Multimedia streaming control
TS 29.199-20	OSA; Parlay X web services; Part 20: Multimedia multicast session management
TR 29.998-06-1	OSA API Mapping; Part 6: User location - user status service mapping; Subpart 1: Mapping to MAP
TR 29.998-06-2	OSA API Mapping; Part 6: User location - user status service mapping; Subpart 2: Mapping to SIP
	New Dedicated Specifications/Reports
-	**Stage 3 Specifications**
TS 29.198-10	OSA API; Connectivity manager SCF
TS 29.199-21	OSA; Parlay X web services; Content management
TS 29.199-22	OSA; Parlay X web services; Policy

Supporting Individual Members: France Telecom, Orange, Ericsson, ETRI, Telenor, Telecom Italia, Sprint, BT

UID	Name	Resource	Hyperlink	TS_TR
360010	**OSA Rel-8**	S1,C5	SP-070692	-
360004	**OSA Stage 1 - Service Requirements**	S1	-	22.127
370034	**OSA Stage 1 - NGN Service Requirement**	S1	SP-070692	22.127
360005	**OSA Stage 2/3 enhancements**	C5	CP-080429	23.198, 29.198, 29.199
370013	Parlay-X Content Management web service (store/manage meta-data)	C5	CP-080429	29.199-21

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370014	Parlay-X Policy web service	C5	CP-080429	29.199-22
370015	Parlay-X Terminal status web service	C5	CP-080429	29.199-08
380054	Presence alignment with OMA and IETF (22.127 CR 0092 S1-071764)	C5	CP-080429	29.199-14/13
390067	Framework Enterprise Operator (Service Subscription function)	C5	CP-080429	29.198-03
390068	Mobility Emergency Location	C5	CP-080429	29.198-06
390069	Connectivity Manager SCF	C5	CP-080429	29.198-10
390070	PAM Presence Agent	C5	CP-080429	29.198-14

The Open Service Access (OSA) enables service application developers to make use of network functionality through open, standardised, secure, extensible and scalable interfaces. Applications see the network functionality offered to them as a set of Service Capability Features (SCFs) in the OSA API. These SCFs provide access to the network capabilities on which the application developers can rely when designing their applications. The OSA API enable network service capabilities in an abstract, network-agnostic way to the application developers independent of:

- where or how these network capabilities are implemented in the network and
- of vendor specific solutions and programming languages.

Interest in web services for telecommunications networks is increasing, with several initiatives in other groups such as OMA OWSER, ETSI TISPAN. Developers require easy access to functionality provided by telecommunications networks in order to use them successfully in a combinational manner, e.g. as part of an SOA. As such, the existing APIs for Parlay-X web services need to be evolved and expanded in order to ensure Parlay-X APIs provide the necessary functionality for developers and Operators to exploit the capabilities of their networks.

OSA APIs (29.198-family)

- The OSA specifications define a set of APIs that enables operator and 3rd party applications to make use of network functionality through a set of open, standardized interfaces.
- The specifications are derived from a UML model of the OSA API. Using the latest document and code generation techniques, the detailed technical description documents, the IDL code, WSDL code and Java API are all produced from a single source UML model. This ensures alignment between all versions, all formats of the API.

OSA Web Services (29.199-family)

- Access to Service Capability Features is realised by using modern state of the art access technologies, like distributed object oriented technique and Web Services technologies. WSDL description of the interfaces are attached to the technical specifications.

Current web service specifications provided by the Parlay/OSA APIs in Rel-7 provide limited support for new functionalities implemented by IMS. In order to provide sufficient functionality for 3rd party developers that wish to develop within the web services framework, the existing functionality needs to be extended in order to support a greater level of control and diversity in web service applications.

Responsibility for Parlay / OSA Stage 1 was divided between 3GPP SA1 and ETSI TISPAN, whilst Stage 2/3 responsibility rested within the JWG (3GPP CT5, ETSI TISPAN and the Parlay group).
TISPAN requirements for NGN R2 are aligned with 3GPP R7 requirements.

SA1 TS 22.127 captures in context of Common IMS, the Rel-8 requirements for exposure of IMS enabling services and capabilities, such as MM Telephony, Presence, Group&List mgmt/XDM, and IMS Messaging over an open Parlay-X/webservices interface to consumer applications. In addition, the work identifies and defines new requirements for exposure of services and capabilities over an open Parlay-X/webservices interface to consumer applications. Appropriate coordination was set up to avoid overlap with proper groups (e.g. TISPAN WG1).

CT5 Stage 2/3 WID (CP-080252) was updated to include the new functionality added in SA1's OSA Stage 1 TS 22.127 on ETSI TISPAN OSA transfer to 3GPP CT5.

TSG#40 (June 2008) decided to move the maintenance of the OSA specifications (R99 to Rel-8), the remaining Rel-8 work and any new OSA work beyond Rel-8 to OMA.

As CT5 was disbanded before the target date for Rel-8 Stage 3 freezing, not all the SA1 requirements could be supported by the corresponding CT5 Stage 2/3 specifications. This creates a discrepancy/misalignment between the current (June 2008) 3GPP OSA Rel-8 Stage 1 vs. Stage 2/3.

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CT5 has documented this delta in the updated WID in CP-080429 as follows:

Work Item	Complete	Specification
370013 Parlay-X Content Management web service (store/manage meta-data)	100%	29.199-21
370014 Parlay-X Policy web service	100%	29.199-22
370015 Parlay-X Terminal status web service	100%	29.199-08
380054 Presence alignment with OMA and IETF (22.127 CR 0092 S1-071764)	100%	29.199-14/13
390067 Framework Enterprise Operator (Service Subscription function)	100%	29.198-03
390068 Mobility Emergency Location	100%	29.198-06
390069 Connectivity Manager SCF	100%	29.198-10
390070 PAM Presence Agent	100%	29.198-14
370012 Ensure Parlay-X composable with identity management frameworks, in particular Liberty Alliance	0%	existing 29.199-xy
370016 Identify communication format used by a particular application	0%	existing 29.199-xy
380047 Security on User Profile Management - reuse GUP API (22.127 CR 0084 S1-071794)	0%	PXWS Framework
380048 Privacy on Subscriber Identity (Liberty Alliance, OASIS) (22.127 CR 0085 S1-071835)	0%	PXWS Framework
380049 Topology Hiding (22.127 CR 0086 S1-071838)	0%	PXWS Framework
380050 Subscriber event notification (22.127 CR 0087 S1-071836)	0%	PXWS Framework
380051 Event notification (22.127 CR 0088 S1-071762)	0%	PXWS Framework
380052 Access policy (22.127 CR 0089 S1-071763)	0%	PXWS Framework
380053 API usage accounting (22.127 CR 0090 S1-071792)	0%	PXWS Framework
380055 Service identification (22.127 CR 0095 S1-071837)	0%	existing 29.199-xy

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10.12 Paging Permission with Access Control (PPACR) UID_360032

Resources: S1,C1,R2

References

Document	Title/Contents
WID(s)	
SP-070501	WID on Paging Permission with Access Control Requirements (PPACR)
CP-070783	WID on Paging Permission with Access Control Requirements for CT1 (PPACR-CT1)
Impacted Specifications	
TS 22.011	Service accessibility - S1 CR#0094 PPAC requirement, CR#0119 PPAC restriction to UTRAN
TS 24.008	Mobile radio interface Layer 3 specification; Core network protocols; Stage 3 - C1
TS 23.122	Non-Access-Stratum (NAS) functions related to Mobile Station (MS) in idle mode - C1
TS 25.331	Radio Resource Control (RRC); Protocol specification - R4 CR#3276 Introduction of PPAC, CR#3313 Early Implementation of PPAC
New Dedicated Specifications/Reports	
TS 24.301	Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3 - C1

Supporting Individual Members: NEC, NTT DoCoMo, Samsung, Sharp, Softbank Mobile, Telecom Italia, Toshiba.

UID	Name	Resource	Hyperlink	TS_TR
360032	**Paging Permission with Access Control (PPACR)**	S1,C1	SP-070501	-
370084	**Stage 1 for PPACR**	S1	SP-070501	22.011
380017	**Stage 3 for PPACR (CT1)**	C1	CP-070783	24.008, 23.122, 24.301

This work is based on TR 22.908 Study on Paging Permission with Access Control (FS_PPAC) UID_330016.

Paging Permission with Access Control Requirements (PPACR) work solves three issues caused by the current access control mechanism not allowing reaching UEs for which access class restriction was applied:

- **Priority Service**
  There is a priority communication service which is produced to an authorized user (e.g. government) by using priority mechanisms such as special access class (i.e. access classes 11 to 15) allocation and high priority level allocation of eMLPP. However there is an issue in the congestion situation (e.g. caused by earthquake) that the authorized user cannot access to the corresponded user when access class barring is applied to the corresponded user.

- **Emergency service**
  User sets up an emergency call and it is unfortunately released. At the condition, emergency agencies (e.g. police) would like to call back the user. However in the current specification, it is impossible to call back if access control restriction has been applied to the user.

- **Communication between UEs in the same area where access control is performed**
  There is an area where access control is performed. In order to allow all the users in the area to setup calls, broadcasting access class numbers are changed at an interval of some seconds. For example, in an interval UEs with access class 0 can perform setup and UEs with access classes 1-9 cannot do setup, in another interval UEs with access class 1 can do setup and UEs with access classes 0, 2-9 cannot do setup. However there is an issue that communication between UE with an access class number and UE with another access class number cannot be established in the area. The communication helps users in the emergency situation, e.g. a mother call to her child to know where he/she is.

This work adds to TS 22.011 functional requirements and information flow for Paging Permission with access control.

CT1 work on PPACR

As it is identified by SA1, there are cases even during access control, the successful terminated call establishment is expected such as priority communication service originated from the authorized user to the user who camps in congested area, emergency service call back, and communication between user UEs in the same area where access

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control is performed. In this case, a network operator performs an access class control, and the access class of originating UE is unbarred and terminating UE is barred.

The current access control mechanism does not allow UEs to respond and establish terminating calls; therefore, it is required to provide the enhanced mechanism to solve this issue.

CT1 specified the Stage3 capabilities and functionalities to meet the requirement defined in SA1 TS 22.011.

The PPAC related capabilities are the permission for UE to respond the paging request while access control operation. UE may make access attempts for mobile terminated call control and terminated message control (e.g., SMS) as an optional procedure of access control.

PPAC is intended to be utilized for the CS/PS domain.

10.12.1 Conformance Test Aspects – Paging Permission with Access Control UID_490017

Resources: R5

UID	Name	Hyperlink	Status_Report	Notes	TS_TR
490017	Conformance Test Aspects – Paging Permission with Access Control (PPAC)	RP-100806	RP-101074	RP#50 completed	UTRA 34.108, 34.123-1, 34.123-2, 34.123-3

Paging Permission with Access Control (PPAC) is a mandatory function in the Rel-8 that improves Mobile Communications, during congestion in emergency situations, such as earthquakes.
In networks congested during an emergency situation with all but essential users barred, the implementation of PPAC would extend the number of use cases to allow: additional combinations of calls between authorized and non authorized users and calls between non authorized users. This feature allows the users to respond to a paging request even when under access class barring.

This work introduces conformance testing of Paging Permission with Access Control for the signalling Layer 3 aspects.

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10.13 Charging for multi-phases services (CHRGMPH) UID_380063

Resources: S1

References

Document	Title/Contents
WID(s)	
SP-080053	WID on Charging for multi-phases services (CHRGMPH)
Impacted Specifications	
TS 22.115	Charging at service delivery CR#0037 Charging for two-phases services, CR#0040 Correction of charging requirement for multi-phase services
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: Telecom Italia, T-Mobile, Deutsche Telekom, Vodafone, Huawei, China Mobile.

UID	Name	Acronym	Resource	Hyperlink	TS_TR
380063	**Charging for multi-phases services**	CHRGMPH	S1	SP-080053	22.115
380070	**Stage 1 for CHRGMPH**	CHRGMPH-s1	S1	SP-080053	22.115

Several services are characterized by an initial period between the service selection and the service provision. Such period starts when the call is taken up by the Service Centre and finishes when the service is really delivered to the end-user. In several cases, the price is charged to the caller only at the provision of the requested service while the latency period is not charged or is correlated to a different tariff. More generally, multiple service phases could occur at different tariffs.

As an example, the services with voice navigation selection in voice band are characterized by the presence of an initial period of interactivity free for the caller: such period starts when the call is taken up by the Service Centre and ends up when the caller makes the choice of the requested service, using a contents' menu (e.g. a voice navigation system).

Such interactive activity may be realized either with an automatic answering machine or with a human operator through live conversation.

This applies to the case where the IMS network is directly connected to the Service Provider (SP), as well as to the interconnection between IMS networks when the SP is not directly connected to the IMS serving network.

In general, charging such a service, it is required to trigger:

1. Start of the first phase of the service, where the network resources are allocated but the real service is not yet provided (a first tariff may apply);
2. End of this first phase of the service / Start of the subsequent phase of the service, where the real service is provided to the user (a second tariff may apply). Multiple service phases may occur in sequence.
3. End of last period of the service;

This work adds via CR to TS 22.115 charging requirements for point 2 above. These requirements apply to the charging among operators and SPs when the SP is directly connected to the IMS serving network, and between operators in case of interconnection when the SP is not directly connected to the IMS serving network.

The solution allows operators to get appropriate information (e.g. using CDR) of the first interactive phase and the subsequent phases of the service provision.

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11 SA3 Features

11.1 Lawful Interception in the 3GPP Rel-8 (LI8) UID_350015

Resources: S3

References

Document	Title/Contents
WID(s)	
SP-070238	WID on Lawful Interception in the 3GPP Rel-8
Impacted Specifications	
TS 33.106	Lawful interception requirements
TS 33.107	3G security; Lawful interception architecture and functions
TS 33.108	3G security; Handover interface for Lawful Interception (LI)
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: BMWi(DE), Nortel, Nokia, Alcatel-Lucent, BT Group, Telefonica O2, HO(UK), PIDS, Ericsson, Cingular, ESTS, BfV(DE), KPN, Siemens Networks.

UID	Name	Acronym	Resource	Hyperlink	TS_TR
350015	Lawful Interception in the 3GPP Rel-8	LI8	S3	SP-070238	33.106, 33.107, 33.108

SAE, MBMS, IMS conferencing and WLAN had been studied for possible Lawful Interception (LI) systemsThis work enhances the LI for Rel-8 architecture and services with focus on enabling LI in EPS; but it also added features such as enabling LI in IMS-based conferencing services.

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11.2 Generic Bootstrapping Architecture Push Function (GBAPush) UID_390046

Resources: S3,C1,C4

References

Document	Title/Contents
WID(s)	
SP-080133	S3 WID on Generic Bootstrapping Architecture Push Function (GBAPush)
Impacted Specifications	
TS 24.109	Bootstrapping interface (Ub) and network application function interface (Ua); Protocol details - CT1
TS 29.109	Generic Authentication Architecture (GAA); Zh and Zn Interfaces based on the Diameter protocol; Stage 3 -CT4
New Dedicated Specifications/Reports	
TS 33.223	Generic Authentication Architecture (GAA); Generic Bootstrapping Architecture (GBA) Push function - SA3
TS 33.224	Generic Authentication Architecture (GAA); Generic push layer **- was moved to Rel-9**

Supporting Individual Members: Ericsson, Huawei, Nokia, Nokia Siemens Networks.

UID	Name	Resource	Hyperlink	TS_TR
390046	**Generic Bootstrapping Architecture Push Function**	S3,C1,C4	SP-080133	-
390146	**SA3 part of GBAPush (33.223)**	S3	SP-080133	33.223
390246	**CT1 part of GBAPush**	C1	CP-090112	24.109
390346	**CT4 part of GBAPush**	C4	CP-090112	29.109

Generic Authentication Architecture (GAA) cannot be used in scenarios where there is no return channel from UE to the network, e.g. broadcast scenarios or when setting up a feedback channel should be avoided or is undesired.
This means that there is a need to establish the GAA master key in a unidirectional manner.
OMA has indicated that such a feature could be used in their services as well.

Primarily this work specifies the GAA Push functionality enabling UE and home network to establish a security association, i.e. a GBA based shared secret, triggered (pushed) by the network.
This feature addresses the fact that GAA cannot be used in scenarios with no return channel from UE to the network.
This security association can be used to establish a second security association between the serving network and UE.
GAA Push functionality should have no or minimal impact on GAA core architecture and functionality.

Secondarily this work provides a "generic push layer" where a generic protection mechanism is specified for the messages that are pushed by the network for which the protection is based on GAA push functionality.

SA3 specified GBA Push in a new TS 33.223 (Push function).

CT1 TS 24.109 and CT4 TS 29.109 made Stage 3 changes required to support GBA Push in Upa interface.

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12 SA4 Features

12.1 Requirements and Test methods for Wideband Terminals (RETEM_WB_T) UID_34045

Resources: S4

References

Document	Title/Contents
WID(s)	
SP-080004	WID on Requirements and Test methods for Wideband Terminals
Impacted Specifications	
TS 26.131	Terminal acoustic characteristics for telephony; Requirements
TS 26.132	Speech and video telephony terminal acoustic test specification
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: Orange, France Telecom, T-Mobile International, Vodafone, Ericsson, Nokia.

UID	Name	Resource	Hyperlink	TS_TR
34045	Requirements and Test methods for Wideband Terminals	S4	SP-080004	26.131, 26.132

Recognizing the advantages brought by WideBand (WB) speech to the voice quality of conversational services, 3GPP has been working for long time on this. To obtain a genuine wideband speech quality, the whole communication chain has to be considered. AMR-WB codec is a high-quality WB speech compression solution for speech transmission over 3GPP radio access and core networks but this quality could be strongly altered if the terminal is not well designed from the acoustic point of view. 3GPP has already conducted work on this issue. Requirements (TS 26.131) and test methods (TS 26.132) for narrow-band and WB terminals were already specified by SA4.

Terminal performance strongly impacts the quality as really perceived by the end-user. Subjective tests have shown that terminal acoustic design impacts the end-user perceived quality as much as the codec itself. Some requirements set in current TS 26.131 do not guarantee obtaining the optimal WB quality.

Some examples of improvements:

- A handset with sensitivity/frequency response curve considered as acceptable regarding limits in TS 26.131 cannot sufficiently render real effective WB sound to the user if its response curve is in the lower part of the defined mask. As a result the difference with narrow-band rendering could be too reduced to justify WB voice services.
- Measurement of the distortion that is done only for one frequency is not sufficient for WB speech.

Without reconsidering such points especially with respect to high-quality WB voice requirements, some terminals would use WB codecs and be declared as WB, without sufficient improvement of acoustic and analogue part.
For the end-user, difference with "normal" terminal would not justify transition to WB telephony.
In some cases extension of frequency without correct study could even induce lower perceived quality especially with respect to narrow band voice obtained with AMR over a well acoustically designed narrow band terminal.

This work enhances TS 26.131 requirements and TS 26.132 test methods, originally narrow band terminals standards including partial update for WB terminals, to ensure adequate perceived quality for WB speech services and interoperability between terminals (for handset, headset and hands-free).

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12.2 Extending PSS and MBMS User Services for optimized Mobile TV UID_34043

Resources: S4

References

Document	Title/Contents
WID(s)	
SP-070757	WID on Extending PSS and MBMS User Services for optimized Mobile TV
Impacted Specifications	
TS 26.234	Transparent end-to-end Packet-switched Streaming Service (PSS); Protocols and codecs
TS 26.346	Multimedia Broadcast/Multicast Service (MBMS); Protocols and codecs
TS 26.946	Multimedia Broadcast/Multicast Service (MBMS) user service guidelines
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: Ericsson, Apple, Vidiator, Nokia, Digital Fountain, RealNetworks.

UID	Name	Resource	Acronym	Hyperlink	TS_TR
34043	**Extending PSS and MBMS User Services for optimized Mobile TV**	S4	PSS_MBMS_OMTV	SP-070757	26.234, 26.346, 26.946

Mobile TV is an important service for MBMS in particular for E-UTRAN access, covered in SA1 TS 22.246 clause 5.1.

Packet Switching Streaming (PSS) enabler was enhanced in Rel-7 allowing fast content switching and start up.
Rel-7 PSS offers Mobile TV with sufficiently fast channel switching performance even on unicast.
PSS and MBMS User Services (MBMSUSE) are foreseen to be used in combination for offering best possible experience to mobile end-user in a network resource efficient way. Therefore, SA4 sees PSS and MBMSUSE as a single entity to be optimized for Mobile TV which includes also downloaded content e.g. to realize Push TV services.
Objectives to extend PSS and MBMSUSE for Mobile TV:

- Tune-in time reduction for MBMS based services;
- Fast Channel Switching for FEC protected channels;
- Guidelines/Improvements PSS to MBMSUSE (and vice versa) channel switching;
- General improvements and additions for MBMSUSE and PSS;
- Time-shifting of live PSS offerings;
- Recording file format in the client;
- Support for more advanced Audiovisual Codecs;
- Server file formats.

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12.3 Encoding formats, transport formats and media description signalling for interworking, QoE, and other enhancements to MTSI-MHI UID_400028

Resources: S4,C3,C4

References

Document	Title/Contents
	WID(s)
SP-080443	S4 Feature WID on Encoding formats, transport formats and media description signalling for interworking, QoE, and other enhancements to MTSI-MHI (MTSI_eMHI)
	Impacted Specifications
-	See below
	New Dedicated Specifications/Reports
-	See below

Supporting Individual Members: Ericsson, Qualcomm, Nokia, France Telecom, Orange, Telecom Italia, T-Mobile International, Samsung, Huawei.

UID	Name	Resource	Hyperlink	TS_TR
400028	**Encoding formats, transport formats and media description signalling for interworking, QoE, and other enhancements to MTSI-MHI**	-	SP-080443	-
34041	**MTSI Video - Dynamic Rate Adaptation/Signalling of Image Size**	S4	SP-080246	26.114
400018	**CT3 part of Enhancement of interworking between MTSI and CS networks**	C3	CP-080774	29.163
400020	**CT4 part of Enhancement of interworking between MTSI and CS networks**	C4	CP-080774	29.332

This Feature has the following Building Blocks:

- MTSI Video: Dynamic Rate Adaptation/Signalling of Image Size (MTSIV_DRASIS) UID_34041
- CT-wide WID on Enhancement of interworking between MTSI and CS networks UID_400019, 400018, 400020)

Rel-7 TS 26.114 defined Media Handling and Interaction (MHI) procedures for Multimedia Telephony Service for IMS (MTSI), enabling telephony-grade services over QoS controlled bearers. Due to Rel-7 closure only a minimum set of requirements could be completed.

In the Common IMS work, it has been decided that codecs are not included and that 3GPP is responsible for ensuring that necessary procedures are defined so that inter-working with other systems is ensured.

SA4 and CT1 realized that the session media configuration in TS 26.114 is suboptimal for many interworking scenarios and for call scenarios requiring forking.

MTSI terminals are deployed and need to interoperate with the existing base of CS 3GPP terminals.
For MTSI video, this requires interworking with the deployed base of 3GPP H.324M video telephony terminals.

Interworking between PS and CS conversational video services introduces challenges that can result in increase of end-to-end latency and/or degradation of video quality. In order to enable good inter-working, MTSI should include features and tool-sets capable of allowing the service to interwork efficiently with CS video telephony terminals.

For these reasons SA4 TS 26.114 MTSI-MHI was enhanced to:

- Introduce higher bit rate, profiles and/or levels for video coding.
- Introduce coding support for generic signal types including non-speech signals (e.g. ring-back signals and music-on-hold).
- Implement necessary media functionality for interworking to ensure that a 3GPP service can interoperate with other similar services, applications and clients defined by 3GPP or other bodies. This includes all media handling aspects e.g.: encoding / transport formats and session description signalling. Most important interworking scenarios:
  - CS/PS voice and/or video telephony services defined by 3GPP (CS GERAN; CS UTRAN and CSoHS).
  - Video interworking with 3G-324M
    - define new SDP attribute(s) to enhance interworking between MTSI video and H.324M terminals;
    - provide guidance on usage of defined SDP attribute(s) by terminals and interworking gateways;
    - provide guidance on usage of RTCP AVPF messages (e.g., Picture Loss Indication and Codec Control Messages) in interworking gateways.

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  - CS/PS voice, video and/or Multimedia Telephony services defined by ETSI.
  - VoIP and/or Multimedia Telephony services defined in ITU, 3GPP2, PacketCable, etc.
- Improve session media configuration for inter-working with other networks, applications and clients.
- Introduce support for service performance monitoring.

Backwards compatibility with Rel-7 was ensured. User experience and service efficiency was enhanced. Interoperability with other similar services was improved.

Interworking was enhanced in close cooperation with CT1, CT3, CT4, TISPAN, etc.

MTSI Video - Dynamic Rate Adaptation/Signalling of Image Size (MTSIV_DRASIS) **UID_34041**

Resources: S4

References

Document	Title/Contents
WID(s)	
SP-080246	S4 BB WID on MTSI Video: Dynamic Rate Adaptation/Signalling of Image Size
Impacted Specifications	
TS 26.114	IP Multimedia Subsystem (IMS); Multimedia telephony; Media handling and interaction (SA4)
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: T-Mobile International, China Mobile, Samsung, Qualcomm, Research in Motion.

UID	Name	Acronym	Hyperlink	TS_TR
34041	**MTSI Video - Dynamic Rate Adaptation/Signalling of Image Size**	MTSI_eMHI-DRASIS	SP-080246	26.114

Dynamic Rate Adaptation

MTSI specifies the PS version of CS conversational services. Compared to existing CS conversational services, MTSI provides the flexibility that enables a more feature rich and greater quality user experience. Additionally, the use of shared wireless resources in MTSI (compared to the use of dedicated resources in CS) can enable operators to simultaneously address the competing requirements of providing good user experience while at the same time making efficient use of available wireless resources.

In order to achieve this, MTSI should include features and tool-sets capable of allowing the service to adapt dynamically to the changing network and user conditions (e.g., mechanisms to enable the sending terminal to adapt its media transmission to changing congestion conditions and user link conditions using end-to-end terminal feedback and/or network-based feedback, etc.). This would ensure maintenance of acceptable user experience across diverse channel and network conditions.

SA4 developed advanced functionality optimizing MTSI in TS 26.114. Dynamic video rate adaptation for MTSI enhances procedures ensuring that acceptable user experience can be achieved while improving service efficiency. It addressed:

- Identification of operating conditions which would benefit from dynamic video rate adaptation;
- Providing guidance on the use of dynamic video rate adaptation for the identified operating conditions;
- Specification of end to end dynamic video rate adaptation signalling mechanisms;
- Specification of associated SDP parameters;
- Providing guidance on the use of various feedback mechanisms (e.g. end-to-end or network based) for improving service efficiency.

Signalling of Image Size

Information on width and height of video is not directly exchanged. Determining width and height of video, based only on existing information set in SDP offer, allows only pre-defined size either too small or too large for typical UE LCD, which necessitates significant resizing of decoded video. From this inefficiency, video quality and spectral efficiency can be reduced.

Therefore, enhancement of MTSI session initiation procedure is necessary to reduce the gap between the size of encoded video and the decoded, resized, and displayed video. In addition, the enhanced session initiation procedure shall be flexible enough to evolve with the progress in the network, video and VLSI technology.

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This work enhances the existing MTSI session initiation procedure with additional negotiation step of width and height of video, and definition of additional size between the current minimum and the maximum size to allow more graceful quality/bit-rate trade-off.

- Define a new SDP attribute for the width and height of video
- Define new sizes between QCIF(176x144) and QVGA(320x240)
- Incorporate new SDP attribute into MTSI session initiation procedure

Enhancement of interworking between MTSI and Circuit Switched networks (MTSI_eMHI) **UID_400018**

Resources: C3,C4

References

Document	Title/Contents
	WID(s)
CP-080774	CT WID on Enhancement of interworking between MTSI and Circuit Switched networks
	Impacted Specifications
TS 29.163	Interworking between the IP Multimedia (IM) Core Network (CN) subsystem and Circuit Switched (CS) networks [CT3 - Add functionality for inter-working enhancement between the 3G-324M and MTSI]
TS 29.332	Media Gateway Control Function (MGCF) - IM Media Gateway (IM-MGW); Mn interface [CT4 - Add functionality for inter-working enhancement between the 3G-324M and MTSI]
	New Dedicated Specifications/Reports
-	-

Supporting Individual Members: Huawei, China Mobile, Ericsson, Qualcomm, Telecom Italia.

UID	Name	Resource	Hyperlink	TS_TR
400018	**CT3 part of Enhancement of interworking between MTSI and CS networks**	C3	CP-080774	29.163
400020	**CT4 part of Enhancement of interworking between MTSI and CS networks**	C4	CP-080774	29.332

This work enhances the relevant protocols addressing video inter-working between the 3G-324M and MTSI including:

- Usage of the enhancement SDP attribute(s) in the inter-working gateways;
- Procedures to use RTCP AVPF messages (e.g. possibly Picture Loss Indication and Codec Control Messages) in the inter-working gateways;

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13 SA5 Features

13.1 Operations, Administration, Maintenance and Provisioning (OAM&P)

Resources: S5

UID	Name	Acronym	Resource	Hyperlink
340063	**OAM&P 8**	OAM8	S5,C1,C4	-
340064	**Network Infrastructure Management**	OAM8-NIM	S5	-
35051	Telecom Management Methodology	OAM8	S5	SP-070296
35053	Advanced Alarming on Itf-N	OAM8	S5	SP-070492
35056	CN CS Bearer Transport Network (BTN) relative NRM	OAM8	S5	SP-070300
390016	Alignment with eTOM and M.3060 architectural concepts	OAM8	S5	SP-080068
400030	IRP SOAP Solution Sets	OAM8	S5	SP-090148
450052	Create missing specifications for IRP XML definitions	OAM8	S5	SP-090553
340065	**Performance Management**	OAM8-PM	S5	-
35061	IP bearer network Performance measurement definitions	OAM8	S5	SP-070301
360001	HSUPA performance measurements	OAM8	S5	SP-070835
360002	Key Performance Indicators (KPIs) for UMTS and GSM	OAM8	S5	SP-070299
340066	**Trace Management**	OAM8-Trace	S5,C1,C4	-
11067	Service Level Tracing in IMS	OAM8-Trace	C1	CP-080315
400022	Service Level Tracing in IMS	OAM8-Trace	C4	CP-080315
350016	**Charging Management small Enhancements**	CH8	S5	-
350038	**Online charging correlation**	CH8	S5	SP-070077
360003	**SMS online charging**	CH8	S5	SP-070293
410045	**Introduce Online Charging from SMS-SC into the SMS Charging Specifications**	CH8	S5	SP-080463

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13.1.1 Telecom Management Methodology UID_35051

Resources: S5

References

Document	Title/Contents
	WID(s)
SP-070296	WID on Telecom Management Methodology
	Impacted Specifications
TS 32.150	Telecommunication management; Integration Reference Point (IRP) Concept and definitions
TS 32.151	Telecommunication management; Integration Reference Point (IRP) Information Service (IS) template
TS 32.152	Telecommunication management; Integration Reference Point (IRP) Information Service (IS) Unified Modelling Language (UML) repertoire
TS 32.154	Telecommunication management; Backward and Forward Compatibility (BFC); Concept and definitions
	New Dedicated Specifications/Reports
TS 32.153	Telecommunication management; Integration Reference Point (IRP) technology specific templates, rules and guidelines
TS 32.155	Telecommunication management; Requirements template

UID	Name	Acronym	Resource	Hyperlink	rapporteur	TS_TR
340063	**OAM&P 8**	OAM8	-	-	-	-
340064	**Network Infrastructure Management**	OAM8-NIM	S5	-	-	-
35051	Telecom Management Methodology	OAM8	S5	SP-070296	Ericsson	32.155, 32.153

Telecom Management (TM) capabilities and functions evolve continuously because for example, new functions are added to manage new kind of nodes introduced into the network, more efficient functions and capabilities are introduced, new technologies are added, old technologies are not longer used. There is a constant need to enhance and further develop the methodology for the evolved TM area.

To spread the way of working for TM, the methodology developed by 3GPP is promoted outside 3GPP. The use of the same or similar methodology to develop management capabilities for the various networks would facilitate the integration of these systems and networks where telecom is a part of. Therefore there are some dependencies on external bodies, e.g. 3GPP2, ITU-T and ETSI that are using a methodology that is common to 3GPP. The needs from these external bodies have to be taken into account. SA5 developed jointly with ITU-T and ETSI methodology for:

- Requirements;
- Information Services;
- Solution Sets (technologies).

Methodology for XML technology was started in Rel-7 and needs to be completed.

SOAP technology was introduced in Rel-7 and the methodology how to use it needs to be developed, so that the same issues do not occur as for XML. It is still not clear how vendor specific extensions shall be done for XML.

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13.1.2 Advanced Alarming on Itf-N UID_35053

Resources: S5

References

Document	Title/Contents
	WID(s)
SP-070492	WID on Advanced Alarming on Itf-N
	Impacted Specifications
-	-
	New Dedicated Specifications/Reports
TS 32.121	Telecommunication management; Advanced Alarm Management (AAM) Integration Reference Point (IRP); Requirements
TS 32.122	Telecommunication management; Advanced Alarm Management (AAM) Integration Reference Point (IRP); Information Service (IS)
TS 32.123	Telecommunication management; Advanced Alarm Management (AAM) Integration Reference Point (IRP); Common Object Request Broker Architecture (CORBA) Solution Set (SS)

UID	Name	Acronym	Resource	Hyperlink	rapporteur	TS_TR
340063	**OAM&P 8**	OAM8	-	-	-	-
340064	**Network Infrastructure Management**	OAM8-NIM	S5	-	-	-
35053	Advanced Alarming on Itf-N	OAM8	S5	SP-070492	Nokia Siemens Networks	32.121, 32.122, 32.123

The current definitions of Information Object Classes (IOCs) and their notifications in case of alarms and changes related to them put a high burden on both, the IRP managers and IRP agents. In alarm situations the number of notifications to be sent across the Itf-N can be very high, but often the information/data contained in the notifications does not justify their transmission. It is also possible that one error results in several alarm notifications and/or additional notifications indicating state or attribute value changes.

TS 32.121, TS 32.122 and TS 32.123:

- Define requirements and methods to improve the information content of alarms (e.g. to help identify the root cause of an alarm and the instances affected by it), thereby contributing to reduce the time-to-repair.
- Define configurable rules for advanced alarm filtering and reducing the number of alarms by applying such advanced alarm filtering.

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13.1.3 CN CS Bearer Transport Network (BTN) relative NRM UID_35056

Resources: S5

References

Document	Title/Contents
WID(s)	
SP-070300	WID on CN CS Bearer Transport Network (BTN) relative NRM
Impacted Specifications	
TS 32.632	Telecommunication management; Configuration Management (CM); Core Network Resources Integration Reference Point (IRP): Network Resource Model (NRM)
TS 32.633	Telecommunication management; Configuration Management (CM); Core network resources Integration Reference Point (IRP): Common Object Request Broker Architecture (CORBA) Solution Set (SS)
TS 32.635	Telecommunication management; Configuration Management (CM); Core network resources Integration Reference Point (IRP): Bulk CM eXtensible Markup Language (XML) file format definition
New Dedicated Specifications/Reports	
-	-

UID	Name	Acronym	Resource	Hyperlink	rapporteur	TS_TR
340063	**OAM&P 8**	OAM8	-	-	-	-
340064	**Network Infrastructure Management**	OAM8-NIM	S5	-	-	-
35056	CN CS Bearer Transport Network (BTN) relative NRM	OAM8	S5	SP-070300	China Mobile	32.632, 32.633, 32.635

Circuit is a logic link between two exchange network nodes which bear the user data such as voice, e.g. 64K slot of one 2M E1. Traffic route represents the route via which bearer flow to a specific destination.

To learn the detailed circuit connection relationship between network nodes and traffic route configuration status of the CN CS bearer transport network related NRM needs to be defined, such as circuit, traffic route, etc.

This work

- Defined Bearer Transport Network (BTN) related NRM applicable to CN CS of UMTS;
- Added BTN relative NRM definition of the CN CS to TS 32.63x-series Configuration Management (CM); Core network resources IRP;

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13.1.4 Alignment with eTOM and M.3060 architectural concepts UID_390016

Resources: S5

References

Document	Title/Contents
WID(s)	
SP-080068	WID on Alignment with eTOM and M.3060 architectural concepts
Impacted Specifications	
TS 32.101	Telecommunication management; Principles and high level requirements (Update Telecom Operation Map references)
TS 32.102	Telecommunication management; Architecture (Update of ITU-T TMN NGNM architectural concepts)
New Dedicated Specifications/Reports	
-	-

UID	Name	Acronym	Resource	Hyperlink	rapporteur	TS_TR
340063	**OAM&P 8**	OAM8	-	-	-	-
340064	**Network Infrastructure Management**	OAM8-NIM	S5	-	-	-
390016	Alignment with eTOM and M.3060 architectural concepts	OAM8	S5	SP-080068	TeliaSonera	32.101/2, 32-series

The PLMN Management architecture is based on ITU-T TMN Recommendation M.3010 and early work of TMForum addressing common working procedures in Telecom called "Telecom Operations Map" (TOM).

TMForum has developed the extended TOM (eTOM), superseding TOM and now widely adopted among operators. ITU-T has published a new set of TMN documents incorporating requirements for the management of Next Generation Networks (NGN), a Service-Oriented Architecture and alignment with the updated business process views from eTOM. Valuable new concepts were added to better support network services, business processes and to reduce operational costs.

The 3GPP TM specifications need to adopt the development of the telecom operators market and the challenges the new services will have on management of the networks. The prime approach of the 3G TM work was to reuse functions, methods and interfaces already defined (or being defined) that were suitable to the management needs of a PLMN.

The fundamental reused platforms have been updated and the SA5 specifications need to be updated accordingly.

The TMN NGN architecture includes a new business process view, based on eTOM. The goal of NGN is to provide the capabilities to make possible the creation, deployment and management of all kind of services. To achieve this it is necessary to decouple and make independent the service creation/deployment infrastructure from the transport infrastructure.

New reference points enabling more run-time flexibility were added. The BML layer is obsolete. A new management layered architecture is introduced. Significant redefinitions of basic concepts as management function blocks, WSF is absorbed into OSF and NEF.

The new concepts need alignment between 3GPP TM and ITU-T TMN NGN, ETSI TISPAN NGN OSS standards.

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13.1.5 IRP SOAP Solution Set UID_400030

Resources: S5

References

Document	Title/Contents
	WID(s)
SP-080276	WID on SOAP Solution Set
	Impacted Specifications
TS	32.111-1, 32.111-2, 32.111-3, 32.111-5, 32.307, 32.317, 32.341, 32.342, 32.343, 32.345, 32.361, 32.362, 32.363, 32.365, 32.411, 32.412, 32.413, 32.415, 32.611, 32.612, 32.613, 32.615, 32.625
	New Dedicated Specifications/Reports
TS 32.111-7	Alarm IRP SOAP SS
TS 32.617	Bulk CM IRP SOAP SS
TS 32.417	Performance Management (PM) IRP SOAP SS
TS 32.367	Entry Point (EP) IRP SOAP SS
TS 32.347	File Transfer (FT) IRP SOAP SS

UID	Name	Hyperlink	rapporteur	TS_TR
340063	**OAM&P 8**	-	-	-
340064	**Network Infrastructure Management**	-	-	-
400030	IRP SOAP Solution Sets	SP-090148	Ericsson	32.111-7, 32.617, 32.417, 32.367, 32.347, 32.111-1, 32.111-2, 32.111-3, 32.111-5, 32.307, 32.317, 32.341, 32.342, 32.343, 32.345, 32.361, 32.362, 32.363, 32.365, 32.411, 32.412, 32.413, 32.415, 32.611, 32.612, 32.613, 32.615, 32.625

Currently the SA5 IRP specifications are mainly using one type of Solution Set (SS), namely CORBA.
The CMIP SS technology has been discontinued after Rel-6.

SA5 has defined SOAP SSs for the Interface IRPs (such as Basic CM IRP in 32.60x) supporting Subscription Management NRM IRP (TS 32.17x), but SOAP SSs are missing for other IRPs e.g. Alarm IRP (TS 32.111-x).

Both SA5 TR 32.809 (Feasibility Study of XML-based (SOAP/HTTP) IRP Solution Sets) and TR 32.818 (Study on 3GPP SA5 / MTOSI XML harmonization) recommended the use of SOAP/XML-based SSs to support all IRPs.

This work provides SOAP SS for **ALL** IRPs not having it, excluding Subscription Management IRP.
ALL means all Rel-7 and all new Rel-8 IRPs such as E-UTRAN NRM IRP.

It is unlikely that all SOAP SSs identified in the WID (see table above) can be produced within the Rel-8 time frame.

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13.1.6 Create missing specifications for IRP XML definitions UID_450052

Resources: S5

References

Document	Title/Contents
	WID(s)
SP-090553	WID on Create missing specifications for IRP XML definitions
	Impacted Specifications
TS 32.150	Telecommunication management; Integration Reference Point (IRP) Concept and definitions
TS 32.153	Telecommunication management; Integration Reference Point (IRP) technology specific templates, rules and guidelines
TS 32.335	Telecommunication management; Notification Log (NL) Integration Reference Point (IRP); eXtensible Markup Language (XML) solution definitions
	New Dedicated Specifications/Reports
TS 32.125	Telecommunication management; Advanced Alarm Management (AAM) Integration Reference Point (IRP); XML definitions
TS 32.355	Telecommunication management; Communication Surveillance (CS) Integration Reference Point (IRP) ; XML definitions
TS 32.505	Telecommunication management; Self-Configuration of Network Elements Integration Reference Point (IRP) ; XML definitions
TS 32.535	Telecommunication management; Software management Integration Reference Point (IRP) ; XML definitions

UID	Name	Hyperlink	rapporteur	TS_TR
340063	**OAM&P 8**	-	-	-
340064	**Network Infrastructure Management**	-	-	-
450052	Create missing specifications for IRP XML definitions	SP-090553	ZTE	new (32.125, 32.355, 32.505, 32.535), 32.150, 32.153, 32.335

This work item creates the missing XML definitions specifications for the following IRPs: Advanced Alarm Management, Communication Surveillance, Self-Configuration of Network Elements, Software Management.
These definitions are required for implementation of Rel-8 Notification Log IRP (TS 32.33x-series).
It is not possible to log the notifications generated by Rel-8 implementations of these IRPs.
Furthermore, they are needed in the specification of SOAP Solution Sets for these IRPs. Without them it is not possible to complete the Rel-9 WI "IRP SOAP Solution Sets continuation from Rel-8 (OAM9) (UID_440065)".

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13.1.7 IP bearer network Performance measurement definition UID_35061

Resources: S5

References

Document	Title/Contents
WID(s)	
SP-070301	WID on IP bearer network Performance measurement definition
Impacted Specifications	
TS 32.321	Telecommunication management; Test management Integration Reference Point (IRP); Requirements
TS 32.322	Telecommunication management; Test management Integration Reference Point (IRP); Information Service
TS 32.323	Telecommunication management; Test management Integration Reference Point (IRP); CORBA Solution Set
TS 32.325	Telecommunication management; Test management Integration Reference Point (IRP); XML definitions
New Dedicated Specifications/Reports	
-	-

UID	Name	Acronym	Resource	Hyperlink	rapporteur	TS_TR
340063	**OAM&P 8**	OAM8	-	-	-	-
340065	**Performance Management**	OAM8-PM	S5	-	-	-
35061	IP bearer network Performance measurement definitions	OAM8	S5	SP-070301	China Mobile	32.321, 32.322, 32.323, 32.325

Standardizing performance measurements can bring a unified criterion for operators to evaluate the performance of networks provided by different vendors. With the evolution of RAN and All-IP Networks, it is very important to measure the performance of an IP network between any two among RNCs, SGSNs, GGSNs, MGWs and MSC Servers. At present, 3GPP does not have performance measurements for this.

This work widens the scope of TS 32.32x TestIRP by adding 3GPP support of IP network performance measurements either by reference to existing measurements from other SDOs or by initiating an effort in those SDOs to include the counters that SA5 has identified in this WI. IP performance mainly deals with the time delay, jitter, packet loss etc between any two NEs.

Some IP network performance measurements methods defined elsewhere (ITU-T, IETF) can be used as reference.

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13.1.8 HSUPA performance measurements UID_360001

Resources: S5

References

Document	Title/Contents
WID(s)	
SP-070835	WID on HSUPA performance measurements
Impacted Specifications	
TS 32.405	Telecommunication management; Performance Management (PM); Performance measurements Universal Terrestrial Radio Access Network (UTRAN)
New Dedicated Specifications/Reports	
-	-

UID	Name	Acronym	Resource	Hyperlink	rapporteur	TS_TR
340063	**OAM&P 8**	OAM8	-	-	-	-
340065	**Performance Management**	OAM8-PM	S5	-	-	-
360001	HSUPA performance measurements	OAM8	S5	SP-070835	China Mobile	32.405

High Speed Uplink Packet Access (HSUPA) is a UMTS/WCDMA uplink evolution standardized by 3GPP in Rel-6. HSUPA boosts the UMTS/WCDMA uplink data rate up to 5.8Mbps. To realize HSUPA, the overall UE/UTRAN MAC architecture, includes a new MAC-es/MAC-e entity which controls access to the E-DCH. A new connection from MAC-d to MAC-es/MAC-e is added to the architecture, as well as a connection between MAC-es/MAC-e and the MAC Control SAP.

HSUPA performance measurements are different from R99 HSDPA and DCH.

This work adds to TS 32.405 performance measurements for HSUPA FDD and TDD modes (e.g. E-DCH successful and failure assignment, E-DCH normal and abnormal release, serving cell change, soft and hard handover etc.

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13.1.9 Key Performance Indicators (KPIs) for UMTS/GERAN UID_360002

Resources: S5

References

Document	Title/Contents
WID(s)	
SP-070299	WID on Key Performance Indicator (KPI) for UMTS/GERAN
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TS 32.410	Telecommunication management; Key Performance Indicators (KPI) for UMTS and GSM

UID	Name	Acronym	Resource	Hyperlink	rapporteur	TS_TR
340063	**OAM&P 8**	OAM8	-	-	-	-
340065	**Performance Management**	OAM8-PM	S5	-	-	-
360002	Key Performance Indicators (KPIs) for UMTS and GSM	OAM8	S5	SP-070299	China Mobile	32.410

KPIs are very important for operators to monitor their network. Currently, vendors and / or operators define their KPIs in proprietary ways which adds a big overhead on the evaluation of network performance and leads to an unfair rating of different vendors and/or operators. Hence KPIs should be standardized by 3GPP.

KPIs and definition of performance measurements are in the scope of network Performance Management (PM). Currently, performance measurements related to UMTS have been specified in 3GPP as follows:

- TS 52.402 Performance Management (PM); Performance measurements – GSM
- TS 32.404 Performance Management (PM); Performance measurements - Definitions and template
- TS 32.405 Performance Management (PM); Performance measurements UTRAN
- TS 32.406 Performance Management (PM); Performance measurements Core Network PS domain
- TS 32.407 Performance Management (PM); Performance measurements Core Network CS domain
- TS 32.408 Performance Management (PM); Performance measurements Teleservice
- TS 32.409 Performance Management (PM); Performance measurements IP Multimedia Subsystem (IMS)

SA5 TR 32.814 UTRAN and GERAN Key Performance Indicators (KPIs) served as basis for this work.

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13.1.10 Service Level Tracing in IMS (OAM8-Trace) UID_11067

Resources: C1,C4,IETF

References

Document	Title/Contents
WID(s)	
CP-080315	WID on Service Level Tracing in IMS
Impacted Specifications	
TS 24.229	Internet Protocol (IP) multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3 - CT1
TS 29.228	IP Multimedia (IM) Subsystem Cx and Dx Interfaces; Signalling flows and message contents - CT4
TS 29.229	Cx and Dx interfaces based on the Diameter protocol; Protocol details - CT4
New Dedicated Specifications/Reports	
TS 24.323	Trace Management Object (MO) - CT1

UID	Name	Resource	Hyperlink	Notes	TS_TR
340066	**Trace Management**	-	-	-	-
11067	CT1 part	C1	CP-080315	CP#42 completed	24.323, 24.229
521028	(IETF)	C1-IETF	CP-080315	CP#58 Removed from Rel-8, Rel-9 and Rel-10 (Not completed internet-draft)	Rel-11 remains draft-dawes-dispatch-debug
531003	(IETF)	C1-IETF	CP-080315	CP#54 Draft removed from 3GPP documentation, covered by draft-dawes-sipping-debug	draft-dawes-sipping-debug-event
400022	CT4 part	C4	CP-080315	CP#42 completed	29.228, 29.229
400021	Deleted - CT3 part	C3	CP-080315	CP#42 stopped (No CT3-impact)	-

This work is linked to SA5 Stage 2 Trace Management (OAM8-Trace) UID_340066, Stage 1 being defined by OMA. The CT WGs Stage 3 work was removed from Rel-7 and is now continued in Rel-8. This work could not proceed without substantial contribution from IETF.

Subscriber and Equipment Trace provide very detailed information at call level on one or more specific mobile(s) or subscribers. This data is an additional source of information to performance measurements and allows going further in monitoring and optimization operations.

Service Level Tracing (SLT) improves and simplifies end-to-end service diagnostics and enhances the operator's ability to manage complex services. SLT is aimed at end-to-end service-level diagnostics, rather than per node tracing.
By definition, SLT is the ability to capture and log all relevant information at each component within a service chain, associated with a specific service that is initiated either by an end-user or a component (see OMA-RD-OSPE-V1_0-20050614-C.pdf).

The following tasks for CT WGs were defined in SA5 Rel-7 Trace Management WID:

- CT1 on trace activation/deactivation over SIP between IMS entities;
- CT4 on trace activation/deactivation over Cx;
- CT1, CT3, and CT4 on End-to-end tracing for IMS;

This work updates the above mentioned interface protocols to include the procedures defined in SA5 TS 32.422 "Trace control and configuration management". Protocol updates are needed for both trace activations, Signalling Based (SBA) and Management Based (MBA), and conveying SLT indication.

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13.2 Charging Management

Resources: S5

13.2.1 Online charging correlation UID_350038

References

Document	Title/Contents
	WID(s)
SP-070077	WID on Online charging correlation
	Impacted Specifications
TS 32.296	Telecommunication management; Charging management; Online Charging System (OCS): Applications and interfaces (Update the OCS architecture, Add online charging correlation functions, Add message flows to describe online correlation)
	New Dedicated Specifications/Reports
-	-

UID	Name	Acronym	Resource	Hyperlink	rapporteur	TS_TR
350038	**Online charging correlation**	CH8	S5	SP-070077	Orange	32.296

TS 32.240 (Charging architecture and principles) provides the possibility to aggregate and correlate charging information produced by different domains (e.g. IMS, PS) and different sources (e.g. x-CSCF, GGSN, etc.).
This intra-domain and inter-domain correlation is specified only for offline charging but not for online charging.

The Online Charging System (OCS) which performs event/session based charging, credit control and rating features collects charging events at the bearer, IMS and service levels.
By controlling the network and application usage separately, the OCS is not able to apply special charging handling to one charging level against the other (e.g. zero rate bearer usage when an IMS session is active). On the other hand, when multiple services are rendered simultaneously to the subscriber, the OCS is not able to perform service bundling of these services.

As a consequence, the correlation functionality needs to be defined for online charging. This work:

- Updates the OCS internal architecture to combine the EBCF (Event Based Charging Function) and SBCF (Session Based Charging Function) into a single OCF (Online Charging Function) that performs both event and session based charging. This allows optimizing the handling of correlation;
- Introduces a correlation function within the OCS as part of the OCF which would be implement the service logic for correlation;
- Introduces a context monitoring function that defines a context related to the multiple sessions/services activated by a user simultaneously;

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13.2.2 SMS online charging UID_360003

References

Document	Title/Contents
WID(s)	
SP-070293	WID on SMS online charging
Impacted Specifications	
TS 32.240	Telecommunication management; Charging management; Charging architecture and principles (Introduce SMS as a standalone service into charging architecture)
TS 32.299	Telecommunication management; Charging management; Diameter charging applications (Introduce new SMS specific information necessary to enable the relevant SMS charging models)
New Dedicated Specifications/Reports	
TS 32.274	Telecommunication management; Charging management; Short Message Service (SMS) charging

UID	Name	Acronym	Resource	Hyperlink	rapporteur	TS_TR
360003	**SMS online charging**	CH8	S5	SP-070293	Vodafone	32.240, 32.299, new 32.274

This work is linked to

- SA2 – Support of SMS over IP networks (UID_32081)
- CT4 – Routeing of MT-SMS via the HPLMN (UID_340016)

The above linked work items introduced new nodes into the SMS architecture (IP-SM-GW and SMS Router) which currently are not covered y SA5 charging specifications. Both nodes are located within the home PLMN and therefore direct online charging (not reusing CAMEL) is possible.
This work does not replace existing SMS related charging performed at the MSC and SGSN according to SA5 TS 32.250 (CS domain charging) and TS 32.251 (PS domain charging).

TS 32.274 specifies offline and online charging for SMS, based on functional description in TS 23.040 and SMS over IP in TS 23.204. It does not replace existing offline SMS charging functionality and therefore is in addition to that defined in TS 32.250 (CS domain charging) and TS 32.251 (PS domain charging). TS 32.274 includes offline and online charging architecture and scenarios specific to SMS, as well as mapping of the common 3GPP charging architecture specified in TS 32.240 onto SMS. It further specifies the structure and content of the CDRs for offline charging, and the charging events for online charging. TS 32.274 relates to other 3GPP charging TSs as follows:

- TS 22.115 Requirements that govern the charging work;
- TS 32.240 Common 3GPP charging architecture;
- TS 32.298 Parameters, abstract syntax and encoding rules for the CDRs;
- TS 32.295 Transaction based mechanism for the transfer of CDRs within the network;
- TS 32.297 File based mechanism transferring CDRs from network to operator's billing domain (e.g. the billing system or a mediation device);
- TS 32.299 3GPP Diameter application used for SMS offline and online charging.

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13.2.3 Introduce Online Charging from SMS-SC into the SMS Charging Specifications UID_410045

References

Document	Title/Contents
WID(s)	
SP-080463	WID on Introduce Online Charging from SMS-SC into the SMS Charging Specifications
Impacted Specifications	
TS 32.274	Telecommunication management; Charging management; Short Message Service (SMS) charging
TS 32.299	Telecommunication management; Charging management; Diameter charging applications
New Dedicated Specifications/Reports	
-	-

UID	Name	Acronym	Resource	Hyperlink	rapporteur	TS_TR
410045	**Introduce Online Charging from SMS-SC into the SMS Charging Specifications**	CH8	S5	SP-080463	Acision	32.274, 32.299

Linked work items

UID_32081 SA2 Support of SMS over IP networks
UID_340016 CT4 Routeing of MT-SMS via the HPLMN

The current charging specifications cover online charging from SMS Routers and IP-SM-GW but only offline charging from SMS-SC. Adding online charging from SMS-SC brings the following advantages for:

a) **operators and charging system vendors**: a consistent interface specification for online charging across SMS Routers, IP-SM-GW and SMS-SC;
b) **operators:** reduced cost for SMS online charging adaptations when they decide to follow a multi SMS-SC vendor and/or router policy for example. (Currently more than 6 flavours of vendor-specific extensions to Diameter specifications are in use for online charging of SMS.)
c) **SMS-SC and charging system vendors:** less protocols to implement and maintain for online charging of SMS.

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14 CT Features

14.1 Conferencing enhancements for Mp interface (eMp) UID_380024

Resources: C4

References

Document	Title/Contents
WID(s)	
CP-070868	WID on Conferencing Enhancements to the Mp Interface
Impacted Specifications	
TS 23.333	Multimedia Resource Function Controller (MRFC) - Multimedia Resource Function Processor (MRFP) Mp interface; Procedures descriptions [Stage 2]
TS 29.333	Multimedia Resource Function Controller (MRFC) - Multimedia Resource Function Processor (MRFP) Mp interface; Stage 3
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: Huawei, Ericsson, China Mobile, Orange, Vodafone

UID	Name	Resource	Hyperlink	TS_TR
380024	**Conferencing enhancements for Mp interface**	C4	CP-080725	-
380025	**Stage 2 for eMp**	C4	CP-080725	23.333
380026	**Stage 3 for eMp**	C4	CP-080725	29.333

Within the IMS, the Multimedia Resource Function (MRF), through interactions with the User Equipment (UE), Application Server (AS) and Serving Call Session Control Function (S-CSCF), provides e.g. video and audio conference capabilities, and the support of announcements, tones and media streams processing.

MRF is decomposed into two functional entities, i.e. the MRFC and MRFP. The Mp interface between these two functional entities supports the H.248 protocol with the additional support of Multimedia specific H.248 Packages.

This work adds further functionality to the Rel-7 basic function by enhancing the Mp procedures and H.248 Profile.

- The MRFC:
  - Controls the media stream resources in the MRFP
  - Interprets information coming from an AS and S-CSCF (e.g. session identifier) and control MRFP accordingly
  - Generates CDRs

- The MRFP:
  - Controls bearers on the Mb reference point
  - Provides resources to be controlled by the MRFC
  - Mixes incoming media streams (e.g. for multiple parties)
  - Sources media streams (for multimedia announcements)
  - Processes media streams (e.g. media analysis)

Rel-7 Mp interface work implements the basic requirements for the Mp interface applications, including playing tone/announcement, detecting DTMF, ad-hoc audio and video conference, etc.

However, Floor control of conference was moved by TSG CT from Rel-7 to Rel-8. Additionally, although requirements such as Message conference were specified in TS 24.147, TS 24.247 and TS 23.228, the corresponding Mp solutions have not been defined yet. This work includes these missing functionalities to the Mp interface.

To further develop and enhance the use of H.248 protocol between the MRFC and MRFP, the requirements, procedures and H.248 Packages were identified and specified. New H.248 Packages were defined by ITU-T SG 16 and/or CT4. The result produced by external bodies was evaluated taking into account the applicability for the packages.

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This work provides solutions to the following requirements:

- Floor Control requirement of conference service
- Message conference
- Number of Participants in conference

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14.2 Contact Manager for 3GPP UICC applications (eUPHBOOK) UID_320014

Resources: C6

CT6 is responsible within 3GPP for specifications of smart card based network authentication applications such as SIM used in 2G systems, USIM used in 3GPP systems and ISIM excluding security algorithms which are developed by SA3.

References

Document	Title/Contents
WID(s)	
CP-080382	WID on Contact Manager for 3GPP UICC applications
Impacted Specifications	
TS 21.111	USIM and IC card requirements (C6)
New Dedicated Specifications/Reports	
TS 31.220	Characteristics of the Contact Manager for 3GPP UICC applications
TS 31.221	Contact Manager for 3GPP UICC applications - internal interface aspects

Supporting Individual Members: Giesecke & Devrient, T-Mobile, Sagem Orga, Oberthur Technologies, Gemalto, SanDisk, Orange, China Mobile

UID	Name	Acronym	Resource	Hyperlink	TS_TR
320014	**Contact Manager for 3GPP UICC applications**	eUPHBOOK	C6	CP-080382	-
320015	**Requirements for Contact Manager**	eUPHBOOK-St1	C6	CP-080382	21.111
350046	**External interface for eUPHBOOK**	eUPHBOOK-Ext_Spec	C6	CP-080382	new 31.220
370004	**Internal interface for eUPHBOOK**	eUPHBOOK-Int_Spec	C6	CP-080382	new 31.221

Limitations of the current phonebook specified in TS 31.102 are felt by some operators when taking advantage of the larger memory capacity available on UICC. Hence, there is a need for specifying a new (scalable) phonebook.

This work adds a set of features for an enhanced USIM phonebook via CR to TS 21.111.

Two new TSs provide the specification for the Contact Manager:

- TS 31.220 defines the Contact Manager External Interface between Contact Manager Server residing on the UICC and Contact Manager External Client;
- TS 31.221 defines the Contact Manager Internal Interface between Contact Manager Server residing on the UICC and Contact Manager Internal Client;

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15 Improvements of the Radio Interface UID_350040

Resources: RP

UID	Name	Resource	Hyperlink	Status_Report
350040	Rel-8 Improvements of the Radio Interface	RP	-	-
350035	**UMTS 700 MHz FDD**	R4	RP-070127	RP-080260
350034	**UMTS 1500 MHz**	R4	RP-070078	RP-070526
410018	**UMTS 1880 MHz TDD**	R4	RP-080757	RP-090044
380074	**UMTS 2300 MHz TDD LCR**	R4	RP-071016	RP-080517
350037	**Further Improved Minimum Performance Requirements for HSDPA UE (FDD) - Two-Branch Interference Cancellation**	R4	RP-070254	RP-080041
370032	**CS Voice Service over HSPA**	R2	RP-070765	RP-080042
25050	**Conformance Test Aspects – CS Voice Service over HSPA**	R5	RP-080160	RP-080542
370033	**Performance requirements for 15 code reception with 16QAM/QPSK (FDD)**	R4	RP-070824	RP-080043
400055	**Conformance Test Aspects – Performance requirements for 15 code reception with 16QAM/QPSK (FDD)**	R5	RP-080311	RP-080818

15.1 UMTS 700 MHz FDD UID_350035

Resources: R4

References

Document	Title/Contents
WID(s)	
RP-070127	WID on UMTS in 700 MHz bands (FDD)
Impacted Specifications	
TR 25.942	Radio Frequency (RF) system scenarios
TS 25.101	User Equipment (UE) radio transmission and reception (FDD)
TS 25.104	Base Station (BS) radio transmission and reception (FDD)
TS 25.133	Requirements for support of radio resource management (FDD)
TS 25.141	Base Station (BS) conformance testing (FDD)
TS 25.306	UE Radio Access capabilities
TS 25.307	Requirements on User Equipments (UEs) supporting a release-independent frequency band
TS 25.331	Radio Resource Control (RRC); Protocol specification
TS 34.121	Terminal conformance specification, Radio transmission and reception (FDD)
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: Cingular Wireless (AT&T), Ericsson, Nokia, Alcatel-Lucent, Qualcomm, Marvell, Motorola.

UID	Name	Resource	Hyperlink	Status_Report	TS_TR
350035	**UMTS 700 MHz FDD**	R4	RP-070127	RP-080260	25.101, 25.104, 25.133, 25.141, 25.331, 25.942, 25.306, 25.307, 34.121

This work updates the UMTS specifications to include support for the 700 MHz bands in the US (ITU Region 2).

This work covers the Upper and Lower 700 MHz bands (FDD) for potential deployment in ITU Region 2 as follows:

Upper 700 MHz band includes the following spectrum blocks:

C Block: 747 MHz – 752 MHz: Down-link (Node B transmit, UE receive)
777 MHz - 782 MHz: Up-link (UE transmit, Node B receive)

D Block: 752 MHz – 762 MHz: Down-link (Node B transmit, UE receive)
782 MHz – 792 MHz: Up-link (UE transmit, Node B receive)

NOTE 1: In these blocks the Node-B transmits in the lower frequency block as this convention has been mandated by the FCC for the public safety spectrum in the Upper 700 MHz band.

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Lower 700 MHz band includes the following spectrum blocks:

A Block:	698 MHz – 704 MHz: Up-link (UE transmit, Node B receive)
	728 MHz - 734 MHz: Down-link (Node B transmit, UE receive)
B Block:	704 MHz – 710 MHz: Up-link (UE transmit, Node B receive)
	734 MHz – 740 MHz: Down-link (Node B transmit, UE receive)
C Block:	710 MHz – 716 MHz: Up-link (UE transmit, Node B receive)
	740 MHz – 746 MHz: Down-link (Node B transmit, UE receive)

NOTE 2: In these blocks the conventional duplexing is used with the Node-B transmitting in the upper frequency blocks as this should mitigate interference with base stations in the Upper 700 MHz band.

NOTE 3: GSM specifications used a reversed duplexing direction in the Lower 700 MHz band (GSM 710 band) and this should be corrected in the GSM specifications.

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15.2 UMTS 1500 MHz UID_350034

Resources: R4

References

Document	Title/Contents
	WID(s)
RP-070078	WID on UMTS1500
	Impacted Specifications
TR 25.942	Radio Frequency (RF) system scenarios
TS 25.101	User Equipment (UE) radio transmission and reception (FDD)
TS 25.104	Base Station (BS) radio transmission and reception (FDD)
TS 25.133	Requirements for support of radio resource management (FDD)
TS 25.141	Base Station (BS) conformance testing (FDD)
TS 25.306	UE Radio Access capabilities
TS 25.307	Requirements on User Equipments (UEs) supporting a release-independent frequency band
TS 25.331	Radio Resource Control (RRC); Protocol specification
TS 34.121	Terminal conformance specification, Radio transmission and reception (FDD)
	New Dedicated Specifications/Reports
-	-

Supporting Individual Members: eAccess, Fujitsu, Mitsubishi, NEC, NTT DoCoMo, Panasonic, Softbank Mobile.

UID	Name	Resource	Hyperlink	Status_Report	TS_TR
350034	**UMTS 1500 MHz**	R4	RP-070078	RP-070526	25.101, 25.104, 25.133, 25.141, 25.331, 25.942, 25.306, 25.307, 34.121

A WG has been established under the national Information and Communications council in Japan to consider the technical condition of the frequency re-arrangement in 1500 MHz band in order to enhance frequency efficiency. The study included co-existing studies with the following technologies: PDC system (ARIB standard RCR STD-27), DIGITAL MCA system (ARIB standard RCR STD-32), Radio astronomy systems, and Mobile satellite communication service, taking the frequency reframing plan in Japan into account. Therefore, the proponents believe that there is high possibility that IMT-2000 would be introduced in Japan in this band.

The consideration of the evolution and migration to introduce IMT-2000 in the 1500 MHz band being studied in the WG under the national Information and Communications council in Japan could be used as the basis for this work, which would reduce the effort required within 3GPP.

UMTS 1500 for potential deployment in Japan:

- 1427.9 - 1452.9 MHz: Up-link (UE transmit, Node B receive)
- 1475.9 - 1500.9 MHz: Down-link (Node B transmit, UE receive)

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15.3 UMTS 1880 MHz TDD UID_410018

Resources: R4

References

Document	Title/Contents
WID(s)	
RP-080757	WID on UMTS 1880 MHz TDD
Impacted Specifications	
TS 25.102	User Equipment (UE) radio transmission and reception (FDD)
TS 25.105	Base Station (BS) radio transmission and reception (TDD)
TS 25.113	Base station and repeater electromagnetic compatibility (EMC)
TS 25.123	Requirements for support of radio resource management (TDD)
TS 25.142	Base Station (BS) conformance testing (TDD)
TS 25.307	Requirements on User Equipments (UEs) supporting a release-independent frequency band
TS 25.331	Radio Resource Control (RRC); Protocol specification
TS 34.124	Electromagnetic compatibility (EMC) requirements for mobile terminals and ancillary equipment
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: CATT, China Mobile, RITT, Spreadtrum Communications, TD Tech, ZTE

UID	Name	Resource	Hyperlink	Status_Report	TS_TR
410018	**UMTS 1880 MHz TDD**	R4	RP-080757	RP-090044	25.102, 25.105, 25.113, 25.123, 25.142, 34.124, 25.307

In China the band 1880-1920 MHz was allocated to LCR TDD.
This work specifies 1.28Mcps TDD system operation in the band 1880-1920 MHz.

Status report in RP-090044

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15.4 UMTS 2300 MHz TDD LCR UID_380074

Resources: R4

References

Document	Title/Contents
	WID(s)
RP-071016	WID on UMTS 2300MHz TDD
	Impacted Specifications
TS 25.102	User Equipment (UE) radio transmission and reception (TDD)
TS 25.105	Base Station (BS) radio transmission and reception (TDD)
TS 25.113	Base station and repeater electromagnetic compatibility (EMC)
TS 25.123	Requirements for support of radio resource management (TDD)
TS 25.142	Base Station (BS) conformance testing (TDD)
TS 25.306	UE Radio Access capabilities
TS 25.331	Radio Resource Control (RRC); Protocol specification
TS 34.122	Terminal conformance specification, Radio transmission and reception (TDD)
TS 34.124	Electromagnetic compatibility (EMC) requirements for mobile terminals and ancillary equipment
	New Dedicated Specifications/Reports
-	-

Supporting Individual Members: CATT, China Mobile, Huawei, RITT, Spreadtrum Communications, TD-Tech, ZTE.

UID	Name	Resource	Hyperlink	Status_Report	TS_TR
380074	**UMTS 2300 MHz TDD LCR**	R4	RP-071016	RP-080517	25.102, 25.105, 25.113, 25.123, 25.142, 34.124, 25.306, 25.331, 34.122

In China the band 2300MHz - 2400MHz had been allocated to TD-SCDMA system and has been introduced in CCSA standard. More recently at WRC 07 this band was allocated to the mobile service on a primary basis and identified for IMT. This band was introduced in the 3GPP specifications for LCR TDD.

This work specifies the 1.28Mcps TDD system operation in the band 2300-2400MHz.

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15.5 Further Improved Minimum Performance Requirements for HSDPA UE (FDD) - Two-Branch Interference Cancellation UID_350037

Resources: R4

References

Document	Title/Contents
	WID(s)
RP-070254	WID on Further Improved Minimum Performance Requirements for UMTS/HSDPA UE (FDD): Two-Branch Interference Cancellation
	Impacted Specifications
TS 25.101	User Equipment (UE) radio transmission and reception (FDD)
	New Dedicated Specifications/Reports
-	-

Supporting Individual Members: AT&T, Ericsson, Motorola, Tensorcomm

UID	Name	Resource	Hyperlink	Status_Report	TS_TR
350037	**Further Improved Minimum Performance Requirements for HSDPA UE (FDD) - Two-Branch Interference Cancellation**	R4	RP-070254	RP-080041	25.101

RAN#30 approved a study item on improved minimum performance requirements for UMTS/HSDPA UE (FDD). RAN4 has since assessed feasibility of both one-branch and two-branch interference cancellation/mitigation receivers. These receivers attempt to cancel the interference that arises from users operating outside the serving cell.
This type of interference is also referred to as 'other cell' interference. In past link level evaluations, this type of interference has been modelled as AWGN, and as such can not be cancelled. The study has developed models for this interference in terms of the number of interfering Node Bs to consider, and their powers relative to the total other cell interference power, the latter ratios referred to as Dominant Interferer Proportion (DIP) ratios. DIP ratios have been defined based on three criteria; median values of the corresponding cumulative density functions, weighted average throughput gain, and field data.

Interference aware receivers (referred to as Type 2i and Type 3i) were defined for Type 2 and Type 3 receivers, respectively. HSDPA throughput gains for the Type 3i receiver were found to be significant for DIP ratios based on the weighted average throughput gain and field data at low geometries. For example, the gains for the DIP ratios based on the weighted average ranged from a factor of 1.2 to 2.05 for QPSK H-SET6 PB3, and from 1.2 to 3.02 for VA30 for network geometries of -3 and 0 dB.
System level studies indicated that a Type 3i receiver provided significant gains in coverage ranging from 20-55% depending upon the channel and user location. In addition, the Type 3i receiver is based upon known and mature signal processing techniques, and thus, the complexity is minimized. With two-branch, equalizer-based receivers already available in today's marketplace, it appears quite doable to develop a two-branch equalizer with interference cancellation/mitigation capabilities.

Given the above, it was concluded that two-branch interference cancellation receivers are feasible for HSDPA

Type 3i receiver has been used as the reference receiver for defining the new specification values for TS 25.101.

This work improves the link level performance of various HSDPA downlink channels in the presence of other cell interference thereby improving the spectral efficiency of these services.

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15.6 CS Voice Service over HSPA UID_370032

Resources: R2

References

Document	Title/Contents
WID(s)	
RP-070765	WID on CS Voice Service over HSPA
Impacted Specifications	
TS 25.322	Radio Link Control (RLC) protocol specification
TS 25.323	Packet Data Convergence Protocol (PDCP) specification
TS 25.331	Radio Resource Control (RRC); Protocol specification
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: Nokia, Nokia Siemens Networks, Qualcomm, Orange, Telefonica, Huawei, Telecom Italia, AT&T, Telekom Austria, Vodafone.

UID	Name	Resource	Hyperlink	Status_Report	TS_TR
370032	**CS Voice Service over HSPA**	R2	RP-070823	RP-070765	25.323, 25.331, 25.322
25050	**Conformance Test Aspects – CS Voice Service over HSPA**	R5	RP-080160	RP-080542	34.108, 34.123-1, 34.123-2, 34.123-3

During Rel-7 several improvements for running voice service over HSPA were introduced to boost capacity and reduce battery consumption of the devices. As these improvements are not available for CS domain speech running on DCH, this work enables mapping the CS domain speech on HSPA. This as such could be seen not limited to speech only, but in this work item speech case shall be focused on. This approach also provides benefits to the VCC operation.

The reasons to consider running CS speech over HSPA are:

- use of DCH in a cell could be minimized and thus more power and code resources are available for HSDPA use
- setting up of the CS call could be faster as well as when using HSPA for SRB
- availability of the benefits of the features in the WI Continuous Connectivity for Packet Data Users, including DTX/DRX for devices to save battery and reduce interference
- faster set-up of PS services in parallel to CS speech as HSPA is readily on

This work provides a mechanism to map CS services over HSPA channels instead of traditional DCH and covers:

- RRC signalling to map CS service to HSPA
- how to multiplex RAB sub-flows
- avoid specification impact to MAC layer
- ensure interoperability with protocol layers above the RAN

15.6.1 Conformance Test Aspects – CS Voice Service over HSPA UID_25050

Resources: R5

UID	Title	WID	SR	TS-TR
25050	**Conformance Test Aspects – CS Voice Service over HSPA**	RP-080160	RP-080542	34.108, 34.123-1, 34.123-2, 34.123-3

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15.7 Performance requirements for 15 code reception with 16QAM/QPSK (FDD) UID_370033

Resources: R4

References

Document	Title/Contents
WID(s)	
RP-070745	WID on Performance requirements for 15 code reception with 16QAM/QPSK (FDD)
Impacted Specifications	
TS 25.101	User Equipment (UE) radio transmission and reception (FDD)
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: Vodafone, Ericsson, Huawei, Interdigital, Nokia, Nokia Siemens Networks, Orange, Qualcomm, Telecom Italia

UID	Name	Resource	Hyperlink	Status_Report	TS_TR
370033	**Performance requirements for 15 code reception with 16QAM/QPSK (FDD)**	R4	RP-070745	RP-080043	25.101
400055	**Conformance Test Aspects – Performance requirements for 15 code reception with 16QAM/QPSK (FDD)**	R5	RP-080311	RP-080818	34.121-1, 34.121-2

It is important for operators to be able to maximise spectrum efficiency in their UMTS networks. Recently 64QAM demodulation requirements with 15 code reception for HSDPA have been progressed in RAN4 with the aim to improve peak rates but also provide some gains in spectrum efficiency.

Since Rel-5 there have been discussions on whether HSDPA demodulation requirements for 15 code reception with 16QAM and QPSK are needed (until Rel-7 this has only been applicable for category 9/10 UEs). Until now it was felt that the use of such a configuration in the UE may be a rare use case, and the work was never completed in 3GPP.

However, on completing the 64QAM and MIMO work item in Rel-7, there is now a gap in demodulation performance requirements between QPSK with 10 codes, 16QAM with 10 codes, and 64QAM with 15 codes. Adding performance requirements for QPSK and 16QAM HSDPA reception with 15 codes allows operators to guarantee that they can maximize the spectrum efficiency performance in their networks by maximizing throughputs particularly in the case when the UE is not in conditions suitable for 64QAM reception. In addition, this allows UEs not supporting 64QAM or MIMO to have the capability to maximize their potential throughput in the cell.

This work introduces performance requirements for QPSK and 16QAM with 15 codes for the HSDPA UE categories 9, 10 and 13 to 16 based on the same reference receiver assumptions as used to derive the enhanced performance requirements Type 2 and Type 3 in Rel-6 and Rel-7 (i.e. LMMSE chip level equalizer with one and two antenna ports). No specific UE implementation is mandated by these enhanced HSDPA requirements.

Status report in RP-080043

15.7.1 Conformance Test Aspects – Performance requirements for 15 code reception with 16QAM/QPSK (FDD) UID_400055

Resources: R5

UID	Title	WID	SR	TS-TR
400055	**Conformance Test Aspects – Performance requirements for 15 code reception with 16QAM/QPSK (FDD)**	RP-080311	RP-080818	34.121-1, 34.121-2

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16 RAN improvements UID_370035

Resources: RP

UID	Name	Resource	Hyperlink	Status_Report
370035	**Rel-8 RAN improvements**	RP	-	-
360013	**Combination of 64QAM and MIMO for HSDPA (FDD)**	R1	RP-070500	RP-080518
410020	Conformance Test Aspects – Combination of 64QAM and MIMO for HSDPA (FDD)	R5	RP-080759	RP-091058
370036	**Improved L2 for uplink**	R2	RP-070717	RP-080265
400056	Conformance Test Aspects – Improved L2 for uplink	R5	RP-080606	RP-090712
440010	Conformance Test Aspects – 1.28 Mcps TDD Improved L2 support for high data rates	R5	RP-090491	RP-100486
370037	**Enhanced Uplink for CELL_FACH State in FDD**	R2	RP-070677	RP-080804
430024	Conformance Test Aspects – Enhanced Uplink for CELL_FACH State in FDD	R5	RP-090152	RP-100483
370038	**Enhanced UE DRX for FDD**	R2	RP-070679	RP-080520
370039	**Enhancements for SRNS Relocation Procedure**	R3	RP-070759	RP-080521
370040	**Enhancements for FDD HSPA Evolution**	R3,R2	RP-080830	RP-080805
380075	**64QAM for 1.28 Mcps TDD HSDPA**	R1	RP-070924	RP-080806
400057	Conformance Test Aspects – 64QAM for 1.28 Mcps TDD HSDPA	R5	RP-080334	RP-090415
380076	**Enhanced CELL_FACH state in 1.28 Mcps TDD**	R2	RP-071038	RP-080807
440009	Conformance Test Aspects – Enhanced CELL_FACH State in LCR TDD	R5	RP-090490	RP-100484
390028	**Continuous Connectivity for packet data users for 1.28 Mcps TDD**	R1	RP-080085	RP-090394
450024	Conformance Test Aspects – Continuous Connectivity for packet data users for 1.28 Mcps TDD	R5	RP-090751	RP-100490
390029	**HSPA VoIP to WCDMA/GSM CS continuity**	R2	RP-080749	RP-090050
390030	**HS-DSCH Serving Cell Change Enhancements**	R2	RP-080227	RP-080811
450026	Conformance Test Aspects – HS-DSCH Serving Cell Change Enhancements	R5	RP-090756	RP-100077
400050	**MIMO for 1.28 Mcps TDD**	R1,R4	RP-080485	RP-090313
450025	Conformance Test Aspects – MIMO for 1.28 Mcps TDD	R5	RP-100120	RP-100660
400052	**Dual-Cell HSDPA operation on adjacent carriers**	R1,R4	RP-080490	RP-080814
420015	Conformance Test Aspects – Dual-Cell HSDPA operation on adjacent carriers	R5	RP-080996	RP-100479
430028	**Conformance Test Aspects – Receiver Type3i**	R5	RP-090010	RP-091066

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16.1 Combination of 64QAM and MIMO for HSDPA (FDD) UID_360013

Resources: R1

References

Document	Title/Contents
WID(s)	
RP-070500	WID on Combination of 64QAM and MIMO for HSDPA (FDD)
Impacted Specifications	
TS 25.101	User Equipment (UE) radio transmission and reception (FDD)
TS 25.104	Base Station (BS) radio transmission and reception (FDD)
TS 25.141	Base Station (BS) conformance testing (FDD)
TS 25.211	Physical channels and mapping of transport channels onto physical channels (FDD)
TS 25.212	Multiplexing and channel coding (FDD)
TS 25.213	Spreading and modulation (FDD)
TS 25.306	UE Radio Access capabilities
TS 25.308	High Speed Downlink Packet Access (HSDPA); Overall description; Stage 2
TS 25.331	Radio Resource Control (RRC); Protocol specification
TS 25.423	UTRAN Iur interface Radio Network Subsystem Application(RNSAP) signalling
TS 25.425	UTRAN Iur interface user plane protocols for Common Transport Channel data stream
TS 25.433	UTRAN Iub interface Node B Application Part (NBAP) signalling
TS 25.435	UTRAN Iub interface use plane protocols for Common Transport Channel data streams
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: AT&T, Ericsson, 3, Qualcomm, TeliaSonera, Telecom Italia

UID	Name	Resource	Hyperlink	Status_Report	TS_TR
360013	**Combination of 64QAM and MIMO for HSDPA (FDD)**	R1	RP-070500	RP-080518	25.308, 25.211, 25.212, 25.213, 25.306, 25.331, 25.433, 25.435, 25.423, 25.425, 25.101, 25.104, 25.141
410020	Conformance Test Aspects – Combination of 64QAM and MIMO for HSDPA (FDD)	R5	RP-080759	RP-091058	34.108, 34.121-1, 34.121-2, 34.123-1, 34.123-2

64QAM use in the downlink is an attractive complement to multi-antenna techniques (MIMO) in the downlink, e.g. in scenarios where deployment of MIMO is not possible.
The combination of 64QAM and MIMO allows for further increased user throughput in favourable radio conditions such as in well tuned outdoor systems or indoor system solutions (cells with isolation).

This work provides support of 64QAM as a downlink modulation scheme for HSDPA in FDD in combination with MIMO for Type II/III UEs, building upon provisions taken together with the introduction of 64QAM support.
This specification includes:

- L1 aspects of 64QAM combined with MIMO
- L2/L3 aspects of 64QAM combined with MIMO
- Iub/Iur support for 64QAM combined with MIMO
- BS and UE requirements for 64QAM combined with MIMO for an agreed set of radio conditions/environments.
- Requirement set point to take the BTS impairments into account

16.1.1 Conformance Test Aspects – Combination of 64QAM and MIMO for HSDPA (FDD) UID_410020

UID	Name	Resource	Hyperlink	Status_Report	TS_TR
410020	Conformance Test Aspects – Combination of 64QAM and MIMO for HSDPA (FDD)	R5	RP-080759	RP-091058	34.108, 34.121-1, 34.121-2, 34.123-1, 34.123-2

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16.2 Improved L2 for uplink UID_370036

Resources: R2

References

Document	Title/Contents
WID(s)	
RP-070717	WID on Improved L2 for uplink
Impacted Specifications	
TS 25.319	Enhanced Uplink, Overall description; stage 2
TS 25.301	Radio Interface Protocol Architecture
TS 25.306	UE Radio Access capabilities
TS 25.321	Medium Access Control (MAC) protocol specification
TS 25.322	Radio Link Control (RLC) protocol specification
TS 25.331	Radio Resource Control (RRC); Protocol specification
TS 25.433	UTRAN Iub interface Node B Application Part (NBAP) signalling
TS 25.435	UTRAN Iub interface use plane protocols for Common Transport Channel data streams
TS 25.423	UTRAN Iur interface Radio Network Subsystem Application(RNSAP) signalling
TS 25.425	UTRAN Iur interface user plane protocols for Common Transport Channel data streams
TS 25.427	UTRAN Iur/Iub interface user plane for DCH data streams
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: Ericsson, Nokia Siemens Networks, Nokia, T-Mobile.

UID	Name	Resource	Hyperlink	Status_Report	TS_TR
370036	**Improved L2 for uplink**	R2	RP-070717	RP-080265	25.319, 25.301, 25.306, 25.321, 25.331, 25.433, 25.435, 25.423, 25.425, 25.427
400056	Conformance Test Aspects – Improved L2 for uplink	R5	RP-080606	RP-090712	34.108, 34.123-1, 34.123-2, 34.123-3
440010	Conformance Test Aspects – 1.28 Mcps TDD Improved L2 support for high data rates	R5	RP-090491	RP-100486	34.108, 34.123-1, 34.123-2, 34.123-3

Work linked to UID_370037 Enhanced Uplink for CELL_FACH State in FDD.

Rel-7 Work Item "Improved L2 support for high data rates" achieved the targeted results of having link layer support for high data rates in downlink, a single DL L2 evolution for all performance enhancements and a smooth transition between old and new DL protocol formats. Flexible RLC PDU sizes and MAC segmentation in downlink were introduced in order to reach high data rates and reduce protocol overhead and padding.

The link layer enhancements in the uplink were not covered in Rel-7.

Analogous to downlink, the RLC protocol with fixed PDU size cannot efficiently support high uplink data rates. Large PDUs allow for higher peak-rates, but it can create problems at the cell border when the UE is power-limited.

In addition to supporting high data rates efficiently, flexible RLC PDU sizes allow reduced header overhead and padding. In addition, the flexible RLC PDU sizes allow less PDUs to be transmitted in a TTI, leading to reduced processing load in the terminals and the network equipment.

Support of enhanced CELL_FACH, CELL_PCH and URA_PCH state was included in the L2 DL improvements. Similarly for the uplink the enhanced protocol should support seamless state transitions between CELL_DCH, CELL_FACH, CELL_PCH and URA_PCH. This however may be dependent on potential enhancements to the CELL_FACH UL data transmission.

In addition MAC segmentation reduced the reduces residual HARQ error rate for high data rates and allows efficient operation at power limited scenarios.

Therefore it would be beneficial to adopt future proof solutions that provide support for flexible RLC PDU sizes and MAC segmentation in uplink. The uplink protocol should also provide a single L2 evolution for all performance enhancements.

In order to facilitate easy deployment of the enhanced protocols, as well as backward compatibility, the methods to enhance transition between old and new PDU formats should be evaluated.

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This work provides a solution for link layer protocols in the uplink for Rel-8, which

- introduces support for flexible RLC PDU sizes
- introduces support for MAC segmentation
- allows smooth transition between old and new protocol formats
- supports seamless state transitions between CELL_DCH, CELL_FACH, CELL_PCH and URA_PCH (dependent on potential enhancements to the CELL_FACH UL transmission)

16.2.1 Conformance Test Aspects – Improved L2 for uplink UID_400056

UID	Name	Resource	Hyperlink	Status_Report	TS_TR
400056	Conformance Test Aspects – Improved L2 for uplink	R5	RP-080606	RP-090712	34.108, 34.123-1, 34.123-2, 34.123-3

16.2.2 Conformance Test Aspects – 1.28 Mcps TDD Improved L2 support for high data rates UID_440010

Testing for Rel-7 UID_340039 Improved L2 support for high data rates and Rel-8 UID_370036 Improved L2 for uplink

UID	Name	Resource	Hyperlink	Status_Report	rapporteur	Notes	TS_TR
440010	**Conformance Test Aspects – 1.28 Mcps TDD Improved L2 support for high data rates**	R5	RP-090491	RP-100737	CATT	RP#49 completed. Testing for Rel-7 UID_340039 Improved L2 support for high data rates and Rel-8 UID_370036 Improved L2 for uplink	34.108, 34.123-1, 34.123-2, 34.123-3

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16.3 Enhanced Uplink for CELL_FACH State in FDD UID_370037

Resources: R2

References

Document	Title/Contents
WID(s)	
RP-070677	WID on Enhanced Uplink for CELL_FACH State in FDD
Impacted Specifications	
TS 25.211	Physical channels and mapping of transport channels onto physical channels (FDD)
TS 25.214	Physical layer procedures (FDD)
TS 25.309	FDD Enhanced Uplink, Overall description; stage 2
TS 25.321	Medium Access Control (MAC) protocol specification
TS 25.331	Radio Resource Control (RRC); Protocol specification
TS 25.423	UTRAN Iur interface Radio Network Subsystem Application Part (RNSAP) signalling
TS 25.433	UTRAN Iub interface Node B Application Part (NBAP) signalling
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: Nokia Siemens Networks, Nokia, Ericsson, Qualcomm, T-Mobile, Telecom Italia.

UID	Name	Resource	Hyperlink	Status_Report	TS_TR
370037	**Enhanced Uplink for CELL_FACH State in FDD**	R2	RP-070677	RP-080804	25.309, 25.211, 25.214, 25.321, 25.331, 25.423, 25.433
430024	Conformance Test Aspects – Enhanced Uplink for CELL_FACH State in FDD	R5	RP-090152	RP-100483	34.108, 34.121-1, 34.121-2, 34.123-1, 34.123-2, 34.123-3

Work linked to UID_370036 Improved L2 for uplink.

In a modern telecommunication network such as UMTS, the operator aims to offer high Quality of Service to users. QoS is the collective effect of service performances, which determine the degree of satisfaction of a user of a service.

Under the heading of Quality of Experience (QoE) one of the more noticeable points faced by a user is the apparent set-up delay or channel allocation time for various connections as well as stand-by times of battery-operated devices.

Considerations how common channels can be made more efficient to address cases where the usage of CELL_DCH state is not preferred by the network are motivated by high interest on "always on"- type of services like active VoIP clients, PoC, Push email and VPN connections expected to be used via UTRAN, which introduce relatively frequent but small packets to be transmitted between UE and server.

Work to reduce uplink and downlink signalling delays, to overcome the limitations of 3GPP Rel-99 common transport channels, was continued in Rel-7 with the WI “Enhanced CELL_FACH state in FDD”. Reduced downlink signalling delays and higher downlink bit rate in CELL_FACH, CELL_PCH and CELL_URA states were achieved by introducing downlink optimizations of the radio together with Node B based scheduling using HSPA. However, the benefits of this enhancement are limited by the poor uplink counterpart.

Thus the target to modify non-CELL_DCH state operations to reduce uplink and downlink signalling delays is not fully addressed if not investigating packet optimized radio together with Node B based scheduling also for uplink.

The reasons to improve the uplink common channel RACH can be summarised as ease of initiating the data transmission and frequent need of many always-on applications to transmit keep-alive messages:

- Sending an HTTP request takes roughly 500 bytes and it has been observed that this requires over ten Rel-99 random accesses to transmit a complete HTTP request which is too much to be in any way practical and a transition to CELL_DCH is needed. However, moving the UE to the CELL_DCH state before sending any uplink messages introduces significant delay before the actual data download can start.
- A typical VoIP application keep-alive message from the application to the network indicating the server that the application is ready to receive calls is too large to fit on a RACH message easily triggering a state transition to CELL_DCH.
  This is bad for the UE power consumption and is very inefficient for the network resource handling.

This work provides the necessary modifications to random access in the 3GPP specifications by:

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- Reducing the latency of user and control plane in the IDLE mode, CELL_FACH, Cell_PCH and URA_PCH state
- Increasing the available peak rate for UEs in CELL_FACH state by direct HSUPA access in CELL_FACH state
- Reducing state transition delay from CELL_FACH, CELL_PCH and URA_PCH state to CELL_DCH state

Complexity and backward compatibility were considered as well.

16.3.1 Conformance Test Aspects – Enhanced Uplink for CELL_FACH State in FDD UID_430024

UID	Name	Resource	Hyperlink	Status_Report	TS_TR
430024	Conformance Test Aspects – Enhanced Uplink for CELL_FACH State in FDD	R5	RP-090152	RP-100483	34.108, 34.121-1, 34.121-2, 34.123-1, 34.123-2, 34.123-3

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16.4 Enhanced UE Discontinuous Reception (DRX) for FDD UID_370038

Resources: R2

References

Document	Title/Contents
WID(s)	
RP-070679	WID on Enhanced UE DRX for FDD
Impacted Specifications	
TS 25.306	UE Radio Access capabilities
TS 25.308	High Speed Downlink Packet Access (HSDPA)
TS 25.321	Medium Access Control (MAC) protocol specification
TS 25.331	Radio Resource Control (RRC); Protocol specification
TS 25.423	UTRAN Iur interface Radio Network Subsystem Application(RNSAP) signalling
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: Nokia, Nokia Siemens Networks, Qualcomm, LG Electronics, Philips, NXP.

UID	Name	Resource	Hyperlink	Status_Report	TS_TR
370038	**Enhanced UE Discontinuous Reception (DRX) for FDD**	R2	RP-070679	RP-080520	25.306, 25.308, 25.321, 25.331, 25.423

Rel-7 work item "Continuous connectivity for packet data users" UID_20046 (or "Continuous Packet Connectivity"), enhanced the efficiency of radio links when not actively transmitting data in either direction.
This Rel-7 efficiency enhancement can be seen both in the system capacity as well in the UE battery consumption.

Rel-7 did not completely covered the support for frequent transmission of small packets due to IP applications keeping their connection alive by periodically sending a message to the network. Despite this type of application being considered in the WI on Enhanced CELL_FACH, where such packets lead to the UE moving to CELL_FACH state and later being explicitly moved back to the CELL/URA_PCH state, there was little consideration of the actual continuous reception activity in CELL_FACH when the packet exchange is rather infrequent. This causes unnecessary receiver activity before the UE can be moved away form the CELL_FACH state, which leads to reduced UE battery life.
In addition, the signalling load is also further increased if the UE is kept in CELL_FACH for shorter periods.
Therefore, minimizing the signalling needed to move the UE from CELL_FACH state was also considered.

Rel-7 didn't fully covered also taking to limits the discontinuous reception opportunities for the CELL_DCH state.
Rel-7 provides a single DRX cycle that is activated if there is no data transmission to the UE over a given period.
But having just a single DRX cycle does not allow the system to use anything more than very conservatively set DRX cycle lengths.

This work provides enhanced power saving mechanisms for UE and reduces the state transition related signalling load by introducing support for:

- discontinuous reception scheme for CELL_FACH state
- efficient state transition from CELL_FACH to CELL/URA_PCH state
- enhanced DRX method to CELL_DCH state in addition to the one provided in Rel-7.

Complexity and backward compatibility were considered as well.

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16.5 Enhancements for Serving Radio Network Subsystem (SRNS) Relocation Procedure UID_370039

Resources: R3

References

Document	Title/Contents
WID(s)	
RP-070759	WID on Enhancements for SRNS Relocation Procedure
Impacted Specifications	
TS 25.133	Requirements for support of radio resource management (FDD)
TS 25.214	Physical layer procedures (FDD)
TS 25.306	UE Radio Access capabilities
TS 25.308	High Speed Downlink Packet Access (HSDPA); Overall description; Stage 2
TS 25.321	Medium Access Control (MAC) protocol specification
TS 25.331	Radio Resource Control (RRC); Protocol specification
TS 25.423	UTRAN Iur interface Radio Network Subsystem Application Part (RNSAP) signalling
TS 25.433	UTRAN Iub interface Node B Application Part (NBAP) signalling
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: Nokia, Nokia Siemens Networks, 3, Huawei, Telecom Italia, Vodafone, T-Mobile.

UID	Name	Resource	Hyperlink	Status_Report	TS_TR
370039	**Enhancements for Serving Radio Network Subsystem (SRNS) Relocation Procedure**	R3	RP-070759	RP-080521	25.306, 25.308, 25.321, 25.331, 25.423, 25.433, 25.214, 25.133

Work linked to UID_370040 Enhancements for FDD HSPA Evolution.

Rel-7 Study “Scope of future FDD HSPA Evolution” TR 25.999 [High Speed Packet Access (HSPA) evolution; Frequency Division Duplex (FDD)] mainly focussed on a deployment scenario compliant with Rel-7 architecture, and resulted in introducing protocol support for this scenario where RNC functionality is merged with the NodeB. Some functions for this scenario were introduced in Rel-7 during this study phase.

Rel-7 didn't completed the mobility improvement in the above scenario where SRNS Relocation happens more frequently.

This work improves the SRNS Relocation procedure such that delay and signalling and processing load are reduced.

Special attention was paid to interworking aspects with previous versions of the affected protocol specifications.

Status report in RP-080521

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16.6 Enhancements for FDD HSPA Evolution UID_370040

Resources: R3,R2

References

Document	Title/Contents
WID(s)	
RP-080830	WID on Enhancements for FDD HSPA Evolution
Impacted Specifications	
TS 25.301	Radio Protocol Interface Architecture
TS 25.346	Introduction of the Multimedia Broadcast Multicast Service (MBMS) in the Radio Access Network (RAN)
TS 25.401	UTRAN overall description
TS 25.413	UTRAN Iu interface RANAP signalling
TS 25.420	UTRAN Iur interface general aspects and principles
TS 25.423	UTRAN Iur interface RNSAP signalling
TS 25.427	UTRAN Iur/Iub interface user plane protocol for DCH data streams
TS 25.433	UTRAN Iub interface Node B Application Part (NBAP) signalling
New Dedicated Specifications/Reports	
TS 25.446	MBMS synchronisation protocol (SYNC)

Supporting Individual Members: Nokia, Nokia Siemens Networks, 3, Vodafone, T-Mobile, Telecom Italia, Huawei.

UID	Name	Resource	Hyperlink	Status_Report	TS_TR
370040	**Enhancements for FDD HSPA Evolution**	R3,R2	RP-080830	RP-080805	25.401, 25.413, 25.420, 25.423, 25.427, 25.433, 25.446, 25.301, 25.346

This work is linked to Rel-7 Study "Scope of future FDD HSPA Evolution" TR 25.999 [High Speed Packet Access (HSPA) evolution; Frequency Division Duplex (FDD)].

TR 25.999 mainly focussed on a deployment scenario compliant with Rel-7 architecture, and resulted in introducing protocol support for this scenario where RNC functionality is merged with the NodeB.
Some functions for this scenario were introduced in Rel-7 during this study phase.

This work improves the support of a deployment scenario where RNC functionality is merged with the NodeB and provides enhancements in the areas of MBMS and RRM by:

- further RRM optimizations
- improved support of MBMS

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16.7 64QAM for 1.28 Mcps TDD HSDPA UID_380075

Resources: R1

References

Document	Title/Contents
WID(s)	
RP-070924	WID on 64QAM for 1.28Mcps TDD HSDPA
Impacted Specifications	
TS 25.102	User Equipment (UE) radio transmission and reception (TDD)
TS 25.105	Base Station (BS) radio transmission and reception (TDD)
TS 25.123	Requirements for support of radio resource management (TDD)
TS 25.142	Base Station (BS) conformance testing (TDD)
TS 25.201	Physical layer - general description
TS 25.221	Physical channels and mapping of transport channels onto physical channels (TDD)
TS 25.222	Multiplexing and channel coding (TDD)
TS 25.223	Spreading and modulation (TDD)
TS 25.224	Physical layer procedures (TDD)
TS 25.306	UE Radio Access capabilities
TS 25.308	High Speed Downlink Packet Access (HSDPA); Overall description; Stage 2
TS 25.321	Medium Access Control (MAC) protocol specification
TS 25.331	Radio Resource Control (RRC); Protocol specification
TS 25.423	UTRAN Iur interface Radio Network Subsystem Application Part (RNSAP) signalling
TS 25.433	UTRAN Iub interface Node B Application Part (NBAP) signalling
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: RITT, CATT, TD-TECH, Spreadtrum Communications.

UID	Name	Resource	Hyperlink	Status_Report	TS_TR
380075	**64QAM for 1.28 Mcps TDD HSDPA**	R1	RP-070924	RP-080806	25.102, 25.105, 25.123, 25.142, 25.201, 25.221, 25.222, 25.223, 25.224, 25.306, 25.308, 25.321, 25.331, 25.423, 25.433
400057	Conformance Test Aspects – 64QAM for 1.28 Mcps TDD HSDPA	R5	RP-080334	RP-090415	34.108, 34.122, 34.123-1, 34.123-2, 34.123-3

This work is linked to Rel-8 Study on Scope of future HSPA Evolution for 1.28 Mcps TDD (UID_370041) TR 25.824 (Scope of HighSpeed Packet Access (HSPA) Evolution for 1.28Mcps TDD).

The use of 64QAM in the downlink is an attractive complement to multi-antenna techniques (MIMO) in the downlink, e.g. in scenarios where deployment of MIMO is not possible.

TR 25.824 shows significant gains provided by 64QAM in scenarios where users can benefit in terms of increased throughput from favourable radio conditions such as in indoor system solutions or well tuned outdoor systems.

This work adds support of 64QAM as a downlink modulation scheme for HSDPA in TDD including specification of:

- L1 aspects of 64QAM
- L2/L3 aspects of 64QAM
- Iub/Iur support for 64QAM
- BS and UE requirements for 64QAM for an agreed set of radio conditions/environments.
- Requirement set point to take the BTS impairments into account

16.7.1 Conformance Test Aspects – 64QAM for 1.28 Mcps TDD HSDPA UID_400057

UID	Name	Resource	Hyperlink	Status_Report	TS_TR
400057	Conformance Test Aspects – 64QAM for 1.28 Mcps TDD HSDPA	R5	RP-080334	RP-090415	34.108, 34.122, 34.123-1, 34.123-2, 34.123-3

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16.8 Enhanced CELL_FACH state in 1.28 Mcps TDD UID_380076

Resources: R2

References

Document	Title/Contents
	WID(s)
RP-071038	WID on Enhanced CELL_FACH state in 1.28 Mcps TDD
	Impacted Specifications
TS 25.123	Requirements for support of radio resource management (TDD)
TS 25.221	Physical channels and mapping of transport channels onto physical channels (TDD)
TS 25.222	Multiplexing and channel coding (TDD)
TS 25.224	Physical Layer Procedures
TS 25.301	Radio interface protocol architecture
TS 25.302	Services provided by the physical layer
TS 25.304	User Equipment (UE) procedures in idle mode and procedures for cell reselection in connected mode
TS 25.306	UE Radio Access capabilities
TS 25.308	High Speed Downlink Packet Access (HSDPA); Overall description; Stage 2
TS 25.321	Medium Access Control (MAC) protocol specification
TS 25.331	Radio Resource Control (RRC); Protocol specification
TS 25.423	UTRAN Iur interface Radio Network Subsystem Application(RNSAP) signalling
TS 25.425	UTRAN Iur interface user plane protocols for Common Transport Channel data streams
TS 25.433	UTRAN Iub interface Node B Application Part (NBAP) signalling
TS 25.435	UTRAN Iub interface use plane protocols for Common Transport Channel data streams
	New Dedicated Specifications/Reports
-	-

Supporting Individual Members: ZTE, RITT, CATT, TD-TECH, Spreadtrum Communications.

UID	Name	Resource	Hyperlink	Status_Report	TS_TR
380076	**Enhanced CELL_FACH state in 1.28 Mcps TDD**	R2	RP-071038	RP-080807	25.123, 25.221, 25.222, 25.224, 25.301, 25.302, 25.304, 25.306, 25.308, 25.319, 25.321, 25.331, 25.401, 25.423, 25.425, 25.433, 25.435

This work is linked to:

- Scope of future HSPA Evolution for 1.28Mcps TDD
- Improved L2 for uplink
- Enhanced CELL_FACH state in FDD
- Enhanced Uplink for CELL_FACH State in FDD
- Improved L2 support for high data rates

Rel-8 Study TR 25.824 (Scope of High Speed Packet Access (HSPA) Evolution for 1.28 Mcps TDD) focused on improving the capability and performance of HSPA-based radio networks. Enhancing CELL_FACH state was one of the subjects investigated during this study.

Delay in set up or channel allocation is one important measure of Quality of Service experienced by the subscriber. TR 25.815 shows that the setup delays on PS and CS domain can be significantly reduced by using HSPA for SRBs. Thus, signalling latency when SRBs are mapped on HSPA can meet the target requirements of Rel-7.

In current CELL_FACH state in 1.28Mcps TDD, the signalling delay on FACH and RACH can be seen as one bottle neck compared to signalling speed on HSPA. This can be identified by some "always on" type IMS services, where the UE is typically kept in CELL/URA_PCH state and normally moved to CELL_DCH when DL/UL user plane is activated. The enhancement on signalling bit rates in CELL_FACH state can reduce the signalling delay experienced by the RRC messages when transiting to CELL_DCH.

This work improves the CELL_FACH state by:

- increasing the available peak rate for UEs in CELL_FACH state by utilising HSPA in CELL_FACH state
- reducing the latency of user and control plane in the CELL_FACH, CELL_PCH and URA_PCH state by higher data peak rate
- reducing state transition delay from CELL_FACH, CELL_PCH and URA_PCH state to CELL_DCH state
- allowing lower UE power consumption in CELL_FACH state by discontinuous reception

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Complexity and backward compatibility were considered.

16.8.1 Conformance Test Aspects – Enhanced CELL_FACH State in LCR TDD UID_440009

UID	Name	Resource	Hyperlink	Status_Report	rapporteur	Notes	TS_TR
440009	**Conformance Test Aspects – Enhanced CELL_FACH State in LCR TDD**	R5	RP-090490	RP-100735	CATT	RP#49 completed	34.108, 34.123-1, 34.123-2, 34.123-3

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16.9 Continuous Connectivity for packet data users for 1.28Mcps TDD UID_390028

Resources: R1

References

Document	Title/Contents
WID(s)	
RP-080085	WID on Continuous connectivity for packet data users for 1.28Mcps TDD
Impacted Specifications	
TS 25.308	High Speed Downlink Packet Access (HSDPA); Overall description; Stage 2
TS 25.319	Continuous connectivity for packet data users; 1.28Mcps TDD
New Dedicated Specifications/Reports	
TR 25.929	Continuous connectivity for packet data users; 1.28Mcps TDD

Supporting Individual Members: TD-TECH, RITT, ZTE, CATT, Spreadtrum Communications.

UID	Name	Resource	Hyperlink	Status_Report	TS_TR
390028	**Continuous Connectivity for packet data users for 1.28 Mcps TDD**	R1	RP-080085	RP-090394	25.929, 25.308, 25.319

This work is linked to Study TR 25.824 (Scope of High Speed Packet Access (HSPA) Evolution for 1.28 Mcps TDD).

Packet-oriented features like HSDPA and E-DCH in UMTS promote the subscribers' desire for continuous connectivity, where the user stays connected over a long time span with only occasional active periods of data transmission, and avoiding frequent connection termination and re-establishment with its inherent overhead and delay.

This is the perceived mode a subscriber is used to in fixed broadband networks (e.g. DSL) and a precondition to attract users from fixed broadband networks.

For a high number of users in the cell it can be assumed that many users are not transmitting any user data for some time (e.g. for reading during web browsing or in between packets for periodic packet transmission such as VoIP). The corresponding overhead control channels and dedicated channels will significantly limit the number of users that can be efficiently supported.

As completely releasing dedicated channels during periods of temporary traffic inactivity would cause considerable delays for re-establishing data transmission and a corresponding bad user perception, this work intends to reduce the impact of control channels while maintaining the DCH state and allowing a much faster reactivation for temporarily inactive users.

This work aims reducing the code consumption (e.g. overhead of physical control channels or related signalling messages) of packet data users for both real-time (e.g. VoIP) and non real-time services (e.g. for users which have temporarily no data transmission in either uplink or downlink).
Packet data users considered here are using only HS-DSCH/E-DCH channels without UL DPCH and DL DPCH.

The aim is to increase the number of packet data users in the UMTS 1.28Mcps TDD system that can be kept efficiently in CELL_DCH state over a longer time period and that can restart transmission after a period of temporary inactivity with a much shorter delay (for example <100 ms) than would be necessary for re-establishment of a new connection.

Another aim is to reduce UE power consumption in CELL_DCH state over a long period by DTX and DRX.

16.9.1 Conformance Test Aspects – Continuous Connectivity for packet data users for 1.28 Mcps TDD UID_450024

UID	Name	Resource	Hyperlink	Status_Report	rapporteur	Notes	TS_TR
450024	**Conformance Test Aspects – Continuous Connectivity for packet data users for 1.28 Mcps TDD**	R5	RP-090751	RP-100739	ZTE	RP#49 completed	34.108, 34.123-1, 34.123-2, 34.123-3

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16.10 HSPA VoIP to WCDMA/GSM CS continuity UID_390029

Resources: R2

References

Document	Title/Contents
WID(s)	
RP-080749	WID on HSPA VoIP to WCDMA/GSM CS continuity
Impacted Specifications	
TS 25.331	Radio Resource Control (RRC); Protocol specification
TS 25.413	UTRAN Iu interface Radio Access Network Application Part (RANAP) signalling
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: Qualcomm, Orange, Telefonica, T-Mobile, Huawei, AT&T, Alcatel-Lucent, Nokia, Nokia Siemens Networks, Vodafone.

UID	Name	Resource	Hyperlink	Status_Report	TS_TR
390029	**HSPA VoIP to WCDMA/GSM CS continuity**	R2	RP-080749	RP-090050	25.331, 25.413

SP#40 had granted SA2 an exception for any necessary changes to SR-VCC specifications as a consequence of the alignment between SR-VCC and HSPA VoIP to WCDMA/GSM CS continuity (see SA2 Liaison in RP-080609).
TSG RAN was informed about the SA2 solution for the SA request (see S2-086123).
This gave a clear direction for further work as SA2 specifications cover also HSPA for the SR-VCC framework.
Hence RAN2 has developed a compatible solution with SA2 thereby avoiding work on diverging alternatives).

A number of enhancements have been introduced in Rel-7 to optimize VoIP services over HSPA.
Support for VoIP service would not be ubiquitous over an operator's entire network from day one.
Therefore there is a need for CS voice to provide continuity of service over an entire network.

This work enhances RAN to allow UTRA-VoIP to WCDMA/GSM CS continuity within the SR-VCC framework defined in TS 23.216. This includes:

- RRC procedure allowing a connected mode UE to switch calls from VoIP to WCDMA CS or directly to GSM CS
- RNC relocation procedure allowing the VoIP call to be transferred to a CS call on UMTS or GSM
- Inform the RNC on UE SR-VCC capability
- Specify abnormal cases such as "handover failure, with the UE returning to the old cell".

16.11 HS-DSCH Serving Cell Change Enhancements UID_390030

Resources: R2

References

Document	Title/Contents
WID(s)	
RP-080227	WID on HS-DSCH Serving Cell Change Enhancements
Impacted Specifications	
TS 25.101	User Equipment (UE) radio transmission and reception (FDD)
TS 25.104	Base Station (BS) radio transmission and reception (FDD)
TS 25.133	Requirements for support of radio resource management (FDD)
TS 25.212	Multiplexing and channel coding (FDD)
TS 25.214	Physical layer procedures (FDD)
TS 25.308	High Speed Downlink Packet Access (HSDPA); Overall description; Stage 2
TS 25.321	Medium Access Control (MAC) protocol specification
TS 25.331	Radio Resource Control (RRC); Protocol specification
TS 25.423	UTRAN Iur interface Radio Network Subsystem Application(RNSAP) signalling
TS 25.433	UTRAN Iub interface Node B Application Part (NBAP) signalling
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: Ericsson, Nokia, Nokia Siemens Networks, Qualcomm Europe, 3.

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UID	Name	Resource	Hyperlink	Status_Report	TS_TR
390030	**HS-DSCH Serving Cell Change Enhancements**	R2	RP-080227	RP-080811	25.101, 25.104, 25.133, 25.212, 25.214, 25.308, 25.321, 25.331, 25.423, 25.433
450026	Conformance Test Aspects – HS-DSCH Serving Cell Change Enhancements	R5	RP-090756	RP-100077	34.108, 34.121-1, 34.121-2, 34.123-1, 34.123-2, 34.123-3

HSPA related features have originally been proposed, optimized and deployed primarily for best effort data delivery. A number of features have been introduced in Rel-6 (F-DPCH) and Rel-7 (CPC) to enable efficient support of real-time services, in particular voice services, over the HSPA related channels. In 2005, 3GPP has also evaluated a proposal to enhance the HS-DSCH serving cell change procedure but could not find consensus that the requirements could not be met with the existing procedures.

Since then, the number of HSDPA deployments has increased significantly enabling more extensive analysis of the serving cell change performance based on actual field data rather than theoretical models. The interest in the transmission of voice bearers (including CS voice) over HS channels has also increased significantly in light of the possible capacity gain and power saving potential. Serving cell change (i.e. mobility) reliability is a critical metric when considering mapping of voice bearers over HS-DSCH. On that basis, a study has been started at RAN#38 to review the reliability of the HS-DSCH serving cell change procedure in the context of real-time services and considering the latest HS-DSCH related features and field experience.

Study on HS-PDSCH serving cell change enhancements (UID_380080 that produced no TR), has concluded that the success rate of the serving cell change procedure is compromised in some difficult scenarios and that enhancements of the serving cell change procedure would make sense to help improve success rate in difficult scenarios.

Candidate schemes for enhancement techniques have been presented and initially discussed in RAN1 and RAN2. These techniques are mostly related to procedures defined by RAN2.

The work specified enhancements to HS-DSCH serving cell change procedure, focusing on modifications needed to:

- Radio protocol procedures and structures
- Iub/Iur protocols
- UE, Base Station and RRM performance requirements

Number of options and impact on UE and network implementations was minimized.

16.11.1 Conformance Test Aspects – HS-DSCH Serving Cell Change Enhancements UID_450026

UID	Name	Resource	Hyperlink	Status_Report	TS_TR
450026	Conformance Test Aspects – HS-DSCH Serving Cell Change Enhancements	R5	RP-090756	RP-100077	34.108, 34.121-1, 34.121-2, 34.123-1, 34.123-2, 34.123-3

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16.12 MIMO for 1.28 Mcps TDD UID_400050

Resources: R1

References

Document	Title/Contents
WID(s)	
RP-080485	WID on MIMO for 1.28Mcps TDD
Impacted Specifications	
TS 25.201	Physical layer - general description
TS 25.102	User Equipment (UE) radio transmission and reception (TDD)
TS 25.105	Base Station (BS) radio transmission and reception (TDD)
TS 25.142	Base Station (BS) Conformance Testing (TDD)
TS 25.221	Physical channels and mapping of transport channels onto physical channels (TDD)
TS 25.222	Multiplexing and channel coding (TDD)
TS 25.223	Spreading and modulation (TDD)
TS 25.224	Physical layer procedures (TDD)
TS 25.306	UE Radio Access capabilities
TS 25.308	High Speed Downlink Packet Access (HSDPA); Overall description; Stage 2
TS 25.321	Medium Access Control (MAC) protocol specification
TS 25.331	Radio Resource Control (RRC); Protocol specification
TS 25.423	UTRAN Iur interface Radio Network Subsystem Application Part (RNSAP) signalling
TS 25.433	UTRAN Iub interface Node B Application Part (NBAP) signalling
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: CATT, RITT, Spreadtrum Communications, TD-TECH, ZTE.

UID	Name	Resource	Hyperlink	Status_Report	TS_TR
400050	**MIMO for 1.28 Mcps TDD**	R1,R4	RP-080485	RP-090313	25.201, 25.221, 25.222, 25.223, 25.224, 25.306, 25.308, 25.321, 25.331, 25.423, 25.433, 25.102, 25.105, 25.142
450025	Conformance Test Aspects – MIMO for 1.28 Mcps TDD	R5	RP-100120	RP-100660	34.108, 34.122, 34.123-1, 34.123-2, 34.123-3

This work is linked to Study TR 25.824 (Scope of High Speed Packet Access (HSPA) Evolution for 1.28 Mcps TDD).

The MIMO technique is introduced to improve the downlink performance of HSPA system.

TR 25.824 shows that MIMO offers significant performance gains with acceptable impact to both UE and UTRAN.

This work improves the system capacity and spectral efficiency by increasing the data throughput in the downlink within the existing carrier. This is achieved by means of deploying multiple antennas at both UE and Node B side. This includes specification of:

- MIMO Physical Layer Aspects
- MIMO Layer 2 and 3 Protocol Aspects
- MIMO UTRAN Iub/Iur Protocol Aspects
- MIMO RF Transmission/Reception, System Performance Requirements and Conformance Testing

16.12.1 Conformance Test Aspects – MIMO for 1.28 Mcps TDD UID_450025

UID	Name	Resource	Hyperlink	Status_Report	TS_TR
450025	Conformance Test Aspects – MIMO for 1.28 Mcps TDD	R5	RP-100120	RP-100660	34.108, 34.122, 34.123-1, 34.123-2, 34.123-3

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16.13 Dual-Cell HSDPA operation on adjacent carriers UID_400052

Resources: R1,R4

References

Document	Title/Contents
WID(s)	
RP-080490	WID on Dual-Cell HSDPA operation on adjacent carriers
Impacted Specifications	
TS 25.101	User Equipment (UE) radio transmission and reception
TS 25.104	Base Station (BS) radio transmission and reception
TS 25.133	Requirements for support of radio resource management
TS 25.211	Physical channels and mapping of transport channels onto physical channels
TS 25.212	Multiplexing and channel coding
TS 25.213	Spreading and modulation
TS 25.214	Physical layer procedures
TS 25.215	Physical layer; Measurements
TS 25.308	High Speed Downlink Packet Access (HSDPA); Overall description; Stage 2
TS 25.321	Medium Access Control (MAC) protocol specification
TS 25.331	Radio Resource Control (RRC); Protocol specification
TS 25.423	UTRAN Iur interface Radio Network Subsystem Application Part (RNSAP) signalling
TS 25.433	UTRAN Iub interface Node B Application Part (NBAP) signalling
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: Ericsson, Qualcomm, Huawei, Alcatel-Lucent, 3, TeliaSonera, Orange, Bouygues Telecom, eMobile Softbank Mobile, Telefonica, Vodafone.

UID	Name	Resource	Hyperlink	Status_Report	TS_TR
400052	**Dual-Cell HSDPA operation on adjacent carriers**	R1,R4	RP-080490	RP-080814	25.101, 25.104, 25.133, 25.141, 25.211, 25.212, 25.213, 25.214, 25.215, 25.306, 25.308, 25.321, 25.331, 25.423, 25.433
420015	Conformance Test Aspects – Dual-Cell HSDPA operation on adjacent carriers	R5	RP-080996	RP-100479	34.108, 34.121-1, 34.121-2, 34.123-1, 34.123-2, 34.123-3

This work was triggered by the UID_390032 Study on Dual-Cell HSDPA (withdrawn TR 25.825 v100).

HSPA features are successfully deployed in many networks. HSPA based mobile internet offerings are very popular and data usage is rapidly increasing.

The peak user throughout has been significantly enhanced as part of Rel-7 (MIMO, Higher Order Modulation). Even better and more consistent user experience across the cell and in particular in the outer cell coverage area is desired.

Deployment of additional network resources, such as a second HSPA carrier, creates an opportunity for network resource pooling as a way to enhance the user experience, in particular when the radio conditions are such that existing techniques (e.g. MIMO) can not be used.

The "Study on Dual-Cell HSDPA operation" revealed feasibility, benefits and complexity of combining network radio resources (i.e. cells on adjacent carriers) to address the operators' desire for enhanced user experience and enhanced user experience consistency.

This work specifies dual-cell HSDPA operation for the following scenarios:

- dual cell transmission only applies to HSDPA physical channels
- two cells belong to the same Node-B and are on adjacent carriers
- two cells do not use MIMO to serve UEs configured for dual cell operation
- two cells operate in the same frequency band

16.13.1 Conformance Test Aspects – Dual-Cell HSDPA operation on adjacent carriers UID_420015

UID	Name	Resource	Hyperlink	Status_Report	TS_TR

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420015	Conformance Test Aspects – Dual-Cell HSDPA operation on adjacent carriers	R5	RP-080996	RP-100479	34.108, 34.121-1, 34.121-2, 34.123-1, 34.123-2, 34.123-3

16.14 Conformance Test Aspects – Receiver Type3i UID_430028

Resources: R5

UID	Title	Hyperlink	Status_Report	Notes	TS-TR
430028	**Conformance Test Aspects – Receiver Type3i**	RP-090010	RP-091066	Testing for Receiver Type3i in 25.101 UE radio Tx and Rx FDD	34.108, 34.121-1, 34.121-2

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16.15 3.84 Mcps TDD MBMS over a Single Frequency Network Integrated Mobile Broadcast (MBSFN-DOB)

Resources: R1

UID	Name	Resource	Hyperlink	Status_Report	TS_TR
360008	**3.84 Mcps TDD MBMS over a Single Frequency Network (MBSFN) Integrated Mobile Broadcast**	R1	RP-081124	RP-080218	25.102, 25.105, 25.123, 25.201, 25.221, 25.222, 25.223, 25.224, 25.304, 25.306, 25.331, 25.346, 25.402, 25.433
440008	**Conformance Test Aspects – 3.84 Mcps TDD MBMS over a Single Frequency Network (MBSFN) Integrated Mobile Broadcast**	R5	RP-090583	RP-100070	34.108, 34.122, 34.123-1, 34.123-2, 34.123-3

Supporting Individual Members: Ericsson, 3, LG Electronics, Nokia, Nokia Siemens Networks, TeliaSonera, Telecom Italia.

Impacted Specifications	
TS 25.102	User Equipment (UE) radio transmission and reception (TDD)
TS 25.105	BS radio transmission and reception (TDD) requirements
TS 25.123	Requirements for support of radio resource management (TDD)
TS 25.201	Physical layer - general description
TS 25.221	Physical channels and mapping of transport channels onto physical channels (TDD)
TS 25.222	Multiplexing and channel coding (TDD)
TS 25.223	http://www.3gpp.org/ftp/Specs/html-info/25223.htmSpreading and modulation (TDD)
TS 25.224	Physical layer procedures (TDD)
TS 25.304	User Equipment (UE) procedures in idle mode and procedures for cell reselection in connected mode
TS 25.306	UE Radio Access capabilities definition
TS 25.331	Radio Resource Control (RRC) protocol specification
TS 25.346	Introduction of the Multimedia Broadcast Multicast Service (MBMS) in the Radio Access network (RAN); Stage 2
TS 25.402	Synchronisation in UTRAN Stage 2
TS 25.433	UTRAN Iub interface NBAP signalling

This work is linked to the Rel-7 work items:

UID_340042 MBMS FDD Physical layer Enhancements
UID_340043 MBMS TDD Physical layer Enhancements

Rel-7 Study on Improvement of the Multimedia Broadcast Multicast Service (MBMS) in UTRAN (UID_20051) assessed in TR 25.905 the possibility of transmitting the MBMS service on all available DL resources using an SFN network with an TDD as well as with an FDD channel structure.

TR 25.905 shows that the attainable data rates using a SFN operation for MBMS can be greatly increased with a minimum impact on the physical channel structure, and thus minimum impact on UE receivers.
In order to take full advantage of the attainable data rates however, higher order modulation and receiver performance supporting MBSFN operation is necessary. To allow a smooth migration for existing UMTS networks towards MBSFN, the MBSFN Integrated Mobile Broadcast (IMB) has been proposed for TDD with a chip rate of 3.84Mcps.

This work includes support for MBSFN IMB 3.84Mcps TDD operation including:

- Configuration of a common primary scrambling code
- Receiver support for suitable equaliser technology, i.e. similar to Type-2 and Type-3
- Handling of delay spread in the UE receiver to support reception of MBSFN IMB that supports the assumed deployment scenario
- Ensuring backwards compatibility with the existing UTRA physical layer architectures in existing spectral assignments (legacy UEs should not camp on a dedicated MBSFN IMB carrier)
- Support for 16QAM on S-CCPCH
- Necessary radio protocol enhancements to support MBSFN IMB operation on a DL only MBSFN carrier
- Minimum UE capabilities related to the support of MBSFN IMB reception and the support of simultaneous services on the unicast carrier
- Iub user and control plane protocols to support MBSFN IMB operation
- UE reception performance requirements for applicable bands for the MBSFN IMB transmission
- BTS requirements for 16QAM transmission on S-CCPCH for applicable bands for the MBSFN IMB transmission

The following conditions apply:

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- UE mobility requirements and procedures related to the unicast carrier must be met
- No optimizations are done within this work item for single receiver (one local oscillator) UEs, i.e. MBMS data loss may occur during periods where a single receiver UE is receiving on the unicast carrier
- SFN area is limited to the RNC area
- unicast serving RNC does not need to be aware of a UE receiving transmissions from a MBSFN IMB carrier

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17 GERAN Features

17.1 GERAN support for GERAN - 3G Long Term Evolution interworking (GELTE) UID_50583

Resources: GP,G1,C1,G3new

UID	Name	Resource	Hyperlink	Notes	TS_TR
50583	**GERAN support for GERAN - 3G Long Term Evolution interworking**	-	GP-061757	-	44.018, 44.060, 45.002, 45.008, 45.010, 48.008, 48.018, 51.010
51583	**G1 part**	G1	GP-061757	GP#41 completed	43.055, 43.129, 43.246, 45.002, 45.008, 45.010
52583	**G2 part**	G2	GP-061757	GP#41 completed	44.018, 44.060, 48.008, 48.018
53583	**CT1 part**	C1	GP-061757	-	24.008
54583	**Testing**	G3new	GP-061757	GP#52 completed	51.010

Supporting Individual Members: Alcatel, Cingular, Ericsson, Huawei, KPN, LG Electronics, Motorola, Nokia, Nortel Networks, Qualcomm, Research In Motion, Siemens, Telecom Italia, TeliaSonera, T-Mobile.

This work is linked to "3G Long term Evolution" UID_25029 and "System Architecture Evolution" UID_320005.

3GPP approved the above WIs for the evolution of 3GPP radio-access technology towards high-data-rate, low-latency and packet-optimized. Requirements for interworking with GERAN networks are captured in RAN TR 25.913 (Requirements for E-UTRA and E-UTRAN) the relevant being:

Co-existence and interworking with 3GPP RATs

The following requirements are applicable to inter-working between E-UTRA and other 3GPP systems:

a) E-UTRAN Terminals supporting also UTRAN and/or GERAN operation should be able to support measurement of, and handover from and to, both 3GPP UTRA and 3GPP GERAN systems correspondingly with acceptable impact on terminal complexity and network performance.
b) E-UTRAN is required to efficiently support inter-RAT measurements with acceptable impact on terminal complexity and network performance, by e.g. providing UE's with measurement opportunities through downlink and uplink scheduling.
c) Interruption time during handover of real-time services between E-UTRAN and UTRAN is less than 300 ms
d) Interruption time during handover of non real-time services between E-UTRAN and UTRAN should be less than 500 ms
e) Interruption time during handover of real-time services between E-UTRAN and GERAN is less than 300 msec
f) Interruption time during handover of non real-time services between E-UTRAN and GERAN should be less than 500 ms
g) Non-active terminals (such as one being in Rel-6 idle mode or CELL_PCH) which support UTRAN and/or GERAN in addition to E-UTRAN shall not need to monitor paging messages only from one of GERAN, UTRA or E-UTRA
h) Interruption time during handover between an E-UTRA broadcast stream and a UTRAN unicast stream providing the same service (e.g. same TV channel) is less than FFS. (Value to be agreed following SA guidance)
i) Interruption time during handover between an E-UTRA broadcast stream and a GERAN unicast stream providing the same service (e.g. same TV channel) is less than FFS. (Value to be agreed following SA guidance)
j) Interruption time during handover between an E-UTRA broadcast stream and a UTRAN broadcast stream providing the same service (e.g. same TV channel) is less than FFS. (Value to be agreed following SA guidance)

The above requirements apply where the GERAN and/or UTRAN networks provide support for E-UTRAN handover.

Reduction in network and terminal complexity and cost by not mandating support for the measurements and handovers to/from GERAN/UTRAN should be considered.

The interruption times above are to be considered as maximum values. These values may be revisited when the overall architecture and the E-UTRA physical layer has been defined in more detail.

This work adds functionality to the GERAN specifications to meet the above requirements. This includes changes to:

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- (P)BCCH System Information
- MS capabilities
- Packet Switched handover
- Session continuity
- InterRAT NACC
- MBMS

- Idle Mode measurements and cell (re)selection;
- Connected and GPRS mode MS measurements on LTE, and measurement reporting;
- MS timing aspects of interRAT change.

Based on experience in network deployment

- changes are performed for A/Gb mode only

17.1.1 Testing for GERAN support for GERAN - 3G Long Term Evolution interworking UID_54583

Resources: G3new

UID	Name	Resource	Hyperlink	Notes	TS_TR
54583	**Testing**	G3new	GP-061757	GP#52 completed	51.010

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17.2 U-TDOA Enhancement (GUTEN) UID_50586

Resources: GP

References

Document	Title/Contents
WID(s)	
GP-070865	WID on U-TDOA Enhancement
Impacted Specifications	
TS 45.008	Radio subsystem link control
TS 43.059	Functional Stage 2 Description of Location Services in GERAN
TS 48.071	SMLC-BSS interface Layer 3 specification
New Dedicated Specifications/Reports	

Supporting Individual Members: TruePosition, T-Mobile USA, Cingular Wireless, SiRF Technology

For E9-1-1 calls, initial positioning is calculated at the beginning of a call. At that time, the MS is transmitting at the maximum power allowed by a BTS. When a mid-call request is received from a Public Safety Answering Point (PSAP) for a location update, the MS operates at a reduced power level in most cases. This results in a typical degradation of 20% for mid-call location accuracy when compared with initial call location accuracy. The goal is to provide the same level of location accuracy performance in mid-call scenarios as is currently provided in the initial call scenarios.

Upon receipt of an Uplink - Time Difference Of Arrival (U-TDOA) Request, the BSC orders the MS to increase power. The resulting interference from the additional power-up is minimal. In current network deployments, the MS typically transmits at the full power allowed by the BTS for approximately 3 seconds at the start of a call, prior to reducing the power level for the remainder of the call via the power control algorithms. This 3-second period accounts for approximately 25% of the total interference of the call, assuming an average call duration of two minutes. The proposed feature would cause the MS to be powered up to the maximum power level allowed by the BTS for about 3 seconds at some point mid-call when the updated location is required. Each location event for a given call would cause a 25% increase in the overall interference contributed by that particular call. E9-1-1 calls account for < 0.1% of all calls. Even in the case of a location update request for every E-9-1-1 call, the effect on the overall interference would be negligible (<0.025%). For services, a single power-up for a duration of 3 seconds for 1% of all calls would result in an interference increase of ~0.25%.

An alternative implementation would be to have the U-TDOA Response message indicate the timing of the power-up (i.e. frame number). This would reduce the needed power-up time to 1 second, further reducing interference concerns. The ability to eliminate this loss in call location accuracy through the use of temporary power-up for mid-call locations has been tested and proven effective in field trials.

This technique increases the probability of determining an MS location under circumstances which could cause degradation in location accuracy. An optional capability to increase MS transmit power was added to the U-TDOA location method.

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17.3 GAN Enhancements (GANENH) UID_50587

Resources: GP

References

Document	Title/Contents
WID(s)	
GP-071484	WID on GAN Enhancements
GP-071560	WID on Update to GAN specifications, TS 43.318 and TS 44.318 for GAN Enhancements
Impacted Specifications	
TS 43.318	Generic Access Network (GAN); Stage 2
TS 44.318	Generic Access Network (GAN); Mobile GAN interface layer 3 specification
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: T-Mobile USA., 3, TeliaSonera, Nokia, Kineto, Alcatel-Lucent, LG Electronics.

Rel-7 GERAN TR 43.902 "Enhanced Generic Access Networks (EGAN) study" showed that all three technical proposals met the objectives of this GAN Enhancement WID, providing enhancement through different approaches.

GERAN found all options in TR 43.902 as feasible but decided to select the Iu-mode as it can be done completely within TSG GERAN and independently of the I-WLAN or SAE work items. The GAN Iu-mode:

- reduces the complexity for delivery of CS and PS services
- reduces the number of functions in the overhead and latency for PS services
- provides good optimization process for future integration

This work adds the GAN Iu-mode to the GAN specifications, TS 43.318 and TS 44.318.

17.3.1 Update TS 51.010 Mobile Station (MS) Conformance Specification for GAN Enhancements UID_53089

Resources: G3new

References

Document	Title/Contents
WID(s)	
GP-071563	WID on Update to TS 51.010 Mobile Station (MS) Conformance Specification for GAN Enhancements
Impacted Specifications	
TS 51.010	Mobile Station (MS) conformance specification
New Dedicated Specifications/Reports	
-	-

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17.4 A-interface over IP (AoIP) UID_50591

Resources: GP,S4,C4,C1,C3

This Feature contains three building blocks as follows:

- GERAN UID_400041 GERAN aspects of AoIP (AoIP)
- SA4 UID_400042 Media Requirements for CS over IP based User Plane (AoIP-CSoIP)
- CTx UID_400y24 Core Network Impacts for A-Interface User Plane over IP (AoIP-CN)

GERAN aspects of AoIP UID_400041

Resources: GP

References

Document	Title/Contents
WID(s)	
GP-080901	WID on AoIP (A-interface over IP)
Impacted Specifications	
TS 48.001	Base Station System - Mobile-services Switching Centre (BSS - MSC) interface; General aspects
TS 48.002	Base Station System - Mobile-services Switching Centre (BSS - MSC) interface; Interface principles
TS 48.008	Mobile Switching Centre - Base Station system (MSC-BSS) interface; Layer 3 specification
TS 48.020	Rate Adaptation on the Base Station System - Mobile Service Switching Centre (BSS-MSC) Interface
TS 49.008	Application of the Base Station System Application Part (BSSAP) on the E-Interface
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: China Mobile, Vodafone, Ericsson, Huawei, ZTE, Alcatel-Lucent, Nokia Siemens Networks, Telecom Italia.

This work was triggered by GERAN Rel-8 TR 43.903 Study on A-interface over IP (AINTIP) UID_50589.

BSS (Base Station System) over IP is a technical trend in wireless network evolution, which can construct high bandwidth efficient networks. BSS over IP consists of Gb interface over IP and A interface over IP.
Gb interface over IP has been specified in Rel-4.
As for the A-interface, only the control plane signalling over IP (SIGTRAN) has been introduced in Rel-7.

TR 43.903 compared different AoIP solutions in terms of related criteria, Phase I (general requirements) and Phase II (technical solutions). This work covers the spin-off AoIP specification activity.

Based on the working assumptions agreed in TR 43.903, one technical option was standardized to meet all the migration deployment scenarios defined during feasibility study.

Media Requirements for CS over IP based User Plane (AoIP-CSoIP) UID_400042

Resources: S4

References

Document	Title/Contents
WID(s)	
SP-080444	WID on Media Requirements for CS over IP based User Plane (AoIP-CSoIP)
Impacted Specifications	
TS 26.102	Mandatory speech codec; Adaptive Multi-Rate (AMR) speech codec; Interface to Iu, Uu and Nb [specify the Nb framing for GSM_FR and GSM_HR and the RTP Parameters for all NB Codecs]
TS 26.103	Speech codec list for GSM and UMTS [specify the parameters for SDP signalling for 3GPP Codecs]
TS 26.202	Speech codec speech processing functions; Adaptive Multi-Rate - Wideband (AMR-WB) speech codec; Interface to Iu, Uu and Nb [specify the RTP Parameters for AMR-WB]
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: Alcatel-Lucent, China Mobile, Ericsson, Huawei, Nokia, Nokia Siemens Networks, Vodafone, Motorola.

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AoIP allows removing transcoders from BSS, improving Transcoding-Free Operation (TrFO), maximizing flexibility for MSC-in-Pool networks and optimizing transport efficiency on the User Plane.
This new feature requires changes to A-Interface Control Plane, A-Interface User Plane and MSC-MGW interface.
To support end-to-end TrFO, minor changes were also necessary on the Nc and Nb interfaces.
The Core Network shall support all 3GPP Codec Types (TS 26.103) including GSM_EFR, GSM_FR and GSM_HR.

This new paradigm for User Plane transport via IP and addition of GSM_FR and GSM_HR for transport via the A- and Nc-interfaces required evaluation and definition of RTP profiles, payload formats and RTP parameters.
SA4 ensured that existing RTP Profiles and payload formats are sufficient for the CS speech telephony in 3GPP.
It also prepared input to standardize all missing RTP payload formats in IETF.
SA4 ensured that the User Plane transports on the AoIP-interface and the SIP-I-based Nb-interface are harmonized.
It standardized all RTP parameters for applications on AoIP-interface and Nb-interface controlled by SIP-I-based Nc interface. SA4 standardized the SDP parameters for all 3GPP Codecs for the SIP-I-based Nc-Interface.
It gave guidance to GERAN for the AoIP Control Plane negotiation for RTP parameters.
It standardized the Nb framing for GSM_FR and GSM_HR for the Nb-interface controlled by BICC-based Nc interface.
SA4 investigated issues related to transport of GTT (Global Text Telephony) and the potential need to support the RTP payload format for Text Conversation (IETF RFC 4103).

Core Network Impacts for A-Interface User Plane over IP (AoIP-CN) UID_400024

Resources: C4,C1,C3

References

Document	Title/Contents
WID(s)	
CP-080278	WID on Core Network Impacts for A-Interface User Plane over IP
Impacted Specifications	
TS 23.205	Bearer-independent circuit-switched core network; Stage 2 - CT4
TS 23.153	Out of band transcoder control; Stage 2 - CT4
TS 23.231	SIP-I based circuit-switched core network; Stage 2 - CT4
TS 23.009	Handover procedures - CT1
TS 29.232	Media Gateway Controller (MGC) - Media Gateway (MGW) interface; Stage 3 - CT4
TS 29.002	Mobile Application Part (MAP) specification - CT4
TS 29.007	General requirements on interworking between the Public Land Mobile Network (PLMN) and the Integrated Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN) - CT3
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: Alcatel-Lucent, China Mobile, Ericsson, Huawei, Nokia Siemens Networks, Vodafone.

CT standardized all Core Network Messages and Procedures to support A-interface User Plane over IP and the extension of Transcoder-Free Operation (TrFO/OoBTC) for GSM_EFR, GSM_FR, and GSM_HR.
All telephony, fax and data (CSD, HSCSD) services shall be supported by the Core Network.

CT made standards for SIP-I based Core Network signalling.
The agreed User Plane transport for the SIP-I based Nb-interface is RTP/UDP/IP, like foreseen for AoIP.

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17.5 New multicarrier BTS class (MCBTS) UID_51147

Resources: G1

References

Document	Title/Contents
WID(s)	
GP-071542	WID on New multicarrier BTS class
Impacted Specifications	
TS 45.005	Radio transmission and reception
TS 45.050	Background for RF Requirements
TS 51.021	Base Station System (BSS) equipment specification; Radio aspects

Supporting Individual Members: Alcatel-Lucent, China Mobile, Ericsson, Huawei, TeliaSonera, T-Mobile, Vodafone, ZTE.

Multicarrier transceiver architectures applied to GSM BTSs would allow several (possibly hopping) GSM carriers to be processed by a single transmitter and power amplifier in the downlink and by a single wideband receiver in the uplink. This sharing of hardware resources by several carriers leads to significant cost reductions for the BTS equipment.

Given the recent advances in components technology, these architectures seem more and more feasible, however feasibility is still conditioned by the relaxation of some of the most severe requirements in TS 45.005.
The relaxation of those requirements must be considered with great care, as it might have impacts on operational scenarios, mainly in the case of uncoordinated operation of networks between two (or more) operators.
There are ongoing discussion in TSG GERAN on pros and cons of this relaxation in TS 45.005 and TS 51.021.
The proposed way addressing the remaining concerns is to specify a new class of BTS with relaxed radio requirements.
Regulatory restrictions apply to the usage of BTSs of this class at the border of the frequencies allocated to an operator. These restrictions could be based on the geographical area where such BTSs are operating.

This work defines a new BTS class based on relaxed radio requirements to allow multicarrier operations while ensuring that such relaxations cannot impact the performance of existing neighbouring networks. It investigated applicability of multicarrier GERAN BTS and identified the extent of required BTS radio modifications for selected deployment scenarios. Furthermore radio performance requirements for such BTS had been investigated for optimizing system integrity in high capacity deployment scenarios including:

- Extent of and need for possible modifications for TX inter-modulation performance at the BTS;
- Extent of and need for possible modifications for RX blocking performance at the BTS;
- Required modifications related to spurious emissions and switching transients at the BTS;
- Treatment of impacts to neighbour GERAN-based networks with prime consideration of 900MHz, 1800MHz bands

Availability of new technology based Multi-Carrier Power Amplifiers (MCPA) and wideband receiver architectures was included in the investigation.

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17.6 Support for Additional Navigation Satellite Systems (ANSS) for LCS UID_38001

Resources: S1,G2,R2

References

Document	Title/Contents
WID(s)	
GP-080776	WID on Support for Additional Navigation Satellite Systems (ANSS) for LCS
Impacted Specifications	
TS 22.071	Location Services (LCS); Service description; Stage 1 (SA1 CR0077)
TS 43.059	Functional stage 2 description of Location Services (LCS) in GERAN
TS 44.031	Location Services (LCS); Mobile Station (MS) - Serving Mobile Location Centre (SMLC) Radio Resource LCS Protocol (RRLP)
TS 44.071	Location Services (LCS); Mobile radio interface layer 3 LCS specification
TS 48.031	Location Services LCS: Serving Mobile Location Centre - Serving Mobile Location Centre (SMLC - SMLC); SMLCPP specification
TS 49.031	Location Services (LCS); Base Station System Application Part LCS Extension (BSSAP-LE)
TS 51.010	Mobile Station (MS) conformance specification
RAN2 TS	25.305, 25.306, 25.331, 25.413, 25.423, 25.433, 25.453 (RAN2 considers performance requirements for Rel-9)
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: Qualcomm, AT&T, Ericsson, Spirent, TeleCommunications Systems.

Galileo and Additional Navigation Satellite Systems (GANSS) support was added by Rel-7 work item A-GNSS-GP. Rel-7 GANSS supports only the Galileo navigation satellite system, but allows adding new satellite systems by assigning new GANSS IDs, GANSS Signal IDs and GANSS Time IDs, together with a few ASN.1 extensions to existing assistance data elements. These ANSS multiply the number of satellites and signals available for free open service positioning, and therefore, will increase the service availability, user experience and accuracy of LCS.
In particular, accuracy, yield and time to first fix will be improved in indoor and dense urban areas, where navigation satellite signals normally exhibit blocking, attenuation and multipath effects.
Higher accuracy is achieved in rural and suburban areas, where high yield and good accuracy are normally possible.

Signal In Space Interface Control Documents (SIS ICD) of the these satellite navigation systems are all freely available:

- Modernized GPS: IS-GPS-200, IS-GPS-705, IS-GPS-800 http://www.losangeles.af.mil/library/factsheets/factsheet.asp?id=9364
- SBAS http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/techops/navservices/gnss/library/documents/
- QZSS http://qzss.jaxa.jp/is-qzss/IS-QZSS_10_E.pdf
- GLONASS http://www.glonass-ianc.rsa.ru/i/glonass/ICD02_e.pdf

This work adds support for ANSS by defining new GANSS IDs for the following navigation satellite systems:

- Modernized GPS;
- SBAS (Satellite Based Augmentation Systems; limited to EGNOS, WAAS, GAGAN, MSAS);
- QZSS (Quasi Zenith Satellite System);
- GLONASS.

Extensions to existing GANSS assistance data elements, where required, shall allow to natively support these ANSS (and their hybrid use) using GERAN signalling.

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17.7 Conformance testing for the Latency Reductions feature (CTLATRED) UID_51149

Resources: G1, G3new

References

Document	Title/Contents
WID(s)	
GP-080367	WID on Conformance testing for the Latency Reductions feature
GP-080368	WID on MS conformance testing for the Latency Reductions feature
GP-080369	WID on BTS conformance testing for the Latency Reductions feature
Impacted Specifications	
TS 51.010	Mobile Station (MS) conformance specification - G3new
TS 51.021	Base Station System (BSS) equipment specification; Radio aspects - G1
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: Huawei, InterDigital Communications, LG Electronics, Nokia, Research in Motion, Rodhe & Schwarz, Ericsson, T-Mobile International, Vodafone.

This work adds test cases to TS 51.010 and TS 51.021 for GERAN Rel-7 Latency Reductions (LATRED) UID_50582.

17.8 MS conformance testing of changes introduced by WI "Support of Packet-switched Handover for GERAN A/Gb mode" (PSHCT-MStest) UID_53091

Resources: G3new

References

Document	Title/Contents
WID(s)	
GP-080411	WID on Mobile Station conformance testing of Packet-switched Handover
Impacted Specifications	
TS 51.010	Mobile Station (MS) conformance specification
New Dedicated Specifications/Reports	
-	-

Supporting Individual Members: Rohde & Schwarz, Qualcomm, Ericsson, Nokia, Motorola

This work provides MS testing for Rel-6 Support of PS Handover for GERAN A/Gb mode (SPSHAGB) UID_50559.

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18 SA1 Studies

18.1 Study on Customised Alerting Tone (FS_CAT) Requirements UID_7026

Resources: S1

References

Document	Title/Contents
WID(s)	
SP-060474	SID on Study of Customised Alerting Tone (CAT) Requirements
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TR 22.982	Study of Customised Alerting Tone (CAT) requirements

Supporting Individual Members: China Mobile, Ericsson, Siemens, Huawei, NEC, Comverse, Lucent.

The Customized Alerting Tone (CAT) service is an operator-specific service by which an operator enables the subscriber to customize the alerting tone which is played to the calling party. CAT service should not negatively affect the conversation between calling and called parties. The caller can experience favourite songs, multi-media clips or other CAT instead of the traditional ringing tones.

As there are many methods to realize the basic functions of CAT, standardization was needed especially for roaming support. Obviously, CAT should be available in spite of the called party's roaming status. Interoperability between different vendors and interoperability between different Public Land Mobile Networks (PLMNs) are required. Furthermore, more and more additional features of CAT are expected by the subscribers, e.g. a user may be able to easily subscribe to the same alerting tone at the same time as he is hearing it by for instance pressing a key.

Currently, most of the CAT mechanisms cannot support roaming scenarios perfectly and some lack scalability.

This work studied the CAT requirements to be standardized e.g.:

- Users can access and choose the alerting tones with more facility, e.g. the caller can easily subscribe to a called party's alerting tone by pressing a key. Digital Rights Management (DRM) issues should be covered in order to make sure that copyrights are not infringed.
- When calling a user of another PLMN, the caller can still hear the alerting tone set by the called party.
- When roaming to another PLMN, the caller can still hear the alerting tone set by the called party.
- The caller can experience the alerting tone set by the called party who is roaming to another PLMN.
- Interactions with: PS services, Supplementary Services, IMS Multimedia Telephony Service, Charging Services and the Generic User Profile (GUP).

TR 22.982 conclusions

- studied requirements and potential new capabilities in 3GPP that need to be standardized for the CAT service, especially additional features for roaming and interoperability support;
- specified the requirements for CAT service in CS and PS domains;
- Voice services were the main focus, but CAT for IMS Multimedia Telephony Service and supplementary services was also considered;

Genealogy of this spec:

antecedent(s)	this spec	descendant(s)
(no antecedents)	22.982	22.182

Spin-off Rel-8 Feature Customized Alerting Tone (CAT) Service UID_340029.

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18.2 Study on Facilitating Machine to Machine Communication in GSM and UMTS (FS_M2M) UID_7027

Resources: S1

References

Document	Title/Contents
WID(s)	
SP-050527	SID on Facilitating Machine to Machine Communication in GSM and UMTS (M2M)
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TR 22.868	Study on Facilitating Machine to Machine Communication in 3GPP Systems

Supporting Individual Members: Siemens, Vodafone, Orange, China Mobile, Rogers Wireless, T-Mobile

Machine to Machine (M2M) communication is seen as a form of data communication between entities that do not necessarily need human interaction. It is different to current communication models as it involves:

- new or different market scenarios;
- a potentially very large number of communicating entities (terminals);
- to a large extend little traffic per equipment;

An example for M2M communication is a service which permanently checks the integrity and safety of a vehicle and reports problems to the garage service.

The role of M2M in the GSM/UMTS business is still limited, but a big potential growth in the 3GPP system is foreseen. The two major limiting factors are the costs for the operator and handling of M2M by both, the end-user and operator. M2M communication may become more relevant in future as:

- M2M in GSM/UMTS is a future growth sector in particular in mature markets;
- The ubiquitous coverage of mobile networks is one main enabler;
- Enhancement of the 3GPP standard could be a stimulator, as business could be addressed more cost efficiently.

Regarding the handling of M2M for the user and the operator the underlying mechanisms for handling subscriptions, subscriber data, numbering issues, etc. were studied. Requirements for M2M communication have been collected.

Lean and simple design as well as efficient use of resources (e.g. air interface and signalling resources) were major objectives. Special consideration was put on the following areas for optimization:

- Charging mechanisms (e.g. simplify charging in relation to M2M purposes);
- Addressing: Already today some networks are running out of E.164 numbering space. This would be aggravated by widespread usage of M2M. IP address space limitation was also studied.
- Types of communication (e.g. one to many, many to many, relevance of mobile originated mobile terminated and always on type of connectivity); Enhancements for the identified communication model; Preferred communication models that could be implemented cost efficiently for M2M
- Handling of large numbers of subscriptions and subscriber data within the network;
- Handling issues of large number of M2M subscriptions for the user of M2M services;
- Impact of optimizations for security (Denial of Service attacks by M2M devices, Effects of theft of M2M that are quite likely unattended, Secure handling of credentials, Access control for M2M terminals).

TR 22.868 conclusions - Possible Requirements

- De-activation of mobility signalling for stationary terminals
- Optimised mobility signalling for low mobility and low activity terminals
- Possibility to instruct individual/group of terminal types e.g. static, low mobility, low activity terminals, not to perform any periodic location updates, and optionally location updates due to movement between Location Area (LA) / Routing Area (RA).
- Possibility to instruct individual/groups of terminal types to perform a location update at a specific date and time
- Purging of subscriber data from VLR/SGSN for low activity / Mobile Originated (MO) only terminals
- Tamper Save/Theft proof terminal including a UICC
- Possibility to change subscription out in the field e.g. after contract expiry without human intervention

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- Possibility to allocate the terminals at initial power up to a network operator without human intervention
- Re-use of PNM mechanisms for M2M communication
- Possibility to define groups and to have group counters to count the traffic to and from the servers at the network boundary
- Per group counters to count location update traffic
- Add a terminal type identifier to the subscription information to facilitate mobility management and charging
- Overcoming the limitations of the IMSI range by alternative addressing solutions
- Simplify terminal and network and thus reduce cost. CS should not be impacted and preferably PS should be used.

Spin-off SA3, CT6 Rel-9 Study on Security Aspects of Remote Provisioning and Change of Subscription for M2M Equipment UID_370053.

Spin-off Rel-10 Feature UID_400033 NIMTC (Network Improvements for Machine-type Communications).

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18.3 Study on Network Composition UID_31089

Resources: S1

References

Document	Title/Contents
WID(s)	
SP-060478	WID on Network Composition
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TR 22.980	Network composition feasibility study

Supporting Individual Members: Siemens, Ericsson, Nokia, Vodafone, NTT DoCoMo, NEC, KDDI, BenQ Mobile.

Over the past years, an increasing number of heterogeneous network types have come to the focus of attention, e.g. heterogeneous access systems (otherwise known as multi-access) Personal Area Networks (PANs), Personal Networks (PNs), Moving Networks etc. This trend is expected to continue. Different scenarios have been studied in TR 22.978 All-IP network (AIPN) feasibility study, which lists "network extensibility/composition" as a key aspect of AIPN.
The integration of PANs and PNs was completed earlier (see Personal Network Management (PNM) UID_31081). Related Stage 1 was produced in TS 22.278 Service requirements for the Evolved Packet System (EPS) and TS 22.259 Service requirements for Personal Network Management (PNM); Stage 1.
3GPP networks had to integrate many of these heterogeneous network types, or to interwork with them, in an efficient manner that for operators is easy to manage and control.

This study builds on the AIPN work and studied in more detail the concept of heterogeneous network/system integration and interworking. This "Network Composition" includes integration of networks with different administrative domains, and the dynamic and flexible integration of ad-hoc networks, PANs, sensor networks etc.
It studied a uniform composition procedure independent of what kind of network is "composed" with the 3GPP system. Complementing the AIPN work a concrete dynamic "plug&play" and flexible composition procedure was studied.

The composition concept was also studied in the 6th FP IST Project of the EU "Ambient Networks" which was introduced in the joint SA2/RAN2/RAN3 meeting in Athens, May 2005 (S2-051145).

This study explores the feasibility of a uniform procedure for the integration of, and the interworking with, a large variety of heterogeneous network types. It focuses on ad-hoc networks, PANs, moving networks etc., but also includes access systems. The intention was to avoid the need for defining a new procedure for integration / interworking with each newly emerging network type and to explore the feasibility of making the composition procedure dynamic and to minimize human intervention ("plug&play"). This uniform procedure is called Network Composition. It is conceivable that roaming within a pre-set commercial and technological environment could be established dynamically using the same procedure.

The study covered the following aspects:

- Purpose and benefits of composition;
- Composition use cases highlighting uniformity, dynamicity, security, manageability, scalability, flexibility, as well as business aspects;
- Potential composition requirements;
- Traits and/or implications of introducing this functionality into the 3GPP system, covering subjects such as management, multi-link radio access, mobility, context & policy awareness, security, and media transcoding & adaptation capabilities;
- Composition process;
- Relations to other functionalities of the evolving 3GPP architecture (e.g. AIPN, PNM).

Service aspects include:

- Uniform handling for network composition (Identical handling of e.g. PANs, Moving Networks, heterogeneous access systems, etc.);
- Flexible control delegation (i.e. flexibility regarding what functionality is assumed in the composing network, such that e.g. a particular control feature can be executed in the 3GPP system or in the other network;
- Support of "plug&play" composition, including aspects such as service continuity in the composed networks.

TR 22.980 conclusions

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- Defines principles, characteristics and requirements of Network Composition. Key terms and concepts are introduced and used when formulating use cases and requirements, as well as the Composition Process which is the core functionality of the novel idea of enabling so called composition-capable networks to connect and e.g. establish roaming agreements dynamically.
- Network Composition provides new ways of networking and interworking, and opens up both for new business opportunities, as well as providing a baseline for solutions on problems that have been identified already today. The use cases aid in giving insights into areas of interest for Network Composition, and describes how values and benefits can be provided to users and network operators as well as service providers, which are coming at different levels of cost and deployment increments.
- Recommends 3GPP to include Network Composition in future work on evolved systems.

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18.4 Study on Requirements of IMS Multimedia Conferencing UID_320024

Resources: S1

References

Document	Title/Contents
WID(s)	
SP-060479	SID on Study of Requirements of IP-Multimedia Subsystem (IMS) Convergent Multimedia Conferencing
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TR 22.948	Study of requirements of IP-Multimedia Subsystem (IMS) convergent multimedia conferencing

Supporting Individual Members: China Mobile, Huawei, Comverse, ZTE, Radvision.

Convergent MultiMedia Conferencing (CMMC) is a service for two or more parties in different locations to communicate using a combination of audio, video, messaging and data. The data communication covers a variety of applications including whiteboard, document sharing, application sharing, desktop sharing, file delivery etc. CMMC is used more and more for on-line collaboration, meeting, training, distance learning, medical treatment etc.

CMMC covers a range of communication activities and technologies. Audio, video and data co-exist in a conversation of multiple parties, which is different from point-to-point multimedia conversation. CMMC provides a variety of data sharing not standardized yet within IMS. This work reviews requirements and studies how to develop CMMC over IMS.

TS 22.228 (Service requirements for IMS; Stage 1) identifies general requirements of IMS convergent conferencing whereas TS 24.147 (Conferencing using IMS; Stage 3) provides protocol details of conferencing within IMS. However, many aspects for the complete IMS conferencing service have not been specified, such as data sharing, media control, floor control, conference policy etc.

IETF SIPPING specifies high-level requirements for conferencing and a framework for conferencing with SIP. IETF XCON specifies a suite of protocols for conference, but the protocols are not intended for wireless mobile environments and are not specified with SIP.

OMA PoC supports video, message and other media in addition to voice, and defines the floor control mechanisms for different media; however applicability to conferencing needs to be checked.

In summary, to enable IMS CMMC and achieve interoperability, many aspects need to be standardized, especially data sharing in conferencing. Requirements for CMMC need to be reviewed, related IMS requirements to support CMMC need to be derived and possible routes for standardization need to be studied. The study

a) identifies IMS CMMC features and describes use cases illustrating the IMS CMMC service requirements;
b) derives the IMS requirements for CMMC services:
   1) Conference framework;
   2) Data sharing session establishment/termination/management in a conference;
   3) Media Resource Function (MRF) function for CMMC;
   4) Multicast capability for CMMC;
   5) Media control for audio, video and data;
   6) Floor control for audio, video and data;
   7) Conference policy;
c) identifies possible routes to standardization:
   1) Adopting existing and emerging standards e.g. OMA, IETF;
   2) Modifying and enhancing existing and emerging standards;
   3) Developing new standards.

TR 22.948 conclusion:

CMMC architecture and protocol should be consistent with IMS conferencing in TS 22.147 and TISPAN TS 183 005. Avoid duplicate work with OMA.

Spin-off Rel-9 Feature UID_370026 Value-Added Services for Short Message Service (VAS4SMS).

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18.5 Study on support of a Public Warning System (FS_PWS) UID_320025

Resources: S1

References

Document	Title/Contents
WID(s)	
SP-080054	SID on Study on support of a Public Warning System (PWS)
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TR 22.968	Study for requirements for a Public Warning System (PWS) service

Supporting Individual Members: AT&T, Fujitsu, KPN, NEC, Nokia, Nokia Siemens Networks, Nortel, NTT DoCoMo, Panasonic, Samsung, T-Mobile, Softbank Mobile.

Natural disasters such as earthquake, tsunami, etc. result in considerable damage to the affected area and loss of life. It is essential that emergency information from local agencies (e.g. government/public service organizations) is provided to the population within the disaster area in order to take action to reduce damage and avoid loss of life.

For earthquake, some in the scientific community believe that early warning information based on detection of Primary waves can help avoiding fatalities as it allows people in the affected area to execute safety measures (e.g. extinguishing gas stoves, opening doors, hiding under the table, moving to a safer place) before the arrival of the destructive Secondary wave.

Feasibility of systems delivering earthquake early warning information to mobile phone users needs to be studied.

This study identifies requirements for a Public Warning System (PWS) with particular emphasis on:

- duration of delivery time;
- volume of information (e.g. to sufficiently describe the warning to the user);
- granularity of the distribution of the public warning (e.g. prefecture, county);
- prevention of spoofing of public warning messages;
- interaction of the public warning message with the services active in the handset;
- support of public warning messages in legacy handsets;
- support of public warnings for roaming subscribers;
- impact on battery life of the handset;
- impact on existing infrastructure and dimensioning;
- support of multiple languages (e.g. deliver alert in the preferred language of the subscriber);
- support of individuals with physical disabilities (e.g. visually impaired);
- type of information to be provided (e.g. what is the event, where is the event, where is the event heading (like a tornado), what actions should be taken by the user, etc.);

As each Region has different requirements based on many factors (e.g. type of disaster, regulatory mandate, scientific community recommendation, current legacy base capability, etc.) this study addresses regional requirements and mandates for this type of service. However the regulatory requirements and use cases for a PWS have not been finalized in all regions, therefore the results of this study are not applicable for those regions. As this service is applicable to emergency situations, every effort should be made to define a service that can be provided over existing mobile networks in the near-term. Support of this service is optional to operators and/or subscribers based on regional requirements and mandates. The study took into account related work in other bodies.

This service should be introduced with minimal impact on current specifications and existing networks.
It should be provided using low cost and simple mechanisms based on those available within existing mobile networks.

This study focussed on providing this service using the CS/PS domain over GERAN/UTRAN. It shows how a public warning message interacts with the services a user is enjoying when receiving the message (e.g. during a voice call).

TR 22.968 conclusions

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Requirements from Europe and Japan for Earthquake Early Warning (EEW) have been identified. Further requirements are expected from other Regions.

The requirements/working assumptions from the three Regions included in the study are significantly different. However it is desirable to specify a PWS fulfilling all Regions' requirements.

The current specifications are not sufficient to cover all scenarios identified in TR 22.968.
The support for most urgent warning notifications is a matter for each PLMN operator or each Region.

Genealogy of this spec:

antecedent(s)	this spec	descendant(s)
(no antecedents)	22.968	22.168

Spin-off Rel-9 Feature UID_380057 (PWS)

Petitioners' Exhibit 1003, p. 297
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18.6 Study on Paging Permission with Access Control (FS_PPAC) UID_330016

Resources: S1

References

Document	Title/Contents
WID(s)	
SP-060785	SID on Paging Permission with Access Control (PPAC)
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TR 22.908	Study on Paging Permission with Access Control (PPAC)

Supporting Individual Members: Fujitsu, NEC, NTT DoCoMo, Toshiba.

The Study on Paging Permission with Access Control (PPAC) investigated three issues caused by the current access control mechanism, which does not allow to reach UEs for which access class restriction was applied:

- **Priority service**
  There is a priority communication service which is produced to an authorized user (e.g. government) by using priority mechanisms such as special access class (i.e. access classes 11 to 15) allocation and high priority level allocation of eMLPP (enhanced Multi-Level Precedence and Pre-emption).
  However, there is an issue in the congestion situation (e.g. caused by earthquake) that the authorized user cannot access to the corresponded user when access class barring is applied to the corresponded user.

- **Emergency service**
  User sets up an emergency call and it is unfortunately released. At the condition, emergency agencies (e.g. police) would like to call back the user. However in the current specification, it is impossible to call back if access control restriction has been applied to the user.

- **Communication between UEs in the same area where access control is performed**
  There is an area where access control is performed. In order to allow all the users in the area to setup calls, broadcasting access class numbers are changed at an interval of some seconds. For example, in an interval UEs with access class 0 can perform setup and UEs with access classes 1-9 cannot do setup, in another interval UEs with access class 1 can do setup and UEs with access classes 0, 2-9 cannot do setup. However there is an issue that communication between UE with an access class number and UE with another access class number cannot be established in the area. The communication helps users in emergency situation, e.g. a mother's call to her child to know where he/she is.

TR 22.908 conclusion

- Use-cases investigated, performed gap analysis and clarified issues;
- Requirements recommended for PPAC (paging permission of the UE applied access control);
- Only one new capability identified: allow UEs with indications from the network to perform location registration and respond to a paging request even though it is under access class barring conditions to complete certain classes of calls or messages (e.g. calls from emergency personnel, etc.).

Spin-off Rel-8 Feature UID_370084 (PPACR)

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18.7 Study on Non-3GPP access Network Selection Principles (NSP) UID_340033

Resources: S1

References

Document	Title/Contents
WID(s)	
SP-080318	SID on Study on Non-3GPP access Network Selection Principles (NSP)
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TR 22.912	Study into network selection requirements for non-3GPP access

Supporting Individual Members: O2, RIM, Gemalto, BT, Softbank Mobile.

Network access via WLAN is becoming more widespread. UEs supporting both 3GPP and non-3GPP access technologies such as WLAN become available. Hence, it is important to have clear requirements describing how multiple access devices use and prioritize networks providing these access technologies.

Selection of networks available only through non-3GPP access technologies is not covered yet by 3GPP and therefore how mobile devices select these networks is undefined.

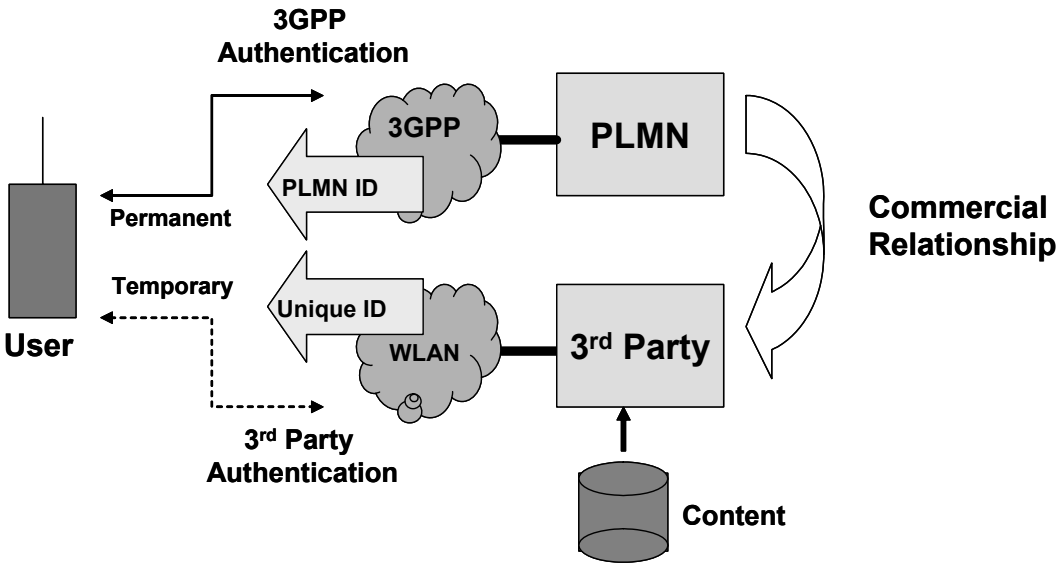
Non-3GPP access technologies were considered in Rel-7 TR 22.811 (Review of Network Selection Principles), which concluded that where multiple technologies are available in a given location, a single mechanism for identifying preferences should be provided.

This work studies how a UE supporting networks through both 3GPP and non-3GPP accesses performs the network selection procedures. It could lead updating TS 22.011 (Service accessibility) to include selection of networks offering these access types. The following aspects for networks offered through non-3GPP access types were considered:

- Automatic selection
- Manual selection
- Operator management of network preferences;
- Operator management of how the device accesses networks.

TR 22.912 provides five use cases; one being when a GSM/3G operator has a commercial relationship with a 3rd party content provider having its own WLAN giving access to a server containing specialized content and services (e.g. music download). The operator arranges with the 3rd party that its subscribers can access the 3rd party over its WLAN to complement its own products and services available over GSM/3G. Authentication and authorization in the WLAN is independent of authentication and authorization in the 3GPP network.

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Use Case for Non-3GPP access NSP

The connection to the 3rd Party is temporary while delivering content or other service. The UE remains registered on the PLMN while also being connected to the WLAN access.

The facility to set an operator- (and user-) defined preference for the selection of this WLAN network is required.

TR 22.912 conclusions

Currently, the network selection behaviour of the UE is defined only for 3GPP access types (i.e. GERAN, UTRAN, E-UTRAN, I-WLAN). With increasing availability of UEs supporting other types of access (currently mainly WLAN but could include other types) it is desirable to define how and when these new access types can be selected.

The reason for this is to ensure predictable behaviour and also allow the user or application to select the most appropriate type of access for the service required. The various considerations include ability to uniquely identify the access, security, the circumstances under which the non-3GPP access would be selected and the user experience.

Concerning the access identity, an agreement should be sought with the specification body (IEEE 802.11) on how to uniquely identify the access. Security requirements should be met and may need consultation with other groups.

A mechanism needs to be defined to control how the UE selects non-3GPP access types and this should complement the mechanisms already in place for the selection of 3GPP access types (GERAN, UTRAN, E-UTRAN, I-WLAN). This should include similar features to those for PLMN network selection mechanism including consideration of "Steering of Roaming".

NOTE: "Steering of Roaming" by the VPLMN is not envisaged for GSM or UMTS.

TR 22.912 identifies requirements for selection of non-3GPP access and lead to TS 22.011 / TS 22.234 CRs.

Spin-off New Feature UID_380062 (N3GTONSP)

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18.8 Study on Value-Added Services for Short Message Service UID_340034

Resources: S1

References

Document	Title/Contents
WID(s)	
SP-060786	SID on Study on Value-Added Services for Short Message Service
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TR 22.942	Study on Value Added Services (VAS) for Short Message Service (SMS)

Supporting Individual Members: China Mobile, Huawei, Comverse, TeliaSonera, RIM.

This study assesses requirements for Value-Added Services (VAS) for the Short Message Service (SMS) and identifies which can be met by existing solutions or could be candidates for future standardization. The study covered:

- Service definition of different VAS for SMS;
- Service interaction between different VAS for SMS;
- Existing solutions from other standards bodies (OMA etc.);
- Identify provisioning aspects of VAS for SMS (e.g. registration, activation, deactivation and withdrawal).

It studied enhanced SMS features, which is of great importance for increasing mobile operators' revenues.
These enhanced capabilities for SMS are proposed as VAS for SMS and include:

- **SM forwarding**
  permits a called mobile subscriber to have the network send all incoming SMs, addressed to the called mobile subscriber's directory number to another directory number. SMs can be forwarded unconditionally, or based on different time period, etc.
- **SM filtering**
  permits the network to filter some SMs on behalf of a called party based on the called party's preferences (e.g. calling party's number, time to send message, etc).
- **SM receipt**
  permits the network to send a receipt (that the called party has customized) to the calling party.
- **SM network storage**
  permits the network helping the subscriber to store messages that the subscriber has sent or received.

Due to some limitations of the current architecture to deploy VAS, SA1 examined:

- The most efficient solution for the implementation of VASs for SMS;
- The most appropriate way to specify such functionality in 3GPP documentation;
- The architectural impact on the existing 3GPP defined architecture;
- If full backward compatibility with existing SMS architecture can be guaranteed.

TR 22.942 conclusions

- Studied requirements of VASs for SMS, which are enhancements (or supplements) of GSM SMS requirements;
- Recommends creating Stage 1 followed by Stage 2 specifications on VAS for SMS in 3GPP;
- Architecture and protocol of various VAS listed in TR 22.942 should be consistent with each other;

Genealogy of this spec:

this spec	descendant(s)
22.942	22.142

Spin-off Rel-9 Feature UID_370026 Value-Added Services for Short Message Service (VAS4SMS).

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18.9 Study on Service continuity between mobile and WLAN networks UID_340035

Resources: S1

References

Document	Title/Contents
	WID(s)
SP-060936	SID on Requirements for seamless roaming and service continuity between mobile and WLAN networks
	Impacted Specifications
-	-
	New Dedicated Specifications/Reports
TR 22.937	Requirements for service continuity between mobile and Wireless Local Area Network (WLAN) networks

Supporting Individual Members: BT, AT&T, Huawei, Giesecke & Devrient, Gemalto.

For Fixed-Mobile Convergence (FMC), some scenarios require seamless roaming between GSM/GPRS/3G mobile and WLAN networks. Both networks may independently be authenticated. To maintain the quality of the customer experience, and due to the difference of networks, handovers to support service continuity may require that the handset is authenticated to both networks simultaneously, for relatively short periods of time.

One use case is where the user, on the way to office, is having a call on a 3GPP access network using the mobile phone. Roaming onto the office WLAN (and vice versa), while still being on the line and the call is transferred without the user noticing any interruption to the network served by the WLAN..

The study proposes requirements while roaming between a GSM/GPRS/3G mobile network and a WLAN network for:

- seamless roaming and service continuity;
- maintaining service quality and service continuity;
- charging;
- security, in particular when networks may be independently authenticated.

TR 22.937 develops use cases and requirements for service continuity between a 3GPP network and another network, which can be:

- a TISPAN NGN with an IMS, accessed by a WLAN;
- an ISP accessed via a WLAN.

Each access network has its own separate security system and the network operators have a commercial agreement for roaming and handover.

TR 22.937 Recommendations

General recommendations

- to reuse the mechanisms already defined in 3GPP specifications and the roaming mechanisms.
- to use the flexibility already defined in 3GPP specification, such as taking benefit from the possibility to establish multiple ISIM (IM Services Identity Module) on the UICC when multiple IMS subscriptions are needed.

Proposed requirements

Security aspects

- It shall be possible for the 3GPP Network Operator (NO) and the WLAN NO to operate their own completely separate security systems, including independent authentication centres in their respective CNs.
- UE shall be capable of connecting to the non-3GPP network via a WLAN in a secure way using the appropriate security and authentication mechanisms for that network.
- UICC shall be able to support separate NAAs for the 3GPP access and WLAN access, where the credentials in each NAA are different.
- Where the UICC supports separate NAAs (Network Access Applications on the UICC) for 3GPP access and WLAN access, the UICC shall permit simultaneous sessions with both NAAs on different logical channels.

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- In case the PNO (Primary Network Operator; a non-3GPP operator with WLAN coverage) has a commercial roaming agreement with the SNO (Secondary Network Operator; a 3GPP operator) that allows PNO users to roam into SNO mobile network, the already defined I-WLAN specification TS 22.234 allows to re-use USIM authentication and network selection mechanism.
- UE shall be capable of connecting to the 3GPP network via a WLAN in a secure way using I-WLAN security and authentication mechanisms for that network as defined in TS 22.234.
- UE shall support already defined security and authentication requirements to connect to the 3GPP network (e.g. USIM-AKA, SIM-AKA) or to the 3GPP IMS domain (e.g. IMS-AKA, HTTP digest).

AKA Authentication and Key Agreement

NOTE: The WLAN network could be considered an IP-CAN when used to access the IMS domain

Service aspects

- It shall be possible to support service continuity of the multimedia session, including the IMS session, if used, from the WLAN to the 3GPP network and vice-versa.
- The system shall be capable of assuring service continuity to the end user, when moving between WLAN access network and the 3GPP access network.
- In the case service continuity is required, there is a work in Rel-8 to define multimedia sessions continuity.
- UE shall be capable of providing information to the user regarding the current type of access used.
- The ability to maintain service continuity when changing networks shall be dependent on the QoS capabilities of the target network.
- It shall be possible for the PNO to reject the change of network if the target network does not provide adequate QoS to maintain service continuity.
- It shall be possible to release the session on change of network if the target network does not provide adequate QoS.
- The system may adapt the service (e.g. degrade or enhance the service) to the capability of the target access.

Charging aspects

- NO shall be aware of the status of the UE with respect to the network attachment and shall be capable of charging the subscriber according to the type of access used.
- NO shall be capable of collecting on-line and off-line charging information.

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18.10 Study on Services Alignment and Migration UID_370086

Resources: S1

References

Document	Title/Contents
WID(s)	
SP-070126	SID on Services Alignment and Migration
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TR 22.983	Services alignment and migration

Supporting Individual Members:3, China Mobile, Telefónica O2 Europe, Orange, RIM, Siemens, T-Mobile, Telecom Italia, Vodafone.

As IMS is introduced there is a need supporting new and existing services by either CS or IMS or in both CS and IMS. In the long term all services will be provided using IMS, however there will be a long transition period when some services will be offered to a user over both CS and IMS. It is important, therefore, that in this transition period, the user experience for each service should be consistent.

In order to ensure a consistent user experience, this study defines how services to the end-user should be delivered and managed regardless of how the user accesses the services (e.g. using CS or IMS).

The study defines how to support existing ("traditional") services as currently defined by 3GPP for CS while allowing new, innovative services to be provided to the end-user using the enhanced capabilities of the IMS.
The study also covers possible migration paths from existing to new service capabilities, and also the user experience of the services when accessing over CS and over IMS including terminal impacts. It considered roaming and call handling, supplementary services (administration, invocation, mid-call service handling), level of support of legacy terminals, and the consideration of UE state and location for services established on CS or IMS and for services transferred between them.

How a consistent user experience can be provided was investigated in the cases where users access services using CS or IMS and where service continuity between CS and IMS is required.

The following aspects were considered for each type of service for each type of access:

- What service features can be supported (e.g. ability for either user on a video call to switch off the video);
- How the service features should be controlled (e.g. by the supplementary services);
- How the service behaves when handing over between CS and IMS based systems.

TR **22.983** studies how services to the end user should be delivered and managed regardless of how the user accesses the services (e.g. using CS or IMS) and to ensure a consistent user experience. The services include but are not restricted to: conversational voice and video services; messaging services and supplementary services as applied to the above. For each of the above types, the service features that should be supported when accessing the service via CS or IMS using any appropriate access type are described. Also, how each service will behave when transferring between domains is described.

TR 22.983 conclusions

With the various types of access and core networks that can be used, it is important that a consistent and predictable service is offered to the end-user. This applies to Tele-Services and Bearer Services and their IMS equivalents as well as to the Supplementary Services.

For the various voice, video and data services, it is important that the user experience is as consistent as possible across the different domains and that as the user moves from one domain to another the service is maintained as far as possible within the capabilities of the domain. This also applies to the various Supplementary Services that are applicable.
It is important, therefore, that the new capabilities offered by enhanced networks are made available to the end-user while at the same time ensuring that the service offered is degraded gracefully if the user moves to a less capable domain.

This also means that it is highly desirable to have some consistency in how the different types of mobile device interact with the network. This is to ensure that services such as Call/Communication Waiting, Call Forwarding/Communication

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Diversion and Call/Communication Barring all work correctly. The cases that need to be considered are where the user moves from one domain (i.e. a particular access network and a particular core network) to another and where the operator enhances the network by changing out old technology for new.

Consideration needs to be given to the user experience when roaming also to ensure that it is possible to deliver the appropriate service level consistent with the capabilities of the serving and home networks.

Some identified requirements are met by ICS (IMS Centralized Services) and VCC (Voice Call Continuity).
Some requirements identified in TR 22.983 may need changes to the existing Stage 1.
The intention is to ensure consistency of data across the domains for Supplementary Services and that service control allows transfer of services across domains whilst maintaining the highest possible level of service consistent with the capabilities of the domain.

Spin-off Rel-9 Feature UID_330017 Services Alignment and Migration (ServAl).

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19 SA2 Studies

19.1 Study on 3GPP System Architecture Evolution UID_32085

Resources: S2,S3

References

Document	Title/Contents
WID(s)	
SP-070163	SID on 3GPP System Architecture Evolution
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TR 23.882	3GPP system architecture evolution (SAE): Report on technical options and conclusions
TR 33.821	Rationale and track of security decisions in Long Term Evolution (LTE) RAN / 3GPP System Architecture Evolution (SAE)
TR 33.822	Security aspects for inter-access mobility between non 3GPP and 3GPP access network

Supporting Individual Members: Vodafone, Ericsson, Siemens, NTT DoCoMo, Nokia, LG Electronics, China Mobile, TeliaSonera, NEC, Huawei, Fujitsu, TIM, Samsung, T-Mobil, 3, ZTE.

In order to ensure competitiveness, a Long-Term Evolution (LTE) of the 3GPP access technology was considered.

The ability of the 3GPP system to cope with the rapid growth in IP data traffic, the Packet-Switched technology utilized within 3G mobile networks requires further enhancement. A continued evolution and optimization of the system concept is also necessary in order to maintain a competitive edge in terms of both performance and cost.
The LTE includes reduced latency, higher user data rates, improved system capacity and coverage, and reduced overall cost for the operator.

Additionally, IP based 3GPP services will be provided through various access technologies. Seamless mobility between heterogeneous access networks (e.g. I-WLAN and 3GPP access systems) is a useful feature for network evolution.

In order to achieve this, an evolution or migration of the network architecture, as well as an evolution of the radio interface were considered.

Architectural considerations covered end-to-end systems aspects, including core network and a variety of IP connectivity access networks (e.g. fixed broadband access).

TR 23.882 provides an evolution / migration framework of the 3GPP system towards higher-data-rate, lower-latency, packet-optimized, multi-RAT. The focus is on PS domain assuming that voice services are supported in this domain.

TR 23.882 addressed the following aspects:

- Architecture impacts stemming from requirements coming from 3GPP TSG RAN. The architectural developments take into account the targets for the evolution of the radio-interface:
    - whether there is a need for a modified network architecture and/or different functional split between network nodes (compared to the current 3GPP architecture);
    - how to provide a very low latency (including C-plane) for the overall network (including Core Network, Radio Access Network and Radio Access Technology);
    - how to provide efficient support of various types of services, especially from the PS domain (e.g. Voice over IP, Presence).

- Architecture impacts stemming from SA1 Rel-7 TR 22.978 "All-IP network (AIPN) feasibility study":
    - support of a variety of different access systems (existing and future) and access selection based on combinations of operator policies, user preferences and access network conditions;
    - how to realize improvements in basic system performance e.g. communication delay, communication quality, connection set-up time etc.;
    - how to maintain the negotiated QoS across the whole system; in particular to address include inter-domain and inter-network interworking.

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- Architecture aspects of supporting mobility between heterogeneous access networks, including service continuity:
    - service continuity between I-WLAN and the 3GPP PS domain;
    - how to support multiple RATs and terminal mobility between different RATs;
    - how to maintain and support the same capabilities of access control (authentication, authorization), privacy and charging when moving between different RATs.

Migration aspects were taken into account for the above, i.e. how to migrate from the existing architecture.

In the course of conducting this study, implementation Work Items were created to address certain aspects.

SA3 studied security aspects in TR 33.821 and TR 33.822.

Spin-off Features:

UID_320005	(SAES)	3GPP System Architecture Evolution Specification-Evolved Packet System (see clause 4)
UID_20068	(LTE)	3G Long Term Evolution - Evolved Packet System RAN part (see clause 5)
UID_50583	(GELTE)	GERAN support for GERAN - 3G Long Term Evolution interworking (see clause 6)

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19.2 Study on Stage 2 aspects of IMS Service Brokering UID_320028

Resources: S2

References

Document	Title/Contents
WID(s)	
SP-060443	SID on IMS Service Brokering enhancements
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TR 23.810	Study on architecture impacts of Service Brokering

Supporting Individual Members: Telcordia, Comverse, Huawei, BT, Orange, Telecom Italia, T-Mobile, GET (Groupe des Ecoles de Tel).

3GPP has adopted the approach of creating a number of IMS enablers that can be used by a number of services.
The success of this approach is proven by the adoption of IMS by other standardisation bodies (e.g. TISPAN, OMA).

Various IMS specifications provide the ability to sequence invocations of IP Multimedia Applications (or their servers) providing a static sequence handing off session control to individual applications (or their servers).
This IMS service control architecture was developed in Rel-5 and remained essentially unchanged since. It includes a Service Interaction Manager (SCIM) as part of the Application Server domain (see TS 23.002).
Additionally, as part of Rel-7 Open Service Access (OSA) Application Programming Interface (API); Service broker Service Capability Feature (SCF) has been developed (TS 29.198-16).

3GPP and OMA have provided specifications for IMS enablers and applications.

This study looks if the current service interaction management architecture (e.g. SCIM as part of AS and Service Broker as part of OSA SCS) properly supports these enablers and applications along with other non-standard applications.

It studied if enhancement to the current service interaction management architecture are needed in order to satisfy the requirements in TS 22.228.

The study considered the concern that if services are provided by different service providers, then the solutions must be able to prevent undesirable alterations of interaction characteristics.

TR 23.810 has proposed no spin-off activity.

NOTE: UID_31088 "IMS Service Brokering enhancements" was moved back from Rel-8 to Rel-7 in order to give a home to 22228CR0036_(Rel-7)_S1-051232.
Hence, Rel-7 ISB has Stage 1 only and is misaligned with Rel-7 Stages 2/3.

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19.3 Study on IMS utilizing multicast bearer services UID_7049

Resources: S2

References

Document	Title/Contents
WID(s)	
SP-060148	SID on IMS utilizing multicast bearer services
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TR 23.847	Enhancements to IMS service functionalities facilitating multicast bearer services

Supporting Individual Members: Siemens, China Mobile, Panasonic, Alcatel.

This work is linked to SA1 Rel-7 MBMS Enhancements (MBMSE) UID_31084.

During the definition of MBMS enhancement requirements in Rel-7 TS 22.228, IMS support of media delivery over multicast bearers was identified as follows:

> "Multicast services allow IMS users and service providers to send multimedia to a group of IMS users simultaneously in an unidirectional way of communication. The underlying network may be able to support mechanisms that optimize the delivery of multimedia to the individual members of that group (e.g. MBMS)"

Initial understanding of architectural implications were based on regional services to grouped IMS users provided at hotspots such as a football stadium.

This work studied feasibility of using multicast bearers (e.g. MBMS) in the context of IMS-based applications. It captured the results of technical considerations and solutions into the facilitation of IMS services over multicast bearer services with a focus on the possible enhancements to IMS functionalities and relevant charging, security and service provision procedures. Considerations included:

- Signalling procedures of multicast enabled IMS services should be analyzed based on the grouped communication scenarios and possible optimizations to the delivery mechanisms should be investigated;
- Identify charging and policy control procedures according to the PCC architecture;
- Identify service provision procedures both in Network Elements and UEs;
- Investigate possible security requirements to multicast enabled IMS functionalities and bearer service entities;
- Real-time QoS requirements e.g. delay , interruption;
- UE capability requirements.

TR 23.847 conclusions

- Documented technical alternatives on the reference architecture with preferred developing principles, signalling flows, PCC impacts.
- Alternative signalling flows were documented for both IMS grouped applications, IPTV and more value-added service cases (provided examples of combined signalling flow of IMS and MBMS in the actual use cases).
- Stage 2 and modification to PCC should be created when needed.
- Concerns on security and media plane QoS were removed because of missing appropriate expertise.

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19.4 Study on Multimedia Session Continuity UID_350051

Resources: S2

References

Document	Title/Contents
WID(s)	
SP-070818	SID on Multimedia Session Continuity
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TR 23.893	Feasibility Study on Multimedia Session Continuity; Stage 2

Supporting Individual Members: Orange, Telecom Italia, SK Telecom, China Mobile, Ericsson, Fujitsu Laboratories of Europe, Huawei, LG Electronics, Marvell, Motorola, NEC, Nokia, Nokia Siemens Networks, RIM, Samsung, Telcordia, Toshiba.

This study took into account ongoing activities in TISPAN and other bodies, and aligns with the following studies to result in a common framework for Service Continuity.

- System enhancements for fixed broadband access to IMS (FBI) (UID_32074)
- Voice Call Continuity between CS and IMS (incl. I-WLAN) (VCC) (UID_32091)
- Study on centralized IMS service control (FS_ICS) (UID_330012)
- 3GPP System Architecture Evolution (FS_SAE) (UID_32085)
- Study on Mobility between 3GPP-WLAN Interworking and 3GPP Systems (FS_SM3GWLAN) (UID_350017)
- Personal Network Management (PNM) (UID_31081)

Service Continuity Stage 1 was included in TS 22.278 "Service requirements for the Evolved Packet System (EPS)".

In the context of studying the general issue of IMS sessions continuity, it was also felt necessary to investigate the following enhancements to the Rel-7 specified continuity mechanisms:

- Support of network based control of domain transfer;
- Handling of the components of a session (PS-PS session continuity), including handling of non-voice components in conjunction with PS-CS continuity;
- Support of session-level continuity between CS and non-3GPP IP accesses for MMSC.

Continuity at the IMS session layer are applicable to both EPC and non-EPC networks, and thus cannot depend solely on the existence of transport layer mobility mechanisms in the EPS.

TR 23.893 studied IMS-level MMSC including potential enhancements to IMS specifications relevant to MMSC e.g.:

- Identification of Session Continuity scenarios;
- PS-PS session continuity;
- PS-PS session continuity in conjunction with PS-CS continuity;
- Session continuity between 3GPP and non-3GPP systems (e.g. TISPAN, WiMAX);
- Network-initiated Multimedia Session Transfer;
- Mobility of media components of a session between different terminals under the control of the same user;
- Coexistence and/or potential interactions with possible underlying mobility solutions defined by 3GPP. Solutions developed within TR 23.893 should not have any impacts to underlying mobility solutions.

Consistent user experience was investigated where Services Continuity between heterogeneous access systems (e.g. different radio accesses) is needed.

Charging impacts have been studied, especially the ability to generate appropriate accounting parameters as subscribers move between various access networks.

Security in each domain is covered by existing security specifications in that specific domain; i.e. CS security aspects are covered by existing CS security specifications, IP-CAN security aspects by existing IP-CAN security specifications, non-3GPP systems security aspects by existing non-3GPP systems specifications and IMS security aspects by existing IMS security specifications.
Voice Call Continuity across these domains should not compromise the security mechanisms of the individual domains.

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TR 23.893 conclusions are given in clause 9 on:

- MMSC scenarios
- MMSC architecture and anchoring solution
- session transfer operator policy
- relationship between ICS and MMSC
- specification of session split/merger functionality
- T-ADS (Terminating - Access Domain Selection) and session split/merger functionality for MMSC and ICS (IMS Centralized Services)
- applicable scope of MMSC
- Single Radio MMSC
- Session Transfer Information
- UE Transfer information flows
- Keep and Release Control Mechanism in UE Transfer Mode

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19.5 Study on centralized IMS services UID_380034

Resources: S2,S1

References

Document	Title/Contents
WID(s)	
SP-070494	SID on Centralised IMS Service Control
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TR 22.892	Study on IMS Centralized Services (ICS) requirements
TR 23.892	IP Multimedia Subsystem (IMS) centralized services

Supporting Individual Members: Alcatel-Lucent, Nortel, , Telcordia, Ericsson, AT&T, Nokia, , Cingular, Telecom Italia, Siemens, Motorola, Huawei, Samsung, NEC, Newstep, Marvell Semiconductor, Airbiquity, LG Electronics, Rogers Communications, T-Mobile, TeliaSonera.

Communication networks are evolving towards packet based infrastructures, and a need exists to specify service requirements and an architecture that support the provision of IMS based services across a variety of access networks (e.g. wireless and wireline, enterprise and consumer, etc.).

Development of the architecture for Voice Call Continuity (VCC) has identified that supporting domain transfer of active mid-call services by implementing these services in both the CS domain and IMS is not a viable solution in the Rel-7 timeframe. Therefore an architecture is necessary allowing implementation of such services in IMS while also allowing control when the serving access network is in the CS domain. In addition to the VCC scenario, the increased deployment of VoIP capable access technologies encourages further service development on IMS also increasing the importance of being able to access these services via CS domain access, independently of the support of VCC.

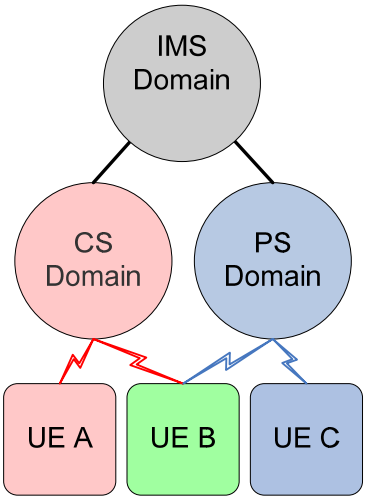
The first objective is the delivery of consistent services to the user mainly via IMS centralized services regardless of the attached access type (e.g. CS domain access or Internet Protocol - Connectivity Access Network (IP-CAN)).

SA1 TR 22.892 describes service experience and proposes service requirements.

SA2 TR 23.892 focuses on how to access IMS-based multimedia telephony services while still allowing innovative services. It includes investigation into call/session establishment via CS domain access and IP-CAN and for calls/sessions transferred across CS domain access and IP-CAN, including the interactions with domain selection. Furthermore it provides consideration for the handling of the multiple media that are enabled by the multimedia telephony communication service. The proposed solution applies to terminals with VCC capabilities and to non-VCC capable terminals. Impact on legacy terminals with the same subscription (e.g. SIM swapping) was studied.

The standardization of an IMS Centralized Services architecture is to be started later based on the results of this study. This can be achieved without completely resolving evolution considerations. A high-level conceptual overview of ICS is provided in the following figure, extracted from TR 22.892.

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IMS Centralized Services concept

TR 22.892 conclusions

- TR 22.892 clause 6 identifies requirements for the 3GPP system on IMS Centralized Services (ICS), which should be used as a basis for introducing ICS requirements into Rel-8.
- ICS related requirements should be captured in a single place (a new clause in TS 22.101 is one alternative).

TR 23.892 conclusions

- **ICS architecture solutions**
  Different approaches have been identified as possible solutions to enable ICS for ICS UE.
  The SIP Application Server approach with I1-cs and I1-ps is recommended as the working assumption for ICS UE.
  I1-cs IMS CS Control Channel implemented over the CS domain
  I1-ps IMS CS Control Channel implemented over the PS domain

The remaining conclusions cover:

- Use of ICCC (IMS CS Control Channel)
- Centralization of conditional call forwarding
- ICS UE receiving home IMS services via an IMSC (ICS Enhanced MSC Server)
- Handling of multiple media for ICS
- Use of ICCC for CS terminations
- Relation between ICS and Service Continuity
- Relation between ICS and MMSC (Multimedia Session Continuity)
- T-ADS (Terminating - Access Domain Selection)

Genealogy of this spec:

this spec	descendant(s)
23.892	23.292

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19.6 Study on Architecture of IMS based Customized Alerting Tone (CAT) UID_380078

Resources: S2

References

Document	Title/Contents
WID(s)	
SP-070905	SID on the Architecture of IMS based Customized Alerting Tone
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TR 23.872	Study on architecture of IP Multimedia Subsystem (IMS) based Customized Alerting Tone (CAT)

Supporting Individual Members: China Mobile, SK Telecom , Comverse, LG Electronics, Huawei.

This study is linked to Rel-7 Study on Multimedia Telephony Capabilities for IMS (MITE) UID_31082, Rel-8 Support of Customised Alerting Tone Service (CAT) UID_340029 and Rel-8 Study on Customized Alerting Tone (CAT) solution for voice and video call in CS domain (FS_CAT_VVC_CS) UID_360031.

CAT is an alerting tone customized by the called subscriber or the calling subscriber which may e.g. be a piece of recorded or composed music, greeting words, voice, advertisement or video. With CAT, the caller can experience favourable songs, multimedia clips or other customized alerting or ringing instead of traditional ones.

Following the completion of TS 22.182 (CAT requirements), standardization of one solution among various alternatives for implementing the basic functions of IMS based CAT (including voice and video call) in IMS domain.

CAT in CS domain was studied by CT4 in TR 29.882 (Customized Alerting Tones in 3GPP CS domain).

Inter-working issues were taken into consideration especially in case when a CAT user is changing domains (between IMS and CS).

This work studied architectural impacts and potential enhancements to IMS specifications to meet the TS 22.182 requirements for CAT in IMS domain, including:

- Architecture and procedures to support basic call scenarios for CAT (including both voice and video call) in IMS domain;
- Interaction with other service, e.g. IMS Multimedia Telephony Supplementary Services;
- Abnormal case handling (e.g. when CAT server fails);
- Multiple domains (including IMS and CS) roaming/interworking.

TR 23.872 Conclusion

- Both, Forking and Early-Session models need to be specified in Rel-8.
- Gateway model (RFC 3960) supports CAT provided by terminating IMS network without additional stage 2.
- CAT inter-working between CS and IMS is included in Rel-8;
- Service Notification requires no additional stage 2 specification;
- Content indirection is not to be included.

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20 SA3 Studies

20.1 Study on Home (e)NodeB Security UID_380085

Resources: S3

UID	Name	Hyperlink	Notes	TS_TR
380085	Study on Home (e)NodeB Security	SP-070783	SP#43 completed	33.820

Supporting Individual Members: Huawei, Vodafone, Nokia, Nokia Siemens Networks, T-Mobile, Samsung, Alcatel-Lucent, Nortel.

This study is linked to the RAN4 Study on 3G Home NodeB/eNodeB (UID_350039) and to the SA5 Study on Self-Organizing Networks (SON) related OAM interfaces for Home NodeB (UID_360007).

H(e)NB is able to provide new services with higher data rate in a low cost. Operators have already indicates their interest in this area. Study of H(e)NB has already started in 3GPP in order to investigate the feasibility of developing a standard solution for H(e)NB. Security is an critical aspect of H(e)NB, but it is not sufficiently covered by the existing work items.

This work studied special security threats of H(e)NB and countermeasures to these threats.

The study included threat analysis of H(e)NB, mutual authentication and security protection between H(e)NB and rest of network, maintenance of the security context between H(e)NB and rest of network, security requirements on the H(e)NB, provisioning of security credentials on the H(e)NB, security solution for verifying the location of the H(e)NB etc. With regard to security protection between the H(e)NB and the rest of the network, bandwidth efficiency had been taken into consideration.

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21 SA5 Studies

21.1 Study of Element Operations Systems Function (EOSF) definition UID_390053

Resources: S5

References

Document	Title/Contents
	WID(s)
SP-070307	SID on Element Operations Systems Function (EOSF) definition
	Impacted Specifications
-	-
	New Dedicated Specifications/Reports
TR 32.819	Telecommunications management; Element management layer - Operation System Function (E-OSF) definition

Supporting Individual Members: China Mobile, CATT, Huawei, TeliaSonera, ZTE.

In the Logical Layered Architecture (LLA) of TMN, Network OSF concerns management at network level and Element OSFs concerns management at Network Element level. These two logical layers respectively play the role of network management function.

The Element Management System (EMS) developed by vendors mainly covers network management functions described in E-OSF and / or N-OSF.

TS 32.101 states that the Element Manager (EM) has two functions element management and sub-network management. However, 3GPP SA5 32.xxx-series do not provide a clear definition for E-OSF to help operators and vendors clarifying what is required when deploying a network.

An EM provided by a vendor implements E-OSF logical functions and may or may not implement N-OSF functions. Even more, the Network Management System (NMS) may or may not direct access NE and implement part of E-OSF. Whether NMS implement or not any E-OSF and whether EM implement or not any N-OSF is outside the 3GPP scope. Mapping rules between physical (EMS, NMS) and logical entities (E-OSF, N-OSF) is outside the scope of this study.

E-OSF definition is based on network operation and maintenance experience and considers the UMTS application environment.
Existing 3GPP documentation does not provide sufficient E-OSF guidelines to operators and vendors.

TR 32.819 defines what is needed in E-OSF. The intention was not to define new requirements for standardization of new Interface IRP and/or NRM IRP and/or System Context.

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21.2 Study on SA5 MTOSI XML Harmonization UID_390037

Resources: S5

References

Document	Title/Contents
WID(s)	
SP-070305	SID on SA5 MTOSI - XML Harmonization
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TR 32.818	Telecommunication management; Study on 3GPP SA5 / MTOSI XML harmonization

Supporting Individual Members: Nortel, Huawei, Alcatel-Lucent, Ericsson, ZTE.

Industry-wide there is a need for harmonization of XML specification methodologies, best practices and guidelines.

SA5 has studied the TMF MTOSI solutions on XML specification methodologies, best practices and guidelines.

This study determined harmonization items with respect to the 3GPP and TMF 608 XML specifications. It identified possible updates to MTOSI XML framework as well as to 3GPP SA5 XML specifications based on dialogue between 3GPP SA5 and TM Forum MTOSI.

TR 32.818 conclusion:

This study assessed whether MTOSI XML recommendations could be considered for future SA5 XML-Based implementations.

On methodology, SA5 is willing to help MTOSI to align with SA5's specifications structure (Requirements, IS, SS).

Concerning IRP specifications, the following was agreed:

- Existing IRP specifications (and their future versions) such as SuM, Notification etc., that have already a SOAP implementation shall be kept untouched.
- Existing IRP specifications that do not have a defined SOAP SS could be considered for XML-Based implementation, considering MTOSI XML recommendations.
- For new IRP specifications requiring XML-based implementation, MTOSI XML recommendation should be considered.

Model harmonization was not needed.

TR 32.818 is a guideline for SA5 Rel-8 and beyond.

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21.3 Study of Common Profile Storage Framework of User Data for network services and management UID_390038

Resources: S5

References

Document	Title/Contents
WID(s)	
SP-060263	SID on Common Profile Storage (CPS) Framework of User Data for network services and management
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TR 32.808	Telecommunication management; Study of Common Profile Storage (CPS) Framework of User Data for network services and management

Supporting Individual Members: T-Mobile, Siemens, Nokia, Cingular, Vodafone, Huawei, Orange.

This study is linked to Rel-6 Subscription Management (SuM) and Rel-6 Generic User Profile (GUP).

Introducing a Common Profile Storage (CPS) Framework of User Data ("Common" meaning common to all applications) for network services and management applications could significantly enhance the ability of 3GPP networks to offer complex and combined services in the areas of:

- Multimedia;
- Data services;
- Value Added Services;
- End-to-end applications.

In light of developments both within 3GPP (e.g. IMS, MBMS, OCS, PCC) and outside 3GPP (e.g. NGN, OMA, etc.) with a growing number of physically disjoint but logically correlated user data stored in several data bases a consolidation and co-ordination of these is needed to prevent further redundancy and possible contradiction and to enable operators to administer and provision complex and combined services.

An initial study of user-related data - in and outside 3GPP - assessed the properties of such a CPS Framework based on:

- needs of Network Elements (NEs) like MMS-RS, HLR, HSS, BM-SC and
- features like Service Management, Subscription Management (SuM) and Charging Management.

Efforts within the mobile and Next Generation Network (NGN) communities to define advanced services within the network (e.g. 3GPP, TISPAN) provided valuable drive for developing the CPS Framework functionality for 3GPP.

This study:

- analysed the consequences of creating one common data model structure for an end-user
  - looked at the existing data specifications in 3GPP;
  - addressed issues like minimizing data redundancy, access control, providing views for applications;
  - analyzed the relationship between an end-user and a subscriber as defined by 3GPP;
- analysed and evaluated current initiatives inside and outside 3GPP;
- analysed the gap between 3GPP specifications (e.g. GUP, SuM, etc.) and existing/emerging solutions with centralized respectively distributed storage models.
- proposes a way forward for standardizing inside or outside 3GPP the "gap" (if existent).

Service Aspects

SA5 investigated features of user data storage arising from the fact that user data is handled within a CPS Framework (with centralized or distributed storage models) and accessed from a variety of NEs and enterprise applications.
SA5 studied the need to develop user data management capabilities arising from service requirements (defined by SA1).

MMI-Aspects

SA5 studied the interface aspects between subscriber/user and service provider.

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TR 32.808 conclusions - proposed standardization actions based on the gaps with the current 3GPP concepts:

- Introduce the Concept of End-User (in SA1)
- Introduce the Concept of Contract (in SA1)
- Introduce the network function Common Profile Store (CPS)

Spin-off New Rel-9 SA1 Feature on User Data Convergence (UDC) UID_400034

21.4 Study of Management for LTE and SAE UID_340036

Resources: S5

References

Document	Title/Contents
	WID(s)
SP-060753	SID on Management for LTE and SAE
	Impacted Specifications
-	-
	New Dedicated Specifications/Reports
TR 32.816	Telecommunication management; Study on management of E-UTRAN and Evolved Packet Core (EPC)

Supporting Individual Members: Ericsson, Nortel, Nokia, Vodafone, Huawei, Motorola, Siemens, China Mobile, ZTE.

The Evolved 3GPP System (SAE/LTE) needs to be managed. Being an evolution of UMTS, the management should also evolve from UMTS. Reuse of existing UMTS management standard solutions has the following benefits:

- It is proven in operation;
- Minimizes both the standardization and product development efforts (i.e. cost and time);
- Provides a base on which more functionality can be developed (compared with starting from scratch);
- Shortens the time to market for LTE and SAE systems;
- Facilitates a seamless coexistence with UMTS management systems.

Complexity of the LTE network places new demands on the Operations and Maintenance of the Network. Therefore in parallel with reuse/evolve existing Management solutions, new revolutionary elements are needed (e.g. Auto-Configuration, Auto-Optimization, Information Model Discovery and P2P Interfaces).

Functionality is supported by use cases or other documented justification.

SA5 assessed reusing the UMTS management for LTE and SAE in order to decide which existing parts can be reused without change, which need changes and which cannot be reused at all.

The study resulted in decisions on management principles for LTE and SAE, e.g. the management architecture, auto-configuration and KPIs, P2P Interface for exchange of Inter Cell Parameters and Information Model Discovery.

Before completing TR 32.816 several implementation WIs had been stared by SA5 e.g.:

- E-UTRAN Network Resource Model (NRM) Integration Reference Point (IRP) UID_380036
- Self-Organizing Networks (SON) UID_390004
- EPC Network Resource Model (NRM) Integration Reference Point (IRP) UID_380037

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21.5 Study on Charging Aspects of 3GPP System Evolution UID_350004

Resources: S5

References

Document	Title/Contents
	WID(s)
SP-070174	SID on Charging Aspects of 3GPP System Evolution
	Impacted Specifications
-	-
	New Dedicated Specifications/Reports
TR 32.820	Telecommunication management; Study on charging management; 3GPP Evolved Packet Core (EPC): Charging aspects

Supporting Individual Members: Alcatel-Lucent, Ericsson, Huawei, Nortel, Nokia, Siemens Networks, T-Mobile.

The Evolved 3GPP System (SAE/LTE) needs reliable and efficient charging solutions. Being an evolution of UMTS, also the charging solutions need to evolve. Reuse of existing UMTS charging solutions has the following benefits:

- It is proven in operation;
- Minimizes both the standardization and product development efforts (i.e. cost and time);
- Provides a base on which more functionality can be developed (compared with starting from scratch);
- Shortens the time to market for LTE and SAE systems;
- Facilitates a seamless coexistence with UMTS management systems.

Functionality is supported by use cases or other documented justification.

SA5 assessed reusing the UMTS charging for the Evolved 3GPP System in order to decide which existing parts can be reused without change, which need changes and which cannot be reused at all.

TR 32.820 conclusions

Charging Requirements and Principles - no changes required.

Charging Architecture - modifications needed for the P-GW and thus the PCEF being in the visited network. Full PCEF with service-aware flow-based charging is located only in P-GW.

Charging Data and Protocols - changes required to the charging data to take into account the new information available due to the different mobility models. The scope of these changes is not large. Changes are also required to the Transferred Account Procedure (TAP) for subscriber charging in case of Local Breakout.

Implementation Work Item - under the Feature SAES UID_320005, a new Building Block UID_390010 (EPC Charging) covers the charging aspects of the Evolved Packet System (EPS).

Specification structure - existing charging TS 32.251 for PS-domain and TS 32.252 for WLAN should be extended for the EPS. Changes are needed to TS 32.240 charging architecture and TS 32.296 OCS architecture and corresponding enhancements of the charging protocols in TS 32.298 and TS 32.299.

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22 CT Studies

22.1 Study on AS-MRFC media server control protocol UID_7048

Resources: C1

References

Document	Title/Contents
WID(s)	
CP-060180	SID on AS, MRFC media server control protocol definition
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TR 24.880	Media server control using the IP Multimedia (IM) Core Network (CN) subsystem; Stage 3

Supporting Individual Members: Hewlett-Packard, BT, Comverse, IAEI, Intel, Vodafone, Huawei.

SIP signalling over the S-CSCF – MRFC interface (Mr-interface) and the AS – S-CSCF interface (ISC) are specified but not the format of the media commands/instructions and results/events carried over this interface.

CT1 studied the definition of a media server control protocol in parallel with CT4's work on Mp interface definition (using H.248 protocol and packages are defined for the required media commands/instructions and results/events). CT1 considered supporting more advanced services (e.g. dialled in conferences, digit collection) and whether 3GPP should specify such a protocol.
The study has identified Stage 2/3 work on the media server control protocol to be used over the Mr/ISC interfaces.

TR 24.880 describes the implementation options and requirements for a media server control protocol to be used with the Mr and ISC interfaces giving several recommendations for media server control:

- both the delegation and protocol models described should be supported. This study recommend the creation of a Cr reference point that can be used for both models;
- RFC 4240 should be supported with the clarifications to VoiceXML invocation defined in the draft-ietf-mediactrl-vxml specification;
- VoiceXML should be used to specify all user dialogs;
- a dedicated control channel should be supported;
- mid-call media processing should be supported;
- the AS/MRFC functional split should be supported with a top-level focus, notification server and conference policy on the AS and with media conference policy handling and low-level conference focus on the MRFC;
- the media server control methods should support organization, registration and extension of capabilities;
- RTSP URLs should be used for services which require the sourcing of streamed media.

TR 24.880 defines requirements for a media server control protocol as follows:

- multimedia services' media control requirements;
- response time requirements;
- packaging, registration and extensibility requirements;
- charging requirements;
- resource Management requirements;
- High Availability requirements;
- QoS control requirements;
- security requirements;
- lawful intercept requirements;
- priority requirements.

Spin-off new implementation Feature UID_380035 (MRFC_TS)

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22.2 Study on IMS Restoration Procedures UID_350018

Resources: C4

References

Document	Title/Contents
WID(s)	
CP-070031	SID on IMS Restoration Procedures
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TR 23.820	Study of IMS restoration procedures

Supporting Individual Members: Ericsson, Nortel Networks, Huawei, Vodafone, Orange.

Although network nodes in the IMS Core Network should have a very high availability, some maintenance stops and occasional failures are unavoidable. Communication links although designed with robust protocols between the Network Elements (NEs) are also subject to failures. There is currently no defined procedure in 3GPP specifications to restore a consistent state in the IMS Core Network after or during a planned or unplanned stop of a NE.
Protocol details and procedures to detect this kind of failures in NEs and communication links are also not specified. This leads to vendor-specific implementations that might not interoperate.
A set of standardized procedures for automatic restoration after loss or corruption of data could reduce the impact of these problems resulting in the improved service to the users. The intention is to have for the IMS domain similar Restoration procedures as for the CS and PS domains in TS 23.007.

CT4 studied behaviour of IMS Core Network upon restart of its NEs or failure of communication links between them, and analyzed alternatives ensuring minimum impact on service to the end-user (the availability of the UE to make and receive IMS sessions). The study also covers procedures triggered by external events indicating problems in IP-CAN.

The study proposes necessary operational protocol recovery mechanisms in the IMS Core Network in order to:

- Limit the time an end-user is affected by restart and downtime of the NEs in the IMS Core Network or the communication links between them.
- Improve the behaviour of the IMS Core Network with indications of network unavailability in the IP-CAN.
- Reduce the operating cost of the IMS Core Network by making as much as possible of the recovery procedures from a restart automatic.
- Ensure that critical services, such as security and charging are not affected in an unacceptable way.

The results of the study may also be used in other interfaces, not part of the IMS Core Network, but with similar protocol implementations, e.g.: I-WLAN, GAA. UE changes should be avoided if possible.

TR 23.820 identified changes required in 3GPP IMS specifications so that a consistent state is restored in the IMS Core Network, after or during a planned or unplanned stop of an NE. The study went through the following steps:

- Establish the requirements that should be covered with these procedures.
  I.e. after a network failure which impacts to the end-user service are acceptable and which not.
- List the service interruption scenarios that need to be studied.
- Provide solutions, so that in all the service interruption scenarios listed, the impacts to the end-user service comply with the requirements. These solutions provide procedures for the automatic restoration to a consistent state in the network and indicate how to trigger these procedures.
- Analyze the impacts of the solutions in the current specifications.
- Conclusion and recommended way forward.

These operational procedures for restoration must avoid overlap with OA&M procedures, which could cause clashes.

TR 23.820 made recommendations on:

- S-CSCF Re-Selection during Re-Registration
- S-CSCF, SIP-AS, HSS and P-CSCF service interruptions

Further improvements might be needed in future releases (see TR 23.820 clause 6.3) and are for further study.

Spin-off new implementation Feature UID_400012 (IMS_RP).

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22.3 Study on IMS Application Server Service Data Descriptions for AS interoperability UID_360030

Resources: C4

References

Document	Title/Contents
WID(s)	
CP-070685	SID on IMS Application Server Service Data Descriptions for AS interoperability
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TR 29.864	Study on IMS Application Server Service Data Descriptions for AS interoperability

Supporting Individual Members: Alcatel-Lucent, Verizon Wireless, Motorola, Nortel, Nokia-Siemens Networks, ZTE.

This work is linked to the CT4 Study on Restoration Procedures (FS_IMS_RP) UID_320006.

Application data for IMS is defined as being "Transparent". Transparency means that HSS and Sh interface do not semantically understand the data but just syntactically how to deal with its entirety.
Application Servers (AS) are free to store data without an openly distributed definition of the stored content. However, because the data is transparent (the format is not standardized) it is potentially an issue for one AS to make use of data defined for another AS (e.g. ASs are supplied by different vendors).

Standardizing the data formats would facilitate interoperation among ASs supplied by the same or different vendors. These AS vendors may be primary and secondary suppliers of the same Service Provider (SP) within an SP's IMS network. This is especially true of mature services, such as the features provided in basic voice subscriptions, and is likely to be true of any future services that achieve a wide deployment.

There has already been work incorporated into 3GPP from TISPAN that point towards the need for definition of common data. The UE may update a service setting (e.g. a forward-to number) in an AS via Ut. The AS may store this information in transparent data in the HSS, but unless the data is defined it cannot be shared with other AS's.
TISPAN defined data structures associated with multimedia telephony services which have been copied into TS 24.173. For example, 24173-ETSI-TS-183-004 provides the XML schema for the call diversion service..

Benefits of standardizing the data formats for services:

- **Multi-vendor AS support.**
  Today's telecom SPs regularly use two or more vendors to provide identical capabilities.
  Standardization has facilitated this, as products must conform to the defined interfaces.
  SPs use this to build competition among vendors and to build business contingencies.
  The AS market, especially for high-penetration services, is expected to follow a similar path.
- **Data Synchronization**
  In defining IMS centralized services, interworking between the HLR/HSS and the Telephony AS may occur to exchange data that is administered in CS domain and IMS. Definition of IMS AS service data descriptions facilitate this exchange.
- **Feature Interaction**
  Advertising and defining data for each application is expected to increase communication regarding features within applications. This makes integration of complex features more likely to succeed, as the information is available to examine for interactions.
- **User re-homing and load balancing**
  To facilitate re-homing of users to ASs and load balancing, the definition of IMS AS service data descriptions increases the opportunity for hosting services on alternative ASs.

This work studied the necessary components of an AS subscriber data definition and the procedures necessary to follow in enabling other applications to define, extend and publish data definitions.

- Clarify the requirements for defining application specific data descriptions
- Study mechanisms for the transfer of service data descriptions to AS.
- Provide solutions to defining data for the Telephony Application Server (TAS).

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- Provide recommendations for how the framework defined for the service data schema can be reused and extended for future service definitions.

TR 29.864 identifies an AS service data representation specific to an IMS Telephony Application Server.
It studies requirements for AS service data definition and transfer of defined service data between AS and HSS.
Further, it exposes a service data definition for a TAS for services defined in TS 22.173 (IMS Multimedia Telephony Service and supplementary services; Stage 1).
It provides recommendations for how the framework can be reused and extended for future IMS service definitions.

TR 29.864 Recommendations

- provide a definition of the IMS Telephony Supplementary service (MMTel) data understood by a variety of TASs;
- define a binary format for these service data in the context of Rel-8;
- define an XML format based on the one defined for Supplementary Services in TS 24.6xy in the context of Rel-8;
- for the binary format, include a service description specifying the services and impacts on the IMS Telephony Supplementary Services for which this approach enables interoperability.
  For the binary approach, describe how an optional extension mechanism works that supports more complex features for some of the services, or introduces new services;
- for the XML format, include a possibility for compression, based on either gzip or EXI;
- this be complemented by the necessary mechanism for transmission over the Sh interface;
- insert this data into the Sh User Data AVP in such a manner that additional transparent data can also be transmitted.

Genealogy of this spec:

this spec	descendant(s)
29.864	29.364

Spin-off Feature UID_410003 (IMS_ASIO) IMS Application Server Service Data Descriptions for AS interoperability.

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23.4 Study on Customized Alerting Tone solution for voice and video call in CS domain UID_360031

Resources: C4

References

Document	Title/Contents
	WID(s)
CP-070518	SID on CAT solution for voice and video call in CS domain / Support CAT (Customized Alerting Tone) in 3G CS domain
	Impacted Specifications
-	-
	New Dedicated Specifications/Reports
TR 29.882	Customized Alerting Tones (CAT) in the 3GPP CS domain

Supporting Individual Members: China Mobile, Alcatel-Lucent, SK Telecom, Huawei, ZTE.

This work is linked to the feature Customized Alerting Tone (CAT) UID_340029.

CAT has been deployed in many countries. The inherited CAT service (content being: music, voice, text, video clip, etc.) becomes a carrier's focus when deploying a 3G network.

There is a need to study how to implement in 3GPP CS domain the CAT requirements in TS 22.182 for both voice and video calls, since there are many alternatives to implement the basic CAT function.

TR 29.882 studied the implementation of CAT (for voice and video call) in 3G CS domain including:

- Basic call scenario for CAT (including both voice and video call);
- Interaction with call forwarding and other supplementary services;
- Interaction with fall back (e.g. CAMEL, etc.);
- Abnormal case; especially CAT server outage.

TR 29.882 Conclusions and Recommendations

Feasibility & Limits of CAT services in the CS domain

- It is possible to provide audio CAT-A and CAT-B services in the CS domain indicating that the called party is being alerted. Providing audio CAT has no requirement on the calling party UE.

- With UEs enhanced with CAT capabilities it is possible to provide multimedia CAT-A and CAT-B services in the CS domain indicating that the called party is being alerted. The calling party may not be able to experience the multimedia CAT when the call spans over ANSI and ITU networks or traverses non-standard transit nodes that do not both-way through connect the bearer during the alerting phase.

- Solutions to provide multimedia CAT in the CS domain towards a non-CAT capable UE may work but in some cases the call will fail (if the end to end bearer is not both-way through-connected during the alerting phase) due to H.245 signalling being unsuccessful.

- CAT copy and CAT stop commands can be supported through the use of DTMF within the same PLMN (as per stage 1 requirements). CAT can only be copied between calling and called subscribers of the same PLMN since no interface is standardized to copy CAT between CAT Servers.
  CAT copy and CAT stop requests for an audio CAT may not work between PLMNs when the call spans over ANSI and ITU networks or traverses non-standard transit nodes that do not both-way through connect the bearer during the alerting phase.

Further analysis would be required to consider whether the following CATs could be supported:

- the progress of communication request (Call Forward, Call Wait, etc.);
- any alerting event during a call session.

CAT is optional for an operator to deploy. CAT services should not impact a network not supporting them.

Preferred solution(s)

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1. **Audio CAT**
   using the GMSC Server Switched Architecture
2. **Multimedia CAT**
   using the GMSC Server Switched Architecture with multimedia UEs enhanced with CAT capabilities.
   CAT is optional for an operator to deploy. If it is deployed, multimedia UEs should support CAT capabilities.

   If an operator's policy is to support CAT service towards the calling party multimedia UE which has not been enhanced with CAT capabilities, the CAT Server Switch Architecture may be used in this case, however due to the number of limitations there was no consensus to pursue this alternative as a standardised solution.
3. **Signalling of calling UE's CAT capability to the GMSC**
   The calling UE's CAT capability should be signalled to the GMSC. This may be done either via the signalling of a new specific CAT indicator through the call control signalling protocol (ISUP/BICC/SIP-I) or via the interrogation of the originating MSC through the MAP Anytime Interrogation / Provide Subscriber Info messages.
   There was no objection to investigate either approach during the normative work.
   The method taking use of UEs session reset capability and transporting this information from the CAT-server to the GMSC Server requires a complex CAMEL 4-architecture and should therefore not be pursued.

Changes required by the GMSC Server switch architecture should be specified in existing specifications.

Spin-off UID_340029 Feature CAT

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23.5 Study on InterWorking Function between MAP based and Diameter based interfaces UID_380023

Resources: C4

References

Document	Title/Contents
WID(s)	
CP-070760	SID on InterWorking Function (IWF) between MAP based and Diameter based interfaces
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TR 29.805	InterWorking Function (IWF) between MAP based and Diameter based interfaces

Supporting Individual Members: Huawei, Vodafone, Orange, T-Mobile, Ericsson, RITT, TeliaSonera, Motorola, Alcatel-Lucent, China Mobile.

This work is linked to the SAES Feature UID_320005.

With network evolution to an all-IP-network, IP based signalling protocols are getting widely used in 3GPP systems. The number 3GPP defined Diameter-based interfaces increased for e.g. PCC, I-WLAN, MBMS, GBA architecture. Due to coexistence in the same system of new and legacy protocols (based on different transport layers e.g. IP and SS7), interworking between these protocols is required by operators.

This study evaluated complexity, performance and duality of an IWF based on concrete use cases. It recommended how to map procedures and parameters, and where to locate the IWF within the network in order to ensure less IWF complexity and best performance.

TR 29.805 evaluates the introduction of an IWF between MAP-based and Diameter-based interfaces. For each interworking deployment scenario, it analyzed how the IWF fulfils specific interworking requirements, and performs mapping of procedures and corresponding parameter handling.

Uses cases involving inter-operator interfaces got higher priority than intra-operator interfaces.

TR 29.805 conclusions:

- IWF scenario 1 to 4 should be specified in Rel-8;
- IWF scenario 5 is not supported in Rel-8.

Spin-off implementation Building Block UID_410007 (MAP2Diam) under the SAES Feature UID_320005.

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24 RAN Studies

24.1 Study on Scope of future HSPA Evolution for 1.28Mcps TDD UID_370041

Resources: R1

References

Document	Title/Contents
WID(s)	
RP-070748	SID on Scope of future HSPA Evolution for 1.28 Mcps TDD
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TR 25.824	Scope of High Speed Packet Access (HSPA) Evolution for 1.2 Mcps TDD

Supporting Individual Members: TD Tech, ZTE, CATT, Spreadtrum.

The importance of enhancing capabilities and performance of HSPA-based radio networks is widely recognized. For protecting operators' investments and offering a smooth migration path towards LTE, the following principles for HSPA evolution were considered:

- HSPA spectrum efficiency, peak data rate, state transition efficiency and latency of both user plane and control plane should continue to evolve;
- Evolved HSPA should be able to operate as a packet-only network based on utilization of Shared Channels only;
- HSPA evolution should be backward compatible in the sense that legacy terminals (R99-DCH and HSPA mobiles) should be able to share the same carrier with terminals implementing the latest features of the HSPA evolution track without any performance degradation;
- Evolved HSPA should be able to offer more efficient QoS support.

The study focussed on improving system performance for services delivered through PS-domain including voice and multimedia conversational services. Critical elements of such an evolution were included e.g. reduced latency, higher user data rates, improved system capacity and coverage, reduced operator cost while maintaining the highest possible level of backward compatibility. The study concentrated on the following items:

- Define a set of requirements for HSPA evolution which covers the following aspects:
  a) Targets for improvements in latency, throughput and spectrum efficiency utilizing the existing 1.28MHz bandwidth
  b) Define constraints in terms of acceptable hardware/software changes to current elements (UE, Node, RNC, SGSN, GGSN)
  c) Define constraints in terms of acceptable network architecture changes
- Determine performance benefits achievable by HSPA and in which scenario HSPA evolution applies most;
- Identify potential solutions to improve HSPA performance towards agreed targets within the defined constraints;
- Make recommendations for subsequent HSPA Evolution implementation work items.

Last Status Report in RP-080290.

NOTE: TR 25.824 and Status Report provide neither Conclusions and Recommendations nor a Work Plan.

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24.2 Study on Synchronized E-DCH for UTRA FDD UID_370042

Resources: R1

References

Document	Title/Contents
WID(s)	
RP-070678	SID on Synchronized E-DCH for UTRA FDD
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TR 25.823	Feasibility study on synchronized E-DCH for UTRA FDD

Supporting Individual Members: Nokia, Nokia Siemens Networks, Qualcomm, T-Mobile International, Ericsson.

The goal of RAN1 Rel-5 study TR 25.854 Uplink Synchronous Transmission Scheme (USTS) was to improve orthogonality of the uplink signals by sharing a common scrambling code and assigning different channelization codes to UEs similarly to downlink. In order to achieve the improved orthogonality at the receiving side (Node B), the transmission time on the UE side needs to be adjusted so that the arrival times in Node B are sufficiently synchronized.

This study did not lead to an implementation work item due to lack of orthogonal codes space (as too many users with DTX would require multiple parallel codes) and at that time all resource allocation resided in RNC.

Since then 3GPP has introduced MAC layer functionality in the BTS to control radio resources with HSDPA and HSUPA, and thus the limitation of RNC-only control of resource allocation was removed. Also the use of 16QAM in the uplink offers potential for putting more data on an individual code channel.

As a consequence, the potential of synchronized uplink transmission should be studied to see what additional benefits could be obtained combining synchronized uplink transmission and BTS based uplink resource allocation. The original focus was on the resulting low data rate capacity (such as speech).

This work studies whether HSUPA-like uplink resource allocation allows more potential of synchronized uplink transmission to be achieved for uplink packet data transmission compared to Rel-5 TR 25.854, with the focus on:

- Resulting performance from BTS based dynamic uplink code allocation;
- Resulting L1/MAC signalling needs to enable BTS based code allocation and uplink synchronization on top of the Rel-7 specification;
- This study did not repeat the basic USTS analysis already existing in TR 25.854 on e.g. synchronization sensitivity.

TR 25.823 conclusion

Synchronised E-DCH study has investigated methods for increasing the capacity of WCDMA uplink, including CDM based Synchronized E-DCH, TDM based Synchronized E-DCH and interference cancellation.

Performance evaluation has been carried out at link and system level, comparing Synchronised E-DCH against Rel-7 HSUPA. At 80-90% HARQ throughput, the CDM based Synchronised E-DCH showed link level gains of 0.75-1dB in a multipath rich channel and 1-2dB in low dispersion channel, while 3 stage parallel IC on HSUPA showed link level gains of 2dB in both kinds of channel. Parallel IC on CDM based Synchronised E-DCH showed additional gains of 1.8dB in TU6 and <0.1dB in PedA (the OVSF already removed most of the interference in the latter case). At low HARQ throughput levels (25%), Synchronised E-DCH and IC showed link level gains of <0.5dB.

System level full buffer simulations were also performed in order to assess the capacity gains available with each of the techniques. Comparing the simulations at 6dB RoT, CDM based Synchronised E-DCH showed capacity gains of 50% in Pedestrian A and 10-15% in TU6. TDM based Synchronised E-DCH showed gains of 50% in Pedestrian A and 30-40% in TU6. Interference cancellation on Rel-7 HSUPA based on a realistic group serial/parallel algorithm showed gains of 50-60% in cell throughput and 40-75% in cell edge user throughput in both dispersive TU6 and non dispersive Pedestrian A channels.

The CDM and TDM approaches effectively share the time/OVSF code resources between users, whereas conventional HSUPA allows each user access to a full OVSF tree. At cell throughput levels of ≥2Mbps, higher coding rates or higher order modulation compared to asynchronous HSUPA would be needed if pure CDM or TDM operation is to be maintained.

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Interference cancellation may be applied to CDM based or TDM based Synchronised E-DCH or to HSUPA. Simulations indicated that application of IC to CDM based Synchronised E-DCH could reduce the number of interference cancellation stages required in a parallel interference canceller by 1 compared with an application to HSUPA. TDM based Synchronised E-DCH could benefit from the fact that the inter-cell interference is dominated by a low number of users in order to further boost capacity, e.g. by being able to operate at a higher RoT level by cancelling or suppressing these dominant interferers.

In terms of complexity, CDM based Synchronised E-DCH increases CM and PAPR at the UE transmitter and requires code scheduling and synchronisation at NodeB. TDM synchronisation requirements are looser, and scheduling may be more straightforward. Interference cancellation implies additional NodeB baseband processing complexity.

Impact on specifications is greatest for CDM based Synchronised E-DCH, significantly lower for TDM and zero for interference cancellation on Rel-7 HSUPA.

Last Status Report in RP-080068

NOTE: TR 25.823 and Status Report provide no Work Plan.

24.3 Study on Improved network controlled mobility between LTE and 3GPP2/mobile WiMAX radio technologies UID_360016

Resources: R2

References

Document	Title/Contents
	WID(s)
RP-070511	SID on Improved network controlled mobility between LTE and 3GPP2/mobile WiMAX radio technologies
	Impacted Specifications
-	-
	New Dedicated Specifications/Reports
TR 36.938	Improved Network Controlled Mobility between E-UTRAN and 3GPP2/Mobile WiMAX Radio Technologies

Supporting Individual Members: Motorola, Intel, Telecom Italia, Sprint, Samsung, NEC, Alcatel-Lucent, Vodafone, Nokia, Nokia Siemens Networks, Ericsson, Nortel, Qualcomm, KDDI, RIM

3GPP is going through Long Term Evolution and System Architecture Evolution implementation work and study items. Important LTE tasks include reduced latency, improved system capability, reduced cost per bit, higher user data rates. It is expected that IP based 3GPP services will be provided through various access technologies, including existing broadband radio access standards like IEEE 802.16e/ETSI BRAN, 3GPP2 including EVDO and 1xRTT.

This work:

- studies mobility between LTE and 3GPP2/mobile WiMAX systems in accordance with SA1 requirements;
- studies validity of existing 3GPP inter-RAT mobility mechanisms and their extendibility to non-3GPP RATs;
- identifies the versions of 3GPP2 and mobile WiMAX technologies (including technology variants) where mobility with LTE is needed;
- identifies frequency bands for which LTE and the studied non-3GPP systems should provide mobility support, including identification of duplex modes and channel bandwidths;
- characterizes impact on 3GPP UE supporting different solutions for handover between LTE and the studied non-3GPP technologies
- identifies requirements for availability of 3GPP2 and mobile WiMAX network configurations (including neighbour lists, raster index, cell identifiers) to 3GPP devices to enable mobility measurement of non-3GPP networks;
- identifies requirements for, and means of, reporting active mode measurements;
- identifies any additions to current mobility procedures.

TR 36.938 is a stage 2-level concept solution for each of the studied mobility scenarios which can be used as a basis for initiating Stage 3 work when moving to the implementation work item.

Even though a common solution is preferable, it is not required for the different mobility scenarios.

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The solution developed for LTE – mobile WiMAX mobility should be reusable for UTRA – WiMAX mobility.

TR 36.938 Conclusions and Recommendations

Conclusions

Minimize impacts on legacy cdma2000 and reduce dependencies between E-UTRA and legacy cdma2000 systems. It was decided to:

- re-use cdma2000 interwork between HRPD and 1XRTT, e.g. supporting S101 interface similar to A21 to exchange messages between E-UTRAN and cdma2000;
- use RRC and S1AP tunnelling to transport cdma2000 messages over E-UTRAN;
- use RRC command to trigger UE to initiate handover preparation at target network via tunnelling;
- support network control of mobility;
- support single- and dual-radio UEs, including single-transmitter dual-receiver configuration.

The cdma2000 inter-working solution is based on multiple E-UTRA mechanisms, e.g. broadcast, measurement control, cell reselection and UE capability handling. Where these are not decided yet, the study proposes to keep alignment with the final E-UTRA decisions.

The eight work objectives and the General Requirement on E-UTRAN in TR 36.938 clause 5 are fulfilled for cdma2000 interworking with E-UTRA.

For mobility between E-UTRAN and WiMAX, studies were made on network architecture and interfaces, WiMAX system information in E-UTRAN, measurement control for RRC_IDLE and RRC_Connected UEs, cell reselection, and handover. Key solutions agreed and captured comprise:

- TWG release 1 and NWG release 1.0.0 as a target WiMAX release
- Architecture and interfaces with FAF, X200, S301, and X101
- Definition of WiMAX system information
- CINR and RSSI as WiMAX measurement quantities
- Threshold based on LTE_IDLE mode measurement control
- Network controlled measurement gap creation for LTE_ACTIVE UEs
- Use of periodic measurement reports and events-triggered measurement reports to report preamble index, measured result on preamble index and BS id
- Priority based cell reselection to WiMAX
- Handover procedure with pre-registration and handover preparation by UE tunnelling of corresponding WiMAX messages to the WiMAX while the UE is in E-UTRAN

Many solutions are derived from existing intra-3GPP inter-RAT mobility mechanisms and they will be aligned to the outcome of the intra-3GPP Stage 3 as much as possible. Transport mechanism and termination/origination points between E-UTRAN and WiMAX outside the scope of TSG RAN and for SA2's decision.

Progress was made meeting mobility requirements between E-UTRAN and mobile WiMAX radio technologies.

Recommendations

It is feasible (Stage 2 solution has been described) to support interworking between:

- cdma2000 and E-UTRAN
- WiMAX and E-UTRAN

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24.4 Study on 3G Home NodeB/eNodeB UID_350039

Resources: R4

UID	Name	Hyperlink	Status_Report	Notes	TS_TR
350039	Study on 3G Home NodeB/eNodeB	RP-070257	RP-080289	RP#40 completed	25.820

Supporting Individual Members: Nokia, Siemens Networks, Ericsson, Motorola, Alcatel-Lucent, Samsung, Huawei. NEC.

With increased UMTS terminal penetration and Fixed-Mobile Convergence, a strong demand is observed for 3G HNB providing attractive services and data rates in home environments.
New services with higher data rate at lower cost, require the study of 3G HNB environments.
Many operators indicated interest, that could lead to fragmented markets with non-standardized solutions.

UTRAN is not optimal for this application as it was developed under the assumption of coordinated network deployment whereas HNB is typically associated with uncoordinated and large scale deployment.

This study investigates amendments to UTRAN (FDD) to fully support HNB application.
This work studies aspects of 3G HNB solution and develops a standardized scenario and solution assuring a multi-vendor environment. It includes architecture, HO scenario, interference consideration, OAM interface aspect, etc.

To minimize impact on existing network, the HNB concept for WCDMA shall operate with legacy terminal (R99 onwards) and core network, and minimize impact on UTRAN interfaces. No UE specifications impact is foreseen.
A feasible solution providing 3G HNB environment should be available.

Work on LTE HeNB (as part of the LTE work item) benefits from scenarios defined as part of this study.
Interference analysis is based on the same scenario for both UTRAN and E-UTRAN as deployment scenarios are the same.

This work develops a framework for 3G HNB. It focuses on building the 3G Femto/Pico environment capable of providing users with high bit rate and low-cost services.

TR 25.820 Summary

It analyzed impact of HNB on macro layer with downlink emphasis and prioritized the interference scenarios below.

Table: Interference Scenario analysis

Number	Aggressor	Victim
1	UE attached to HNB	MNB Uplink
2	HNB	MNB Downlink
3	UE attached to MNB	HNB Uplink
4	MNB	HNB Downlink
5	UE attached to HNB	HNB Uplink
6	HNB	HNB Downlink

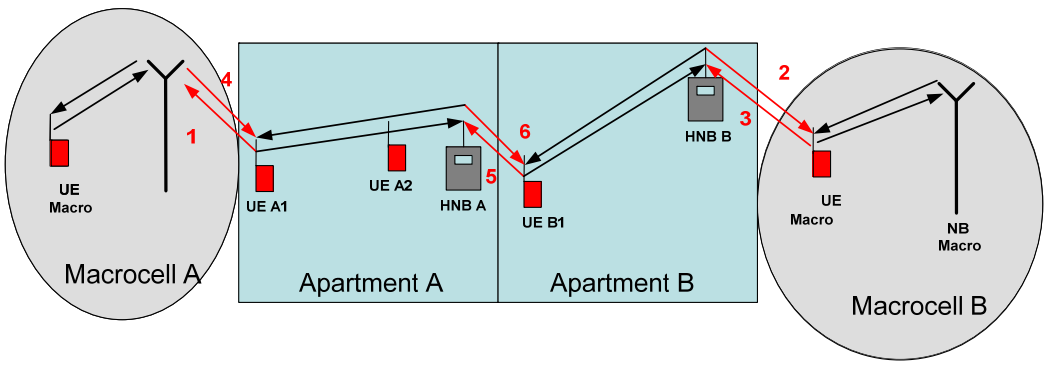


Figure: Interference scenarios

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A wide range of possible HNB deployment configurations are envisaged. TR 25.820 uses interference scenarios to investigate impact of HNB deployment on existing BS requirements. However, the interference scenarios are dependent on the deployment configurations.

Successful HNB (dedicated or co-channel) deployment needs minimum performance requirements for all scenarios.

TR 25.820 Conclusions

RAN4 Conclusions

RAN4 identified new requirements affecting RF aspects. Their feasibility is addressed by:

- H(e)NB should not degrade significantly the performance of networks deployed in other channels. Feasible. Dedicated carrier deployment of HNB is feasible for both Open and Closed Subscriber Group systems in a wide range of deployment configurations. Co-existence between HNB and UTRAN networks in adjacent channels is comparable with co-existence for local area Bases Stations.
- H(e)NB configurations intended for deployment in the same channel as an existing E-UTRAN network should ensure their combined performance is not significantly worse than that of the original network. Feasible, however especially in the case of CSG there will be an increased level of interference relative to dedicated deployment; interference mitigation techniques have been studied to reduce this.
- H(e)NB should provide reasonable performance whether deployed in isolation or whether multiple H(e)NB are deployed in the same area. Feasible, however in high-density deployments, techniques may be needed to mitigate inter-HNB interference.
- As a H(e)NB may be privately owned and portable, it shall only radiate while it is confirmed that such an emission complies with regulatory requirements in force where that HNB is operating. Feasible
- The HNB must support UE speeds up to 30 km/h. Feasible
- HNB must support existing UTRAN UEs. Feasible

RAN2 Conclusions

RAN2 studied intra- and inter-frequency mobility solutions and access control for UMTS HNBs. Different solutions based on current Rel-7 have been studied. No quantitative results have been presented.

RAN2 concluded there are a few solutions but having drawbacks/limitations (restrictions on deployment) an operator needing to decide upon.

For Rel-8 UE some mechanisms that optimize mobility and access control have been presented already.

Recommendation for Rel-8 UMTS HNB:

1) Solutions to optimize the mobility and access control should be specified;
2) Solution for UMTS Home-NodeB aligned with the ones decided for E-UTRAN Home-eNBs ("CSG cells") should be analyzed first;
3) Removal of constraints in procedures for (macro) cell reselection to efficiently support HNB cells should be investigated (e.g. removal of cell barring for 300 s for reselection if highest ranked cell is a CSG cell).

RAN3 Conclusions

Deploying 3G HNB with legacy UEs and legacy CN nodes is feasible. Further proposed enhancements are FFS.

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25 GERAN Studies

25.1 Study on A-interface over IP (AINTIP) UID_50589

Resources: GP

References

Document	Title/Contents
WID(s)	
GP-071562	SID on A-interface over IP
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TR 43.903	A-interface over IP Study (AINTIP)

Supporting Individual Members: China Mobile, Vodafone, Telecom Italia, Ericsson, Huawei, ZTE, Alcatel-Lucent, Nokia Siemens Networks, Motorola, Nortel Networks.

BSS (Base Station System) over IP is a trend in wireless network evolution, which can construct high bandwidth, high efficiency and low cost basic networks. BSS over IP involves Gb interface and A interface over IP (AINTIP).
Gb interface over IP was standardized in Rel-4. For AINTIP, control plane signalling over IP (SIGTRAN) has been introduced in Rel-7 while certain features (e.g. MSC in Pool and Layered Architecture) require an intermediate signalling network for best performance.

During the specification in Rel-7 of A interface control plane signalling over IP, some operators expressed the concern that in order to take full advantage of IP based technologies the protocols of A interface user plane should be adapted for IP based transport. The IP based transport protocols provide a low cost intermediate network which is very attractive to the operators because CAPEX and OPEX can be significantly reduced.

AINTIP can also simplify the implementation of MSCs in a pool. Furthermore, UTRAN and more advanced RAN can use a common IP backhaul with GERAN.

This study shows it is feasible to introduce in 3GPP specifications the User Plane transport over IP for the A-interface (BSS – MGW interface). In particular it is possible to define a solution that, at the same time:

- benefits from the flexibility of the IP transport on the A-interface,
- improves bandwidth efficiency through the use of 3GPP Codecs on the A-interface,
- allows to reuse installed Transcoder equipment,
- allows to remove Transcoders from the BSS,
- enables Transcoder Free Operation (TrFO) in the BSS,
- maximizes the likelihood for end-to-end TrFO and therefore improves service quality vs. existing TDM-based BSS.

TR 43.903 made a detailed analysis of all requirements, except:

a) All teleservices, bearer services, VGCS and supplementary services defined for GSM shall be supported on the BSC-MGW interface (Comment: Not studied in full detail, but no issues are expected.)
b) GSM/AMR Codec adaptation shall be possible, e.g. due to overloading of the BSC or radio conditions. The GSM/AMR Codec adaptation delay shall be in the same order as in the current A-interface solution. (Comment: This requirement could be understood as "Codec Type" adaptation or as "AMR Codec Mode" adaptation. AMR Codec Mode adaptation is addressed under Requirement 18, see below. Codec Type adaptation has been studied in clause 7. Several feasible solutions have been identified.)
c) End-to-end speech delay shall not be increased. Congestion in the IP transport may introduce additional delay; however the end-to-end delay shall not exceed the ITU G.114. (Comment: Not studied. This will be investigated further. It is, however, expected that the selected solution complies with this requirement.)
d) It shall be possible to secure the BSC-MGW interface (see item e) below). (Comment: Not studied in full detail, but the same method as for SIGTRAN should be applicable.)
e) Speech interruption times during handovers shall be in the same order as in the current TDM implementations (Comment: Not studied. This will be investigated further. It is, however, expected that the selected solution complies with this requirement.)

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f) The interaction of dynamic AMR Codec change and TrFO shall not degrade the overall quality of the speech in the case of MS to MS calls. (Comment: Not studied in full detail. No issues are expected because AMR Codec Mode adaptation for MS-to-MS calls in TrFO is already specified in TS 45.009.)

From the items under "further investigation" two items have not been addressed in detail:

- Since IP transport is vulnerable to unauthorized intrusions, security aspects shall be investigated. (Comment: Not studied in full detail, but the same method as for SIGTRAN should be applicable.)
- Support for GAN (Comment: Not studied in detail, no issues expected.)

The investigated solution allows smooth migration from legacy, TDM-based A-interface to new, IP-based A-interface.

Working Assumptions were formulated to guide the specification phase.

The investigated solution assumes support on the MSC-MGW- (Mc) and the MGW-MGW- (Nb) interfaces and therefore cooperation with TSGs CT and SA is required.

Spin-off UID_50591 Rel-8 Feature AoIP (A-interface over IP).

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25.2 Study on Multi-User Reusing-One-Slot (MUROS) UID_50590

Resources: GP

References

Document	Title/Contents
WID(s)	
GP-072033	WID on Study on Multi-User Reusing-One-Slot
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TR 45.914	Circuit switched voice capacity evolution for GSM/EDGE Radio Access Network (GERAN)

Supporting Individual Members: China Mobile, Ericsson, Nokia Siemens Networks, Nokia, Nortel Networks, NXP, Qualcomm, Telecom Italia, Vodafone.

This feature increases voice capacity of GERAN by a factor of two per BTS transceiver. The increase in user amount and voice traffic puts a huge pressure on operators especially within populous countries. Furthermore, as voice service price gets cheaper, most operators face the challenge to obtain efficient utilization of hardware and spectrum resource.

One approach of increasing voice capacity is to multiplex more than one user on a single time slot and ARFCN, thus the capacity can be significantly improved for a certain TRX hardware and possibly spectrum resource. Furthermore, such a feature is expected to provide voice capacity improvement both for full rate and half rate channels.
This work further enhances the voice capacity of GERAN by means of multiplexing at least two users simultaneously on the same radio resource both in downlink and in uplink. Channels under interest for doubled voice capacity are TCH/FS, TCH/HS, TCH/EFS, TCH/AFS, TCH/AHS and TCH/WFS with related associated signalling channels.

Implementation impact of Multi-User Reusing-One-Slot (MUROS) to the MS was investigated by analyzing different receiver types, e.g. legacy GMSK terminals supporting or not DARP phase 1 (Downlink Advanced Receiver Performance). For this the design of a new set of training sequences with improved cross correlation properties to the existing set of training sequences is foreseen and expected to be evaluated. Furthermore, the introduction of MUROS should change hardware as little as possible and should not decrease voice quality. The impact on network planning and frequency reuse was investigated.

The study included investigation of different optimised pulse shapes for MUROS for both the uplink and the downlink. For this purpose, link-level and system-level performance evaluation was used; including investigation into usage at the band edge, at the edge of an operator's band allocation and in country border regions with no frequency coordination. Impacts to the Abis interface was investigated.

Any TRX hardware capable of multiplexing more than one user on a single ARFCN time slot shall support legacy GMSK mobiles, this includes non-SAIC mobiles and SAIC mobiles.

GP#48 completed as Rel-8. Spin-off implementation WI UID_420002 VAMOS (Voice services over Adaptive Multi-user channels on One Slot)

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25.3 Study on Optimized Transmit Pulse Shape for Downlink EGPRS2-B (WIDER) UID_51148

Resources: G1

References

Document	Title/Contents
WID(s)	
GP-072026	WID on Optimized Transmit Pulse Shape for Downlink EGPRS2-B
Impacted Specifications	
-	-
New Dedicated Specifications/Reports	
TR 45.913	Optimized transmit pulse shape for downlink Enhanced General Packet Radio Service (EGPRS2-B)

Supporting Individual Members: Ericsson, Nokia, Nokia Siemens Networks, Research In Motion, TeliaSonera, Vodafone.

This work is linked to GERAN Rel-7 REduced symbol Duration, Higher Order modulation and Turbo coding for downlink (REDHOT) UID_50121.

EGPRS2-B feature has been included into GERAN Rel-7 with the legacy GMSK pulse shape. This pulse shape yields good performance and can be used without any requirements on the operator network scenario.

Initial analysis showed that in certain network scenarios, a spectrally wider pulse shape can further improve data throughput performance. To obtain superior data throughput performance, investigation of a wider pulse shape is needed, including the network scenarios that will benefit from a wider pulse shape. Selection of either the legacy pulse shape or the new pulse shape will be under operator control.

It is not clear to what degree the current spectral mask can be widened without causing a detrimental impact on legacy MSs in these networks. It is also not clear if a spectral mask relaxation is dependent on the modulation transmitted or whether it can be assumed to be applicable for all modulations. It is important to continue to improve the GERAN system performance with new features, and as such it is relevant that this topic is carefully and independently studied. Spectral mask changes were also studied and implemented when 8-PSK modulation and the linearized GMSK pulse shape were introduced in 1998/1999.

This work investigated the impact of downlink spectral mask changes for EGPRS2-B on GSM system performance and identified an optimized transmit pulse shape This work involved investigations at the link level and at the system level. When ACP is referenced, this may be evaluated at several offsets from the carrier, to be determined by GERAN WG1.

When applying a new transmit pulse shape, implementation margin must be taken into account when ensuring that the pulse shape conforms to the new spectral mask when transmitter impairments and issues such as spectral regrowth are taken into account. Design impacts of the optimized pulse shape with regard to the usage at band edge, at edge of an operator's band allocation, and in country border regions where no frequency coordination is in place, were also described.

Selection of an optimized pulse shape is performed based on optimization criteria to be agreed by GERAN WG1.

Evaluation of an optimized pulse shape uses a similar approach as in the GERAN Rel-6 TR 45.903 (Feasibility study on Single Antenna Interference Cancellation (SAIC) for GSM networks) UID_51101.

Network Level Analysis

Network level analysis was performed for network configurations agreed by GERAN WG1 for different penetrations of legacy GMSK pulse shape and optimised pulse shape, respectively, being operated in downlink. The purpose of this analysis is to define different interferer profiles for a given penetration of the wider TX pulse shape and a given network configuration.

Link Level Studies

Link level studies were performed using the set of interferer profiles agreed by GERAN WG1 that were determined in the network level analysis. The purpose of the link level studies is to determine the relevant inputs to feed into system level evaluation, analyzing both the impact to legacy users and data service throughput. The link level study:

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1. Investigated the impact of the variation in legacy mobile implementations to the impact on legacy users and the system data throughput using the interferer profiles:
    a. One or more "reference MS receiver" designs may be defined to test the link level performance against. The resulting performance and impact for each tested transmit pulse shape will be assessed using these models;
    b. In addition to defining sample reference mobile implementations, mobile manufacturers will be encouraged to provide link level simulation results to determine the resulting performance and impact when different transmit pulse shapes are evaluated. This information shall then be used as an input to system level simulations (along with results from any "reference MS receiver(s)" agreed by GERAN WG1).
2. Investigated the impact of different channel profiles to the impact on legacy users and the system data throughput using the generated interferer profiles:
    a. Using vendor provided results plus reference MS receiver models (if any), determine how much the resulting performance and impact varies as the channel profile is changed. Profiles with high and low velocities as well as with and without frequency hopping shall be analyzed.

System Level Studies

Using the information determined from the link level studies described above, system simulations to determine overall impact and data throughput gains were performed for any studied transmit pulse shape. Representative network scenarios to be examined will be determined by GERAN WG1. The following system level impacts were studied:

1. The performance of legacy speech services is evaluated by examining the change in dropped calls of legacy mobile stations when:
    a. the transmitter output conforms to the spectral mask being studied with implementation margin taken into consideration;
    b. The legacy mobile is examined using the interferer profiles from the network level analysis.
2. The performance of legacy data services is evaluated by examining the change in mean throughput. Investigate the change in data performance of legacy mobile stations when:
    a. the transmitter output conforms to the spectral mask being studied with implementation margin taken into consideration;
    b. The legacy mobile is examined using the interferer profiles from the network level analysis.
3. The improvement in data throughput will be examined when:
    a. the transmitter output conforms to the spectral mask being studied with implementation margin taken into consideration;
    b. the interferer profiles from the network level analysis are used and different penetration levels of reference MS receivers (as previously defined) and MS receivers that are compatible with EGPRS2-A and EGPRS2-B are considered.

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26 Rel-8 Completed Items

UID	Name	Acronym	Resource
0	Release 8 SA/CT Features	-	-
320005	3GPP System Architecture Evolution Specification - Evolved Packet System (non RAN aspects)	SAES	S1,S2,S3,S5,C1,C3,C4,C6,IETF
450022	Conformance Test Aspects – Mobility management based on DSMIPv6 (Dual-Stack Mobile IPv6)	DSMIPv6_UEConTest	R5
370025	IMS Centralized Service Control (ICSRA)	ICSRA	S1,S2,C1,C3,C4,IETF
370059	IMS Multimedia Telephony and Supplementary Services	IMSTSS	S1,S5,C1,C3,C4,IETF
390035	3GPP2 Input to Common IMS	CIMS_3GPP2	S1,S2,S3,C1,C3,C4
350005	IMS Enhancements for support of Packet Cable access	PktCbl	S2,S3,C1,C3,C4
360012	IMS System enhancements for corporate network access	IMS_Corp	S2,S1,C1,C4,IETF
380069	Maintenance of TISPAN documentation	MAINTISP	S2,C1,C3,C4,IETF
390056	IMS Service Continuity	IMS-Cont	S2,S1,C1
370078	Security Enhancements for IMS	IMS-Sec	S3,C1,C4
34046	IMS initiated and controlled PSS and MBMS User Service	IMS_PSS_MBMS_US	S4,S3,IETF
713024	Multimedia interworking between IMS and CS networks	MIW-IMS	C3,C4
360029	IMS Stage 3 IETF Protocol Alignment - phase 2	IMSProtoc2	C1,IETF
380014	Interworking between User-to-User Signalling (UUS) and SIP	UUSIW	C1,C3,IETF
380018	Support of Overlap signalling	Overlap	C3,C1,C4
380035	AS/MRFC Stage 2 and 3	MRFC_TS	C1,IETF
400012	IMS Restoration Procedures	IMS_RP	C4,C1
410003	IMS Application Server Service Data Descriptions for AS interoperability	IMS_ASIO	C4
340030	I-WLAN Network Selection Principle (NSP)	IWLANNSP	S1,C1,C6
370049	Mobility between 3GPP-WLAN Interworking and 3GPP Systems	IWLAN_Mob	S2,C1
460006	Conformance Test Aspects – Mobility between 3GPP WLAN Interworking and 3GPP Systems	IWLAN_Mob_UEConTest	R5
7042	Enhancements for Voice Group Call Service (VGCS) Applications (EVA)	EVA	S1,C1,C4,G2
31081	Personal Network Management	PNM	S1,C1,S3
330005	eCall Data Transfer	EData	S1,C1
34042	eCall data transfer Phase 2: Comparison of alternative in-band modem solutions and standardization of one in-band modem solution	eCall_Phase2	S4
450001	eCall Conformance Testing	eCall_MSTest	G3new
450023	Conformance Test Aspects – non-modem procedures of eCall sessions in UTRA	UMTS_eCall_UEConTest	R5
380060	IP Interconnection of Services	IPinterc	S1,S2,S5,C3
360025	Support of (G)MSC-S – (G)MSC-S Nc Interface based on the SIP-I protocol	SIP_Nc	C4,C3
370051	Earthquake and Tsunami Warning System	ETWS	S1,S2,C1,C4,G2
440011	Conformance Test Aspects – UMTS Earthquake and Tsunami Warning System (ETWS) FDD	ETWS_UMTS_UEConTestFDD	R5
380059	In Case of Emergency numbers storage and easy access on UICC	ICE	S1,C6
330006	Local Charging Zone Requirements	LCZR	S1
340029	Customized Alerting Tone (CAT) service	CAT	S1,C1,C3,C4
340031	Service-Level Interworking for Messaging Services	MESSIW	S1,S2,C3,C1
340044	Multimedia Priority Service	PRIOR	S1,C1,C3,C4
360010	Open Service Access (OSA) Rel-8	OSA8	S1,C5
360032	Paging Permission with Access Control (PPACR)	PPACR	S1,C1
490017	Conformance Test Aspects – Paging Permission with Access Control (PPAC)	PPAC_UEConTest	R5
380063	Charging for multi-phases services	CHRGMPH	S1
380065	Home NodeB / eNodeB	HomeNB	S1,C1,C4
390033	UTRA HNB	HNB	RP,S5
430022	UTRA HNB – UE Conformance Testing	HNB-UEConTest	R5
350015	Lawful Interception in the 3GPP Rel-8	LI8	S3

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390046	**Generic Bootstrapping Architecture Push Function**	GBAPush	S3,C1,C4
34045	**Requirements and Test methods for Wideband Terminals**	RETEM_WB_T	S4
34043	**Extending PSS and MBMS User Services for optimized Mobile TV**	PSS_MBMS_OMTV	S4
400028	**Encoding formats, transport formats and media description signalling for interworking, QoE, and other enhancements to MTSI-MHI**	MTSI_eMHI	S4,C3,C4
340063	**Rel-8 Operations, Administration, Maintenance and Provisioning (OAM&P)**	OAM8	S5,C1,C4,IETF
350016	**Rel-8 Charging Management small Enhancements**	CH8	S5
380024	**Conferencing enhancements for Mp interface**	eMp	C4
320014	**Contact Manager for 3GPP UICC applications**	eUPHBOOK	C6
320001	**(Small) Technical Enhancements and Improvements for Rel-8**	TEI8	All

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UID	Name	Acronym	Resource
0	Release 8 RAN/GERAN Features	-	-
20068	Rel-8 LTE – 3G Long Term Evolution - Evolved Packet System RAN part	LTE	RP,S5
25029	Rel-8 LTE – Terminal Conformance Test Specification	LTE-UEConTest	R5
350040	Rel-8 Improvements of the Radio Interface	RInImp8	RP
25125	Rel-8 Improvements of the Radio Interface - UE Conformance Testing	RInImp-UEConTest	R5
370035	Rel-8 RAN improvements	RANimp	RP
25126	Rel-8 RAN improvements - UE Conformance Testing	RANimp-UEConTest	R5
360008	3.84 Mcps TDD MBSFN Integrated Mobile Broadcast	MBSFN-DOB	R1
440008	Conformance Test Aspects – 3.84 Mcps TDD MBSFN Integrated Mobile Broadcast	MBSFN_IMB_UEConTest	R5
50583	GERAN support for GERAN - 3G Long Term Evolution interworking	GELTE	GP,G1,C1,G3new
55586	U-TDOA Enhancement	GUTEN	GP
50587	GAN Enhancements	GANENH	GP
50591	AoIP (A-interface over IP)	AoIP	GP,S4,C4,C1,C3
51147	New multicarrier BTS class	MCBTS	G1
38001	Support for Additional Navigation Satellite Systems (ANSS) for LCS	ANSS	S1,G2,R2
51149	Conformance testing for the Latency Reductions feature	CTLATRED	G1, G3new
53091	MS conformance testing of changes introduced by WI "Support of Packet-switched Handover for GERAN A/Gb mode"	PSHCT-MStest	G3new
400025	Test - (Small) Technical Enhancements and Improvements for Rel-8	TEI8_Test	R5,G3new

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ID	Name	Acronym	Resource	TR
0	Release 8 SA/CT Studies	-	-	-
7026	Study on Customised Alerting Tone (CAT) Requirements	FS_CAT	S1	22.982
7027	Study on Facilitating Machine to Machine Communication in GSM and UMTS (M2M)	FS_M2M	S1	22.868
31089	Study on Network Composition	FS_NetComp	S1	22.980
320024	Study on Requirements of IMS Multimedia Conferencing	FS_IMSconf	S1	22.948
320025	Study on support of a Public Warning System	FS_PWS	S1	22.968
330016	Study on Paging Permission with Access Control	FS_PPAC	S1	22.908
340033	Study on Non-3GPP access Network Selection Principles (NSP)	FS_N3GtoNSP	S1	22.912
340034	Study on Value Added Services for Short Message Service	FS_VAS4SMS	S1	22.942
340035	Study on Service continuity between mobile and WLAN networks	FS_SMLSWLAN	S1	22.937
370086	Study on Services Alignment and Migration	FS_ServAl	S1	22.983
32085	Study on 3GPP System Architecture Evolution	FS_SAE	S2,S3	-
32086	Stage 2 Interim conclusion for RAN Work to start	FS_SAE	S2	23.882
32087	Stage 2 study on 3GPP architectural development	FS_SAE	S2	23.882
7024	Security study for Inter-access mobility between non-3GPP and 3GPP system	FS_SAE	S3	33.821, 33.822
320028	Study on Stage 2 aspects of IMS Service Brokering	FS_ISB_ST2	S2	23.810
7049	Study on IMS utilizing multicast bearer services	FS_MLTICAST-IMS	S2	23.847
350051	Study on Multimedia Session Continuity	FS_MMSC	S2	23.893
380034	Study on centralized IMS service control	FS_ICS	S2,S1	-
370087	Study on centralized IMS services requirements	FS_ICS-S1	S1	22.892
330012	Study on centralized IMS services control	FS_IMS_CSC	S2	23.892
380078	Study on Architecture of IMS based Customized Alerting Tone (CAT)	FS_CAT-St2	S2	23.872
380085	Study on Home (e)NodeB Security	FS_HNB_Sec	S3	33.820
360015	Study on Transferring of emergency call data – in-band modem solution	eCALLIBMS	S4	26.967
35065	Study on Element Operations Systems Function (EOSF) definition	OAM7-NIM- EOSF	S5	32.819
35074	Study on SA5 MTOSI XML Harmonization	OAM8-NIM-XML	S5	32.818
320006	Study on Common Profile Storage (CPS) Framework of User Data for network services and management	OAM7-CPS	S5	32.808
340036	Study on Management for LTE and SAE	FS_OAM_LTE_SAE	S5	32.816
350004	Study on Charging Aspects of 3GPP System Evolution	FS_SAEcharg	S5	32.820
7048	Study on AS-MRFC media server control protocol	MRFC	C1	24.880
350018	Study on IMS Restoration Procedures	FS_IMS_RP	C4	23.820
360030	Study on IMS Application Server Service Data Descriptions for AS interoperability	FS_IMS_ASIO	C4	29.864
360031	Study on Customized Alerting Tone (CAT) solution for voice and video call in CS domain	FS_CAT_VVC_CS	C4	29.882
380023	Study on InterWorking Function between MAP based and Diameter based interfaces	FS_MAP2Diam	C4	29.805

ID	Name	Acronym	Resource	TR
0	Release 8 RAN/GERAN Studies	-	-	-
370041	Study on Scope of future HSPA Evolution for 1.28 Mcps TDD		R1	25.824
370042	Study on Synchronized E-DCH for UTRA FDD		R1	25.823
360016	Study on Improved network controlled mobility between LTE and 3GPP2/mobile WiMAX radio technologies		R4	36.938
350039	Study on 3G Home NodeB/eNodeB		R4	25.820
50589	Study on A-interface over IP	AINTIP	GP	43.903
50590	Study on Multi-User Reusing-One-Slot	MUROS	GP	45.914
51148	Study on Optimized Transmit Pulse Shape for Downlink EGPRS2-B	WIDER	G1	45.913

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27 Rel-8 Stopped Items

UID	Name	Acronym	Resource	Hyperlink	Notes
0	**Release 8 Features**	-		-	-
390020	**Deleted - Issues for CT4 TR 29.803**	SAES	C4	CP-080068	CP#41 Work stopped and continued in Normative specifications
350029	**Deleted (covered by 380068): Functions and procedures for SAE to support LCS**	SAES-SA-FP_LCS	S2	-	SP#37 stopped
350032	**Deleted (covered by 380064): SAE aspects of Emergency Calls**	SAES-SA-EmCall	S2	-	SP#37 stopped
340019	**Deleted - CT1 aspects of SAES**	SAES-St3	CP,C1	CP-060674	SP#37 stopped
350019	**Deleted - CT1 aspects of SAES**	SAES-St3	C1	CP-060674	SP#37 stopped
340052	**Deleted - Interoperability**	SAES-St3-interop	C1	CP-060674	SP#37 stopped
350020	**Deleted - CT3 aspects of SAES**	SAES-St3	C3	CP-060675	SP#37 stopped
350021	**Deleted - CT4 aspects of SAES**	SAES-St3	C4	CP-060676	SP#37 stopped
340021	**Deleted - UE to EPC NAS signalling (incl. MBMS and QoS aspects)**	SAES-St3-sig	C1	CP-060674	SP#37 stopped
340027	**Deleted - User and Control plane protocols**	SAES-St3-prot	C4	CP-060676	SP#37 stopped
340037	**Deleted - Architecture enhancements for non-3GPP accesses**	SAES-non_3GPP	S2	SP-060926	SP#34 stopped. Replaced by UID_350027 and its children
320030	**Deleted - Stage 2 of architecture for the 3GPP System Architecture Evolution**	SAES-St2	S2	SP-060926	SP#34 stopped. Replaced by UIDs 340018 and 340037. (SP#34 report discussion of SP-060917.)
350023	**Deleted - SA aspects of System Architecture Evolution**	SAES-SA	S2	-	SP#34 stopped
380046	**Deleted - WLAN Offline Charging**	CH8	S5	SP-070750	SP#42 stopped
350036	**Deleted - UMTS 2300 MHz FDD/TDD**	RInImp8-UMTS2300	R4	RP-070128	RP#41 stopped
31067	**Deleted - All-IP Network**	AIPN	S1	SP-050181	SP#38 stopped. 25/07/08 Moved UID_31059 Study on All-IP Network (FS_AIPN/was AIPFS) to Rel-7 out of the stopped Rel-8 Feature UID_31067 Deleted - All-IP Network (AIPN)
340032	**Deleted - was Rel7 - LCS for 3GPP Interworking WLAN**	LCS4_IWLAN	S2	SP-060818	SP-35 stopped
330010	**Deleted - never approved- FBI Phase 2**	FBI2	S2	-	SP#38 stopped
330007	**Deleted -Enhancements to BS30 Bearer service for Videotelephony**	BS30	S1	SP-060484	SP#38 stopped (no support)
370055	**Deleted - IMS Enhancements Rel-8**	IMS8	S1	-	SP#38 stopped
400023	**Deleted - Contact Manager Conformance Test specifications**	eUPHBOOK-Test	C6	CP-080430	CP#47 work stopped/abandoned
53092	**Deleted - MS conformance testing of Support of Conversational Services in A/Gb mode via the PS domain**	SCSAGBCT-MStest	G3new	GP-080330	GP#43 work stopped/abandoned (completion 0%)

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UID	Name	Resource	Hyperlink	Notes	TS_TR
0	**Release 8 Studies**				
350017	**Deleted - Study on Mobility between 3GPP-WLAN Interworking and 3GPP Systems**	S2	SP-070106	SP#41 stopped. Draft TR 23.827 content implemented in TS 23.327.	withdrawn 23.827
370044	**Deleted - equals 340035 -FS on Service continuity between mobile and WLAN networks**	S1	SP-070557	SP#39 stopped	22.937
380068	**Deleted - Study on Evaluation of LCS Control Plane Solution for EPS**	S2	SP-070819	SP#40 spin-off Feature UID_400038 (LCS_CPS_EPS). SP#40 FS stopped	23.891
380080	**Deleted - Study on HS-PDSCH serving cell change enhancements**	R4	RP-071044	RP#39 stopped (no TR produced). Spin-off HS-DSCH Serving Cell Change Enhancements (UID_39003)	none
390032	**Deleted - Study on Dual-Cell HSDPA operation**	R1	RP-080228	RP#43 stopped (draft TR 25.825 v100 withdrawn). Conclusions in RP-090318 (RAN1 findings of the UTRA Multi-Carrier Evolution study). RP#42 New WI approved on Dual-Cell HSDPA operation on adjacent carriers (UID_400052)	withdrawn 25.825 v100

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TSG#65 completed IETF dependency

UID	Name	Acronym	Rapporteur	Notes	TS_TR
531002	(IETF) CT1 aspects of IMS_Corp (RFC 7316)	IMS_Corp	Keith Drage	CP#65 completed	RFC 7316 (was draft-vanelburg-dispatch-private-network-ind)

Ongoing Rel-8 IETF dependency

UID	Name	Acronym	Resource	Rapporteur	Notes	TS_TR
521014	(IETF) CT1 aspects - Stage 3 for ICSRA (draft-ietf-salud-alert-info-urns)	ICSRA	C1-IETF	Roland Jesske	Submitted to IESG for publication	draft-ietf-salud-alert-info-urns
521020	(IETF) Stage 3 CW-IMS (salud-alert-info-urns)	CW_IMS	C1-IETF	Roland Jesske	Submitted to IESG for publication	draft-ietf-salud-alert-info-urns
521025	(IETF) IMS Stage 3 IETF Protocol Alignment (draft-ietf-salud-alert-info-urns)	IMSProtoc2	C1-IETF	Roland Jesske	Submitted to IESG for publication	draft-ietf-salud-alert-info-urns
521026	(IETF) Stage 3 MGCF UUSIW (cuss-sip-uui)	UUSIW	C1-IETF,C3-IETF	Roland Jesske	Submitted to IESG for publication	draft-ietf-cuss-sip-uui
551001	(IETF) Stage 3 MGCF UUSIW (cuss-sip-uui-isdn)	UUSIW	C1-IETF,C3-IETF	Keith Drage	Submitted to IESG for publication	draft-ietf-cuss-sip-uui-isdn

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Annex A:
Change history

Change history		
Date	**Subject/Comment**	**Ver.**
2007-12	Stage 1 frozen Dec 2007 (SA1 exceptions concluded Jun 2008)	
2008-06	Stage 2 frozen Jun 2008 (SA2 exceptions concluded Sep 2008, SA3 LI8 exception concluded Mar 2009)	0.0.1
2008-09	1st draft despatched to TSG#41 for comment	0.0.1
2008-11	Post-TSG#41 updates	0.0.2
2008-12	Stage 3 frozen Dec 2008 (SA4 eCall_Phase2 exception concluded Sep 2009)	0.0.3
2009-01	Post-TSG#42 updates. Draft despatched to TSG#43 for comment	0.0.4
2009-04	Post-TSG#43 updates	0.0.5
2009-04	Post-TSG#43 updates	0.0.6
2009-06	Post-TSG#44 updates	0.0.7
2009-09	Post-TSG#45 updates Completed: UID_320019 CT1 aspects of EVA UID_34042 eCall data transfer Phase 2: Comparison of alternative in-band modem solutions and standardization of one in-band modem solution (SA4) UID_390071 CAT solution for voice and video call in CS domain (CT3) UID_340012 Stage 3 for PRIOR (CT1) UID_400056 Conformance Test Aspects – Improved L2 for uplink (R5) UID_53089 Update TS 51.010 Mobile Station (MS) Conformance Specification for GAN Enhancements (G3new) Stopped/Abandoned/Deleted: UID_53092 MS conformance testing of Support of Conversational Services in A/Gb mode via the PS domain (SCSAGBCT-MStest) G3new Added New WIDs: UID_450052 Create missing specifications for IRP XML definitions (OAM8) S5 UID_450001 eCall Conformance Testing (eCall_MSTest) G3new UID_450023 Conformance Test Aspects - non-modem procedures of eCall sessions in UTRA (R5) UID_450024 Conformance Test Aspects – Continuous Connectivity for packet data users for 1.28 Mcps TDD (R5) UID_450025 Conformance Test Aspects – MIMO for 1.28 Mcps TDD (R5) UID_450022 Conformance Test Aspects – Mobility management based on DSMIPv6 (Dual-Stack Mobile IPv6) R5 UID_450026 Conformance Test Aspects – HS-DSCH Serving Cell Change Enhancements (R5)	0.0.8
2009-12	Post-TSG#46 updates Completed: UID_25029 LTE – Terminal Conformance Test Specifications (LTE-UEConTest) UID_410020 Conformance Test Aspects – Combination of 64QAM and MIMO for HSDPA (FDD) UID_430028 Conformance Test Aspects – Receiver Type3i UID_450052 Create missing specifications for IRP XML definitions (OAM8)	0.0.9
2010-04	Post-TSG#47 updates Completed: UID_360012 IMS System enhancements for corporate network access (IMS_Corp) UID_440011 Conformance Test Aspects – UMTS Earthquake and Tsunami Warning System (ETWS) FDD UID_450026 Conformance Test Aspects – HS-DSCH Serving Cell Change Enhancements UID_440008 Conformance Test Aspects – 3.84 Mcps TDD MBSFN Integrated Mobile Broadcast UID_51149 Conformance testing for the Latency Reductions feature (CTLATRED) Stopped/Abandoned/Deleted: UID_400023 Contact Manager Conformance Test specifications (eUPHBOOK-Test)	0.1.0
2010-06	Post-TSG#48 updates (added attachment Rel-8_Work_Plan_20100621) Completed: UID_51148 Study on Optimized Transmit Pulse Shape for Downlink EGPRS2-B (WIDER) UID_450023 Conformance Test Aspects – non-modem procedures of eCall sessions in UTRA UID_430023 Conformance Test Aspects – UTRA HNB (FDD) UID_420015 Conformance Test Aspects – Dual-Cell HSDPA operation on adjacent carriers UID_430024 Conformance Test Aspects – Enhanced Uplink for CELL_FACH State in FDD UID_450025 Conformance Test Aspects – MIMO for 1.28 Mcps TDD	0.1.1

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2010-09	Post-TSG#49 updates Completed: UID_450022 Conformance Test Aspects – Mobility management based on DSMIPv6 (Dual-Stack Mobile IPv6) UID_460006 Conformance Test Aspects – Mobility between 3GPP WLAN Interworking and 3GPP Systems UID_440010 Conformance Test Aspects – 1.28 Mcps TDD Improved L2 support for high data rates UID_440009 Conformance Test Aspects – Enhanced CELL_FACH State in LCR TDD UID_450024 Conformance Test Aspects – Continuous Connectivity for packet data users for 1.28 Mcps TDD UID_450001 eCall Conformance Testing (by GERAN3new) Added New WIDs: UID_490015 Test interworking of IP Multimedia Services Identity Module (ISIM) terminals with IMS UID_490017 Conformance Test Aspects – Paging Permission with Access Control (PPAC)	0.2.0
2011-01	Post-TSG#50 updates. Completed: UID_50590 Study on Multi-User Reusing-One-Slot (MUROS) UID_420018 Test interworking of LTE Terminals with the USIM UID_490017 Conformance Test Aspects – Paging Permission with Access Control (PPAC) UID_25042 LTE – Terminal Radio Transmission and Reception Conformance Test Specifications	0.2.1
2011-04	Post-TSG#51 updates	0.2.2
2011-06	Post-TSG#52 updates Completed CT6 Testing: UID_490015 Test interworking of IP Multimedia Services Identity Module (ISIM) terminals with MS Added IETF dependencies: UID_521011 (IETF) Stage 3 for Mobility management based on DSMIPv6 SAES UID_521012 (IETF) Stage 3 for Mobility management based on DSMIPv6 SAES UID_521013 (IETF) Stage 3 for Interfaces EPC - non-3GPP IP access SAES UID_521014 (IETF) CT1 aspects - Stage 3 for ICSRA ICSRA UID_521015 (IETF) CT1 aspects - Stage 3 for ICSRA ICSRA UID_521016 (IETF) CT1 aspects - Stage 3 for ICSRA ICSRA UID_521017 (IETF) CT1 aspects - Stage 3 for ICSRA ICSRA UID_521018 (IETF) CT4 aspects - Stage 3 for ICSRA ICSRA UID_521019 (IETF) Stage 3 CCBS_CCNR CCBS_CCNR UID_521020 (IETF) Stage 3 CW-IMS CW_IMS UID_521021 (IETF) Maintenance of TISPAN R2 MAINT_R2 UID_521022 (IETF) IMS initiated and controlled PSS and MBMS User Service IMS_PSS_MBMS_US UID_521023 (IETF) IMS Stage 3 IETF Protocol Alignment IMSProtoc2 UID_521024 (IETF) IMS Stage 3 IETF Protocol Alignment IMSProtoc2 UID_521025 (IETF) IMS Stage 3 IETF Protocol Alignment IMSProtoc2 UID_521026 (IETF) Stage 3 MGCF UUSIW UUSIW UID_521027 (IETF) AS/MRFC Stage 2 and 3 MRFC_TS UID_521028 (IETF) Service Level Tracing in IMS OAM8-Trace UID_521029 (IETF) (Small) Technical Enhancements and Improvements for Rel-8 TEI8	0.2.3
2011-09	Post-TSG#53 updates. Completed IETF dependencies: UID_521012 (IETF) Stage 3 for Mobility management based on DSMIPv6 SAES UID_521022 (IETF) IMS initiated and controlled PSS and MBMS User Service IMS_PSS_MBMS_US	0.2.4
2012-01	Post-TSG#54 Dec 2011 updates. Completed: UID_531003 (IETF) Service Level Tracing in IMS (CT1 dependency) OAM8-Trace_IETF UID_54583 Testing for GERAN support for GERAN - 3G Long Term Evolution interworking GELTE	0.2.5
2012-03	Post-TSG#55 updates	0.2.6
2012-06	Post-TSG#56 updates	0.2.7
2012-09	Post-TSG#57 updates	0.2.8
2013-01	Post-TSG#58 Dec 2012 updates	0.2.9
2013-03	Post-TSG#59 updates	0.2.10
2013-06	Post-TSG#60 updates Completed IETF dependencies: Call Completion on Busy Subscriber (CCBS)/Call Completion on Non-Reachable (CCNR) on IMS UID_521019 (IETF) Stage 3 CCBS_CCNR C1-IETF,C3-IETF RFC 6910 (was draft-ietf-bliss-call-completion)	0.2.11
2013-09	Post-TSG#61 updated IETF dependencies	0.2.12
2013-12	Post-TSG#62 updated IETF dependencies. Completed: UID_521017 (IETF) CT1 aspects - Stage 3 for ICSRA (RFC 7006 was draft-ietf-mmusic-sdp-miscellaneous-caps)	0.3.0
2014-03	Post-TSG#63 updated IETF dependencies	0.3.1
2014-06	Post-TSG#64 updated IETF dependencies. Completed: UID_521016 (IETF) CT1 aspects - Stage 3 for ICSRA (RFC 7195) UID_521018 (IETF) CT4 aspects - Stage 3 for ICSRA (RFC 7254) Stopped: UID_521021 (IETF) Maintenance of TISPAN R2 (avasarala-dispatch-comm-div-notification)	0.3.2
2014-09	Post-TSG#65 updated IETF dependencies. Completed: UID_531002 (IETF) CT1 aspects of IMS_Corp (RFC 7316)	0.3.3

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APPENDIX 2

4G, LTE-Advanced Pro and The Road to 5G

Third Edition

Erik Dahlman

Stefan Parkvall

Johan Sköld



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Preface

LTE has become the most successful mobile wireless broadband technology, serving over one billion users as of the beginning of 2016 and handling a wide range of applications. Compared to the analog voice-only systems 25 years ago, the difference is dramatic. Although LTE is still at a relatively early stage of deployment, the industry is already well on the road toward the next generation of mobile communication, commonly referred to as the fifth generation or 5G. Mobile broadband is, and will continue to be, an important part of future cellular communication, but future wireless networks are to a large extent also about a significantly wider range of use cases and a correspondingly wider range of requirements.

This book describes LTE, developed in 3GPP (*Third-Generation Partnership Project*) and providing true fourth-generation (4G) broadband mobile access, as well as the new radio-access technology 3GPP is currently working on. Together, these two technologies will provide 5G wireless access.

Chapter 1 provides a brief introduction, followed by a description of the standardization process and relevant organizations such as the aforementioned 3GPP and ITU in Chapter 2. The frequency bands available for mobile communication are also be covered, together with a discussion on the process for finding new frequency bands.

An overview of LTE and its evolution is found in Chapter 3. This chapter can be read on its own to get a high-level understanding of LTE and how the LTE specifications evolved over time. To underline the significant increase in capabilities brought by the LTE evolution, 3GPP introduced the names LTE-Advanced and LTE-Advanced Pro for some of the releases.

Chapters 4−11 cover the basic LTE structure, starting with the overall protocol structure in Chapter 4 and followed by a detailed description of the physical layer in Chapters 5−7. The remaining Chapters 8−11, cover connection setup and various transmission procedures, including multi-antenna support.

Some of the major enhancements to LTE introduced over time is covered in Chapters 12−21, including carrier aggregation, unlicensed spectrum, machine-type communication, and device-to-device communication. Relaying, heterogeneous deployments, broadcast/multicast services, and dual connectivity multi-site coordination are other examples of enhancements covered in these chapters.

Radio frequency (RF) requirements, taking into account spectrum flexibility and multi-standard radio equipment, is the topic of Chapter 22.

Chapters 23 and 24 cover the new radio access about to be standardized as part of 5G. A closer look on the requirements and how they are defined is the topic of Chapter 23, while Chapter 24 digs into the technical realization.

Finally, Chapter 25 concludes the book and the discussion on 5G radio access.

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We thank all our colleagues at Ericsson for assisting in this project by helping with contributions to the book, giving suggestions and comments on the content, and taking part in the huge team effort of developing LTE and the next generation of radio access for 5G.

The standardization process involves people from all parts of the world, and we acknowledge the efforts of our colleagues in the wireless industry in general and in 3GPP RAN in particular. Without their work and contributions to the standardization, this book would not have been possible.

Finally, we are immensely grateful to our families for bearing with us and supporting us during the long process of writing this book.

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Abbreviations and Acronyms

3GPP	Third-generation partnership project
AAS	Active antenna systems
ACIR	Adjacent channel interference ratio
ACK	Acknowledgment (in ARQ protocols)
ACLR	Adjacent channel leakage ratio
ACS	Adjacent channel selectivity
AGC	Automatic gain control
AIFS	Arbitration interframe space
AM	Acknowledged mode (RLC configuration)
A-MPR	Additional maximum power reduction
APT	Asia-Pacific telecommunity
ARI	Acknowledgment resource indicator
ARIB	Association of radio industries and businesses
ARQ	Automatic repeat-request
AS	Access stratum
ATC	Ancillary terrestrial component
ATIS	Alliance for telecommunications industry solutions
AWGN	Additive white Gaussian noise
BC	Band category
BCCH	Broadcast control channel
BCH	Broadcast channel
BL	Bandwidth-reduced low complexity
BM-SC	Broadcast multicast service center
BPSK	Binary phase-shift keying
BS	Base station
BW	Bandwidth
CA	Carrier aggregation
CACLR	Cumulative adjacent channel leakage ratio
CC	Component carrier
CCA	Clear channel assessment
CCCH	Common control channel
CCE	Control channel element
CCSA	China Communications Standards Association
CDMA	Code-division multiple access
CE	Coverage enhancement
CEPT	European Conference of Postal and Telecommunications Administrations
CGC	Complementary ground component
CITEL	Inter-American Telecommunication Commission
C-MTC	Critical MTC
CN	Core network
CoMP	Coordinated multi-point transmission/reception
CP	Cyclic prefix
CQI	Channel-quality indicator

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CRC	Cyclic redundancy check
C-RNTI	Cell radio-network temporary identifier
CRS	Cell-specific reference signal
CS	Capability set (for MSR base stations)
CSA	Common subframe allocation
CSG	Closed Subscriber Group
CSI	Channel-state information
CSI-IM	CSI interference measurement
CSI-RS	CSI reference signals
CW	Continuous wave
D2D	Device-to-device
DAI	Downlink assignment index
DCCH	Dedicated control channel
DCH	Dedicated channel
DCI	Downlink control information
DCF	Distributed coordination function
DFS	Dynamic frequency selection
DFT	Discrete Fourier transform
DFTS-OFDM	DFT-spread OFDM (DFT-precoded OFDM)
DIFS	Distributed interframe space
DL	Downlink
DL-SCH	Downlink shared channel
DM-RS	Demodulation reference signal
DMTC	DRS measurements timing configuration
DRS	Discovery reference signal
DRX	Discontinuous reception
DTCH	Dedicated traffic channel
DTX	Discontinuous transmission
DwPTS	Downlink part of the special subframe (for TDD operation)
ECCE	Enhanced control channel element
EDCA	Enhanced distributed channel access
EDGE	Enhanced data rates for GSM evolution; enhanced data rates for global evolution
eIMTA	Enhanced Interference mitigation and traffic adaptation
EIRP	Effective isotropic radiated power
EIS	Equivalent isotropic sensitivity
EMBB	Enhanced MBB
eMTC	Enhanced machine-type communication
eNB	eNodeB
eNodeB	E-UTRAN NodeB
EPC	Evolved packet core
EPDCCH	Enhanced physical downlink control channel
EPS	Evolved packet system
EREG	Enhanced resource-element group
ETSI	European Telecommunications Standards Institute
E-UTRA	Evolved UTRA

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E-UTRAN	Evolved UTRAN
EVM	Error vector magnitude
FCC	Federal Communications Commission
FDD	Frequency division duplex
FD-MIMO	Full-dimension multiple input−multiple output
FDMA	Frequency-division multiple access
FEC	Forward error correction
FeICIC	Further enhanced intercell interference coordination
FFT	Fast Fourier transform
FPLMTS	Future public land mobile telecommunications systems
FSTD	Frequency-switched transmit diversity
GB	Guard band
GERAN	GSM/EDGE radio access network
GP	Guard period (for TDD operation)
GPRS	General packet radio services
GPS	Global positioning system
GSM	Global system for mobile communications
GSMA	GSM Association
HARQ	Hybrid ARQ
HII	High-interference indicator
HSFN	Hypersystem frame number
HSPA	High-speed packet access
HSS	Home subscriber server
ICIC	Intercell interference coordination
ICNIRP	International Commission on Non-Ionizing Radiation Protection
ICS	In-channel selectivity
IEEE	Institute of Electrical and Electronics Engineers
IFFT	Inverse fast Fourier transform
IMT-2000	International Mobile Telecommunications 2000 (ITU's name for the family of 3G standards)
IMT-2020	International Mobile Telecommunications 2020 (ITU's name for the family of 5G standards)
IMT-Advanced	International Mobile Telecommunications Advanced (ITU's name for the family of 4G standards).
IOT	Internet of things
IP	Internet protocol
IR	Incremental redundancy
IRC	Interference rejection combining
ITU	International Telecommunications Union
ITU-R	International Telecommunications Union—Radio communications sector
KPI	Key performance indicator
LAA	License-assisted access
LAN	Local area network
LBT	Listen before talk
LCID	Logical channel identifier
LDPC	Low-density parity check code
LTE	Long-term evolution

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MAC	Medium access control
MAN	Metropolitan area network
MBB	Mobile broadband
MBMS	Multimedia broadcast−multicast service
MBMS-GW	MBMS gateway
MB-MSR	Multi-band multi-standard radio (base station)
MBSFN	Multicast−broadcast single-frequency network
MC	Multi-carrier
MCCH	MBMS control channel
MCE	MBMS coordination entity
MCG	Master cell group
MCH	Multicast channel
MCS	Modulation and coding scheme
METIS	Mobile and wireless communications Enablers for Twenty−twenty (2020) Information Society
MIB	Master information block
MIMO	Multiple input−multiple output
MLSE	Maximum-likelihood sequence estimation
MME	Mobility management entity
M-MTC	Massive MTC
MPDCCH	MTC physical downlink control channel
MPR	Maximum power reduction
MSA	MCH subframe allocation
MSI	MCH scheduling information
MSP	MCH scheduling period
MSR	Multi-standard radio
MSS	Mobile satellite service
MTC	Machine-type communication
MTCH	MBMS traffic channel
MU-MIMO	Multi-user MIMO
NAK	Negative acknowledgment (in ARQ protocols)
NAICS	Network-assisted interference cancelation and suppression
NAS	Non-access stratum (a functional layer between the core network and the terminal that supports signaling)
NB-IoT	Narrow-band internet of things
NDI	New data indicator
NGMN	Next-generation mobile networks
NMT	Nordisk MobilTelefon (Nordic Mobile Telephony)
NodeB	A logical node handling transmission/reception in multiple cells; commonly, but not necessarily, corresponding to a base station
NPDCCH	Narrowband PDCCH
NPDSCH	Narrowband PDSCH
NS	Network signaling
OCC	Orthogonal cover code
OFDM	Orthogonal frequency-division multiplexing

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OI	Overload indicator
OOB	Out-of-band (emissions)
OSDD	OTA sensitivity direction declarations
OTA	Over the air
PA	Power amplifier
PAPR	Peak-to-average power ratio
PAR	Peak-to-average ratio (same as PAPR)
PBCH	Physical broadcast channel
PCCH	Paging control channel
PCFICH	Physical control format indicator channel
PCG	Project Coordination Group (in 3GPP)
PCH	Paging channel
PCID	Physical cell identity
PCRF	Policy and charging rules function
PDC	Personal digital cellular
PDCCH	Physical downlink control channel
PDCP	Packet data convergence protocol
PDSCH	Physical downlink shared channel
PDN	Packet data network
PDU	Protocol data unit
P-GW	Packet-data network gateway (also PDN-GW)
PHICH	Physical hybrid-ARQ indicator channel
PHS	Personal handy-phone system
PHY	Physical layer
PMCH	Physical multicast channel
PMI	Precoding-matrix indicator
PRACH	Physical random access channel
PRB	Physical resource block
P-RNTI	Paging RNTI
ProSe	Proximity services
PSBCH	Physical sidelink broadcast channel
PSCCH	Physical sidelink control channel
PSD	Power spectral density
PSDCH	Physical sidelink discovery channel
P-SLSS	Primary sidelink synchronization signal
PSM	Power-saving mode
PSS	Primary synchronization signal
PSSCH	Physical sidelink shared channel
PSTN	Public switched telephone networks
PUCCH	Physical uplink control channel
PUSCH	Physical uplink shared channel
QAM	Quadrature amplitude modulation
QCL	Quasi-colocation
QoS	Quality-of-service
QPP	Quadrature permutation polynomial

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QPSK	Quadrature phase-shift keying
RAB	Radio-access bearer
RACH	Random-access channel
RAN	Radio-access network
RA-RNTI	Random-access RNTI
RAT	Radio-access technology
RB	Resource block
RE	Resource element
REG	Resource-element group
RF	Radio frequency
RI	Rank indicator
RLAN	Radio local area networks
RLC	Radio link control
RNTI	Radio-network temporary identifier
RNTP	Relative narrowband transmit power
RoAoA	Range of angle of arrival
ROHC	Robust header compression
R-PDCCH	Relay physical downlink control channel
RRC	Radio-resource control
RRM	Radio resource management
RS	Reference symbol
RSPC	Radio interface specifications
RSRP	Reference signal received power
RSRQ	Reference signal received quality
RV	Redundancy version
RX	Receiver
S1	Interface between eNodeB and the evolved packet core
S1-c	Control-plane part of S1
S1-u	User-plane part of S1
SAE	System architecture evolution
SBCCH	Sidelink broadcast control channel
SCG	Secondary cell group
SCI	Sidelink control information
SC-PTM	Single-cell point to multipoint
SDMA	Spatial division multiple access
SDO	Standards developing organization
SDU	Service data unit
SEM	Spectrum emissions mask
SF	Subframe
SFBC	Space−frequency block coding
SFN	Single-frequency network (in general, see also MBSFN); system frame number (in 3GPP).
S-GW	Serving gateway
SI	System information message
SIB	System information block
SIB1-BR	SIB1 bandwidth reduced

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SIC	Successive interference combining
SIFS	Short interframe space
SIM	Subscriber identity module
SINR	Signal-to-interference-and-noise ratio
SIR	Signal-to-interference ratio
SI-RNTI	System information RNTI
SL-BCH	Sidelink broadcast channel
SL-DCH	Sidelink discovery channel
SLI	Sidelink identity
SL-SCH	Sidelink shared channel
SLSS	Sidelink synchronization signal
SNR	Signal-to-noise ratio
SORTD	Spatial orthogonal-resource transmit diversity
SR	Scheduling request
SRS	Sounding reference signal
S-SLSS	Secondary sidelink synchronization signal
SSS	Secondary synchronization signal
STCH	Sidelink traffic channel
STBC	Space−time block coding
STC	Space−time coding
STTD	Space−time transmit diversity
SU-MIMO	Single-user MIMO
TAB	Transceiver array boundary
TCP	Transmission control protocol
TC-RNTI	Temporary C-RNTI
TDD	Time-division duplex
TDMA	Time-division multiple access
TD-SCDMA	Time-division-synchronous code-division multiple access
TF	Transport format
TPC	Transmit power control
TR	Technical report
TRP	Time repetition pattern; transmission reception point
TRPI	Time repetition pattern index
TS	Technical specification
TSDSI	Telecommunications Standards Development Society, India
TSG	Technical Specification Group
TTA	Telecommunications Technology Association
TTC	Telecommunications Technology Committee
TTI	Transmission time interval
TX	Transmitter
TXOP	Transmission opportunity
UCI	Uplink control information
UE	User equipment (the 3GPP name for the mobile terminal)
UEM	Unwanted emissions mask
UL	Uplink

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UL-SCH	Uplink shared channel
UM	Unacknowledged mode (RLC configuration)
UMTS	Universal mobile telecommunications system
UpPTS	Uplink part of the special subframe, for TDD operation
URLLC	Ultra-reliable low-latency communication
UTRA	Universal terrestrial radio access
UTRAN	Universal terrestrial radio-access network
VoIP	Voice-over-IP
VRB	Virtual resource block
WARC	World Administrative Radio Congress
WAS	Wireless access systems
WCDMA	Wideband code-division multiple access
WCS	Wireless communications service
WG	Working group
WiMAX	Worldwide interoperability for microwave access
WLAN	Wireless local area network
WMAN	Wireless metropolitan area network
WP5D	Working Party 5D
WRC	World Radio communication Conference
X2	Interface between eNodeBs.
ZC	Zadoff-Chu

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CHAPTER

1 INTRODUCTION

Mobile communication has become an everyday commodity. In the last decades, it has evolved from being an expensive technology for a few selected individuals to today's ubiquitous systems used by a majority of the world's population.

The world has witnessed four generations of mobile-communication systems, each associated with a specific set of technologies and a specific set of supported use cases, see Figure 1.1. The generations and the steps taken between them are used here as background to introduce the content of this book. The rest of the book focuses on the latest generations that are deployed and under consideration, which are fourth generation (4G) and fifth generation (5G).

1.1 1G AND 2G—VOICE-CENTRIC TECHNOLOGIES

The first-generation (1G) systems were the analog voice-only mobile-telephony systems of the 1980s, often available on a national basis with limited or no international roaming. 1G systems include NMT, AMPS, and TACS. Mobile communication was available before the 1G systems, but typically on a small scale and targeting a very selected group of people.

The second-generation (2G) systems appeared in the early 1990s. Examples of 2G technologies include the European-originated GSM technology, the American IS-95/CDMA and IS-136/TDMA technologies, and the Japanese PDC technology. The 2G systems were

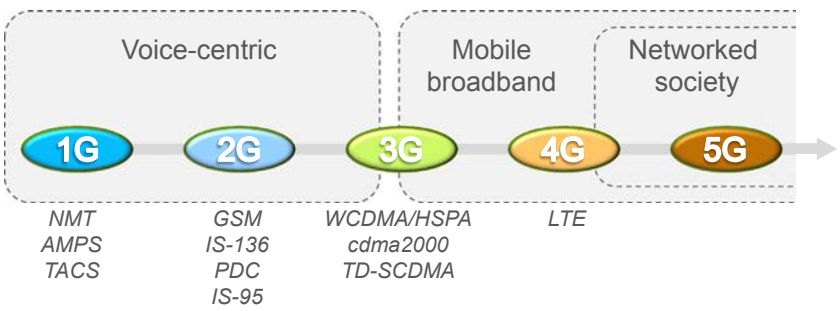


FIGURE 1.1

Cellular generations.

4G, LTE-Advanced Pro and The Road to 5G. http://dx.doi.org/10.1016/B978-0-12-804575-6.00001-7
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still voice centric, but thanks to being all-digital provided a significantly higher capacity than the previous 1G systems. Over the years, some of these early technologies have been extended to also support (primitive) packet data services. These extensions are sometimes referred to as 2.5G to indicate that they have their roots in the 2G technologies but have a significantly wider range of capabilities than the original technologies. EDGE is a well-known example of a 2.5G technology. GSM/EDGE is still in widespread use in smartphones but is also frequently used for some types of machine-type communication such as alarms, payment systems, and real-estate monitoring.

1.2 3G AND 4G—MOBILE BROADBAND

During the 1990s, the need to support not only voice but also data services had started to emerge, driving the need for a new generation of cellular technologies going beyond voice-only services. At this time in the late 1990s, 2G GSM, despite being developed within Europe, had already become a de facto global standard. To ensure global reach also for 3G technologies it was realized that the 3G development had to be carried out on a global basis. To facilitate this, the *Third-Generation Partnership Project* (3GPP) was formed to develop the 3G WCDMA and TD-SCDMA technologies, see Chapter 2 for further details. Shortly afterward, the parallel organization 3GPP2 was formed to develop the competing 3G cdma2000 technology, an evolution of the 2G IS-95 technology.

The first release of WCDMA (release 99[1]) was finalized in 1999. It included circuit-switched voice and video services, and data services over both packet-switched and circuit-switched bearers.

The first major enhancements to WCDMA came with the introduction of *High Speed Downlink Packet Access* (HSDPA) in release 5 followed by *Enhanced Uplink in release 6,* collectively known as *High Speed Packet Access (HSPA)* [61]. HSPA, sometimes referred to as 3.5G, allowed for a "true" mobile-broadband experience with data rates of several Mbit/s while maintaining the compatibility with the original 3G specifications. With the support for mobile broadband, the foundation for the rapid uptake of smart phones such as the iPhone and the wide range of Android devices were in place. Without the wide availability of mobile broadband for the mass market, the uptake of smart phone usage would have been significantly slower and their usability severely limited. At the same time, the massive use of smart phones and a wide range of packet-data-based services such as social networking, video, gaming, and online shopping translates into requirements on increased capacity and improved spectral efficiency. Users getting more and more used to mobile services also raise their expectations in terms of experiencing increased data rates and reduced latency. These needs

[1]For historical reasons, the first 3GPP release is named after the year it was frozen (1999), while the following releases are numbered 4, 5, 6, and so on.

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were partly handled by a continuous, and still ongoing, evolution of HSPA, but it also triggered the discussions on 4G technology in the mid-2000s.

The 4G LTE technology was from the beginning developed for packet-data support and has no support for circuit-switched voice, unlike the 3G where HSPA was an "add-on" to provide high-performance packet data on top of an existing technology. Mobile broadband services were the focus, with tough requirements on high data rates, low latency, and high capacity. Spectrum flexibility and maximum commonality between FDD and TDD solutions were other important requirements. A new core network architecture was also developed, known as *Enhanced Packet Core* (EPC), to replace the architecture used by GSM and WCDMA/HSPA. The first version of LTE was part of release 8 of the 3GPP specifications and the first commercial deployment took place in late 2009, followed by a rapid and worldwide deployment of LTE networks.

One significant aspect of LTE is the worldwide acceptance of a single technology, unlike previous generations for which there has been several competing technologies, see Figure 1.2. Having a single, universally accepted technology accelerates development of new services and reduces the cost for both users and network operators.

Since its commercial introduction in 2009, LTE has evolved considerably in terms of data rates, capacity, spectrum and deployment flexibility, and application range. From macro-centric deployments with peak data rates of 300 Mbit/s in 20 MHz of contiguous, licensed spectrum, the evolution of LTE can in release 13 support multi-Gbit/s peak data rates through improvements in terms of antenna technologies, multisite coordination, exploitation of fragmented as well as unlicensed spectrum and densified deployments just to mention a few areas. The evolution of LTE has also considerably widened the use cases beyond mobile broadband by, for example, improving support for massive machine-type communication and introducing direct device-to-device communication.

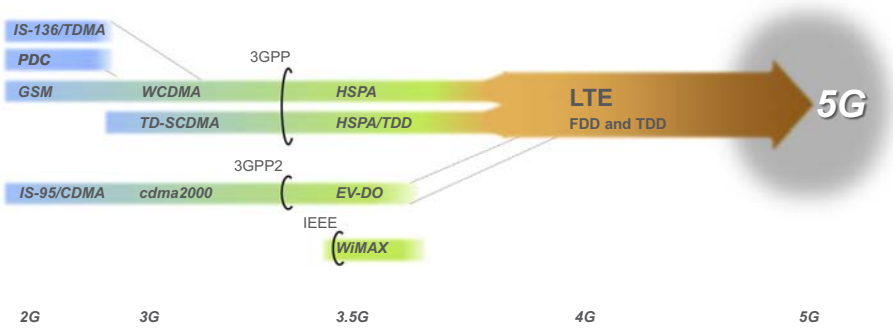


FIGURE 1.2

Convergence of wireless technologies.

1.3 5G—BEYOND MOBILE BROADBAND—NETWORKED SOCIETY

Although LTE is still at a relatively early stage of deployment, the industry is already well on the road towards the next generation of mobile communication, commonly referred to as fifth generation or 5G.

Mobile broadband is, and will continue to be, an important part of future cellular communication, but future wireless networks are to a large extent also about a significantly wider range of use cases. In essence, 5G should be seen as a platform enabling wireless connectivity to all kinds of services, existing as well as future not-yet-known services and thereby taking wireless networks beyond mobile broadband. Connectivity will be provided essentially anywhere, anytime to anyone and anything. The term *networked society* is sometimes used when referring to such a scenario where connectivity goes beyond mobile smartphones, having a profound impact on the society.

Massive machine-type communication, exemplified by sensor networks in agriculture, traffic monitoring, and remote management of utility equipment in buildings, is one type of non-mobile-broadband applications. These applications primarily put requirements on very low device power consumption while the data rates and amounts of data per device are modest. Many of these applications can already be supported by the LTE evolution.

Another example of non-mobile-broadband applications are *ultra-reliable and low-latency communications* (URLLC), also known as critical machine-type communication. Examples hereof are industrial automation, where latency and reliability requirements are very strict. Vehicle-to-vehicle communication for traffic safety is another example.

Nevertheless, mobile broadband will remain an important use case and the amount of traffic in wireless networks is increasing rapidly, as is the user expectation on data rates, availability, and latency. These enhanced requirements also need to be addressed by 5G wireless networks.

Increasing the capacity can be done in three ways: improved spectral efficiency, densified deployments, and an increased amount of spectrum. The spectral efficiency of LTE is already high and although improvements can be made, it is not sufficient to meet the traffic increase. Network densification is also expected to happen, not only from a capacity perspective, but also from a high-data-rate-availability point of view, and can provide a considerable increase in capacity although at the cost of finding additional antenna sites. Increasing the amount of spectrum will help, but unfortunately, the amount of not-yet-exploited spectrum in typical cellular bands, up to about 3 GHz, is limited and fairly small. Therefore, the attention has increased to somewhat higher frequency bands, both in the 3−6 GHz range but also in the range 6−30 GHz and beyond for which LTE is not designed, as a way to access additional spectrum. However, as the propagation conditions in higher frequency bands are less favorable for wide-area coverage and require more advanced antenna techniques such as beamforming, these bands can mainly serve as a complement to the existing, lower-frequency bands.

As seen from the discussion earlier, the range of requirements for 5G wireless networks are very wide, calling for a high degree of network flexibility. Furthermore, as many future

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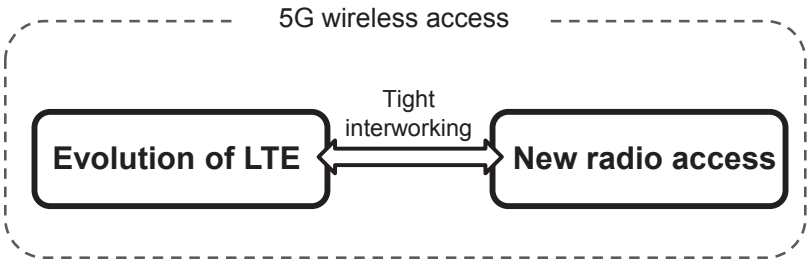


FIGURE 1.3

5G consisting of LTE evolution and a new radio-access technology.

applications cannot be foreseen at the moment, future-proofness is a key requirement. Some of these requirements can be handled by the LTE evolution, but not all, calling for a new radio-access technology to complement LTE evolution as illustrated in Figure 1.3.

1.4 OUTLINE

The remainder of this book describes the technologies for the 4G and 5G wireless networks.

Chapter 2 describes the standardization process and relevant organizations such as the aforementioned 3GPP and ITU. The frequency bands available for mobile communication is also be covered, together with a discussion on the process for finding new frequency bands.

An overview of LTE and its evolution is found in Chapter 3. This chapter can be read on its own to get a high-level understanding of LTE and how the LTE specifications evolved over time. To underline the significant increase in capabilities brought by the LTE evolution, 3GPP introduced the names LTE-Advanced and LTE-Advanced Pro for some of the releases.

Chapters 4–11 cover the basic LTE structure, starting with the overall protocol structure in Chapter 4 and followed by a detailed description of the physical layer in Chapters 5–7. The remaining Chapters 8–11, cover connection setup and various transmission procedures, including multi-antenna support.

Some of the major enhancements to LTE introduced over time is covered in Chapters 12–21, including carrier aggregation, unlicensed spectrum, machine-type communication, and device-to-device communication. Relaying, heterogeneous deployments, broadcast/multicast services, dual connectivity multisite coordination are other examples of enhancements covered in these chapters.

RF requirements, taking into account spectrum flexibility and multi-standard radio equipment, is the topic of Chapter 22.

Chapters 23 and 24 cover the new radio access about to be standardized as part of 5G. A closer look on the requirements and how they are defined is the topic of Chapter 23, while Chapter 24 digs into the technical realization.

Finally, Chapter 25 concludes the book and the discussion on 5G radio access.

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CHAPTER

SPECTRUM REGULATION AND STANDARDIZATION FROM 3G TO 5G

2

The research, development, implementation, and deployment of mobile-communication systems are performed by the wireless industry in a coordinated international effort by which common industry specifications that define the complete mobile-communication system are agreed. The work depends also heavily on global and regional regulation, in particular for the spectrum use that is an essential component for all radio technologies. This chapter describes the regulatory and standardization environment that has been, and continues to be, essential for defining the mobile-communication systems.

2.1 OVERVIEW OF STANDARDIZATION AND REGULATION

There are a number of organizations involved in creating technical specifications and standards as well as regulation in the mobile-communications area. These can loosely be divided into three groups: standards developing organizations, regulatory bodies and administrations, and industry forums.

Standards developing organizations (SDOs) develop and agree on technical standards for mobile-communications systems, in order to make it possible for the industry to produce and deploy standardized products and provide interoperability between those products. Most components of mobile-communication systems, including base stations and mobile devices, are standardized to some extent. There is also a certain degree of freedom to provide proprietary solutions in products, but the communications protocols rely on detailed standards for obvious reasons. SDOs are usually nonprofit industry organizations and not government controlled. They often write standards within a certain area under mandate from governments(s), however, giving the standards a higher status.

There are nationals SDOs, but due to the global spread of communications products, most SDOs are regional and also cooperate on a global level. As an example, the technical specifications of GSM, WCDMA/HSPA, and LTE are all created by 3GPP (Third Generation Partnership Project) which is a global organization from seven regional and national SDOs in Europe (ETSI), Japan (ARIB and TTC), United States (ATIS), China (CCSA), Korea (TTA), and India (TSDSI). SDOs tend to have a varying degree of transparency, but 3GPP is fully transparent with all technical specifications, meeting documents, reports, and email reflectors publically available without charge even for nonmembers.

4G, LTE-Advanced Pro and The Road to 5G. http://dx.doi.org/10.1016/B978-0-12-804575-6.00002-9
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Regulatory bodies and administrations are government-led organizations that set regulatory and legal requirements for selling, deploying, and operating mobile systems and other telecommunication products. One of their most important tasks is to control spectrum use and to set licensing conditions for the mobile operators that are awarded licenses to use parts of the radio frequency (RF) spectrum for mobile operations. Another task is to regulate "placing on the market" of products through regulatory certification, by ensuring that devices, base stations, and other equipment is type approved and shown to meet the relevant regulation.

Spectrum regulation is handled both on a national level by national administrations, but also through regional bodies in Europe (CEPT/ECC), Americas (CITEL), and Asia (APT). On a global level, the spectrum regulation is handled by the *International Telecommunications Union* (ITU). The regulatory bodies regulate what services the spectrum is to be used for and also set more detailed requirements such as limits on unwanted emissions from transmitters. They are also indirectly involved in setting requirements on the product standards through regulation. The involvement of ITU in setting requirements on the technologies for mobile communication is explained further in Section 2.2.

Industry forums are industry lead groups promoting and lobbying for specific technologies or other interests. In the mobile industry, these are often led by operators, but there are also vendors creating industry forums. An example of such a group is GSMA (GSM association) which is promoting mobile-communication technologies based on GSM, WCDMA, and LTE. Other examples of industry forums are *Next-Generation Mobile Networks* (NGMN) which is an operator group defining requirements on the evolution of mobile systems and *5G Americas*, which is a regional industry forum that has evolved from its predecessor 4G Americas.

Figure 2.1 illustrates the relation between different organizations involved in setting regulatory and technical conditions for mobile systems. The figure also shows the mobile industry view, where vendors develop products, place them on the market and negotiate with operators who procure and deploy mobile systems. This process relies heavily on the technical standards published by the SDOs, while placing products on the market also relies on certification of products on a regional or national level. Note that in Europe, the regional SDO (ETSI) is producing the so-called *Harmonized standards* used for product certification (through the "CE" mark), based on a mandate from the regulators. These standards are used for certification in many countries also outside of Europe.

2.2 ITU-R ACTIVITIES FROM 3G TO 5G

2.2.1 THE ROLE OF ITU-R

ITU-R is the radio communications sector of the ITU. ITU-R is responsible for ensuring efficient and economical use of the RF spectrum by all radio communication services. The different subgroups and working parties produce reports and recommendations that analyze and define the conditions for using the RF spectrum. The goal of ITU-R is to "ensure interference-free operations of radio communication systems," by implementing the *Radio*

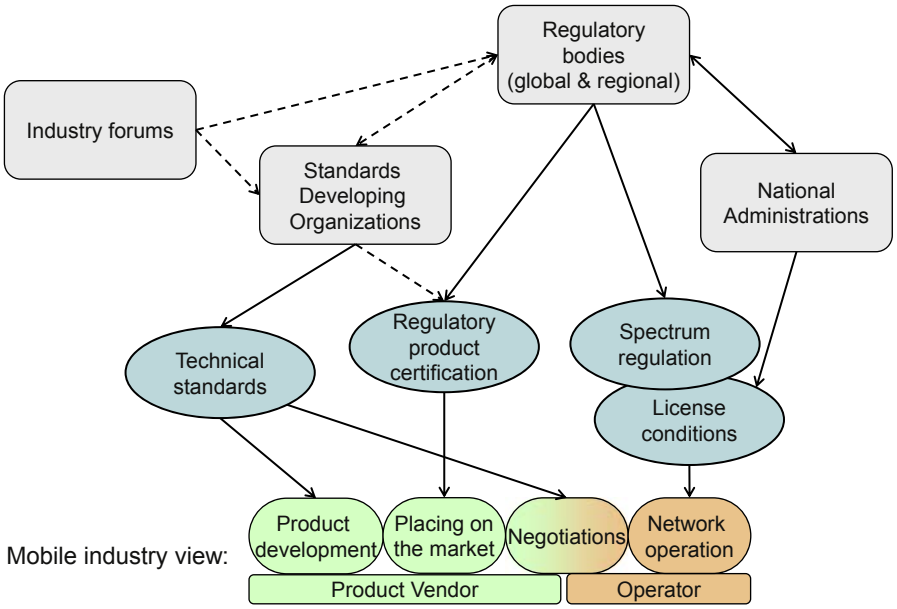


FIGURE 2.1

Simplified view of relation between regulatory bodies, standards developing organizations, industry forums, and the mobile industry.

Regulations and regional agreements. The Radio Regulations is an international binding treaty for how RF spectrum is used. A *World Radiocommunication Conference* (WRC) is held every 3−4 years. At WRC the Radio Regulations are revised and updated and in that way provide revised and updated use of RF spectrum across the world.

While the technical specification of mobile-communication technologies, such as LTE and WCDMA/HSPA is done within 3GPP, there is a responsibility for ITU-R in the process of turning the technologies into global standards, in particular for countries that are not covered by the SDOs are partners in 3GPP. ITU-R defines spectrum for different services in the RF spectrum, including mobile services and some of that spectrum is particularly identified for the so-called International Mobile Telecommunications (IMT) systems. Within ITU-R, it is *Working Party 5D* (WP5D) that has the responsibility for the overall radio system aspects of IMT systems, which, in practice, corresponds to the different generations of mobile-communication systems from 3G and onward. WP5D has the prime responsibility within ITU-R for issues related to the terrestrial component of IMT, including technical, operational, and spectrum-related issues.

WP5D does not create the actual technical specifications for IMT, but has kept the roles of defining IMT in cooperation with the regional standardization bodies and maintaining a set of recommendations and reports for IMT, including a set of *Radio Interface Specifications* (RSPC). These recommendations contain "families" of *radio interface technologies*

(RITs)—all included on an equal basis. For each radio interface, the RSPC contains an overview of that radio interface, followed by a list of references to the detailed specifications. The actual specifications are maintained by the individual SDO, and the RSPC provides references to the specifications transposed and maintained by each SDO. The following RSPC recommendations are in existence or planned:

- For IMT-2000: ITU-R Recommendation M.1457 [1] containing six different RITs including the 3G technologies.
- For IMT-Advanced: ITU-R Recommendation M.2012 [4] containing two different RITs where the most important is 4G/LTE.
- For IMT-2020 (5G): A new ITU-R Recommendation, planned to be developed in 2019−2020.

Each RSPC is continuously updated to reflect new development in the referenced detailed specifications, such as the 3GPP specifications for WCDMA and LTE. Input to the updates is provided by the SDOs and the Partnership Projects, nowadays primarily 3GPP.

2.2.2 IMT-2000 AND IMT-ADVANCED

Work on what corresponds to third generation of mobile communication started in the ITU-R already in the 1980s. First referred to as *Future Public Land Mobile Systems* (FPLMTS) it was later renamed IMT-2000. In the late 1990s, the work in ITU-R coincided with the work in different SDOs across the world to develop a new generation of mobile systems. An RSPC for IMT-2000 was first published in 2000 and included WCDMA from 3GPP as one of the RITs.

The next step for ITU-R was to initiate work on IMT-Advanced, the term used for systems that include new radio interfaces supporting new capabilities of systems beyond IMT-2000. The new capabilities were defined in a framework recommendation published by the ITU-R [2] and were demonstrated with the "van diagram" shown in Figure 2.2. The step into IMT-Advanced capabilities by ITU-R coincided with the step into 4G—the next generation of mobile technologies after 3G.

An evolution of LTE as developed by 3GPP was submitted as one candidate technology for IMT-Advanced. While actually being a new release (release 10) of the LTE specifications and thus an integral part of the continuous evolution of LTE, the candidate was named LTE-Advanced for the purpose of ITU-R submission. 3GPP also set up its own set of technical requirements for LTE-Advanced, with the ITU-R requirements as a basis.

The target of the ITU-R process is always harmonization of the candidates through consensus building. ITU-R determined that two technologies would be included in the first release of IMT-Advanced, those two being LTE and WirelessMAN-Advanced [3] based on the IEEE 802.16m specification. The two can be viewed as the "family" of IMT-Advanced technologies as shown in Figure 2.3. Note that, among these two technologies, LTE has emerged as the dominating 4G technology.

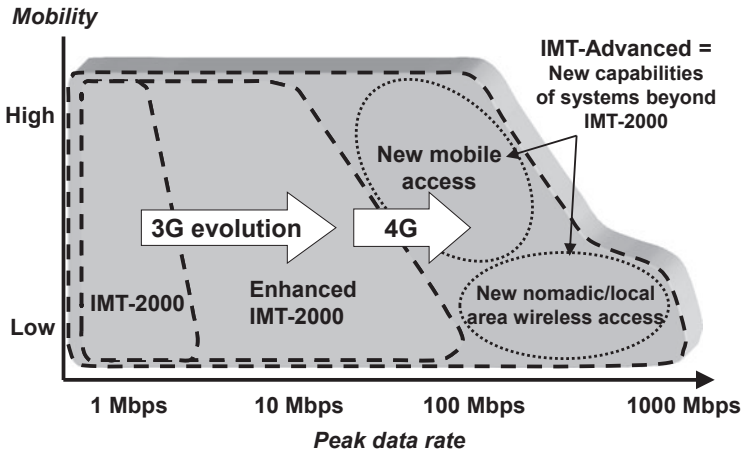


FIGURE 2.2

Illustration of capabilities of IMT-2000 and IMT-Advanced, based on the framework described in ITU-R Recommendation M.1645 [2].

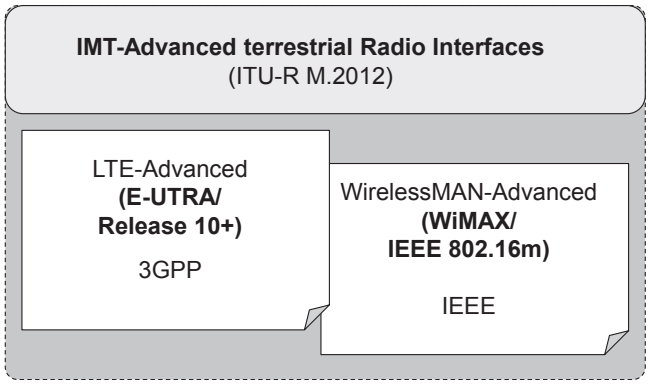


FIGURE 2.3

Radio interface technologies in IMT-Advanced.

2.2.3 IMT-2020

During 2012 to 2015, ITU-R WP5D set the stage for the next generation of IMT systems, named IMT-2020. It is to be a further development of the terrestrial component of IMT beyond the year 2020 and, in practice, corresponds to what is more commonly referred to as "5G," the fifth generation of mobile systems. The framework and objective for IMT-2020 is outlined in ITU-R Recommendation M.2083 [63], often referred to as the "Vision" recommendation. The recommendation provides the first step for defining the new developments of

IMT, looking at the future roles of IMT and how it can serve society, looking at market, user and technology trends, and spectrum implications. The user trends for IMT together with the future role and market leads to a set of usage scenarios envisioned for both human-centric and machine-centric communication. The usage scenarios identified are *Enhanced Mobile Broadband* (eMBB), *Ultra-Reliable and Low Latency Communications* (URLLC), and *Massive Machine-Type Communications* (MTC).

The need for an enhanced MBB experience, together with the new and broadened usage scenarios, leads to an extended set of capabilities for IMT-2020. The Vision recommendation [63] gives a first high-level guidance for IMT-2020 requirements by introducing a set of key capabilities, with indicative target numbers. The key capabilities and the related usage scenarios are further discussed in Chapter 23.

As a parallel activity, ITU-R WP5D produced a report on "Future technology trends of terrestrial IMT systems" [64], with focus on the time period 2015−2020. It covers trends of future IMT technology aspects by looking at the technical and operational characteristics of IMT systems and how they are improved with the evolution of IMT technologies. In this way, the report on technology trends relate to LTE release 13 and beyond, while the vision recommendation looks further ahead and beyond 2020. A report studying operation in frequencies above 6 GHz was also produced. Chapter 24 discusses some of the technology components considered for the new 5G radio access.

After WRC-15, ITU-R WP5D is in 2016 initiating the process of setting requirements and defining evaluation methodologies for IMT-2020 systems. The process will continue until mid-2017, as shown in Figure 2.4. In a parallel effort, a template for submitting an evaluation

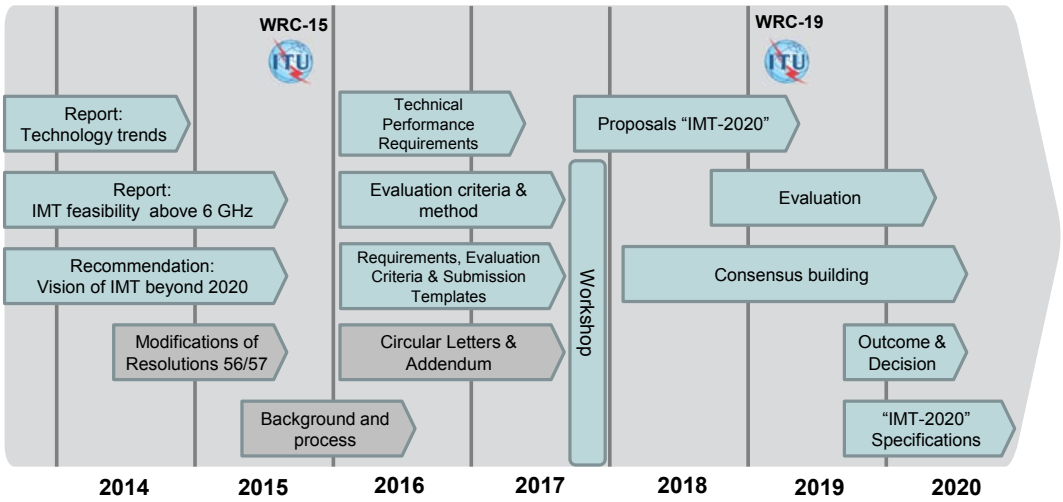


FIGURE 2.4

Work plan for IMT-2020 in ITU-R WP5D [4].